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From *Enkyklios Paideia* to Wikipedia:
Genealogies of Knowledge in French Encyclopedism

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**Abstract**

From *Enkyklios Paideia* to Wikipedia:
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This dissertation presents a genealogical approach to the understanding and conceptualization of encyclopedic knowledge in the French tradition. Critical analysis of key encyclopedic moments in the works of Vincent de Beauvais, Charles Sorel, and Denis Diderot reveals a penchant to retool knowledge in order that it might be managed and controlled. Encyclopedias however did not initially concern themselves with regulating knowledge, but rather entailed formative dimensions used for the cultivation of self-knowledge. In the *Speculum Maius*, this paradigm gave way to new systems of learning that reoriented encyclopedism away from the contemplative, towards imposed systems of understanding. *The Science Universelle* and *Encyclopédie* continued this effort through the development of systematic presentations of knowledge characterized by dialogue with contemporary research and theory. The propensity to refashion encyclopedic knowledge continues to inform epistemological and structural evolution in encyclopedias — most distinctly, through platforms based online such as Wikipedia, whose operating paradigm privileges efficiency and being up-to-date over and above the framing of its contents. Not only does Wikipedia put into question humanity's relationship with digitally mediated encyclopedic knowledge, it redefines it. Such concerns are of fundamental significance for contemporary society captivated by questions of information systemization and use. This interdisciplinary study, which is at the crossroads of French Literature, philosophy, history, critical theory, and the digital humanities, enabling it to offer a more nuanced, longitudinal approach to the study of encyclopedism.

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If not for Glenn Fetzer, this dissertation would have been a lost opportunity.

**CONTENTS**

**Figures**

# Introduction

> An **encyclopedia** or **encyclopaedia** (also spelled **encyclopædia**, see spelling differences)[1] is a type of reference work or compendium holding a comprehensive summary of information from either all branches of knowledge or a particular branch of knowledge.[2] Encyclopedias are divided into articles or entries, which are usually accessed alphabetically by article name.[3] Encyclopedia entries are longer and more detailed than those in most dictionaries.[3]Generally speaking, unlike dictionary entries, which focus on linguistic information about words, encyclopedia articles focus on factual information concerning the subject for which the article is named.[4][5][6][7]
>
> -Article "Encyclopedia." www.wikipedia.com

A cursory reading of the first paragraph of Wikipedia's entry on the encyclopedia seems to hold a wealth of information. It tells us an encyclopedia is a type of reference that comprises a thorough overview of information from either every branch of knowledge or from a specific branch. It elaborates that encyclopedias structure their entries in abecedarian fashion like dictionaries but are set apart from them due to differences in content. The claim seems to be that Encyclopedia entries focus on fact, while dictionaries center on the use of language. All in all, it seems a succinct and to the point primer. Nevertheless, deeper reflection on Wikipedia's article led me to ponder the epistemological, structural, and functional foundations of the encyclopedia. Just how does Wikipedia prioritize, understand, and organize its contents; and to what end? Is the knowledge presented by Wikipedia simply an instantiation of the natural progression of encyclopedic evolution?

French philosopher Michel Foucault was cognizant of the challenges involved in the ordering of knowledge, and used the fiction of Jorge Luis Borges to facilitate his entry into the problematic. He elaborates,

> Ce texte [*Emporio celestial de conocimientos benévolos*] cite "une certaine encyclopédie chinoise" où il est écrit que "les animaux se divisent en : a) appartenant à l'Empereur, b) embaumés, c) apprivoisés, d) cochons de lait, e) sirènes, f) fabuleux, g) chiens en liberté, h) inclus dans la présente classification, i) qui s'agitent comme des fous, j) innombrables, k) dessinés avec un pinceau très fin en poil de chameau, l) et cætera, m) qui viennent de casser la cruche, n) qui de loin semblent des mouches. (Foucault, 1966 7)

While this list sounds absurdly improbable (provoking Foucault's famous laugh), it serves to underscore how the possibility of order is reliant on language insofar as it sets up an understanding the order of things. As Bates explains "there is no world of things 'to be arranged' but only a linguistic practice that creates a world of order" (Bates 4). Language then does not represent *a priori* or original order rather it creates it. Most saliently, Foucault's appropriation of Borges allows him to probe the gathering space in which things are assembled, and to conclude there is no natural order. Rather, order is a product of hidden rules and laws that determine how language treats and orders its objects. (Foucault, 1966 11)

Accusations of a lack of natural order might nevertheless be leveled against the texts included in this dissertation, which spans nearly two millennia: beginning with Pliny the Elder's *Naturalis Historia* and ending with Wikipedia. Indeed, most of the critical work on encyclopedism does not run up against the longitudinal problem because

most scholars specialize in a particular era or work, so they merely treat encyclopedias of a specific period. There are exceptions. Jason Koenig and Greg Woolf's edited volume *Encyclopaedism from Antiquity to the Renaissance* offers an excellent introduction to the first 1500 years of encyclopedism (even touching on Chinese encyclopedism). Meanwhile, Alain Rey's *Miroirs du monde: Une histoire de l'encyclopédisme*, is a short but sweeping study of encyclopedism "from Democritus to Wikipedia, China to the Maghreb" (West 1330). Richard Yeo's *Encyclopaedic Visions: Scientific Dictionaries and Enlightenment Culture* offers a much briefer but important study from the Republic of Letters to the Encyclopedia *Britannica*, while Andreas Kilcher's longitudinal analysis explores what he calls the three paradigmatic encyclopedic tropes (literature, alphabet, and texture) of the last four hundred years.

This dissertation is not an ordered presentation, a "history of encyclopedias" in any traditional sense. Rather, it seeks to examine key moments in the history of encyclopedism where critical changes in the understanding and ordering of knowledge come to the fore. In order to answer these genealogical questions, we must step back and undertake a longitudinal analysis of the conceptualization and structure of prior encyclopedic knowledge from its earliest origins to its latest incarnations. More precisely, through critical analysis of encyclopedic texts from across the canon, we will examine the changing treatment of knowledge: its basis, how it was understood, and how it was compiled and structured into a unified whole. Such an analysis will enable us to better understand the foundation, structure, and ordering principles of contemporary encyclopedic knowledge, a concern of fundamental significance for contemporary society captivated by questions of information systemization and use.

Still, we might reasonably begin by the etymology of the word encyclopedia, which was first coined in the Renaissance, but whose conceptual and semantic roots had their locus in the culture of Ancient Greece.[1] Linguistically, the term comes from the words *enkyklios* (ἐγκύκλιος), which can mean 'circular,' 'complete,' 'recurrent,' 'common,' or 'ordinary,' and *paideia* (παιδεία), meaning 'education,' though in a more robust sense than the English term implies (Morgan 33-34). Combined, the words most often had the sense of a 'common education,' but also had the secondary definition of a systematic presentation of the disciplines of study, and the all-encompassing knowledge that contains them. Together, *enkyklios* and *paideia* invoked notions both of structure and of completeness. While the Greek conception of education was often considered to be of a more specialized and theoretical nature, the Sophists and Aristotle advanced notions of generality and breadth to the idea of educational study (Beagon 11-12). Thus *enkyklios paideia* came to denote what was commonly thought by the Greeks to be the sort of well-rounded learning propaedeutic for engagement in the affairs of the state (Marrou 211-235). In the Roman context, *enkyklios paideia* became further connected to practical considerations, not simply existing in and for itself, but "follow[ing] the courses of activity and life" (Beagon 11-12). The formation of the word "encyclopedia" in the fifteenth century was the result of a mistaken coupling of its component parts in the works of Pliny (*Naturalis Historia*) and Quintilian (*Institutio Oratoria*) and came to denote works that presented systematized pedagogical curricula, or those that linked

[1] See, "Encyclopaedias: Definitions and Theoretical Problems,", 3–29, 14–15 and 27–29. The first titular occurrence was in the work *Encyclopedia orbisque doctrinarum, hoc est omnium artium, scientiarum, ipsius philosophiae index ac divisio* which was published in 1517 by Johannes Aventinus.

disciplines together (Blair 380). Still, this definition does not represent any modern conception of the word, and therein lies the problem.

Due to the absence of such a genre in antiquity (Morgan 71), König and Woolf argue that the treatment of the earliest 'encyclopedic texts' is best undertaken through the lens of "shared encyclopaedic motifs and ambitions and techniques, all of them linked in some way with the idea of comprehensive and systematic knowledge-ordering" (König and Woolf 23). While somewhat cut and dry, this definition not only serves to characterize the earliest encyclopedic texts but also facilitates identification of those of the present.

Encyclopedic knowledge however did not initially concern itself with totalization of knowledge, but rather with the sort of learning formative "of individuals so that they were equipped to act in a variety of social and cultural contexts" (Morgan 89). Early encyclopedias did not exist solely in and for themselves; they were meant for practical application. Specifically, the encyclopedic texts of Celsus and Pliny both were concerned with how humans might practically intercede in nature. As such, the changing conception and understanding of 'nature' provides us with an ideal metric for investigating key moments in the evolution of encyclopedic thought.

In order to situate and valorize the key encyclopedic moments adumbrated in this dissertation, I begin with a brief history of encyclopedism in the West starting with prolific Roman writer Marcus Terentius Varro (116-27 B.C), who is considered the world's first encyclopedist. He produced the non-extant *Disciplinarum Libri* (The Nine Books of Disciplines), which contained instruction in grammar, rhetoric, logic, arithmetic, geometry, astronomy, music, medicine, and architecture. The first seven of

these subjects, which were later divided into the *trivium* and *quadrivium* became the basis of the medieval curriculum. The only extant "encyclopedic" literature of this period consists of works by Celsus, and Pliny the Elder, which both contained "instrumental view[s] of knowledge (König and Woolf 39)," bound to practical considerations.

While this dissertation primarily treats French Encyclopedism, I begin my first chapter with an investigation of Pliny's *Naturalis Historia* (79 A.D.) as the exemplar which founded and set up the defining features of the genre: a pretension to a unified system of knowledge presented to "intervene in the world" (König and Woolf 39). Through dialogue with ancient sources such as Chrysippus and Diogenes Laertius, along with Classicist Mary Beagon, Andrew Wallace-Hadrill, and Pierre Hadot, I investigate the possibility of Stoic ontology behind the conception of the *Naturalis Historia*, which comprehends the world as imbued with spirit. Since every facet of the natural world is considered to be infused by the divine and hence potentially instructive to humanity, attention to the natural world is vital. As such, the *Naturalis Historia's* attempt to catalog the workings and actions of the natural world can be seen as providing not just knowledge of the world, but a useful handbook of life.

The next figure worthy of mention is Martianus Capella (420–490), whose encyclopedic allegory *De nuptiis Philologiae et Mercurii* served to summarize the seven 'liberal arts' and was in use some one thousand years after the death of its author (Grant, 2004 139). Roman Statesman Cassiodorus' (490-585) *Institutiones divinarum et saecularium litterarum* was the first Christian Encyclopedic text to be compiled. Divided into sacred and profane sections, the latter included the seven liberal arts. Less than one hundred years later, Isidore of Seville compiled the *De Natura Rerum* an encyclopedic

cosmology, and the 20 book *Etymologiae* (630), which became the best-known encyclopedia of the Middle Ages. It influenced generations of encyclopedic descendants, including Rabanus Maurus's *De universo* or *De rerum naturis* (the most dominant encyclopedia of the Carolingian Age), Bartholomaeus Anglicus's *De Proprietatibus Rerum*, and Vincent de Beauvais's thirteenth century *Speculum Maius*, which is the second encyclopedic text treated by this dissertation.

Like Pliny's *Naturalis Historia*, the tripartate *Speculum Maius* (1250) was an encyclopedic treatment of the natural order, as attested by its name 'The Great Mirror.' Unlike Pliny's pantheist paradigm, Vincent de Beauvais understood his oeuvre as mirroring the divinely created (Christian) order. The work has been the subject of numerous studies by scholars including Eva Albrecht, Serge Lusignan, Monique Paulmier-Foucart, Hans Voorbij and most recently Mary Franklin-Brown. My investigation engages these Medievalists, in dialogue with the theology and hermeneutics of Augustine, the pedagogical treatises of the Victoreens, and the findings of historians of medieval technology.

While de Beauvais believed knowledge was immanent to the natural order, the *Speculum's* Christian principal of organization reoriented its conception and presentation of knowledge. I examine this reconfiguration in the second tome, the *Doctrinale*, which takes the advent of humanity's fall into sin as foundational to human epistemology. I examine how the advent of primal sin was acknowledged as inhibitory to human understanding, reorienting human knowledge to the status of intellectual prosthesis. Specifically, I follow up on its conception of encyclopedic knowledge as palliating the intellectual losses instantiated by the Fall, and hence regaining a right relationship with

God. Most importantly, I consider the implication that such knowledge was multifaceted, touching different aspects of the natural world. I examine how this change in encyclopedic paradigm reoriented humanity's relationship with natural knowledge on the meta-level, from learning from the working's of nature in the *Naturalis Historia* to one of imposing systems of learning on the natural world.

The *Speculum's* appearance in the thirteenth century, which is now known as the Encyclopedic Age, gave way to a century of Arab dominance in Encyclopedic production (Muhanna). Subsequently, the fifteenth century not only bore witness to the birth of the modern term encyclopedia, but that of the Gutenberg press. The facility of publication increased the availability of new pedagogical texts, in addition to re-introducing into wider circulation medieval encyclopedic texts such as: The *De proprietatibus rerum* (printed 1470), Thomas of Cantimpré's, *De natura rerum* (Originally 1228-1244, but printed in 1475), and the *Speculum maius* (printed in 1472-6) (Collison Chap 2). However what most characterized Renaissance encyclopedias was "the new level of care devoted to recording, saving and managing information about familiar places and authors as well as new ones" (Blair 381).

Charles Sorel's *Science Universelle* (1634-1668), the subject of my second chapter, stood in the tradition of encyclopedic pedagogy that was initiated in the Renaissance. However, unlike many of its immediate predecessors, the *Science Universelle* focused primarily on the natural world. Most prominent in Sorel's encyclopedic treatment was the drive to reorient natural knowledge toward a closer relationship with empirical research and theorization. I investigate this move in conversation with Sorelians: Émile Roy, Antoine Adam, and Martine Alet; and historians

Laurence Brockliss, Richard Yeo, and Ann Blair. With philosophers Robert Pasnau, Daniel Garber, and Dennis des Chenes, I reflect on how Sorel's new initiative was accompanied by an ambition to rethink systematization and organize its subjects. I believe that through his inauguration of a systematic presentation of encyclopedic knowledge characterized by dialogue with contemporary research and theory, Sorel enabled a new way to understand the practicality of encyclopedic knowledge.

The requirement for vigorous engagement with contemporary thought led the Republic of Letters to adopt literary practices to meet this need. Through literary journals and commonplace books, the intellectual community was able to freely circulate and exchange ideas and information—practices that helped inspire the creation of Denis Diderot and Jean le Rond d'Alembert's *Encyclopédie* (1751-1772). The *Encyclopédie*, which is the object of my third chapter, not only functioned as a major intellectual commonplace in mid-eighteenth-century France and beyond, it was the foundational encyclopedic prototype of the modern period. Due to the preponderance (one might say encyclopedic) scope of the literature on this work, I have found it necessary to diversify the scope of my interlocutors in order to situate my position. Historians and literary scholars David Bates, Daniel Brewer, Robert Darnton, Anne Goldgar, and Richard Yeo helped to set the literary scene, while philosophers Francis Bacon, René Descartes, Immanuel Kant, Martin Heidegger, and Jürgen Habermas served to lay the philosophical ground. John Bender, Johanna Drucker, and Michael Marrinan facilitate additional frames of entry.

The focus of the chapter is on the *Encyclopédie's* aspiration to intellectual emancipation and collection of all of the world's knowledge, which are scrutinized in

order to problematize the authority, as well as the order of knowledge. I advance this question on the structural level of the *renvois*. A precursor to the hyperlink, the *renvois* or cross-references, which enabled readers to cut-across the text of the *Encyclopédie* to related entries, facilitating the understanding that entries do simply not stand on their own, but function in a network of references. Through actualizing the power of the *renvois*, the readers were invited to probe further, so that they might advance empirical research and understanding themselves and help with the goal of realizing useful knowledge (Brewer, 2011 55).

Today's Internet encyclopedia Wikipedia (2001-present), which is the focus of my fourth chapter, claims to be the world's most comprehensive work and is characterized by its propensity toward efficiency. It is not only available online free of charge to anyone with an Internet connection, but also is perhaps the most successful example of crowdsourcing to date. In this chapter, I reflect on how the radically open nature of Wikipedia facilitates speed and productivity enabling it to grow at impressive rates. Its efficiency also permits the inclusion of the latest news and research in virtual concomitance with their occurrence. However, Wikipedia's temporal efficacy changes the structure and foundation of encyclopedic knowledge due to its reliance on systems of order that eschew the framing of their content.

This dissertation does not present a traditional examination of the history of encyclopedism. Rather, it endeavors to adumbrate key moments where critical changes in the understanding of encyclopedic knowledge become prominent. This analysis will not only enable a better comprehension of the changing foundation, structure, and unity

of encyclopedic knowledge, it will enable us to reflect on new directions and possibilities for future encyclopedic archives.

# Chapter One

## Two Handbooks of Life

> Deserving of treatment before all things are the subjects included by the Greeks under the name of *enkyklios paideia*; and nevertheless they are unknown, or have been obscured by subtleties, whereas other subjects have been published so widely that they have become stale. It is a difficult task to give novelty to what is old, authority to what is new, brilliance to the common-place, light to the obscure, attraction to the stale, credibility to the doubtful, but nature to all things and all her properties to nature. Accordingly, even if we have not succeeded, it is honourable and glorious in the fullest measure to have resolved on the attempt.
> -Pliny the Elder, *Preface to the Naturalis Historia in the Form of a Letter*

**Introduction**

Although written in 79 A.D., Pliny the Elder's summary and justification of his *Naturalis Historia* in the dedicatory preface to the Roman Emperor Vespasian captures the enlightening and arduous nature of the encyclopedic endeavor. The words *Enkyklios paideia*[2] as detailed in the introduction most often had the sense of a 'common education.' Our interest lies in the secondary meaning of the words; that of a systematic presentation of the disciplines of knowledge, and the all-encompassing knowledge that contains them. By this definition the *Naturalis Historia* is not an encyclopedia, but it is certainly encyclopedic in its treatment of the natural world — systematically examining subjects from Astronomy to Mining.

Pliny's opus is not only the earliest extent western encyclopedic text; it had a profound influence on encyclopedism for the next millennium and a half. As Richard Yeo elaborates, "It became the most well-known and used reference work until the Renaissance" (2001, 65) and subsequent natural histories that followed owed a

[2] For a detailed discussion of the sense of the two words see "Pliny's Natural History: Enkuklios Paideia and the Ancient Encyclopedia," Journal of the History of Ideas 70 (2009): 1–21

conceptual debt to Pliny. However it is not my goal to broach the history of Pliny's reception from Antiquity to the present, which is the subject of Aude Doody's insightful tome.[3] Rather my ambition is to use Pliny's treatment of the whole of the natural order to set the stage for our inquiry into the timeliness and structure of encyclopedic knowledge through the lens of nature.

My recognition of Pliny's belief in the instructional possibility of every aspect of nature is understood in light of Mary Beagon's insight into his work. Namely, that Pliny adheres to a Stoic ontology of nature (Myers 1992), which is divinely imbued, and permeates all of life. While the work has undergone a cornucopia of scholarly approaches, from medieval fact searching to its contemporary treatment as a Roman cultural artifact, it is Mary Beagon's recent demonstration of the Stoic influence on Pliny's thought that informs my study (1992). In this chapter, I demonstrate that Pliny's method for acquiring knowledge is actualized through attention to the workings and uses of nature in order to provide a handbook on life. This particular epistemology will impact the sort of knowledge he elucidates as intrinsically practical in nature. This is due to his understanding of nature as the provider and educator of humanity.

Pliny's representation of nature will determine what is known and hence how this knowledge functions in relation to humanity. Specifically, nature is seen as fundamental for instructing humanity on how to live through its workings. It is this attention to the mechanisms of nature (what it does and produces), which provides humanity with an understanding of how to live. This chapter focuses on the representation of the natural world ("life," to use Pliny' term) as key to understanding human life and knowledge in

[3] See, Doody (2010).

Pliny's *Naturalis*. As Wallace-Hadrill has explained, this assertion is not novel in that Beagon has already demonstrated the connection between nature and life in the *Naturalis* (1990 84). However, investigation into the specific epistemological aspects of such a worldview as being constitutive of human knowledge and conduct through nature's representation and appropriation has not yet been undertaken. Such an investigation is fundamental to understanding how the representation of nature began in the encyclopedic movement. Namely, how does Pliny's representation and categorization of nature set the standard for structuring and understanding knowledge in the encyclopedic tradition?

In accordance with Pliny's constitution of knowledge as learning from the natural phenomena of nature, the kind of knowing demonstrated in the *Naturalis* is largely concerned with human appropriation of natural phenomena. By "phenomena," I mean nature's mechanics or workings such as the differing amounts of sunlight received on earth in relation to distance from the sun (1.LXXVII). This knowledge is appropriated by humanity in relation to the keeping of time (1. LXXIX). This understanding is bound up with Pliny's Stoic epistemology of nature's divinity and its role as the supreme mediator of knowledge. Specifically, that human understanding is actualized through nature, and cannot be accomplished without recourse to some action on nature's part. Thus robust investigation of every aspect of the natural order is needed in order to understand nature's workings. This attention to nature's actions, manifest in every aspect of the natural order is propaedeutic to learning to live, and consequently to the compilation of the *Naturalis* as regards its coverage of disciplines ranging from astronomy to geography.

These assertions are bound up in several premises that I will adumbrate over the course of the chapter. First, I will re-affirm the scholarly consensus that the *Naturalis Historia* was written with a particularly strong Stoic philosophical worldview. I am not however interested in parsing the minutiae of stoic thought and its particular instantiations in the *Naturalis*, which Beagon and others have accomplished. Rather, the demonstration of Stoic influence will serve to illustrate the reason for the scope of the work and why natural phenomena are understood to be the best instructor of humanity. Pliny's Stoic ontology will not simply inform his understanding of the natural world as ordered through divine reason. Rather, it is his adherence to the stoic practice of attention that I wish to demonstrate. Pliny saw the exercise of attention to be propaedeutic to learning from and using the whole of the natural order. As stated by Mary Beagon, "For Pliny, useful knowledge is not to be artificially divided and confined within the bounds of certain *arts* . . .a more telling comparison might be made with one of the earliest exponents of the 'arts of living' Hippias of Elis" (1992 13). The 'arts of living' are practical skills that facilitate the life of the individual. Thus Pliny's project was akin to compiling a handbook of life, through the examination of the natural order. This, I will demonstrate, creates a strong link between encyclopedic knowledge and the practice of life. More importantly, Pliny's manner of knowing precludes an investigation into the processes behind the natural phenomena because what is known (what nature does) and how it is known (through attention to the actions of nature) are so intertwined. This occurs because Pliny's attention to the phenomena of nature amounts to a cataloging of what nature does, through attention to its actions. Yet his emphasis on nature's superior reason as the teacher of humanity leads to a wariness of direct human

involvement in the control of nature, which is of utmost importance with respect to our subsequent investigation of Vincent de Beauvais, who reverses the dynamic.

In the second half of the chapter, I will broach Vincent de Beauvais' 13th century tripartite encyclopedic *Speculum Maius,* or *Mirror of the World*. The *Speculum* was compiled at the height of the scholastic age, and thus marks the apex of Christian learning and understanding of the known world. Though this may seem a rather presumptuous leap, de Beauvais' encyclopedic work also functions as a handbook;[4] and, as I will demonstrate, one interested in laying out humanity's practice of life through its representation and understanding of the natural world. Like the *Naturalis*, the *Speculum* was informed by a divinely imbued nature[5], which guided human knowledge. While Pliny saw nature as following divine reason, de Beauvais saw nature as expressing facets of God's divine truth. This idea was propagated by St. Augustine, "This world is to be used, not enjoyed, so that the invisible things of God may be seen" (2008 1-3.4). *Utendum est hoc mundo, non fruendum, ut invisibilia Dei per ea, quae facta sunt*. To this end, the *Mirror of Nature* tome differs from the *Naturalis*, in that its goal is largely linguistic exegesis, with the objective of illuminating scripture. Yet as I will demonstrate, the Augustinian philosophy of divine illumination is also at work in the *Mirror of Doctrine* (tome serving human rehabilitation after the Fall). Hence, our interest is principally the eschatological teleology that informs this tome's characterization of

[4] See, Franklin-Brown (2012, 159)

[5] The impetus for the *Speculum Maius* is seen as the Epistle of Paul to the Romans, "The invisible things of him from the creation of the world are clearly seen, being understood by the things that are made, even his eternal power and Godhead." This understanding of nature as God's created revelation, constituting the *Book of the World* (opposed to the revealed revelation of scripture) cements the medieval understanding of earthly creation as being instructive of divine nature, and hence de Beauvais' encyclopedic project.

humanity's ability to constitute knowledge. Specifically, humanity's loss of their ability to understand and comprehend as a result of the fall will be explored as essential to understanding the modes of knowing espoused by the *Mirror of Doctrine* (The second tome of the *Mirror of the World*). This intellectual loss will illustrate de Beauvais's conception of the *Mirror of Doctrine* as an aid to the practice of life in the lapsarian state. Yet this undertaking will not be wholly achieved due to de Beauvais's introduction of theoretical knowledge, which entailed the study of different modes of access that stood in for 'direct understanding.' Through these categories, de Beauvais departs from his initial Christian conditions of knowledge through the inclusion of a-theological categories of knowing such as metaphysics, physics, and mathematics. Specifically, de Beauvais describes the prelapsarian state of knowledge that is lost due to the advent of sin. Yet, instead of remedying that loss with Christian theology and practice, he inserts theoretical modes of access, characterized by their different manners of understanding and regulating nature. This move, as I demonstrate, has a profound influence on what constitutes encyclopedic knowledge. Specifically, de Beauvais' introduction of technical frameworks for the representation of the natural world into the encyclopedic corpus changes the nature of knowledge. Instead of the understanding of "things as they are" the theoretical disciplines simply treat one facet or cross section of reality. Such an approach inverts Pliny's epistemological dynamic of natural reason over human reason and places humanity over and above nature.

**Pliny's Stoic Commonplace**

Stoicism was founded through the establishment of a school by Zeno of Citium some time in the late fourth century B.C. and persisted for five centuries. Hence an

exhaustive longitudinal study of Stoic thought on Pliny's *Naturalis* is not possible in this chapter. There are, however, general precepts that can be ascribed to Stoicism. In the inaugural lecture of his chair at the Collège de France, Pierre Hadot situated the Stoic paradigm in the following manner: "The Stoics, for instance, declared explicitly that philosophy for them was an exercise . . . it did not consist in teaching an abstract theory—much less in the exegesis of text—but rather in the art of living" (1995 83). It is this reference to knowledge as a practical exercise which informs our investigation. It is necessary to understand the connection between the arts of living and understanding; most clearly because Pliny explicitly understood the practice of being attentive to the natural given as accruing knowledge. According to Hadot, it was only through attention (the fundamental Stoic spiritual attitude) (1992 84) to the natural given (life) that one gained knowledge of how to live. Yet Pliny also demonstrated such an understanding in his conception of the natural order; specifically that every facet of the natural order is potentially instructive to humanity.

In discussing the compilation of the *Naturalis Historia* in his letter to Vespasian, Pliny stated: "to be alive means to be awake" *vita vigilia est*. The word that is translated into English as 'awake' is in fact the Latin root for vigilance. Indeed it has the primary sense of guarding, watch, vigilance or alertness. The practice of life then necessitates vigilance, which, because of Pliny's Stoic worldview, implies a connection between attention and knowledge. Consequently the proper manner of living for Pliny involved attention to the natural phenomena of nature. This particular attitude was informed by his understanding of the natural order possessing divinely imbued reason. It was only through attention to the natural phenomena of nature's reason that humanity was able to

learn. This conception of nature as instructive of humanity will inform Pliny's understanding of what knowledge entails; namely following nature.

The thirty-seven-volume *Naturalis Historia* outlines and expounds Pliny's ontological parallels with Stoicism and their mutual understanding of nature as a divinely infused teacher:

> The world and this—whatever other name men have chosen to designate the sky whose vaulted roof encircles the universe, is fitly believed to be a deity, eternal, immeasurable, a being that never began to exist and never will perish. What is outside it does not concern men to explore and is not within the grasp of the human mind to guess. It is sacred, eternal, immeasurable, wholly within the whole, nay rather itself the whole, finite and resembling the infinite certain of all things and resembling the uncertain, holding in its embrace all things that are without and within, at once the work of nature and nature herself. (1.I)

Nature, according to Pliny, is equal to and coextensive with divinity or God. It has no beginning, will have no end and is everything that is in the human purview. Thus, Pliny is a materialist, considering immaterial beings impossible or unworthy of consideration. Pliny also sees nature as being ordered in a certain manner and hence following certain rules. Consequently, having described the motions of the planets, he states, "Many more facts can be produced about these mysteries of nature and the laws that she obeys" (1.XV). While grandiloquent, Pliny's opening section on cosmology fundamentally intertwines rational divinity with nature in the tradition of Stoic philosophy. This is fundamental to our study, as I demonstrate that Pliny compiled the *Naturalis* in view of

the Stoic practice of attention to the natural order. This ontological conception of nature is compared by Cicero to that of Chrysippus, an early Stoic:

> Divine power resides in reason, and in the soul and mind of the universe; he calls the world itself a god, and also the all-pervading world-soul, and again the guiding principle of that soul, which operates in the intellect and reason, and the common and all-embracing nature of things; also the power of Fate, and the Necessity that governs future events; beside this, the fire that I previously termed ether; and also all fluid and soluble substances, such as water, earth, air, the sun, moon, and stars, and the all-embracing unity things; and even those human beings who have attained immortality. (2003 Sect 1.8.20)

For Chrysippus, pantheism is the metaphysical outlook, the world being equated with the divine. Divine reason is understood to subsume and imbue nature, as well as direct its course. Such an understanding is primary, as the principal mode of Stoic conduct is attention to the rationality of nature. So nature as fundamentally imbued with, and thus guided by intellect and reason becomes the guide and measure for the right manner of living. Since divine reason imbues the natural order, it is the perfect teacher of humanity. Diogenes Laertius attests to this through his summary of Zeno of Citium's *On the Nature of Man*. According to Zeno, human beings are constituted through "li[ving] in agreement with nature" (*homologoumenon tei phusei zen*) (1962 VII. 87). This is central because, as I have posited, it is Pliny's implied thesis in the *Naturalis*: that it is only through scrutiny and attention to the natural phenomena of nature that man is able to learn how to live. Living in agreement with nature for Pliny is demonstrated by a manner of knowing which

he exposits in the *Naturalis*, namely one anchored in attention to the phenomena of nature's reason.

I have implicitly argued for Pliny's membership in the Stoic *Weltanschauung*. Yet if we are to take seriously the supposition that attention to Nature is proper to the practice of life, we must inquire into Pliny's treatment of the instructional capacity of the whole of the natural order. As previously stated, the *Naturalis Histoira* comprises thirty-seven books and treats the entire natural order, of which humans are theoretically only a small part. Yet I will demonstrate that for Pliny, humans cognitive capacities are fundamentally brought about by their rational relationship with nature. Indeed, the implied thesis of the *Naturalis* is that nature has something to teach humanity through engagement with its divinely imbued action. In the seventh chapter of the *Naturalis Histoira*, the sole section devoted to human beings, Pliny muses on the odd constitution of human persons in comparison with the rest of the natural order. Unlike other animals, humans alone amongst creatures have the ability to learn, for "man alone knows nothing save by education—neither how to speak nor how to walk nor who to eat" (VII. 0). It is, then, humans' ability to learn which sets them apart from animals. As Mary Beagon points out, "Pliny favors the view that nature is somehow responsible for most of life's discoveries" (1992 65). Yet such understanding only comes about through engagement with the whole of the natural order—and hence Pliny's encyclopedic project. Indeed, limited investigation would seem to lead to narrow-mindedness concerning the potential natural phenomena of nature. Hence, "What is not deemed miraculous when first it comes into knowledge? How many things are judged impossible before they actually occur? Indeed the power and majesty of the nature of the universe at every turn lacks

credence if one's mind embraces parts of it only and not the whole" (VII.1). Undeniably Pliny sees the entire natural order as interconnected through divine ordering and hence worthy of investigation. Such investigation, however, implies mindful attention to all of nature's doings no matter how insignificant they may appear, as one can never be sure when nature will reveal itself.

**Understanding Nature in the *Naturalis***

While human beings are only explicitly examined in one book of the work, they are treated as a facet of the whole of the natural order through the manner in which nature is understood. Thus what is scrutinized are nature's natural phenomena which are then appropriated by humanity in the practice of life. This attitude is important because it sets the mode of inquiry *ab initio* of nature as the backdrop in relation to humanity's habitus. Nature constitutes the supreme teacher of humanity (being imbued with divine reason and hence that to which humanity must acquiesce), cataloged through Pliny's encyclopedic exposition in the *Naturalis* of the interconnected whole of the natural order.

The question becomes: how is nature presented as constituting human knowledge and the practice of life? Mary Beagon gives us a detailed etymological study of the concepts involved in her chapter on "Man and Nature." My focus, (which is based on Beagon's reading) acknowledges humanity's inability to secure knowledge itself. Pliny's comments on the so-called "Mithridatic antidote" give us insight into this view of human epistemology:

> The Mithridatic antidote is composed of fifty-four ingredients, no two of them having the same weight, while of some is prescribed one-sixtieth part of one

> denarius. Which of the gods, in the name of Truth, fixed these absurd proportions? No human brain could have been sharp enough. It is plainly a showy parade of the art, and a colossal boast of science. And not even the physicians know their facts. (XXIX. 8)

It is clear from this passage that nature is functioning over and above human intelligence. As such, Pliny considers the antidote's discovery a fluke, as human reason is simply unable to conceive of such a concoction. This passage is significant because it demonstrates the inability of humanity to reason or act by its own powers. Instead, humanity's cognitive capacity must give credence to the instructive potential of nature. Human understanding is then brought about through nature and its natural phenomena. The question then becomes how humanity is actually educated. The answer would seem to be that humanity is educated through the workings of nature itself, and humanity's "discovery" of said natural workings. The following passage cements nature's hegemony in human learning by insisting that all "discoveries" are due to nature and not human intellectual power:

> The mere treatment of this subject undoubtedly increases the admiration that I at least feel for the men of old; the greater the number of plants waiting to be described, the more one is led to revere the careful research of the ancients and their kindness in passing on the results. Without a doubt even the bounteousness of Nature herself might seem to have been surpassed by them in this way if the discoveries had been the result of human endeavor. But as it is, it is clear that this bounteousness has been the work of the gods, or at least due to their inspiration,

> even when the actual discoverer was a man, and that the same Mother of all things both produced the herbs and made them known to us. (XXVII. 1)

This is one of the more explicit passages concerning Pliny's conception of epistemology, and its reliance on nature. Pliny views knowledge as being actualized by Nature and not through the cognitive capacities of humanity. The emphasis is placed on Nature as having created and made known the various plants. According to this passage and the Mithridates passage, discovery 'happens upon' the investigator such that what is understood is not a result of human powers of investigation. Rather, the discovery occurs through the demonstration of nature. Pliny does not go into great detail on the mechanics of how discoveries are given; I will argue that they seem to be the result of human beings' ability to perceive the patterns and the workings of nature, and appropriate them for human use. Humans are unique in that they are able to notice and recognize what nature does and adopt its mechanisms. Discovery thus does not imply a reasoned understanding of the efficacy of the treatment due to humanity's inability to discover the principles behind it. It is not something which any agreed upon method or procedure will reveal. Understanding only comes about through a focused attention on, and all-inclusive inquiry into the workings of nature through focused attention. In this way, the potential uses of nature may reveal themselves to humanity. Natural knowledge for Pliny is then both contemplative, in that it instructs humanity in the practice of attention, and also life-giving in that it is often directed toward intrinsic practicality. Still, one can rightly inquire into how these discoveries occur: how does nature show itself to humanity? I argue that, above reason, or chance or pure observation, it is that natural knowledge reveals itself, and is revealed through its actions and workings. That is, attention to the

potential use that can be made of the actions of nature through its phenomena guides human knowledge and life.

Take for instance Pliny's remarks on seed grafting:

> Nature has also taught the method of grafting by means of seed; a seed that has been hurriedly swallowed whole by a hungry bird and has become sodden by the warmth of its belly is deposited together with a fertilizing manure of dung in a soft bed in the fork of a tree, or else, as often happens, is carried by the wind into some crevice or other in the bark; as a result of this we have seen a cherry tree growing on a willow, a plane on a laurel, a laurel on a cherry, and berries of different colours growing together. It is also reported that the same thing may be caused by a jackdaw when it hides seeds in the holes that are its storehouses. (XVII.12)

This passage reiterates the notion of a natural instructor of humanity. However, what is most interesting is the attention to what nature does. A seed is deposited in some manner by nature, into a cleft in the tree and becomes grafted into the existing system. Even the method of grafting by leaf, which was discovered by chance, is accomplished through the actions of nature:

> Grafting was taught us by Chance, another tutor and one who gives us perhaps more frequent lessons, and this was how he did it: a careful farmer, making a fence round his house to protect it, put under the posts a base made of ivy-wood, so as to prevent them from rotting; but the posts when nipped by the bite of the still living ivy created life of their own from another's vitality, and it was found

> that the trunk of a tree was serving instead of earth. (XVII.24)

Hence, what is remarkable about this discovery is not that it was discovered by chance. Instead, the discovery of grafting through nature's action is significant regardless of the haphazard manner of its detection. As Beagon demonstrates, Pliny sees the manifestation of chance encounters with nature's power on part of humanity as being no less directed by nature's power (1992 64). Rather, what is key is humanity's ability to appropriate any and all of nature's mechanisms for their own use.

The *Naturalis*' thirty-six chapters begin with a treatment of the cosmos, before narrowing its focus to geography and the treatment of humanity. Pliny discusses animals and plants before dedicating twelve chapters to nature's potential for medical treatments. Such an emphasis helps establish Pliny's engagement with the natural order as motivated primarily through its correlation with human life. Let us examine the opening entry of chapter 8, which treats elephants and their dual interest as both creatures worthy of human contemplation as well as their potential for practical human use:

> The largest land animal is the elephant, and it is the nearest to man in intelligence: it understands the language of its country and obeys orders, remembers duties that it has been taught, is pleased by affection and by marks of honour, nay more it possesses virtues rare even in man, honesty, wisdom, justice, also respect for the stars and reverence for the sun and moon. Authorities state that in the forests of Mauretania, when the new moon is shining, herds of elephants go down to a river named Amilo and there perform a ritual of purification, sprinkling themselves with water, and after thus paying their respects to the moon return to the woods

> carrying before them those of their calves who are tired. They are also believed to understand the obligations of another's religion in so far as to refuse to embark on board ships when going overseas before they are lured on by the mahout's sworn promise in regard to their return. And they have been seen when exhausted by suffering (as even those vast frames are attacked by diseases) to lie on their backs and throw grass up to the heaven, as though deputing the earth to support their prayers. Indeed so far as concerns docility, they do homage to their king by kneeling before him and proffering garlands. The Indians employ the smaller breed, which they call the bastard elephant, for ploughing. (VIII.1)

This characterization of Elephants is immediately anthropomorphic, the knowledge steeped in human categories of life. Yet what is known? It seems to be what elephants are capable of doing. The nine subchapters that follow all describe their actions and behavior principally in relation to humanity. They are understood because of their ability to learn from human training, due to their capacity for human-like emotion, and their role in history and culture. Thus, the fact that "The females of the genus elephant are much more timid than the males (VIII.9)" is mentioned in the context of the breaking of Elephants for domestication. This particular mode of inquiry and understanding permeates the chapters on animals. Even at such moments where the animals under discussion appear to have no direct interest for humanity, Pliny reiterates the global need for such scrutiny of the behavior of animals. Hence, the treatment of insects is prefaced in the following manner:

> But we marvel at elephants' shoulders carrying castles, and bulls' necks and the fierce tossings of their heads, at the rapacity of tigers and the manes of lions,

> whereas really Nature is to be found in her entirety nowhere more than in her smallest creations. I consequently beg my readers not to let their contempt for many of these creatures lead them also to condemn to scorn what I relate about them, since in the contemplation of Nature nothing can possibly be deemed superfluous. (XI.1)

This requisite to treat the whole natural order, even those aspects which seem redundant, serves to reiterate the majesty of nature and its capacity to work in amazing ways. The piercing of human skin by certain insects, while a nuisance, still demonstrates a working of divine providence of which humans are obliged to take note. As Beagon reiterates, "he (Pliny) shows his preference to recording a miracle of nature over investigating how these qualities really work. (141)" This demonstrates Pliny's skepticism with regard to human intellectual ability. Humans are not able, in his view, to understand the reasons behind nature's workings. They are, however, able to notice and record the workings of nature, which while seemingly trite in their apparent inconsequence is an exercise in attention that leads to discovery. These discoveries are then appropriated by humanity. As Pliny reiterates, "our purpose is to point out the manifest properties of objects, not to search for doubtful causes" (XI.2). Pliny is clearly not interested in the question of why or how something comes about, but rather in an observable understanding of what nature does. Other Pliny scholars have acknowledged this emphasis on the state of affairs. Trevor Murphy states "the *Natural History* professes to put before the reader the world of elements as it impinges on our senses—much the same province that modern science has taken for itself" (2004 212). Yet the emphasis on sensory information is limited to properties, and is not the doubtful search (in Pliny's view) for the reasoning behind the

manifestation of the natural phenomena. This is manifestly significant because of the connection between knowledge and life it implies. Pliny, while a product of Roman culture, nevertheless sees encyclopedic knowledge as being bound to interaction with the world. Hence, knowing in the *Naturalis* implies an exhortation to attentive scrutiny to the actions and productions of nature in view of its possible use.

Pliny's treatment of plants is undertaken in this same spirit. The emphasis is placed on use; "Moreover, there are a thousand other uses for those trees which are indispensable for carrying on life. We use a tree to furrow the seas and to bring the lands nearer together, we use a tree for building houses; even the images of the deities were made from trees. (XII.2)" This stress on use is highlighted throughout the chapter, with detailed descriptions of various cultural and religious uses interspersed in the commentary. Indeed some of the commentary that some readers might call extraneous is simply presented to better inform the reader about procurement, "The right of controlling the sale of cinnamon is vested solely in the king of the Gebbanitae, who opens the market by public proclamation. The prices formerly were 1000 denarii a pound, but this was raised to half as much again after the forests had been burnt. (XII.42)" Due to the encyclopedic nature of the work, one is able to revisit VI.32 and read more about the Gebbanitae. In this way, the interconnections between the subjects treated in the text anticipate a system of order (the *renvois*) that comes about much later, and are an important clue as to why no subject is left uninvestigated, simply because Pliny sees nature and its appropriation by humanity as a dynamic interconnected system.

Undeniably, the appropriation of nature by humanity is most evident from books twenty to thirty-two. Pliny announces his treatment of humanity's reliance on nature in

the following manner: “From this point we are going to deal with a most important work of nature, namely to tell man his proper foods, and to force him to acknowledge that his means of living are unknown to him” (XX.1). This statement introduces twelve chapters of medical treatments obtained from the natural phenomena of nature. The crux of the statement reiterates humanity’s ignorance in regard to the mechanisms of nature. Again, it is nature that instructs humanity, but this instruction is undercut by its sheer complexity that stymies human ability to understand nature’s mechanisms. Hence, “the magnetic stone draws iron to itself while another kind of stone repels it; the diamond, the rare delight of wealth, unbreakable and invincible by all other force, is broken by goat's blood” (XX.1). Although goats’ blood is not in fact capable of breaking a diamond, the information is useful in that it conveys Pliny’s understanding of nature’s mechanisms. He sees nature as being so complex that nothing should astonish humanity with regard to its abilities. The problem for Pliny seems to be a lack of robust inquiry into the uses of nature. He clearly admires his predecessors who went to great lengths to discover the working of nature’s mechanisms.

> This peculiar glory of plants which I am now going to speak of, Mother Earth producing them sometimes for medicinal purposes only, rouses in one's mind admiration for the care and industry of the men of old; there was nothing left untried or unattempted by them . . . they have scoured also trackless mountain heights, unexplored deserts and all the bowels of the earth, finding out the power of every root and the uses to which can be put mere slim threads of vegetation, and turning to healthful purposes that which the very beasts refuse to touch as food. (XXV.1)

It is in this human ability to work through the natural phenomena of nature for their possible use to humanity that we see an ethical dimension to Pliny's project. Beagon has documented that Pliny has a rather contentious relationship with what he saw as Roman perversion of nature in regards to luxury (1992 77). In addition, he also saw it as having a negative impact on proper living. The disassociation between knowledge and the pursuit of luxury is also evident in his treatment of wealth, which is made especially explicit in book two. "Age has overtaken the characters of mankind, not their revenues, and now that every sea has been opened up and every coast offers hospitable landing, an immense multitude goes on voyages—but their object is profit not knowledge; and in their blind engrossment with avarice they do not reflect that knowledge is a more reliable means even of making profit" (II. 45). The crux would seem to be that investigation into the natural world is not only salutary to the individual, but that knowledge itself is capable of producing economic benefit. Indeed the benefits from the investigation of the natural world was not only useful for life, it could also produce economic benefit.

The *Naturalis Historia* accomplished a robust investigation of the contents of the natural world — Pliny taking unknown years compiling and recording many of the aspects of nature's phenomena into a coherent whole the likes of which had never before been attempted. His notion of *enkyklios paideia* anchored the project as an educational exercise in attention to workings of nature, and true to his philosophy, Pliny's died investigating the eruption of Mount Vesuvius in 79 A.D.[6] However, Pliny's exhortation to follow nature's rational order in order to learn how to live will be turned on its head in

[6] See Books 6.14 and 6.20 in Pliny, and P. G. Walsh. *Complete Letters*. Oxford: Oxford UP, 2006. Print.

Vincent de Beauvais' *Speculum Maius*. Specifically, De Beauvais will echo Pliny's naturalistic instructive paradigm in the Christian mode (as useful for understanding God the creator) while simultaneously introducing tools for understanding creation that will serve to aid humanity in its fallen state. Hence, in his tome on doctrine, de Beauvais will introduce theoretical modes of accessing nature designed to palliate the intellectual loss of the fall. These deficiencies in human understanding will open up the possibility of new areas of knowledge, which act as epistemological prosthesis to humanity's lapsarian state. More specifically, de Beauvais will introduce methods of understanding (mathematics, metaphysics, physics), and rules of comportment and practice into the *Speculum*. These disciplines place emphasis on human transformation of the natural order through their attempt at systemization and mastery. Hence, in contrast to Pliny, the emphasis will no longer be on attention to the natural phenomena for possible appropriation, but on the tools for its schematization and manipulation.

Like his ancient predecessor Pliny, Dominican friar Vincent de Beauvais was under the patronage of his country's potentate, France's King Louis IX. Relatively little is known about de Beauvais' life, for his place in history was secured through his compilation of the *Speculum Maius*. As Lusignan, Paulmier-Foucart, and Duchenne elaborate, the work itself has a complex literary history and was the product of at least twenty-five years' effort on the part of de Beauvais and his mendicant brothers from 1235-1260 (1997 23). The *Speculum* as left by de Beauvais consisted of three *specula* based upon the biblical teleology of creation, fall, and redemption. Hence, creation as recounted in the book of Genesis was the basis of the *Speculum Naturale*; the advent of sin as exemplified by the fall of humanity was the focus of the *Speculum Doctrinale*; and

the redemption of humanity as seen through God's working though human history was the topic of the final volume, that of the *Speculum Hystoriale*. This biblical principle of organization was paramount not simply in the organization of the *Speculum Maius* but also in its material and epistemological outlook. There have been many studies on aspects of the work, but I will largely focus on the *Doctrinale*, which treats the advent of human sin; specifically the cognitive capacities humanity lost. Inquiry into this aspect humanity's understanding of nature as presented in the *Doctrinale,* will serve to demonstrate its continuity with de Beauvais' conception of natural knowledge as laid out in the *Naturale* (tome on creation). Additionally, the *Doctrinale* serves to mark a transition in the understanding of nature; from a largely linguistic paradigm (in the *Naturale*), to one concerned with different theoretical modes of inquiry and access. This is significant in that the *Doctrinale* lays out modes of understanding seen as necessary for living, the goal of Pliny's *Naturalis*.

**The Fall and Divine Illumination in the *Speculum Maius***

Vincent de Beauvais' appropriation and interpretation of Christian teleology serves as the principle of organization of the Speculum: creation is the subject of the tome on nature (*Naturale)*, the fall of humanity into sin is treated in the tome on doctrine (*Doctrinale),* and redemption of humanity is the basis of the tome of history (*Historiale)*. More importantly, however, this principle also influenced its epistemological understanding. Thus, as Franklin-Brown reminds us, the *Naturale* understands itself to be built around the first six days of creation in the book of Genesis (2012 257). Likewise, the *Doctrinale* treats human knowledge in the state of sin. Our interest in the *Doctrinale* tome will entail considering the divine gifts God gave to humanity for the understanding

and management of creation in the fallen state that de Beauvais delineates. This is essential to our project of following the conceptualization of knowledge and nature in the encyclopedic tradition as being useful for understanding what it means to be human.

The advent of sin in the Christian tradition served for de Beauvais as the cornerstone for his organization of the *Speculum Maius*, and the touchstone for what constituted human knowledge; precisely because the Christian perception of sin alters human cognitive capacities after the fall. It also served as the framework for addressing how such deficiencies could be palliated. Consequently, understanding the state of human nature and the effects of original sin becomes essential to understanding the content and conceptualization of the tome. The index of the *Doctrinale* covers sixty-three chapters and also includes information propaedeutic to conceptualization of the *Doctrinale*. Our interest is de Beauvais' succinct summary of prelapsarian human nature in chapter nine, which will serve as his template of organization for the rest of the *Doctrinale*. It will also serve to demonstrate his conception of human prelapsarian understanding as denoting divine illumination. Significantly, divine illumination connects the *Doctrinale* with the *Naturale* and opens up different modes for the understanding of nature that will be treated in due course. De Beauvais opens chapter nine of the first book of the *Doctrinale* in the following manner:

> Truly, God, in God's creation, had given three (gifts) to humans. The first was, that God had done this for the purpose of God's own image. Second, what [God had done] for the purpose of God's own likeness. The third was the immortality of the body, only if it had continued in obedience of the creator. These three goods had existed for humankind in the state given from heaven; and they had

> begun naturally and originally: and the two other goods of humankind, just as they were established from without; one [good] beneath them [that is, humankind], the other above them. The earth beneath them, God above them. The earth [is] a seeable good, and a passing one; God [is] an unseen good, and an eternal one. In this state, humankind had been blessed, in that, [humankind] shall be blessed. Under God, [humankind] existed with status, above the earth, with merit. [Humankind is] about to be withdrawn from an inferior good, about to arrive at a superior good (*Doctrinale* Book I.9)
>
> Tria vero dederat homini Deus in creatione sua. Primum fuit, quod eum fecerat ad imaginem suam. Secundum quod ad suam similitudinem. Tertium erat immortalitas corporis, si tamen perstitisset in obsequio creatoris. Haec tria bona fuerant homini in conditione divinitus data; et naturaliter et originaliter infitafuerant: et alia duo bona hominis, quasi extra eum pro sita fuerunt; unum subtus eum, aliud supra eum. Subtus eum mundus, supra eum Deus. Mundus visibile bonum, et transitorium; Deus invisibile bonum, et aeternum. In isto fuerat homo beatus, in illo beatificandus. Sub Deo fuit conditione, supra mundum dignitate. De inferiori bono recessurus, ad superius bonum perventurus.

De Beauvais directly appropriates this theology from the *Liber Exceptionum*, the educational handbook of Richard of St. Victor, who in turn was influenced by his predecessor Hugh of St. Victor's *Didascalicon*. The idea of humanity bearing the image and likeness of God is taken directly from Genesis 1:26, while the immortality of the human body is suggested in Genesis 2:17. For our purposes, what is interesting about

this conception of prelapsarian humanity is not only what image, likeness, and immortality entail, but what this conception implies in terms of humanity's ability to understand the created order.

Richard of St. Victor lays out this conception of humanity in the opening part of the *Liber exceptionum*; "His image he made him with understanding and according to his likeness he made him with love . . . he was made according to God's image [so] he would know God and by virtue of the fact that he was made according to the likeness of God [so] he would love God."[7] Understanding and love are equated by Richard to the light and heat of a fire such that "the spiritual creature shines in knowing; and by that good by which he was made according to the likeness of God, he shines in loving" (298). This observation is essential not only in that it firmly ties de Beauvais' schema to Victoreen thought (which provided the framework of de Beauvais's encyclopedic division); it addresses the epistemology behind this conceptualization of humanity as actualized by divine illumination.

Divine illumination, as understood by the Victoreens, was a concept taken from Saint Augustine of Hippo, which according to Linda Schumacher was widely preponderant in the West until the late thirteenth century (2011 22). Nevertheless, Ronald Nash states that Augustine scholars consider that "no other important aspect of Augustine's philosophy is as difficult to understand and to explain as this notion that God in some way illumines the mind of man" (2001 180). Nevertheless, Schumacher breaks down divine illumination into five categories in terms of the help that it provides to the

[7] See, Harkins, Franklin. T, and Frans van Liere, eds. *Interpretation of Scripture: Theory: A Selection of Works of Hugh, Andrew, Richard and Godfrey of St. Victor, and of Robert of Melun*. Vol. 3. New City Press, 2013. Pg. 297

mind of man: divine illumination actualizes the cognitive capacity (it is the source that enables the mind to understand); it provides cognitive content (the object of cognition), through help with the process of cognition (the force that enables connections to be made), with certitude (what is being understood cannot be doubted), and finally knowledge of God, so that (as Augustine states in the *Confessiones Corpus Christianorum*) the particular knowledge of the thing in question may "be converted to Him by whom it was made more and more to live by the fount of life to see light in His light (Psalm 35:10) and to become perfect, radiant with light, and in complete happiness" (1991 13.4.5).[8]

It is, then, the light of God that enables human understanding, and therefore adoration. It was also the guiding philosophy of the Victoreens whose thought de Beauvais appropriated in his structuring of the *Doctrinale*. Divine illumination provided divine help in every facet of the cognitive process, from capacity, to the realization that such light is indeed God himself.[9] As such, the doctrine had profound implications with regard to how humans were constituted in their capacity to receive and understand knowledge. The idea itself comes from the gospel of John, "In the beginning was the Word, and the Word was with God, and the Word was God. He was in the beginning with God; all things were made through him, and without him was not anything made that was made. In him was life, and the life was the light of men. The light shines in the

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[8] *cui restat converti ad eum, a quo facta est, et magis magisque vivere apud fontem vitae, et in lumine eius videre lumen et perfi ci et inlustrari et beari.*

[9] See, Augustine (1991) "It remains for it to be converted to Him by whom it was made more and more to live by the fount of life to see light in His light (Psalm 35:10) and to become perfect, radiant with light, and in complete happiness." conf. 13.4.5, trans. Chadwick: cui restat converti ad eum, a quo facta est, et magis magisque vivere apud fontem vitae, et in lumine eius videre lumen et perfi ci et inlustrari et beari.

darkness, and the darkness has not overcome it." This is a reference to Jesus Christ or the second person of the Trinity. The divine *logos* incarnate as Jesus Christ is the light and life of the world and so illuminates all, and even those in darkness cannot overcome or escape from his illumination. As stated by Augustine in *The Literal Meaning of Genesis*, "There is mention of the Son, who is also the Word, where Scripture declares: "God said, let there be light."

> But there is mention of the Son, who is also the Word, where Scripture declares: "God said, 'Let there be. . . '." Thus, in Him who is the Beginning, Holy Scripture places the origin of created be-ing, which exists through Him but still in an imperfect state. But it shows that to Him as the Word belongs the perfecting of created being, which is called back to Him to be formed by a union with its Creator and by an imitation, in its own way, of the Divine Exemplar, who, eternally and unchangeably united with the Father, is of necessity identical in nature with Him. (1982 23)

Hence, theologically speaking, Jesus the second person of the trinity functions as the mouthpiece of God the Father who creates the universe. This particular understanding is the impetus for understanding divine illumination. For as being created by the Word, all of creation reflects the Creator in some aspect of its existence. It is important to note that this will not just hold for corporeal creation, but for a-corporeal truths as well. As Koetsier and Bergmans explain mathematics is seen as being divinely illuminated because it expresses divine truths concerning reality (2004 19).

The key to this paradigm is that the things in the world that are known and named reflect the divine *logos* by which they were created, and human minds, which are

structured according to the same divine *logos* (part of the image of God), can know and understand the things God has created and hence in a certain manner participate in his thought. As elucidated by Linda Schumacher, "He [God] enables the mind to participate of its own accord in a unifying pattern of cognition analogous to that of Him who thinks one thing – Himself" (2011 37). Thus, in a certain manner, human minds as being created by God, are constituted in such a way that they are able to perceive his handiwork and then reflect upon aspects of His creation. The key, however, is that such insight into divine truth is actualized by God, not humanity. This realization 'then' enables humans to know him more fully, through the study of his creation. While this doctrine seems difficult to fathom for modern readers, it makes sense through the understanding that Jesus (the second person of the Trinity) was with God in the 'beginning' and is the Word, who gives birth to physical reality.

Divine illumination also has direct ties to Augustine's semiotic understanding of Paul's *Epistle to the Romans*; namely that the words, signs, and physical realities of the natural order were all interconnected, bearing different aspects of God's divine nature. Specifically, "The invisible things of him from the creation of the world are clearly seen, being understood by the things that are made, even his eternal power and Godhead. (Rom 1.20)" The understanding espoused by Augustine was reliant on the principal that God had created the heavens and the earth. As such, creation was understood as bearing in some manner the imprint of its maker, and hence is able to refer to him.

Consequently, all of creation functioned in a referential manner for humanity. Since all of creation, and indeed language as well as other signs, were understood as created by God, they functioned together reflecting the light of God, and hence pointed to

him. This hermeneutic was so profound in its influence that it was the de facto mode of understanding in the *Naturale* tome of the *Speculum*, most recently explored by Mary Franklin-Brown's *Reading the World*. In its manner of conception, The *Naturale* was seen as an attempt to treat God's special revelation of scripture through his general (created) revelation of nature. Hence an encyclopedic cataloging of the created order was seen as a way of furthering knowledge of God materially through exegesis of the book of Genesis. De Beauvais' introduction of his encyclopedic project in the *Libellus Apologeticus* testifies to this:

> I have united and put in order these extracts under the form of a compendium, in one totality, remaining that which would serve to establish the dogma of our faith, define the mores, to promote our attachment to charity or still more expose the mystical sense of the holy scriptures or the literal or symbolic sense of their truth . . . For I am in fact certain—and I have confidence in the Lord-this work will be of great utility, for me and for those who read it with attention and sympathy, not only to understand God in himself and through his creatures visible and invisible, and thus love [God] and bring the heart to a spirit of charity through the words of fire and the numerous examples of so many of the Saints. [10]
>
> In unum corpus voluminis quodam compendio et ordine summatim redigere. Ex his dumtaxat praecipue quae pertinere videntur, vel ad fidei nostrae dogmatis astructionem, vel ad morum instructione, sive ad excitandam charitatis devotionem, aut divinarum scripturarum mysticam expositionem, vel ad ipsius

[10] Nota Bene: The first half of the citation is from I. "DE CAUSA SUSCEPTI OPERIS ET EIUS MATERIA", while the second is from IV. "DE UTILITATE OPERIS ET APOLOGÍA AUCTORIS"

> veritatis manifestam aut symbolicam declarationem . . . Certus sum enim, et confido in Domino, hoc ipsum opus non solum mihi, sed omni studiose legenti, non parum utilitatis afierre, non solum ad Deum per se, et creaturas visibiles et invisibiles cognoscendum, ac per hoc diligendum, et cor suum in devotione charitatis multorum doctorum ignitis sententiis et exemplis excitandum.

It seems clear that de Beauvais hoped to inculcate in his readers understanding and ipso facto love of God by cataloging the created order based upon a ternary world grounded in divine illumination. This is vital because, while the *Naturale* tome had long been seen to function under this paradigm, I have demonstrated divine illumination's influence as the guiding philosophy behind the conception of epistemology in the *Doctrinale* as well.

As I established, the Augustinian concept of divine illumination directly appropriated by de Beauvais via the Victoreens parallels Pliny's pantheistic nature in important ways both in the sense that divine illumination gives birth to, and is instructive of humanity. Pliny and de Beauvais thus see human existence (and that of the natural world) as a result of divine activity. In turn, creation instructs human understanding as it does in Pliny's *Naturalis*. The crux of the problem for de Beauvais is that the human capacity for understanding was corrupted as a result of the fall. For Pliny, there seems to be no such barrier. Yet human understanding is achieved in both the *Naturalis Historia* and the Speculum *Doctinale* through forces outside the human intellect. Hence, nature actualizes understanding in Pliny's *Naturalis*, and divine illumination of nature actualizes it in de Beauvais's *Doctrinale*. Yet nature in the Christian paradigm is not seen as being partly divine (as is the case in pantheism), it is merely seen as carrying facets of divine truth. The loss of direct access to this divine truth will necessitate the learning of various

disciplines. Indeed, such a consequence is in marked opposition to the understanding elucidated in the *Naturale,* where divine illumination is manifest in the ternary understanding of words. Yet the schemas of understanding present in the *Doctrinale* (likewise conceived under the influence of divine illumination) will refigure humanity's relationship to the natural world. Specifically, theoretical modes of access will stand in for prelapsarian 'direct understanding.' Additionally, the loss of the immortal body will necessitate humanity intervening in the workings of nature. Thus, the form of understanding most clearly exposited in the *Naturalis Historia*, that of yielding to the instructive power of nature, will be reversed as humans attempt to put strictures on nature through modes of theorization and control. This is significant in that mastery of nature will become a central concern of the encyclopedic movement.

It was through his conception of the paradisiac state of knowledge and its subsequent loss that de Beauvais opened up modes of access that were characterized by their attempts to measure and regulate nature. This is in distinction to Pliny's subservient position, where humanity is actualized through its adherence to nature's natural phenomena. According to de Beauvais's theorization, it becomes necessary for humanity to learn metaphysics, physics, and mathematics to remedy the 'direct insight' lost due to the fall. In addition to the insertion of 'practices' that treat the 'management' of life, de Beauvais includes mechanical arts meant to palliate humanity's mortal state. However these arts involve humanity interceding and intervening in the working of the natural world; a contrast to Pliny's ideal of attentively following nature for direction on the practice of life. Yet all of these palliatives involve manners of classification and systemization based upon the possibility of control. Nature then becomes known through

various means of theorization and regulation. This is essential for our inquiry into the representation of the natural world as key to understanding what it means to be human.

**Wisdom, Virtue, and Necessity**

Fundamental to this investigation is de Beauvais' conception of human understanding espoused in the *Doctrinale* as based upon divine illumination. As I will demonstrate, these parameters will introduce categories of knowledge into de Beauvais' *Speculum* that function as modes of systemization and control. We will recall that de Beauvais conception of humanity involved the bearing of God's image, likeness, and immortality. However, the fall of humanity into sin as delineated by de Beauvais brought an end to these gifts.

> Moreover, there are three principle evils, which defile the three preceding goods. For indeed the divine image was perverted by means of ignorance, the divine likeness by means of desire, the immortality of the body by means of weakness. And thus the path of humanity (darkness) was made through ignorance, and also (perilous) through desire: (and the angel of God) it is the weakness of the body (following) since, by means of mortality, until it returns to the earth from which it was taken. There are three further cures, by which the three evils, having been said earlier, are held back, and the three goods are reshaped, namely Wisdom, Virtue, and Necessity. Wisdom is the understanding of things just as they are. Virtue is the disposition of the soul suited to reason according to the manner of nature. Necessity is that without which we are not able to live. (*Doctrinale*, 1.9)
>
> Sunt autem tria mala principalia, quae corrumpunt tria bona praecedentia. Per

> ignorantiam namque corrupta est divina imago, per concupiscentiam divina similitudo, per infirmitatem immortalitas corporis. Facta est itaque via hominis (tenebrae) per ignorantiam, et (lubricum) per concupiscentiam: (et angelus Dei) id est infirmitas corporis ad vindictam immissa (persequens) cum, per mortalitatem, donec revertatur in terram de qua assumptus est. Porro tria sunt remedia, quibus tria mala praedicta repelluntur, et tria bona reformantur, scilicet Sapientia, Virtus, Necessitas. Sapientia est comprehensio rerum prout sunt. irtus est habitus animi in modum naturae rationi consentaneus. Necessitas est qua vivere non possumus.

To summarize, the fall of humanity into sin brought about a corruption of humanity's ability to know God and his creation, and to love him and his creation. De Beauvais characterizes this path as one of *tenebrae*, or taken in shadow or darkness. This again denotes a loss of access to the illuminating light of God. It is this dual corruption of knowledge and love that necessitated the loss of human immortality. Since the divine brightness and heat that characterized humanity's prelapsarian state were no longer present, humans lost their immortal bodies. While this theological concept seems far removed from the conceptualization of the *Doctrinale*, it is in fact that which permits us to lay out its categories of knowledge and understand how they functioned.

In order to compensate for these losses, humanity was given three 'gifts', which were meant to aid their fallen state. Wisdom was given to compensate humanity for its loss of knowledge. Likewise, virtue was given in order to palliate the disordered desire brought about by the fall. Finally, in order to counteract mortality, humanity was given necessity. These categories will undergo a shift of content in De Beauvais' *Doctrinale*, which transposes them into systems of access, regulation, and practice. In contrast to

Pliny's *Naturalis*, the practice of encyclopedic knowledge as propaedeutic to life becomes connected with learning modes of access, rules of management and modes of manipulation that place emphasis on the mastery of certain disciplines instead of attention to the natural phenomena of nature.

These three gifts of wisdom, virtue, and necessity as delineated by de Beauvais will develop into the categories of theory, practice, and mechanics, which serve to categorize the various subjects included in the *Doctrinale*.

> Theory, driving out ignorance, illustrates Wisdom: Practice, removing vice, strengthens virtue. Mechanics, avoiding scarcity, moderates the failing of the present life. Theory, since it is in all things, and since it is not to be investigated, chooses truth. Practice arranges the method of living rightly, and also the shape of instruction, and the favorable education of the virtues. Mechanics, overseeing the descending things, troubles itself looking after the things requisite to the human body.
>
> Theorica ignorantiam expellens, Sapientiam illuminat: Practica vitium excludens, virtutem roborat. Mechanica penuriam cavens, praesentis vitae defectum temperat. Theorica in omni quod est, et quod non est scrutari verum eligit. Practica modum vivendi recte, et formam discliplinae, secundum virtutum institutionem, disponit. Mechanica res defluentes administrans, humano corpori necessaria providere satagit.

These categories were created to palliate the loss of God's divine illumination. Direct access to God we will remember, not only entailed perfect knowledge, but love of God

and immortality. Yet their material inclusion will become separated from their Christian roots in de Beauvais' appropriation of them through their exclusion of Christian theology and practice. In sum, the *Doctrinale* does not include a systematic theology designed to regain knowledge, or a robust treatment of spiritual exercises to aid in the combat against vice, nor still a reflection on soteriology. Instead, theories of knowledge, the practice of virtue, and the mechanics of necessity were billed as the tools for the redemption of human knowledge, practice, and immortality. These classifications that were taken from Richard's Victoreen schema in the *Liber exceptionum* eclipse their theological foundations as a result of the subjects that are treated. Theory that was given as a replacement for divine knowledge involves the disciplines of mathematics, physics, theology, and metaphysics. The "practice of virtue" becomes transmuted into private and familial ethics, along with those of the city. Wedged into the *Doctrinale* are two books on the virtues and vices,[11] which are remnants of its original conception as a treatment of the subject. Alongside these are a book on domestic economy and four books on politics and law. Necessity, designed to alleviate the needs of a mortal body, involved the seven mechanical arts (as listed by de Beauvais) of weaving, blacksmithing, war, navigation, agriculture, hunting, alchemy (taking the place of medicine), and the theatrical arts. Medicine is noticeably separated from the seven, and three books are devoted to it.

Hence theory, whose aim is to replace humanity's prelapsarian ability to know things in their reality, becomes detached from its theological epistemology. Instead of knowledge of things in and of themselves, or as de Beauvais says "things as they are,"[12]

[11] See, Franklin-Brown (2012) p. 216, The inclusion of the Virtues and the Vices points to the conception of the tome as a handbook on proper Christian practice.
[12] See, Vincentius. *Speculum Maius Doctinale* I. IX

the theoretical disciplines only touch one aspect of reality. Accordingly, mathematics, physics, and metaphysics are included to temper the loss of divine access to knowledge entailed by sin. In fact, Theology, the one discipline with the greatest claim to fill the loss set up by de Beauvais, is relegated to the shortest book in the *Doctrinale*. This final book includes no presentation of Christian theology and remains unfinished. Instead, mathematics (which included the ancient *quadrivium* of arithmetic, music, geometry, and astronomy) and Aristotelian physics and metaphysics (which included optics, mechanics, and engineering) are presented as the primary theoretical tools of understanding. More importantly, theory introduces tools for knowledge in place of what is supposed to be perfect knowledge in and of the thing itself. These tools are characterized by their rules and attempts at systemization. This conception of understanding becomes significant in that a mastery of certain methods of inquiry becomes necessary for the understanding of nature. This application of certain rules of understanding will anticipate what can be known. One cannot simply inquire broadly into nature's natural phenomena as Pliny did: in order to possess truly circular knowledge, one must also acquire the proper modes of access. These individual modes of access, however, only treat one particular facet of inquiry, and there is no systematic treatment concerning how these modes of access are related to one another.

In addition to theory, de Beauvais delineates various practices that were meant to aid in the living of life touched by original sin. The problem is that none of these so-called practices are practices at all; rather they are rules and laws. The distinction is important because of the *Doctrinale's* original conception as a handbook on the virtues

and vices.[13] Indeed, the *Doctrinale* includes two chapters that treat the virtues and vices, but they are characterized by short citations and no systematic treatment. This shortcoming in content was recognized by de Beauvais' contemporaries and resulted in the creation of the *Speculum Morale* after his death. This was most likely due to the understanding that Christian virtues were meant to be actual exercises that could aid the reconstitution of the individual in view of God's will for human lives. However, the inclusion of law and jurisprudence in place of Christian practice transformed knowledge into rule, procedure, and precedent. Hence, De Beauvais' treatment of 'virtue' does not entail practice meant to aid humans in their combat against the effects of sin but rather includes rules and laws. Accordingly, de Beauvais' treatment of ethics, by its very nature, implies the need to regulate humanity, underscoring their inability to act rightly.

Finally, the *Doctrinale* contains treatments of the mechanical arts and medicine meant to aid humanity's mortal state. However, one must note that medicine is separated from the seven mechanical arts, and indeed it was not present in Johannes Scotus Eriugena's original 9th Century list of mechanical arts. Likewise, in comparison to the subjects enumerated under theory and practice, the mechanical arts entail learning certain rules and procedures necessary in their management of the natural order. Thus the teaching of the mechanical arts of weaving, blacksmithing, war, navigation, agriculture, hunting, alchemy, and the theatrical arts all involve a certain amount of control over their

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[13] See, Lusignan, Serge, Monique Paulmier-Foucart, and Marie-Christine Duchenne
"It seems to appear in the plan . . . in the two-part version of the *Speculum Naturale*: books 15 through 17 announce a extended treatment of the forms of sin that we do not find in the three part Speculum Maius that we are familiar with" p. 115
« il semble apparaître dans le plan . . .dans la version *bifaria* du *Speculum Naturale*: les livres XV à XVII annoncent un traitement étendu des formes du péché qu'on ne retrouve pas dans le *Speculum Maius* en trois parties que nous connaissions» p. 115

respective objects. This is indeed established by de Beauvais in chapter nine of book one of the *Doctrinale*; "Necessity [being] regulated by the administration of temporal things, that to which mechanics (applies). (I.9)"[14] *Temperatur vero Necessitas administratione temporalium, ad quam Mechanica*. More importantly, such intervention and control is based upon human innovation, and thus seems to distance the source of understanding from divine illumination, such that while it is God who makes possible said discoveries, the actual discoveries are made by humanity. Augustine himself seems to attest to this state of affairs in *The City of God*:

> By the sole grace of God which is in Christ—has not the genius of man invented and applied countless astonishing arts, partly the result of necessity, partly the result of exuberant invention, so that this vigor of mind, which is so active in the discovery not merely of superfluous but even of dangerous and destructive things, betokens an inexhaustible wealth in the nature which can invent, learn, or employ such arts? What wonderful— one might say stupefying— advances has human industry made in the arts of weaving and building, of agriculture and navigation! With what endless variety are designs in pottery, painting, and sculpture produced, and with what skill executed! What wonderful spectacles are exhibited in the theatres, which those who have not seen them cannot credit! How skillful the contrivances for catching, killing, or taming wild beasts! And for the injury of men, also, how many kinds of poisons, weapons, engines of destruction, have been invented, while for the preservation or restoration of health the appliances and remedies are infinite! (XXIV).

[14] Ibid. Vincentius. Speculum Maius

The mechanical arts, in Augustine's view, are a result of human ingenuity and genius; seemingly signaling the absence of God's help in their discovery. What is more, the vocabulary utilized by de Beauvais in respect to humanity's relationship with nature leans toward ideas of administration and management.

Serge Lusignan's article *Les Arts Mechanique dans le Speculum Maius* offers an opposing view of humanity's rapport with Nature, which merits our consideration. At base, Lusignan's critique centers on the idea that human intervention in the natural order is unoriginal at best, and adulterous at worst.

> Ces actes humains sont dit mécaniques ou adultérins parce qu'ils ne font qu'imiter la nature. *Adulterinus* en latin veut dire qui se fait passer pour un autre et qui de ce fait et trompeur. Ceci amène Hugues à qualifier les arts mécaniques d'adulterinae au sens où ils gouvernent l'action humaine sur la nature . . . entendu au sens de ce qui est donné dans la nature ou produit par la nature, est supérieur à ce qui est artificiel, c'est-à-dire ce qui est résultat d'une transformation humaine de la nature, à savoir une imitation . . . C'est donc sur la base d'une conception assez peu positive de l'agir humain sur la nature que Hugues assoit les arts méchaniques." (1982 39-40)

Lusignan's declaration that Hugh's understanding of human action on nature is 'not very positive' is simply false. Lusignan bases his argument on Book One, Chapter nine in the *Didascalicon*, which is copied almost verbatim by Vincent de Beauvais in Book XI, Chapter One of the *Doctrinale*. However Lusignan does not include Hugh's clarification of humanity's intervention in nature, which is also included by de Beauvais:

> For it is fitting that nature should provide a plan for those beings which do not know how to care for themselves, but that from nature's example, a better chance for trying things should be provided to man when he comes to devise for himself by his own reasoning those things naturally given to all other animals. Indeed, man's reason shines forth much more brilliantly in inventing these very things than ever it would have had man naturally possessed them. Nor is it without cause that the proverb says: "Ingenious want hath mothered all the arts."
>
> Oportuit enim ut illis, quae sibi providere nesciunt, natura consuleret, homini autem ex hoc etiam maior experiendi occasio praestaretur, cum illa, quae ceteris naturaliter data sunt, propria ratione sibi inveniret. multo enim nunc magis enitet ratio hominis haec eadem inveniendo quam habendo claruisset. nec sine causa proverbium sonat quod: "Ingeniosa fames omnes excuderit artes."

If anything, Hugh's (and by extension) de Beauvais' conception of the mechanical arts is glowing. The *Didascalicon* ends the chapter saying "so we look with wonder not at nature alone but at the artificer as well." *Ut iam cum natura ipsum miremur artificem*.

Indeed God gave the mechanical arts to humanity, but he does not seem to participate in the process of discovery as is clearly the case for Pliny: he simply makes them possible. For Pliny, nature was codified by its potential appropriation by humanity through attention to nature's natural phenomena. For de Beauvais, the use of nature implies schemas for its manipulation. The use of nature is hence vital to the conception of both the *Naturalis Histoira* as well as the *Doctrinale*. Meanwhile, Vincent de Beauvais' conception of understanding nature in the *Doctrinale* is largely informed by

attempts at theorizing modes of access and control, which place humanity in the position of arbiter of knowledge. This conception of nature is quite distinct from Pliny's conception of nature as being the supreme arbiter of knowledge. Hence the *Doctrinale* presents nature through its potential for analysis and systematization through human rules.

**Conclusion**

While the dialogue between Pliny the Elder and the scholastic Vincent de Beauvais might be questioned given their extra millennial separation, not to mention religious and philosophical differences, they are undeniably the two most important figures of encyclopedism in the first 1500 years of *Anno Domini*. Though separated by time and cultural habitus, both the *Naturalis Historia* and the *Speculum Maius* owe their constitution of knowledge to theological convictions. While Pliny understood nature in a pantheistic paradigm, de Beauvais understood nature to be divinely imbued.
Yet most importantly Pliny the Elder and Vincent de Beauvais have remarkably similar conceptions of the necessity of natural knowledge in their respective goals of elucidating humanity's relationship to nature in the practice of life.

Pliny the Elder's conception of knowledge with regard to human life can be described as a critical engagement with the whole of the natural order as propaedeutic to learning to live. Vincent de Beauvais' engagement with the natural order is complicated by his treatment of it as an exegetical tool on the one hand, and its potential for analysis and manipulation by humanity on the other. In the *Doctrinale,* the fall of humanity into sin fundamentally changed its ability to understand the natural order, and hence necessitated theoretical modes of access, comportment, and practice. This is best

contrasted with Pliny's understanding of the natural order. In the *Naturalis*, there seems to be no hindrance to human access of the natural world in that nature itself actualizes the human understanding. Yet the natural phenomena of nature are by no means obvious in that humans must attentively explore and engage with nature in order to perceive its workings. Nature is known by what it does and hence requires attention to its natural phenomena. However, there is no fundamental default in humanity's capacity to understand nature. Rather, nature's complexity and the finitude of humanity act to limit understanding. The very opposite is the case for de Beauvais. According to the Augustinian conception of the fall that de Beauvais appropriated via the Victoreens, humanity's act of prideful self-love fundamentally transformed their relationship with creation and themselves, resulting in defaults of understanding and comportment. Hence knowledge of the world in the *Doctrinale* section of the *Speculum* becomes analytical, with the learning of different modes of access standing in for 'direct understanding.' This potential for different modes of access leads to potential manipulation of the natural order, given that certain laws and practices are now fundamental to the understanding of nature. Thus, the advent of the theoretical disciplines of mathematics, physics, and metaphysics serve as tools for the study of nature. Yet they imply an insufficiency of understanding that de Beauvais clearly delineated. Specifically, the fall into sin undercut humanity's ability to know things in their reality and so humans were given theoretical tools to serve as prostheses in order to better understand creation. Yet, instead of knowledge of "things as they are" the theoretical disciplines only touch one aspect of reality. In only touching one aspect of reality, humanity began to exercise some semblance of control over the natural world due to the prescribed nature of the theoretical

disciplines. This conception of humanity's attempt to master nature can be contrasted with Pliny's understanding of nature's activation of human understanding. Instead of humanity learning from the workings of nature's divine order, it is humanity that begins to impose the strictures of its understanding upon the world. This is most evident with the mechanical arts where humanity's main concern is the manipulation of nature. These particular actions are not the result of attention to the natural phenomena of nature, but are rather human attempts to systematize and control it. In instituting theoretical modes of inquiry and access into the encyclopedic tradition, de Beauvais delineated method and manipulation as vital to understanding nature in a manner that was not previously actualized.

This theory of access and manipulation will be further explored in Charles Sorel's *Science Universelle* through investigation of his proposed universal science. Sorel will use his universal science to reexamine the essence of nature. This reexamination of the natural phenomena of nature is based on empirical engagement with the new understandings of reality that the 17$^{th}$ century occasioned. Thus my interest will not be focused on the idea of the 'whole' as present in the *Naturalis Historia*. Nor will it be on the theoretical understanding initiated by de Beauvais' *Speculum Doctrinale*. Rather Sorel's encyclopedic exposition will involve the reexamination of what it means to know nature, and how such knowledge informs its use.

# Chapter Two

## Universal Learning

> On croit bien que le titre de la *Science Universelle* est capable d'attirer beaucoup de gens, avec ce qui est promis de l'enchainement des Sciences et des Arts, et de la réfutation des erreurs vulgaires : Néanmoins ces paroles ne feront pas comprendre à chacun la méthode de l'ouvrage.
> -Charles Sorel, *Préambule au Lecteur de la Science Universelle*

**Introduction**

Charles Sorel sieur de Souvigny's pursuit of a 'universal science' for the natural ordering of knowledge and refutation of error was the object of over thirty years of work on his part.[15] Yet history remembers Sorel primarily as the first historiographer of France, and for his novels *Francion* (1623 and 1633), *Le Berger extravagant* (1627), and *Polyandre* (1648). Notwithstanding Sorel's reputation as a literary critic and satirical novelist, he was very much an intellectual who kept abreast of the latest scientific and philosophical thought. Émile Roy attests to this (1891 375), as does Antoine Adam who elaborates, "Il [Sorel] fréquentait des philosophes et des érudits, Gui Patin, Gassendi et leurs doctes amis" (1958 23). Sorel's relentless intellectualism gave birth to the *Science Universelle*, a monograph written in the vernacular, whose approach, as the foreword affirms, is by no means as apparent as the title implies. Indeed, Sorel's method does not resemble encyclopedic knowledge in any previously recognizable instantiation. Sorel explains part of what sets the *Science Universelle* apart in his *Bibliothèque Française*:

> Il (La Science Universelle) ne contient pas les abrégés de Grammaire, de Logique, d'Arithmétique, de Géométrie et des Autres Arts ou Sciences, comme s'étaient pu figurer des gens qui n'en avaient jamais rien vu. De même qu'on en trouve dans

[15] The four volumes of *La Science Universelle* appeared successively from 1634 to 1668.

> quelques livres qu'on veut passer pour les bonnes encyclopédies : il n'y a pas grand honneur à copier ce qui se rencontre ailleurs. (1970 432)

In singling out 'bonnes encyclopédies' Sorel is clearly referring to the educational manuals of the day, which Yeo characterized as containing summaries of the most substantial branches of knowledge considered necessary for the instruction of the educated individual (2001 7). According to Verdier, the *Science Universelle* is best translated as universal knowledge or learning (1984 106), which alludes to its pretension as a pedagogical text designed to give its reader, "un cours complet d'éducation" (1891 387). Sorel was clearly not interested in replicating any of the myriad pedagogical manuals of his day, which contained mere summaries of knowledge (Sorel I. 22-23). Rather Sorel set his sights on reevaluating the contents and structure of encyclopedic knowledge through engagement with the latest theorization and discovery (Roy 375). In this way, he hoped to change the manner in which the study of the natural world was executed through the introduction of a universal method, which would serve to "reduisant toutes les Sciences a une seule" and "combat les erreurs anciennes et les nouvelles" (Sorel 432). Nevertheless, Sorel clearly saw his corpus as fitting into the tradition of encyclopedic works as testified by his appropriation of *enkyklios paideia* in the prefatory *Proposition de la Science Universelle.* However, Sorel's "Universal Science" no longer conforms to a natural order, but rather one governed by reason understood as the basis of a "true" philosophy.

> Pour nous donner une Science universelle conforme à la droite raison ou vraie philosophie, il faut qu'elle soit plus étendue que la vulgaire, comme sera celle qui comprendra tout, laquelle sera véritablement une parfaite encyclopédie, ou un

> cercle et enchainement de toutes les sciences et de tous les arts, dont l'on verra l'ordre naturel et la plus certaine liaison. (I.32)

Through his adumbration of the traditional encyclopedic expression *enkyklios paideia* (the linking and circumscription of the arts and sciences), Sorel privileges reason and the idea of a chain of knowledge that valorizes the concept of order as standards to which his circle of knowledge must conform in order for instruction to take place. Moreover, Sorel's *Science Universelle* broadened the number of subjects normally included in the encyclopedic works of the day through his call for an extension of scope. These encyclopedic standards foreshadow the enlightenment project emblematized by the *Encyclopédie*, in that it too was concerned with changing its reader's manner of thinking about the natural world.

Sorel believed that his particular method was the key to revealing the perfection of his *Universal Science* and the encyclopedic work it performs. Indeed, the question of method will constitute our point of departure; what was Sorel's method based on, how did it function, what sort of effects did it bring about? Sorel claimed his method was necessary for one to see the 'natural order' and 'perfect connection' that are present in his approach. More so, only the method of the universal science was declared capable of correcting the vulgar error that had crept into society (I. *Proposition, 53*). Yet, I will show that in its attempt to create a universal science, the *Science Universelle* actually occasions a reexamination of the essence of nature, through its drive for experimental validation of theoretical postulations. In order to situate Sorel's project in regard to the previous encyclopedic works addressed by this dissertation, I will provide a brief

summary of encyclopedic history from the medieval period to the seventeenth century. This will serve to demonstrate the rupture between medieval conceptions of knowledge and the new modes of understanding engaged by Sorel's *Science Universelle*. I will then show that Sorel was familiar with the group of thinkers called the 'novateurs', who were unanimous in their rejection of Aristotelian thought. I believe that such familiarity was not accidental in that Sorel used the *Science Universelle* to reevaluate the understanding of nature and to engage some of the dominant metaphysical debates of the day. As such, I will argue that the *Science Universelle* constituted a major change in how nature was known, that is, how it was represented and understood within encyclopedic thought. More precisely, Sorel's work opened up a space in which to reevaluate the essence of the physical world. This reexamination of nature not only involved the 'being' of nature, but its use as well. The significance of such an Encyclopedic undertaking was twofold; it established the idea of a necessary order to encyclopedic knowledge that was to be followed with regard to understanding the 'essence and 'usage' of nature. Specifically, 'nature' was treated systematically in order to give the reader a cumulative understanding of the subject.[16] As Sorel explains, "il en faut faire une recherche entière, afin d'être universellement savant: mais l'on doit procéder en ceci avec un ordre très-exact" (I. 3). Secondly, the *Science Universelle* included information for the manipulation and use of the natural world for human benefit, contents not typically present in the educational encyclopedias of the day.

[16] As Sorel states in his Proposition de la Science Universelle, "Cette Science générale est enchainée de telle façon que l'on n'en savait posséder pleinement aucune partie, sans avoir acquis le tout. (35)"

Nearly four centuries passed between the appearance of de Beauvais' *Speculum Maius* and Sorel's *Science Universelle.* In terms of monumental scope, one could argue that Diderot and d'Alembert's *Encyclopédie* should be the next encyclopedic work treated. However, Sorel provides us with an important pivot in the history of encyclopedism that allows us to explore the lingering influence of Aristotelian philosophy on encyclopedic texts. Firstly, the Aristotelian worldview dominated Renaissance understandings of nature, a supremacy that was challenged and eventually supplanted. Secondly, while Aristotelianism is foremost a philosophical stance, it also provided the corpus for university instruction, which was intimately connected with encyclopedism. The *Science Universelle* inherited these particular convictions, and through its desire to reevaluate the foundation of encyclopedic order and content, opened up new possibilities of conceiving knowledge through its desire to change the manner in which nature was understood.

As Franklin-Brown explains, the *Speculum's* appearance in the thirteenth century marked the entry of Aristotelianism into encyclopedic discourse (2012 98), and its influence on encyclopedic structure and content. Yet, as Faith Wallis elucidates, its appearance also marked a decline in medieval encyclopedism (1974 197). As a result of its entry, encyclopedic production in Europe fell into a period of decay and the fourteenth century now stands as a testament to the dominance of Arab encyclopedism.[17] Meanwhile, according to Ann Blair, the advent of the Renaissance, "involved a new scale of encyclopedic activity rather than the development of a completely new practice. (2012

[17] See, Muhanna, Elias. "Why Was the Fourteenth Century a Century of Arabic Encyclopedism." Ed. Jason König and Greg Woolf. *Encyclopaedism from Antiquity to the Renaissance*. Cambridge; New York: Cambridge University Press, 2013.

389)" This was largely the result of the invention of the Gutenberg press in 1440, which allowed for the rapid dissemination of knowledge. Still, the history of Renaissance encyclopedism is not easy to parse due to the heterogeneity of texts that came into circulation. As Joseph Freedman clarifies, medieval encyclopedic texts such as the *De proprietatibus rerum* (which was published no less that thirteen times before the end of the fifteenth century), became widely available (1994 212-56). As Ogilivie shows, the initial drive to classify plants for medical use in the mid-sixteenth century allowed for the emergence of the discipline of botany (2008). This contributed to the production of encyclopedic texts, which contributed to natural history's eventual emergence as a distinct subject in the early seventeenth century. These herbals (as these encyclopedic texts are known) themselves readily demonstrate the shift from ancient (and in particular Aristotelian) natural history to one based on evolving conceptions of empirical research and classification. Even so, more traditionally comprehensive encyclopedic texts appeared, perhaps most notably the *Margarita Philosophica,* (1496- reprinted ten times in the sixteenth century)[18] whose goal was a summary of the university curriculum of the day. The work the *Speculum Maius* performed by prioritizing natural knowledge in order to palliate the intellectual loss of the Fall was continued, according to Yeo, by Calvinist Johann Heinrigh Alsead through his 1630 *Encyclopaedia Septem Tomis Distincta* (2001 3). Not unsurprisingly, the word 'encyclopedia' when it was first coined in the Renaissance was very much connected with "the course of learning appropriate to the educated person,"(2001 7) that is, the subjects and 'path' of study one should undertake. Indeed, because the *Science Universelle* takes itself to be an educational text whose order

[18] Anon., *List of Editions of the Margarita Philosophica* 1503-1599

is of utmost importance (through its claim to concatenate the arts and sciences, and correct vulgar error), it behooves us to briefly gloss university education in the early Renaissance and its influence on encyclopedic content, order, and method.

According to Daniel Andersson, by the early thirteenth century, the reintroduction of Aristotelian philosophy formed "the foundation of the university curriculum" (2013 407) and encyclopedic philosophical writings continued to be produced into the fifteenth century. Yet, as Freedman explains, by the early sixteenth century philosophical handbooks and encyclopedias became virtually non-existent, due to their loss of place in the university curriculum of the day (1994 215). It was around this same time that the concept of method became important in Central European schools and universities. Joseph Freedman argues that due to their lack of place in the university curriculum, "By the 1540s, philosophical disciplines were no longer regarded as parts of a unified whole. The concept of method apparently was viewed by many educators as a means to help restore unity and cohesion to philosophical instruction" (1994 223). The words used to describe method in logic texts of the day almost always included the words *via* and *ordo,*[19] attesting to the idea of a path to, as well as a logical order necessary to the acquisition of knowledge. Freedman argues that professors at European schools and universities used the concept to "develop relatively uniform teaching methods which could be applied to a multitude of different and quite diverse academic disciplines" (1994 222). Hence, the idea of a specific order of, or progression to knowledge became the unifying principle for proper educational practice.

[19] See Freedman appendix L p. 245

This new emphasis on order was applied to the philosophical disciplines following their reemergence in university curricula in the early seventeenth century. As Dennis des Chenes comments:

> Texts were written to serve the teaching of Aristotle in the universities. The curriculum of the first three year of study consisted in a systematic exposition of the *Logic*, the *Physics*, *De generation et corruptionne*, *De anima*, the *Metaphysics*, the *Nicomachean Ethics* . . .We may lament the rigidity of the curriculum, but we can only envy its coherence. A *physics* course could presuppose knowledge of the *Logic*, a *De anima* course that of the *Logic* and the *Physics*, and so forth. (1996 8)

The order of such a curriculum was paramount to its mastery such that a student could not follow a course in ethics without first having understood the required prerequisites. This idea of order that was necessary to the unity of these curricula was evident in the increasing number of encyclopedic texts they engendered.[20] However, Aristotelianism did not only indirectly give rise to the concept of order, but was prevailing in its influence over the study of the natural world. As Daniel Garber states,

> The situation with respect to the dominant paradigm at the beginning of the period [the seventeenth century] is not an insuperable problem. I think that it is plausible to identify it as the Aristotelian natural philosophy. Even though it is only part of the mix of disciplines that go to make up the study of nature in the period, I think it is fair to say that is has a kind of dominance over the field. It is the Aristotelian conception of nature, the Aristotelian natural philosophy writ broadly that

[20] See, Freedman pgs. 232, 234

> separates mathematics and natural history from natural philosophy, that infuses mathematical sciences such as astronomy with the basic assumptions that shape them, such as geocentrism. (2009 15)

This was the hegemony exercised by the Aristotelian natural philosophy of the time over university instruction. Not only did it undergird the suppositions that constituted academic disciplines, it influenced their scope of study. For instance, in Astronomy, Aristotelian geocentrism prefigured astronomical study around the assumption that the Earth is the center of the universe.[21] Thus, while Aristotle and his followers did not directly influence the study of the more narrow disciplines of natural history (undertaken by compilers of herbal encyclopedic texts), and mathematics, Aristotelianism was the dominant worldview.

**Overtaking Aristotle**

Sorel was very much aware of the hegemony of the compositional and sequential nature of (primarily Aristotelian) education and desired to put it into question. In the run-up to his presentation of his universal science questions, he writes: "Est il à propos de parler d'abord des principes et des causes, et après du mouvement, du lieu, du vide, de l'infini, et du temps? Croit-on que de nouveaux écoliers y puissent comprendre quelque chose? Comment savent-ils à quoi tout cela peut servir, s'ils n'ont pas encore considéré le monde dans ses premières apparences" (I. 53)? Sorel is clearly referencing Aristotle's *Physics,* the text deemed essential for the understanding of natural philosophy. Yet in his enumeration of the concepts contained in the *Physics*, we see a rejection of Aristotelian

[21] See Garber, *Galileo, Newton and all that: if it wasn't a scientific revolution, what was it?* 9-18

natural philosophy in favor of another manner of achieving knowledge, which will be the focus of our study.

Sorel was by no means alone in his rejection of Aristotle. In the preceding century and through the seventeenth, a group of thinkers emerged who rejected Aristotelian natural philosophy (2015 3-4). As Garber explains, these 'novateurs' as they were commonly known, did not share a common vision besides their rejection of Aristotelianism (2013). However, they were united in their search for something with which to replace it. While Sorel cannot perhaps be called a 'novateur' in his own right, he did provide philosophical sketches of their projects in the fourth volume of the *Science Universelle*. In doing so, Sorel provided an account of, at the time, what constituted the latest discoveries in 'scientific' and philosophical thought. In fact, he spends nearly eighty pages on *Les Novateurs Modernes* (as he calls them) and includes sections on Bernardino Telesio, Petrus Ramus, Nicolaus Copernicus, Galileo Galilei, and René Descartes among others. Such familiarity attests to Sorel's position as someone with widespread knowledge of the philosophical and scientific debates of his day. While Sorel is not usually considered an original thinker himself, his *Science Universelle* advocated for robust engagement with the latest philosophical and scientific debates of the day. As Isabelle Moreau elucidates, his method would serve as a meta-science, capable of unifying diverse modes of thought through the ordered linking of its contents (2006). Sorel's method is of interest in that it facilitates an encyclopedic reexamination of the essence of nature in the *Science Universelle*. More specifically, Sorel's *Science Universelle* stands as an encyclopedic space for the reassessment of the essence of the

natural world that the seventeenth century occasioned. This was most saliently seen in the search for new philosophical and scientific theories that appeared in the period.

Unlike other encyclopedic texts, Sorel's project did not contain treatments of the 'arts and sciences'; instead it first treats questions concerning the nature of the world, and its possible use through inquiry into the objects of nature. The first volume dealt with the *L'être et propriétés des corps principaux*. The second continued this trajectory through investigation into *L'être et propriétés des corps dérivés*, along with a shorter section on *L'être et propriétés des choses spirituelles*. Volume three treats *L'usage et perfection des choses Corporelles et spirituelles*, while the fourth deals with *l'origine des sciences et des arts et leur enchainement*. This composition is not the linking of the arts and sciences promised in the introduction, but rather a new manner of envisioning education, as Emile Roy explains, "Elle [La Science Universelle] était surtout destinée aux professeurs et aux écoliers. Sorel pensait que les découvertes des savants et des philosophes modernes devaient dorénavant sortir des cabinets et des livres pour entrer dans l'enseignement public" (1891 375). As we will see, Sorel's desire for more visibility in regard to pioneering discoveries and ideas is evident in his examination of the natural world. In particular, he pays attention to points of contention concerning its nature as well as on new philosophical ideas surrounding how it should be understood.

As previously summarized, this focus on the new (both in terms of content and of method) was to combat the pervasive problems Sorel saw in the encyclopedic manuals of the day used for instruction. Sorel's *Remonstrance* goes into some detail concerning, *Le mal [qui] vient du défaut de l'instruction et du désordre de plusieurs livres*. Sorel specifies, "Cela incite plusieurs d'en composer chacun à leur mode, espérant d'en obtenir

une grande gloire" (I. *Remonstrance,* 22). The perceived disorder and lack of coherence in these encyclopedic texts, which merely copy prior knowledge, propelled Sorel to create his own. His sights were also set on the preconceived schemata and modes of understanding objects based on Aristotelian philosophy because of their lack of underpinning. He explained his reasoning most succinctly in the fourth volume, demonstrating the incompatibility of Aristotelian thought with regards to understanding nature:

> Les Aristotéliciens admettent sans fondement des qualités virtuelles productrices des premières, vu que toutes les expériences qu'ils vantent pour leur opinion, peuvent facilement être résolues par les substances actuellement et formellement existantes dans les corps qui produisent telles actions, comme chacun pour peu qu'il soit vérifié aux choses naturelles, pourra facilement connaître, par une subtile recherche de ces effets. (IV. 355)

Sorel's explicit mention of imposed 'qualitez virtuelles' is unquestionably a reference to the qualities of Hot, Cold, Wet, and Dry, which were considered inseparable from Aristotelian prime matter. According to Robert Pasnau, these qualities were understood as "the most basic principles responsible for shaping matter. . . prior even to the four elements inasmuch as they explain those elements" (42). Sorel critiqued the 'qualitez virtuelles' for their lack of foundation, and sought to ground natural knowledge in the study of objects themselves, and not on what Sorel understood as unfounded Aristotelian first principles.[22] It should be noted that Aristotle is not the only target in view; rather *La*

[22] Mendell. Aristotelian Mathematical Science was based on the idea that "there must be first, unprovable principles for any science, in order to avoid both circularity and infinite regresses."

*Science Universelle* had in view all errors, both ancient as well as 'new,' which reflected the disputes raging over the changing idea of nature that was occasioned in the seventeenth-century.[23]

As detailed, the seventeenth century was the occasion for the widespread rejection of Aristotelian thought and a search for new ways of conceiving the world. However, this change was by no means universal or even immediate. Daniel Garber uses the Protestant Reformation as a metaphor for what occurred in seventeenth-century natural philosophy. Just as the Protestant Reformation entailed the emergence of a variety of groups with their own particular "vision of true religion (2009 15)," so too did various figures emerge with their own particular visions of the world. Thus there were "Galileans, Cartesians and Baconians, followers of Telesio or Bruno, Alchemists and natural magicians (2009 15)" all of whom had their own ideas concerning the essence of nature. Sorel was very much aware of these figures and the nature of their thought, and like Descartes he was concerned by the lack of a foundation on which to build knowledge. As detailed, the *Science Universelle* hoped to palliate this problem by anchoring itself on the study of nature itself. Through experiential study, Sorel believed it possible to reassess the errors concerning the essence of the natural world by way of an ordered empirical examination.

In order to facilitate this, Sorel insisted on a specific method of empirical inquiry into nature through the use of reason. Isabelle Moreau lays out its logic in the following manner:

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[23] See, Title Page of the *Science Universelle*

> Il faut 'commencer par les choses les plus proches et les plus connues', avant de prétendre percer les secrets de la nature  La progression se fera graduellement, des choses les plus basses aux plus hautes . . .À l'intérieur de cette composition d'ensemble, la distribution des matières suivra logiquement un 'ordre de résolutions ou de division, autrement dit, un ordre analytique offrant la distinction et la distribution des choses qui sont propre à l'instruction. (2006 80)

Those things which are the closest Sorel called 'principal bodies,' or the largest things which one is able to perceive visually (I. *Chapitre Premier*).  From these base materials, Sorel moved to more specific entities following an 'order of resolution and division' such that the materials covered branched out like a tree of knowledge.  The hope was that reasoned empirical inquiry into nature would serve as a field for examining new and old understandings concerning the nature of the world.  The execution of this was predicated on Sorel's understanding of a natural progression inherent to the study of nature (his method), which is grasped through the use of 'correct reason.'  Sorel reiterates, "c'est la nature même qui nous dit qu'elle se peut trouver et que nous en sommes capables" (I. 2). At base, Sorel saw an empirical study of nature based on reason as the most natural form of investigation into the essence of nature (I. 5).  This was not the deductive reasoning of Descartes, but rather a method of inductive empirical study that traverses the natural world in a logically ordered manner.  In this way, questions concerning the essence of reality could be examined in due course with the aim of reevaluating the essence of nature.

**Method**

As Verdier demonstrated, the *Science Universelle* set itself apart in the encyclopedic genre through its insistence on a new method of imparting knowledge (1984 107). The problem of method requires closer examination in order for its claim of securing and unifying knowledge to be sufficiently adumbrated. As detailed, the mid-sixteenth century saw the emergence of the importance of method in the university setting. According to Peter Dear, this preoccupation continued into the seventeenth century where "humanist tradition established a vision of knowledge as an interconnected whole, which method might map out" (1998 148). The minutiae of how this occurred preoccupied the most brilliant minds of the day from René Descartes to Francis Bacon. Method became a subject of instruction in the seventeenth century, and was widely taught using Eustachius a Sancto Paulo's widely disseminated and highly esteemed *Summa philosophiae* (1648 106),[24] whose subject matter was divided into four "questions." The first question, which treated the subject itself, is defined thus: "The name of method is understood in two ways: first, indeed, as an order of learning or a part of it; secondly, as an order of that judgment of the mind by which those things in some discipline are disposed uninterruptedly." Method was then understood generally as connected with order, but more specifically, as the particular manner of reasoning by which those subjects of order are disposed. The other questions included by Sancto Paulo included the process or manner of treating "every question or difficulty," along with the purpose of the method, and finally practices of "division and partition."

[24] "Methodi nomen dupliciter accipieur: primo quidem pro ordine et serie eorum omnium quae in univera alique doctrina vel ejus parte traduntur ; secundo, pro ordinatione seu eo animi juricio quo res illae in aliqua diciplina continue disponuntur."

It is clear that Sorel understood his universal science as fulfilling Sancto Paulo's general definition of method. He states "Il faut reconnaitre qu'il y en a une générale qui est un enchainement de toutes. C'est proprement une science des sciences qui est la première des autres et qui comprend toutes les inférieures pour les faire apprendre avec plus d'ordre et de facilité" (I. 52). More precisely, there is a general manner of ordering which connects subjects together. Yet the idea of order has been raised to the level of a scientific enterprise. Specifically, structure has utmost importance in respect to the contents they situate, such that questions of placement and disposition become equal in importance to the information included. An order of knowledge was necessary in order to ensure the proper ground and path to knowledge. However, Sorel did not seem to have a robust procedure for the actual discovery of "every question or difficulty" (the second question treated by Sancto Paulo). Unlike Descartes' wish to base reason on mathematics[25] or Bacon's specialized method of induction,[26] Sorel reasoned through the study of nature itself. He stated explicitly that his universal science could only function through the correct application of reason on the natural world. He makes this dual approach clear in the opening pages of the *Science Universelle*, laying the burden of encyclopedic knowledge on empirical inquiry and reason. In doing so, Sorel set the stage for the various competing theories concerning the nature of the world to be affirmed or denied based on reasoning through experience. As Sorel states in his introduction to the universal science:

[25] See, Judovitz 1988. p.40, and Joachim and Harris. 1997. Rules III, IV, and V
[26] See, Bacon and Fowler. 1878.

> Il ne faut que suivre la nature, la considérant en elle-même et en ses effets, et cherchant les expériences où elle nous découvre plusieurs secrets très rares. En d'autres occasions, il ne faut que tirer des conjectures des choses les plus cachées par les plus connues, faisant agir la raison par des règles certaines, et par un pouvoir qu'elle rencontre en elle-même, avec la réserve de rien arrêter sur ce qui sera douteux et qui surpassera notre puissance. (I. *Introduction*, 2)

Sorel states that one must simply follow nature in itself and its effects in order to attain understanding. This declaration reaffirms Sorel's distance from Aristotelian thought, through his recourse to empirical observation contra certain pre-prescribed categories of understanding. Sorel questions, "comment savent-ils à quoi tout cela [principes, causes, mouvement, lieu, vide, l'infini et temps] peut servir s'ils n'ont pas encore considéré le monde dans ses premières apparences" (I. 53)? This is not to say that the *Science Universelle* does not engage with theoretical topics or categories. Rather, it understood sensory investigation as primary to understanding the nature of the world. While such a task appears *de novo* in its attempts to start from 'first appearances' and reasoned empirical inquiry, the subjects treated were often the focus of metaphysical conflict (unsurprisingly given Sorel's familiarity with the new theories and philosophical ideas circulating amongst the novateurs). Nevertheless, Sorel viewed reasoned empirical investigation as providing the touchstone for questions concerning the essence of nature. The *Science Universelle* occasioned this shift in understanding through its reexamination of nature in the context of the seventeenth century.

In order to facilitate this stance and to initiate the project, Sorel reiterates "tout ce que nous pouvons apprendre ne dépend pas de nous et ne se trouve pas en nous-même, il en faut faire une recherche entière" (I. 4). Thus, human knowledge cannot be guaranteed by humans themselves *contra* Descartes, but rather founded in a comprehensive study of nature. As such, the *Science Universelle* starts with the largest bodies one can perceive with the senses and then moves on to smaller entities. It was this specific order that secured the connection for Sorel. Yet 'universal knowledge' could only occur through understanding the whole of nature. Nature itself was to serve as the teacher of humanity and as the keystone for the connection of the encyclopedic universal science. Indeed, there is a constant exhortation in the *Science Universelle* to "s'instruire selon la nature, (I. 68)" which reiterates Sorel's belief in the natural world as the basis and foundation for knowledge. This shift in foundation toward a materialist account of nature is significant because it excised religious influence on natural knowledge. Indeed, while Sorel does pay lip service to the Christian worldview, Martine Alet demonstrates that his metaphysical account is in fact decidedly critical of such a worldview (2014 78-79). As such, the *Science Universelle* was a forerunner to the Enlightenment project in its attempt to throw off the instructional guidance the Catholic Church might impose.

The structure of *La Science Universelle* was such that nature itself would guide the manner of inquiry; in starting with the largest 'principal bodies' and working downward (moving from large corporeal bodies to the smallest), one would naturally traverse the natural order in the manner of a circle to create a unified whole. This path of inquiry probably had its source in Ramist logic whose method mandated movement from the general to the particular (1973 117). The nature of method in the Sorelian sense was

largely focused on the idea of an order of inquiry, over and above a robust procedure for answering specific questions pertaining to specific topics. This fact radically altered the material layout of his work, such that there are no specific entries *per se*. Rather, the *Science Universelle*[27] was envisioned as one long connected tome of investigation and demonstration. The order of exploration of the subjects facilitated this; starting from the principal bodies, and on down to animals and human beings themselves. What is implicit in the idea of Sorel's 'path' of knowledge is that it is teleological. One has to work through the tomes in order to gain access to the totality. It was only in concert with its parts that the *Science Universelle* was fully comprehensible, for each part was claimed interdependent such that, "de générale est enchainée de telle façon que l'on n'en savoir posséder pleinement aucune partie, sans avoir acquis le tout" (I. 35).

The object of this inquiry begins in the first volume *De l'être des choses et de leurs Propriétés,*[28] in which Sorel empirically inquires into the principal bodies and their properties as perceived by the senses and refined by reason. He states, "Nous verrons aussi ce qu'elles sont, et comment et pourquoi elles sont faites; c'est là proprement savoir leur être, non seulement dans une simple notion, mais avec toutes leurs natures particulières" (I. 3). Sorel accomplished his investigation of objects' 'being' in all their particular natures through order of placement; from general to more particular objects of study in the manner of a tree of knowledge.

Sorel's internal method in the *Science Universelle* is best characterized as a form of dialectic debate, probably an intellectual inheritance of the scholastic dialectical form

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[27] While the *Science Universelle* is split up into 4 volumes, my focus will be on the Sorel's empirical inquiries into nature and not into the being and properties of *les choses spirituelles,* which comprises the second half of the second tome.

[28] See Sorel I.53 in Ancient Greek "knowledge of nature"

*quaestiones disputatae* in that he would present competing beliefs concerning aspects of nature.[29] In order to demonstrate that he possessed the correct manner of understanding the topic, he would refute the opposing viewpoint by reasoned empiricism. Through an 'inductive empirical investigation' of the object under discussion, Sorel would demonstrate empirically the reasoning behind his conclusions by experimentation or demonstration. As such, Sorel's reevaluation of the natural world valorized a new materialist account of nature (one opposed to that of Aristotle) that opened up a new way of thinking about empiricism. Specifically, his emphasis on experimentation and empirical study opposed the theoretical structures imposed by Aristotelian thought, and placed emphasis on the testability of theoretical ideas in the style of Bacon.[30] Émile Roy confirms Sorel's belief in the necessity of an education based on experimental investigation, "Il (Sorel) désire aussi que le professeurs fassent dans les classes des expériences et qu'il aient à leur disposition les instruments les plus simples. N'a-t-il même l'audace de réclamer pour chaque collège un petit jardin botanique, une collection de minéralogie et de zoologie" (1891 376)? This pedagogical philosophy of inquiry is also evident in his *Science Universelle*.

**Experimental Demonstration**

Yet Sorel's encyclopedia did not only open up new experimental modes of learning, its realization introduced important secondary characteristics that would later become vital to the project of eighteenth-century encyclopedism. This will be demonstrated through examination of Sorel's evidentiary arguments for atomism and its demonstration of an order to knowledge, in his discussion of the possibility of a vacuum

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[29] See Lawn.
[30] See, C. Vasoli 1978 p. 57, 70, and Bianchi 1992. 375-377, 396 et 400.

and its push to change the nature of knowledge out of self-imposed nonage,[31] and through treatment of the heliocentric model and its introduction of controversial knowledge.

As Des Chene explains, the question of prime matter was of intense scholarly debate, because many of the philosophers of the day found "the (Aristotelian) hypothesis of an entirely formless stuff underlying all corporeal substances to be useless, or worse than useless" (1996 82). This dismissal stemmed from the conclusion that matter is pure potentiality, being the thing from which objects are formed, but not being the thing itself.[32] In other words, the identity of the object was more connected to its form, than its substance. While Sorel's own atomic theory is far removed from modern understanding,[33] it did establish interest and investment in new modes of understanding the world, through his engagement with atomistic thinkers. Pierre Gassendi, a friend of Sorel's, was perhaps among atomism's most prominent defenders. While he is not named in Sorel's treatment of the 'novateurs' in volume four, his name appears in some of the lists of the 'novatores' that circulated at the time.[34] We also know from Sorel's philosophical sketches of Antoine de Villon (IV. 355), Étienne de Clave (IV. 427), Sébastien Basson (IV. 425), and René Descartes (IV. 418), that he was well acquainted with other proponents of atomism and its close cousin, corpuscularism.[35]

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[31] Immanuel Kant's enlightment motto Sapere aude (Dare to Know) in his essay *What is Enlightement* states that it indicates, "man's emergence from his self-imposed nonage. Nonage is the inability to use one's own understanding without another's guidance. This nonage is self-imposed if its cause lies not in lack of understanding but in indecision and lack of courage to use one's own mind without another's guidance."

[32] See, Aristotle, and Hussey. 1983. (ic9 192a31)

[33] See Sorel, *Tome Second*. 544 Sorel's atoms were either wet or dry.

[34] See, Frey, Ianus Caecilius. 2003. Originally published 1646.

[35] The primary difference between atomism and corpuscularism is the existence of the void. Descartes held that all matter was in constant movement in order to prevent the existence of a void. Nevertheless, while corpuscularism could be considered a version of

Corpuscularism, which denied the atoms-and-void theory of ancient atomism, affirmed that all bodies are composed of one type of matter, which is infinitely divisible.

While Sorel was undeniably familiar with the atomistic theories of a variety of thinkers, he nevertheless attempted to provide his own justification for a reformulation of Democritus' atomism (the ancient model his own most resembles)[36] saying, "non pas tant que l'on ne connaisse qu'il y peut avoir de la division, puisqu'il y a partout des pores. (544)" Sorel does not defend his position simply on the possibility of material division, but rather through reference to experimentation demonstrating the porousness of materials, which leads him to conclude in favor of atomism. He explains in the following manner, "On peut même soutenir que le verre a des pores, et on tachera de le prouver. Nous considèrerons que si durant l'été, l'on met de l'eau froide dans un vaisseau de verre, l'on trouvera de l'humidité au dehors . . .si, en hiver on y met de l'eau chaude, l'on le verra un peu fumer, ce qui prouve encore beaucoup qu'il a des pores" (I. 439-440). The argument for the porousness of materials seems to demonstrate that material substance is made up of tiny particles, otherwise, it would suggest that water slips across a seemingly solid barrier. Sorel's declaration of atomism only comes at the end of his treatment of 'beings.' In accordance with his longitudinal method of moving from what is more general in nature, to what is more particular, he lays the foundations of his demonstration of atomism much earlier in the work. This is done to create connections between the sections so that like a logical proof, the conclusion follows from the

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atomism, "[Descartes] presented a corpuscularian basis for his physics, which denied the atoms-and-void theory of ancient atomism and affirmed that all bodies are composed from one type of matter, which is infinitely divisible (*Meteorology* 6:239). See Hatfield, (Spring 2014 Edition)

[36] For a detailed discussion of the essentials of Sorelian atomism and its rapport with Greek and 17th century atomic theorists See, Alet. 2014. p. 15-39

premises. This is key to the order of the *Science Universelle* and vital to the concept of method it purports to produce.

An argument for atomism is visible in Sorel's analysis of light, which occurs much earlier in the section. The primary question under consideration begins with the origins of light: are rays of light part of the substance of the sun or simply representative of it? It quickly becomes apparent that the question of the materiality of light is at the origins of such an inquiry. The discussion is set up in the following manner: "que les rayons sont des petites parties de la substance. Les autres au contraire disent que la lumière qui vient du soleil, ne sort point de lui par une véritable fluxion, et que c'est la ressemblance qui se fait paraître" (I. 446). Hence, we see Sorel grappling with what appears to be the wave-particle problem in physics, namely whether light consists of a particle or a wave. This debate, which had its origins in the atomist thought of Gassendi,[37] did not reach its apex until later in the century when Christian Huygens and Isaac Newton debated the topic.[38] Sorel's coverage of the issue resumes with the rival postulation that if indeed that which leaves the sun is corporeal, it would not be able to pass through air and water and glass like it does. Sorel argues that light is indeed corporeal because all of the objects mentioned as obstacles to the passage of physical light have pores, which allow for the passage of light. "L'on peut leur dire qu'encore que les rayons soient corporels, ils ne laissent pas de passer au travers de l'air et de l'eau et même du verre puisque tous ces corps ont des pores" (447). Sorel's experimentation does not pass the muster of the scientific method. Nonetheless, it demonstrates his commitment to reexamine the essence of nature through reasoned experimental

[37] See, Fisher. (Spring 2014 Edition)
[38] See, Huygens. 1979.

demonstration; demonstration that also served to test the veracity of theoretical postulations concerning nature. Most important of all, it demonstrates the order and cumulative effects of Sorel's system of knowledge, because, without Sorel's earlier demonstrations of light's porousness, his pronouncement of atomism would be without foundation.

Sorel's interest in experimentally demonstrating a theoretical position continued in his discussion of Plenism. The idea of a vacuum had its intellectual roots in Parmenides' poem *On Nature*. In this poem, Parmenides states that only being exists.[39] Aristotle took up the idea in his *Physics* where he cracked "even if we consider it on its own merits the so-called vacuum will be found to be really vacuous."[40] Yet the existence and possibility of a vacuum was a controversial subject in the early modern period. Francis Bacon's knowledge of Aristotle formed his reflection and experimentation on the issue, although he ultimately sided with Aristotle in his declaration of its impossibility.[41] Galileo too was interested in the question, and concluded, "One must admit then that a vacuum is sometimes produced by violent motion or contrary to the laws of nature, (although in my opinion nothing occurs contrary to nature except the impossible, and that never occurs)" (1914 11-12). These two were by no means the only minds of the day to consider the question of the void or vacuum.[42]

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[39] See, Thatcher. 1915 p. 158 "For there is nothing which is not that could keep it from reaching out equally, nor is it possible that there should be more of what is in this place and less in that, since it is all inviolable. For, since it is equal in all directions, it is equally confined within limits."
[40] See, Aristotle and Hussey. 1993, 216a26-7
[41] See, Bacon, Delorme, Steele. 1935 and footnote 29 in Grant, 1974. p. 328
[42] See, Jousten. 2008, Chapter 1.

Sorel too treated the controversial issue in the first volume of the *Science Universelle*.[43] He summarized the stakes thus:

> Plusieurs philosophes ne veulent pas que ce soit cela principalement qui y serve. Ils disent que ce qui rend ces corps si prompts à succéder en la place l'un à l'autre, c'est que la Nature abhorre le vide: mais l'on leur dispute ceci par des arguments divers, car tant s'en faut qu'on avoue qu'il n'y ait point de vide en la Nature, qu'au contraire on prétend montrer qu'il s'y peut trouver, et qu'il est fort nécessaire, de sorte que ce n'est point par la seule fuite que les corps sont placés. On peut bien croire que selon les lois que la Nature s'est prescrites, elle empêche souvent qu'il n'y ait du vide quelque part, mais de dire que nécessairement il faille que les corps s'élèvent ou s'abaissent pour faire qu'il y ait point de vide en aucun lieu, et qu'il s'en trouve qui se fracassent plutôt que de souffrir, c'est ce que nous ne devons pas accorder en la façon qu'on le propose. (I. 41)

Here, Sorel echoes the famous phrase '*horror vacui*'[44] attributed to followers of Aristotle and opened up a space for the discussion concerning the nature and possibility of a vacuum. At issue was the idea that there could be parts of the natural order where literally nothing exists, something that philosophers and theorists found incomprehensible. Sorel, however, carried out a sustained rebuttal of the proponents of Plenism and then turned to proving the vacuum's existence experimentally. His arguments rely on descriptions of experimental procedures:

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[43] See, Sorel. I p. 40-85
[44] See, Jousten. 2008. p.1

> Ayant empli de vif-argent une sarbacane de verre dont un bout est scellé, on bouche l'autre ouverture avec le doigt, et de ce côté-là le tuyau est plongé tout droit en un vaisseau moitié plein de vif argent et moitié d'eau, puis l'on retire le doigt, de sorte que le vif argent descend en partie, laissant au haut de la sarbacane, un espace que l'on prétend être vide. (62)

This account of the so-called Torricellian Vacuum refers to an experiment first carried out by Evangelista Torricelli,[45] which resulted in the creation of what appeared to be an "empty" space inside a glass receptacle. Today, Torricelli's experiment is held to be the first definitive proof of the existence of vacuums.[46] Most interestingly, the description calls for the reader to carry out the experiment in order to understand its significance.

Many of these experimental demonstrations, however, had unforeseen consequences. The 1633 condemnation of Galileo by the Inquisition[47] over his support of heliocentrism, which occurred a mere year before the publication of the *Science Universelle*, testifies to the delicate nature of the issue. Likewise, Descartes delayed the publication of his own treatise in support of heliocentrism[48] (it was eventually published after his death) because of the risks involved in questioning the essence of nature. As such, one understands the intellectual climate of the seventeenth century as one where the

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[45] See, Heilbron. 2003. p. 818 Today it is recognized a having been the first instance of a created vacuum.
[46] See Boi. 5
[47] See, Feyerabend. 1975. While Galileo's condemnation, and subsequent imprisonment is considered one of the great injustices of human history, Paul Feryeraband argues convincingly that that the church was correct in its course of action. According to the 'scientific' standards of the day (and even now) Galileo's arguments were shown to be poor. Experts of the day "would have been aghast at Galileo's attempt to get knowledge out of an instrument as little understood as the telescope." (Footnote 12, 128) Due to heliocentrism's lack of rigor, the church was simply exercising due diligence.
[48] See, Ariew. 2010. p. 27

basic essence of nature was in flux and perhaps more importantly, dangerous to question. Thus Sorel's emphasis on experimental demonstration here and throughout the *Science Universelle* opened up the possibility for natural knowledge to be confirmed by the individual, an important step toward the emancipatory project of the Enlightenment's *Encyclopédie*.

The publication of the *Science Universelle* was by no means an insignificant gesture on Sorel's part. As Brockliss states:

> Just as the professors gave scant attention to the ideas of the other philosophical sects of antiquity, so they seemed virtually oblivious of contemporary developments in natural philosophy. Only two professors--Crassot and Frey--mentioned the Copernican theory. . . In fact the other professors had little to say about the structure of the heavens. They simply debated traditional *quaestiones* such as the nature of heavenly matter and the incorruptibility and motions of the heavens. (40)

While Frey and Crassot may have engaged with the heliocentric question, Crassot dismissed it outright, and Frey was at best agnostic.[49] In the section entitled *De L'immobilité de la Terre*, Sorel seems to toe the official Catholic line on the issue. This is unsurprising given the highly contentious nature of the topic. Nevertheless, Sorel spends over fifty pages parsing the arguments, and, as Gabrielle Verdier concludes, leaves little doubt as to where his intellectual loyalties lie (1984 111). Sorel opens the debate stating, "jusques ici il a semblé aux hommes les plus sensés que la Terre ne bougeait d'une place; mais depuis un certain temps il y a eu des Astronomes et des

[49] See, Blair (2008). Footnote 65

philosophes, qui publiant une vieille opinion renouvelée, nous ont voulu persuader que le soleil est immobile, et que c'est la terre qui tourne" (I. 146). Soon after however, Sorel proceeds to give powerful experiential arguments for the accuracy of the heliocentric model. He says,

> On tache aussi de rendre supposition nécessaire pour excuser certains inconvénients qui se trouvent aux démonstrations du mouvement des planètes selon la voie ordinaire, spécialement en ce que l'on n'avait point gardé de proportion en ces cercles que l'on appelle épicycles, dans lesquels les planètes font leur cours, tandis qu'elles sont portées par eux d'autres grands cercles ; comme par exemple en celui de Venus que l'on s'était imaginé d'une telle étendue que lors que cette planète était en bas, elle se devait montrer seize fois plus grande qu'alors qu'elle était au plus haut, et que même elle devait descendre jusqu'au dessous de la lune, ce que ne se ferait pas sans que l'on s'en aperçut. . . mais les nouveaux astronomes ont cru qu'ils avaient mieux ôté le désordre s'imaginant une nouvelle disposition céleste où le soleil est au milieu, Mercure après qui fait son cours autour de lui, et Venus au dessus qui l'environnent encore. (I. 152-153)

Here Sorel recounts the problem of epicycles, where planets were attached not simply to the concentric circles that orbited the earth (according to geocentrism), but circles attached to circles, which accounted for the problem of retrograde motion. Yet the new heliocentric model accounted for these problems and others. Sorel in fact has a hard time hiding where his loyalties lie on the issue, stating "Mais ceux qui se sont figuré ce nouvel ordre ont pourvu à tout" (I. 152). Despite these rhetorical moves, Sorel is exhaustive in

his presentation of the issue, discussing a multiplicity of ancillary issues including planetary suspension[50] and motion.[51] At base, the heliocentric model accounts for the problems brought forth by empirical observation, and as such wins Sorel's tacit approval. Still, the publication of a pedagogical text destined for wide circulation which included such controversial information a mere year after Galileo's condemnation was daring on Sorel's part.

While it is not possible here to examine the totality of subjects contained in Sorel's first two volumes on '*L'être*,' those adumbrated testify to Sorel's desire to reexamine the status of nature through experimental demonstration. However, knowledge of the properties of nature only constituted the first half of the universal science. The second half "doit traiter du changement qui y peut donner extérieurement par l'industrie et la prudence des Hommes" (II. 2). The reason for this division is clear for Sorel, who saw his universal science as needing to be of use to humanity.

> Ayant besoin de plusieurs préceptes pour subvenir à nos diverses nécessités, nous croyons qu'il n'y a qu'une Science Universelle qui nous puisse rendre contents. . . Nous jugerons que ce doit être une connaissance générale de tout ce qui est au monde, et que si l'on apprend quelquefois en particulier la nature de tout ce que l'on voit, il s'en faut beaucoup que l'on ne sache tout ce qui peut être su: Car l'on ne sait point encore par ce moyen ce que fait chaque chose, et ce que nous en pouvons faire, à quel usage nous les pouvons toutes employer, et quel changement nous y pouvons apporter pour leur entière perfection ou pour simple amélioration. (I. 2-3)

[50] See, Sorel I p.165
[51] See, Sorel I pgs. 166-167

At center, Sorel saw humanity's capacity for controlling or even changing the nature of the 'entities of the world' as the linchpin to humanity's satisfaction. However, I wish to draw out the connection between inquiry into the entities of the world as established in the first half of the *Science Universelle* and their use in the second. This inclusion expanded the scope of the text, and opened up the possibility for the inclusion of the Mechanical Arts in encyclopedic texts, something that was vital to the *Encyclopédie*. Sorel clearly saw his research into the "vérité de leur Etre, et de leur Nature, (I. 1)" as informing the potential uses of nature (III. 2). I will establish that just as the first part of the universal science reexamined the essence of nature through experiential corroboration, so too did the second further this idea in its desire to manipulate nature.

**Theory and Practice**

Natural study not only provided the foundation of the encyclopedic project, it was considered *sine qua non* for understanding how nature might be used or manipulated. Sorel specifies in the fourth volume of the *Science Universelle* that "La consideration de ce qui se fait des Choses et de leur Usage, Melioration, et Perfection ou Imitation, il s'en forme autant d'Arts, les recherchant par le mesme ordre que les Sciences qui dependent de l'Etre et des Proprietez" (502). Sorel thus understood consideration of a thing's 'being' and 'properties' as having direct import into the consideration of how that thing could be used, ameliorated, perfected, and imitated. What is exceptional about the *Science Universelle* was Sorel's insistence that the treatment of usage, amelioration, perfection, and imitation in the technical arts proceed according to the same order as his treatment of the 'being' and 'properties' of the natural sciences. Sorel began such a

reflection in the third volume's first chapter inquiring into humanity's possible manipulation of nature,

> Nous nous sommes employés jusque ici à considérer toutes les choses qui subsistent au monde, et à savoir la vérité de leur être et de leur nature, en quoi nous avons vu aussi les changement qu'elles peuvent souffrir par leur propres forces; Il reste d'apprendre quel changement y peut être apporté par l'extérieur, et ce que nous sommes capables d'y exécuter, soit en les appliquant à l'usage où elles sont propres par leur action prochaine, soit en les exposant seulement devant les autres choses avec lesquelles elles peuvent faire quelque nouveauté. De là nous connaitrons qu'il y en a qui opèrent par leurs effets, et par ce qui sort d'elles sans qu'il y ait rien de changé en leurs substances; les autres sont changées véritablement, parce qu'elles peuvent demeurer entre les mains des hommes, et ce que les hommes en font est un changement indifférent, pour montrer simplement leur pouvoir; ou bien de la commodité à quelque autre chose, et sert à quelque usage, ce qui est un changement utile. (III. 1-2)

Sorel's desire to manipulate nature and to inquire into its potential use for the benefit of humanity follows the same order as his section on being. Accordingly, he begins with *du pouvoir que l'on a sur les corps principaux,* the first subject of the first volume. It is through this order that Sorel examines the potential manipulation and imitation of nature. Thus, the section treats the sun and its potential appropriation by humanity. This is done largely through technical means such that what is accomplished is achieved through specialized tools or processes. Sorel describes one such manipulation in the following manner: "Si les rayons du soleil frappent droit en une place découverte, en les recevant

dans quelque miroir, l'on le peut faire aller dans une chambre obscure qui sera auprès; l'on peut encore avec des miroirs concaves renvoyer la chaleur sur d'autres corps. C'est en cette façon que les hommes ont du pouvoir sur ce qui dérive des corps célestes" (III. 5). The basic idea is that humans can deliver heat and light to specific areas through the manipulation of light by way of optical apparatuses.

Another prominent example of the re-imagination of nature's manipulation and imitation in the *Science Universelle* was Sorel's examination of metallurgy (long considered a mechanical art). The inclusion of this topic in a text written for scholastic pedagogy initiated a redefinition of encyclopedic education. This was due to the fact that the mechanical arts' instructions on the manipulation and imitation of nature were not seen as meriting inclusion in a scholastic textbook. Sorel considers the creation of alloys:

> On peut dire encore là dessus, que si on tire le sulfure et le mercure de deux substances différentes, ou bien si l'on réduit deux métaux à leurs principes pour en faire un tiers, il ne faut point objecter encore, que de deux espèces il ne s'en peut faire une seule, ou bien que l'une ne peut être changée par le mélange de l'autre, et qu'elle demeure toujours ce qu'elle était. (III. 201)

This reflection is part of a longer sustained treatment on the nature and possibility of the manipulation of metal and means to use and change the nature of objects.

It is perhaps not unsurprising that Sorel also considered more dubious possibilities for the use and manipulation of nature, such as the transmutation of metal through the philosophers' stone. "Ceux qui on beaucoup étudié sur ce sujet, prétendent faire davantage. Ils assurent que l'on peut préparer une matière si accomplie, que si l'on en jette une petite portion, non seulement sur l'argent, mais sur l'étain ou quelque autre

métal impur, tout sera converti en or" (III. 204). While Sorel ultimately decided against the possibility of such a substance, he does demonstrate a willingness to reexamine and evaluate a variety of ideas concerning the use and transformation of nature in a sustained way.

**Conclusion**

Charles Sorel's *Science Universelle* was not conventional in its method and mode of composition in comparison to other educational texts of its day; it nonetheless constitutes an important touchstone in the history of encyclopedic thought. Most significantly, Sorel endeavored to excise error from the conceptualization of encyclopedic knowledge through his attempt to reexamine natural philosophy. Through his familiarity with the so-called 'novateurs,' Sorel attempted to give a new account of nature through an empirical investigation into the being and properties of the natural order. His method of a reasoned empirical investigation into the 'principal and derivative' bodies allowed the *Science Universelle* to flow from one subject to the next in the manner of a tree of knowledge. In this manner, Sorel was able to link the various sections and entities of the first volume. While this particular mode of linking in itself was novel in terms of its method, material inclusion, and aims, the defining feature of Sorel's corpus was his attempt to change the nature of 'encyclopedic learning' through his reevaluation of the essence of the natural world and how it was known. This allowed him to break with convention, and to order various new theories and assertions concerning the essence of the world into a unified whole.

In this way, the *Science Universelle* conforms to the Plinian term *enkyklios paideia* in its attempt to create a consolidated connected whole. However, the idea of

such a whole became focused on the rejection of error over and above the aspiration to perfect connection and totalization. This was because Sorel saw empirical inquiry as foundational for the reevaluation of the use and imitation of nature. Perhaps most importantly, the *Science Universelle* opened up the possibility for the Enlightenment through its presentation of knowledge. The idea of an order to knowledge, the practicality of Sorel's demonstrations, and his inclusion of controversial ideas were vital to the project of the Encyclopédie. Additionally, his expansion of materials included in the *l'Usage, et de la Melioration et Perfection ou imitation des choses Corporelles et choses Sprituelles* was vital to the sorts of practical knowledge that was introduced in the *Encyclopédie*. This idea of use being fundamental to encyclopedic thought will be further explored in Diderot and D'Alembert's *Encyclopédie ou Dictionnaire raisonné des Sciences, des Arts & des Métiers.* More specifically, I will investigate the structural conception of Diderot and D'Alembert's encyclopedia in relation to its entries on nature and technology. The primary focus will be the manner in which the *Encyclopédie* is conceptualized to represent and connect the technical appropriation of nature both textually in the articles and visually in the plates. Such an inquiry will illuminate new forms of knowledge created relationally in the *Encyclopédie.*

# Chapter Three

## Enlightening Knowledge

> L'OUVRAGE dont nous donnons aujourd'hui le premier volume, a deux objets: comme *Encyclopédie*, il doit exposer autant qu'il est possible, l'ordre & l'enchaînement des connoissances humaines:
> comme *Dictionnaire raisonné des Sciences, des Arts & des Métiers*, il doit contenir sur chaque Science & sur chaque Art, soit libéral, soit mécanique, les principes généraux qui en sont la base, & les détails les plus essentiels, qui en font le corps & la substance.
> -Jean-Baptiste le Rond d'Alembert, *Discours Préliminaire*

### Introduction

The *Encyclopédie*, or *Dictionnaire raisonné des Sciences, des Arts & des Métiers* secures its place in the history of encyclopedism not only through its aim of ordering and linking human knowledge, but also through its ambition to transform human understanding so as to "changer la façon commune de penser" (Diderot, "Encyclopédie" 1755). The editors of the *Encyclopédie* accomplished this end through deep reflection on the status of encyclopedic knowledge and its order. Though the *Encyclopédie* employed abecedarian and taxonomic systems of order, their contribution to the field is most saliently visible through their employment and perfection of a system of order called the *renvois*. At base, the *renvois* situated an article in relation to its peers by cross-referencing other related articles in the text. These mechanisms, which predetermined the articles deemed related to one another nevertheless facilitated new schemata for the understanding and production of knowledge, thereby furthering the potential for such knowledge to transform humanity's understanding of, and place in the world. They were so successful in this project that they "helped crystallize the Enlightenment as an intellectual and reformist movement" (Brewer 447).

According to Immanuel Kant's canonical essay *An Answer to the Question: What is Enlightenment*, the period was characterized by "man's emergence from his self-imposed immaturity. Immaturity is the inability to use one's own understanding without another's guidance. Immaturity is self-imposed if its cause lies not in lack of understanding but in indecision and lack of courage to use one's own mind without another's guidance" (2013). As detailed, the aims of the *Encyclopédie* were not neutral. According to Peter Heehs "The Encyclopédie . . .played a significant role in one of the most important social trends of the eighteenth century: the transfer of knowledge and knowledge-based power from the clergy and nobility to the people" (2013 87). Geoffrey Bennington elaborates, "The basic thought is that independent of belief in God, they [The Catholic Church] have an interest in keeping people ignorant, and the whole point of the Enlightenment, is that [knowledge] is not reserved for a special few." In keeping with the motto of the period *Sapere Aude*, or 'Have the courage to use your own understanding' (Kant), The *Encyclopédie* labored to emancipate knowledge from the power of a preponderant system of royal and religiously institutionalized controlled and controlling knowledge by redefining the scope of knowledge, augmenting the subjects included, widely disseminating its learning, and most importantly, re-inscribing its epistemological locus in human reason (Darnton, "The Business" 539).

The *Encyclopédie's* ambitious emancipatory mission did not emerge *ex nihilo*. Rather, a certain drive to intellectual rigor, democratization, and wider transmission amongst the *Encyclopédie's* forerunners laid the groundwork. Indeed, though less than a century elapsed between the final volume of the *Science Universelle* and the first volumes of the *Encyclopédie*, there was hardly a dearth of encyclopedic activity. The

propagation of literary journals toward the end of the seventeenth century greatly increased the flow of information among members of an intellectual community called the Republic of Letters (Goldgar 54). The group, which existed "only in the minds of its members, (Goldgar 2)" operated outside of the traditional social norms in that "all members had equal rights to criticize the work and conduct of others" (Goldgar 3). The egalitarian nature of the group was trans-national and "ignored the distinctions of nationality and religion" (Goldgar 3). For our purposes, it is important to consider their modes of communication: namely, literary journals that most often contained summaries of new works that facilitated an increased pace of scholarship outside the strictures of monarchical and institutional control (Habermas 51-88). The idea of a literary "touchstone for all other books (Grafton 194)" that could facilitate the free circulation of ideas lay behind the conception of Furetière's *Dictionnaire Universel* of 1690[52] and of Pierre Bayle's *Dictionnaire Historique et Critique* (1697 and 1702), which were important forerunners of the *Encyclopédie*.

Bayle in particular has been cited as an important inspiration to the intellectual spirit of the *Encyclopédie.* Notably, "The critical skepticism, applied so brilliantly by Bayle to questions in theology, philosophy, and history, made him the invisible mentor of Diderot and d'Alembert" (Yeo 43). Although he was listed in the original *Prospectus* next to Bacon, Descartes, Newton, Locke, and others, Bayle was left out of the *Discours préliminaire*. Probably deemed too controversial for inclusion "due to his heterodox reputation" (Yeo 43) he was nevertheless praised in the article *Pyrrhonienne ou Sceptique Philosophie*. Here Diderot lauded that "Bayle eut peu d'égaux dans l'art de

[52] The Dictionary was ordered alphabetically, which was highly revolutionary. See Wells. 1973. p. 16; the Starnes and Noyes, English Dictionary

raisonner, peut-être point de supérieur" (Diderot 1765). Bayle exemplified the freethinking intellectual who was unafraid of tackling error[53] in the vast array of material that had begun to circulate amongst the intelligentsia. This critical, but open-minded spirit was captured in his *Dictionnaire,* which Diderot and D'Alembert in turn appropriated in the *Encyclopédie* where it received a more systematic turn.

Bayle brought his critical attitude to bear on his encyclopedic *Dictionnaire*, which he envisioned as a benchmark for the information-saturated Republic of Letters (Yeo 44; Goldgar 54). This disposition was also present in the dictionaries of arts and sciences prevalent at the time. As Yeo elaborates, "These works offered the possibility of a reliable codification of knowledge by seeking to record any consensus, and by fixing the meaning of terms" (54). Such was the ambition of Ephraim Chambers's *Cyclopedia* through its pretensions as a commonplace book and 'universal Dictionary', which acted as a "survey of the Republic of Learning" (Chambers "Preface"). Chambers himself declared that his oeuvre would, "answer all the Purposes of a Library" (Chambers, I. ii-iii). Moreover, Chambers wanted to distinguish his work from others by emphasizing its cohesion (Yeo 122), which will serve as a point of departure for our own investigation of the structure of the *Encyclopédie.* Nevertheless, the *Cyclopedia* was more than a simple precursor to the *Encyclopédie*. It was apart of the cannon of commonplace books and was an important and bestselling encyclopedia in and of itself (Yeo 115). It was certainly this status that attracted John Mills and Gottfried Sellius to prepare a French translation. The project, however, soon eclipsed its original goal, and at its completion the

[53] The original aim of the *Dictionnaire Historique et Critique* was to be a 'dictionary of errors, correcting the mistakes of other works such as Moréri's.' See, Yeo. 2001, p.43

*Encyclopédie* included over 75,000 entries spread across thirty-five volumes.[54] Such a monumental undertaking surpassed the capacity of Denis Diderot, the originally hired translator, who with his science and mathematics co-editor Jean le Rond d'Alembert enlisted the help of over 150 contributors. Labeled the "Encyclopedists," the group included such luminaries as Rousseau, Voltaire, Montesquieu, Turgot, Condorcet, and Condillac along with lesser names such as de Jaucourt, who himself wrote a full quarter of the entries (Kafker 125-150).

Part of the reason for the *Encyclopédie's* renown is undoubtedly due to its wide-ranging impact. It had an initial print run of four thousand two hundred and fifty (Febvre Martin 220), a remarkable number, as volumes of the day rarely had print runs over one thousand five hundred (O'Brien, 78 footnote 10). Yet even this monumental print run could not satisfy the French demand, and the *Encyclopédie* went through several more editions. Even these numbers do not accurately testify to the number of people who might have read the *Encyclopédie*: "Most literate Frenchmen must have been excluded from the subscription list . . . but thousands of them belonged to *cabinets littéraires*, where they could read as much as they wanted for as little as one and a half livres a month" (Darnton 298).

Robert Darnton offers a dazzling analysis of the immense popularity that later editions of the *Encyclopédie* had from the 1770s onward. It not only had a prodigious following in France, but also was widely diffused throughout Europe and beyond. "Its sales pattern looks like an itinerary from a Grand Tour: London, Amsterdam, Brussels,

[54] An initial seventeen volumes of text were published between 1751-1765, along with 11 volumes of plates between 1762-1772. A supplement of four volumes of text and 1 book of plates appeared in 1776-1777, along with a two-volume index in 1780.

Paris, Lisbon, Madrid, Naples, Venice-and beyond, to Munich, Prague, Pest, Warsaw, Moscow, Saint Petersburg, Copenhagen, and Hamburg" (Darnton 299). Less than twenty years after the final volume of the initial run was released in 1772, Thomas Jefferson could reference it without introduction in a letter to an American correspondent, saying "I state the reason for adopting 11-3 pouces as the equivalent of the English foot. It is so stated by D'Alembert in the *Encyclopedie*" (Jefferson 161). As Darnton explains, it is "hard to estimate the number of sets that reached other continents, (318)" or even how they might have been read. What is certain is the opus had unprecedented reach and impact, and is a crowning achievement of the period.

Due to its prominence as the direct forebear of the *Encyclopédie*, the *Cyclopedia's* attempt at structuring and mapping the present state of knowledge has direct import for this study (Yeo 71). Indeed, Chambers was praised by D'Alembert in the *discours préliminaire* for, "Il a bien senti le mérite de l'ordre encyclopédique, ou de la chaîne par laquelle on peut descendre sans interruption des premiers principes d'une Science ou d'un Art jusqu'a ses conséquences les plus éloignées" (D'Alembert). Thus what D'Alembert most admired in the *Cyclopedia* (in contrast with similar commonplace works), was its attempt to situate and structure its contents through chains of reason descending from first to last principles. Unlike Chambers' work, however, and unlike other earlier dictionaries, the *Encyclopédie* expanded the scientific entries so that they extended beyond "terms used in the arts and sciences" (Yeo 77). As Diderot recounts, "loin de se borner à la définition du mot, on se proposera d'exposer en détail tout ce qui appartient à la chose" (Diderot, "Encyclopédie" 1755). While the distinction between a dictionary and an encyclopedia is hence directly related to an effort to structure content, the move

beyond mere definition toward entries written by savants deeply implicated in the study of their subjects changed the nature of eighteenth-century encyclopedism.

What is more, the *Encyclopédie* did not limit itself in scope like the reference works produced by other institutions:

> L'académie française ne fournirait à une Encyclopédie que ce qui appartient à la langue & à ses usages; l'académie des inscriptions & belles-lettres, que des connaissances relatives à l'Histoire profane, ancienne & moderne, à la Chronologie, à la Géographie & à la Littérature; la Sorbonne, que de la Théologie, de l'Histoire sacrée, & des Superstitions; l'académie des sciences, que des Mathématiques, de l'Histoire naturelle, de la Physique, de la Chimie, de la Médecine, de l'Anatomie, l'académie de Chirurgie, que l'art de ce nom; celle de Peinture, que la Peinture, la Gravure, la Sculpture, le Dessein, l'Architecture, &c. l'Université, que ce qu'on entend par les Humanités, la Philosophie de l'école, la Jurisprudence, la Typographie. (Diderot, "Encyclopédie" 1755)

As this list demonstrates, and as Marcel Hénaff corroborates, "The encyclopedic survey was a passion of the eighteenth century, which saw a proliferation of dictionaries—dictionaries of ideas, languages, civilization, the arts, techniques" (56). However, the editors of the *Encyclopédie* were different, as they endeavored to, "rassembler les connaissances éparses sur la surface de la terre; d'en exposer le système général aux hommes avec qui nous vivons, & de le transmettre aux hommes qui viendront après nous" (Diderot, "Encyclopédie" 1755). As such, the scope of the *Encyclopédie* was unlike any other encyclopedic endeavor in its ambition to treat and assemble such vast and multifaceted knowledge into one general system.

In short, the *Encyclopédie* endeavored to "contenir un jour toutes les connaissances des hommes" (D'Alembert "*Discours"*). According to Hénaff, the encyclopedic ambition of a work like the *Encyclopédie* stands at the aporia between totality and excess precisely because it purports to "say everything" while simultaneously "uncovering everything, in the sense of the intention (or threat) to 'tell all'" (55-56). This dual implication to 'say everything,' such that nothing would be left out, and to 'tell all,' so that everything might be exposed and laid bare comports perfectly with the emancipatory ambition of the *Encyclopédie.*

Nevertheless the *Encyclopédie's* pretension to complete knowledge and Diderot's understanding of its inherent impossibility due to its ever-evolving nature (particularly in natural philosophy) put into question the long-term relevance of the project. As Diderot espouses "Le temps qui a émoussé notre goût sur les questions de critique et de controverse, a rendu insipide une partie du dictionnaire de Bayle. Il n'y a point d'auteur qui ait tant perdu dans quelques endroits, et qui ait plus gagné dans d'autres. Mais si tel a été le sort de Bayle, qu'on juge de ce qui serait arrivé à l'Encyclopédie de son temps" (Diderot, "Encyclopédie" 1755).

If we are to take Diderot at his word, it seems fair to characterize the *Encyclopédie* as an intellectual touchstone, which like Bayle's dictionary, will eventually become outmoded. The significance of the *Encyclopédie's* longevity will become evident as we proceed; however, at this time, I would argue that the principal interest of the *Encyclopédie* lies in its vision of intellectual emancipation, and the sort of relationship it engenders between humanity and the natural world. As I have demonstrated, the *Encyclopédie* was engrossed in spreading rigorously reasoned, all-

encompassing information to a vast audience. In the spirit of the Enlightenment, the hope was that an encyclopedia conceived in the century of the *philosophe*[55] could change how people thought. I will demonstrate that in its endeavor to liberate humanity from its inability to "use one's mind without another's guidance, (Kant)" the *Encyclopédie* demonstrates an increasing ambition to master and control knowledge, and through it, the natural world.

Specifically, through its systems of order, the *Encyclopédie* enabled its readers to review the state of knowledge as it existed in the mid-eighteenth century. However, the *Encyclopédie's* systems of order did not simply function to display knowledge, they enabled its evolution. In order to demonstrate this, I shall first inquire into how the *Encyclopédie* was structured through exploration into the systems of order used to arrange its contents. Specifically, I will demonstrate that the editors of the *Encyclopédie* established systems of order that facilitated intellectual emancipation by putting the reader in a new position of control. The *Système figuré des Connaissances Humaines* (characterized by the editors as both a taxonomical tree and map of the contents of the *Encyclopédie*) and system of *renvois* (italicized words present in the articles that directed the reader to another article) employed by the editors to structure the *Encyclopédie* performed this emancipatory gesture through an epistemic departure from traditional systems of organization. In doing so, they allowed the user to appropriate and direct the systems of order. At the same time, they called for critical thinking on the part of the reader, thereby facilitating the advancement of knowledge. Expressly, I shall

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[55] See, Diderot, "Encyclopédie" *J'ai dit qu'il n'appartenait qu'à un siècle philosophe, de tenter une Encyclopédie; & je l'ai dit, parce que cet ouvrage demande par - tout plus de hardiesse dans l'esprit, qu'on n'en a communément dans les siècles pusillanimes du goût. Il faut tout examiner, tout remuer sans exception & sans ménagement.*

demonstrate that the systems of order used to parse the natural world were very much concerned with initiating new discovery and invention for the understanding and regulation of the world. This will be established through investigation of the articles as well as the plates. The dual effort to master and control the systemization and contents of knowledge, I argue, fundamentally altered the relationship of humanity to encyclopedic knowledge. Critical reflection on the relationship between structure and the evolution of knowledge will facilitate deeper reflection on the timeliness of encyclopedic knowledge and humanity's relationship with the natural world.

The process of editing the *Encyclopédie,* which involved the navigation of censors, the supervision of engraving, and the complications of publication, also involved questions of order, structure, and epistemology. Daniel Brewer argues that "More significant than any "new" knowledge the *Encyclopédie* contains is its reflection on the enabling conditions of knowledge in general, a turning back or speculation upon how the encyclopedic text represents ordered knowledge and thereby produces desired effects" (Brewer, 1993 17). More important than the contents of the *Encyclopédie*, according to Brewer, was the deliberation on the underpinnings and structures of knowledge that its editors presented, most saliently in the *Prospectus* (written by Diderot)*, Discours préliminaire* (written by D'Alembert), and the article entitled *Encyclopédie* (written by Diderot). The editor's self-reflection was important because it questioned the foundations of knowledge,[56] as well as the disposition of the order of knowledge. Most importantly, this reflection was not done in and for itself, but in regard to the

[56] See, D'Alembert. *Discours Preliminaire.* D'Alembert gives credit to Descartes saying, "Si Descartes qui nous a ouvert la route, n'y a pas été aussi - loin que ses Sectateurs le croyent, il s'en faut beaucoup que les Sciences lui doivent aussi peu que le prétendent ses adversaires."

epistemological work it hoped to accomplish, whose goal, as was detailed, was to remake knowledge through changing the common manner of thinking. While the co-editors did not hold the same enlightenment philosophy, as evidenced by their somewhat divergent understandings of nature, they both "considered the philosopher's task to be the investigation of the material world, (Anderson 407)," which I will demonstrate was part and parcel of their enlightenment goal.

In the widely circulated *Prospectus*[57] written in 1749 to generate interest and subscribers for the project, Diderot made the following comment concerning the foundational principles of knowledge: "Le premier pas que nous ayons à faire dans cette recherche, est d'examiner, qu'on nous permette ce terme, la généalogie & la filiation de nos connaissances, les causes qui ont dû les faire naître, & les caractères qui les distinguent; en un mot, de remonter jusqu'à l'origine & à la génération de nos idées" (D'Alembert).

This was exactly the task performed by d'Alembert in his *Discours préliminaire,* who found the origin of ideas to be the senses in the tradition of Francis Bacon and John Lock, in contradiction to the innate ideas of Descartes.[58] According to D'Alembert, "Toutes nos connaissances directes se réduisent à celles que nous recevons par les sens; d'où il s'ensuit que c'est à nos sensations que nous devons toutes nos idées"

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[57] This was the second prospectus produced for the project, which was created after a hostile split between the publisher André Le Breton and the originally hired translators John Mills and Gottfried Sellius.

[58] See, D'Alembert. "Il est donc évident que les notions purement intellectuelles du vice & de la vertu, le principe & la nécessité des lois, la spiritualité de l'âme, l'existence de Dieu & nos devoirs envers lui, en un mot les vérités dont nous avons le besoin le plus prompt & le plus indispensable, sont le fruit des premières idées réfléchies que nos sensations occasionnent."

(D'Alembert). While sensations are at the origin of ideas, the operations of the human mind are what produce the different objects of knowledge. D'Alembert continues,

> Les objets dont notre âme s'occupe, sont ou spirituels ou matériels, & notre âme s'occupe de ces objets ou par des idées directes ou par des idées réfléchies. Le système des connaissances directes ne peut consister que dans la collection purement passive & comme machinale de ces mêmes connaissances; c'est ce qu'on appelle mémoire. La réflexion est de deux sortes, nous l'avons déjà observé; ou elle raisonne sur les objets des idées directes, ou elle les imite. Ainsi la mémoire, la raison proprement dite, & l'imagination, sont les trois manières différentes dont notre âme opère sur les objets de ses pensées.

Through the distinction between ideas that seem to come immediately (which are described by D'Alembert as passive or automatic), versus those that come after some consideration (which are divided into reflection or imitation of the received ideas), D'Alembert derives the three main divisions of the *Encyclopédie,* as those of memory, reason, and imagination. By positing human beings as the origin of knowledge, the editors of the *Encyclopédie* transformed the epistemological locus of the encyclopedic project from exteriorly guaranteed principles to that of the human subject.

Hence in the manner of Charles Sorel's *Science Universelle*, D'Alembert's *Discours préliminaire* proceeds to offer an account of the genesis of various arts and sciences based on human need.[59] Yet unlike Sorel, d'Alembert does not see the investigation and subsequent intellectual abstraction of disciplines as proceeding in a circular manner. Rather he invokes the image of a tree of knowledge to conceptualize

[59] "Tout s'y rapporte à nos besoins, soit de nécessité absolue, soit de convenance & d'agrément, soit même d'usage & de caprice."

understanding. "Après le détail où nous sommes entrés sur les différentes parties de nos connaissances, & sur les caractères qui les distinguent, il ne nous reste plus qu'à former un Arbre généalogique ou encyclopédique qui les rassemble sous un même point de vue, & qui serve à marquer leur origine & les liaisons qu'elles ont entelles." This manner of picturing encyclopedic knowledge betrays the long history and difficulties of arriving at knowledge itself, the path being described as:

> Une espèce de labyrinthe, de chemin tortueux où l'esprit s'engage sans trop connaître la route qu'il doit tenir. Pressé par ses besoins, & par ceux du corps auquel il est uni, il étudie d'abord les premiers objets qui se présentent à lui; pénètre le plus avant qu'il peut dans la connaissance de ces objets; rencontre bientôt des difficultés qui l'arrêtent, & soit par l'espérance ou même par le désespoir de les vaincre, se jette dans une nouvelle route.

This circuitous path testifies to the advancement of knowledge that proceeds irregularly along different paths. It is also characterized as representing a chronological order of knowledge in that the generation of knowledge epistemologically conforms to the order of discovery historically. In this way, "this double order of ideas (textual and epistemological) is related to a third, historical order" (Brewer, 2006 18). As such, the textual categorization of the *Encyclopédie*, conforms to the generation of ideas in their use of memory, reason, and imagination, which in turn are paired to the three main objects of human knowledge:

> Ainsi la mémoire, la raison proprement dite, & l'imagination, sont les trois manières différentes dont notre âme opère sur les objets de ses pensées. . . Ces trois facultés forment d'abord les trois divisions générales de notre système, & les

> trois objets généraux des connaissances humaines; l'Histoire, qui se rapporte à la mémoire; la Philosophie, qui est le fruit de la raison; & les Beaux-arts, que l'imagination fait naître. (D'Alembert *Discours Préliminaire*)

While he does not say so explicitly, D'Alembert sees these faculties as building on one another, for before reasoning can take place, the 'soul' must hold on to its objects of perception. Likewise, in order for the imagination to function, reason must already be in play. In his defense of the placement of the imagination as the highest faculty, he says, "Si nous plaçons la raison avant l'imagination, cet ordre nous paraît bien fondé, & conforme au progrès naturel des opérations de l'esprit." D'Alembert's defense of the order of operations carried out in the mind presents a rigid argument for the validity of the *Système Figuré des Connaissance Humains*. Nevertheless, it does not account well for why "certain categories of ideas or certain subjects are 'taken in charge' by one faculty of the mind rather than another" (Adams 198). This is key because it alludes to the arbitrary nature of the *Système Figuré*, which, as will be demonstrated, opens up the possibility for the *renvois*.

The *Système Figuré* itself owes its intellectual inheritance to Francis Bacon who had initially divided the human faculties into memory, imagination, and reason (1974). In fact, Bacon's influence was so evident that Diderot and D'Alembert had to defend themselves against accusations of plagiarism from the Jesuit Berthier in the *Journal de Trévoux*.[60] The *Système Figuré* however presents an inflexible predetermined schema for the placement of its articles, which cannot account for its branches of knowledge and the operations of the mind that would lead to their generation and relations. From this

[60] See, *Journal de Trévoux*, January, 1751, p. 188.

substantiation, David Adams argues that the *Système Figuré* was created as polemical propaganda, over and above any kind of epistemological or taxonomic pretensions it might claim to have.[61] This claim is a product of internal inconsistencies in the tree of knowledge itself. He explains, "It is not at all clear why the study of nature, the 'science de la nature' as Diderot calls it, should be so utterly and clearly separated from the 'uniformity of nature.' After all, one can scarcely study astronomy, for example, unless one assumes that the planets and stars have, as Newton had demonstrated . . .mathematically, predictable courses" (202). Unsurprisingly, these internal problems, as well as inconsistencies in the epistemological writings of Diderot himself[62] led Adams to regard the *Système Figuré* as obscuring the unity of the encyclopedic project. Nevertheless, Adams's objection to the rigid taxonomy of knowledge presented in the *Système Figuré* is in fact vital to the introduction of the system of *renvois* that are incorporated in the text of the *Encyclopédie*. This is precisely because the *Système Figuré* cannot account for the separation of disciplines that it presents. However, through incorporating in-text cross-references, the editors are able to accomplish what the *Système Figuré* could not.

Robert Darnton, while not as suspicious regarding the inconsistencies of the *Système Figuré* itself, also nevertheless recognizes the polemical thought behind its conception. Specifically, he demonstrates that Diderot's revision of Bacon's tree of knowledge grafted religion to philosophy in a devious manner. The rational, designed to

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[61] Adams sees their subordination of Religion to Reason and Philosophy as the principal interest of the taxonomy

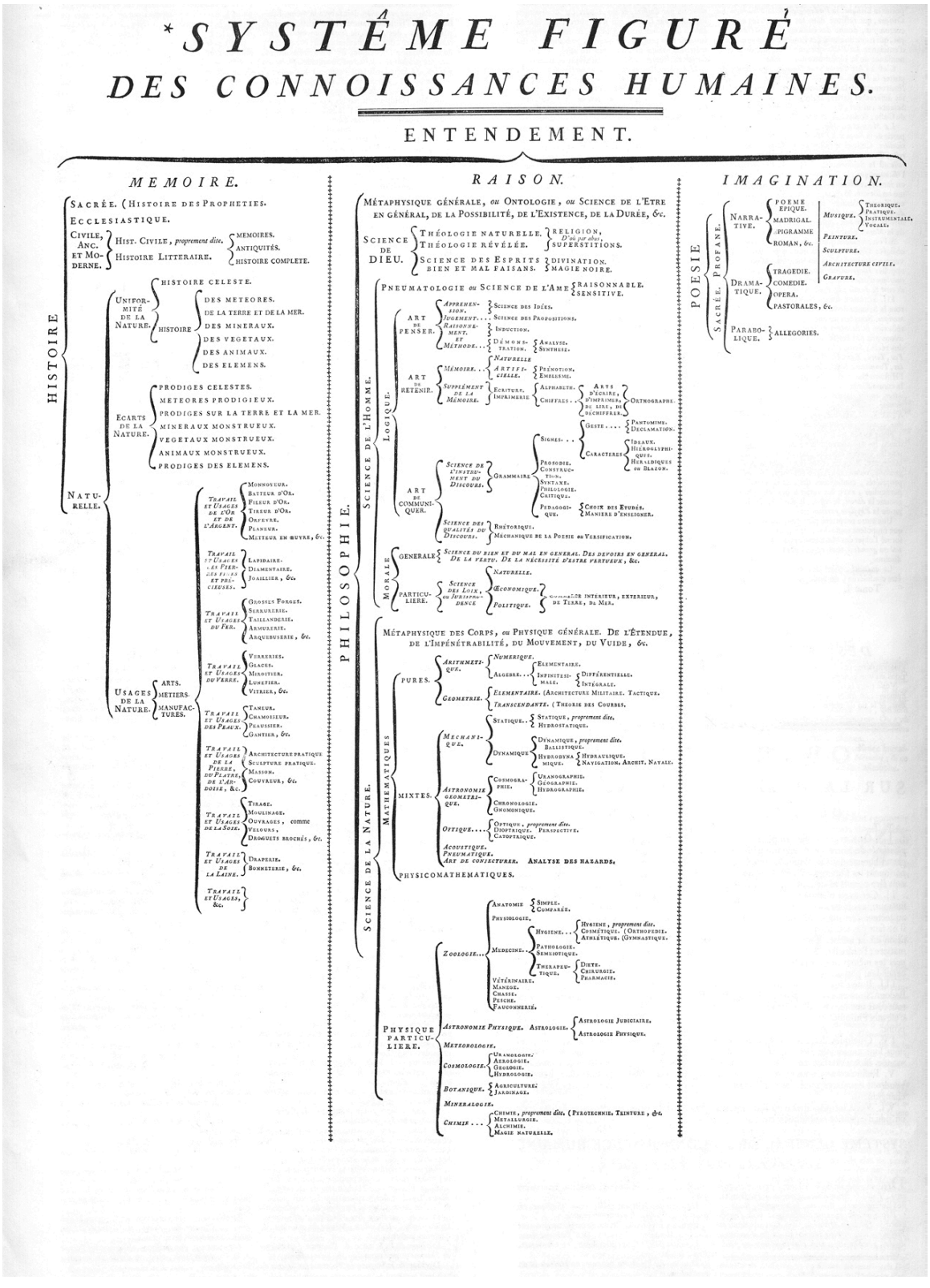
[62] See, *Pensées philosophiques* (1746), *Les Bijoux indiscrets* (1748), *Mémoires sur différents sujets de mathématiques* (1748), *Lettre sur les Aveugles* (1749), and *Lettres sur les Sourds et Muets* (1751)

retain a unity of knowledge, "smacked of heresy because it seemed to subordinate theology to reason, which they [(Diderot and D'Alembert)] described in a Lockean manner, as if one could arrive at knowledge of God by building sensations into ever more complex and abstract ideas" (2009 200). This theological excision valorized a uniquely empirical system of knowledge, with humanity as its epistemological mediator, a key component of the *Encyclopédie's* emancipatory goals of putting knowledge into the hands of its readers.

The repositioning of humanity as supreme arbiter of knowledge radically changes the constitution of knowledge. As Didert explains in the article entitled *Encyclopédie*:

> C'est que si l'on bannit l'homme ou l'être pensant & contemplateur de dessus la surface de la terre; ce spectacle pathétique & sublime de la nature n'est plus qu'une scène triste & muette. L'univers se taît; le silence & la nuit s'en emparent. Tout se change en une vaste solitude où les phénomènes inobservés se passent d'une manière obscure & sourde. C'est la présence de l'homme qui rend l'existence des êtres intéressante; & que peut-on se proposer de mieux dans l'histoire de ces êtres, que de se soumettre à cette considération? Pourquoi n'introduirons-nous pas l'homme dans notre ouvrage, comme il est placé dans l'univers? Pourquoi n'en ferons-nous pas un centre commun? Est-il dans l'espace infini quelque point d'où nous puissions avec plus d'avantage faire partir les lignes immenses que nous nous proposons d'étendre à tous les autres points? Quelle vive & douce réaction n'en résultera-t-il pas des êtres vers l'homme, de l'homme vers les êtres? (Diderot, "Encyclopédie" 1755).

# *SYSTÊME FIGURÉ
## DES CONNOISSANCES HUMAINES.



In particular, by grounding knowledge in human reason, Diderot reoriented humanity vis-à-vis the world: "capable not simply of understanding the world, but more important, of actively organizing all forms of knowledge, thereby representing the world as understandable, that is, able to be grasped, ordered, and ultimately mastered by the rational mind" (Brewer, "Ordering Knowledge" 449). This conception of human subjectivity is one of the defining features of the modern age. As Martin Heidegger states, "man becomes the being upon which all that is, is grounded as regards to its Being and its truth" (1977 127). This occurred through humanity becoming the epistemological epicenter (subject) of knowledge capable of ordering and mastering the objects of knowledge through representation. By representation, *vorstellen,* Heidegger means "to set out before oneself and to set forth in relation to oneself" (1977 131). In this way "the world" becomes "a domain given over to measuring and executing, for the purpose of gaining mastery over that which is as a whole" (1977 131). This is not to say that the natural world no longer provides the ground for human knowledge, but rather mathematics governs its ordering. In placing man at the center of the *Système Figuré* and the *Encyclopédie* in general, the editors of the *Encyclopédie* endeavored to establish the possibility of controlling and mastering the objects of knowledge.

**Knowledge and Order**

Hence, while there is some arbitrariness to the *Système Figuré*, the impetus behind the generation of their "tree of knowledge" testifies to the editors' dream of making knowledge useful (Brewer, 2011 55). As Brewer elucidates, "The order of things in the *Encyclopédie* is determined above all by the status accorded them as belongings, by their usefulness to an ordering subject. Things in the encyclopedic text do not simply

exist, they are meant to be used . . . which is one reason for the countless images of tools and machines in the encyclopedic plates" (Brewer, 2006 19). Read in light of Heidegger's comments in *The Age of the World Picture*, Brewer's astute observation points to encyclopedic order as powerful in its emancipatory gesture. As David Bates explains, "the encyclopedic order has been read rhetorically, as an exercise of power" (2002 3). However, this does not mean there is "no important epistemological function" to the arbitrariness of the order presented in *Encyclopédie*. Rather it is precisely the mathematical framework of the system, which I shall demonstrate, allows for humanity to order and hence master their environs.

As established by Adams, the taxonomic order initiated by the *Système Figuré* falls flat through its separation of categories of knowledge that clearly need to be in dialogue. This does not mean, however, that the gesture was not powerful. In their attempt to categorize knowledge and map its relations, the Encyclopedists demonstrated human ability to systematize knowledge according to their needs. Indeed, Christiane Klapisch-Zuber argues convincingly that in the *Discours préliminaire* Diderot "moved from representing the encyclopedic system as a tree to showing it cartographically" (2007 307). Such a characterization is perhaps unsurprising given that the trope of a map comports more readily with the *Discours Préliminaire's* goal of demonstrating the connection between disciplines and hence allowing each discipline to become better known through its relations with other topics. As Klapisch-Zuber points out, the editors' understanding of the *Encyclopédie's* the *Système figuré des Connaissances Humaines* changed between the publication of the *Prospectus* (1749) and that of *Discours préliminaire* (1751) in which it was presented as:

> Une espèce de Mappemonde qui doit montrer les principaux pays, leur position & leur dépendance mutuelle, le chemin en ligne droite qu'il y a de l'un à l'autre; chemin souvent coupé par mille obstacles, qui ne peuvent être connus dans chaque pays que des habitants ou des voyageurs, & qui ne sauraient être montrés que dans des cartes particulières fort détaillées. Ces cartes particulières seront les différents articles de notre Encyclopédie, & l'arbre ou système figuré en sera la mappemonde.

As a *mappa mundi*, the *Système figuré* became a metaphorical synoptic map enabling the reader to see the general position of the articles in the encyclopedic text. The map was useful due to the necessary but cumbersome alphabetic ordering principle of the *Encyclopédie*.

***Renvois***

In order to further palliate the rigidity of the abecedarian order, the system of *renvois* was created. The *renvois* could cut across the text in order to connect one or more articles in relation to another. But the 'routes' (described as known only to those "citizens and travelers" of each "country" on the map) are not conceptually useful because one must be intimately familiar with a particular article in order to know which other articles connect to it. At the time, the sheer number of connections made picturing such knowledge practically impossible. Nevertheless, the system of *renvois* eclipses the *Système figuré* in importance due to its connective possibilities. This is not to say that the *Système figuré* played no role in the organization of the articles; in fact, each entry falls

under a category laid out in the *Système figuré*[63] (hence its construal as a map). In this way, the *Système Figuré* secures the system of *renvois*, which as will be demonstrated, is the most preponderant system of order presented in the *Encyclopédie.*

For example, if one looks up the article, "Naturel," one is presented with the following entry:

> NATUREL, adj. (Philos.) se dit de quelque chose qui se rapporte à la nature, qui vient d'un principe de la nature, ou qui est conforme au cours ordinaire & à l'ordre de la nature. Voyez *Nature*. Quand une pierre tombe de haut en bas, le vulgaire croit que cela lui arrive par un mouvement naturel, en quoi le vulgaire est dans l'erreur. Voyez l'article *Force***,** p. 112. du VII. vol. j. col. Les guérisons faites par les Médecins, sont des opérations naturelles; mais celles de Jésus-Christ étaient miraculeuses & surnaturelles. Voyez *Miracle*, voyez aussi l'article *Naturel* qui suit. Enfants naturels, sont ceux qui ne sont point nés d'un légitime mariage. Voyez *Bâtard*. Horizon naturel, se dit de l'horizon physique & sensible. Voyez *Horizon*. Jour naturel, voyez *Jour*. (D'Alembert, "Naturel" 1765)

The entry immediately identifies itself as falling under the branch of philosophy per the Système figuré. Throughout the entry, italicized words point the reader to other articles to further his or her understanding of the topic. The openness of the *renvois* system thus empowers readers to explore the *Encyclopédie* according to their interests by allowing

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[63] See, D'Alembert. *Discours Preliminaire On a placé pour l'ordinaire après le mot qui fait le sujet de l'article, le nom de la Science dont cet article fait partie; il ne faut plus que voir dans le Système figuré quel rang cette Science y occupe, pour connaître la place que l'article doit avoir dans l'Encyclopédie.* Nevertheless, there are instances where this is not always the case, or even where the category given is not present in the *Système figuré*.

them to impose their own order of knowledge on the text. In this manner, the *renvois* enables the reader to follow (or not) any particular "path" of knowledge, and hence they direct their own apprehension of knowledge.

As Bernard Groethuysen adumbrates,

> Ils se borneront sagement à amasser des faits, pour les ranger ensuite dans un ordre encyclopédique. Et une fois qu'ils auront ordonné ce dont ils se sont saisis, ils verront l'univers des objets se transformer en quelque choses de connu, en un ensemble de donnée scientifiques, de faits dûment constatés, en quelque chose que l'homme tient et qui est à lui. Des rapports se seront établis entre l'homme et l'objet inconnu et ces rapports rendront familier. (1939 315)

It is through the act of ordering, that the objects become known. Foucault elucidates this paradigm of knowledge in *Les Mots et Les Choses*; one secures and understands through the arrangement and disposition of objects:

> Car le fondamental, pour l'épistémè classique, ce n'est ni le succès ou l'échec du mécanisme, ni le droit ou l'impossibilité de mathématiser la nature, mais bien un rapport à la *mathesis,* qui jusqu'a la fin du XVIIIe siècle demeure constant et inaltéré. Ce rapport présente deux caractères essentiels. Le premier c'est que les relations entre les êtres seront bien pensées sous la forme de l'ordre et de la mesure, mais avec ce déséquilibre fondamental qu'on peut toujours ramener les problèmes de la mesure à ceux de l'ordre. De sorte que le rapport de toute connaissance à la *mathesis* se donne comme la possibilité d'établir entre les choses, même non mesurables, une succession ordonnée. (1966 71)

Foucault's reference to a *mathesis* that understands its problems through the schemas of measure and order is an explicit reference to Descartes. The term (*mathesis universalis*), which appears only in the *Regulae ad directionem ingenii,* refers to Descartes' hope of creating a universal system of measure and order, which could apply to "tous les objets quelconques" (Descartes, 1824 283). This hope for such a system, however, does not indicate Descartes's belief in a unity among the contents of a given system, but rather, "a methodological unity of sciences within a theory of quantities and proportions" (Mittelstrass, 1979 598). As he explains in the *Discours de la méthode*,

> Je n'eus pas dessein, pour cela, de tâcher d'apprendre toutes ces sciences particulières, qu'on nomme communément mathématiques, et voyant qu'encore que leurs objets soient différents, elles ne laissent pas de s'accorder toutes, en ce qu'elles n'y considèrent autre chose que les divers rapports ou proportions qui s'y trouvent, je pensai qu'il valait mieux que j'examinasse seulement ces proportions en général, et sans les supposer que dans les sujets qui serviraient à m'en rendre la connaissance plus aisée" (Descartes, 1843 39).

It is not then an experimental method of understanding, but the possibility of imposing a mathematical system of relations that necessarily holds between objects due to the certainty that mathematical proportions provide. As Judovitz elaborates, "This conceptual interpretation of mathematics sets up a new perception and standard for things, which is not derived experientially from them but which is rather imposed upon them as an axiomatic order to which they must submit" (1988 40).

In sum, the possibility of knowledge in the classical *episteme* as described by Foucault relies on Descartes's understanding that "they all (areas of knowledge) rely for

their foundation upon a possible science of order" (1966 63). This particular legacy of Descartes' is alive and well in the conceptual framework of the *Encyclopédie,* not only through its attempt to order knowledge in the *Système Figuré,* but also through the more powerful system of *renvois.*

The significant problem with the *renvois* is that they offer no similarity to the hierarchy of knowledge represented in the *Discours préliminaire* when mapped (Blanchard and Olsen 60).[64] Thus, though they are categorized according to the headings of the *Système figuré*, their mapped structure is not hierarchical, but rather rhizomatic. When this structure is visualized (made possible by the work of Blanchard and Olsen), two distinct 'hemispheres' of knowledge emerge. The first comprises primarily experimental sciences and natural history (chemistry, botany etc.) while the second is formed of a cluster of abstract and applied sciences, along with the disciplines of history, law, and morals (Blanchard and Olsen 60). Such a revised picture of the linkages between the various articles betrays the main conceptualization of order that constitutes the *Encyclopédie* as that of the *renvois*. As general editor, Diderot was responsible for creating the links between articles. Despite his clarification concerning the different types of *renvois,* and their potential to create new speculative truths or arts, Diderot cannot account for his choices for article connection. Philip Stewart concedes,

> Their extensions increase exponentially so that there would be no possible means for even the authors and editors to keep track of them all . . . had the editors had in hand at one time the whole work, they could of course have made certain cross-

[64] Blanchard and Olsen used the CNRS and University of Chicago's ARTFL project to digitally map the system of cross-references in the Encyclopédie. The resulting representation is highly informative in light of Diderot's comments on the conceptual hegemony the *renvois* perform.

> references more systematic, but in fact this would not have sufficed to create a completely ordered system, for the inevitably exponential structure of cross-references makes them inherently beyond control. (178-180)

Yet the lack of control is not a failure on the part of the editors. Rather, it seems to have been intentional. It not only had certain obvious practical value, such as hiding controversial material likely to draw the ire of a censor (Ayoub 340) but also functioned as a nod to the emancipatory ambition of the *Encyclopédie* on the level of its conceptualization. By supporting in-text cross-referencing, through the *renvois* the editors of the *Encyclopédie* placed their reader's in a position to produce chains of encyclopedic knowledge themselves.

Consequently, unlike that of the *Système figuré*, the system of connections the *renvois* creates is not easily visualizable or comprehensible due to the thousands of links which exist and the nature of their crosscutting capacity. The particular rhizomatic structure that results from the mapping of the *renvois* seems just as arbitrary as the categorical divisions and placements of the *Système figuré*. Gilles Deleuze and Félix Guattari took the term rhizome from Botany and revived it to describe an "a-centered, nonhierarchical, non-signifying system" (23). This revelation concerning the order of the *renvois* stands in direct opposition to the hierarchical tree-like structure of the *Système figuré*. Nevertheless, knowing that the links were undoubtedly deliberately placed (Stewart 178), Diderot's system of order is akin to that of the *Système figuré* in that individual articles are situated in a greater system of order (whether preconceived or not) and linked to be understood in reference to each other. The salient quality of the *renvois*

is the multiplicity of connections that exist, which are then appropriated by the reader allowing for a manifold understanding of the topic in question.

Gilles Blanchard and Mark Olsen have shed new light on the importance of the *renvois* to the order of the *Encyclopédie*. Blanchard and Olsen make a good case for their significance as the single most important organizational principle of the *Encyclopédie*. Diderot attests to this in the article 'Encyclopédie,' calling it "*[la] partie de l'ordre encyclopédique la plus importante*" (Diderot, "Encyclopédie" 1755). Nevertheless, the *renvois* do not always function in the same manner. Rather, Diderot

> Distingue entre différents types de renvois, dont les deux principaux sont les « renvois de mots », qui doivent aider le lecteur à comprendre des termes spécifiques à une science et inconnus de lui, et les « renvois de choses », qui doivent mettre en évidence des analogies, les liens et les principes communs, ou bien au contraire les différences, les contrastes et les réfutations. On s'attend donc à ce que les renvois du premier type restent en général internes à une classe de connaissances ou à l'autre, alors que ceux du second type sont susceptibles d'emmener le lecteur d'une catégorie à une autre. (Blanchard and Olsen 54)

D'Alembert explains the employment of the system of *renvois* in the *Discours préliminaire*: "On a tâché que l'exactitude & la fréquence des renvois ne laissât là - dessus rien à désirer; car les renvois dans ce Dictionnaire ont cela de particulier, qu'ils servent principalement à indiquer la liaison des matières; au lieu que dans les autres ouvrages de cet espace, ils ne sont destinés qu'à expliquer un article par un autre." In this manner the *Encyclopédie* produces knowledge in conjunction with other articles, and does not simply function as a reference dictionary.

> Diderot elucidated this very possibility in his explanation of the renvois:
>
> Il y a une troisième sorte de renvois à laquelle il ne faut ni s'abandonner, ni se refuser entièrement; ce sont ceux qui en rapprochant dans les sciences certains rapports, dans des substances naturelles des qualités analogues, dans les arts des manœuvres semblables, conduiraient ou à de nouvelles vérités spéculatives, ou à la perfection des arts connus, ou à l'invention de nouveaux arts, ou à la restitution d'anciens arts perdus. Ces renvois sont l'ouvrage de l'homme de génie. Heureux celui qui est en état de les apercevoir. Il a cet esprit de combinaison, cet instinct que j'ai défini dans quelques-unes de mes pensées sur l'interprétation de la nature. (Diderot, "Encyclopédie" 1755)

The key to this description of the *renvois* is their potential to bring about the discovery of new speculative truths, as well as the discovery, amelioration, and restitution of arts. Consequently it is my contention that the *renvois* of text of the *Encyclopédie* function as knowledge generators. Johanna Druker explains the difference between static representations and knowledge generators as follows:

> Knowledge generators [are] capable of generating new information through their use. Representations are static in what they show and reference — a bar chart presenting statistics about voting patterns is a good example. Knowledge generators have a dynamic, open-ended relation to what they can provoke; for instance, a train timetable can be used to calculate any number of alternate itineraries. (65)

Druker's examples lead one to understand the difference between knowledge generators and representations in terms of the possibility of multiple outputs. Undoubtedly one can

use bar charts to secure new information, but they are not able to show more than one thing. On the other hand, knowledge generators are multiply connective. They are by their very nature able to generate more than one output, and *ipso facto* the user must take action in order for the output to occur. Thus the claim that "it falls to the knower to determine the criteria according to which he or she lays claim to know the world" (Druker 54) becomes even more powerful given that the system of *renvois* enables exactly this determination through their various possible appropriations by the user.

Hence, while the *renvois* of the text are not (immediately) visually mediating in the sense that they are not "visualizations based on abstractions of statistical data" (Druker 7), they do function as interfaces between separate categories in the manner of a hyperlink, such as those found in Wikipedia. The possibility of such linking, then, not only "reveal[s] the order and linkage between all forms of human knowledge (Brewer, 2011 54)" but also enables the generation of new knowledge.

Potential exemplars of such discoveries are not lacking, as Diderot provides some himself. He questions:

> Sur les cas très-rares où la nature nous offre des phénomènes solitaires qui soient permanents, tels que l'anneau de Saturne; ne pourrait-on pas faire rentrer celui-ci dans la loi générale & commune, en considérant cet anneau, non comme un corps continu, mais comme un certain nombre de satellites mus dans un même plan, avec une vitesse capable de perpétuer sur nos yeux une sensation non-interrompue d'ombre ou de lumière? C'est à mon collègue M. d'Alembert à apprécier ces conjectures. (Diderot, "Encyclopédie" 1755)

Here Diderot correctly ascertains that Saturn's rings are not continuous, but rather, are composed of a certain number of satellites moving at high speed. The specificity of such a conjecture is astonishing in retrospect. But what enables the conclusion is the integration of a specific natural phenomenon into the laws of astronomy. Indeed, the *Encyclopédie's* entry on Saturn (author unknown) furthers this line of inquiry stating:

> Galilée est le premier qui ait découvert que Saturne n'était pas rond; mais M. Huyghens est le premier qui ait fait voir que ces inégalités venaient de la forme de son anneau. Il publia cette découverte en 1659, dans son *systema Saturnianum*. On ne sait si l'anneau tourne autour de Saturne ou non: on ignore aussi l'usage auquel il est destiné. M. Huyghens fait le plan de l'anneau de Saturne fort large, & l'épaisseur fort mince. La circonférence extérieure de l'anneau paraît élevée de plus de 18000 lieues au-dessus de la surface de Saturne. Hist. de l'acad. 1715, p. 45, mem. p. 46. Cet anneau semble n'être qu'un amas & une suite de satellites, si proche les uns des autres, qu'ils ne sont que l'apparence d'un anneau continu. L'anneau se trouvant entre le soleil & Saturne, jette sur Saturne une ombre mobile, & c'est une espèce de bande. La vue de la phase ronde, de la phase elliptique, ou des autres, dépend de la position de l'anneau & par rapport au Soleil, & par rapport à notre oeil. Le plan de l'anneau passe-t-il par notre oeil; nous ne le voyons point, parce que le tranchant de l'anneau est tout ce que l'on en pourrait voir, & il est trop mince pour être visible à une si grande distance; c'est pourquoi Saturne, dont le globe est sphérique, paraît seul dans sa phase ronde, ce qui s'observe tous les quinze ans. Voyez le recueil d'observ. par MM. de l'acad. des Sciences. Mais si la position de l'anneau change, & que son plan s'inclinant au

> rayon visuel nous regarde obliquement au moment qu'il reçoit les rayons du Soleil, alors une partie du plan circulaire est cachée derrière le globe, une partie est située devant le globe, auquel elle paraît appliquée, sans laisser voir d'espace intermédiaire; & confondant sa lumière avec celle du globe de la planète, elle donne au disque apparent la figure d'une ellipse. Enfin, si l'anneau se trouve posé de manière que son plan prolongé passe par le centre du soleil, il n'y a que le tranchant de l'anneau qui reçoive des rayons du centre; & comme cette lame est mince, le tranchant échappe à notre vue, & les anses disparaissent. (Diderot, "Saturne" 1765)

Entries such as this not only provided a commonplace concerning what was known regarding the planet Saturn at the time, they called on articles to explain and inform one another about prospective areas of inquiry.

In like manner, Diderot saw the potential for existing technology to illuminate other areas of need. He reasons astutely that a printing press could be created to serve the needs of musicians: "Ne pourrait-on pas étendre le petit art d'imprimer en caractères percés, à l'impression ou à la copie de la Musique? On aurait du papier réglé. Les portées de ce papier seraient aussi tracées sur les petites lames des caractères" (Diderot, "Encyclopédie" 1755). This postulation occurred through reflection on the technology presented in the *Encyclopédie*, a material inclusion not previously seen in encyclopedic texts.

The potential for the *Encyclopédie* to provoke research was also in the mind of d'Alembert. In the *Discours préliminaire,* he states:

> Nous ne voulons point ressembler à cette foule de Naturalistes qu'un Philosophe moderne a eu tant de raison de censurer; & qui occupés sans cesse à diviser les productions de la Nature en genres & en espèces, ont consumé dans ce travail un tems qu'ils auraient beaucoup mieux employé à l'étude de ces productions même. Que dirait-on d'un Architecte qui ayant à élever un édifice immense, passerait toute sa vie à en tracer le plan; ou d'un Curieux qui se proposant de parcourir un vaste palais, emploierait tout son temps à en observer l'entrée?

Through reference to the tree of knowledge, D'Alembert declares his desire for research to be conducted. That is, he understands the *Encyclopédie* not as an end in itself but as a tool to provoke the study of the natural world. This is the argument of David Bates, who has explored the tree of knowledge's later *mappemonde* trope. He argues that maps "organize details in a whole which, without the help of the map, would be lost because of our limitations . . . The point is that the map reveals something only when it creatively transforms the immediacy of experience" (Bates 19). This observation becomes all the more powerful when considered in light of the *renvois*. Specifically, the physical act of traversing the pages of the *Encyclopédie* embodies knowledge in a manner that pure intellectual abstraction does not allow.

The very act of arranging and connecting knowledge opens up the possibility for future discovery in that it reveals breaks in the system. As Diderot himself states,

> Je distingue deux moyens de cultiver les sciences: l'un d'augmenter la masse des connaissances par des découvertes; & c'est ainsi qu'on mérite le nom d'inventeur: l'autre de rapprocher les découvertes & de les ordonner entre elles, afin que plus d'hommes soient éclairés . . . Par le moyen de l'ordre encyclopédique, de

> l'universalité des connaissances & de la fréquence des renvois, les rapports augmentent, les liaisons se portent en tout sens, la force de la démonstration s'accroît, la nomenclature se complète, les connaissances se rapprochent & se fortifient; on aperçoit ou la continuité, ou les vides de notre système, ses côtés faibles, ses endroits forts, & d'un coup-d'oeil quels sont les objets auxquels il importe de travailler pour sa propre gloire, & pour la plus grande utilité du genre humain. Si notre Dictionnaire est bon, combien il produira d'ouvrages meilleurs? (Diderot, "Encyclopédie" 1755)

Only through the encyclopedic order performed by the system of *renvois* can gaps in knowledge become visible. As such, the inquiry and research that the *Encyclopédie* was understood to provoke was seen as eventually leading to a re-mapping of the terrain of knowledge. Indeed, the editors of the *Encyclopédie* were well aware of the precarious state of their encyclopedic knowledge:

> Mais l'observation & la physique expérimentale multipliant sans cesse les phénomènes & les faits, & la philosophie rationnelle les comparant entre eux & les combinant, étendent ou resserrent sans cesse les limites de nos connaissances, font en conséquence varier les acceptions des mots institués; rendent les définitions qu'on en a données inexactes, fausses, incomplètes, & déterminent même à en instituer de nouveaux. Mais ce qui donnera à l'ouvrage l'air suranné, & le jettera dans le mépris, c'est surtout la révolution qui se fera dans l'esprit des hommes, & dans le caractère national. (Diderot, "Encyclopédie" 1755)

In fact, this is the goal of the encyclopedists: to emancipate control of the production of knowledge and put it into the hands of the people. It is about the democratization of

knowledge. Yes, epistemology and the field of knowledge were understood and demonstrated to be contingent, in a flux of constant renewal or rethinking. Yet, in the recognition of the contingency of knowledge, the hope was that a critical attitude could be adopted. As such, the editors of the *Encyclopédie* invited their readers to assess and make reasoned judgments on the state of knowledge and to question its authority and structure. The thought was that through critical thinking individual minds and the national character could be transformed to constantly question and probe the state of knowledge and to look steadily into the future. In the spirit of the Enlightenment, the *Encyclopédie* was not only to emancipate humanity but also to turn individual humans into emancipators.

**The *Planches***

If the systems of order at work in the text of the *Encyclopédie* functioned to emancipate knowledge and place it into the hands of its readers, can the same be said of the volumes of plates? They are mentioned almost as an afterthought at the end of the *Discours préliminaire*, where their inclusion is described as a mechanism for holding the reader's attention and, at best, to ensure they do not lose their way.[65] Yet this early-envisioned use of the *planches* soon gave way to something much more interesting. At the project's end, they constituted an encyclopedia in and of themselves (Barthes 90). More precisely, they can be viewed as containing depictions of nearly every human art and craft.

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[65] See, D'Alembert. *Discours Preliminaire*, "Un lecteur ouvre un volume de Planches, il aperçoit une machine qui pique sa curiosité."
"Nous n'avons pas voulu ressembler à un homme qui ferait planter des guides à chaque pas dans une route, de crainte que les voyageurs ne s'en écartassent. Il suffit qu'il y en ait par - tout où ils seroient exposés à s'égarer."

Out of the two thousand five hundred and sixty-nine plates included in the volumes under the direction of Diderot, only one-half of one volume was devoted to natural history (Werner, 1993 20). In fact, the elucidation of knowledge concerning "science" and natural history was not its contributors' principal goal. "Les encyclopédistes ne s'intéressent pas à la science pour la science, et c'est sans doute la raison de leur éclectisme en manière de classification. Mais ils s'intéressent prodigieusement aux applications" (Proust 237). Indeed, Diderot's push to legitimize and impel the respectability of the mechanical arts has been well documented (Werner and Kostelnick, 2012 443), and the plates of the *Encyclopédie* are widely acknowledged as facilitating this objective. Specifically, by placing the *Arts* and *Métiers* on equal footing with more respected areas of knowledge, the *Encyclopédie's* plates served to "rescue these activities both from the derogatory attitudes of learned elites and from the self-imposed secrecy of artisan guilds" (Yeo 146).

In doing so, the editors of the *Encyclopédie* hoped to wed so-called "practical" knowledge with "theoretical" knowledge in hope of something more:

> Tout Art a sa spéculation & sa pratique: sa spéculation, qui n'est autre chose que la connaissance inopérative des règles de l'Art: sa pratique, qui n'est que l'usage habituel & non réfléchi des mêmes règles. Il est difficile, pour ne pas dire impossible, de pousser loin la pratique sans la spéculation, & réciproquement de bien posséder la spéculation sans la pratique. Il y a dans tout Art un grand nombre de circonstances relatives à la matière, aux instruments, & à la manœuvre que l'usage seul apprend. (Diderot, "Art" 1751)

In placing research and practice on equal footing, Diderot not only raised the standing of those who practiced "practical" disciplines but also melded them together in the pursuit of discoveries useful to humanity (O'Connor 792). As such, the overwhelming majority of the plates were produced to depict the *Arts* and *Métiers*, whose goal was an initiative to elevate useful knowledge (Dear 170).[66] Indeed, according to the *Système Figuré*, the vast majority of the plates are situated in the category of *Memoire*, under the branch of *Histoire Naturelle*, in the section entitled *Usages de la Nature*. If one takes this into account, it becomes apparent that a huge portion of the *Encyclopédie* was devoted to the presentation of various tools and methods for the manipulation of the natural world in order to have control over it.

The question of how one is to understand the plates is the focus of a now-famous essay by Roland Barthes, who argues that the plates of the *Encyclopédie* are not simply images used to facilitate the understanding of the text. Rather, Barthes concludes,

> D'une manière générale, l'Encyclopédie est fascinée, à force de raison, par l'envers des choses : elle coupe, elle ampute, elle évide, tourne, elle veut passer derrière la nature. Or tout envers est troublant : science et para-science sont mêlées, surtout au niveau de l'image. L'Encyclopédie ne cesse de procéder à une fragmentation impie du monde, mais ce qu'elle trouve au terme de cette cassure n'est pas l'état fondamental des causes toutes pures; l'image l'oblige la plupart du temps à recomposer un objet proprement déraisonnable; la première nature une fois dissoute, une autre nature surgit, aussi formée que la première. En un mot, la

[66] See also D'Alembert's entries *DECOUVRIR, and TROUVER* in the *Encyclopédie* "Knowing how was now starting to become as important as knowing why. In the course of time those two things would become ever more similar, as Europe learned more about the world in order to command it."

> fracture du monde est impossible : il suffit d'un regard-le nôtre-pour que le monde soit éternellement plein. (105)

Barthes does not hide his characterization of the encyclopedic project's attempt to pass "behind nature" in order to reveal its make-up. However in doing so, the encyclopedic image is described as causing some major destruction. It cuts, "amputates, hollows out, and turns." Through this fragmentary gesture, the image recomposes its object into something else, its "first nature" being "dissolved," another springing up, which is just as "figured" as the first. The plates of the *Encyclopédie* attempt to reveal something more fundamental about the constitution of something, but in doing so, necessarily lose something as well; they show yes, but they also hide. Still, Barthes recognizes the plates' power to displace and change the perception of the object to be, "l'une des grandes richesses de *l'Encyclopédie* que de varier (au sens, musical du terme) le niveau auquel un même objet peut être perçu, libérant ainsi les secrets mêmes de la forme" (Bender and Marrinan 101).[67] This will be our point of departure; how do the plates of the *Encyclopédie* (by themselves and in conjunction with their textual entries) refocus the gaze of the viewer to liberate knowledge?

This is the major question broached by John Bender and Michael Marrinan in their recent analysis of the plates of the *Encyclopédie*. In *The Culture of Diagram*, they demonstrate, contra Barbara Stafford and Martin Jay, that the plates of the *Encyclopédie* open up the possibilities of the visual for creating new and heterogeneous knowledge. Their thesis is grounded in their understanding of the plates not simply as images but

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[67] John Bender and Michael Marrinan note that for Barthes, "The discontinuities that displace the gaze of the view seem to be the unifying principle of the plates." pgs. 27-28

rather as diagrams,[68] which Bender and Marrinan define as "a proliferation of manifestly selective packets of dissimilar data correlated in an explicitly process-oriented array that has some of the attributes of a representation but is situated in the world like an object" (7). While the heterogeneity and multiplicity of diagrammatic use are explored throughout the work, at base, diagrams "are things to work with. By framing our concept of the diagram as a flexible tool of research, we link it to Diderot's idea that the *Encyclopedia* makes knowledge visible by its system of correlations [rapports] rather than its arrangement of materials" (10). Such an understanding of diagrammatic knowledge refocuses the understanding of the plates to working images. Like the system of renvois in the text of the *Encyclopédie*, the diagrammatic plates actually open us to the possibility for new understanding of the subject through their capacity to bring about an array of meanings. This possibility follows due to the absence of a single point of view, which calls for the viewer to produce some kind of understanding. Bender and Marrinan explain that:

> The visual arrays of the *Encyclopedia's* plates-their strict frontality, their discontinuity with the fictive spaces of tableaux, their pervasive whiteness that joins visual parts to the network of numbers and letters keyed to a text-fail to converge in a single vantage point or entity that might be called a viewer. Users of diagrams, unlike viewers, are functional components inseparable from the system in which they are imbricated. They are empowered to initiate a process of correlation even as they realize their subjective presence is liminal-almost non-existent. (72)

[68] The multiple ways in which this occurs is explored in the second chapter of their work.

This assertion is bound up with several premises that are articulated over several chapters. The first is that the plates function as diagrams, which "align, juxtapose, and contrast two kinds of information,"[69] much like the *renvois*. Diagrams like the *renvois* necessitate participation from the reader. Indeed, the viewers are not simply "empowered" as Bender and Marrinan articulate, but must carry out an attempt to correlate the information provided in the plate. As such they should be considered users. The fact that the user of the diagrams is "inseparable from the system imbricated (72)," is because the very act of accruing information from them *ipso facto* calls on the noetic capacities of a user. In the simplest terms, the plates by their very nature call upon the user to correlate and compare the disparate pieces of information presented. If this is indeed the case, then the plates of the *Encyclopédie* do not simply present knowledge, but call on its user to take part in the process of producing knowledge themselves. Due to the participatory manner in which this occurs, the readers of the *Encyclopédie* emancipate knowledge, become co-creators of knowledge, allowing them to reach conclusions never explicitly stated.

The question remains: how does this understanding of the manipulative aspect of diagrammatic knowledge lead the user to reevaluate their understanding of the natural world? My answer (alluded to by Bender and Marrinan) is that the gaps or discontinuities inherent in diagrams allow the user to imagine new possibilities for the manipulation of nature. The noted American inventor Thomas Blanchard, for example, referenced the *Encyclopédie's* depiction of lathes in his 1820 patent in order to differentiate his machine from the "previous modes of turning irregular surfaces"

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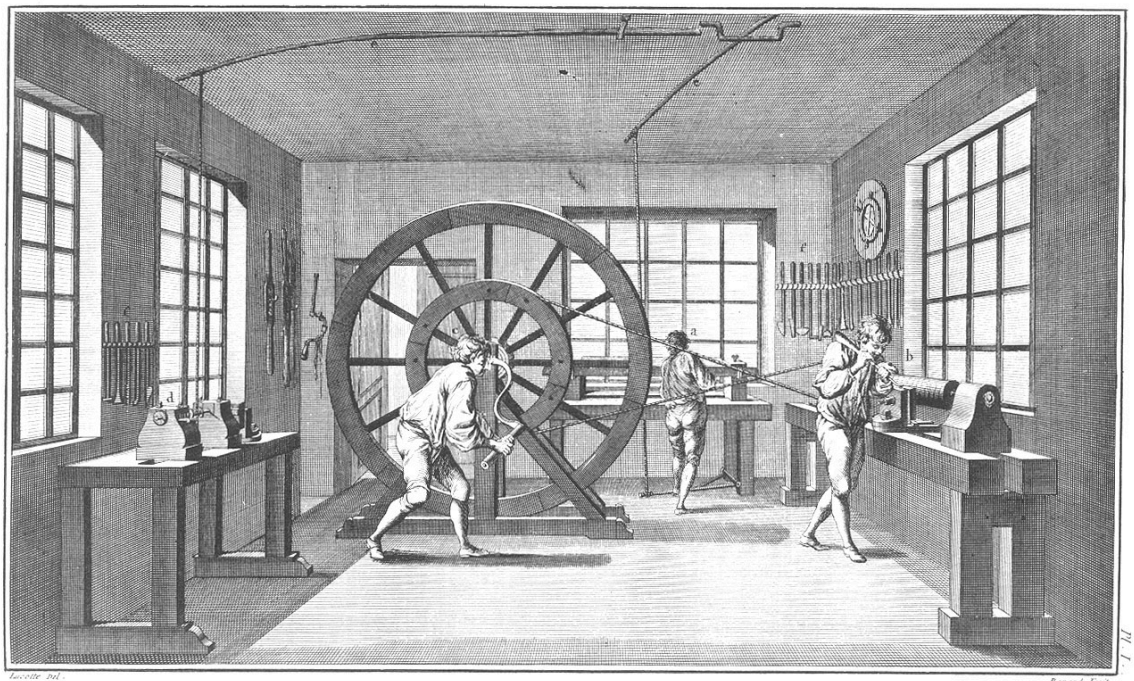
[69] See Bender and Marrinan's discussion pgs. 6-10

depicted in the *Encyclopédie* (124). We also have evidence of an error in the *Encyclopédie's* description pertaining to the combing of flax, leading to the fabrication of a new tool. "Cette partie de métier de toilier que l'Encyclopédie nomme Peigne, et dont elle a donné une description très imparfaite. Les procédés qu'elle indique pour la fabrication des peignes, est celle qui a produit tant de peignes défectueux et dont la vue a excité le génie inventif du St Fouquier" (Hilaire-Pérez 159). While such examples are hard to find, at the very least, they demonstrate that plates of the *Encyclopédie,* (like its text) functioned as a touchstone for eighteenth century technology practiced in society, as well as a commonplace for future innovation.

**Conclusion**

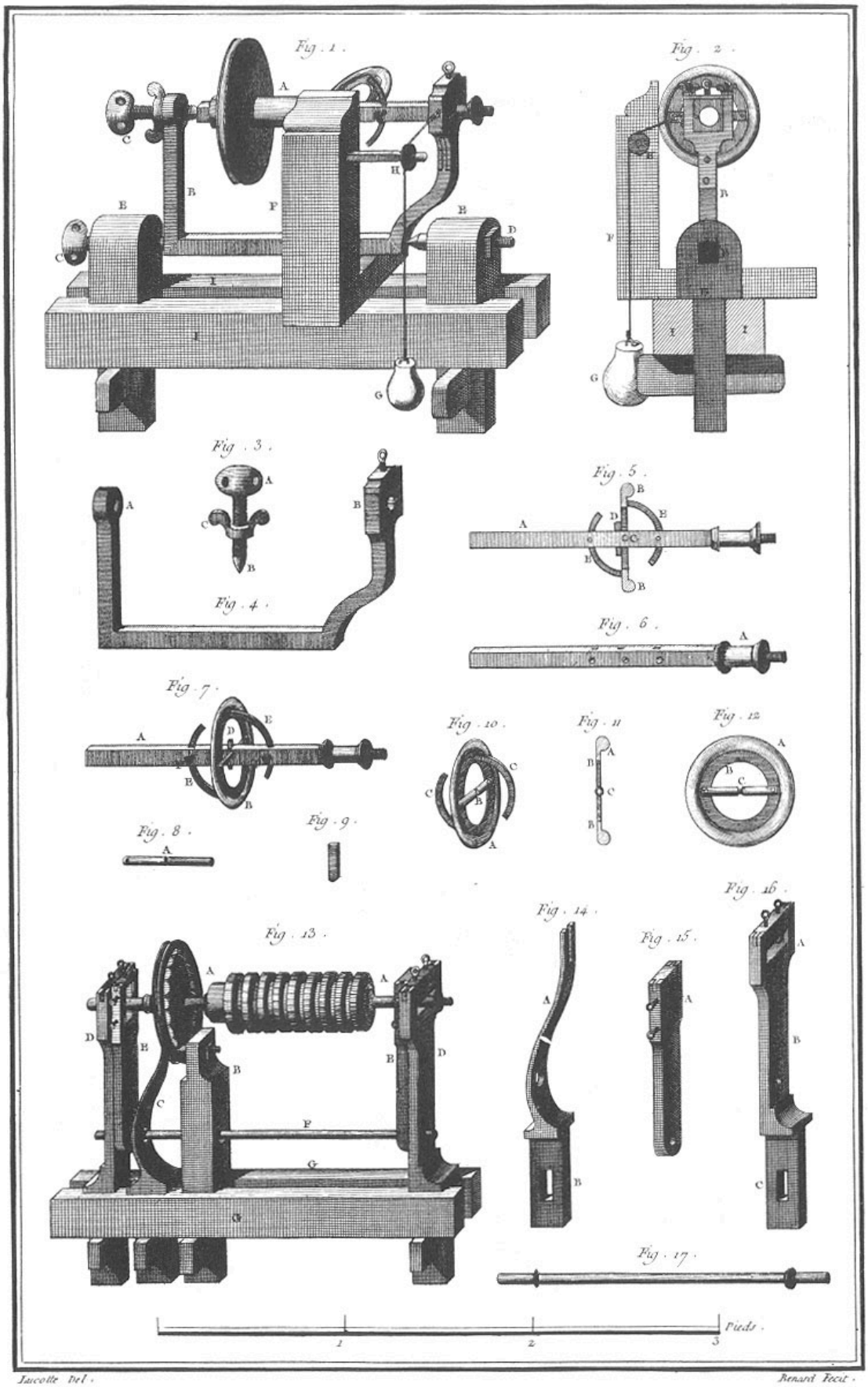
The *Encyclopédie* has not unreasonably "become almost synonymous with the enlightenment" (Yeo xii). Yet in its drive to transform its reader's manner of thinking by emancipating knowledge, it went a step further. Specifically, the *Encyclopédie* redeployed the systems of order into the hands of its users through the inclusion of the *renvois* system. This system functioned as a tool with which to probe the current state of knowledge and to look for gaps and potential new areas of inquiry. As such, the *Encyclopédie* was forward-thinking in its understanding of a necessary progression of knowledge, which anticipated new knowledge and technology. The emancipatory character of the articles of the *Encyclopédie* was also present in the plates, which, when used, called upon the noetic capacities of the user to correlate and connect the disparate parts of the diagram. Thus, the diagrams did not simply call upon the user to question the presentation of knowledge; they necessitated it in order that they might be understood. Through their call to appropriate and reimagine new technologies, the plates too were

undeniably oriented toward the future. These characteristics of the *Encyclopédie* undeniably altered the nature of encyclopedic knowledge. In addition to a call to master and instrumentalize knowledge, the *Encyclopédie* called into question the structure and order of encyclopedic knowledge by demonstrating the necessary contingency of any order of knowledge. This facet of encyclopedic epistemology will be explored through a study of Wikipedia. While the other encyclopedic works in my dissertation are beholden to structural frameworks, Wikipedia lacks such a means of order. Instead, Wikipedia relies on implicit and hidden conceptual foundations centered on tropes of efficiency and speed, which allow it to stay up-to-date in almost concurrent fashion. This state of affairs puts into question the nature of contemporary encyclopedic knowledge, due to Wikipedia's lack of interest in questing what knowledge is and how it is produced.



Tourneur, *Atelier*

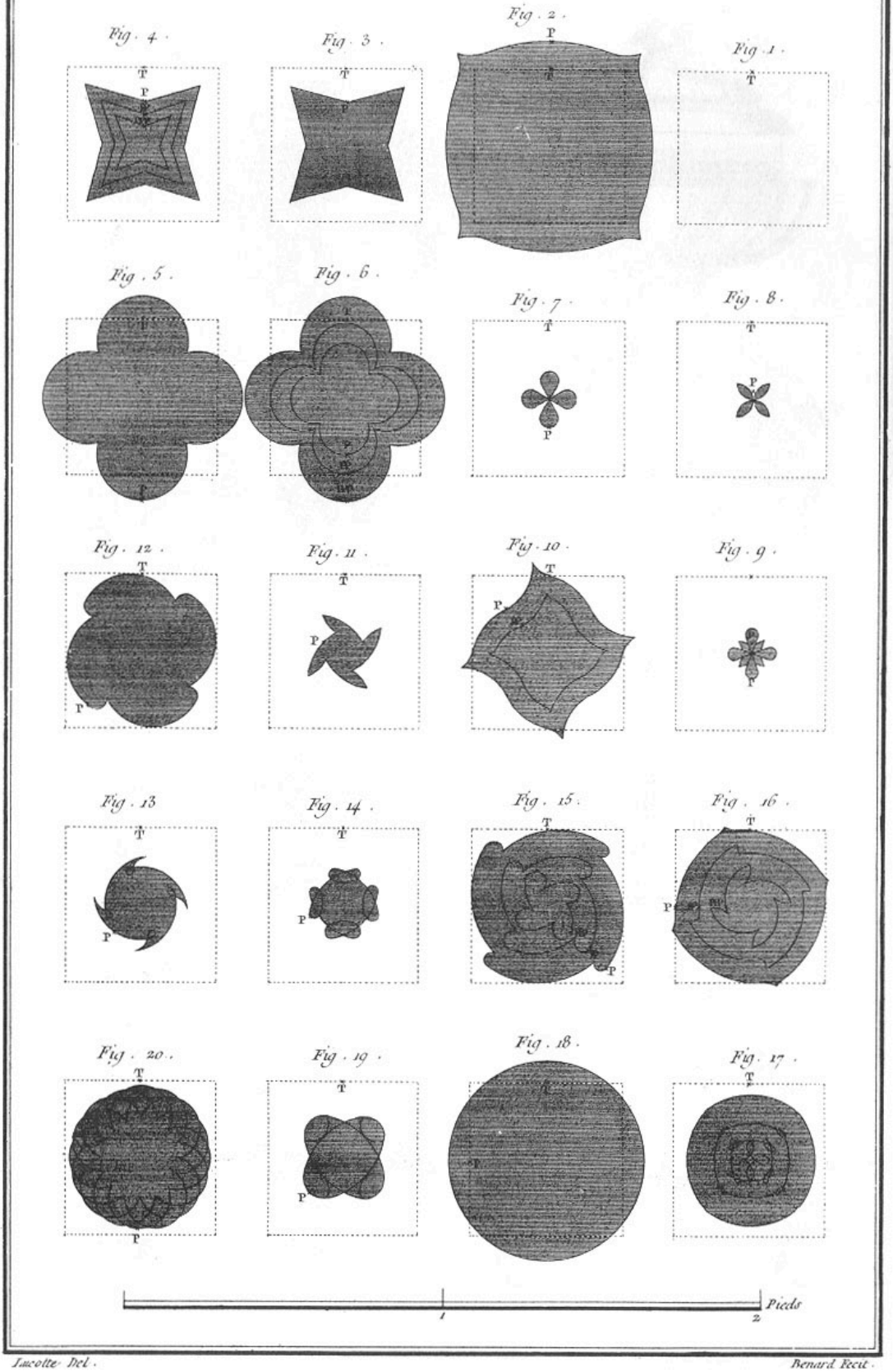
Pl. XXXII.




Jacotte Del.

Benard Fecit.

Pl. LIX.




Lucotte Del.

Benard Fecit.

Chapter Four

Wikipedia and the Digital Age

> **Wikipedia** (/ˌwɪkɪˈpiːdiə/ or /ˌwɪkiˈpiːdiə/ ***WIK-i-PEE-dee-ə***) is an Internet encyclopedia, supported and hosted by the non-profit Wikimedia Foundation. It is a free-of-cost encyclopedia with its articles being free-content; those who use Wikipedia can edit almost any article accessible.[5] Wikipedia is ranked among the ten most popular websites,[4] and constitutes the Internet's largest and most popular general reference work.
> -Article "Wikipedia." www.wikipedia.com

**Introduction**

In January of 2001, Jimmy Wales and Larry Sanger formally launched *www.wikipedia.com*. The idea was simple; a free Internet encyclopedia built upon the backs of volunteer editors — literally anyone with an Internet connection could produce content. As of May 2016, it comprised 288 different language editions, with over 500 million unique visitors a month, and over 5 million articles in the English edition alone ("Wikipedia" Wikipedia). The internet traffic index alexa.com ranks it 6th globally among most frequently visited websites, only Google, YouTube, Facebook, Baidu (the leading Chinese language search engine), and Yahoo rank higher in popularity ("Top Sites" Alexa). Due to its immense scope, and number of visitors, Wikipedia's declaration of being the Internet's most comprehensive and popular general reference work is plausible. Yet I will demonstrate that Wikipedia's pretensions to encyclopedic knowledge are put into question by its operating in a paradigm that above all privileges speed over and above any systematic authentication or organization of its contents.

I contend that Wikipedia was established on these principles in order to stand in a certain relationship with time — one that is open to the future. I argue that Wikipedia's constitution fundamentally transforms the creation and systematization of encyclopedic

knowledge by putting into question the need for more traditional systems of order. The ambition of this chapter is to clarify how this occurs and to reflect on the consequences of such a move. At base, I understand Wikipedia's pretensions to being current as the hidden conceptual foundation of the project. My critique hence is unlike those commonly made of Wikipedia. Its principal goal is not to question Wikipedia's content and structure in and of themselves. Rather, I do so in order to problematize Wikipedia's current encyclopedic practice, which evinces a disinterest in situating and structuring its contents into a whole. Instead, Wikipedia's aspires to be up-to-date but readily malleable so that its contents may be appropriated and directed in line with its users' desires.

Wikipedia seems well aware of its protean reputation, which allows it to keep abreast of the current state of knowledge. In fact, it was one of the original reasons why Wikipedia was brought into existence. Before Wikipedia was formally launched, its creators Jimmy Wales and Larry Sanger were immersed in another encyclopedic project called Nupedia. Like Wikipedia, it was created on the basis of volunteer collaboration. Unlike Wikipedia, its volunteers were considered experts in their fields. In almost all cases the volunteers possessed doctoral degrees, and the articles they wrote underwent a rigorous seven-step review process ("Nupedia" Wikipedia). Nupedia, however, had a problem; it was horribly inefficient. It went live on March 9, 2000, but "by early winter, 2001, Nupedia had published approved versions of only about 25 articles" (DiBona Chap. 20). Sanger recounts, "Jimmy and I were very well agreed that Nupedia's slow productivity was probably going to be an ongoing problem and that there needed to be a way, moreover, in which ordinary, uncredentialed people could participate more easily." The problem, as stated quite plainly by Sanger was that Nupedia was horribly sluggish.

It was not able to produce articles in a timely manner, and as a result, had the quality of being obsolete before getting off the ground. To solve this problem, Sanger and Wales introduced a new website that allowed peer collaboration on articles; an enterprise that is now known as Wikipedia.

**The Rules of Collaboration**

Wikipedia's claims to encyclopedic knowledge are guaranteed by the thought that Internet users can collaborate to "compile the sum of all human knowledge" ("Neutral point of view" Wikipedia). Thus anyone with an Internet connection can create, edit, modify or delete its content. Widely known for its lack of systemization, Wikipedia has two basic rules. The first rule mandates a "neutral point of view" (NPOV), stating that users must attempt to "represent fairly, proportionately, and, as far as possible, without editorial bias, all of the significant views that have been published by reliable sources on a topic" ("Neutral point of view" Wikipedia). As such, individual articles are intended to accommodate as many "significant views" as possible into one article ("Neutral point of view" Wikipedia).

The second of Wikipedia's core content policies states that information provided must be verifiable but not original, and so "editors must provide reliable print sources for everything they post . . . and none of it may be based on original research, but only on material available elsewhere" (Leitch 38).

These now well-known rules governing Wikipedia's collaborative foundation—(NPOV), verifiability by citation, and No original research (NOR)-while seemingly banal, advance a problematic reality; Wikipedia attempts to provide the most

comprehensive up-to-date information at the expense of fact-checking its contents and any principles of organization. Rather, it passes the responsibility on to others.

> Jimmy Wales admits as much in regard to the NOR policy. It was imposed, As a practical means to deal with physics cranks . . . it can be quite difficult for us to make any valid judgment as to whether a particular thing is true or not. . . but what we can do is check whether or not it actually has been published in reputable journals or reputable publishers. It is quite convenient to avoid judging the credibility of things by simply sticking to things that have been much better equipped to decide. ("Core Content Policies" Wikipedia)

The NOR policy was instituted to streamline the writing of articles on Wikipedia. Yet as Leitch has noted, it does nothing to solve the problem of reliability. *Mutatis mutandis*, it simply passes the responsibility onto the sources themselves. As Shane King elaborates, "we haven't solved the problem. We've shifted the burden of evaluating the credibility of the theory to evaluating the credibility of the sources" (King). NOR might be a plausible solution if Wikipedia had some sort of strategy or system for evaluating the sources it cites. It does not. As such, Wikipedia makes no distinction between *The New England Journal of Medicine* and a journal like *Scientia Ricerca*. The difficulty is that "it is a matter of policy that no specific article should seek to improve on its sources, (King)" rather they simply have to be present. These rules, which work in tandem, allow Wikipedia to grow without having to consider or judge what is being put online.

The prescription to a neutral point of view likewise can be understood in light of a certain aim to up-to-date efficiency on the part of Wikipedia. As Axel Bruns succinctly summarizes, the (NPOV) "merely aims to offer for the user's own evaluation the various

representations of knowledge currently in wider circulation, without an attempt to distill from these an objective presentation of knowledge in its own right" (132). One could label the inability (or unwillingness) to distill a coherent whole as simple laziness. Bruns sees and seems to buy into this criticism as "lament that any sense of existence of a universal 'truth' has been thoroughly undetermined in a postindustrial, postmodern context" (121). However, Bruns's analysis seems to be begging the question. He characterizes the postmodern context as having disproved the concept of truth, yet it is evident that he himself seems to hold the 'postmodern context' as a kind of universal 'truth.' By this, I mean that Bruns understands the 'postmodern context' to be the best way of characterizing our age, and as such, holding some claim to truth. What is more, Bruns seems to be conflating the possibility of coherence with objective 'Truth.' One can present a coherent objective presentation of knowledge that nonetheless contains divergent opinions. It is another step altogether to label something as 'Truth.'

Nevertheless, the general consensus on NPOV is that it is a robust tool for enabling dissenting opinions to exist side-by-side (albeit without standards for presentation), while also fostering the growth of Wikipedia. As Bruns explains, "Conflict over the correct representation of a topic, therefore, is redirected through the operation of the NPOV policy ideally toward all sides of the argument engaging productively to ensure that their preferred interpretation is presented most convincingly" (120). At base, the policy allows open input that fosters the robust growth of Wikipedia. While the policy does encourage growth, its claims to presenting 'all sides of the argument' are undermined by the tyranny of the majority position. Specifically, it is the majority

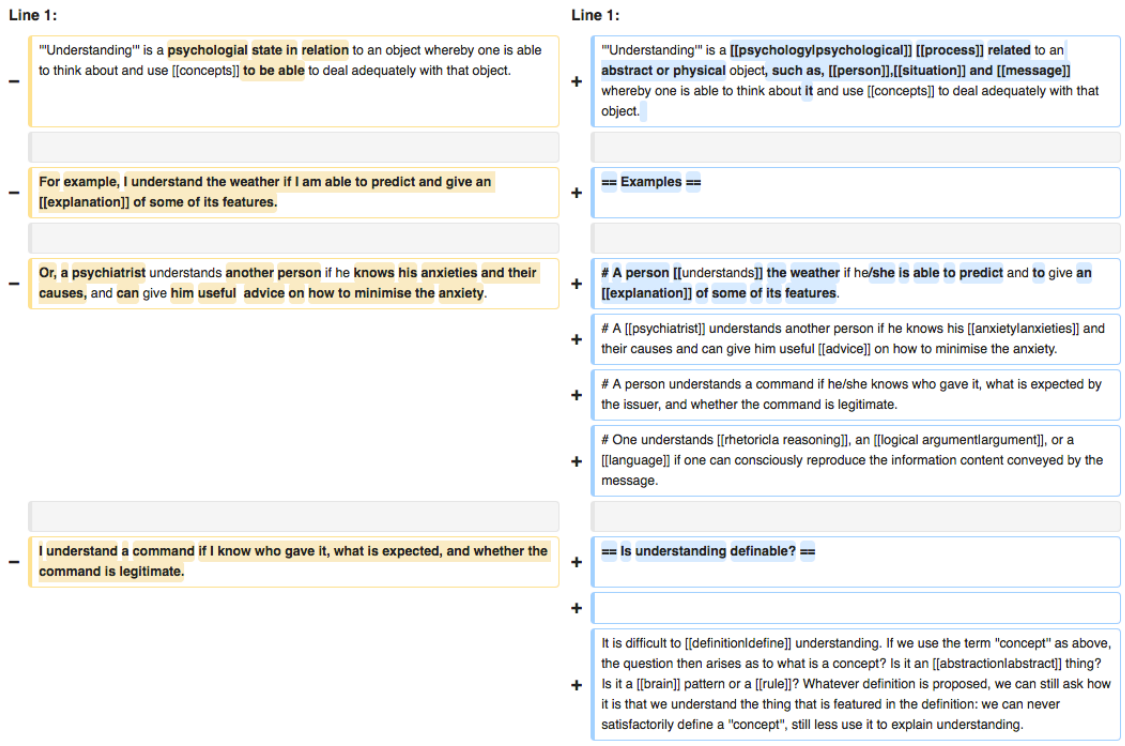
consensus of the particular users who are interested in a topic that becomes 'knowledge,' not the 'various representations of knowledge currently in wider circulation.'

The question is whether such knowledge is well founded. A comparison between the article on 'Understanding' in Wikipedia and 'Connoissance' in the *Encyclopédie* respectively might shed some light on the matter.

Wikipedia's entry on 'Understanding' begins in the following manner:

> **Understanding** (also called **intellection**) is a psychological process related to an abstract or physical object, such as a person, situation, or message whereby one is able to think about it and use concepts to deal adequately with that object. Understanding is a relation between the knower and an object of understanding. Understanding implies abilities and dispositions with respect to an object of knowledge sufficient to support intelligent behavior. ("Understanding" Wikipedia)

It is admittedly hard to know how to begin an analysis of the entry beyond its basic thrust: a process of the mind that treats 'abstract' or 'physical' objects, and is able to do something with said understanding. We know that the article links to a variety of others, and that it references a source written by Carl Bereiter, which appears to be the primary source for the content of the entry. However in order to better understand the underpinnings of the article, it would be beneficial to 'go back' to the creation of the entry in 2003 by user TonyClarke ("Understanding: Difference between revisions" Wikipedia). The following side-by-side is rather illuminating:




The column on the left indicates the initial entry in 2003, while the column on the right indicates the forty-eight intermediary changes made between 2003 and the next substantial version. This second version, which displays the state of the article as it existed in 2006, allows one to easily see the evolution the entry started to take. Compared to the version present at the time of this writing, there exists (present as of this writing) the notion that understanding is a 'psychological state' that consists of being in a certain relation to an object. Furthermore, understanding allows for the holder of the 'psychological state' to use the resulting intellection to do something. Nevertheless, the article is not situated well in relation to its peers. Yes, there are hyperlinks that situate it in some sense to other articles, but Wikipedia itself gives little in the way of overall context for understanding the entry's place in the 'whole.' Moreover, the article is clearly founded upon general consensus with regard to the sources its users decide to employ.

Meanwhile, the article '*CONNOISSANCE'* in the *Encyclopédie,* which was written by German Huguenot Johann Heinrich Samuel Formey starts off thus:

> CONNOISSANCE, s. f. (Métaph.) M. Locke définit la connoissance la perception de la liaison & convenance, ou de l'opposition & disconvenance qui se trouve entre deux de nos idées: partout où se trouve cette perception, il y a de la connoissance; & où elle n'est pas, nous ne saurions parvenir à la connoissance. On peut réduire cette convenance ou disconvenance à ces quatre espèces, selon M. Locke: 1° identité ou diversité; 2° relation; 3° coexistence; 4° existence réelle: & pour ce qui est de la première espèce de convenance ou de disconvenance, qui est l'identité ou la diversité, le premier pas que fait l'esprit humain dans la connoissance de la vérité, c'est d'apercevoir les idées qu'il a, & de voir ce que chacune est en elle - même; & par conséquent de connaître qu'une idée n'est pas l'autre, quand ces deux idées sont différentes. Ces premières connoissances s'acquièrent sans peine, sans effort, sans faire aucune déduction, & dès la première vue, par la puissance naturelle que nous avons d'apercevoir & de distinguer les choses. (Diderot "Connoissance")

Immediately, one sees that the article is considered a branch of Metaphysics and is based on the philosophy of Englishman John Locke. Further reading reveals the author's engagement with Locke's *Essay Concerning Human Understanding*, which is considered a cornerstone in the history of British Empiricism (Uzgalis). Just these two facts alone are a clear attempt at situating the article in the whole, and an explicit understanding of its theoretical foundation reveal a conception of encyclopedism a world away from Wikipedia.

Wikipedia's constitution as a social experiment in knowledge production, as demonstrated by our inquiry into the article 'Understanding,' results in an odd characteristic: it is never complete. Specifically, due to the collaborative efforts of its users, Wikipedia is always in the process of being modified in some way, which gives Wikipedia an organic quality. As James Gleick puts it, "In the Wikipedia universe, reality cannot be pinned down with finality. That idea was an illusion fostered in part by the solidity of a leather-and-paper encyclopedia" (382).[70] While Gleick is misguided in his characterization of the situation,[71] he has a point: Wikipedia is radically open and contingent by its very nature. Yet, as I have demonstrated, leather-and-paper encyclopedias (the Encyclopédie is the first among his list) do not pin down reality as Gleick states. There is a difference between an encyclopedia being 'finished' or 'completed' and it making a claim to metaphysical finality, or conclusiveness. Still, Wikipedia did abolish the kind of staying power that print encyclopedias possessed. Delving further into the procedures and practices involved in Wikipedia will elucidate the nature of contemporary encyclopedic 'knowledge.' This study will also bring into question the structure of knowledge, through demonstration of an ever-expanding push to flexibility in service of being up-to-date.

As detailed, the basic idea behind Wikipedia is that anyone can create, edit, modify, or delete its content, which greatly adds to its productive flexibility. According to Andrew Lih, the reason behind such a laissez-faire policy is simply due to the

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[70] An initiative to publish printed volumes of English Wikipedia as it existed in 2015 was undertaken as an art project by Michael Mandiberg. However the cost of printing the 7,473 volumes as it existed at the time was prohibitively expensive, and only 106 volumes were printed. See, (Print Wikipedia)

[71] Per the article "Encyclopédie," Diderot was well aware that the *Encyclopédie's* efforts to 'pin down' reality would be supplanted in time.

contingent nature of the project. "Wikipedia can allow anyone to edit because any action can be easily undone by anyone else in the community" (6). Hence, the larger community of users will regulate any error, inaccuracy, dispute, trolling, or vandalism. This process has been characterized as Stigmergy, "a term coined by Pierre-Paul Grasse to describe how wasps and termites collectively build complex structures; as Istvan Karsai writes, it 'describes the situation in which the product of precious work, rather than direct communication among builders, induces [and directs how] the wasps perform additional labor.'" In practice, this means that much of the work is done on an *ad hoc* basis. As such, the collective will of the community of editors attracted to particular articles determines the course of an article based on the state in which an article is found. Compilation of different information into a whole is not in fact a new encyclopedic practice. Pliny undertook the practice "by perusing about 2000 volumes . . . we have collected in 36 volumes, 20,000 noteworthy facts obtained from one hundred authors that we have explored" (Rackham) as did most other encyclopedic luminaries. The prevalence of *compilation* can be traced from Pliny through Isidore of Seville, Vincent de Beauvais, Gregor Reisch, Ephraim Chambers, Denis Diderot, and the Encyclopedia Britannica. The difference with Wikipedia is that the synthetic work is done by literally anyone with an Internet connection, and the ability to type and click, which lends Wikipedia enormous efficiency. But this reality does not fully explain how information is added to Wikipedia.

**Bots, Speed, and Hyperlinks**

To be sure, human beings do the vast majority of the heavy lifting; however, computer programs colloquially known as 'bots' aid them, not only adding content, but

also modifying and deleting it. Bots have been prevalent from the earliest days of Wikipedia and were created due to the drain of time-consuming tasks on human editors. The story of their origin is particularly telling. Late in 2002, recent computer science graduate Derek Ramsey discovered Wikipedia and decided to add U.S. Census data to the site, starting with the 3,000 counties in the U.S. When he decided to move on to the almost thirty-three thousand cities, however, he realized the task would take months to accomplish, and so he created some software to accomplish it task akin to the bots already at work on Wikipedia fixing punctuation. But in this case, his "bot was going to be a bit different . . . In an English Wikipedia with just over 50,000 articles, he was about to push the button and add 33,832 more, all in one shot. He would instantly be responsible for 40 percent of all Wikipedia articles" (Lih 102). He indeed hit enter, and Wikipedia has not been the same since.

Ramsey's experiment spawned a revolution, and today, the question is how much of the activity on Wikipedia is due to bots, and how much is due to humans. In order to get an idea, one simply has to log on to Thomas Steiner's real-time statistics page to see the breakdown by language version (Steiner). The statistics vary widely by country and by time of day. Still, even Steiner's results are not complete, as they cannot take into account some of the most active bots on Wikipedia ("The Shadowy World" MIT). As of 2016, bots exist that automatically produce articles and correct stories based on simultaneous monitoring of news sources. As the MIT technology review has noted, "It's not hard to see how this could become much more sophisticated" ("The Shadowy World" MIT). For example, one can easily conceive of a computer program monitoring a

presidential speech on CNN and creating a summary article posted to Wikipedia moments after it airs.

Bots, however, are not limited to creating stories. Other designated roles filled by bots include removing vandalism, reporting potential conflicts of interest, and correcting spelling (Merrill). At the very least this state of affairs demonstrates the increasing automatization of Wikipedia by digital means. It also reveals Wikipedia's protean nature: tens of thousands of edits occur every second, and any attempt at permanency would require reevaluating Wikipedia's constitution. In fact, Wikipedia has taken on a life of its own, becoming a self-subsisting entity in its own right. To be sure, Wikipedia's immateriality facilitates its lifelike quality (in contrast to the materiality of the other encyclopedic entities treated in this dissertation); however, as other Internet encyclopedias establish, this is not at all the only possible constitution for Internet encyclopedias.

According to Roy Rosenzweig, the increasing synchronicity of Wikipedia with real world events gives it a news-like quality:

> Offer[ing] a first draft of history, but unlike journalism's draft, that history is subject to continuous revision. *Wikipedia*'s ease of revision not only makes it more up-to-date than a traditional encyclopedia, it also gives it (like the Web itself) a self-healing quality since defects that are criticized can be quickly remedied and alternative perspectives can be instantly added.

In order to keep track of the constant flux, each article on Wikipedia has a 'View History' page where the user can see every emendation made since the creation of the page. In order to facilitate active cooperation, each page also has a 'Talk' page where users can

come to discuss potential strategies for improving the page or moderating disputes. More importantly, these pages facilitate analysis and resolution of particular points of contention concerning specific articles. In this respect, Wikipedia is first amongst its peers in providing a history of its unremitting editorial process. Wikipedia even maintains a "Lamest edit wars" page to chronicle the time wasted "debating topics of no practical value" ("Lamest edit wars." Wikipedia). Examples of contention include whether the Monty Hall problem is a puzzle of probability or of game theory, whether U2 is an "Irish band" or rather a band that happens to have formed in Ireland (since two of its members were born in the United Kingdom), and whether *e* (the mathematical constant) should be considered an 'actual' number ("Lamest edit wars." Wikipedia). While intended to be amusing rather than demonstrative of "Wikipedia policy or guidelines" these pages in concert with the 'View History' pages provide key insights into the myriad internal debates that emerge out of an unrestricted project, and perhaps, more essentially, its dynamic and future-oriented outlook.

Wikipedia's open access approach to compilation leads to a profound lack of systemization. According to founder Jimmy Wales, Wikipedia is something that works in practice, but does not have any real theoretical foundations (Lih 20). In point of fact, although "Wikipedia maintains a rough hierarchical classification of subject areas, few people use it as an entry point. It's maintained as a relic of history" (Lih 115). Due to its electronic nature, the thought was that users need only type their query into Google in order for them to find the information they seek. According to Wikipedia authority Andrew Lih, editors of past encyclopedias developed a taxonomical system due to space constraints inherent in print media.

> Diderot's *Encyclopédie* and Encyclopedia Britannica . . . were paper-based, they were necessarily limited by shelf space, printing costs, and other practical physical limits. Human editors, starting from a hierarchical taxonomy of what to include, centrally organized them to encompass the topics of the known world. To plan out the volumes, they needed a system of classification. (115)

While it is true that the most recent modern encyclopedias were print-based, it is a stretch to say their taxonomic systems were created to 'plan out' the volumes. In the *Encyclopédie*, the *Système figuré* served to depict the epistemological reevaluation of knowledge that its editors performed. In doing so, it also functioned to frame the order, structure, and connections of the objects of human knowledge. While the *Système figuré* was far from perfect, it was an attempt to give context to the contents of the *Encyclopédie*. The absence of any similar effort on the part of Wikipedia puts into question the nature of contemporary encyclopedism. Wikipedia is not anchored or framed in any obvious manner, nor does it attempt to situate its contents. This fact gives it a rather amorphous quality, which betrays the loss of one of the central ideas inherent in encyclopedism: that of an aggregate whole.

Wikipedia claim to connectivity offers little help in this matter. Comparable to the *Encyclopédie's* system of *renvois* (in fact one might say that Wikipedia perfected their use), Wikipedia uses hyperlinked text to enable its user to access related entries. Taken together, the hyperlinks are characterized as creating "internal links [that] bind the project together into an interconnected whole" ("Wikipedia: Manual of Style/Linking" Wikipedia). The obvious question is: what kind of whole? While the *Encyclopédie* did stretch the limits of order and representation put forth by the *Système figuré,* there was

still an attempt at situating its contents. Wikipedia seems to eschew such a possibility even as it takes up the mantel of the *renvois*.

Whereas the *renvois* of the *Encyclopédie* functioned not only to connect and facilitate the constant critical evaluation and re-mapping of knowledge, Wikipedia by its very nature constantly actualizes the latter. The dynamic efficiency of Wikipedia's principles of operation enables it to be open to future changes that might necessitate implementation. Users (and robots) are constantly adding, deleting, or modifying content and links based on nearly concomitant synchronization with real world events.

According to Axel Bruns, the "return to knowledge structures dominated by taxonomic principles is highly unlikely—certainly for the unruly, changeable content of the Web itself" (191). The reason for this phenomenon is, "classification according to fixed schemata is unable to cope with the range of information and knowledge now available within the global knowledge space, for both practical and conceptual reasons" (192). Such also seems to be the case for Wikipedia due to its constitution. Namely, because Wikipedia is not conceptualized to operate on taxonomic or rules based schema, it is likely to continue in its present form; that is, as driven by the dynamic nature of 'the global knowledge space' on the levels of its structure and content. This allows it to stay incredibly current, being constantly revised according to the latest news and information, but without any concept of place in a whole.

The question is where does this leave us? James Gleick answers:

> Too much information, and so much of it lost. An unindexed Internet site is in the same limbo as a misshelved library book. This is why the successful and powerful business enterprises of the information economy are built on filtering

> and searching. Even Wikipedia is a combination of the two: powerful search, mainly driven by Google, and a vast, collaborative filter, striving to gather the true facts and screen out the false ones. Searching and filtering are all that stand between the world and the library of Babel. (410)

Wikipedia is indexed alphabetically like the *Encyclopédie* (a fact I was ignorant of prior to this writing). Its index is all but useless. This is why most of the articles retrieved from Wikipedia come about by making use of the hyperlinks embedded in individual articles, or (as Gleick explains) through search. In this way, 'search' functions as the new index for Wikipedia primarily due to its being the most efficient manner of finding an article. Gleick says, "the old ways of organizing knowledge no longer work" (410). His solution asks "Who will search; who will filter" (410)? Perhaps the questions should be, how might we charitably introduce metrics for content composition and structure? How might we frame the information available to make it more useful?

One intriguing possibility might be to emulate Google and graph the pages and connections of Wikipedia. As a large graph, the individual pages would constitute the nodes, and the hyperlinks the links to other nodes. Through mapping Wikipedia's structure, one might learn (as Sergey Brin and Larry Page did) that not all connections are equal. More precisely, Google indexes the pages on the World Wide Web and ranks them, not simply according to the links present on the page, but according to the pages a particular page links to and what other pages link to it (Levy 21). In this way, Google is able to pinpoint any individual page's importance in the network and provide its users with a list of possible choices to their search query.

This knowledge presents intriguing new possibilities for Wikipedia; namely, implementing a system akin to Google's to rank articles, and then providing visualizations of where a particular article falls in the network of the Wikipedia Web. What is certain is that metrics for structuring the information of Wikipedia both internally and externally have been fundamentally altered, being rendered subordinate to the requisites of efficiency and speed.

**Secondary Appropriation**

While Wikipedia's impetus to efficiency problematizes its contents and structure, such a state of affairs does have extraordinary practical implication. Actually, the dynamic 'lifelike' nature of Wikipedia is *sine qua non* for its productive use. Thus, what is most interesting about Wikipedia are the possibilities for real-world decisions and actions that can be taken due to Wikipedia's future-oriented push for constant revision and re-evaluation. This occurs on the textual as well as the meta-level. For example, articles on Wikipedia are widely used by programs like Google and Apple's personal assistant Siri to answer questions. For example, if one were to ask Siri what year the Eiffel Tour was built, the answer would most likely come from Wikipedia. Since it is constantly being updated and modified, it constitutes the most comprehensive open-source repository on the Internet, a status that makes it an ideal source for appropriation. This basic content level appropriation is different from meta-level appropriation, which I define as knowledge or data generated from the content or data available on Wikipedia that is not inherent in the content or data itself. It is achieved through information acting on information.

Consider for example how meta-level appropriation of Wikipedia data was used to forecast influenza. In 2013, the Centers for Disease Control and Prevention launched a competition "to find the best way to forecast the characteristics of the 2013-2014 influenza season using data gathered from the internet" ("How Wikipedia Data" MIT). Kyle Hickmann of the Los Alamos National Laboratories answered the call using Wikipedia (Biggerstaff 357).

The standard approach used to survey flu outbreaks in the United States is collecting data from local health departments and then using the data to create influenza-like illness (ILI) reports "for planning and mitigating activities based on what is believed to be the current state of influenza throughout the U.S." (Hickmann). There are, however, significant limitations to such a method. Namely, the technique only includes individuals who seek treatment, and even then, there exists a one to two-week delay before the data becomes available.

Hickmann and his collaborators' solution to this problem was to use Wikipedia to supplement the ILI reports, in the hopes of providing a more robust model for predicting the growth of flu. The potential for Wikipedia to assist in predicting influenza outbreaks exists because "Wikipedia provides summary article access logs to anyone who wishes to use them. These summaries contain, for each hour from December 9, 2007 to present (and updated in real-time), a compressed text file listing the number of requests served for every article in every language, for articles with at least one request." Hence, each time an article is accessed on Wikipedia, the instance and URL address is recorded. This data is publicly available and was found by Hickmann to be highly correlated with historical ILI reports and "allow[s] for accurate prediction of ILI data several weeks

before it becomes available" (Hickmann). While the technique is subtle, the idea (that people with influenza are likely to look up their symptoms on Wikipedia) is not. As access logs are updated in real time and the information is open to anyone with a computer and Internet connection, Wikipedia provides an ideal metric for aiding in the prediction of influenza outbreaks in the United States.

**Conclusion**

David Bell commented (I believe correctly) in a 2012 *New Republic* essay on the state of contemporary (digital) encyclopedism:

> For an online encyclopedia, two of the main selling points are comprehensiveness, and being up-to-date . . . Can one imagine the editors also trying constantly to revise a "map of knowledge," and editing dozens of related articles and hyperlinks each time they make a single substantive change? It is hard to imagine any such enterprise making enough money to pay the salaries of the army of editors this would all require . . . On Wikipedia, contributors do constantly try to update many different related articles to take account of new material they introduce. But Wikipedia, of course, has no plan, no system, no map of human knowledge. (Bell)

Some might call this Wikipedia's fatal flaw—an indifference (or inability) to situating its contents. Indeed, one might wonder if Wikipedia can still be called an encyclopedia. If it cannot, one might ask if it matters, and if so, why? The answers to these questions are hardly cut-and-dry. Certainly, the essence of encyclopedism has fundamentally changed, and Wikipedia has asked the proverbial question: do we (Wikipedia) need to provide (new or old) systems of order to further structure our contents within a whole? Their

answer seems to be no. The task that remains is to question this assertion and justify the response. What is clear is that if we hope to take full advantage of Wikipedia, we must find new manners to frame and structure its contents.

# Conclusion

The overarching goal of this dissertation has been to use the changing idea of nature as a means of approaching the question of knowledge's order and structure. This has entailed a longitudinal study of some of the most canonical encyclopedic texts in Western history. In choosing such divergent works as the *Naturalis Historia*, *Speculum Maius*, *Science Universelle*, *l'Encyclopédie*, and *Wikipedia*, the project has been able to articulate the dynamic shifts that encyclopedic knowledge has undergone from antiquity to the present. Specifically, critical analysis of the canon demonstrates an inextricable link between the changing idea of what "nature" is and how it should be organized into a unified whole. By elucidating the development of encyclopedic knowledge, we have demonstrated an increasing propensity to efficiently use and instrumentalize this knowledge over-and-above interest in framing it; a state of affairs that seems to be directly correlated with encyclopedism's increasingly dynamic relationship with time.

Pliny the Elder's *Naturalis Historia* provides an ideal point of departure for this analysis. As detailed, Pliny's opus articulates a Stoic ontology, which understands the world as imbued with spirit. Since every facet of the natural world is understood to be potentially instructive to humanity, attention to the natural world is vital. As such, the *Naturalis Historia* recognizes encyclopedic knowledge as immanent to the workings and actions of the natural world. This particular epistemological stance can be characterized as a call to attention, precisely because knowledge is something that must be observed in the workings of nature. Encyclopedic knowledge in the *Naturalis Historia* can then be charitably understood as eternal, being intrinsically bound to the workings of the cosmos.

Like the *Naturalis Historia*, the *Speculum Maius* should be considered a handbook of nature. In contrast to Pliny, however, Vincent de Beauvais considers the world to be divinely created, and hence, to carry facets of God's divine truth. While Beauvais still considers knowledge immanent to the natural order, the *Speculum's* Christian teleology reorients its conception and presentation of such knowledge. This reconfiguration is most evident in the *doctrinale* tome, which takes the advent of humanity's fall into sin as constitutive of human knowledge. Specifically, because primal sin was viewed as inhibitory to human understanding, the learning and cataloguing of knowledge were vital. The knowledge enclosed in *doctrinale* was not only designed to palliate the intellectual losses instantiated by the Fall but was also considered necessary to regaining right relationship with God. Most importantly, this knowledge was realized (discovered) by human intellectual capacities (in contrast to its actualization by Nature in the *Naturalis Historia*), thereby reorienting encyclopedic knowledge on the meta-level from passive understanding to active learning.

Charles Sorel's *Science Universelle* reimagined encyclopedic knowledge of the natural world through the renegotiation of its content and structure. Most salient in his encyclopedic treatment was the drive to be in dialogue with contemporary knowledge. By establishing discourse and exchange as part and parcel of the encyclopedic enterprise, Sorel reoriented encyclopedism toward a closer relationship with empirical research and philosophical theorizing. This new drive was accompanied by an ambition to robustly systematize and organize its subjects of knowledge. Through the inauguration of a systematic presentation of encyclopedic knowledge characterized by dialogue with

contemporary research and theory, Sorel brought to light the necessity for encyclopedias to be up-to-date.

The necessity for a robust relationship with contemporary thought lead the Republic of Letters to adopt literary practices to meet this need. Through literary journals and commonplace books, the intellectual community was able to circulate the free exchange of ideas and information—practices that helped inspire the creation of the *Encyclopédie*.

Denis Diderot and Jean le Rond d'Alembert's *Encyclopédie* functioned as a principal intellectual commonplace in mid-eighteenth-century France and beyond. Through its aspirations to intellectual emancipation, the *Encyclopédie* problematized the authority as well as the staying power of knowledge. This occurred primarily on the structural level of the *renvois*, by enabling readers to question the current understandings and assumptions of the day. It also called upon its readers to probe further so that they might advance empirical research and understanding themselves. Through their understanding of a certain contingency to knowledge, the editors of the *Encyclopédie* positioned the epistemological outlook of encyclopedism toward the future. Increasingly important was the drive to speed up the distribution and consumption of encyclopedic knowledge, the underlying pillar of Wikipedia.

As detailed, Wikipedia's claim to be the world's most comprehensive work is characterized by its propensity for efficiency. It not only is available online free of charge to anyone with an Internet connection but also is perhaps the most successful example of crowdsourcing to date. The radically open nature of Wikipedia facilitates speed and productivity, enabling it to grow at impressive rates. Its efficiency also permits

the inclusion of the latest news and research in virtual concomitance with their occurrence. But it does so at the expense of structure. The question now is whether or not we have reached an impasse; has the management of information been sacrificed for speed and the need to be up-to-date, or can encyclopedic structure once again be rethought so that its knowledge might again be put to work?

**Bibliography**

Adam, Antoine. *Romanciers Du XVII Siecle: Sorel, Scarron, Furetiere, Me De La Fayette.* Tours: Gallimard, 1958.

Adams, David. “The Système Figuré and the Encyclopédie.” *Ordering the World in the Eighteenth Century*. Ed. Diana Donald and Frank O'Gorman. Basingstoke: Palgrave Macmillan, 2006.

Alet, Martine. *Charles Sorel et Son Monde*. Paris: Honoré Champion, 2014.

Anderson, Wilda. "Eighteenth-century Philosophy." *The Cambridge History of French Literature*. By William E. Burgwinkle, Nicholas Hammond, and Emma Wilson. Cambridge: Cambridge UP, 2011.

Andersson, Daniel. “Philosophy and the Renaissance Encyclopedia.” Ed. Jason König and Greg Woolf. *Encyclopaedism from Antiquity to the Renaissance*. Cambridge; New York: Cambridge University Press, 2013.

Ariew, Roger. *The A to Z of Descartes and Catesian Philosophy*. Lanham, MD: Scarecrow, 2010.

Aristotle, and Edward Hussey. *Aristotle Physics*. Oxford: Clarendon, 1983. Print.

Aquinas, Thomas. *Summa Theologiae: Volume 31, Faith: 2a2ae. 1-7*. Vol. 31. Cambridge University Press, 2006.

Augustine. *Confessiones Corpus Christianorum*, Series Latina 27, 235 trans. Henry Chadwick (Oxford: Oxford University Press, 1991). 13.4.5

Augustine, St, and R. P. H. Green. *On Christian Teaching*. Oxford University Press, USA, 2008.

Augustinus, Aurelius, and John H. Taylor. *The Literal Meaning of Genesis: The Works of the Fathers in Translation*. New York, NY U.a.: Newman Pr., 1982.

Ayoub, Josiane Boulad. "Le Projet Révolutionnaire De L'Encyclopédie." *Les Grandes Figures Du Monde Moderne*. Ed. François Blanchard. Sainte-Foy, Québec: Presses De L'Université Laval, 2001.

Bacon, Francis, and Thomas Fowler. *Novum Organum*. Oxford: Clarendon Pr., 1878. Print.

Bacon, Francis. *The Two Books of Francis Bacon: Of the Proficience and Advancement of Learning, Divine and Human.London*: Printed by J. M'Creery for T. Payne, 1808.

Bacon, Roger, Ferdinand M. Delorme, and Robert Steele. *Questiones supra libros octo Physicorum Aristotelis*. (1935).

Barthes, *Le Degré zéro de l'écriture suivi de Nouveaux Essais Critiques*. Paris: Seuil, 1972.

Bates, David. "Cartographic aberrations: epistemology and order in the encyclopedic map." *Using the Encyclopédie: Ways of Knowing, Ways of Reading*. By Daniel Brewer and Julie Candler Hayes. Oxford: Voltaire Foundation, 2002.

Beagon, Mary. *Roman nature: the thought of Pliny the Elder*. Oxford [England: Clarendon Press ;, 1992. Print.

Beauvais, Vincent de. *Speculum quadruplex sive Speculum maius*, 4 vols. (Douai: Balthazar Bellère), 1624

Bell, David A. *What We've Lost With the Demise of Print Encyclopedias*. New Republic. Hamilton Fish V, 19 Mar. 2012. Web. 08 Aug. 2016. <https://newrepublic.com/article/101795/encyclopedia-britannica-publish-information>.

Bender, John B., and Michael Marrinan. *The Culture of Diagram*. Stanford, CA: Stanford UP, 2010.

Bennington, Geoffrey. Personal Interview. April 26, 2014

Bianchi, Lorenzo. *Des novateurs modernes en la philosophie: Telesio tra eruditi e libertini nella Francia del Seicento*. Bernardino Telesio e la cultura napoletana (1992)

Bible, Holy. "New international version." *Grand Rapids: Zondervan* (1984).

Biggerstaff, Matthew, et al. *Results from the centers for disease control and prevention's predict the 2013–2014 Influenza Season Challenge*. BMC Infectious Diseases 16.1 (2016):

Binkley, Peter. "Pre-Modern encyclopædic texts. " *Proceedings of the Second COMERS Congress, Groningen*. 1996.

Blair, Ann. "Student Manuscripts and the Textbook." *Scholarly Knowledge: Textbooks in Early Modern Europe*. Ed. Emidio Campi, Simone De Angelis, Anja-Silvia Goeing, and Anthony T. Grafton. Genève: Librairie Droz, 2008. N. pag. Print.

Blair, Ann M. "Revisiting Renaissance Encyclopedism." Ed. Jason König and Greg Woolf. *Encyclopaedism from Antiquity to the Renaissance*. Cambridge; New York: Cambridge University Press, 2013.

Blanchard, Gilles, and Mark Olsen. *Le Système de renvois dans l'Encyclopédie: Une Cartographie des structures de connaissances au XVIIIe siècle*. Recherches sur Diderot et sur l'Encyclopédie 31-32 (2002): 45.

Boi, L. *The Quantum Vacuum: A Scientific and Philosophical Concept, from Electrodynamics to String Theory and the Geometry of the Microscopic World.* Baltimore: Johns Hopkins UP, 2011.

Bourgeat, J. B. *Etudes Sur Vincent De Beauvais, Théologien, Philosophe, Encyclopédiste: Ou, Spécimen Des Études Théologiques, Philosophiques Et Scientifiques Au Moyen Âge, XIIIe Siècle, 1210-1270*. Paris: A. Durand, 1856. Print.

Bruns, Axel. Blogs, *Wikipedia, Second Life, and beyond: From production to produsage*. Vol. 45. Peter Lang, 2008.

Burke, Peter. *A Social History of Knowledge: From Gutenberg to Diderot, Based on the First Series of Vonhoff Lectures given at the University of Groningen (Netherlands)*. Cambridge, UK: Polity, 2000. Print.

Burke, Peter. *A Social History of Knowledge. from the Encyclopaedia to Wikipedia*. Cambridge: Polity, 2011. Print.

Brewer, Daniel. *The discourse of enlightenment in eighteenth-century France: Diderot and the art of philosophizing*. Vol. 42. Cambridge University Press, 2006.

Brewer, Daniel. *The Enlightenment past: Reconstructing eighteenth-century French thought*. Cambridge University Press, 2008.

Brewer, Daniel. "Ordering Knowledge." *A New History of French Literature*. Ed. Denis Hollier and R. Howard. Bloch. Cambridge, MA: Harvard UP, 1989.

Brewer, Daniel. *The Encyclopédie: Innovation and Legacy*. Ed. James Fowler. *New Essays on Diderot.* Cambridge: Cambridge UP, 2011.

Brewer, Daniel. *The Work of the Image: The Plates of the Encyclopédie.* Stanford French Review 8:2-3 (1984)

C. Vasoli, *L'enciclopedismo del Seicento*, Naples 1978

Cicero, Marcus Tullius, and Andrew R. Dyck. De Natura Deorum. Cambridge, U.K.: Cambridge UP, 2003. Print.

Chambers, E. Cyclopedia; Or, *A Universal Dictionary of Arts and Sciences. Containing an Explanation of the Terms, and an Account of the Several Subjects in the Liberal and Mechanical Arts, and the Sciences Human and Divine. Intended as a Course of Ancient and Modern Learning*. London: Printed for J.F. and C. Rivington, 1786.

Chene, Dennis Des. *Physiologia: Natural Philosophy in Late Aristotelian and Cartesian Thought*. Ithaca: Cornell UP, 1996. Print.

Christiane Klapisch-Zuber. "The Tree." *Finding Europe: Discourses on Margins, Communities, Images Ca. 13th - Ca. 18th Centuries.* Ed. Anthony Molho, Diogo Ramada. Curto, and Niki Koniordos. New York: Berghahn, 2007.

Cicero, Marcus Tullius, and Andrew R. Dyck. *De Natura Deorum*. Cambridge, U.K.: Cambridge UP, 2003. Print.

Collison, Robert. *Encyclopedias: Their History Throughout the Ages. A Bibliographical Guide with Extensive Historical notes to the General Encyclopedias Issued throughout the World from 350 B.C. to the Present Day*. New York & London: Hafner Publishing Company, 1966.

"Core Content Policies." *Wikipedia, the free encyclopedia* 20 May 2016. Wikipedia. Web. 9 June 2016. <https://en.wikipedia.org/wiki/Wikipedia:Core_content_policies>.

D'Alembert, Jean Le Rond, and Michel Malherbe. *Discours préliminaire de l'Encyclopédie*. Vrin, 2000.

Darnton, Robert. *The Business of Enlightenment: A Publishing History of the Encyclopédie*, 1775-1800. Cambridge: Belknap of Harvard UP, 1979.

Darnton, Robert. "Philosophers Trim the Tree of Knowledge: The Epistemological Strategy of the Encyclopédie." *The Great Cat Massacre: And Other Episodes in French Cultural History*. New York: Basic, 2009.

Dear, Peter. *Method and the Study of Nature*. Ed. Daniel Garber and Michael Ayers. The Cambridge History of Seventeenth-century Philosophy. Cambridge: Cambridge UP, 1998.

DiBona, Chris, Mark Stone, and Danese Cooper. *Open sources 2.0: The continuing evolution*. " O'Reilly Media, Inc.", 2005.

Diderot, Denis, and Jean Le Rond d'Alembert. *Encyclopédie ou Dictionnaire raisonné des Sciences, des Arts et des Métiers...* Vol. 1. chez Briasson, 1751.

Diderot, Denis, and Jean Le Rond d'Alembert. *Encyclopédie ou Dictionnaire raisonné des Sciences, des Arts et des Métiers...* Vol. 2. chez Briasson, 1751.

Diderot, Denis, and Jean Le Rond d'Alembert. *Encyclopédie ou Dictionnaire raisonné des Sciences, des Arts et des Métiers...* Vol. 3. chez Briasson, 1753.

Diderot, Denis, and Jean Le Rond d'Alembert. *Encyclopédie ou Dictionnaire raisonné des Sciences, des Arts et des Métiers...* Vol. 5. chez Briasson, 1755.

Diderot, Denis, and Jean Le Rond d'Alembert. *Encyclopédie ou Dictionnaire raisonné des Sciences, des Arts et des Métiers...* Vol. 11. chez Briasson, 1765.

Diderot, Denis, and Jean Le Rond d'Alembert. *Encyclopédie ou Dictionnaire raisonné des Sciences, des Arts et des Métiers...* Vol. 14. chez Briasson, 1765.

Derrida, Jacques. *Mal d'archive*. Galilée, 1995.

Descartes, René. *Oeuvres De Descartes*, Publiées Par Victor Cousin. Ed. Victor Cousin. Vol. 11. Paris: F.G. Levrault, 1824. Print.

Descartes, René, and Louis Aimé Martin. *Oeuvres philosophiques*. Société du panthéon littéraire, 1843.

Descartes, René. *Discours de la méthode.* Paris: Garnier Frères, 1960.

Doody, Aude. *Pliny's natural history: Enkuklios Paideia and the ancient encyclopedia*. Journal of the History of Ideas 70.1 (2009): 1-21.

Doody, Aude. *Pliny's Encyclopedia: The Reception of the Natural History.* Cambridge, UK: Cambridge UP, 2010. Print.

Drucker, Johanna. *Graphesis: Visual Forms of Knowledge Production*. Cambridge MA: Harvard UP, 2014. Print.

"Encyclopedia." *Wikipedia, the free encyclopedia* 20 May 2016. Wikipedia. Web. 20 August 2016. < https://en.wikipedia.org/wiki/Encyclopedia>.

Eustachius. *Summa philosophiae* 1648

Febvre, Lucien, and Henri-Jean Martin. *The Coming of the Book: The Impact of Printing 1450-1800*. London: NLB, 1976. Print.

Feyerabend, Paul. *Against Method: Outline of an Anarchistic Theory of Knowledge*. London: NLB, 1975. Print.

Fisher, Saul, "Pierre Gassendi", The Stanford Encyclopedia of Philosophy (Spring 2014 Edition), Edward N. Zalta (ed.), URL = <http://plato.stanford.edu/archives/spr2014/entries/gassendi/>.

Fowler, Robert L. "Encyclopaedias: Definitions and theoretical problems. " *Pre-modern encyclopaedic texts*. Brill, 1997. 1-99.

Franklin-Brown, Mary. *Reading the World: Encyclopedic Writing in the Scholastic Age*. The University of Chicago Press. 2012. Print.

Frey, Ianus Caecilius. 2003. *Cribrum Philosophorum*. Edited by Roger Ariew and Daniel Garber. Originally published 1646.

Foucault, Michel. *Les mots et les choses*. Paris: Gallimard, 1966.

Foucault, Michel. *L'archéologie du savoir*. éditions Gallimard, 1969.

Foucault, Michel, and Colin Gordon. "The Confession of the Flesh." *Power/knowledge: Selected Interviews and Other Writings*, 1972-1977. New York: Pantheon, 1980. N. pag. Print.

Freedman, Joseph S. *Encyclopedic Philosophical Writings in Central Europe during the Hight and Late Renaissance (ca. 1500- Ca. 1700).* Archiv Für Begriffsgeschichte 37.1 (1994): 212-56.

Galilei, Galileo. *Dialogues concerning two new sciences*. Translated from the Italian and Latin into English by Henry Crew and Alfonso de Salvio with an Introduction by Antonio Favaro (New York: Macmillan, 1914)

Garber, Daniel. *Galileo, Newton and all that: if it wasn't a scientific revolution, what was it? (A manifesto)*. Circumscriber: International Journal for the History of Science 7 (2009)

Garber, Daniel. *Telesio Among the Novatores: Telesio's Reception in the Seventeenth-Century* at "Early Modern Philosophers and the Renaissance Legacy" (Munich, September 19-20, 2013) Unpublished conference paper.

Garber, Daniel. *Descartes among the Novatores*. Res Philosophica 92.1 (2015)

Gleick, James. *The Information: A History, a Theory, a Flood. New York*: Pantheon, 2011. Print.

Goldgar, Anne. *Impolite Learning: Conduct and Community in the Republic of Letters, 1680-1750*. New Haven: Yale UP, 1995.

Grafton, Anthony. *The Footnote: A Curious History*. London: Faber and Faber, 1997. Print.

Grant, Edward. *A Source Book in Medieval Science*. Vol. 1. Harvard University Press, 1974.

Grant, Edward. *Science and Religion, 400 B.C. to A.D. 1550: From Aristotle to Copernicus.* Westport, CT: Greenwood, 2004. Print.

Groethuysen, Bernard. "L'Encyclopédie." *Tableau De La Littérature Française.* Paris: Gallimard, 1939.

Gutting, Gary. "Michel Foucault", The Stanford Encyclopedia of Philosophy (2013 Edition), Edward N. Zalta (ed.), URL= < http://plato.stanford.edu/entries/foucault>

Hadot, Pierre, Arnold I. Davidson, and Michael Chase. *Philosophy as a Way of Life: Spiritual Exercises from Socrates to Foucault*. Malden, MA: Blackwell, 1995. Print.

Haas, Frans A. J. De, and Jaap Mansfeld. *Aristotle: On Generation and Corruption*. Oxford: Clarendon, 2004.

Habermas, Jürgen. *The structural transformation of the public sphere: An inquiry into a category of bourgeois society.* MIT press, 1991.

Harkins, Franklin. T, and Frans van Liere, eds. *Interpretation of Scripture: Theory: A Selection of Works of Hugh, Andrew, Richard and Godfrey of St. Victor, and of Robert of Melun*. Vol. 3. New City Press, 2013. APA

Hatfield, Gary. "René Descartes", *The Stanford Encyclopedia of Philosophy* (Winter 2012 Edition), Edward N. Zalta (ed.), URL = <http://plato.stanford.edu/entries/descartes/

Heehs, Peter. *Writing the Self: Diaries, Memoirs, and the History of the Self*. New York: Bloomsbury Academic, 2013. Print.

Heidegger, Martin. *The Question concerning Technology, and Other Essays*. New York: Harper & Row, 1977. Print.

Heidegger, Martin, W. B. Barton, and Vera Deutsch. *What Is a Thing?* Chicago: H. Regnery, 1968. Print.

Heidegger, Martin. “The age of the World Picture,” in *The Question Concerning Technology, and Other Essays.* Translation and introduction by William Lovitt (New York: Harper and Row, Harper Tourchbooks, 1977).

Heilbron, John L., ed. *The Oxford companion to the history of modern science*. Oxford University Press, 2003.

Hénaff, Marcel. *Sade, the Invention of the Libertine Body*. Minneapolis: U of Minnesota, 1999.

Hickmann KS, Fairchild G, Priedhorsky R, Generous N, Hyman JM, et al. (2015) “Forecasting the 2013–2014 Influenza Season Using Wikipedia.” *PLOS Computational Biology* 11(5): e1004239. doi: 10.1371/journal.pcbi.1004239

Hilaire-Pérez, Liliane. *L'invention Technique Au Siècle Des Lumières*. Paris: A. Michel, 2000. Print.

"How Wikipedia Data Is Revolutionizing Flu Forecasting." MIT Technology Review 3 Nov. 2014: n. pag. Web. 14 June 2016. <https://www.technologyreview.com/s/532246/how-wikipedia-data-is-revolutionizing-flu-forecasting/>

Huygens, Christiaan. *Traité De La Lumière Où Sont Expliquées Les Causes De Ce Qui Luy Arrive Dans La Réflexion & Dans La Réfraction, Et Particulièrement Dans L'étrange Réfraction Du Cristal D'islande*. Leide: Pierre Vander Aa, 1690.

Jefferson, Thomas. *The writings of Thomas Jefferson: being his autobiography, correspondence, reports, messages, addresses, and other writings, official and private*. Volume 3. Washington, D.C, 1853-1854.

Joachim, Harold H., and Errol E. Harris. *Descartes's Rules for the Direction of the Mind*. Bristol, England: Thoemmes, 1997. Print.

*Journal de Trévoux*, January, 1751

Jousten, Karl. *Handbook of vacuum technology*. Wiley-VCH, 2008.

.

Judovitz, Dalia. *Subjectivity and Representation in Descartes: The Origins of Modernity*. Cambridge: Cambridge UP, 1988. Print.

Kafker, Frank A. “Notices sur les auteurs des dix-sept volumes de «discours» de l'Encyclopédie.” *Recherches sur Diderot et sur l'Encyclopédie* 7.1 (1989)

Kant, Immanuel. *Kant: Political Writings*. Cambridge University Press, 1991.

Kant, Immanuel. *An Answer to the Question:'What is enlightenment?'*. Penguin UK, 2013.

Kilcher, Andreas. *Mathesis und Poiesis: Die Enzyklopädik der Literatur 1600 bis 2000*. Munich, 2003.

King, Shane. "NPOV and Credibility." Wikimedia. Web. 11 August 2016. <http://lists.wikimedia.org/pipermail/wikien-1/2004-December/017610.html>

Koetsier, Teun, and Luc Bergmans, eds. *Mathematics and the divine: a historical study*. Elsevier, 2004.

König, Jason, and Greg Woolf. *Encyclopaedism from Antiquity to the Renaissance*. Cambridge University Press, 2013.

Laertius, Diogenes. *Lives of eminent philosophers*, ed. and trans. R. D. Hicks 2: trans. The Loeb Classical Library edm (London: Willian Heineman, 1962)

"Lamest edit wars." *Wikipedia, the free encyclopedia* 9 June 2016. Wikipedia. Web. 9 June 2016. https://en.wikipedia.org/wiki/Wikipedia:Lamest_edit_wars

Lawn, Brian. *The Rise and Decline of the Scholastic Quaestio Disputata: With Special Emphasis on Its Use in the Teaching of Medicine and Science*. Leiden: New York, 1993. Print.

Leitch, Thomas M. *Wikipedia U: Knowledge, Authority, and Liberal Education in the Digital Age*. Baltimore: Johns Hopkins UP, 2014. Print.

Levy, Steven. *In the Plex: How Google thinks, works, and shapes our lives*. Simon and Schuster, 2011.

Lih, Andrew. *The Wikipedia Revolution: How a Bunch of Nobodies Created the World's Greatest Encyclopedia.* New York: Hyperion, 2009.

Liu, Alan. *The Laws of Cool: Knowledge Work and the Culture of Information*. Chicago: U of Chicago, 2004. Print.

Lough, John. *The Encyclopédie*. New York: D. McKay, 1971. Print.

Lusignan, Serge, Monique Paulmier-Foucart, and Marie-Christine Duchenne, eds. *Lector et compilator*. Vol. 9. creaphis editions, 1997.

Lusignan, Serge. "Préface au Speculum maius de Vincent de Beauvais: réfraction et diffraction." *Cahiers d'Etudes Médiévales Montréal* 5 (1979): 11-146.

Lusignan, Serge, “Les arts mécaniques dans le Speculum doctrinale de Vincent de Beauvais.” *Les arts mécaniques au Moyen Âge*, Montréal, Bellarmin; Paris, Vrin (Cahiers d'études médiévales, 7), 1982

Marrou, Henri Irénée. “Saint Augustin et la fin de la culture antique.” Paris: Boccard. (1938).

Matthews, Gareth B. “Knowledge and Illumination.” *The Cambridge Companion to Augustine.* Ed. Eleonore Stump and Norman Kretzmann. Cambridge, UK: Cambridge UP, 2001.

Mendell, Henry. “Aristotle and Mathematics”, *The Stanford Encyclopedia of Philosophy* (Spring 2014 Edition), Edward N. Zalta (ed.), URL= <http://plato.stanford.edu/entries/aristotle-mathematics/#2

Merleau-Ponty, Maurice. *Phenomenology of perception*. Motilal Banarsidass Publishe, 1996.

Merrill, Brad. “The Bots Who Edit Wikipedia (And The Humans Who Made Them).” *MakeUseOf. Web Culture*, n.d. Web. 11 July 2016. <http://www.makeuseof.com/tag/bots-edit-wikipedia-humans-made/>

Mittelstrass, Jürgen. “Philosopher's Conception of Mathesis Universalis from Descartes to Leibniz.” *Annals of Science* 36.6 (1979)

Moreau, Isabelle. *La Science Universlle, Ou Comment "parvenir à Une Félicité souveraine”: Analyse Des Seuils Du Texte-portée épistémologique Et Enjeux Philosophiques*. Ed. E. Bury and Eric Van Der Schueren. “Charles Sorel, Polygraphe.” Québec: Presses De L'Université Laval, 2006.

Morgan, Teresa. *Literate Education in the Hellenistic and Roman Worlds*. Cambridge, U.K.: Cambridge UP, 1998. Print.

Muhanna, Elias. “Why Was the Fourteenth Century a Century of Arabic Encyclopedism.” Ed. Jason König and Greg Woolf. *Encyclopaedism from Antiquity to the Renaissance*. Cambridge; New York: Cambridge University Press, 2013.

Murphy, Trevor Morgan. *Pliny the Elder's Natural History: The Empire in the Encyclopedia*. Oxford: Oxford UP, 2004. Print.

Myers, Sara K. *Review of Roman Nature: The Thought of Pliny the Elder*. Bryn Mawr Classical Review 04.03.19, 1992

Nash, Ronald *The Light of the Mind: St. Augustine's Theory of Knowledge* ( Lexington : University Press of Kentucky, 2003

"Neutral point of view." *Wikipedia, the free encyclopedia* 20 May 2016. Wikipedia. Web. 20 May 2016. <https://en.wikipedia.org/wiki/Wikipedia:Neutral_point_of_view>.

Newton, Isaac. *Opticks, or, a treatise of the reflections, refractions, inflections & colours of light.* New York. Dover Publication, Inc, 1979.

"Nupedia." *Wikipedia, the free encyclopedia* 9 June 2016. Wikipedia. Web. 19 June 2016.

O'Brien, John E. *Critical Practice from Voltaire to Foucault, Eagleton and Beyond: Contested Perspectives*. Boston: Brill, 2014. Print.

O'Connor, Sean M. *The Overlooked French Influence on the Intellectual Property Clause*. The University of Chicago Law Review (2015)

Ogilvie, Brian W. *The Science of Describing: Natural history in Renaissance Europe*. University of Chicago Press, 2008.

Pasnau, Robert. "Scholastic Qualities, Primary and Secondary." *Primary and Secondary Qualities: The Historical and Ongoing Debate.* Ed. Lawrence Nolan. New York: Oxford UP, 2011.

"Print Wikipedia." *Wikipedia, the free encyclopedia* 14 September 2016. Wikipedia. Web. 14 September 2016. <https://en.wikipedia.org/wiki/Print_Wikipedia>.

Proust, Jacques. *Diderot et L'Encyclopédie*. Paris: A. Colin, 1962.

Ramus, Petrus. *Quod sit unica doctrinae instituendae methodus*, translated into English in "Renaissance Philosophy", ed. L. A. Kennedy, The Hague and Paris, 1973

Rackham, H.. *Natural History*. Cambridge, Mass.: Harvard University Press, 19381963. Print. 14 Oct. 2014 http://www.masseiana.org/pliny.htm#INTRODUCTION

Reagle, J. M., Jr. (2008). *In good faith: Wikipedia collaboration and the pursuit of the universal encyclopedia* (Order No. 3308287). Available from ProQuest Dissertations & Theses Global. (304527872).

Rey, Alain. *Miroirs du monde: une histoire de l'encyclopédisme*. Fayard, 2007.

Robert, Jean-Dominique. "Condillac, Essai sur l'origine des connaissances humaines, précédé de Jacques Derrida, L'archéologie du frivole." *Revue Philosophique de Louvain* 72.16 (1974): 798-798.

Rosenzweig, Roy. "Can History Be Open Source? Wikipedia and the Future of the Past." *The Journal of American History* 93.1 (2006): 117-46.

Roy, Émile. *La Vie Et Les œuvres De Charles Sorel, Sieur De Souvigny* (1602-1674). Paris: Hachette, 1891.

Saint Augustine (Bishop of Hippo.), et al. Augustine: City of God, *Christian Doctrine*. Hendrickson Publishers, 1994.

Schumacher, Linda. *Divine Illumination: The History and future of Augustine's Theory of Knowledge*. Wiley-Blackwell, 2011.

Seneca, Lucius Annaeus, and Harry M. Hine. *Natural Questions*. Chicago: The University of Chicago Press, 2010. Print.

Smith, Merritt Roe. *Harpers Ferry Armory and the New Technology: The Challenge of Change*. Ithaca, NY: Cornell UP, 1977.

Sorel, Charles. *La Science Universelle : TOME PREMIER. Contenant les avant-discours touchant les Erreurs des Sciences & leurs Remèdes. Avec le livre I. Livre de l'Etre et des Propriétés des Corps Principaux, qui sont la Terre, l'Eau, l'Air, le Ciel, & les Astres*, Paris, Jean Guignard. 1668

Sorel, Charles. *La Science Universelle : TOME SECOND. De l'estre, et des proprietez des Choses Corporelles Livre II. Traitant des Corps Derivez, comme sont les Meteores, les Terres diverses, les Pierres, les Metaux, et les Animaux. Avec le livre de l'Etre, et des proprietez des choses Spirituelles, qui sont les Ames, les Andes et Dieu,* Paris, Jean Guignard. 1668

Sorel, Charles. *La Science Universelle* : *TOME TROISIESME. De l'usage, et de la Melioration et Perfection ou Imitation des choses Corporelles et des choses Spirituelles. Où l'on trouve la Theorie des Arts, avec plusieurs Inventions curieuses,* Paris, Jean Guignard. 1668

Sorel, Charles. *La Science Universelle* : *TOME QUATRIESME. De l'Usage des Idées, ou de l'origine des Sciences & des Arts, & de leur Enchainement. Du Langage, de l'Ecriture, & des Chiffres*., Paris, Jean Guignard, 1668

Sorel, Charles. *La Bibliothèque Francaise*. Genève: Slatkine, 1970. Print.

Stalnaker, Joanna. *The Unfinished Enlightenment: Description in the Age of the Encyclopedia*. Cornell University Press, 2010.

Steiner, Thomas. "Bots vs. Wikipedians." -Anons vs. Logged-Ins-Bot Counter. Wikipedia, 14 June 2016. Web. 15 June 2016. <https://wikipedia-edits.herokuapp.com/>.

Stewart, Philip. “The 'Encyclopédie' On-line.” *Using the Encyclopédie: Ways of Knowing, Ways of Reading*. By Daniel Brewer and Julie Candler Hayes. Oxford: Voltaire Foundation, 2002.

Thatcher, Oliver Joseph, ed. *The Library of Original Sources: The Greek world*. Vol. 2. University Research Extension Company, 1915.

*The Holy Bible: Containing the Old and New Testaments*, Revised Standard Version. New York: Collins' Clear-Type, 1971.

“The Shadowy World of Wikipedia's Editing Bots.” MIT Technology Review 13 Feb. 2014: n. pag. Web. 14 June 2016. <https://www.technologyreview.com/s/524751/the-shadowy-world-of-wikipedias-editing-bots/>.

Top Sites. *Alexa Top 500 Global Sites*. N.p., n.d. Web. 24 June 2016. <http://www.alexa.com/topsites>.

“Understanding.” *Wikipedia, the free encyclopedia* 20 May 2016. Wikipedia. Web. 20 May 2016. <https://en.wikipedia.org/wiki/Understanding>.

“Understanding: Difference between revisions” Wikipedia, the free encyclopedia 17 August 2016. Wikipedia. Web. 17 August 2016. <https://en.wikipedia.org/w/index.php?title=Understanding&type=revision&diff=37539580&oldid=861658>.

Uzgalis, William. “The Influence of John Locke's Works”, *The Stanford Encyclopedia of Philosophy* (Winter 2012 Edition), Edward N. Zalta (ed.), URL = <http://plato.stanford.edu/entries/locke/influence.html>

Verdier, Gabrielle. Charles Sorel. Vol. 728. Twayne Pub, 1984.

Vincentius. *Speculum Maius: Quorum Primo Tota Naturalis Historia: Altero Omnium Doctrinarum Disciplinarumq Farrago: Tertio Vero Omnis Moralis Philosophia: Quarto Denique Universa Totius Orbis Omniumq Populorum Ab Orbe Condito, Ad Auctoris Usque Tempus ... Continetur .. Venetiis*: Nicolinus, 1591. Print.

Wallace-Hadrill, Andrew. “Pliny the Elder and man's unnatural history.” *Greece and Rome (Second Series)* 37.01 (1990)

Wallis, Faith. *Structure and Philosophy in Mediaeval Encyclopaedias*. PhD diss., Thesis (MA)--McGill University, 1974.

Wells, Ronald A., *Dictionaries and the Authoritarian Tradition: A study in English Usage and Lexicography*, The Hague: Mouton, 1973.

Walsh, Patrick Gerard, ed. *Complete Letters*. Vol. 1. OUP Oxford, 2006.

Wells, Ronald A., *Dictionaries and the Authoritarian Tradition: A study in English Usage and Lexicography*, The Hague: Mouton, 1973. Print.

Werner, Stephen. *Blueprint: A Study of Diderot and the Encyclopédie Plates.* Birmingham, Ala.: Summa Publications, 1993. Print.

West, William N. "Encircling Knowledge." *Renaissance Quarterly* 68.4 (2015): 1327-1340.

"Wikipedia." *Wikipedia, the free encyclopedia* 20 May 2016. Wikipedia. Web. 20 May 2016. <https://en.wikipedia.org/wiki/Wikipedia>.

"Wikipedia: Manual of Style/Linking" *Wikipedia, the free encyclopedia* 20 May 2016. Wikipedia. Web. 20 May 2016. <https://en.wikipedia.org/wiki/Wikipedia:Manual_of_Style/Linking>

Yates, Frances Amelia. *The art of memory*. Vol. 64. Random House, 1992.

Yeo, Richard. *Encyclopaedic visions: Scientific dictionaries and enlightenment culture.* Cambridge University Press, 2001.