Paley, William: science and rhetoric in his natural theology

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ABSTRACT

William Paley's *Natural Theology* is probably the nineteenth century's most well-known design argument. As such an influential book, it is almost expected that twentieth century intellectual historians should at least pay a footnote to it. In midst of all these studies about the impact of *Natural Theology* upon the nineteenth century, one key fact is forgotten: *Natural Theology* and its sources were written in the *eighteenth* century. It is the goal of this thesis to demonstrate that Paley's design argument must be compared to the intellectual climate of that time period. Chapters 1 and 2 outline the rhetorical argument and the tools that Paley used to persuade his polite eighteenth century audience. The majority of scientific sources and examples he used were well-known names and therefore implicitly contributed to the believability of his argument. Accordingly, chapters 3 and 4 investigate why Paley's scientific sources added credibility to *Natural Theology*. Chapters 5 and 6 examine the actual scientific data that Paley turned into examples for his design argument. Setting the rhetoric aside, what was the actual scientific picture communicated by his examples? In these chapters, we find that even though Paley argues against random change, he does support a morphological *telic change*—the development of a supplemental part based on a pre-existing, fixed body part. As every chapter of this thesis unfolds, it will become more apparent that Paley was an intellectual heir to the eighteenth century. He wrote in a polite manner and employed a body of standard eighteenth century natural philosophical knowledge. It is this context that must be addressed and seriously considered when studying the nineteenth century intellectual legacy of *Natural Theology*.

William Paley: Science and Rhetoric in his *Natural Theology*

Contextualising the Eighteenth Century Rhetorical Nuances and Scientific Examples Used by William Paley to Communicate Divine Design to his Polite Audience

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Declaration:

The material contained in the thesis has not previously been submitted for a degree at this or any other university.

INTRODUCTION TO THESIS

William Paley's *Natural Theology* is probably the nineteenth century's most well-known design argument. At the beginning of the century, it was hailed as a literary masterpiece by theologians and natural philosophers alike. Its publication figures demonstrate that *Natural Theology* still commanded the respect of the reading public through the mid and latter years of the Victorian Era. As such an influential book, it is almost expected that twentieth century intellectual historians should at least pay a footnote to it. Historians of theology often cite it as the most outstanding natural theology argument written in the English language. Its possible influence upon Charles Darwin's intellectual development often earns it a passing reference by historians of science. Historians of philosophy often mention it in relation to its connections with early nineteenth century natural philosophers like Whewell and Sedgwick. In midst of all these studies about the impact of *Natural Theology* upon the *nineteenth* century, one key fact is forgotten: the majority of *Natural Theology* was written in the *eighteenth* century.

Printed in 1802, *Natural Theology* deceptively bears a nineteenth century publication date. However, Paley was educated at Cambridge during the 1760s and the arguments that would later be included in *Natural Theology* were developed by Paley in the moral and ethical works that he penned during the last three decades of the eighteenth century. Paley actually began to write *Natural Theology* in the 1790s and it probably would have been published in the final years of the decade were it not for his ill health. *It is the goal of this thesis to demonstrate that Paley's* Natural Theology *was a product of the eighteenth century and that his design argument must be compared to the intellectual climate of that time period.* Of the many ways that I could pursue this goal, I contextualise Paley's design argument by approaching it as Paley himself viewed the work, that is, as a piece of inductive classical rhetoric. To this goal, this thesis consists of six chapters. The first two detail Paley's placement within the early modern humanist rhetorical tradition.

Chapter 1 outlines the basic structure of a rhetorical argument. It draws a clear distinction between a valid *rhetorical* argument and a valid *logical* argument. Paley was writing the former and, therefore, in order to convince his audience, he had to pull their heartstrings. The way an orator did this was by inserting carefully selected examples called *commonplaces* that appealed to the passions of the audience. As with all early modern natural theological works, many of Paley's commonplaces were empirical examples taken from the natural world. Because Paley was so concerned about his audience's perception of his argument, Chapter 2 identifies Paley's readers to be eighteenth century gentlemen who maintained a keen interest in all areas of philosophical

enquiry. Based on his keen knowledge of this audience, Paley not only included commonplaces that would appeal to their genteel sentiments, he also omitted and degraded key concepts that could implicitly distract them. In these two chapters, it becomes clear that Paley was not attempting to 'prove' design to an audience interested in an objective logical argument. Rather, Paley was simply skilfully reworking an inductive rhetorical argument for an audience who already knew and agreed with the conclusion.

The majority of commonplaces that Paley inserted into *Natural Theology* were either empirical examples taken from anatomy and natural history or the names of authors popularly known to be scientific authorities. I call the latter the 'rhetoric of reference' and investigate Paley's employment of this rhetorical tool in Chapters 3 and 4. In these two chapters, I demonstrate the cultural and scientific reasons why Paley included these authors as commonplaces. Since the scientific enterprise was not specialised in the eighteenth century, we find that Paley's sources earned their money through various pursuits, many of these being clerical, medical or educational. We also find that Paley most often inserted sources whose personal natural theology convictions were similar to his and who would therefore implicitly confer believability to his argument. Chapters 5 and 6 examine the actual scientific examples that Paley turned into commonplaces for his design argument. Chapter 5 concerns what sort of picture Paley's commonplaces painted about the inanimate natural world. What did he mean by the words 'law' and 'nature'? More specifically, setting the rhetoric aside, what was the actual scientific content of Paley's astronomy and mineral examples? Chapter 6 looks at Paley's commonplaces taken from animate nature. It first points out that Paley personally classified organisms based on their morphology. The examination of this system of relations reveals that even though Paley argues against the random change of body parts, he does support a *telic change*. This sort of change allows for the development of a supplemental part based on a pre-existing, fixed body part.

As every chapter of this thesis unfolds, it will become more apparent that Paley was an intellectual heir to the eighteenth century. He wrote in a gentlemanly manner and employed a body of standard eighteenth century natural philosophical knowledge. It is this context that must be addressed and seriously considered when studying the nineteenth century intellectual legacy of *Natural Theology*. Historians who anachronistically criticise Paley through the lens of nineteenth and twentieth century changes in the scientific paradigm must reconsider writing about "poor Paley" and his "inability even to conceptualize Darwin's...alternative—the argument that finally, and permanently, brought

his system down."[1] By laying down this type of retrospective looking-glass and by meeting Paley in his historical context we can begin to understand the complex and intriguing world that recognised Paley's *Natural Theology* to be the most cogent and eloquent restatement of an argument that they already believed.

Some in their discourse desire rather commendation of wit in being able to holde all arguments, then of iudgement in discerning what is true, as if it were a praise to know what must be said, and not what should be thought. Some have Common places and Theames wherein they are good, and want varietie, which kinde of povrtie is for the most part tedious, and nowe and then ridiculous.

— Sir Francis Bacon —

Essayes, Religious Meditations. Places of Perswasion and Disswasion

[1] Stephen Jay Gould, *Eight Little Piggies – Reflections in Natural History* (New York: W.W. Norton & Company, 1993), 150.

SECTION I:
RHETORIC AND REFERENCE
Paley's Rhetoric Explained and Contexualised

Chapter 1
RHETORIC AND NATURE
Paley and the Legacy of Classical and Renaissance Rhetoric

Chapter 1 Introduction

The influence of rhetoric upon the explanation of data obtained from experimental natural science is a burgeoning field and recent scholarship has many different facets. In fact, several of these studies will be mentioned in the course of the next two chapters. But, in consideration of such variegated studies, this chapter seeks to accomplish one goal: to contextualise the interaction between classical rhetoric and natural philosophy in early modern Britain. More specifically, I am interested in how rhetorical commonplaces taken from the natural world were used in natural theological arguments. This chapter only seeks to trace the contours of this interaction so that Paley's location within this intellectual tradition can be established. The reason this location must be traced is because the *modus operandi* of natural theology in the sixteenth through eighteenth centuries was to construct an inductive rhetorical argument for design out of natural philosophy and natural history commonplaces.

To detail the rhetorical context that shaped Paley's argument for design, this chapter discusses three major topics. First, elements of the classical Ciceronian argument pertinent to the general construction of an early modern British design argument are explained. Using Cicero as a model, I pay specific attention to the classical distinction between inductive and deductive rhetorical arguments. Since most natural theology arguments of this time were inductive rhetorical arguments, I further explain how easy it is for these arguments to be confused with deductive logical arguments. I then point out how classical inductive rhetoric allows for reasoning that would be considered fallacious if included in a logical argument. The second section of this chapter introduces the usage and historical development of rhetorical commonplaces. As we will see, a commonplace is a well-placed example used to pull at the heartstrings of an audience. In discussing the intellectual lineage of commonplaces, close attention is paid to how the usage of natural commonplaces emerged in the rhetorical cultures of Britain and France during the Renaissance.

Drawing out the implications of the subsequent usage of natural commonplaces after the Renaissance, the third section of this chapter traces the utilisation of such commonplaces into the eighteenth century. After an initial historiographical interlude about the current lack of studies that investigate the interaction between eighteenth century humanism and the history of science, I suggest that because natural theology was a rhetorical enterprise, it fit snuggly into the gentlemanly world of eighteenth century polite

discourse. Moreover, its usage of natural commonplaces was strikingly similar to the rhetorical system used by natural historians to arrange data collected from the natural world. Thus, natural history and natural theology during this time were simply children of the same rhetorical father and natural scientific mother. Because of this context, writers like Paley were both theologians and a natural historians. In this chapter I discuss this culture so that Paley's context can be more readily understood in the following chapters.

The Classical Ciceronian Rhetorical Argument

Among the many classical authors who wrote about rhetoric, Aristotle and Cicero held that the art of the orator is divided into three overarching classes: *epideictic*, *deliberative* and *judicial*. In *De Inventione*, Cicero defines these classes. "The epideictic is devoted to the praise or censure of a particular individual; the deliberative is at home in the political debate and involves the expression of an opinion; the judicial is at home in a court of law and involves accusation and defense or a claim and counter-plea."[2] All three of these classes must use an argument to persuade an audience. There are two types of argument: *deductive* and *inductive*. Deductive utilizes syllogistic reasoning. "*Deduction* or syllogistic reasoning is a form of argument which draws a probable conclusion from the fact under consideration itself; when this probable conclusion is set forth and recognised by itself it proves its own import and reasoning."[3] It consists of a *major premise* and its *proof*, a *minor premise* and its *proof*, and, finally, a *conclusion*. The number of minor premises can be expanded so that the argument is basically a string of syllogisms based on the conclusions of previous syllogisms.

Inductive rhetorical arguments are not syllogistic. In the words of Cicero, "*Induction* is a form of argument which leads the person with whom one is arguing to give assent to certain facts to which he has assented."[4] Induction is heavily dependent on analogy. Furthermore, Cicero emphasises that, "In argumentation of this kind I think the first rule to lay down is that the statement which we introduce as a basis for analogy ought to be of such a kind that its truth must be granted."[5] This statement is the answer to the focus question that the argument is attempting to prove. This focus question is called the *constitutio*. "Every subject which contains in itself a controversy to be resolved by speech and debate involves a question about a fact, or about a definition, or about the nature of an act, or about legal processes. This question, then, from which the whole case arises, is called *consitutio* or the 'issue'." Thus, no matter if the argument is deductive or inductive, it should seek to resolve the question presented by the *constitutio*. For inductive

[2] Cicero, *De Invetione*, i.v.7. For Aristotle's discussion see *Rhetoric*, i.3.5.
[3] Cicero, *De Inventione*, i.xxxiv.57.
[4] Cicero, *De Inventione* i.xxxi.51
[5] Cicero, *De Inventione*, i.xxxi.53.

arguments, this is accomplished by presenting a long chain of similar and related examples that lead the audience to make a series of assents. Each assent brings the audience one step closer to agreeing with the *constitutio* statement. Even more so than the deductive rhetorical argument, the inductive argument is highly contextual and the orator must know what will persuade and how many assents are needed before the audience will agree with the *constitutio* statement.

Paley uses an inductive argument in *Natural Theology*, even though he had opted for deductive rhetorical arguments in previous ethical writings. Paley's *constitutio* asks: Does the natural world exhibit a purposeful design? This question leads to the focus statement of his argument: The natural world is purposefully designed. In his words: "[T]he contrivances of nature surpass the contrivances of art, in the complexity, subtlety, and curiosity of the mechanism; and still more, if possible, do they go beyond them in number and variety: yet, in a multitude of cases, are not less evidently mechanical, not less evidently contrivances, not less evidently accommodated to their end, or suited to their office, than are the most perfect productions of human ingenuity."[6] To convince his audience, Paley's inductive argument includes an arsenal of examples taken from the natural world. As with Cicero, Paley knew that these examples would have to be analogies. In chapter III he readily admits, "I know no better method of introducing so large a subject, than that of comparing a single thing with a single thing; an eye, for example, with a telescope".

Throughout *Natural Theology* Paley continually states that his argument is dependent upon analogy. This frank admission would not have been too disturbing to Paley's audience. In the eighteenth century, analogy was one of the primary ways scientific information was communicated from natural philosopher to natural philosopher and from natural philosopher to the reading public. The series of examples and analogies that lead the audience to assent to the *constitutio* statement are made more effective by the orator's usage of metaphors and similes. Both of these are a means to an ends, not an ends in themselves. They serve to strengthen the analogous examples that support the *constitutio* statement. Thus, metaphors and similes should be clear and should be carefully selected and constructed with the *constitutio* statement in mind. Elaborate metaphors and similes may draw the audience's attention to the argument, weak ones might detract from it. But, more importantly, they should "strike the senses if all offensiveness is to be avoided in those objects to which the comparison must naturally draw the minds of the audience."[7]

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[6] Chapter III, 'Application of the Argument'.
[7] Cicero, *De Oratore*, iii.xli

The 'striking of the senses' allows the orator to create an argument that can be both rhetorically valid and logically *invalid* at the same time. Since Paley used an inductive rhetorical argument, I will concentrate on the informal logical fallacies often courted by this type of rhetoric. But, before I do this, I must emphasise that Paley does not claim his argument is logical—even though he does not concede that it is illogical either. When Paley refers to a 'proof', he does not mean a logical proof, he means a rhetorical one. This is very similar to the conception of a 'proof' in a court of law. At times Paley states that if the reader does not acccept that his examples prove contrivance, then the whole argument is useless to that particular reader. For instance, after he has presented the bulk of his natural commonplaces, Paley resumes his argument for contrivance. He begins by stating the following: "CONTRIVANCE, if established, appears to me to prove every thing which we wish to prove. Amongst other things, it proves the *personality* of the Deity, as distinguished from what is sometimes called nature, sometimes called principle."[8] For our purposes, the important part of this sentence is the phrase, "if established". The reader must agree with Paley's examples and analogies if the argument is going to work.

This point being made, the reason it is important to identify the informal logical fallacies in Paley's argument is because Paley sometimes treats his rhetorical conclusions as if they had been proved logically. Paley often establishes a conclusion based on analogical induction and then later refers to it as if it is an ontological fact. Viewing the argument contextually, this situation probably did not create many problems for those who read Paley's argument at the beginning of the nineteenth century. As we see in the second chapter of this thesis, Paley's primary audience was the gentry, a group of people who would have known the difference between a logical proof and a rhetorical proof. However, during the rest of the nineteenth century, *Natural Theology* became popular amongst the middle and working classes, a group of people who often did not know the difference between these two types of proofs. This allowed them to conflate what Paley originally meant by a 'proof' and to misunderstand the rhetorical nature of Paley's project.

In what is now called informal logic, when discussing a subject or an object, it is fallacious to assume that the lesser of the parts are the same as the greater of the parts. This is called the fallacy of composition. With this fallacy in mind, note Cicero's following instructions: "All arguments from comparison are valid if they are of the following character: What is valid in the greater should be valid in the less... Likewise the reverse: What is valid in the less should be valid in the greater."[9] This being the case, the orator's argument often gives a logical appearance and thereby gains assent by appealing

[8] Chapter XXIII, 'Of the Personality of the Deity'.
[9] Cicero, *Topica*, iv.23.

to the sentiments of the listener. Additionally, because classical rhetoric was often used in litigious settings, appeals to legal authority were standard. Just after the above quotation in *Topica*, Cicero states, "Extrinsic arguments depend principally on authority." From the time of Cicero onward, these type of appeals to an authoritative person were easily abused and one finds orators often inserting personalities with important or noticeable names who had nothing to do with law. This practice might have worked for orators, but, in the world of informal logic, this type of practice invalidates an argument because it is an irrelevant appeal to authority. Thus, it is easy to see how the differentiation between a valid and invalid argument depends on the rhetorical or logical rules one decides to follow. If Paley were making a *logical* argument, he would have committed the fallacy of composition and the fallacy of an irrelevant appeal to authority. He also would have committed the fallacy of equivocation, *post hoc ergo propter hoc*, *argumentum consensus gentium*, *argumentum ad verecundiam*, and *petitio pricipii*. But, Paley was not making a logical argument and, therefore, criticising him for committing informal fallacies is to forget that he is making a rhetorical argument. This being the case, however, recognizing these informal fallacies in *Natural Theology's* rhetorical argument does give insight into what Paley's audience was willing to inductively accept.

Natural Commonplaces and *Topoi* in the Renaissance

In the usage of classical rhetoric, metaphor and simile was standard in Paley's day. But, as with most disciplines, rhetoric was influenced by its context. By the eighteenth century, rhetorical practices had become engrafted into natural philosophy. I will first briefly explain how this happened and then I will discuss how these changes are significant to Paley's usage of natural history and anatomy in *Natural Theology*. Previous to the Renaissance, rhetoric was primarily an oral pursuit. In order to create a persuasive argument, Cicero insisted upon five basic skills: *inventio* (argument construction), *collocatio* (arrangement of the argument), *memoria* (memorising the argument), *elecutio* (ornamentation of the argument), and *actio* (delivering the argument). Aiding these skills were *copia* and *imitatio*. *Copia* refers to a persuasive argument that has fruitfully mined all possible resources for examples. Serene Jones states: "Cicero considers a copious orator to be one who, having studied philosophy and history, is able to draw upon vast reserves of linguistic usage and choose the phrase, term, argument, or example best suited to the audience's sentiments."[10] *Imitatio* refers to the actual process of mining those sources and the skillful usage of previous orator's arguments.

During the Renaissance, two rhetorical processes considerably expanded were *copia* and *imatatio*. These two skills were used in the creation of Renaissance

commonplace books. A scholar would cull interesting passages, convincing examples or rhetorical turns of phrase out of classical Greek and Latin texts. Once this is done, he copied these commonplaces into a book where they were grouped into related headings under tables. When looking for a commonplace, the classical orator Quintilian avers that "it is for the individual orator not merely to employ his powers on its application, but on the invention of similar methods as the circumstances of the case might demand."[11] The practice of culling examples allows the collector to use commonplaces from classic texts just as the classical practitioners of rhetoric used the commonplaces of myth, jokes, and cultural examples. A good example of this process is Erasmus. Ann Moss nicely describes this situation, "The copious deployment of examples becomes the stuff of rhetoric itself, and, at least in the 1512 text of [Erasmus's] *De Copia*, abstract classification of valid modes of inference is entirely displaced by 'an enormous supply of examples exhibiting the greatest possible diversity.'"[12]

In England, this culling of *topoi* was a common practice during the time of Bacon who writes about commonplaces in the section about discourse in *Essayes*:

> *Some in their discourse desire rather commendation of wit in being able to holde all arguments, then of iudgement in discerning what is true, as if it were a praise to know what must be said, and not what should be thought. Some have Common places and Theames wherein they are good, and want varietie, which kinde of povrtie is for the most part tedious, and nowe and then ridiculous.*[13]

In regard to this tradition and related to Moss's thesis, Ann Blair asserts that commonplaces influenced Francis Bacon's methodological approach to the natural world.[14] Bacon is no stranger to British intellectual historians. His *Novum Organum* was an important natural philosophy and methodology book in Britain even after the publication of Newton's *Principia*. Blair's assertion is part of her larger project which argues that, in the sixteenth and early seventeenth centuries, the collection of literary commonplaces easily led into the practice of culling natural philosophical commonplaces to be used as convincing rhetorical examples. These commonplaces taken from nature were organised into tables (also known by their Aristotelian rhetorical distinction, '*topoi*') so that they could be easily referenced and/or remembered. In this role, Renaissance commonplaces and tables are closely linked to the classical rhetorical practice of *copia* and *imitatio*, and *memoria*.

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[10] Serene Jones, *Calvin and the Rhetoric of Piety* (Louisville: Westminster John Knox Press, 1995), 19.
[11] *Institutionis Oratoriae*, v.i.
[12] Ann Moss, *Printed Commonplace-Books and the Structuring of Renaissance Thought* (Clarendon Press: Oxford, 1996), 109.
[13] Francis Bacon, *Essayes. Religious Meditations. Places of Perswasion and Disswasion.* 1527. (The Haslewood Books: London, 1924), 2-3.
[14] Ann Blair, *The Theater of Nature – Jean Bodin and Renaissance Science* (Princeton: Princeton University Press, 1997)

This rhetorical collection and usage of commonplaces or *topoi* during the Renaissance affected both theology and natural philosophy. Moss states: "Stressing original Biblical sources, rhetorically trained theologians like Erasmus and his contemporary Jean Calvin culled scripture references to support their new doctrinal and sacramental arguments."[15] Similarly, natural philosophy, especially natural history, were subsequently affected by the same process. Using the works of the Frenchman Jean Bodin as an example (especially his *Universae naturae theatrum* of 1596), Blair argues that the practice of culling rhetorical and linguistic commonplaces was expanded to include commonplaces taken from nature. This was a two step process for Bodin. He first culled information from the natural histories of Pliny and Theophrastus. Bodin then used this 'collection' process to gather information from the natural world around him. In doing so, Bodin was "creating physical knowledge." This produced a situation in which, "'Credulity' can therefore coexist with observation, new facts with traditional ones, without generating any internal tension."[16] Blair also expands this thesis and avers that Bacon's collection of *topoi* and the "credulity" he gives to them is similar to Bodin's method: "The *New Organon* presents Bacon's new tool for scientific investigation, which turns out to be just such a method of commonplaces 'carrying the face of a world' and designed for 'action.'"[17]

Previous to Blair, Paolo Rossi argued that Bacon drew from the wealth of sixteenth century rhetorical rules developed for the practice of *memoria* and *inventio*. Regarding Bacon's use of invention, Rossi writes that Bacon, "deals with problems concerning the understanding of nature in the typically rhetorical terms of a discussion of the invention of arguments."[18] To aid in scientific discovery, Bacon proposes the use of tables—a practice he might have taken from Peter Ramus. These tables are composed of natural commonplaces and help a person to remember and compare important information gained through experimentation and observation.[19] In Bacon's scientific project, the facts and figures in these tables function in the same way as the commonplaces used in rhetoric. Thus, during 1607, when he first attempted to outline the use of tables in regard to the invention of natural places, Bacon used the terms tables and topics synonymously.[20] It is through this collecting of tables (or *topoi*) that greater knowledge about the world is obtained. Hence, these tables based on *topoi* form the basic component of Bacon's

[15] See Serene Jones, *Calvin and the Rhetoric of Piety* (Louisville: Westminster John Knox Press, 1995). Calvin used 'Nature' as a commonplace when he was arguing against opponents in political and doctrinal matters. Susan E. Schreiner, *The Theater of his Glory – Nature and the Natural Order in the Thought of John Calvin* (Durham: The Labyrinth Press, 1991).
[16] Blair, 547.
[17] Blair, 550.
[18] Paolo Rossi, *Francis Bacon: from Magic to Science*, trans. Sacha Rabinovitch, (London: Routledge and Kegan Paul, 1968), 193.
[19] Ramus discusses the classical orator Quintilian's polymathic topic collection method: "But at last he draws together the countless topics." Even though Ramus disagrees with Quintilian's usage of this mass collection, he is quick to state his approval of the actual collection process: "Here Quintilian cannot be called negligent in seeking out so many items from all over." (Ramus, 122).

approach to scientific research. Stephens writes about this process, "Tables are used when the material is easily broken down into a series or an enumeration; otherwise each item is numbered and taken down separately."[21] He further states that three histories of Bacon, *History of the Dense and Rare*, *The History of Life and Death*, and *Catalogue of Particular Histories*, follow this pattern.

Cultural Legacy: Nature, Commonplaces and *Topoi*

In the section above, we saw that the Renaissance rhetorical practice of commonplaces, and the tables formed from them, utilised information taken from the natural world. Unfortunately, the historical studies of this scientific and cultural application of classical rhetoric after Newton are rather sparse. There are two significant reasons for this. The first is the decreasing linguistic priority given to classical texts by the early modern era itself and the subsequent assumption that their legacy is nominal to early modern science. Relatedly, the second reason for the absence of such studies is the priority that the early modern era began to give to observation and empirical experimentation. Associated with these reasons, historians of science sometimes foster a characteristically negative view of the ambiguities caused by humanism in the scientific enterprise.[22] In the studies about Britain that do address Restoration or Hanoverian rhetoric, significant attention is paid to metaphor, but not the conceptual contributions of classical rhetoric. Consequently, the influence of classical rhetoric upon the explorers, gentleman polymaths and parson naturalists who catalogued the natural world from the late seventeenth to the early nineteenth centuries is ignored.

These collectors are often overlooked for two reasons. First, the term 'natural history' encompasses about a dozen specialised or so latter twentieth century scientific fields. Because of funding sources, specialisation and publishing interests, contemporary historians are often interested in tracing the 'history' of evolution, the 'history' of biology, the 'history' of embryology and so on. As Peter Bowler argues, this type of projection of categories onto early modern natural history jumps from 'significant' person to 'significant' person and easily leaves behind the multitude of collectors whose opinions and personalised taxonomy systems exerted influence within their culture.[23] When such people are overlooked, the potential influence of classical rhetoric upon their practice of 'science' is easily missed. Second, histories of 'natural history' often fail to make a distinction between the *collectors* and *classifiers*. This point is made by Latour and

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[20] Rossi, 205.
[21] James Stephens, *Francis Bacon and the Style of Science*, (The University of Chicago Press: Chicago, 1975), 118-119
[22] Anthony Grafton has commented on this in his *Defenders of the Text: The Traditions of Scholarship in the Age of Science 1450-1800* (Cambridge: Harvard University Press, 1991).
[23] This theme is often reiterated by anthropologists of science. Peter Bowler, *Evolution, The History of an Idea* (Berkeley, University of California Press, 1989).

Miller.[24] Explorers, gentleman polymaths and parson naturalists collected information that was usually sent to someone like Linnaeus, Buffon or Joseph Banks to be classified. Michel Foucault and subsequent authors have argued that these larger systems were part of a intellectual scheme that held the world was ordered by God and that this order could be found if one seriously scrutinized nature. This being the case, there were still many different systems that existed not only between the classifiers, but also between the collectors who were out ascertaining specimens for the classifiers.[25] Sometimes historians compare the systems of the classifiers, but the organization systems used by the collectors remain virtually unexplored.[26]

If one were to explore the systems of such collectors, one would find that the organisational system offered by rhetorical tables played an influential role. It is highly improbable that these collectors were not familiar with the classical practice of collecting and arranging commonplaces.[27] Since many of them were gentlemen, medical doctors and clergy, they would have received a classical education.[28] Collecting commonplaces from a book of rhetoric would not be dissimilar to collecting commonplaces from the book of nature. One group of writers who culled commonplaces from their own experiences and from the natural world was the physico-theologians. Ray, Nieuwentyjt, Derham and Paley all use personal observations as commonplaces in their natural theologies. In this sense, tables were formed to collect commonplaces that were conducive to their argument. Like Bodin's theatre of nature, in the natural theological books written by these men, rhetoric was the key system used to organise the natural world. Like Bodin, these men culled

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[24] Bruno Latour, *Science in Action: How to Follow Scientists and Engineers through Society* (Milton Keynes: Open University Press, 1987). David Philip Miller, 'Joseph Banks, empire and "centers of calculation" in late Hanoverian London' in David Philip Miller and Peter Hanns Reill, eds. *Visions of Empire – Voyages, botany, and representations of nature* (Cambridge: CUP, 1996), 21-38.

[25] Both Allen and Mackay point out that many latter eighteenth century collectors were not very familiar with the Linnaean system. David Elliston Allen, *The Naturalist in Britain – A Social History* (London: Penguin, 1976), 31. David Mackay, 'Agents of empire: the Banksian collectors and evaluation of new lands' in Mill and Reill (1996), 41.

[26] As inferred above, there have been numerous studies which address how the pre-nineteenth century conception of a fixed world and the chain of being affected Europe's attempt to order the world into coherent categories—Foucault's being one of the most well known. The proclivity to order seems to be an intuitive reaction within the mind of humans that attempts to give the world meaning. When writing episodes of conflict between different cosmologies, Rudwick has averred, "In other words, they are episodes in which people on both sides appealed to some aspect of nature, such as the origin and history of the earth, in order to support and justify their attempts to propagate their own view of the *meaning* of personal and social life and of the conduct appropriate to the life." Martin J. S. Rudwick, 'The Shaping and Meaning of Earth History' in David C. Lindberg and Ronald L. Numbers, eds., *God and Nature* (London: University of California Press, 1986), 297. I am only suggesting that classical rhetoric as a possible mode of organization used in this search for order during the eighteenth century has not been investigated. Regarding the emergence of taxonomical classification systems in relation to an intuitive concept of order, see Scott Atran, *Cognitive Foundations of Natural History* (Cambridge: CUP, 1990)—especially Part IV, Section 8, 'The Method of Families and Classes', 183-206.

[27] Although, at this point I must point out that some of the books from the eighteenth century that are called 'commonplace books' are not linked to the collection of rhetorical commonplaces or tables at all. A good example of this is George Berkeley's journal or 'day-book' written in the first decade of the eighteenth century that was published with the name *Berkeley's Commonplace Book* (London: Faber & Faber Limited, 1930). As G. A. Johnston's introduction states, "The main interest of the *Commonplace Book* lies, however, not in its reflection of Berkeley's reading, but in its revelation of his thinking. The *Commonplace Book* is a record of his thinking rather than a register of his reading."

[28] I must emphasize that effects of humanism were felt during the *entire* eighteenth century throughout the Republic of Letters. Thacker writes about its presence throughout the century: "Most often, the classical ideal continued in a fairly 'pure' form, and we may see it as the 'alternative' or even the 'opponent' of the new romantic ideal of the eighteenth century." Christopher Thacker, *The Wilderness Pleases – The Origins of Romanticism* (London: Croom Helm, 1983), 6. For a general background of this eighteenth century context, see R. R Bolgar, ed., *Classical Influences on European Culture A.D. 1500-1700* (Cambridge: CUP, 1976). An interesting study about the application and modification of classical fable in the eighteenth century is addressed in Thomas Noel, *Theories of the Fable in the Eighteenth Century* (London: Columbia University Press, 1975). Also see R. R. Bolgar, *Classical Influences on Western Thought A.D. 1650-1870* (Cambridge: CUP, 1979).

commonplaces from previous natural history books, and then produced an argument by combining them with natural commonplaces produced by their own experience. With the exception of Ray, most physico-theologians of the seventeenth and eighteenth centuries were collectors and not classifiers. In a larger cultural sense, they really did not need to be concerned with classification because the common perception of the natural world was that it was an ordered chain of being.

In this sense, natural history and natural theology share the same collecting process as a conceptual foundation. Since a primary concern of natural history was collecting specimens from nature, the elastic table and commonplace approach of rhetorical tables would have proved conducive to this goal. From the beginning, natural theology works were inductive rhetorical arguments whose conceptual history reach as far back as Xenophon and Cicero. From this foundation, the insertion of commonplaces and tables taken from the natural world was easily accomplished and sought to convince the audience of a designed world. This is why we see the eighteenth century rhetorician Blackwall praising Bentley in his popular rhetorical textbook. He writes that the "admirable" Dr. Bentley is a great man "To whom all scholars are obliged for his learned Performances upon the *Classics*; and all Mankind for his noble and glorious Defense of *Religion*."[29] When fashioning a design argument, most physico-theologians like Bentley created a 'design' or a 'mechanism' table in which relevant natural commonplaces could be placed.

Natural theologies thrived on commonplaces taken from the natural world. For example, in the preface to *The Religious Philosopher*, Nieuwentyjt states, "[I]t may be inferr'd that the exact and experimental Observations of what we see in the World, is a demonstrative Means, not only to obviate so many Causes and Inducements to *Atheism*, but likewise to attain the Knowledge of God and his Perfections by his works; and let no Man think it strange, that in the following Discourses I make use of this Method, and not of other kind of Arguments, which are commonly called *Metaphysical*." From a list of commonplaces, the natural theologian inserted the examples that best suited the audience intended for his own design argument. So, in this sense, they were collectors of new and old bits of natural history. Since one of the key practices of *imitatio* was to eloquently re-use examples and argument arrangements that had been effective in the past, we see the reoccurrence of several commonplaces in the physico-theological tradition. Three of the most prevalent being the clock, eye and ear. Moreover, in his *Natural Theology*, Paley simply uses the same collection tools provided by past natural theologians. In doing so, he

[29] Anthony Blackwall, *An Introduction to the Classics Containing, A Short Discourse on their Excellencies and Directions How to Study Them to Advantage* (4th ed. London: Charles Rivington, 1728), 34.

draws from the Classical, Renaissance and early modern British physico-theological *topoi* and commonplace rhetorical tradition.

Moreover, this usage of common-places in rhetoric and physico-theology was part of the large scale usage of such a practice within Paley's gentlemanly culture. One of the most widely read magazines by this culture was *The Gentleman's Magazine*. A letter to the editor in 1801 demonstrates that the general use of commonplace tables were still a feature of polite society. Like the tables compiled by Cicero, these are tables of law reports. The notice reads: "I have been engaged for more than 40 years in collecting, compiling, and digesting, an index, or a table or references, to many of the law reports; the whole being arranged under proper heads, with subdivisions under each, in a manner, it is presumed, hitherto unattempted."[30] Another example of the eighteenth century cultural legacy of rhetorical arrangement can be seen in an interesting letter to the editor in the 1788 edition of *The Gentleman's Magazine*. It details the contents of a museum made of collection cabinets. From the letter it appears that it was not uncommon for British gentlemen travellers to seek out small personal museums of 'curiosities' maintained by fellow gentlemen. In regard to the seventeenth century, Bredekamp has argued that similar *Kunstkammer* arrangements by gentlemen collectors were mini-rhetorical natural arguments in themselves—the cabinets being the tables and the contents being the commonplaces.[31] This practice of arrangement seems to have continued all the way into the late eighteenth century.[32] This fact combined with the rhetorical foundations of physico-theology and natural history suggests a longer legacy of rhetorical arrangement than has been previously investigated by historians.

Chapter 1 Conclusion

It was the purpose of this chapter to lay the contextual foundation for an investigation into the interaction between rhetoric and natural science in William Paley's *Natural Theology*. Paley was born and educated during the mid-eighteenth century. During this time, he familiarised himself with ciceronian rhetoric, the employment of commonplaces and the polite etiquette of gentlemanly society. Appealing to the gentlemen of his time, he continued to use these skills during the 1770s through the 1790s, eventually becoming one of the most well-published theologians in Hanoverian England.

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[30] Stevens Totton, 'Index to Law Reports', *The Gentleman's Magazine*, May 1801, 404-405.

[31] Horst Bredekamp, *The Lure of Antiquity and the Cult of the Machine*, Alison Brown, *trans.* (Markus Wiener Publishers: Princeton, 1995). A *Kunstkammer* was a collection of natural formations, machines, works of art and ancient sculptures. Bredekamp propounds that Bacon's "ordering" approach to natural history was similar to the arrangement of the contemporary *Kunstkammer*. The "ordering" of objects in a *Kunstkammer* is also very similar to the "ordering" of *topoi* in an argument. Like the reoccurring quotations from Cicero and examples from mythology found in the letters of humanist writers, the *Kunstkammer* exhibited reoccurring *topoi* which sought to impress the noble audiences of Europe. The best example of this reoccurring type of *Kunstkammer* commonplaces are automaton dolls.

[32] Anonymous Correspondent, 'Sketch of Mr. Green's Museum at Lichfield', *GM*, Oct. 1788, 847. The letter is accompanied by a large foldout picture of one side of the museum and stresses that since, "The Catalogues of this Museum not having found their way to the London booksellers, many ingenious travellers pass through this city, unappraised of that source of information and amusement which the sight of this great and valuable collection of the wonders of Art and Nature would afford them."

Thus, even though *Natural Theology* was published at the beginning of the nineteenth century, Paley was an intellectual heir to eighteenth century humanism. The method of Paley's utilisation of scientific commonplaces in his design argument was familiar to those who bought his books. Rhetoric was used then by those who wanted to present their ideas and opinions politely and Paley's employment of empirical commonplaces selected from the natural world only emulated a successful method used by past natural theologians and historians. The point was not to use new data to argue for a new conception of the world. The point was to take time-tested old data and perhaps some interesting new data and to eloquently restate it like none other had done before. The conclusion was expected. The method of argumentation was established. The genius was in the actual selection of commonplaces and in the construction of the rhetorical argument. Truly, beauty was in the eye of the gentleman beholder whose predetermined palate loved the taste of what he deemed to be proper rhetoric. In Paley's context, the eyes of his gentleman beholders recognised him to be a rhetorical genius. Paley's inductive argument was cogently written and his natural commonplaces were painstakingly selected from established works of natural history and natural theology. Paley simply took an old argument and fashioned it to perform new tricks.

Chapter 2
PALEY'S RHETORIC
Audience, Degradation and Avoidance in *Natural Theology*

Chapter 2 Introduction

In the past chapter, I alluded to the fact that Paley was appealing to a gentlemanly audience that expected its authors to conform to a polite intellectual norm. In Chapter 2, I discuss this audience and several rhetorical moves used by Paley to advance his argument for design. Since Paley used commonplaces from the natural world in his inductive rhetorical argument, his selection of these commonplaces was dependent upon his ability to anticipate which illustrations his audience would find most convincing. As Cicero and other classical orators knew well, knowledge of one's audience is the central pillar of a well crafted rhetorical argument. To discuss Paley's audience, the following chapter consists of three sections. The first section highlights the cultural context of the audience. Specific attention is given to how Paley fits into the political and intellectual milieu of the eighteenth century. The general reading audience of this time period was most often rhetorically trained, politically conservative and educated on the classical model. In fact, the political conservatism of Britain's aristocracy, gentry, clergy and emerging middle class turned even more towards the right at the end of the century in reaction to the French Revolution's bludgeoning of aristocrats and wealthy merchants.

One of the most important intellectual assets a gentleman could have during the eighteenth century was his ability to carry on polite conversation—both in person and in correspondence. This ability to politely communicate relied heavily on the conceptual structures provided by classical rhetoric. Since I am more concerned with the natural scientific commonplaces Paley used in *Natural Theology*, I concentrate more on this aspect even though devices like memory tools and the construction of arguments also influenced polite conversation. In section two of Chapter 2, I investigate the clues that *Natural Theology* gives of such a polite and rhetorically influenced audience. I first do this by looking at statements that Paley himself makes about his popular intention for the book and by his usage of nomenclature. I then explain how an eighteenth century gentleman's understanding of rhetoric was closely associated with the conception of self-education. *Natural Theology* was part of this tradition and I give examples of how the book could be used for the general education of a reader with limited scientific knowledge.

The bulk of Paley's commonplaces were taken from anatomy and natural history. Yet, even though these examples were empirical and connoted objectivity, they were not randomly selected. For the success of his argument, Paley took great care to avoid

scientific examples that were distracting or damaging. He also skilfully inserted potentially harmful examples so that they would not distract or cause doubt within the mind of his reader. The last section of Chapter 3 discusses two rhetorical tools Paley used to accomplish this goal. The first was pre-emptive degradation. Paley used this tool to introduce information that he deemed necessary for his argument, but which could potentially detract from the divine design he was attempting to demonstrate. The second rhetorical tool was omission. Paley simply left out any recent or long standing scientific information that might motivate a reader to disagree with his argument. Omission would have been a rather tricky business for Paley because there were certain theological and philosophical issues during the latter eighteenth century that sparked great controversy in the minds of the reading public. The inclusion or exclusion of commonplaces that dealt with these ideas would have been most certainly noticed. Paley's employment of skillful avoidance and omission on such issues as vitalism and materialism demonstrate that he knew his audience well and that he was a rhetorical master who knew how to select commonplaces that would pull on the heartstrings of the 1802 reading public.

The Context of Paley's Audience

Natural Theology offers a unique glimpse of the popularisation of natural history during a time when British scientific inquiry was notably affected by a variety of social factors. Two of these being the French Revolution and the rising bourgeoisie class. In this context, Paley crafted *Natural Theology* as a rhetorical argument that uses calculatedly select natural history and anatomy commonplaces to sway the opinion of its audience. Since *Natural Theology* was so popular during the nineteenth century, it is often forgotten that Paley wrote for a reading public that would have been more familiar with eighteenth century natural philosophy and literary etiquette. On the whole, this audience was more concerned with the 'polite' gentlemanly knowledge that confirmed the order of British society. In the eighteenth century, "Politeness conveyed upper-class gentility, enlightenment and sociability to a much wider élite whose only qualification was money, but who were glad to spend it on acquiring the status of gentleman."[33] Because Paley had four decades of publishing experience under his belt, he knew his audience well. To craft a successful rhetorical argument, he knew what type of information to include and what type of information to omit. Since Cicero wrote that an orator must know his audience, let us now address the gentlemanly audience for whom Paley wrote.

[33] Paul Langford, *A Polite and Commercial People – England 1727-1823* (Oxford: Oxford University Press, 1992), 4. Kuhns informatively commented on this audience when writing about Hume: "To establish oneself as a member of the republic of letters requires a lifelong devotion to a variety of literary tasks, among which Hume counted ethical theory, political and critical essays, and of course history, in addition to the philosophical books he considered his most thoughtful works." Richard Kuhns, 'Hume's Republic and the Universe of Newton' in Peter Gay, ed. *Eighteenth Century Studies* (New York: Russell & Russell, 1975), 76.

Immediately after its publication and during the first half of the nineteenth century, *Natural Theology* was hailed as a rhetorical masterpiece. Later praise for it from such unlikely bedfellows as Charles Darwin and Archbishop Whately of Dublin demonstrate its ability to demand respect from those who shared radically different ideologies. Whately, an eminent author of logic and rhetoric textbooks himself, believed *Natural Theology* to be one of the greatest works of rhetoric written in the English language.[34] The goal of its inductive argument was simple: to demonstrate that the world is mechanically designed, and therefore requires a contriving designer. The argument is not logical, it is rhetorical. In fact, its frequent usage of *petitio principii* would make any logician want to dismiss Paley in utter frustration. The argument is not original. Paley drew from the seventeenth and eighteenth century natural theological tradition displayed in the works of John Ray, William Derham and Bernard Nieuwentyjt.[35] But, the argument was convincing to those who first received it. This positive reception is demonstrated by the many editions that were printed within the first few years of the book's publication.[36] But why was such a familiar argument so successful?

One answer to this question is *context*. *Natural Theology* was published in 1802. At this time, England was fearful of the recent military and political exploits occurring in France. It was the common perception of many British subjects that the revolution had been caused by the 'godless' philosophies that emerged out of recent French scientific inquiry.[37] Consequently, a conservative backlash, both political and scientific, occurred in Britain at this time. In such a context, Paley's familiar teleological argument would have reassured the genteel British reading public of an omnipotent designer who was ultimately responsible for the fate of the world. Since Paley was a skilled rhetorician, he followed the time proven dictum of the classical orators that stated that a rhetorician must know his audience. Based on the disposition of the audience, an orator must choose effective commonplaces grouped under organisational *topoi* headings that either convince or skillfully play the heartstrings of the audience.

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[34] However, Whately did not agree with Paley on every point. Whately especially took issue with Paley's commitment to contrived benevolence. "In the *Natural Theology* Paley has exceedingly well pointed out numerous instances of evident design in the Universe, and such wise design as manifestly proves an intelligent Creator. But in what he says of *benevolent* design... he labors under the disadvantage resulting from his peculiar views on the subject of morality. Not that he is to be complained of for not satisfactorily explaining—what no one *can* explain—the existence of evil in the Universe" Richard Whately, 'Dr. Paley's Works' in *Miscellaneous Lectures and Reviews* (London: Parker, Son, and Bourn, 1861).

[35] John Ray (1627-1705) *The Wisdom of God Manifest in the Works of Creation* (London: 1691), William Derham (1657-1735), *Artificial Clock-Maker* (London 1696), *Physico-Theology* (London: 1713), and *Astro-Theology* (London: 1714), and Bernard Nieuwentyjt (1654-1718) *A Religious Philosopher* (London: 1718).

[36] Aileen Fyfe, 'The Reception and Subsequent Transformation of Paley's *Natural Theology*', a paper delivered at the conference *John Ray and His Successors: The Clergyman as Biologist*, Braintree, Essex, 18-21 March 1999.

[37] Of the many books that address this subject, the two which afford me the most clarity are Peter J. Bowler's *Evolution: A History of the Idea* (Berkeley: University of California Press, 1989) and L. S. Jacyna's *Philosophical Whigs. Medicine, Science, and Citizenship in Edinburgh, 1789-1848* (London: Routledge, 1994).

Paley's intended audience was the gentry, clergy and emerging middle class.[38] In 1802, these readers comprised the majority of the British reading public. To this segment of the population, scientific information was 'polite'. It could be obtained through various media: public lectures, books, pamphlets and magazine articles. Alice Walters states, "These scientific media adapted the social agendas of the polite by promoting familiarity with natural philosophy, astronomy, and other scientific disciplines as legitimate, socially ornamental, and even necessary accomplishment."[39] Included within this desire for scientific information is what Simon Schaffer calls "that 'craze' and 'episteme' of the eighteenth century"[40]—that is, natural history. During the second half of the eighteenth century, this 'craze' became one of the most popular forms of literature and a writer like Paley would be included in this category.[41] This yearning for natural history information was often associated with the public's desire to experience the new sights supplemented and instigated by the many published travel accounts of the early eighteenth century. In regard to this 'bucolic science', Drouin and Bensaude-Vincent assert the following point about natural history popularisers: "By concentrating on a particular subject – such as animal behaviour or floral display, in exotic or familiar surroundings – and by portraying the naturalist as an adventurer or an explorer of the treasures of nature, they have perpetuated the belief in a traditional ideal of natural history as both pleasant and useful."[42] By the 1750s, this 'cult of natural history' had become the most lucrative genre of the publishing market and Paley capitalised upon the works of authors like Erasmus Darwin, William Withering and Oliver Goldsmith who wrote within this category.[43] Paley knew that his audience would recognize such authors and that they also would be familiar with examples taken from popular natural histories. Thus, because Paley knew his audience, he was able to insert scientific information that they would find convincing.

Natural Theology and the Gentleman Reader

Natural Theology provides several informative indicators of this audience, most of which point to the fact that Paley was writing for a gentlemanly audience. This can be seen by whom Paley chooses to cite as references, either in the body of the text or in the footnotes. I call this process the 'rhetoric of reference' and I discuss Paley's sources more

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[38] Gillespie writes about the appeal of Paley's mechanical terminology to the classes affected by Britain's industrialization. Neal C. Gillespie, "Divine Design and the Industrial Revolution. William Paley's Abortive Reform of Natural Theology." *Isis*, 1990, **81**:214-229.

[39] Alice Walters, 'Conversation Pieces: Science and Politeness in Eighteenth Century England' *History of Science* (1997) **35**: 121-154. Quotation taken from page 123.

[40] Simon Shaffer, 'Natural Philosophy and Public Spectacle in the Eighteenth Century' *History of Science* (1983) **21**: 1-43.

[41] In *The Naturalist in Britain*, Allen writes about the fashionable pursuit of natural history in his 'The Rise to Fashion' chapter. Although, I must state that I do not agree with his statement that natural history was in a "temporary period of decadence" during the latter eighteenth century. The many popular natural histories published during this time seem to point to a different conclusion.

[42] Jean-Marc Drouin and Bernadette Bensaude-Vincent, 'Nature for the People', in N. Jardine, J. A. Secord and E. C. Spary, eds., *Cultures of Natural History* (Cambridge: CUP, 1996), 409.

[43] For an excellent chapter discussing this state of affairs see G. S. Rousseau's chapter entitled 'Science Books and Their Readership' in his *Enlightenment Borders, Pre- and Post-Modern Discourses, Medical, Scientific* (Manchester: Manchester University Press, 1991).

thoroughly in Chapters 3 and 4. Like the natural history and anatomy examples, these references were most likely considered to be commonplaces—they had to pull at the heartstrings of the audience. The heartstring in this case was 'polite' discourse. Almost every single one of Paley's thirty or more sources comes from the canon of 'polite' and accepted seventeenth and eighteenth century authors. Paley knew that certain authors and certain approaches to natural philosophy would not help in persuading his polite audience. This is why we see Paley referencing highly esteemed authors like Joseph Addison or Erasmus Darwin.[44] Thus, from the beginning, it is evident that Paley is attempting to reach a broad spectrum of this reading public. This can also be seen by several statements that Paley makes in *Natural Theology* about his audience. Paley demonstrates his sensitivity to the popular possibilities of his book by stating, "of muscular actions, even of those which are well understood, some of the most curious are incapable of popular explanation; at least without plates and figures."[45] Later he writes, "The account given will not convey to a reader ignorant of anatomy... (nor can any short and popular account do this), but it is abundantly sufficient to testify contrivance."[46] At the beginning of chapter three, Paley makes it very clear that he desires to avoid "technical language."

Paley's assumption about his audience in the natural history sections demonstrates that the audience was educated enough to be familiar with basic Latin and natural philosophical information. A long quotation from Nicolaus Steno at the end of Chapter IX assumes the reader (or an acquaintance of the reader) knew how to read Latin.[47] In the natural history sections, Paley also sometimes assumes that the reader possesses a basic knowledge of Latin names for plants and animals common to the British landscape. Paley presupposes the knowledge of natural history nomenclature to such an extent that he sometimes does not feel the need to describe the details of the Linnaean system that he is using in the text, "We are not writing a system of natural history; therefore, we have not attended to the classes, into which the subjects of that science are distributed. What we had to observe concerning different species of animals, fell easily, for the most part, within the divisions, which the course of our argument led us to adopt."[48]

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[44] For more on this 'polite' culture and its relation to authors like Addison, see Stephen Copely, 'Polite Culture in Commercial Society' in Andrew Benjamin, Geoffrey N. Cantor, and John R. R. Christie, eds., *The Figural and the Literal: Problems of Language in the History of Science and Philosophy, 1630-1800* (Manchester: Manchester University Press, 1987), 176-201.

[45] William Paley. *Natural Theology* (2nd ed. London: J. Vincent, 1802), 152 or, Chapter IX, 'Of the Muscles.' At this point I must clarify the system that I use to footnote quotations from *Natural Theology*. Since the book has been published so many times, it would be unhelpful to the reader if I cited the specific page of the edition that I used. In most instances, I quote from the 1802 second edition. But, for reference reasons, I state the number and name of the chapter so that it can be found by those consulting later editions.

[46] Paley, *Natural Theology*, Chapter X, 'Of the Vessels of Animal Bodies.'

[47] A very interesting reference indeed. Steno was a Danish physician whose actual name was Niels Stensen (1638-1686). He studied medicine in Copenhagen and then Leyden and eventually became physician to Ferdinand II and then Cosimo II in Florence. In Italy he converted to Catholicism. In 1672 became professor of anatomy in Copenhagen and then spent the remainder of his life as a Bishop, first in Titiopolis, then moving to Hanover and finally ending up in Hamburg. This is one of few catholic scholars quoted by Paley.

[48] Paley, *Natural Theology*, Chapter XIX, 'Of Insects.'

Even though Paley's audience may have had a basic knowledge of natural history and anatomy terms, Paley's provision of specific definitions for more obscure animals and body parts suggests that they may not have been familiar with advanced technical nomenclature. In regard to anatomy, for the gentlemanly class at this time, these technical terms could have been seen as *professional* information, and therefore potentially ungentlemanly. It must be remembered that eighteenth century surgeons and physicians were considered professionals and that medical and scientific specialisation did not occur in earnest until the nineteenth century. The key was in *how* the information was conveyed. A gentleman would think twice about perusing a surgeon's textbook, but he would readily read an eloquent account of the body by such acclaimed sources as Addison or *The Gentleman's Magazine*. As the variegated pages of these types of works indicate, literary learning, general medical and natural history information was included alongside a gentlemanly knowledge of the classics and politics.[49] This climate is clearly evinced by a statement by Thomas Pole in his *The Anatomical Instructor*, a popular eighteenth century textbook for gentlemen. He confidently asserts: "By the gentleman, Anatomy ought to be considered as a brand of education, no less necessary to form the accomplished character, than any other department of philosophy."[50] Even in 1811, a 'gentleman' interest was maintained in the rapidly changing discipline of chemistry.[51] Thus, the preference Paley gives to the anatomical and natural history examples in his argument was intended to appeal to the same gentlemanly audience.

Another subject a gentleman reading *Natural Theology* must know was classical rhetoric. By the eighteenth century, this subject was concerned with the accumulation of information to be inserted into polite literary discourse. Cicero held that an orator must be a polymath because such an accomplishment creates a familiarity with the most effective examples to be used in an argument. Cicero also held that this training started at a young age and that it was a lifelong process. A true orator continually educated himself by collecting examples from his own academic pursuits, personal experience and from other works of rhetoric. To this goal, travelling abroad and personally observing the natural world afforded a rewarding list of commonplaces that could be used in the rhetoric of

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[49] A letter to the editor in 1801 states: "MANY of your correspondents have shewn great ability in their observations on the subject of Natural History; and certainly they could not have chosen any investigation more amusing to themselves, or more entertaining to their readers." 'Queries in Natural History', *GM*, Oct. 1801, 906.

[50] Thomas Pole, *The Anatomical Instructor; or, an illustration of the modern and most approved methods of preparing and preserving the different parts of the Human Body and of Quadrupeds, by injection, corrosion, maceration, distention, articulation, modelling, &c. With a variety of Copper-Plates.* (London: Printed by Couchman and Fry; and sold by the author, No. 11, Talbot-Court, Gracechurch-Street, and by W. Darton and Co. No. 55, Gracechurch-Street, 1790), pp. vii-viii.

[51] In *A Syllabus of a Course of Chemical Lectures Read at Guy's Hospital*, written by William Babington, Alexander Marcet and William Allen (London: The Royal Free School Press, 1811), it is stated that: "Chemistry...has become in some degree necessary in the general system of education; and however different the views with which the *Gentleman*, the Artist, and the Manufacturer may enter upon its study, each will obtain information adapted to the particular line of his pursuit." Emphasis added.

conversation and correspondence. It also created a lifelong learning experience. Blackwall writes,

> *A Gentleman who travels thro' the finest Countries in the World, is in all respects qualify'd to make Observations, and then writes a faithful and curious History of his Travels. I can read his Relations with Pleasure and Improvement, and will pay him Praise due his Merits; but must believe that if I my self travell'd thro' those Countries, and attentively view'd and consider'd all those Curiosities of* Arts *and* Nature *which he describes, I should have a more satisfactory* Idea *and higher Pleasure, than 'tis possible to receive from the exactest Accounts.*[52]

In this quotation, we see that it is not just the commonplaces that are notable, rather, it is also the arrangement and the educational opportunity afforded to the reader by the information. Rolland, the popular mid-eighteenth century rhetorician, wrote of how collecting commonplaces is educational: "'Tis obvious that such models, so beautiful and perfect in their kind, being proposed to youth, either for reading, or for subjects of composition, are very well adapted to raise their own genius, and enlarge the inventive faculty."[53]

For the education of the readers of *Natural Theology*, Paley takes great care to define technical terms or names and frequently uses colloquial words instead of a previously defined technical counterpart. For example, when referring to the foot Paley writes about the ginglymus fortis, which he then defines it to be the ankle. Yet, in subsequent sections, Paley does not use the term ginglymus fortis, he reverts back to the colloquial name of ankle. This occurrence of a technical definition and the subsequent reversion back to a colloquial name is an extremely common method used in *Natural Theology*. This suggests, for the argumentative purposes of his book, that Paley included the technical nomenclature as a rhetorical device connoting authority and not as a scientific necessity. Another explanation for Paley's oscillation could be that he was attempting to avoid the possible professional stigmatisation of the technical terms. The usage of this process in the physico-theological tradition varies with the preference of the author.[54] This curious use of terms also was practised in eighteenth and early nineteenth century editions of *The Gentleman's Magazine*, which often included articles and letters

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[52] Anthony Blackwall, *An Introduction to the Classics* (London: Charles Rivington, 1728), 56.

[53] Mr. Rolland, *The Method of Teaching and Studying the Belles Lettres,or, An Introduction to Languages, Poetry, Rhetoric, History, Moral Philosophy, Physics, &c. With Reflections on Taste, and Instructions with Regard to the Eloquence of the Pulpit, the Bar, and the Stage, Vol. II* (5th. ed. London: C. Hitch, 1759), 32-33. Rolland was a Professor of Rhetoric at the University of Paris and the English translation of his work did very well in Britain.

[54] For instance, in *The Religious Philosopher*, Nieuwentyjt uses technical language only when there is no colloquial counterpart for the body part under discussion. On the other hand, Derham uses a great deal of technical Latin taxonomy terms in his *Physico-Theology*. To select one of the hundred or so examples, when detailing the inner ear of bird he writes, "The *Drum*, as some call it, or *Membrana Tympani*, as others, consists of two Membranes, the Outer, which covers the whole *Meatus*, Bason, or *Drum* (as some call it) and the inner Membrane." William Derham, *Physico-Theology* (8th ed. London: W. Innys and R. Manby, 1732), 342.

that oscillated between technical names (from natural history and anatomy) and colloquial terms.[55]

Pre-emptive Degradation and Skilful Avoidance

As an orator, Paley knew that commonplaces which appealed to accepted forms of authority would find favour amongst the gentlemen readers of his book. Of the natural philosophers cited, all of them were accepted as leaders in scientific studies. Most of the British authors cited were fellows of the Royal Society. Paley does not refer to any contemporary speculative scientific theories, he simply sticks with time honoured or contemporary respected names such as John Ray, William Derham, William Cheselden, James Keill, John Hunter or Colin Maclaurin. To further strengthen his argument, Paley frequently utilises two other classical rhetorical practices: degradation and avoidance—both of which required a keen knowledge of his audience. The former practice degrades a weak point that cannot be omitted. This is a psychological tactic because the act of degradation elicits sympathy from the audience. Once this degradation has been accomplished, the potentially harmful, but necessary, information can be reintroduced later in the argument. The latter practice of avoidance simply omits information that could be harmful to the argument. Let us look at examples of each of these practices in *Natural Theology*.

In terms of scientific commonplaces, it was Paley's conviction that human anatomy (and to a certain extent, natural history) provided the best examples for the design argument. However, if one was arguing for contrived design, the rest of nature could not be ignored. Since omitting such areas as astronomy and botany could possibly damage the credibility of his argument, Paley knew that he must address them. Since these two areas were still developing disciplines at the time, Paley creates a loophole for his argument by using pre-emptive degradation. Before discussing botany he states, "I think a designed and studied mechanism to be, in general, more evident in animals, than in *plants*; and it is unnecessary to dwell upon a weaker argument, where a stronger is at hand."[56] He makes a similar disclaimer at the beginning of the astronomy chapter: "My opinion of Astronomy has always been, that it is *not* the best medium through which to prove the agency of an intelligent Creator"[57] Even though Paley makes such pre-emptive

[55] For instance, in the May, 1801 issue there is a letter that gives the colloquial and the Latin taxonomy names for several different types of plants. "[T]he light-coloured pedals collect the rays of the sun in a focus, striking on the parts of fructification; as in the snowdrop (*galanthus*), primrose (*primula*), &c." This practice occurs again later in the letter. *The Gentleman's Magazine*, May 1801, 393. For the same practice, also see the letter entitled, 'Apiaries and Honey-tree recommended', *The Gentleman's Magazine*, April 1801, 293; and the article 'Description of the *Cantharis*, or Glow Worm', *GM*, January 1801, 14-16. As an interesting side note, many of these natural history commentators use Sir John Hill's *History of Animals* as their source. It was first published in 1672, but was reprinted in 1748-51 and in 1773.

[56] William Paley, *Natural Theology*, Chapter XX, 'Of Plants.'

[57] William Paley, *Natural Theology*, Chapter XXII, 'Astronomy.'

cursory statements, he does not refrain from incorporating the chapters on astronomy and botany into his design argument.

This pre-emptive approach was a common technique used by Paley. If he suspected that the natural philosophical *topoi* being used could possibly be cited as evidence against his argument, he would first downgrade the information only to use it again later in the book. A good example of this technique is his treatment of physio-"chymical" reactions.[58] Paley's first mention of physio-"chymical" reactions occurs in Chapter VII's discussion of "the mechanical and immechanical functions of animals and vegetables". He states that the acid in the stomach is stronger than caustic alkali or mineral acid and is thereby a possible submechanical explanation for digestion. The reason this example was included was because it fit nicely into Paley's mechanistic design argument. Yet, four pages later Paley slights "chymical" analysis because it still cannot yet explain several basic functions of the human body.[59] Paley continues this valid/invalid usage of physio-"chymical" reaction *topoi* throughout the entire book depending on how they can be inserted into his rhetorical argument. In one section, one will find Paley dismissing "chymistry" and making statements like, "Of this last surprising dissolution I say nothing; because it is 'chymistry,' and I am endeavoring to display mechanism." Conversely, in other sections, one will find Paley referring to Abbe Spallanzani's experiments on gastric juices or stating, "A Chymical operation could not be followed with greater art or diligence, than is seen in hatching a chicken."[60] Paley's rhetorical valuing and devaluing of scientific information occurs throughout the entire book.

In his rhetoric textbook, Blackwell states: "OMISSION is when an Author pretends, that he conceals and omits what he declares. I do not mention my Adversary's scandalous Gluttony and Drunkeness."[61] During the eighteenth century, there were many theories concerning the animate or non-animate qualities of matter. Paley does state his stance on the these qualities, but, on the whole, he avoids directly critiquing them—because to critique them could point to intellectual "Gluttony" and this would distract his audience. A good example of this act of avoidance is his treatment of vitalism. This

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[58] In the following pages I use Paley's "chymical" spelling to denote the conception of chemistry that he is discussing in *Natural Theology*. At this time, most of the medical textbooks use the spelling "chemical" and it seems that Paley is using the archaic spelling as a rhetorical device to perhaps elicit the confusion surrounding the term in past centuries.

[59] A claim that was actually supported by many natural philosophers at the time. Note John Brown's pronouncement: "But chemistry, what ever it might be at a future period, is still only little more than a mass of deductions drawn from random experiments, a group of phenomena, the mutual connection of which to one another, or their general relation to a common cause, is by no means traced, and their applications to use left equally limited and doubtful." John Brown, *Observations on the Principles of the Old System of Physic, Exhibiting a Compend of the New Doctrine. The whole containing a new account of the state of medicine from the present times, backward, to the restoration of the Grecian learning in the western parts of Europe.* (Edinburgh: Apollo Press, by Martin and M'Dowall, 1787), iii. Even by 1811, we find the following statement in a popular chemistry textbook: When taking "a retrospective view of the state of Chemical Science eight or ten years ago" it states "it will appear that a number of discoveries have been made since that period, which have opened new fields of investigation, and have in some instances pointed out the imperfection of our former systems." William Babbington, Alexander Marcet and William Allen, *A Syllabus of a Course of Chemical Lectures Read at Guy's Hospital* (London: Royal Free School Press, 1811), iii-iv.

[60] William Paley, *Natural Theology*, Chapter XVIII, 'Instincts.'

[61] Anthony Blackwall, *An Introduction to the Classics* (London: Charles Rivington, 1728), 195.

theory was the belief that there was a divine 'force' or 'spark' animating matter. It was not a new idea for the eighteenth century. The very year before Paley finished *Natural Theology* Robert Hooper published his *A Compendious Medical Dictionary*. Under the "CHEMISTRY" entry he states, "All have mistaken or overlooked that principle of life which incessantly acts upon the solids and fluids; modifies, without ceasing, the impression of external objects; impedes the degenerations which depend on the constitution itself; and presents to us phenomena which chemistry never could have known or predicted by attending to the invariable laws observed in inanimate bodies."[62] In opposition to these vitalistic views were the materialists who argued that living organisms were simply complex forms of organised matter void of any divine sustenance.[63] Consequently, Paley was writing in the wake of these traditions. In Paley's endeavour to create a mechanistic argument for design, he avoided addressing materialist and vitalist wrangling over causation—a rather astute move considering that there were supporters of both approaches who would discredit Paley's argument should he attempt to vehemently side with either approach. To this goal of moderation, Paley is content to stop explaining mechanism after he has provided ample evidence of morphological design.

This practice of mechanical description was a very popular approach among many eighteenth century physicians. Leiden's Herman Boerhaave (1688-1738) practiced it and it was continued all the way to the turn of the nineteenth century with such an influential physician as the Cambridge educated William Heberden (1710-1801). Though a religious man,[64] this London practitioner avoided animation and causation disputes. For example, at the beginning of his immensely popular textbook, *Commentaries on the History and Cure of Diseases* (1802), he breezes over animation by stating: "Whatever animation be, experience has undoubtedly acquainted us with several means both of deadening, and of invigorating its operations."[65] For many medical professors like Heberden, this "means" was simple description and nothing more. It was strongly linked to the eighteenth century

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[62] Robert Hooper, *A Compendious Medical Dictionary. Containing an Explanation of the Terms in Anatomy, Physiology, Surgery, Practice of Physic, Materia Medica, Chemistry, &c. &c.* (London: Printed for Murray and Highley, Fleet Street; Cuthell, Middle Row, Holborn; H. D. Symonds, Paternoster Row; Callow, Crown Court, Soho; Cox, St. Thomas's Street, Borough; and Dwyer, No. 29, Holborn, 1801)

[63] This school was sparked by the writings of Albrecht von Haller (1708-1777). Even though Haller himself did believe in the soul, he sought to explain the body mechanically in his 1752 monograph entitled *On the irritable and sensible parts of the body.* He concluded that some parts of the body were *sensible*, in that they were able to react to pain, and that other parts of the body were *irritable* in that they reacted to chemical, electrical, and mechanical stimuli. This research laid the foundation for later physicians to postulate that organisms could react to the environment in such a way that they did not need divine intervention. The Scotsman William Cullen (1710-1790) promoted a nervous principle and his student John Brown (1735-1788) promoted levels of excitability in living matter. Karl E. Rothschuh, *History of Physiology.* Trans. Guenter B. Risse. (New York: Robert E. Krieger Publishing Company, 1973), 123-132. For a more in depth investigation of eighteenth century vitalism see E. Benton, 'Vitalism in Nineteenth-Century Scientific Thought: A Typology and Reassessment.' *Stud. Hist. Phil. Sci.*, 1974, 5:17-48. Also see, John Brown's edition of William Cullen's, *Observations and principles of the old system of physic: exhibiting a compend of new doctrine...* (Edinburgh: C. Elliot, 1789).

[64] In his 1827 memoirs, William MacMichael, the well known physician to King George IV and William IV, writes: "From his early youth Dr. William Heberden had entertained a deep sense of religion". He then relates an interesting story of how Heberden purchased and then burned a manuscript about the inefficiency of prayer written by the recently deceased Dr. Conyers Middleton. William MacMichael, *The Gold-Headed Cane* (London: John Murray, 1827 – Reprinted in a facsimile edition, London: The Royal College of Physicians, 1968), 131-132.

conception of a detached mechanical description of the natural world. This was the approach of religious and nonreligious doctors alike.[66] Paley's choice to follow such a system of description is most probably why his argument came under such heavy attack by later Darwinians. In the anatomy and natural history sections of *Natural Theology*, Paley's description of "what it is" on a macro level and not "how it works" on a micro level constrictively limited his argument as the nineteenth century began to make advances in evolutionary theory, chemistry and physiology. As is further explained in the following chapters of this thesis, Paley does not believe that matter has an inherent organising force. But, he does not dwell on this fact, especially in the sections addressing living organisms. Moreover, Paley certainly does not use this belief about matter as a proof for design. He basically tip toes around the issue.

Contextually viewing Paley in light of the debates of the eighteenth century, his ability to skilfully avoid the vitalist and materialist controversy is notable. In one statement on the discussion of nerves, he avoids Haller's irritability, Stahl's and Hunter's life principle, Cullen's nervous principle and several other theories, "[T]here is no truth nor justice in endeavouring to bring a cloud over our understandings...by suggesting that we know nothing of voluntary motion, or irritability, or the principle of life, or sensation, of animal heat, upon all which animal functions depend; for our ignorance of these parts of the animal frame concerns not at all our knowledge of the mechanical parts of the same frame".[67] Once again, as with his comments on "chymistry," Paley discredits the information because he believes science does not know enough about the subject to make a final authoritative claim. Later in the book, Paley re-emphasises his program of skilful evasion, "For our purpose, it is unnecessary to ascertain the principle upon which the heart acts. Whether it be irritation excited by the contact of blood, by the influx of the nervous fluid, or whatever else be the cause of its motion, it is something which is capable of producing, in a living muscular fibre, reciprocal contraction and relaxation."[68] Once again, in regard to established practice of seventeenth and eighteenth century anatomy, this type of statement was acceptable, and for that matter, normative. Granted, there were some physicians and natural historians like Buffon promoting radical vitalist and materialist philosophies. But the medical material being printed in Britain, to educate the physician and gentlemanly lay person was usually more concerned with function and

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[65] William Heberden, *Commentaries on the History and Cure of Diseases* (London: T. Payne, Mews-Gate, 1802); reprinted, (New York: Hafner Publishing Company, 1962), p. 9.

[66] Only in the two last pages of his 483 page textbook does Heberden readdress animation, "Whoever applies himself to the study of nature, must own we are yet greatly in the dark in regard even to brute matter, and that we know little of the properties and powers of the inanimate creation." He goes on to state, "for to living bodies belong many additional powers, the operation of which can never be accounted for by the laws of lifeless matter."

[67] Paley, *Natural Theology*, Chapter VII, Of the *Mechanical* and *Immechanical* Functions of Animals and Vegetables.'

[68] Paley, *Natural Theology*, Chapter X, 'Of the Vessels of Animal Bodies.'

form, rather than with causal explanations. It was the same for natural history works. This predilection is evinced in the fact that even though gross anatomy was well established by the seventeenth century, a concerted effort to explain and implement physiological information did not occur until the turn of the nineteenth century. By rhetorically weaving a path around the potential mire of vitalistic and materialistic controversy, Paley pre-empted any criticisms from prominent figures in these fields that might have swayed the impressionable opinions of the reading public.

Chapter 2 Conclusion

This chapter discussed *Natural Theology's* audience. It was a genteel public that practised a polite discourse heavily influenced by argumentative tools obtained from classical rhetoric. One of the most influential of these tools was the awareness of how one's ideas were going to be received by an audience. Thus, when collecting examples to be used in an argument, one needed to be intimately aware of the current political and intellectual climate. In the first section of this chapter, I explained this climate and how Paley's argument was designed to appeal to this latter eighteenth century audience. In the second section of Chapter 2, I took this explanation one step further. I cite several clues from the pages of *Natural Theology* itself that further indicate the book's intended audience. Among these clues were Paley's actual statements about the popular intent for the book and his oscillation between technical and colloquial scientific nomenclature. In the last section of this chapter, I discussed how Paley used the rhetorical tools of omission and pre-emptive degradation. He employed these tools to selectively avoid scientific commonplaces that could potentially undermine his argument.

The interaction of scientific information and rhetoric demonstrated in Paley's *Natural Theology* was not an uncommon occurrence for the latter eighteenth century. In fact, the interaction between these two areas was normative in the natural history and natural theology books of the day. An author's selection of commonplaces and acute awareness of the audience often had great impact on how lucrative the book would be for the author and the publisher. Books were expensive and gentlemen were not interested in purchasing works that disagreed with their conservative conception of society. This was why David Hume made money on his histories and not on his critical works of philosophy. Authors who did not write within the accepted intellectual framework and who did not select convincing commonplaces simply did not make any money. Paley serves as a good case in point of somebody who financially benefited from writing within the accepted intellectual system. As the son of a cleric turned schoolmaster, Paley's family did not have any significant financial holdings. This meant that Paley's only way of making money was through church positions or by publishing. By the time that Paley

began to write *Natural Theology* in the 1790s, he had already made himself money and a reputation by publishing books on theology and ethics. Paley's books were successful because he knew his audience.

When Paley began to cull commonplaces for *Natural Theology* from scientific books and personal contacts, he knew that he must always use examples that would appeal to his audience and eventually sell his book. Since the mixture of natural science and rhetoric was already established in natural history and natural theology books, it was Paley's task to select persuasive examples based on his knowledge of his audience and then to write an eloquent and convincing argument around the examples. Paley masterfully performed both of these tasks and then lived to see the initial financial success of his book. Part of the reason for the success of his scientific commonplaces, was because he selected scientific data and sources that were familiar to his readers. But why did Paley's commonplaces specifically appeal to his audience? And in regard to such a varied selection of such commonplaces, what was the cosmology actually communicated by Paley's scientific examples? The rest of this thesis examines these two questions.

SECTION II
THE RHETORIC OF REFERENCE
The Sources of Paley's Anatomy and Natural History Commonplaces

CHAPTER 3
PHYSICIANS, CLERICS, AND A QUIVER OF NEWTONIAN ARROWS
The Context and Content of Paley's Anatomy and Astronomy Sources

Chapter 3 Introduction

The following two chapters address why Paley's scientific sources appealed to his 1802 audience. In Chapters 1 and 2, we saw that the examples of Paley's argument were tailored to pull on the heartstrings of a gentlemanly reading public whose political and intellectual disposition had been shaped by the mid to latter eighteenth century. To communicate a more conservative view of science, Paley not only included choice of empirical commonplaces taken from the natural world, he also included references to select authors whose names themselves conveyed authority and acceptability to an 1802 gentleman. In Chapters 3 and 4, I investigate this 'rhetoric of reference', that is, the authors that Paley specifically cites within the text or in footnotes. I am particularly interested in explaining the scientific and cultural issues that made them authoritative to Paley and his audience. This discussion sets the stage for Chapters 5 and 6 where I investigate the actual empirical data that Paley presents about the natural world.

In classical tradition, a well-placed reference to an easily recognized authority was a staple of an orator's bag of insertable examples. For instance, in regard to this practice in Renaissance rhetoric, Ann Moss writes, "In the professional areas of philosophy, medicine, law and theology, quoted testimony is essential in demonstration and argumentation, but it must be severely adapted to the plain style, shorn of potentially obfuscating and deluding figures of speech, which is appropriate to technical subjects."[69] Paley directly followed this practice by utilising accepted "testimony" from natural history and anatomy authors. He did not complicate his examples by elaborately detailing the qualifications of each writer. The authority of each source was conferred by the fact that the author was already commonly known and accepted by Paley's audience. No doubt, other than the cited sources, there were other authors who shaped Paley's conception of the natural world. For instance, there are potential Lockean conceptions of nature and hints of Aristotelian teleology. There were also many natural history and anatomy publications that Paley could have used to obtain the natural philosophical examples that he used to prove his design argument. These authors and works, however, are not specifically stated as sources and are therefore negligible in regard to Paley's rhetorical intent.

Both chapters 3 and 4 have one main focus: to establish the scientific and cultural authority of Paley's cited sources. Chapter 3 covers Paley's anatomy and astronomy

[69] Ann Moss, *Printed Commonplace-Books and the Structuring of Renaissance Thought* (Oxford: Clarendon Press, 1996), 258.

references and Chapter 4 concerns Paley's animated natural history sources. In both chapters, I treat these references to scientific authors as rhetorical commonplaces. The reason why Chapter 3 addresses anatomy and astronomy sources is strictly practical. In comparison to his natural history sources, Paley utilises a smaller number of references for these areas and it is therefore easier to discuss them both in one chapter. Paley believed that human anatomy offered the most convincing commonplaces for a design argument. Keeping this belief in mind, it is interesting to note that Paley only uses two significant sources when writing about human morphology: James Keill and William Cheselden. Even though both of these men were well published, Paley only refers to their respective anatomy textbooks. Paley astutely selected Keill's *Anatomy of the Human Body* (1698) and Cheselden's *The Anatomy of the Human Body* (1713) because both of these books fit within his mechanical portrayal of anatomy and because they were established sources for the eighteenth century reading public.

In addition to anatomical form and function, scattered references in *Natural Theology* indicate that Paley had a mechanical conception of various physiological processes. But, because of their "chymical" associations he was wary of referring to them too often. However, one physiological process that consistently attracts Paley's attention is digestion. The authoritative authors he used on this subject were Lazzaro Spallanzani, John Hunter and John Stevens. In comparison to his anatomy references, these sources offer a more contemporary representation of the subject at hand. All three of these men gave authority to Paley's design argument because they were associated with well-known British scientific societies and were often cited in arguments against spontaneous generation. In Paley's day, such contemporary information was often compared to older, established scientific writers and not vice versa. Thus, even though Keill and Cheselden wrote about one hundred years before Paley published *Natural Theology*, the culture of the eighteenth century allowed for the continual re-use of such authors who were confirmed authorities on the subject. To the modern eye, the publication dates of Keill and Cheselden connote 'dated' information. But, to the eye of Paley's contemporaries, their names connoted 'accepted' and 'proven' facts.

Of Paley's cited astronomy sources, two are from the early to mid eighteenth century and only one was contemporary to Paley. This contemporary source was Bishop John Brinkley, the astronomer royal for Ireland. Paley corresponded with Brinkley via his long-time Cambridge mathematician friend John Law, the Bishop of Elphin. In regard to the entire 'Astronomy' chapter, Paley acknowledges his debt to Brinkley on the chapter's first page. Paley needed such a name to confer believability to what mid-nineteenth century natural theologians would consider one of the most important chapters of *Natural*

Theology. When Paley wrote *Natural Theology*, Newtonian physics still dominated British cosmology. To add even more credibility to the plethora of unfootnoted astronomy commonplaces, Paley cites Colin Maclaurin and Roger Cotes. Truly, Paley was practising the 'rhetoric of reference' because both of these men knew Newton personally and were highly respected names in the world of Newtonian mathematics. Cotes helped publish the second edition of *Principia* and Maclaurin's *An Account of Sir Isaac Newton's Philosophical Discoveries* was one of the most published popularisations of Newtonian physics in the eighteenth century. Additionally, not only were these men Newtonian authorities, both shared strong natural theological convictions.

After reading Chapter 3, it becomes clear that Paley often used anatomy and astronomy references whose work connoted scientific authority. But, it also becomes apparent that he used references whose well-known personal religious convictions would have additionally given his sources an implied theological credibility. It is the purpose of the following chapter to bring out both of these factors. I must re-emphasise that I specifically concentrate on the scientific and cultural factors that made each source acceptable to Paley's readers. For this reason, comments about how Paley used these sources within his argument are kept to a minimum and are usually confined to the last paragraph of each section. Even though such an investigation is needed, it is beyond the scope of this thesis to entertain such an intricate topic. Thus, the basic focus of Chapter 3 is to establish why Paley used the names of certain scientific writers as commonplaces in his argument for design.

Iatromechanics: Cheselden and Keill

'Iatromechanic' is sometimes a rather broad term. In a narrow sense, it refers to the natural philosophers at the beginning of the eighteenth century who sought to use Newtonian laws of attraction to explain physiological processes. To these men, the body's *form* and *function* was analogous to a machine. James Keill (1673-1719) and William Cheselden (1688-1752), Paley's two major anatomical sources, were both iatromechanists. Also amongst this group of physicians was Archibald Pitcairne (1652-1713), David Gregory (1659-1708) and George Cheyne (1671-1743). These men specifically believed that the body could be reduced to mathematical principles.[70] The key for Newton in the application of his principles to the human body was to realise that 'forces' of matter were not inherent. Matter, whether it be a planet or a blood cell, was sustained by God. One of the foundational authors of iatromechanism was James Keill. In his *Account of Animal Secretion*, published in 1708, Keill argues for attractive forces in the body based on

[70] For the mathematical context, see Tore Frängsmyr, 'The Mathematical Philosophy', in Frängsmyr, Heilbron and Rider, eds., *The Quantifying Spirit in the 18th Century* (Oxford: University of California Press, 1990), 27-44.

Newton's theory of attraction in matter. This reference to unpinpointed 'attractive forces' in Keill served well for natural theologies, but would later turn physiological inquiry to the mechanically elusive forces of vitalism, sensibility and irritability.[71] In using Keill as a source for *Natural Theology*, Paley was more concerned with supporting his own machine metaphor and in using an easily recognisable name. Keill easily met these criteria, although he probably would have been known to Paley's readers not by his *Account of Animal Secretion*, but by his *Anatomy of the Human Body* (1698)—the book Paley quotes in *Natural Theology*.

Keill's anatomy book went through numerous editions in the eighteenth century and benefited from Keill's comprehensive medical education in Edinburgh, Paris, Leiden, Oxford, Cambridge and as a practising physician. In 1699, Keill had purchased a M.D. from Aberdeen, but his reputation was more enhanced by the honorary M.D. he received from Cambridge in 1705.[72] Even though there were later editions, Paley astutely decided not to reference them. In *Natural Theology*, Paley cites the third edition of Keill's *Anatomy*. Keill's reputation made his name well known to Paley's audience. Because of Keill's Newtonian format, morphological mechanical examples were abundant. But, the specifics of the 'forces' of Keill's iatromechanics would not have been completely integrated into the third edition because it was not until the 1710 fourth edition that a more definitive version of the Newtonian inspired iatromechanical theories was included. It was in this later edition that Keill integrated what he had proposed in *Account in Animal Secretion* and in other articles that he wrote for the *Philosophical Transactions* during the first decade of the eighteenth century. These articles and their promotion of 'mathematical physick' fit well into the iatromechanical proclivities of the Royal College of Physicians at this time. By the time of Keill's death, the belief that "the human body was composed of the soul and the 'machine of the body' together" was common.[73] The inclusion of such theoretical information in the fourth edition that many would have considered dated by the time of Paley is probably why Paley chose to use Keill's third edition. Thus, since Paley used an earlier edition of *Anatomy*, he was able to avoid the possible theoretical entanglements of iatromechanics, but to keep the basic mechanical examples.

In a broader sense, the term 'iatromechanic' refers to the general application of Newtonian principles to the study of the human body during the mid to latter eighteenth century. Realising that Newtonian physics may not be the best way to describe physiological functions, these physicians and surgeons concentrated more on

[71] Anita Guerrini, 'James Keill, George Cheyne, and Newtonian Philosophy', *Journal for the History of Biology*, (1985) **18**: 247-266.
[72] *Dictionary of Scientific Biography*, VII, 274-75.
[73] Julian Martin, 'Sauvages's Nosology and Medical Enlightenment in Montpellier', in Andrew Cunningham and Roger French, eds., *The Medical Enlightenment of the Eighteenth Century* (Cambridge: CUP, 1990), 111-137.

morphological description and held that the body's *form* could be likened to a machine. The bones and muscles resembled wheels, pulleys and levers. The heart resembled an engine. For the doctors who were interested in the source of movement, concepts like irritability, sensibility and vitalism played an important role. One of these iatromechanic doctors was Paley's other significant anatomy source, William Cheselden. As one of the most well-known surgeons of the eighteenth century, Cheselden served as another persuasive referential commonplace to be inserted by Paley. Cheselden was an entrepreneurial London surgeon known for his popular lectures. In 1718, he became popular enough to move to St. Thomas's where he delivered four courses a year. Using visual aids, Cheselden's lectures promoted anatomy as an "entertaining and enlightening subject of natural philosophy",[74] which is no doubt one of the major reasons for his lecturing success. Indeed, Cheselden's methods did ruffle some feathers of the London medical profession. In 1714, the Barber-Surgeons Company called Cheselden to task because he "did frequently procure Dead bodies of Malefactors from the place of execution and dissect them at his own house."[75]

Aside from the body-snatching drama, in the 1720s and 1730s, Cheselden increased his fame through his dextrous and quick lithotomy operations. Most lithotomies took up to a gruelling twenty minutes, whereas Cheselden could do in under five. He charged £500 for the operation and wrote up the procedure in the *Treatise on a High Operation for the Stone* (1723).[76] This treatment of the topic became a standard treatise for several decades, much to the chagrin of John Douglas, who claimed he had invented a better method.[77] In addition to his *Treatise*, Cheselden had a strong publishing record that included the widely used anatomical atlas *Osteographia* (1733) and Paley's choice, *The Anatomy of the Human Body* (1713). Cheselden also published in the *Philosophical Transactions*, one popular article being 'An account of some observations made by a young gentleman born blind.'[78] Haller's visiting him on his British tour in 1727 demonstrates that Cheselden's writings were also popular in Europe. In 1745, near the end of his life, Cheselden and John Ranby were the primary draftsmen of a petition that would eventually lead to a break between the association of surgeons with barbers. This

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[74] Susan C. Lawrence, *Charitable Knowledge – Hospital Pupils and Practitioners in Eighteenth Century London* (Cambridge: CUP, 1996), 182.

[75] This was a grave problem because this created a situation, "By which means it became more difficult for Beadles to bring away the Companies Bodies and likewise drew away the members of this Company and other from the Public Dissections and Lectures at the Hall". Susan C. Lawrence, 85. Quoted from the minutes of the Court of Assistance, 25 March 1714. It must be noted that books and articles written about such a notable figure as Cheselden are practically non-existent. He does not even merit an entry in *The Dictionary of Scientific Biography*.

[76] Lawrence L. Conrad, Michael Neve, Vivian Nutton, Roy Porter, and Andrew Wear, *The Western Medical Tradition 800 BC to AD 1800* (Cambridge: CUP, 1995), 436, 450.

[77] Philip K. Wilson, 'Acquiring surgical know-how: occupational and lay instruction in early eighteenth-century London', in Roy Porter, ed., *The Popularization of Medicine 1650-1850* (London: Routledge, 1992), 56.

[78] William Cheselden, 'An account of some observations made by a young gentleman born blind, or lost his sight early, that he had no remembrance ever having seen, and was couch'd between 13 and 14 years of age', *Philosophical Transactions*, (1729) **35**: 447-52.

petition and their substantial contributions to the *Philosophical Transactions* increased their fame and prompted their election to the Royal Society.[79]

Cheselden was primarily a surgeon. His method of anatomical inquiry was one of description and his writings reflect this disposition. They are primarily interested in detailing the *form* of human anatomy within the mechanistic-philosophical framework so characteristic of the mid to latter eighteenth century. In following such a format, Cheselden, like most medical Newtonians of his time, avoids any primary causation and mind-body questions. In fact, Paley's ability to avoid such issues seems to follow the same pattern. Like Paley, Cheselden's personal and economic desire for the public to openly embrace his lectures and writings would have motivated him to avoid such questions. In eighteenth century London, one could not sell a book or attract an audience if one's theories were too threatening to the theological or moral convictions of the general public. With his popular appeal and mechanical overtones, Cheselden made an excellent reference for Paley's argument. Using his name communicated authority. It made Paley's argument more believable. Similarly, even though Keill was interested in physiological definitions based on Newtonian physics he was well known and his basic conception of the body's form was mechanical. Like Cheselden, Paley used Keill's name and the information in his anatomy books as commonplaces to make a more convincing argument.[80] For the genteel reader of *Natural Theology*, Keill and Cheselden were established sources. The names of these men were used in polite conversation and therefore were already appropriate commonplaces for dialogue in the British gentlemanly culture. This, in addition with their mechanical proclivities, made them excellent references for *Natural Theology*.

Dissertations on Digestion: Spallanzani, Stevens and Hunter

Throughout *Natural Theology*, Paley is rather fond of using commonplaces related to digestion. To give credibility to his gastric juice examples, he cites three well-known latter eighteenth century authors who wrote about this topic: Lazzaro Spallanzani, John Hunter and Edward Stevens. Let us examine the reputations of these three men. Let us first look at Lazzaro Spallanzani (1729-99). The experiments and writings of this Scandianian priest and polymath remain foundational in the fields of physiology and natural history to this day. Spallanzani studied and taught mostly in Lombardy. Some of his most significant achievements include the discrediting of spontaneous generation, the refutation of animalcules, the establishment of arteriovenous anastomoses in warm-blooded animals and coining the concept of gastric juice. Like Paley, Spallanzani

[79] Philip Wilson, 'An Enlightenment Science? Surgery and the Royal Society', in Roy Porter, ed., *Medicine in the Enlightenment* (Amsterdam: Rodopi, 1995), 373.

[80] More could be written about the rhetorical similarities between *Natural Theology* and the anatomy books of Cheselden and Keill. For this reason I have added an Appendix to the end of this thesis that discusses four similarities between these books.

disagreed with many aspects of Buffon's writings—especially Buffon's spontaneous generation claims. Because the English speaking world of the eighteenth century had its own natural philosophers who wrote about these areas and because of the lack of English translations of Spallanzani's works, his ideas did not enjoy popular recognition in England. However, he was known to the halls of the Royal Society. In 1768 he sent a copy of his work on snail regeneration to them.[81] It was translated by M. Maty as *An Essay on Animal Reproduction* and he was subsequently elected a fellow of the society.

In 1784 and 1789, Thomas Beddoes supervised the English translation and publication of Spallanzani's *Dissertations Relative to the Natural History of Animals and Vegetables.*[82] This is the work footnoted by Paley in *Natural Theology*. The two volumes consist of six dissertations and were based on his experiments on birds and other animals (and, at times, himself) that took place during the 1770s. The experiments confirmed Redi's 1675 account of the power of fowl gizzards and shed much light on the digestive powers of gastric juice. Paley calls Spallanzani the "indefatigable Abbé" and uses his digestive research to demonstrate how each animal's digestive system is specifically tailored to that animal *sui generis*. Paley condenses Spallanzani's digestion research into five points: Gastric juice is not a simple diluent and it does not have the nature of saliva. Digestion is not dependent upon putrefaction, fermentation or heat.[83] Paley specifically refers to Spallanzani's *Dissertations* two other times. He cites *Dissertation I*, section LIV and *Dissertation III*, section CXL, to once again illustrate the divine relation of body parts to the needs of the animal. But, just as important as Spallanzani's experiment, was the fact that Spallanzani was an authority on digestion. By using such a source, Paley made his argument more convincing.

Another digestion source in *Natural Theology* is Edward Stevens, who Paley states is from Edinburgh. This statement of Stevens's origin is only partially correct. Stevens was actually from the American colonies. Reputedly the half brother of the famed Alexander Hamilton, Stevens took an A.B. from King's College, New York and then took a M.D. from the University of Edinburgh in 1777. He was admitted to the Royal Medical Society of Edinburgh one year before he received his degree. While his fellow colonists were fighting the British during the American Revolution, Stevens served as the RMS president in 1779 and in 1780. During his medical studies in Edinburgh, he wrote *Dissertatio inauguralis de alimentorum concoctione* in 1777, which earned him the honour of being the first person to isolate human gastric juice. In the following decades, Spallanzani used this study when performing his digestion experiments mentioned above.

[81] Originally published as *Prodromo di un opera da imprimersi sopra le riproduzioni animali* (Modena, 1768)
[82] Originally published as *Dissertazioni di fisica animale e vegetabile...* (Modena, 1776).

In 1784, an abridged English translation of Stevens's dissertation was appended to an English translation of Spallanzani's *Dissertations Relative to the Natural History of Animals*. Considering this state of translation affairs, it is unclear whether Paley used the Latin or the English version of Stevens's work. In Chapter X, 'Of the Vessels of Animal Bodies', Paley writes: "Dr. Stevens of Edinburgh, in 1777, found, by experiments tried with perforated balls, that the gastric juice of the sheep and the ox speedily dissolved vegetables, but made no impression upon beef, mutton, and other animal bodies." Even though Paley had studied classics at Oxford, to read the technical Latin of this dissertation so long after his studies would have been a chore. Therefore, it is most probable that Paley read the English translation appended to Spallanzani's works.[84] This translation would have been known by those reading *Natural Theology* who were actually familiar with the specifics of digestion.

Paley's last digestion source was an essay on this topic in the *Philosophical Transactions* by John Hunter (1728—1793). One of the many Scotsmen who migrated to the potentially lucrative late-eighteenth century medical world of London, Hunter trained both with his brother William and the prominent surgeon William Cheselden. Hunter then served in the military, came to London and set up practice as a surgeon. Among his many students were Edward Jenner and John Abernethy. Hunter is less known for his original contributions to applied medicine. He is most often cited as a compiler and commentator of animal anatomy and natural history.[85] His essays on this subject were published well into the middle of the nineteenth century.[86] In 1767 he was elected a fellow of the Royal Society and his reputation as a lecturer and surgeon eventually secured him the post of surgeon general in 1790. Often seen as an important figure in the history of medicine, Hunter actually wrote more about natural history.[87] In this situation, Hunter departed from the Newtonian practice of straight-forward description and often found himself writing about what he called the 'vital force.'

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[83] Paley, *Natural Theology*, Chapter X, 'Of the Vessels of Animal Bodies.'

[84] Like William Cheselden, Edward Stevens is a notable eighteenth century personality about whom practically nothing has been written. He was born in St. Croix, Virgin Islands. After his presidency of the Royal Medical Society in Edinburgh, he went back to America and served as the consul-general to Santo Domingo from 1799-1800. Upon his return to the States in 1803 through 1804, he interacted with the American Philosophical Society. He then returned to St. Croix and was involved with politics in the Caribbean for the rest of his life. Aside from Stacy B. Day's 1969 doctoral dissertation, her short article in the *Dictionary of Scientific Biography*, (the source of the information stated in this chapter) and Roy A Swanson's 1962 article in *Surgery*, nothing else has been written about him this century.

[85] L.S. Jacyna, 'Images of John Hunter in the Nineteenth Century', *History of Science* (1983) **21**: 85-108.

[86] Some of his medical articles include 'The State of the Testis in the Foetus and on Hernia Congenita' (1762), 'Treatise on Venereal Disease' (1786) 'Treatise on the Blood, Inflammation and Gun-Shot Wounds', (posthumous, 1794).

[87] Rolfe writes that John Hunter wrote around thirty natural history articles and that, conversely, Hunter only wrote about twenty on human anatomy and medicine. W. D. Rolfe, 'Breaking the Great Chain of Being', W. F. Bynum and Roy Porter, eds., *William Hunter and the Eighteenth Century Medical World* (Cambridge: CUP, 1985). On this point Rolfe directs the reader to J. Dobson ~~was~~ because of the massive amount of students he had taught during his time in London—John Abernethy being on of the most famous students to take up the vitalist cause. L. S. Jacyna, 'Immanence or Transcendence – Theories of Life and Organization in Britain, 1790-1835', *Isis* (1983), **74**: 311-329.

Hunter's belief in a 'vital force' fits within the movement called vitalism. In the eighteenth and nineteenth centuries, those who subscribed to this theory often tried to explain a perceived animating 'force' or 'spark' in living matter.[88] In the eighteenth century, vitalism most often opposed philosophies that attributed the animation of living bodies strictly to mechanical forces. On the continent and in Britain, there were many natural philosophers who wrote about this idea.[89] In the past two decades, scholars have pointed to the important theoretical and political role this concept played in the history of medicine.[90] For Hunter, the concept of digestion was closely linked to this living principle. In his *Lectures on the Principles and Practice of Surgery*, he addresses this concept: "Every individual particle of the animal matter, then, is possessed of life, and the least imaginable part which we can separate is a much alive as the whole." In his essay about Hunter's treatise, *The Natural History of Human Teeth*, Roger King makes the connection between digestion and Hunter's living principle very clear. He points out that Hunter considered one of the distinguishing internal features of an animal to be its stomach and its subsequent need for the digestion of nourishing nutrients. King asserts, "Digestion was of central importance to Hunter in his research into the animal œconomy."[91] Furthermore, this living principle allowed animate matter to sometimes 'know' how to organise itself. Paley quotes Hunter on this principle: "Dr. Hunter discovered a property of this fluid [gastric juice]...that in the stomachs of animals which feed upon flesh, irresistibly as this fluid acts upon animal substances, it is only upon the *dead* substance that it operates at all. The living fibre suffers no injury from lying in contact with it."[92] By quoting Hunter in this manner, he insinuates the vitalism of Hunter, but does not state his position. People reading *Natural Theology* who were familiar with Hunter's position could have easily assumed Paley was demonstrating vitalistic proclivities by including such a quotation. But, in reality, Paley does not directly state that he supports vitalism—he is simply once again using the well-known convictions of a source to guide the assumptions of his audience.

Clerical Calculus: Bishops Brinkley and Law

As Paley readily admits, a great deal of the information in his astronomy section was given to him by John Brinkley (1763-1835), the astronomer royal for Ireland. But, Paley's correspondence with Brinkley was dependent upon and mediated by the bishop-

[89] For instance, at the turn of the seventeenth century it was promulgated by Georg E. Stahl (1659-1734) and in the following years it was promoted by François Sauvage (1706-1767), Etienne de Condillac (1715-1780) and Théophile de Bordeu (1722-1776).
[90] François Duchesneau, 'Vitalism in late eighteenth-century physiology: the cases of Barthez, Blumenbach, and John Hunter', Bynum and Porter, *William Hunter*, 259-296. Adrian Desmond, *The Politics of Evolution – Morphology, Medicine, and Reform in Radical London* (Chicago: The University of Chicago Press, 1989). Desmond make specific reference to Hunter in several sections.
[91] Roger King, 'John Hunter and *The Natural History of Human Teeth*: Dentistry, Digestion, and the Living Principle', *Journal of the History of Medicine and Allied Sciences* (1994) 49: 513. The preceding quotation from Hunter's *Lectures* is also taken from this article.
[92] Chapter X, 'Of the Vessels of Animal Bodies.'

mathematician John Law (1745-87), the Lord Bishop of Elphin. The first of only two footnotes in the 'Astronomy' chapter of the 1802 edition of *Natural Theology* acknowledges Paley's astronomical debt to both Brinkley and Law. I will first discuss the relevance of the latter. John Law was the oldest son of Edmund Law (1703-87), the Bishop of Carlisle. John Law graduated from Christ's College, Cambridge and with his father's help became Archdeacon of Carlisle. When John Law left Carlisle in 1782, Paley was appointed to the position. It was there that Paley began to seriously entertain the idea of writing a book about natural theology. John Law and Paley were close friends during their time at Cambridge and during the later 1760s, they both were lecturers at Christ's College. After university, Paley and Law corresponded on many of the topics that later appeared in Paley's writings.

Paley's contact with John Law was one that spanned several decades and even after the publication of *Natural Theology*, Paley was still entertaining suggestions from him. Because of this fact, it is not surprising that they corresponded about the scientific proofs that could be used to support a natural theological argument. Paley does not mention Law as a source. But, a letter from Law to Paley gives an interesting insight into several of his sources. At present, this Law-Paley correspondence is lost. But, Edmund Paley (Paley's son and biographer) writes about this correspondence and includes an excerpt from a rather detailed letter written in 1797. Because of Law's references to several scientific authors, this letter is important because it mentions the natural philosophical sources and scientific information used in Paley's planetary astronomy argument. In regard to this topic, Law writes, "In your chapter on divine contrivance, you must have an article on the solar system, which no one can describe more forcibly or eloquently."[93] The letter makes direct reference to such cosmologically minded authors as John Ray, Bernard Nieuwentyjt, Colin Maclaurin, William Derham, Richard Bentley, and Georges-Louis Leclerc Buffon. Save for Bentley, Paley directly refers to all of these authors throughout *Natural Theology*.

The letters of Law and Paley were part of an elaborate correspondence network orchestrated primarily by Bishop Edmund Law, John Law's father and the former master of Peterhouse, Cambridge. Along with several others, Edmund Law had introduced suggestions for liberal educational reforms at Cambridge and for political reform in London during the 1760s. He failed and subsequently used his political connections to secure the bishopric of Carlisle. Paley and John Law became part of Edmund Law's attempted reform while they were tutors at Cambridge.[94] They then became part of his

[93] Edmund Paley, *Life of Dr. Paley*, 327.
[94] D. L. LeMahieu, *The Mind of William Paley* (London: University of Nebraska Press, 1976).

correspondence network after they left. For the next several decades, Edmund Law used the parishes and ecclesiastical positions at Carlisle as a funnelling point for like minded clergy members. As mentioned above, he appointed John Law Archdeacon and this position was succeeded by William Paley, who kept the appointment for the rest of his life.[95] Notably, two of the many clerics to be funnelled through Carlisle were John Douglas and Thomas Percy.[96] All of these men formed a large correspondence network that Paley used to garner information and critiques not only for his *Natural Theology*, but for many of this other books.

John Brinkley was known to Paley via the correspondence Paley had with John Law. Brinkley and Law were both practising mathematicians, whereas Paley's mathematical studies terminated when he left Cambridge. Along with Brinkley, John Law was part of another correspondence network that consisted of Royal Society fellows and other influential natural philosophers. Brinkley was a well-known name in astronomical studies before and even more after Paley wrote *Natural Theology*. Elected as the first astronomer royal for Ireland in 1792, Brinkley had previously graduated from Caius College, Cambridge in 1788. He then went to the Royal Observatory in Greenwich as an assistant to Nevil Maskelyne, the astronomer responsible for supervising the *Nautical Almanac*. During his time in Greenwich, Brinkley was ordained by the Church of England. This eventually allowed him to become the Bishop of Cloyne in 1826—a position that was held one hundred years earlier by the fluxion calculus critic George Berkeley. While Brinkley was helping Paley with *Natural Theology*, he was also busy writing his acclaimed astronomy lectures that would later be incorporated into his influential *Elements of Plane Astronomy*. Published in 1808, this text became a popular academic astronomy textbook in the early nineteenth century.

In light of the complicated mathematical formulas being used to determine planetary physics at the end of the eighteenth century, Paley needed someone like Brinkley or John Law who could cut to the chase and explain the theories to him. Since he was not an astronomer, Paley particularly needed the credibility that Brinkley's name afforded. Even though Paley does not specifically refer to any *Philosophical Transactions* articles about Newtonian mathematics or astronomy, a footnote in the 1826 edition refers the reader to two articles that were published in 1778 and 1798. It states that Paley used these sources. This means that Brinkley and the *Philosophical Transactions* were probably his two major astronomy sources. The former article was Charles Hutton's, "An

[95] It also must be pointed out that Paley's two first parishes, Great Musgrave and Appleby, and his later parish in Sunderland, were under the control of the Bishop of Carlisle.

[96] John Douglas (Canon of Winsor 1762, Bishop of Carlisle 1787 and Bishop of Salisbury 1791) and Thomas Percy (Dean of Carlisle 1778 and Bishop of Dromore 1782). Select letters housed in the British Library.

Account of the Calculations made ...in order to determine the Mean Density of the Earth,"[97] and the latter was Rev. John Hellins's, "An Improved Solution to the a Problem in Physical Astronomy by which significantly converging Series are obtained, which are useful in Computing the Peturbations of the Motions of the Earth, Mars, and Venus by mutual Attraction."[98] These articles are intricately complex and if Paley used them, the prowess of both Law and Brinkley would have been invaluable. Yet, even though Paley and Law were good friends and corresponded regularly about the natural theological enterprise, it was Brinkley's name that provided the mathematical and astronomical authority.

A Quiver of Newtonian Missiles: Colin Maclaurin and Roger Cotes

Colin Maclaurin (1698-1746) was a gifted mathematician from Scotland. Educated at the University of Glasgow, he was among a group of mathematicians who explained and popularised Newtonian philosophy via textbooks.[99] Likewise, Maclaurin and another member of this group, Roger Cotes, advanced the study of synthetic geometry in England. Among his many other accomplishments, he was well known for receiving the 1724 prize of the Royal Academy of Sciences in Paris and for his lectures at the University of Edinburgh. A practical man with his eye on the contemporary Glasgow economical scene, he published a memoir in 1735 that detailed how to ascertain the volume of a molasses barrel. This gained him respect on a local level.[100] In 1740, Maclaurin wrote about the tides and, like his French contemporary Maupertuis, created a Newtonian mathematical framework for proving that the earth was an oblate spheroid—a fact mentioned several times by Paley.[101] Maclaurin's 1742 response to Bishop George Berkeley's 1734 critique of Newtonian fluxional calculus enabled him to produce his *Treatise of Fluxions*, a standard reference point for Newtonian philosophers for the rest of the century. But, the most lasting of his academic contributions is the book quoted by Paley in *Natural Theology*: *An Account of Sir Isaac Newton's Philosophical Discoveries*.

The informative biography at the beginning of *Discoveries*, details how the book was originally meant to survey important events in the history of natural philosophy.

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[97] Charles Hutton, "An Account of the Calculations made from the Survey and Measures taken at Schelhallien, in order to determine the Mean Density of the Earth", Reprinted in *Philosophical Transactions of the Royal Society of London – From their commencement, in 1665, to the year 1800 Vol. XIV, from 1776-1778*, (London: Blackfriars, 1809), 408-423..

[98] John Hellins, "An Improved Solution to the a Problem in Physical Astronomy by which significantly converging Series are obtained, which are useful in Computing the Peturbations of the Motions of the Earth, Mars, and Venus by mutual Attraction", Reprinted in *Philosophical Transactions of the Royal Society of London -- From their commencement, in 1665, to the year 1800 Vol. XVIII, from 1796-1798*, (London: Blackfriars, 1809), 408-427.

[99] It must be emphasized that during this time England's interest in arithmetic books waned in comparison to other European countries at the beginning of the eighteenth century. Most of the textbooks were written for the benefit of advanced mathematical study. Florian Cajori, *A History of Elementary Mathematics with Hints on Methods of Teaching* (London: MacMillan Company, 1897), 208.

[100] Judith V. Grabiner, 'A Mathematician Among the Molasses Barrels: Maclaurin's Unpublished Memoir on Volumes', *Proceedings of the Edinburgh Mathematical Society*, 1996, 39, 193-240.

[101] Maupertuis was the first influential French Newtonian and wrote about the earth's oblate spherical shape in the last two chapters of *Figures des astres*, published in 1732. See chapter three of David Beeson, *Maupertuis: an intellectual biography*, (Oxford: The Voltaire Foundation, 1992).

Maclaurin's posthumous editor writes: "Sir *Isaac Newton* dying in the beginning of 1728, his nephew Mr. *Conduitt* proposed to publish an account of his life, and desired Mr. *Maclaurin's* assistance; who out of gratitude to his great benefactor, cheerfully undertook and soon finished the history of the progress which philosophy had made before Sir Isaac's time."[102] However, publication difficulties and personal circumstances prevented the book from being published.[103] Maclaurin eventually used the ill-fated copy as a rough draft for *Discoveries*. Published posthumously by his family in 1748, this book was one of the most recognised renditions of Newton's philosophy in the eighteenth century and a study of its distribution would make an interesting investigation into the popularisation of Newtonian ideas in Hanoverian England. Such a popular book made Maclaurin an excellent commonplace for Paley's argument. People from the reading public were familiar with Maclaurin's mechanical and mathematical exposition of the world. There are over nine-hundred subscriber's names listed at the beginning of the book—royalty, clerics, barristers, advocates, physicians, surgeons, medical doctors, gentlemen, students, college libraries, chamberlains, goldsmiths, philosophical societies, sheriffs, college masters, apothecaries, merchants and professors of law, botany, medicine and philosophy. Copies of the first edition were sent to Scotland, Ireland, England, Holland, Jamaica and Virginia.[104] As a mathematics student at Christ's College, Cambridge a mere twenty years after the first edition of *Discoveries*, Paley would have at least been familiar with Maclaurin's exposition of Newton's mathematics and philosophy. *Discoveries* went through several editions and Paley quotes from the third edition in his *Natural Theology*.

The last chapter of *Discoveries* was dictated by Maclaurin from his deathbed and elucidates the assertion of its title: 'Of the Supreme Author and Governor of the Universe, the true and living God.' In this mini-natural-theological exposition, he garners causal support from Aristotle and Plotinus, labels Descartes's cosmology as disgusting to the "sober and wise part of mankind," dismisses Spinoza's and Leibnitz's absolute necessity, applauds how Newton's causation is theologically expedient, and attempts to rectify theological misinterpretations of Newton's philosophy.[105] To the later goal, Maclaurin

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[102] Maclaurin, Colin. *An Account of Sir Isaac Newton's Philosophical Discoveries, in Four Books*, London: Printed for the author's children: and sold by A. Millar, J. Nourse, G. Hamilton, J. Balfour, A. Kincaid at Edinburgh, J. Barry at Glasgow, and J. Smith at Dublin, 1748, vi.

[103] Pemberton's biography and exposition of Newton's works came out in 1728.

[104] A cursory view of the names of those who received the book also provides insight to the popular appeal of the book. Some of those who received copies of the book were: His Grace the late Duke of Bridgewater, His Grace the Lord Viscount Barrington, His Grace the Lord Berkley, The Rev. Mr. Bentley, Fellow of Trinity College, Cambridge, His Grace the Lord Archbishop of Canterbury, The Right Hon. the Lord High Chancellor, The Rev. Dr. Concybeare, Dean of Christ Church, Oxon, The Rev. Mr. Colson, Lucasian Professor of Mathematics in Cambrige, William Cullen, M. D. in Glasgow, His Grace the Lord Archbishop of Dublin, The Rev. Dr. Fanshaw, Regius Professor of Divinity at Oxford, Martin Folkes, Esq., James Monro, M. D., Mr. Alexander Monro, Professor of Anatomy in the University of Edinburgh, Mr. Donald Monro, Student at Edinburgh, The Right Hon. Lord Newport, Lord Chancellor of Ireland, The Right Hon. the Earl of Orrery, The Rev. Robert Smith, Master of Trinity College, Cambridge, The Rev. Dr. Walker, Vice Master of Trinity College, Cambridge, and Mr. Whiston, of Trinity College, Cambridge.

[105] Previously in the book, Maclaurin critiques Leibniz's dynamics and Bernoulli's theory of motion. He especially opposed Bernoulli's *vis viva* ("living force") principle because of its mechanical orientation that seemed to exclude the need for God. As with Samuel Clarke, Maclaurin was more in favor of active principles that necessitated God's reoccurring intervention in the world. Peter M.

specifically attempts to wrestle the concept of gravity from the hands of the materialists by asserting that "Its action is proportional to the quantity of solid matter in bodies, and not to their surfaces, as is usual in mechanical causes: this power, therefore, seems to surpass mere mechanism."[106] Lest anyone be theologically confused, Maclaurin goes on to state, "But, whatever we say of this power [gravity], it could not possibly have produced, at the beginning, the regular situation of the orbs and the present disposition of things...The same powers, therefore, which at present govern the material universe...are very different from those which were necessary to have produced it from nothing."[107] Unlike his ambiguous position on vitalism, Paley agrees with Maclaurin and firmly states his opposition to those who believe gravity is inherent to matter (Paley's stance on this aspect of gravity is discussed in Chapter 5). Maclaurin's position on gravity appealed to the teleological persuasion of Paley's audience. Maclaurin was an accepted source in physics and, like several other of his sources, Paley used the convictions popularly associated with his name to strengthen the teleological implications of his argument.

Like Maclaurin, Roger Cotes (1682-1716) was a personal friend of Isaac Newton and was involved with publishing of the 1713 second edition of Newton's *Philosophiae naturalis principia mathematica*. It must be remembered, that at the beginning of the eighteenth century, many of Newton's mathematical and astronomical propositions were yet to be *proved*. It took the first half of the century for mathematicians to demonstrate the soundness and utility of Newtonian physics, calculus and geometry. Cotes was among these scholars. So was Colin Maclaurin, Richard Bentley, Samuel Clarke, and, interesting enough, Buffon, who translated Newton's *The Method of Fluxions and Infinite Series* into French in 1740. Cotes was a brilliant mathematician and the scientific world was sorrowful when he died at the age of thirty-three. It is said that upon hearing of the death of Cotes, Newton exclaimed: "If Cotes had lived, we might have known something." Indeed, Cotes built upon trigonometry theorems forming factors of $x^n - 1$, an approach admired by both Maclaurin and Newton. [108]

After graduating from Trinity College, Cambridge, Cotes had served his alma mater as the first Plumian professor of astronomy and natural philosophy. In this capacity, he promoted Newton's scientific method and made several original contributions to the field of mathematics. As with Maclaurin's writings, Paley and the other gentlemen studying mathematics at Cambridge would have probably been required to at least be familiar with Cotes's works. It is also highly probable that Brinkley recommended Cotes

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Harman, 'Dynamics and Intelligibility: Bernoulli and Maclaurin' in R. S. Woolhouse, ed., *Metaphysics and Philosophy of Science in the Seventeenth and Eighteenth Centuries* (London: Kluwer Academic Publishers, 1988), 213-226.

[106] Maclaurin, *Discoveries*, 387.

[107] Maclaurin, *Discoveries*, 387-88.

to Paley. While Paley was writing *Natural Theology*, Brinkley was busy proving what was known as "Cotes's theorem," a fluxion formula postulated in Cote's 1722 posthumous work *Harmonia mensurarum.* In 1797, Brinkley proved this theorem in his essay "A General Demonstration of the Property of the Circle Discovered by Mr. Cotes Deduced from the Circle Only."[109] Because of this state of intellectual affairs, it is highly probable that Brinkley either explicitly or implicitly motivated Paley to mention Cotes in *Natural Theology's* astronomy chapter.

On a theological note, Cotes shared the view of many Newtonians that the intricacy of the world pointed to a Deity. This conviction made him not only a good mathematical reference for *Natural Theology*, but also a reference indirectly associated with the natural theological enterprise. In his preface to the second edition of the *Principia* he wrote, "Newton's distinguished work will be the safest protection against the attacks of atheists, and nowhere more surely than this quiver can one draw forth missiles against the band of godless men."[110] Likewise, the prefatory biography of Maclaurin's *Discoveries* confirms the theological orientation of both Maclaurin and Cotes: "He [Maclaurin] agreed with Mr. Cotes, in thinking *that the knowledge of nature will ever be the firmest bulwark against Atheism*, and consequently the foundation of true religion...The argument from final causes, from the order and design that evidently shews itself throughout the universe, Mr. *Maclaurin* held to be the shortest and simplest of all others."[111] This statement would have been available to everyone who read *Discoveries* and further demonstrates the commitment of both Cotes and Maclaurin to natural theology. In these two men, Paley selected two powerful sources to further convince his audience of design.

Chapter 3 Conclusion

In Chapter 3 we considered the 'rhetoric of reference' found in Paley's anatomy and astronomy sources. After considering *Natural Theology's* most reoccurring names, it became clear that Paley used well-known scientific authors to communicate authority. Moreover, these authors were also acceptable to Paley's gentlemanly audience. By using such polite authors as rhetorical commonplaces, Paley not only had to consider the scientific achievements of a source, he also had to consider the source's appeal to his audience. Keeping this factor in mind, the positive personal convictions of several authors towards the natural theological enterprise is hard to overlook. In fact, simply mentioning

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[108] Florian Cajori, *A History of Mathematics* (London: The Macmillan Company, 1909), 242.
[109] *Transactions of the Royal Irish Academy*, (1797) 7: 151-159.
[110] Quoted in Shirley A Roe, *Matter, Life, and Generation –Eighteenth-Century Embryology and the Haller-Wolff Debate* (Cambridge: CUP, 1981), 102.
[111] Maclaurin, xx.

the names of Maclaurin and Cotes within a natural theology argument probably conferred just as much authority to Paley's audience as several uncited bits of astronomical data.

The combined presence of such implied philosophical undertones and usage of empirical data from the natural world brings up several important questions. Was the argument successful because of Paley's ability to write politely? Was its success based on the scientific examples or the audience's personal convictions? Because of many cultural factors involved in these questions, there probably will never be one definitive answer. But, in general, based on Paley's gentlemanly audience and the information mentioned in Chapter 3, I assert that the initial success of *Natural Theology* was a combination of Paley's ability to anticipate what sources his audience would accept and his selection of clear scientific examples—many of which had already been used in previous natural theological arguments. Paley himself readily admits that his argument will only convince those who already share theological convictions similar to his. He was simply inserting the names of well-known authors and select empirical examples into an argument that was already familiar to his audience. This astute knowledge of his audience is further demonstrated by the authors that he used as commonplaces in the natural history sections of *Natural Theology*. Let us turn to the next chapter and investigate these sources.

CHAPTER 4
EXTRAORDINARY ANIMAL AND VEGETABLE FACTS
The Context and Content of Paley's Animated Natural History Sources

Chapter 4 Introduction

Chapter 3 investigated the rhetorical utility of the astronomy and anatomy authors cited by Paley. In the same manner, Chapter 4 demonstrates why Paley's natural history sources appealed to his 1802 audience. As with his anatomy and astronomy references, several of these authors not only communicate scientific authority, they also implicitly carry the natural theological commitments of each author. In addition, we will see that Paley continues to use authors who appealed to the gentlemanly tastes of his audience. To court such a readership, Paley often found it more conducive to cite natural history popularisers alongside noted authorities in the field. Unlike today, this would not have raised too many eyebrows. In Paley's context, most natural history information fell within the bounds of acceptable gentlemanly discourse. Each gentleman considered himself a competent person capable of applying reason to just about any field of inquiry. Admittedly, this practice was changing and by the mid 1820s, the walls of specialisation were beginning to be recognized amongst the reading public. But, Paley wrote before this distinction and we must accordingly examine the popularisers alongside those who practised their own empirical research upon the natural world.

To investigate the rhetorical weight of Paley's popular and 'specialised' natural history sources, Chapter 4 contextualises the works of Erasmus Darwin, John Ray, William Derham, Bernard Nieuwentyjt, Oliver Goldsmith, the French Academy, Joseph Addison and William Withering. These men form the bulk of all cited natural history authors in *Natural Theology*. Although their works spanned the entirety of the eighteenth century, they all wrote books frequently purchased by gentlemen who distinguished themselves by reading polite literature. None of the British authors in this list devoted themselves to the full-time to the study of the natural world. They were physicians, clerics and men of letters. Save for the French Academy, all of these sources subscribed to some form of the natural theological argument—a conviction that was not necessarily shared or stated by all eighteenth century natural history authors. As with the former chapter, I establish the scientific and/or cultural authority of each source. For this reason, I concentrate not only on the authors cited by Paley, but also on biographical details that help explain their fame within the eighteenth century gentlemanly culture. Like his astronomy and anatomy sources, Paley uses works that were published all throughout the eighteenth century. One of the most contemporary of these authors was the physician Erasmus Darwin. As a practising physician and noted botanist, Darwin represented a

literary genre that fused scientific data with poetry. He was well published and therefore served as a good source for Paley's rhetorical intentions. Even though his natural philosophy was creative, his writings were often taken for a brand of monotheistic natural theology. Contemporary with Darwin was another of Paley's botanical sources: William Withering. Also a physician, Withering was known for his botany books. These works were intended for the general reading public—more specifically as genteel natural history handbooks. Withering was a proponent of the Linnaean system and his most well known book was *Botanical Arrangement*.

Keeping with his practice of citing authors whose personal beliefs conformed to his natural theological program, Paley cites three prominent physicotheologians: John Ray, William Derham and Bernard Nieuwentyjt. All three of these men had published natural theology books during the first half of the eighteenth century. These works were immensely popular in Hanoverian England and they all went through numerous editions. As established in Chapter 2, these types of natural theology books were ideal for the gentleman reader because they not only provided a new perspective on an established teleological argument, but they also provided natural history commonplaces that could be inserted into polite discourse. In keeping with his commitment to such an audience, Paley also cites two popular men of letters: Oliver Goldsmith and Joseph Addison. The latter wrote at the beginning of the eighteenth century. Paley cites Addison because his essays propounded a cosmological design argument and because Addison was probably *the* most recognised authority on polite discourse. Likewise, Oliver Goldsmith was known to Paley's readers because of his literary endeavours and because his close association with Samuel Johnson. Briefly departing from his proclivity to quote British authors, Paley also cites the French Academy. This source connoted scientific authority, but Paley had to be careful to demonstrate that he did not subscribe to their teleological convictions (or lack thereof). He did this by accepting the empirical data supplied by the Academy, but by disagreeing with the methodology by which they made their final cosmological conclusions. With all of Paley's sources, he is always careful to cite them at the most opportune time and takes great care utilising quotations from their work. Each author's name and the quotations from his work are efficiently reduced to a rhetorical commonplace skilfully inserted into Paley's argument for design.

Erasmus Darwin and Extraordinary Vegetable Facts

Although their conception of nature and God was different, Paley's botanical section refers to the writings of Erasmus Darwin, FRS (1731-1802)—a cleverly creative scholar sometimes doomed by historians of science to live in the shadow of his grandson Charles Darwin. Erasmus Darwin was a popular author of natural philosophical poems.

His method was to write the poem and then to include footnotes or a lengthy appendix to explain the scientific terms that he used. In addition to promulgating non-traditional botanical and cosmological ideas, Darwin also promoted liberal political opinions in his works. Darwin supported the ideological aims of both the American and French revolutions. But, as the killing wore onward in the French revolution, he tempered his republican opinions. Because of Darwin's leftist political views, George Canning and his team of editors at the *Anti-Jacobean Review* published a mocking parody of Darwin's works in 1798. The poem was written by a "Mr. Higgins" and entitled *The Loves of the Triangles*—the title mimicking Darwin's iambic pentameter in *The Loves of the Plants*. It begins with the following lines directed at Darwin:

> *STAY your steps, or e'er your feet invade*
> *The Muse's haunts, ye Sons of WAR and TRADE!*
> *Nor you, ye Legion Fiends of CHURCH and LAW,*
> *Pollute these Pages with unhallow'd paw!*[112]

Later, the poem specifically lambastes Darwin for his political opinions:

> *Thus, happy FRANCE! in thy regenerate land,*
> *Where TASTE with RAPINE saunters hand in hand;*
> *Where, nursed in seats of innocence and bliss,*
> *REFORM greets TERROR with a fraternal kiss*[113]

The main goal of Canning's poem is not to ridicule the science of Darwin's poems, nor was it to discredit the nature of Darwin's didacto-scientific technique. Rather, it is to attack the evolutionary theory that Darwin creates out of those facts. It was believed that this type of thinking led to atheism, namely, the repudiation of the ten commandments. Such beliefs were held by the anti-religious French Encyclopaedists and were believed by many British to be one of the progenitors of the contemporary political events in France. A page and half footnote to Line 39 takes great pains to mockingly explain Darwin's theory: "Upon this view of Things, it seems highly probable that the first effort of Nature terminated in the production of VEGETABLES, and these being abandoned to their own *energies*, by degrees detached themselves from the surface of the earth, and supplied themselves with wings or feet, according as their different propensities determined them, in favour of aërial and terrestrial existence."[114] Despite such scientific and political pokings, Darwin's contributions to natural philosophical popularisation and observation were substantial. The Canning poem may be seen as a disaster to a modern historian, but to Darwin, it was merely a ripple in a pseudo-literary pond. Indeed, Renwick maintains

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[112] George Canning, *The Loves of the Triangles*, published in three editions of the *Anti Jacobin*: 16 April, 23 April and 7 May 1798. Collected and republished in, George Canning, ed., *The Anti-Jacobin; or, Weekly Examiner in Two Volumes, Volume II*, (London: J. Wright, 1799). Quotation taken from pages 168-9.

[113] Canning, 204.

[114] Canning 172. These footnotes include a plethora of scientific information. In them, everything from theories, to natural philosophers to geometrical terms are carefully and clearly defined. Since this information is part of a *political* publication, the

that Darwin "was not wrong about his public" and that "The contemporary being accepted it. Horace Walpole was delighted; and if the younger generation scoffed, Darwin himself acknowledged good-humouredly the accuracy of Canning's parody in *The Anti-Jacobin*".[115]

In addition to his provocative poems, Darwin wrote about digitalis's effects on dropsy and was instrumental in founding the Lunar Society, Lichfield Botanical Society and Derby Philosophical Society. In his botany chapter, Paley refers to two of Darwin's works: *The Botanic Garden, Part I, containing the Economy of Vegetation, a Poem with Philosophical Notes* (1791) and *Phytologia, or the Philosophy of Agriculture and Gardening*...(1800). Both of these books contain ideas that directly contradict ideas propounded in *Natural Theology*. For instance, in the astronomy chapter Paley criticises Buffon for asserting that the planets were formed by matter from the sun. Yet, in *The Botanic Garden*, Erasmus Darwin propounds the same theory and other geological concepts irreconcilable with Paley's description of the earth.[116] Paley's first reference to Darwin comes from *Phytologia* and occurs in the 'Of Plants' chapter when he is discussing how a seed will always grow upward, no matter which way it has been cast to the ground. In regard to this "extraordinary vegetable fact", the quotation is simply a description: "The plumule (it is said) is stimulated by the *air* into action, and elongates itself when it is thus most excited; the radicle is stimulated by *moisture*, and elongates itself when *it* is thus most excited. When one of these grows upward in quest of its adapted object, and the other downward."[117] Paley then focuses on the word "adapted" in this quotation and infers that it is God who gave this quality to the seed. No mention is made to what Darwin means by "adapted". But in a rare moment, Paley does admit, this situation, "does not disprove contrivance; it only moves it a little further back".[118] Paley's second reference to "Dr. Darwin" is a quotation from *The Botanic Garden* and is also used solely for botanical description purposes. Specifically, it is made to support Paley's argument for mechanical and reproductive design in the *vallisneria* plant.

But, Paley could have obtained such descriptions from any botanical textbook. Why would he use such a potentially damaging author like Darwin? There are many possible answers to this question. I believe that Paley was following his practice of using popular authors that would give a familiar credibility to his work. Darwin was such an

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presence of such scientific material must be noted. These footnotes were popularizing science, or at the very least, solidifying the scientific knowledge of the magazine's audience.

[115] Taken from Renwick's 'The Face of Earth' chapter in *English Literature 1789-1815* (Oxford: Clarendon Press, 1963). With a rather broad definition of 'science', this chapter gives an informative, brief treatment of Darwin, but then turns its focus to travel literature. Also, *The Gentleman's Magazine*, which was interested in good taste, in 1801 did not have a problem with publishing a letter that mentions Darwin's *Botanic Garden*. *GM*, February 1801, 106-107.

[116] Desmond King-Hele, *Doctor of Revolution – The Life and Genius of Erasmus Darwin*, 2nd ed., (London: Faber and Faber, 1977), pp. 213-230.

[117] Paley's footnote references this as, "Darwin's Phytologia, p. 144". Paley, 387.

author and would serve such a purpose. Even though his statements were politically liberal (which would include statements against the slave trade which remained unabolished until 1807), they must have not upset the crown too much because George III often told Lady Charlotte Finch, the governess of Queen Charlotte's daughters, that he would like to have Darwin as his personal physician. It also must be noted that Darwin makes many references to "the Almighty" and "the Creator" in his works.

Since Erasmus Darwin is the grandfather of Charles Darwin, many modern authors often only look for potential "evolutionary" precursors in his work.[119] But, the average reader of *Natural Theology* at the turn of the nineteenth century was not specifically looking for such ideas and much of what Darwin wrote was ambiguous enough to fit within the confines of a gentleman's Christian faith. King-Hele underscores the fact that Darwin was careful not to offend Christians. He writes that Darwin, "averts suspicion of atheism by referring, like a good Deist, to 'the Great First Cause'".[120] Even Charles Darwin defended his grandfather's belief in God. In the 1870s he wrote: "Dr. Darwin has been frequently called an atheist, whereas in every one of his works distinct expressions may be found showing that he fully believed in God as the Creator of the Universe."[121] Charles Darwin goes on to cite examples of how his grandfather wrote about God, how he opposed the follies of atheism[122] and how he concluded one of the chapters in his *Zoonomia* (a book which Charles admits had an influence on the shaping of his own evolutionary ideas) with the words of the Psalmist: "*The heavens declare the Glory of God, and the firmament sheweth his handiwork.*"[123] Based on this assessment, it is easy to see why Paley used Darwin's name and works as commonplaces for his design argument. Furthermore, Paley simply extracted examples from Darwin's books to support his argument and then moved on to his next proof for design.

Physicotheolgians: Ray, Derham and Nieuwentyjt

In a letter regarding *Natural Theology* dated October 1802, John Law wrote to Paley: "I am reperusing your excellent work, and, *decies repetita placebit.* I do not perceive a particle of laudanum in it from beginning to end, and there is as much spirit in the conclusion as in any part. It will supersede Ray, Derham, and Nieuwentyt."[124] Even though these three authors mentioned by Law wrote on a wide range of physico-

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[118] Paley, 388.

[119] Clark evidently viewed Erasmus Darwin in such a manner because he devotes his one Darwin paragraph to outlining Darwin's proto-evolutionary views. He quotes from Paley's *Sermons and Particular Subjects* XXXIII (the internal note is Clark's): "'All the changes in Ovid's metamorphoses might have been effected by these appetencies [Erasmus Darwin's word], if the theory were true; yet not one example, not the pretence of an example is offered of a single change being known to have taken place....The hypothesis remains destitute of evidence.'" M. L. Clark, *Paley – Evidences for the Man* (London: SPCK, 1974), 97.

[120] Desmond King-Hele, *Erasmus Darwin*, 1st ed., (London: Macmillan & Co Ltd, 1963), 72.

[121] Charles Darwin, *Preliminary Notice*, (London: John Murray, 1879), 43.

[122] An 'atheist' in Erasmus Darwin's intellectual milieu was usually somebody who did not believe in the ten commandments.

[123] Darwin, 43-47.

theological topics, Paley most often references them in conjunction with the natural history commonplaces included in his argument. Let us examine why Paley considered them to be convincing sources. Often called the 'British Linnaeus', John Ray was a nonconformist who graduated from Trinity College, Cambridge in 1648. He later refused to sign the act of uniformity in 1662 and this cost him his Cambridge fellowship. With the collaboration and patronage of Francis Willughby, Ray was able to collect specimens and write about natural history. In 1660, Ray published *Catalogus plantarum circa Cantabrigiam nascentium*, an attempt to classify all of the plants in Cambridgeshire. From the 1660s to the 1690s, Ray's publishing record was rather prodigious. He published several books, including his *Historia Generalis Plantarum* (1686) and many articles in the *Philosophical Transactions*. In 1690, Ray published his *Synopsis*, a book held in high esteem for the next one hundred years. Like Linnaeus, and later Cuvier and even Paley, Ray believed that species are fixed, but he also believed that limited transmutation was possible.

In the early 1690s, Ray published two works of natural theology that would influence Paley: *The Wisdom of God* (1691) and *Three Physico-Theological Discourses* (1693). These two books effectively laid the foundation for the physico-theological genre that would thrive in England for the next century. The *Discourses* are important for this tradition because they demonstrate that Ray did not subscribe to literal one-week creation in Genesis.[125] *The Wisdom of God* was a project that Ray had conceived while he was young. Cuvier once summed up the work with the following words: "It is an exposition of the admirable care with which Providence has disposed all beings for the functions they have to perform in the great scheme of the universe, and has furnished each in suitable degree with all that may be required for its preservation and support."[126] The book was immensely popular, as William Derham attests: "The book was so well received by the public, that it soon got universal applause, and the impression was presently sold off, so that it came to a much greater impression the year following, and afterwards to other editions in 1701, 1704, 1709, and 1714."[127] Indeed, Charles Raven, Ray's principle biographer this century, makes the following statement about the book and its context: "During that time there was developed a type of theology, of which *The Wisdom of God* is

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[124] Edmund Paley, *An Account of the Life and Writings of William Paley* (London: 1825. Reprinted, Hants: Gregg International Publishers Limited, 1970) 335.

[125] M. Roberts, 'The Genesis of Ray and his successors: the fall of the House of Ussher', a paper given at the conference entitled John Ray and his Successors: the Clergyman as Biologist (Braintree, Essex, 18-21 March 1999). I also gained a unique perspective on Ray's *Wisdom of God* through John Hedley Brooke's paper, '"Wise me nowadays think otherwise" John Ray, Natural Theology, and the Meaning of Anthropocentrism'.

[126] Cuvier and Aubert Dupetit Thouars, 'Notice of Ray, by Cuvier and Aubert Dupetit Thouars (From the Biographie Universelle) Translated by G. Busk, Esq., F.R.C.S.' in Edwin Lankester, *Memorials of John Ray* (London: The Ray Society, 1846), 107.

[127] William Derham, 'Select Remains and Life of Ray', Edwin Lankester, *Memorials of John Ray*, 44.

the first example, capable of giving appropriate expression to the Christian faith in a scientific age. This is John Ray's proper memorial."[128]

Prior to Raven, John Ray's principle biographer was the eighteenth century cleric William Derham (1657-1735), who Paley also quotes in *Natural Theology*. Like Ray, Derham was a clergyman interested in combining theology with natural history. Unlike Ray, Derham attended Oxford, graduating from Trinity College in 1679. During his life, Derham was the chaplain to the Prince of Wales, Canon of Windsor, Fellow of the Royal Society and was awarded a doctorate of divinity from Oxford. Although Derham published original natural philosophical works in the *Philosophical Transactions*, his historical legacy lies in his editing, compiling and arranging the natural theological and philosophical works of such well-known men as Robert Hooke and John Ray.[129] Derham's principle works are the *Artificial Clock-Maker* (1696), *Physico-Theology* (1713), *Astro-Theology* (1714), *Christo-Theology* (1729), and *A Defense of the Church's Right in Leasehold Estates*. None of Paley's several references to Derham list a specific published source. However, since they concern natural history, it is most probable that he is referring to *Physico-Theology*. As most historians recognise, this work is heavily dependent upon Ray's *Wisdom of God*—a point readily admitted by Derham in the introduction of the book. In a prologue to the reader he writes, "I hope he will not candidly think me no Plagiary, because I can assure him I have along (where I was aware of it) cited my Authors with their due Praise."[130] This unoriginality did not prevent his works from being popular. For instance, *Physico-Theology* was probably more well known in the eighteenth century than Ray's *Wisdom of God*, and *Astro-Theology* went through three or four editions and was still referenced in the nineteenth century.[131] Regarding the goal of this book, Derham states: "I was minded to try what I could do towards the Improvement of *Philosophical* Matters to *Theological* Uses."

Another physico-theologian deemed by Paley to be an appropriate reference was Bernard Nieuwentyjt (1654-1718). He was Dutch and mostly self-educated, although he did study law and medicine at the universities of Leiden and Utrecht. Familiar with contemporary natural philosophy, especially that of Keill and Wolff, he wrote his works in Dutch because he claimed he wanted his works to be useful to his own countrymen.[132] It is not clear whether or not he was proficient enough to compose academic treatises in

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[128] Charles Raven, *John Ray Naturalist – His Life and Works* (Cambridge: CUP, 1942), 478. Raven devotes the entire last chapter of this book to *The Wisdom of God.*

[129] David M. Knight, 'William Derham', *Dictionary of Scientific Biography.* This is the only article on Derham written in the last forty years that I could find.

[130] William Derham, *Physico-Theology: or, A Demonstration of the* Being *and* Attributes *of God, from His Creation.* (8th ed. London: W. Innys and R. Manby, 1732), x.

[131] George Scott, 'Dedication', Lenkester, *Memorials of John Ray*, footnote on pp. 3-4.

[132] "I write in the *Low-Dutch* Tongue, to the End that I may be more useful to my own Countrymen". Stated in 'The Author's Epistle to the Reader' in John Chamberlayne's first English edition of *A Religious Philosopher* (London: Pater-Noster Row, 1718).

Latin. Nieuwentyjt's writings usually addressed medicine, mathematics, or physico-theology. His mathematical writings argued against Leibnizian calculus and Spinoza's Imagery System.[133] In England during the eighteenth century, his most well known book was *A Religious Philosopher, or the Right Use of Contemplating the Works of the Creator*, divided into three major sections that individually addressed animal bodies, the formation of the elements and the heavens. In its Dutch form, the book was immensely popular, going through at least seven printings. The book was translated into English in 1718 by John Chamberlayne and went through several editions during the rest of the century. Freudenthal holds that a comparison of Derham's *Discourses* and *A Religious Philosopher* hint that Nieuwentyjt used Derham's work as the nucleus for his work.[134] Indeed, in the 1718 dedication of *A Religious Philosopher*, Chamberlayne writes: "My Lord, I beg leave to call the Learned Physician, who is my Author, the Dutch *Ray* or *Derham*, because, like those two *English* Philosophers, he has so well proved the *Wisdom*, Power, and *Goodness* of *GOD* by the strongest Argument, *Observations* on *Facts*, and *Demonstrations* drawn from *Experiments*." This being the case, Paley does not quote from this book, rather, he references an unnamed piece written by Nieuwentyjt in the *Leipsic Transactions* about the muscles humans use when they breathe. However, this information was readily available in the anatomy section of *A Religious Philosopher* and the *Leipsic Transactions* article could have been a reprint of the same information. Regardless of these specifics, Nieuwentyjt, like Ray and Derham, described a natural world that was ordered and managed by God. All three of these men used empirical data as commonplaces in their natural theological arguments. By the end of the eighteenth century, their works were practically canonical in the vast array of natural theology literature and this is why Paley used their names in his *Natural Theology*.

Gentleman Goldsmith and the Reader of Taste

Oliver Goldsmith (1728-74) was a successful polymath author whose works spanned the ever widening range of eighteenth century gentlemanly learning. After earning a BA from Trinity College, Dublin, he attended medical school in Edinburgh and then began life as an author.[135] In 1769, Goldsmith was contracted to write *An History of the Earth and Animated Nature*. It took five years to complete and was published two months after Goldsmith's death in April of 1774. Essentially, *Animated Nature* is a well written summary of accepted eighteenth century natural historical information—the main

[133] E. W. Beth, 'Nieuwentyjt's Significance for the Philosophy of Science' *Synthese* (1953-55) 9: 447-453.
[134] Hans Freudenthal, 'Bernard Nieuwentyjt', *Dictionary of Scientific Biography*.
[135] Some of his more successful works were *The Citizen of the World* (1762), *The Vicar of Wakefield* (1766), *The History of England from the Earliest Times to the Death of George II* (1771). As of 1886, *The Vicar of Wakefield* was so popular that it had gone through ninety-six editions.

sources being such authorities as Lucretius, Linnaeus, Buffon and Reaumur.[136] This type of 'summary-writing' was common practice during the time and Goldsmith followed the same method when he wrote his popular history books. Goldsmith's writing skill and his former medical training made *Animated Nature* less complicated and easier to read for Paley and for the gentlemanly audience than would have been reading *Natural Theology*.[137] Indeed, while Goldsmith was writing the piece, his contemporary Samuel Johnson, who eventually came to respect the work, once sarcastically said that the work would be an entertaining "Persian Tale".[138]

Animated Nature was well received on the popular level. This is interesting to note because natural history in Britain during the 1760s-1770s, on an academic level, did not enjoy the same popularity that it had at the turn of the eighteenth century. However, it seems the reading public was still interested in such information and depended on books like *Animated Nature* to quench their interest. Like Paley, Goldsmith was fond of a natural theological approach to nature. Over ten years before he completed *Animated Nature*, the introduction he wrote for R. Brooke's *System of Natural History* averred, "[T]he improvement of natural knowledge may conduce to the improvement of religion and piety, it was thought expedient to make this work as cheap as possible, that it might fall within the compass of every studious person, and that all might be acquainted with the great and wonderful works of nature, see the dependence of creature upon creature, and of all upon the Creator."[139] When *Animated Nature* was published, and in the works that mention it for the next fifty years, the general consensus was that its eight volumes were lucidly written, but not necessarily the most scientific work on the subject.

In a 1774 article of the *Critical Review*, after Goldsmith's volumes of natural historical information are equated to such works as la Pluche's *Nature Displayed*, the reviewer then quickly states that there are mistakes and that it "is too superficial, and it receives an air of puerility from being written in the form of a dialogue." In his article in the *Monthly Review*, the London naturalist and chemist Edward Bancroft, FRS, argues that Goldsmith relied too heavily upon Buffon. Because of this dependence, the second, third

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[136] Other sources included Aristotle, Diodorus Siculus, Pliny, Aldrovandus, Brisson, Ray, Duhamel, Hale, Dampier, and Ulloa.

[137] Many of those reading Goldsmith's work when it was published would have known that he was a keen lover of birds. His comments on birds in *Animated Nature* are made interesting with personal anecdotes from his childhood wanderings in and around the Shannon tributaries in Ireland. This anecdotal system of personal observation was common in popular natural history works during the eighteenth century and was also used by Paley in *Natural Theology*. For comments about Goldsmith's aviary observations in *Animated History*, see chapter 13, "'Animated Nature' and 'Retaliation'" in Stephen Gwynn, *Oliver Goldsmith* (London: Thornton Butterworth, Ltd., 1935).

[138] Robert Anderson, 'Goldsmith's Life viewed at the turn of the eighteenth and nineteenth centuries by Robert Anderson, in *The Works of the British Poets... In Ten Volumes*, 1795, x, 809-14'. This introduction has been reprinted in a collection of Goldsmith reviews, articles and introductions collected in G. S. Rousseau's *Goldsmith – The Critical Heritage* (London: Routledge & Kegan Paul, 1974). Also see John Ginger, *The Notable Man – The Life and Times of Oliver Goldsmith* (London: Hamish Hamilton, 1977), 337. Johnson made this statement before he knew the extent of Goldsmith's academic interest in natural history.

[139] Taken from the introduction of R. Brooks's *System of Natural History* quoted in James Prior, *The Life of Goldsmith, M. B. from a Variety of Original Sources Volume I*, (London: John Murray, 1837), 471. In 1763 Goldsmith was paid to both correct the proof and write an introduction for this work.

and fourth volumes were rather weak. This is a point made by most reviewers who had extensive knowledge of natural history. Note the physician and literary writer Robert Anderson's 1795 appraisal: "The four last volumes, comprehending the natural history of *birds, fishes, insects,* &c. are particularly defective, probably because in composing them, he no longer had the assistance from Buffon, whose volume on birds he does not appear to have seen."[140] In general, depending on the critic's empirical or philosophical persuasion, these types of comments could be made about other natural histories published at the end of the eighteenth century. The demand for comprehensive natural histories written in English during this time period motivated popularisers like Goldsmith to re-summarise old books and to compile new and esoteric natural historical details discovered on foreign expeditions and in gentleman's studies. Naturally, such a task was time consuming and easily subject to criticism.

In regard to the work's style and clarity, no matter the date, all reviewers shower Goldsmith with compliments. The first line of the *Critical Review's* article about *Animated Nature* asserted: "A judicious system of natural history, blending entertainment with information, has hitherto never appeared in the English language, nor indeed been accomplished in any other."[141] In the last sentence of his review, Bancroft admits: "It is however but justice to observe, that notwithstanding the fault of our Author's performance, the manner and style in which it is written is generally pleasing"[142] And Anderson wrote, "His *Natural History* is a compilation of unequal merit."[143] Perhaps this is why, in spite of its deficiencies, *Animated Nature* enjoyed significant popularity well into the 1840s. In Prior's 1837 biography of Goldsmith, he asserts that *Animated Nature* was a larger and equally popular version of Gilbert White's *Natural History of Selborne*, attracting readers that would normally have been "repelled" by more complicated works. Even though these two works are different (White's was based on close personal observation and Goldsmith was largely a summary of other's work), both served as popular natural history sources for the general reading public. Additionally, Prior holds that, "It's great charm is its style; combining that ease, freshness, and freedom which throw an irresistible attraction over his pages and render every reader of taste an admirer;

[140] Anderson in Rousseau, 222. Perhaps Goldsmith did not see these works by Buffon, but it is clear that, in addition to his medical training, his personal interest in natural history, and the sources listed in ff. 2, he was exposed to "1., The History of Quadrupeds; 2. of Birds; 3. of Fishes and Serpents; 4. Insects; of Mineral Waters; [and] 6. of Vegetables", because these were the titles of R. Brookes's *System of Natural History* for which he was paid to correct and write an introduction in 1763. James Prior, *The Life of Goldsmith*, 469. Because of failing health, Goldsmith left the correction of bird section proofs to Joseph and Rev. Thomas Percy, two men who knew nothing about the area. A. Lytton Sells, *Oliver Goldsmith – His Life and Works* (London: George Allen & Unwin Ltd, 1974), 183-84.

[141] No author stated, 'Discriptive and Analytic Review, *Critical Review* August-November 1774, xxxviii, 97-105, 220-7, 258-66, 329-40', Rousseau 135-152. Quotation taken from page 135.

[142] William Rider, 'William Rider on Goldsmith's prose style, in *An Historical Account'*, Rousseau, 158.

[143] Anderson in Rousseau, 222.

while after the lapse of sixty years, notwithstanding correction of many mistakes, no book has yet superseded it with the general reader."[144]

Paley relied heavily on volumes IV and V of *Animated History*. A quick glance at *Natural Theology's* footnotes reveal that, when writing about animal natural history, Paley refers to Goldsmith more than any other author. Like Goldsmith, Paley does not follow any methodological natural historical arrangement.[145] Whether writing about the movement of pectoral and dorsal fins, muscles of the opossum pouch, the upper chap of a parrot or sparrow fledglings, Paley refers to Goldsmith with the same confidence as he does to such medical authorities as Cheselden or Keill or an astronomical authority like Brinkley. It is notable that Paley is not fond of directly quoting Goldsmith's work. He simply summarises the information and then notes the specific volume and page. Paley does make a brief comment about the nature of the content of *Animated Nature*. In the "Prospective Contrivances" chapter, Paley comments that Goldsmith "has taken from Buffon" an example of the Indian babyrouessa hog. This and other comments from the "Astronomy" chapter suggest that Paley gave Buffon more than a cursory glance.[146] Regardless of how Paley specifically chose to insert his Goldsmith citations, Paley's use of Goldsmith as a source would have appealed to the 1802 gentleman reader, especially those who were influenced by the literary coterie of Samuel Johnson. Goldsmith's works appealed to a gentleman's taste of 'well-written' literature and therefore served as an excellent name for Paley to mention in *Natural Theology*.

Antiquated French Academicians

Amidst the vast array of British authors, Paley's natural history knowledge was supplemented by the French Royal Academy's *Memoirs for a Natural History of Animals*. The Royal Academy of Sciences in Paris was founded in 1666. For the first two decades of its existence, it was dominated by aristocrat natural philosophers. After the Academy's 1699 regulations were instituted, it moved more towards a position of phenomenological positivism. During the early to mid eighteenth century, the Academy became one of the most liberally minded and prestigious scientific organisations in Europe, only to be hampered by institutional inflexibility in the last years of the Old Regime. Subsequently, the Academy fell victim to the revolution and its doors were closed on 8 August 1793. The Constitution of 1795 democratised the "royalist" science of the Academy and

[144] James Prior, *The Life of Goldsmith, M.B. from a Variety of Original Sources Volume II*, (London: John Murray, 1837), 507.

[145] Note Bancroft's frustration with Goldsmith on this matter: "Our Author has however adopted no methodological arrangement worthy of notice; and his descriptions, negligent of those distinguishing peculiarities of structure, which enable us to discover the name and species of each individual, are almost wholly employed upon their more amusing properties and relations." Rousseau, 153.

[146] It is also interesting to note that this comment about Goldsmith's usage of Buffon was omitted from the 1826 J. Vincent edition of *Natural Theology*. Compare pages 236-37 in 1826 *Natural Theology* edition (Oxford: J. Vincent) and pages 270-71 in the 1802 edition.

reorganised the body into The French Institute.[147] This was the body that existed when Paley wrote and published *Natural Theology*.

If one does not pay attention to the dates of *Memoirs'* publication, its inclusion in *Natural Theology* could initially lead one to believe that this French source damaged Paley's rhetorical argument. Paley gives two different dates of publication when he makes separate references to this source: 1687 and 1701. The first two chapters of this thesis noted that one reason for *Natural Theology's* success stems from the fact that it re-enforced theological and political order in the wake of Britain's perceived disorder of the French Revolution. Based on the history of the Royal Academy, both of these dates fall within more politically conservative years of the institution (and well within the time of the monarchy) and therefore contribute to Paley's implied political order.[148] In fact, *Memoirs* was originally published in 1671 as *Mémoires pour Servir à l'Histoire Naturelle des Animaux*, only five years after the founding of the Royal Academy. In a footnote, Paley informs the reader that the book was translated into *The Memoirs of the Natural History of Animals* in 1701 by the Royal Society—further confirming that it is an accepted gentlemanly source. The date of 1687 probably refers to a second French edition used by the Society for the English translation.

In light of its conservative *political* inclinations, it must be noted that many of the members of the French Academy were not *theologically* conservative during the latter seventeenth century. Paley side-steps this problem by critiquing unnamed and temporally unidentified "French philosophers" in general. In Chapter III, 'Application of the Argument', Paley writes about the bony and cartilaginous orbit above the eye of the *coatimondi* species.[149] His footnote indicates that anatomical data were provided by the *Memoirs*. There is no critique or comment about French science,[150] the reference is simply counted as a credible source. However, the next reference to *Memoirs* is not as neutral. It occurs in the same chapter after Paley's discussion of muscular and membrane contraction in the human eye. After this discussion he predictably concludes: "Does not this, if any thing can do it, bespeak an artist, master of his work, acquainted with his materials?" Immediately following this quotation, Paley sarcastically quotes the following agnostic conclusion from *Memoirs*: "'Of a thousand other things' say the French Academicians, 'we perceive not the contrivance, because we understand them only by the

[147] Detailed treatment of the Royal Academy of Paris and the French Institute can be found in Roger Hahn's *The Anatomy of a Scientific Institution – The Paris Academy of Sciences, 1666-1803*, (London: University of California Press, 1971).
[148] Similarly, in *A Religious Philosopher*, Nieuwentyjt quotes from the 1699 *History of the French Academy of Sciences* when writing about the enamel on teeth.
[149] The *coatimondi*, or *Coati Mondi*, is a species of Brazilian raccoons. Georges Cuvier, *The Animal Kingdom Vol. V* (London: George Whittaker, 1827), 115.
[150] By "French science" I mean "science reported in publications in the French language"; Maurice Crossland, *Science Under Control – The French Academy of Sciences 1795-1914* (CUP, 1992), 12- also see his larger discussion of the term and context on pages 11-49.

effects, of which we know no causes: but here we treat of a machine, all the parts whereof are visible; and which need only be looked upon, to discover the reasons of its motion and action.'"[151] By using this quotation, Paley demonstrates scepticism toward *liberal* French cosmologies, but not towards the actual scientific information used by these men to support such cosmologies. Thus, Paley is skilfully making a distinction between the actual scientific data and the theories created by certain Frenchmen out that data. Combined with the politically conservative nature of the latter seventeenth century *Memoirs* and his implied distinction between data and theory, Paley creates room for his examples to be rhetorically convincing to his gentlemanly audience—it allows his argument to benefit from the scientific authority conferred by the data he uses as commonplaces.

So, Paley does not accept certain cosmological conclusions of the Academy but does accept the Academy's scientific authority and its empirically based observational methodology. That Paley accepts the Academy's scientific authority is evinced later in the book when he again footnotes the *Memoirs* as a source for information regarding the eye of the chameleon. Elsewhere, Paley even quotes an unnamed "lively French writer" on how the skin conveniently conceals the potentially unsightly mechanistic movements inside the body of a human being.[152] Like the seventeenth century French Academy, Paley continually uses the machine metaphor and, as we will see in Chapters 5 and 6, this allows him to concentrate on the 'effects' of nature and ignore the specifics of its 'causes'. What Paley does not accept is the theologically hostile connotations of the Academy's conclusion. By plainly ridiculing the *Memoirs's* conclusion and not the scientific authority or methodology, Paley strengthens the implied political stance and scientific reputation of his argument but rids his argument of non-teleological theological connotations. Accordingly, it is probably not coincidental that Paley includes Charles Bonnet's (1720-93) name as a scientific source. Bonnet lived in francophone Switzerland and was a corresponding member of the Academy of Sciences, but not a member.[153] Bonnet worked with the eighteenth century's intellectual framework that believed the universe possessed uniformity—more or less a revised version of Plotinus's chain of being.[154] Paley makes a brief reference to Bonnet's view on a bird's windpipe. But this

[151] Chapter III, 'Application of the Argument'.
[152] Chapter XI, 'Of the Animal Structure Regarded as a Mass'.
[153] As with his contemporary Oliver Goldsmith, Bonnet read the teleologically underpinned writings of la Pluche's *Spectacle de la nature* when he was young. Bonnet was a well known natural historian in France and England and maintained correspondence with such influential personages as Réaumur and Haller. Bonnet's embryological correspondence with the latter is discussed in Shirley A. Roe, *Matter, Life, and Generation – Eighteenth Century Embryology and the Haller-Wolff Debate*, (Cambridge: Cambridge University Press, 1981), 36-44.
[154] Lorin Anderson, *Charles Bonnet and the Order of the Known* (London: D. Reidel Publishing Company, 1982), 34-58.

would have been enough to flirt with the Academy of Science's reputation, and to reemphasize Paley's conservative commitment to natural theology.

Similarly, lest his readers be confused as to his regard for contemporary French science, Paley distances himself from the newly formed Institute by using Jacques Bernardin Heri de Saint Pierre as a source. Saint Pierre was an élitist and a vehement critic of the Institute. Paley references Pierre's *Etudes de la Nature*. It was published as three volumes in 1784 and then expanded into four volumes in 1788. Even though some of the information in these books was criticised when they were published (a reoccurring theme of most natural histories during this time), they still were popular publications, especially in Britain. The year before the publication of *Natural Theology* there is a letter to the editor of *The Gentleman's Magazine* that concludes: "Atheist! art thou nothing daunted by the perfection of Nature? nothing by the arguments of the wisest men? nothing by the praises the creation send forth?" In this letter the primary natural history examples are quoted from Saint Pierre's work.[155] As one of the greatest critics of the newly formed Institute, Saint Pierre published a short novel named *La Chaumière Indeinne* in 1791.[156] This fable used fiction to spread his anti-Institute message. Hahn states that "Saint Pierre rejected the academic approach in favor of his simple, unadorned, common-sense apprehension of nature which effectively by-passed the tortuous metaphysical systems of naturalists that had obscured sublime Nature as a work of the almighty". Furthermore, Saint Pierre's motto was "Let Everyman be a scientist".[157] Was this not the ideal author for Paley to use? By footnoting Saint Pierre, Paley once again gains the authority of the French natural history examples, but distanced himself from the political context of the science espoused by the French Institute.

Joseph Addison's Pilfered Proofs

Joseph Addison was born in 1672. Educated at Queen's College and Magdalen College, Oxford, he was one of the most well known men of letters at the beginning of the eighteenth century. He travelled widely during his youth, his travels across the continent being financed by the crown and Lord Chancellor Somers. In 1704, he wrote a poem entitled 'The Campaign' about the Duke of Marlborough's European military invasion. This poem attracted the attention of Lord Treasurer Godolphin and Addison was asked to be the Commissioner of Appeals, a position recently vacated by John Locke. Addison

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[155] "I assert that Nature is connected by the most durable links, and that without the minutest part the whole would in a short time prove to be chaos...Saint Pierre says, 'Plants have as many principle parts, as there are elements with which they preserve a relation. By their flowers they stand related to the *sun*, which fecundates their seeds and carries them on to maturity...'" The rest of this long quotation details how all creation is related to each other. *The Gentleman's Magazine*, May 1801, 393.

[156] *La Chaumière Indeinne* enjoyed popular success based on the reputation of *Paul et Virginie*, a best selling book popular in France during the 1790s and in England during the early nineteenth century.

[157] Hahn, 156. In addition to both of these quotes taken from Hahn, all of the information in this paragraph was also take from his book (pp. 154-155, 182-186, 411). Although Saint Pierre is an notable critique of early republican science, it is hard to find anything written about him. Even the discussion of Saint Pierre in Crossland's *Science Under Control* is a summary of Hahn's work.

was the quintessential gentleman and during his life he enjoyed literary success and was appointed to many prestigious governmental posts. In fact, he was twice appointed to the office of Secretary of State.[158] The Addisonian writings that influenced Paley were the essays that he wrote for the gentleman's serial entitled the *Spectator*. Addison saw himself as the spokesperson for the English gentleman, and this confident self appraisal was probably not far from the mark since, "[T]he influence of the *Spectator* on English manners and taste has been described as being only slightly less than that of the Bible."[159]

In an age when reason was believed to be the most expedient method for discussing the existence of God, Addison was a champion of the design argument. He shared with Paley a love for natural history and believed in the providential design of animals. Indeed, in 1710 he wrote, "the arguments for Providence drawn from the natural history of animals being in my opinion demonstrative."[160] As most philosophers of his time, he had a high regard for nature: "Infinite goodness is so communicative in nature, that it seems to delight in the conferring of existence upon every degree of perceptive being."[161] In an excellent chapter on Addison's proofs for divinity, Edward and Lillian Bloom aver: "Addison himself, for personal and altruistic reasons, was eager to set forth in the *Spectator* various demonstrations for divinity. By defining the basis of his own belief, he intended a lesson in religious understanding, to show the need for obedience to ecclesiastical authority and submission to supernal will."[162] Paley probably first came to Addison's writings when he wrote his Cambridge lectures, and later his *Horae Paulinae*, *Evidences* and *Moral Philosophy*—in fact, the chapter headings in Addison's *The Evidences of the Christian Religion* bear an intriguing resemblance to the topics in Paley's *Evidences*. In addition to his essays in the *Spectator*, Addison wrote for two other serials, the *Tatler* and the *Freeholder*. In these essays Addison often addressed the practice and morality of religious belief. These writings would have been easily available to Paley. When Addison died, a vast sample of his writings was collected by Richard Hurd, the Bishop of Worcester, and were readily published for the next one hundred years.

Like Paley, Addison borrowed many of his teleological arguments and examples from other natural theologians/philosophers like Ray and Derham. He also believed there were not any inherent organising principles to be found in matter. Although Paley only gives one reference to Addison in *Natural Theology*, Paley's system of eloquently

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[158] For a short summary of Addison's life, see the *Preface* in volumes I and II of Richard Hurd, *Addison's Works* (London: Henry G. Bohn, 1854). For a more detailed treatment, see Peter Smithers, *The Life of Joseph Addison* (Oxford: Clarendon Press, 1954).

[159] Maximillian E. Novak's introduction to Edward A. Bloom, Lillian D. Bloom, and Edmund Leites, *Educating the Audience: Addison, Steele, & Eighteenth Century Culture* (Los Angeles: University of California Press, 1984), vi.

[160] *The Spectator*, No. 120.

[161] *The Spectator*, No. 519.

[162] Edward and Lillian Bloom, *Joseph Addison's Sociable Animal – In the Market Place, On the Hustings, In the Pulpit* (Providence: Brown University Press, 1971), 187.

reworking tried and proven examples is far from dissimilar. This pilfering of proofs was excepted and even applauded if they were astutely restated. The preface of *The Evidences of the Christian Religion* quotes the theologian Thomas Burnet's positive opinion about Addison. Burnet, a widely read theologian, knew Addison well and even preached his funeral sermon. The quotation praises Addison for thoughts concerning the "wisdom and greatness of God". Burnet then quotes Addison's praise of the Royal Society, "'wishing them a happy success in their laudable attempts, to discover the true nature of the works of God; and praying that they and all other searchers into physical truths, may cordially refer their attainments to the glory of the great author of nature and to the comfort of mankind'".[163] Throughout his *Evidences*, Addison emphasises that revealed theology is far superior to natural theology. But, the proofs of nature add to what God has provided in the scriptures. Thus, in his chapter, 'Advantages of Revelation above Natural Reason', we see Addison writing about the church, "where our adoration is directed to the supreme Being, and (to say the least) where is nothing either in the object or manner of worship that contradicts the light of nature."[164]

In addition to Addison's belief in "the light of nature", his essay, the 'Immateriality of the Soul' (one of his more well known expositions of teleological reasoning), gives three proofs for the soul's immortality. The first is the immaterial nature of the soul itself. The second is from the soul's inherent passions and sentiments, which he lists to be "love of existence," "horror of annihilation", "hopes of immortality", satisfaction in practising virtue and the "uneasiness" accompanied with committing a vice. The third is the just, good and wise nature of the Supreme Being.[165] These are points that have been "opened and improved by other who have written on the subject." Interestingly, after listing these proofs, Addison slips in his own example. He asks, "How can it enter into the thoughts of a man, that the soul, which is capable of such immense perfections, and receiving new improvements to all eternity, shall fall away into nothing almost as soon as it is created?"[166] This quote, and most of Addison's program, relies on the cosmological argument for design and fits well within the eighteenth century's chain of being approach to natural history.

However, even this example was pilfered off the platter of pre-existing providential proofs, as indicated by Hurd's seemingly apologetic editorial footnote at the bottom of the page of *Spectator* No. 111: "See this subject finely pursued by Mr. Wollaston.—Still, there are those who will acknowledge no force in the argument." This

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[163] Joseph Addison, *The Evidences of the Christian Religion with Additional Discourses on the Being and Attributes of God and other Important Doctrines of Natural and Revealed Religion, 5th Edition* (Glasgow: Robert Urie, 1759), v-vi.
[164] Addision, *Evidences*, 180.
[165] *Spectator* No. 111, Hurd, Vol. II, page 443. The Blooms also comment on these proofs on page 199.

being the situation of eighteenth century teleological writing, Paley's subsequent pilfering of Addison's design proofs should not be a surprise. As we will see in Chapter 6, Paley skilfully regurgitates Addison's essay on instinct in his "On Instincts" chapter in *Natural Theology*. However, more importantly for Paley's treatment of natural history, it is significant that Paley references Addison when he is discussing animal instinct. Much of natural history in the eighteenth century went far beyond empirical description and often bestowed human attributes upon animals or attempted to explain why nature was the way it was. From Addison at the beginning of the century, to Gilbert White's *Natural History of Selborne* near the end, natural history and anthropomorphic literary techniques such as personification and teleological arguments often went hand in hand. Paley often does this in *Natural Theology* to make the reader more sympathetic to his argument. It is then only fitting that one of his authoritative authors should be one who also skilfully exhibits this ability.

William Withering and Little Spiral Bodies

Aside from both being mentioned in Paley's 'On Plants' chapter, William Withering (1741-99) and Erasmus Darwin share another significant connection: they were disputants in two well known eighteenth century botanical quarrels. The first one concerned which of the two had discovered that digitalis could be used for medicinal purposes and the second regarded the nomenclature of English plants. This debate was well known because, in the larger picture of latter eighteenth century botany, Withering was a significant scientific figure. In 1766 he received a M.D. from the University of Edinburgh. He then established a prosperous medical practice in Stafford and became an active member of the Lunar Society, the Linnaean Society, the Royal Academy of Sciences of Lisbon and the Royal Society. His life long work was the creation and continual revision of *A Botanical Arrangement of all Vegetables Naturally Growing in Great Britain* first published in 1776. The third edition of the work in 1796 bore the title *An Arrangement of British Plants; According to the Latest Improvements of the LINNÆAN SYSTEM*.[167] This book was a standard botanical text in Britain and enjoyed acclaim in both France and Germany. Outside academic circles, because it was a clearly written and well organised book, *Botanical Arrangement* was the leading text for British naturalists at the end of the eighteenth century. It was deliberately aimed at a popular audience and was accordingly written in English and not Latin.[168] Withering also wrote several medical and mineralogy treatises and maintained a personal interest in meteorology. Like many of the previously mentioned sources for *Natural Theology*,

[166] Hurd, Vol. II, 444.
[167] Since Paley used the *Botanical Arrangement* title, I have adopted the same title to refer to the book for the rest of this section.

Withering was a firm believer in the natural theological enterprise. In the final words of the *Introduction* added to the third edition of *Botanical Arrangement*, Withering asserts the following about his botanical pupils/readers:

> *They will find that the Study of Nature is ever attended with pleasing reflections: that the Study of Botany, in particular, independent of its immediate use, is as healthful as it is innocent. That it beguiles the tediousness of the road, that it furnishes amusement at every footstep of the solitary walk, and, above all, that it leads to pleasing reflections on the bounty, the wisdom, and the power of the great CREATOR.*[169]

The rest of the book is a listing, description and bibliography of plants based on the Linnaean system.

The references to Withering that Paley actually chooses to identify (e.g. he sometimes fails to include an edition and page number),[170] come from the second and third editions of *A Botanical Arrangement*. Three of these references/commonplaces concern the *cuscuta Europaea*, the *colehicum autumnale* and the roots of mistletoe. They function as botanical descriptions inserted into mini arguments for providence. For instance, after his reference to the *colehicum autumnale*, (autumnal crocus), Paley quotes Withering on the seasonal formation of its blossoms: "As this plant blossoms late in the year, and probably would not have time to ripen its seeds before the access of winter, which would destroy them, Providence has contrived its structure such, that this important office may be performed at a depth in the earth out of reach of the usual effects of frost."[171] In the footnote, Paley states that this quotation is taken from page 360 of *Botanical Arrangement*. He gives no edition. Perhaps this occurs on 'page 360' of the first or second edition, but it does not occur in the third edition of *Botanical Arrangement* cited by Paley in the first edition of *Natural Theology*. Even the editors of *Natural Theology's* 1826 edition, who found the correct page and volume number for two other ambiguous Withering references, were not able to identify the location of this quotation. This makes one wonder if Paley was concerned about properly identifying the location of his scientific information or if he was only interested in the validity the information gave to his argument. Moreover, Paley would have had to diligently scour the pages of *Botanical Arrangement* to find the references to Providence that he quotes in *Natural Theology*. This is because Withering sticks to the botanical facts and only writes about his vague theological convictions a couple of times in the entire book.

When referencing or quoting Withering, Paley remains faithful to the botanical information listed in *Botanical Arrangement*. Compare the following descriptions of

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[168] David Elliston Allen, *The Naturalist in Britain* (London: Penguin Books, 1976), 48.
[169] William Withering, *An Arrangement of British Plants; According to the Latest Improvements of the LINNÆAN SYSTEM: To which is Prefixed an Easy Introduction to the Study of Botany, Vol. II* (London: M. Swinny, 1796), 30.
[170] By the 1820s, editors of *Natural Theology* solved this problem by ascertaining and then inserting the volume and page numbers of *Botanical Arrangement* referenced by Paley.
[171] Chapter XX, 'Of Plants'.

cuscuta europæa. First, Withering's summary of Linneaus, as indicated by the *LINN* at the end of the text:

> *This plant is parasitical, without seed lobes. The seed itself opens and puts forth a little spiral body, which does not seek the earth to take root, but climbs in a spiral direction from right to left, up other plants, from which, by means of vessels, it draws its nourishment. Leaves none, except here and there a very small membranaceous scale lying close under a branch. LINN.*[172]

Second, Paley's quotation of Withering:

> *"The* cuscuta Europæa *is a parasitical plant. The seed opens and puts forth a* little spiral body, *which does NOT seek the earth to take root, but* climbs *in a spiral direction, from the right to left, up other plants, from which, by means of vessels, it draws its nourishment."* [173]

Even though Paley uses quotation marks, the quotation is not word for word. Also, Paley chooses to add emphasis to the words "spiral" and "climb" because they serve to rhetorically strengthen his design argument—an argument not present in Withering's description. The following sentence occurs immediately after Paley's above quotation:

> *The "little spiral body" proceeding from the seed, is to be compared with the fibres which seeds send out in ordinary cases; and the comparison ought to regard both the form of the threads and direction. They are straight; this is spiral. They shoot downwards; this points upwards. In the rule, and in the exception, we equally perceive design.*

As with his comments about anatomy and astronomy, it seems that Paley is faithful in his representation of the actual empirical description of the physical object or idea taken from his sources. But, it seems Paley is not as faithful to original context from which the empirical commonplace is taken. Furthermore, here we reach a question of intent and informational lineage. The flow of botanical information regarding the *cuscuta* originated with Linnaeus (or even possibly an herbal written by monks), was used by Withering and then was passed on to Paley. Although all these people believed in the design argument, all of their intentions were slightly different. The basic empirical or physical description of an object taken from the natural world remained the same while the structuring of theories or beliefs around it changed.

Chapter 4 Conclusion

In this chapter we investigated who Paley's natural history sources were and how he used them. All of the authors cited were staple reading material for Paley's gentlemanly audience. Erasmus Darwin was not only a botanist and physician, he was also a well published poet of natural philosophy. John Ray, William Derham and Bernard Nieuwentyjt had been standard names in natural theology for well over half a century. Oliver Goldsmith's *Animated Nature* was one of the most popular natural histories of the latter eighteenth century. The early writings of the French Academy still connoted French

[172] Withering, *An Arrangement of British Plants*, 209.
[173] Chapter XX, 'Of Plants'.

scientific authority, yet, allowed Paley to avoid the negativity associated with post-revolution French science. Joseph Addison was probably the most recognised eighteenth century authority on polite discourse. William Withering was one of the leading proponents of the Linnaean system whose authority was demonstrated by the many editions of his book *Botanical Arrangement*. By investigating the authority of these authors in Paley's context, we also found that, like his anatomy and astronomy sources, Paley often selected authors whose personal natural theological convictions were similar to the one he was arguing in *Natural Theology*. Paley knew that his audience would also know the convictions of his authors and therefore his sources often contributed to the inductive assent characteristic of his rhetoric.

In addition to discussing why Paley cites these authors, I also investigated how he used them. In several instances, it was apparent that Paley's sources themselves would not have necessarily agreed with how Paley used the information taken from their books. For instance, the French Academy was more interested in looking at what they deemed to be the empirical 'facts' from the natural world. Paley's usage of their work in a natural theological argument was not consistent with the objective reason they were interested in propounding. Paley also reworded botanical descriptions from Withering's book and then placed the rewording in quotations. In this act, Withering's material was reworked so that it distinctly reflected Paley's own conception of design. These types of examples make one wonder if Paley respected the source in itself, or if he respected it because of the implied scientific value it could give to his argument. This type of question brings us back to the rhetorical foundations of the book. Paley was careful not write anything that would offend the majority of his audience. The fact that *Natural Theology* was so popular gives us insight into just what type of reworking of data or misrepresentation of sources his audience was willing to accept. Clearly Paley's descriptions and quotations based loosely on authors like Withering and the French Academy did not produce too many ripples in the 1802 intellectual pond. Most of the reviews written about *Natural Theology* hail it as a masterpiece. Therefore, the inserting or slight twisting of information taken from other sources in the name of the argument at hand seems to be acceptable provided that argument appeals to the general sentiments of the audience. It is this contextual milieu that shaped Paley's argument—it is this contextual milieu that made it successful.

SECTION III
BEHIND THE RHETORIC
Paley's Natural History Commonplaces

There is no subject in which the tendency to dwell upon select or single topics is so usual, because there is no subject, of which, in its full extent, the latitude is so great, as that of natural history applied to the proof of an intelligent Creator.
—Chapter XXVII

Chapter 5
NATURE, LAW AND PLANETARY ASTRONOMY
Paley's Inanimate Commonplaces

Chapter 5 Introduction

Now that Chapters 3 and 4 have discussed why Paley's sources appealed to his audience, Chapters 5 and 6 will explain the actual scientific concepts that *Natural Theology* laid before them. As he states in *Natural Theology*, Paley was not writing a system of natural history. But this did not stop him from making a *tour de force* of the known natural world. When considering the breadth of natural history information available in *Natural Theology*, it is once again helpful to remember that Paley was a product of the eighteenth century. In this intellectual setting, broad sweeping ideas about nature were commonplace and a gentleman could confidently claim to be both an adept natural philosopher and a connoisseur of fine literature. Paley uses both of these qualities to weave his rhetorical argument. Since Paley had his own agenda for his natural history commonplaces, he does not present them systematically and, therefore, related ideas and terms are scattered throughout the five hundred pages of *Natural Theology*. This effectively makes the book one gigantic jigsaw puzzle of natural history commonplaces. There are many ways one could try to reassemble these commonplaces to see just what Paley is saying about key scientific concepts. As these next two chapters will demonstrate, every single natural history commonplace is taken from the observable 'is' of nature. All of the stated scientific information is accepted, established and empirical. Paley uses ontological examples and refrains from metaphysical speculation. Likewise, Paley is not interested in origins. He is not interested in explaining how God made the natural world. With this commitment in mind, the question that shapes the next two chapters is: what is the 'is' of the natural world presented by Paley's natural history commonplaces?

After considering the book in its entirety, it seems that these commonplaces generally fall into one of two categories: those which represent inanimate matter and those which represent animate matter. I analyse Paley's inanimate matter commonplaces in Chapter 5. The first half of Chapter 5 details what Paley writes about two overarching concepts that affected his selection of inanimate commonplaces for *Natural Theology*: Nature and Law. Like many of his contemporaries, Paley's concept of 'nature' had many different facets. At times he refers to nature as fixed and at other times he refers to it as active. The oscillation between these two related, but different conceptions of nature was not only a rhetorical move, but also a frequent occurrence in latter eighteenth century England. Paley was aware of the protean status of this word and he sometimes used its

ambiguity to his advantage. Another multi-nuanced term in Paley's day was the word 'law'. It could mean a mechanical, natural or scriptural law. Since all 'laws' at this time were believed to originate with the divine law-giver, this inter-relation was possible. On the whole, the textual context of Paley's reference to a law can usually determine what type of law he was writing about—but there are some ambiguous instances that offer little indication as to whether or not Paley is referring to scriptural or Newtonian laws. Like the word 'nature', the protean status of 'law' was maximised for its rhetorical possibilities.

The second half Chapter 5 delineates Paley's conception of planetary astronomy as portrayed by the commonplaces that he chose to include in *Natural Theology*. Paley's first sentence in the 'Astronomy' chapter of *Natural Theology* bluntly states, "My opinion of Astronomy has always been, that it is *not* the best medium through which to prove the agency of an intelligent Creator." Many historians have taken this statement at face value and skipped over this last chapter of jigsawed scientific and theological information. Yet, as I explained in Chapter 2, Paley often uses the rhetorical tool of preliminary degradation before he introduces pertinent information that might indirectly damage his argument. This chapter is no exception. Immediately following the sentence quoted above, Paley goes on to aver, "[B]ut that, this being proved, it shows, beyond all other sciences, the magnificence of his operations. The mind which is once convinced, it raises to sublimer views of the Deity than any other subject affords."[174] In other words, astronomy commonplaces provide persuasive examples for his design argument.

Since Paley lived in the eighteenth century, he took most of his examples from that time period and even from the preceding centuries. Thus, it was these seventeenth and eighteenth century scientific commonplaces that greeted the many eyes that perused the pages of *Natural Theology* in the *nineteenth* century. Moreover, even though Paley's chapter about astronomy is very small compared to the amount of writing he spends on animal and vegetable natural history, it would be brought under increasing scrutiny as the nineteenth century made rapid advances in astronomy and geology. This situation makes this one small chapter of limited information just as significant as the many other chapters devoted to other aspects of natural history. It is the purpose of Chapter 5 to identify and discuss the cosmology promulgated by astronomical commonplaces of *Natural Theology*. It delineates the picture of the natural world that Paley paints with his palate of animate matter commonplaces for the scientifically nescient or prescient eyes of his 1802 reading public.

Part I
The Insatiable Variety of Nature: Paley's Conception of 'Nature' and 'Law'

Natura naturans and *Natura naturata*

Throughout Western history, there have been four prevailing arguments for the existence of God: cosmological, ontological, teleological and moral. Using a series of scientific commonplaces, Paley offers his reader one of a teleological variety, with a dash of cosmological spice on the side. His analogies are taken from the observational 'is', examples that can be directly observed in the natural world. This method was simply a continuation of the ethical works that he wrote in the decades before *Natural Theology*. When writing about Paley's pragmatic moralism, D. L. LeMahieu states: "In the interplay between abstract theoretical principles and immediate realities, he inevitably chose the latter, the 'is' over the 'what might be'".[175] Likewise, when writing about natural history, Paley devotes his effort to the 'is' of the natural world, rather than the 'what might have been', thereby avoiding what has been called the Kantian "illegitimate question of the ultimate origin of living organizations."[176] Paley makes this commitment clear throughout the entire book with statements like: "In strictness, however, we have no concern with duration prior to that of the visible world"[177] In this sense, Paley is a true empiricist because he only considers natural phenomena that can be observed. Indeed, Newtonian science studied phenomena as they might be observed here and now, refusing to speculate on the origin of things.[178]

To understand Paley's teleological argument, it is crucial to delineate the nuances represented in his usage of the words 'nature' and 'natural' During the eighteenth century, these two words implied a plethora of variegated meanings significantly influenced by the ethical, theological, political and/or natural philosophical commitments of the author and audience. How did Paley fit into this milieu? We will first look at Paley's use of the word and then compare it with the concept of 'nature' that existed in the eighteenth century. First and foremost, for Paley, above nature there is "Divine Nature". It is "a Being, infinite, as well in essence as in power". Moreover, this Deity exists above, and is not to be confused with, "what is sometimes called nature and sometimes called principle."[179] This division of the natural world into a tangible static "nature" and into intangible

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[174] All Paley quotations, unless otherwise designated, are taken from Chapter XXII, 'Astronomy'.
[175] D. L. LeMahieu, *The Mind of William Paley - A Philosopher and His Age* (London: University of Nebraska Press, 1976), 116.
[176] Nicholas Jardine, 'The Significance of Schelling's "Epoch of a Wholly New Natural History": An Essay on the Realization of Questions', in R.S. Woolhouse, ed. *Metaphysics and Philosophy of Science in the Seventeenth and Eighteenth Centuries* (London: Kluwer Academic Publishers, 1988), 331.
[177] William Paley, *Natural Theology*, Chapter XXIV, 'Of the Natural Attributes of the Deity'.
[178] G. S. Rousseau and Roy Porter, *The Ferment of Knowledge – Studies in the Historiography of Eighteenth Century Science* (Cambridge: Cambridge University Press, 1980), 279.
[179] Both quotes taken from Chapter XXIII, 'Of the Personality of the Deity'. Addison also uses the term 'Divine Nature' in a similar manner. See *The Spectator*, No. 565, Friday, July 9, 1714.

"principles" is a foundational assumption behind Paley's design proofs. When Paley uses the word 'nature', he could mean either of these two concepts. To use the classical distinction, these two concepts are *Natura naturans* and *Natura naturata*. As a scholar of classical ethics, Paley would have been well aware of these terms. *Natura naturata* refers to the created, passive and fixed aspects of nature. It is frequently associated with scholastic Aristotelian deductive reasoning. This would be what Paley means by "nature" in the above quotation. *Natura naturans* refers to the creative, changing and active manifestations of nature. It is often linked with the new, inductive approach to nature ushered in by the Renaissance and such authors as Francis Bacon.[180] This would be what Paley means by "principles" in the above quotation. Note the following list:

Natura naturata	*Natura naturans*
Scholastics	Renaissance
Deductive	Inductive
Created	Creative
Fixed	Active

Let us further investigate the presence of these two concepts in *Natural Theology*. First, we will examine *Natura naturata*. Paley writes about this concept in two different ways. One way is to use the word 'nature' in its lowercased form. Two of the many pertinent examples of this concept can be found in the 'On Insects' chapter. When making one of his many teleological points, Paley avers: "[I]t seldom happens that precisely the same purpose, and no other, is pursued in any other work which we compare, of nature and of art." Like a work of art, nature in its *Natura naturata* mode is created. Likewise, a page later, Paley quotes Cicero, one of the progenitors of teleological reasoning: "But to return to insects. I think it is in this class of animals above all others, especially when we take the multitude of species which the microscope discovers, that we are struck with what Cicero called 'the *insatiable* variety of nature.'". The second, and by far most prevalent, manifestation of *Natura naturata* in *Natural Theology* is countless data presented in the commonplaces Paley enlists for his design argument. It is this fixed aspect of the natural world that provides the observable stuff on which Paley builds his proofs.

Paley's concept of *Natura naturans* is "that intelligence which was [or is] employed in creation".[181] It is active and observable. It sometimes resembles an attribute of God. When writing about *Natura naturans*, Paley sometimes paints a confusing picture because he uses both "Nature" (uppercase) and "nature" (lowercase) to refer to this concept. Compare the following quotes from Paley's 'On Plants' chapter. Our first example is a capitalized *Natura naturans*: "When we come, however, to look more

[180] D. G. Charlton, *New Images of the Natural in France* (Cambridge: Cambridge University Press, 1984), 67-69. Paolo Rossi also writes about this in his book about Francis Bacon.
[181] Chapter XIV, 'Prospective Contrivances'.

closely into the structure of this plant [autumnal crocus], we find that, instead of its being neglected, Nature has gone out of her course to provide for its security, and to make up for its defects." A second *Natura naturans* example is non-capitalized and occurs when Paley is writing about the *dionæa muscipulta*: "Here, under a new model, we recognize the ancient plan of nature, viz., the relation of parts and provisions to one another, to a common office, and to the utility of the organized body to which they belong."[182] This upper and lowercase oscillation between *Natura naturans* 'nature' references sometimes makes it difficult to initially discern whether or not Paley is writing about *Natura naturata* or *Natura naturans*. Interestingly, Paley uses the word "nature" most often to refer to *Natura naturans*. This is because, as mentioned above, all of the natural commonplaces that he provides on just about every page are de facto *Natura naturata*.

At this juncture, we must consider whether or not Paley's use of the word 'nature' is representational of the word's use in other literature of the time. A casual glance at the *Oxford English Dictionary's* entry for the "nature" demonstrates that the word had a plethora of meanings in the eighteenth century alone. It was a word that was used in just about every academic and literary circle. These different meanings were only accentuated in the permissive exegetical and doctrinal climate of Hanovarian England.[183] In general, the term 'nature' went through several definitions during the eighteenth century.[184] Sometimes the natural philosopher's usage agreed with the poet's. Sometimes it didn't.[185] In general, during the first four decades of the eighteenth century, the term 'nature' was used to refer to the immutable and telic natural world created by God and ordered by mechanical laws that God had set in motion. The approach was generally that of *Natura naturata*. God, not 'nature', was the active force behind matter. In the middle of the century, this view began to change. The application of Newtonian physics demonstrated that the universe ran rather well on its own and really did not need frequent twiggings from God. In addition, a growing influx of specimens from the Americas suggested that certain animal and plant species might be mutable. Thus, 'nature' became an active force of its own—but a force still fully subordinate to God. At the end of the century, the French

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[182] It must be noted that Paley's references to *Natura naturans* seek only to explain teleological aspects of the observable natural world. As we noted above, and will see again below, Paley is not interested in origins. The *dionæa muscipulta* is colloquially known as a sundew. The nomenclature Paley used for this plant was obsolete by 1830. John Lindley, *An Introduction to the System of Botany* (London: Longman, Rees..., 1830), 154.

[183] This subject is informatively addressed by Roy Porter's 'Creation and Credence' chapter in Barry Barnes and Steven Shapin, *Natural Order – Historical Studies of Scientific Culture* (Beverly Hills: Sage Publications, 1979).

[184] See Jacques Roger's 'The Living World' chapter in G. S. Rousseau and Roy Porter; A. E. Pilkington, ''Nature' as Ethical Norm in the Enlightenment' in L. J. Jordanova, *Languages of Nature – Critical Essays on Science and Literature* (London: Free Association Books, 1986); P. M. Heimann, 'Voluntarism and Immanence: Conceptions of Nature in Eighteenth Century Thought' in John W. Yolton, *Philosophy, Religion and Science in the Seventeenth and Eighteenth Centuries* (Rochester: University of Rochester Press, 1990), 393-405.

[185] The natural theological use of natural history was practiced frequently by British poets during the eighteenth century. See William Powell Jones, *The Rhetoric of Science – A Study of Scientific Ideas and Imagery in Eighteenth-Century English Poetry* (London: Routledge and Kegan Paul, 1966) and Martin C Bettestin's 'Tom Jones': The Argument of Design' in *The Augustan Milieu* (Oxford: Clarendon Press, 1970).

Revolution occurred. In France, based on advances in chemistry, geology and sidereal astronomy, the concept of 'nature' became an independent active force that was mutable—a *Natura naturans* that eliminated the need to refer to God.

In England at the end of the eighteenth century, however, the term remained a boggled mixture of the *Natura naturans* and the *Natura naturata*, depending on the political atmosphere.[186] It bore heavy social connotations for any gentlemanly reading audience. To this audience, 'nature' and 'natural' were significantly tied to the ethical foundations of Britain's political order. Not only did the word and its adjective have the *Natura naturans* and the *Natura naturata* connotations, it also could refer to 'human nature' and its long standing ethical link to 'Natural Law'. Willey writes about this predicament: "'Natural' in this context...lost all reference to what is original or primitive", it came to mean what was congenial and representative of, "the educated and most polite nations of the civilized world."[187] Therefore, from natural histories to theological mysteries, the word was woven back and forth through the literary fabric so much that it became a protean term. Considering this, Paley's fluctuating usage of 'nature' does conform to the contemporary intellectual climate's usage of the term. In fact, it serves well to illustrate the confusion surrounding the term and its diminutives at the end of the century.

Conflation and Equation of 'Law'

As we noted, *Natura naturata* commonplaces form the bulk of Paley's rhetorical design argument. Most of these examples are taken from animated nature, that is, the animal and vegetable realms. From observing these examples alone, Paley argues that a person can observe a telic 'order' in the natural world because, "Order itself is only the adaptation of means to an end: a principle of order therefore can only signify the mind and intention which so adapts them."[188] This telic 'order' then leads one to look beyond a the microcosmic to the macrocosmic where one will then see an even grander "order of things" (Paley uses the term "the order of things" to signify what he understands to be the interdependent and mechanically sound operations of "nature").[189] When this happens, one

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[186] Yet, it could be argued that this phenomena existed before the Revolution. Just to select one author out of the many, Gilbert White's *Natural History of Selborne* (written during the 1770s, 1780s and published in 1789) demonstrates this double usage of the term "nature". Compare the following verse to a quotation take from a letter to Daines Barrington. First the verse:

> *The pendent forest, and the mountain green,*
> *Strike with delight; there spreads the distant view,*
> *That gradual fades till sunk in misty blue:*
> *Here Nature hangs her slopy woods to sight,*
> *Rills purl between, and dart the quivering light.*

Now, the letter to Barrington: "Not that system is by any means to be thrown aside; without system the field of Nature would be a pathless wilderness." In the first quote, "Nature" is active, in the second it is passive—even though he capitalizes both words. Gilbert White, *The Natural History of Selborne* (Oxford: Oxford University Press, 1993), 3,195.

[187] Basil Wiley, *The 18th Century Background – Studies on the Idea of Nature in the Thought of the Period* (London: Chatto & Windus, 1980), 20.

[188] Chapter V, 'Application of the Argument Continued', Sect. VI.

[189] This type of reasoning is directly linked to Paley's ethical conception of the world. It is also very similar to Abraham Tucker's *The Light of Nature* (1768-78). LeMahieu noted this point, as did Leslie Stephen. For a treatment of Tucker's teleology and concept of

comes to appreciate other design examples taken from mechanical 'laws' of the mineral realm. Like any good Newtonian, Paley believed this "order of things" is empirically observable, fixed and must not be used to extrapolate the 'origin of things'. Moreover, Paley assumes that the reader has the sense to recognize this animated and mineral 'order' and fully admits that his argument depends on this recognition: "the established order of nature" must be supposed to prevail, "or we cannot reason at all upon the subject".[190]

Let us now unravel what Paley means by 'law'. Like 'nature', this word is a highly contextual and often a confusing term. When referring to the mathematical 'laws' of Newtonian natural philosophy above, I was very careful to use the term 'mechanical laws'. This is because a thorough reading of *Natural Theology* demonstrates that Paley often conflates mechanical 'laws' with ethical 'laws'. In Paley's intellectual context, the term 'nature' and the term 'law' were often used as corollary terms. Where there was 'nature' there was 'law'. This was not only true of the physico-theology writers like Paley, but of their critics as well. Glacken has observed that, "Of the eighteenth century thinkers critical of the design argument and the teleological view of living nature, the general opinion was that they [the critics] often drifted into triviality; they were too centered on human problems, they too readily identified human needs with Natural Law." Subsequently, the association of mechanical 'laws' with ethical 'laws' so affected empirical research that "One sees in the serious writers of nature, like Buffon and Goethe, an even greater impatience with final causes in studying nature and with the glaring failure to distinguish between laws of nature and the conveniences of man."[191]

Because of this conflation of terms and for purposes of clarity, I will set out some definitions before we delve further into Paley's 'laws'. I use the term 'Natural Law' to connote the eighteenth century's conception of ubiquitous laws found by reason in human nature. Natural Law in this sense is therefore an ethical term. In his book about the French enlightenment, Crocker lucidly explains that there were two different sources of moral judgement in the eighteenth century. One source was scripture, which was gained through *revelation*. The other source was that of custom or human moral progress. This was gained through *reason*. In between reason and revelation was Natural Law. "It holds moral truths to be prior to experience and yet involved in experience, to be above expediency and yet be fundamentally more useful than expediency, to be set forth by the will of God and yet directly discoverable by each human being through that intuitive

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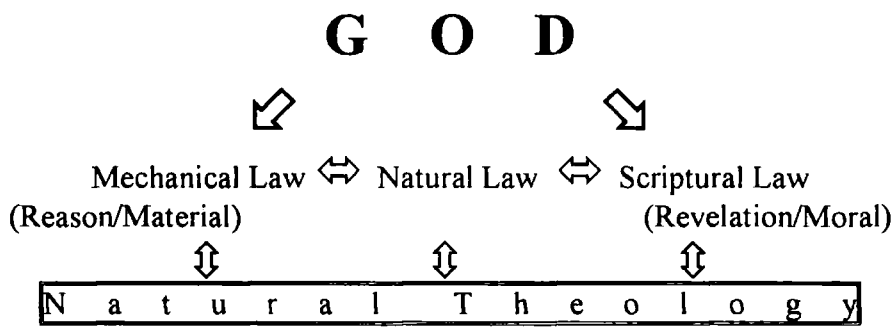
order see William Glen Harris, *Theology in the Philosophy of Joseph Butler and Abraham Tucker* (Ph.D. Dissertation: University of Philadelphia, 1941).

[190] Chapter XXVI, 'The Goodness of the Deity'. The previous quote taken from Chapter V, 'Application of the Argument Continued'.

[191] Clarence J. Glacken, *Traces on the Rhodian Shore – Nature and Culture in Western Thought from Ancient Times to the End of the Eighteenth Century* (London: University of California Press, 1967), 517-518.

aspect of his rationality commonly called 'right reason.'"[192] Throughout Western history, the concept of Natural Law has been a moral corollary of 'human nature', 'state of nature' and 'law of nature'. Since it was an ethical norm found in human 'nature', it was often viewed on the same level as any other 'law' from the natural world. However, for the purposes of this study on Paley's eighteenth century context, we must differentiate Natural from 'Mechanical Law'.

As intimated above, the term 'Mechanical Law' connotes the mathematical principles deduced from Newtonian physics. In this usage, Mechanical Law is thus a natural philosophical term. As a historiographical point, I must hasten to add that Mechanical Law is not a *term* that occurs readily during Paley's time. But, the *concept* of Mechanical Law does occur frequently, especially at the end of the eighteenth century and so for the lack of a better word, this is why I use the term. Like the terms Natural Law, 'human nature' and 'state of nature' and 'law of nature,' 'Mechanical Law' was understood to be created by God. As with most natural theologies, both Mechanical Law and Natural Law were *supplementary* to the Scriptural Laws found in the Bible. Building on Crocker's explanation, Mechanical Law was associated with reason and Scriptural Law was associated with revelation and Natural Law was in between them. During Paley's life, Natural theology in England was the popular medium where the interactions, commonalties and overlappings of the concept of 'law' could be discussed. A study which investigates how this medium allowed the British reading public to differentiate between Mechanical, Natural and Scriptural Law is yet to be written. But for the time being, let the following diagram suffice:



In *Natural Theology*, Paley uses the term 'law' to refer to Mechanical Law, Natural Law and Scriptural law. This amalgamation, or perhaps, conflation, was characteristic of the literature of the time and occurred frequently among most of Paley's sources. Erasmus Darwin is probably the best example. Regarding the amalgamatory status of the term 'nature' in Darwin's writings, McNeil asserts, "Darwin sought to provide a framework which would incorporate all social, intellectual, and moral

[192] Lester G. Crocker, *Nature and Culture – Ethical Thought in the French Enlightenment* (Baltimore: Johns Hopkins Press, 1963), 3.

developments into the operations of nature. 'The laws of motion are the laws of nature', he observed in the first page of his medical treatise Zoonomia."[193] A cursory overview of Paley's sources easily reveals that the nuances of the words 'law' and 'nature' changed within the context of each author's personal belief system. The word 'law' could be mechanical for Cheselden, it could be moral for Addison and so on. This propensity was also true for pre-Revolutionary French literature. Even Voltaire had conflated the concept of Mechanical Law and Natural Law.[194] One should therefore not be surprised to find that Paley not only conflates, but equates a Mechanical Law with a Natural Law: "But what do we mean by the laws of nature, or by any law? Effects are produced by power, not by laws. A law cannot execute itself. A law refers us to an agent."[195] In Paley's rhetoric, this and other references to an agent make both the material Mechanical Laws and the moral Natural Law telic. Once this is established, "[I]t may also be asserted, that the general laws with which we are acquainted, are directed to beneficial ends."[196] In this case, order and 'laws' (in the collective sense) are a means to determining the teleological ends of natural theology.

This telic view of order and law excludes the acceptance of chance and does not permit change that would allow anything in the world to deviate from its divinely appointed purpose. Paley knew that his argument would not be effective if he could not convincingly eliminate these two concepts. In regard to change, he opts for an implicit attack. He does this by peppering his design proofs with anthropomorphic descriptions and verbs. Like the long history of natural theology from which he drew, this made empirical observations of the natural world personal and meaningful and therefore more believable. For example, see how chance is implicitly ruled out in the following quotation: "*Grasses* are Nature's care. With these she clothes the earth; with these she sustains its inhabitants. Cattle feed upon their leaves; birds upon their smaller seeds; men upon the larger; for few readers need be told, that the plants which produce our bread-corn, belong to this class."[197] Conversely, Paley takes chance head on, or at least, he *claims* to address directly the challenge chance makes against his argument: "NATURAL THEOLOGY has ever been pressed with this question: Why, under the regency of a supreme and benevolent Will, should there be, in the world, so much as there is of the appearance of *chance*?" The key words here are *appearance of chance*. Since everything is governed by God and Mechanical and Natural Laws that God set in motion, there is no

[193] Maureen McNeil, 'The Scientific Muse: The Poetry of Erasmus Darwin', L. J. Jordanova, Ed., *Languages of Nature: Critical Essays on Science and Literature* (London: Free Association Books, 1986), 172.
[194] Peter Gay, *The Party of Humanity – Studies in the French Enlightenment* (London: Weidenfeld and Nicolson, 1959) ff. 9, pp. 200-201.
[195] Chapter XXIV, 'The Natural Attributes of the Deity'.
[196] Chapter XXVI, 'The Goodness of the Deity'.
[197] Chapter XX, 'Of Plants'.

room for chance. Humans may not be able to see these laws at work, but they are still there. As Paley states, "The *appearance of chance* will always bear a proportion to the ignorance of the observer." When dice are cast, the observer may not know the outcome, but despite the observer's ignorance, this outcome is still determined by the Mechanical Laws operating upon the dice. When a jury makes its decision about the action of a free agent, the observer may again not know the outcome, but the decision is determined by the Natural Law framing the jury's deliberation. In both cases, "The difference resides in the information of the observer, and not in the thing itself; which, in all the cases proposed, proceeds from intelligence, from mind, from counsel, from design"[198] Thus, when Paley directly addresses chance, it is not an option.

PART II
An Orange in the Moderating Hand: Paley's Planetary Astronomy

Paley's Planetary and Astronomical Commonplaces

A high percentage of British natural philosophical energy during the eighteenth century was spent upon applying Newtonian principles to the natural world. Astronomy was no exception. At the beginning of the century, there was a great deal of theoretical astro-theological speculation and the plethora of books on this topic during this time period demonstrates the prominence and cultural fertility of these speculative systems. During the 1750s through the 1770s, the theoretical aspect of Newtonian enquiry in Britain refocused on practical utility and technological application to industry.[199] The scant amount of specialised historical research done on this topic and time period tentatively points to a trickle of speculative British astro-cosmology, such as Thomas Wright's 1750 *An Original Theory or New Hypothesis of the Universe*. But, on the whole, it seems that during these decades, the speculative theoretical mantle based on Newton's mathematical principles and philosophy was passed on to continental natural philosophers such as Buffon, Immanuel Kant and J. H. Lambert. By the end of the century, like the concept of nature, continental cosmological theories were either atheological, or vague enough to where agnostics could comfortably modify them.

By writing at the end of the eighteenth century, Paley had the distinct advantage of astro-theological hindsight. By surveying the natural theology texts of the two previous centuries, Paley recognized the rhetorical weakness of inductive, scientifically based astro-theological systems. It was too easy for a cosmology woven from scientific and theological information to fall to pieces when new scientific discoveries were made. In

[198] For this discussion of chance, see Chapter XXVI, 'The Goodness of the Deity', Parts I and II.
[199] This state of affairs is detailed nicely in Betty Jo Teeter Dobbs's and Margaret C. Jacob's, *Newton and the Culture of Newtonianism*, (Atlantic Highlands: Humanities Press International, 1995).

this sense, astronomy examples were different from anatomy and natural history commonplaces. At the time, the latter seemed more deductive and left less room for speculation. To a gentlemanly culture still heavily influenced by humanist thinking, the mathematical systems being developed to calculate planetary perturbances or the shape of the earth were not as easily observable as, say, the human body or plants that grew in gardens. When one stepped outside and looked at the sky, the world did not *appear* to be a heliocentric spheroid rotating in a mathematically calculable orbit. Yet, when one looked at the leg of a new animal species found in South America, it could be easily observed that the leg *appeared* to be used for running. Furthermore, even if one did understand the basic assumptions of astronomy, the mathematics were so complex that only specialists could understand the equations. This situation made astronomy examples potentially 'unsafe' and confusing for those wishing to use them as rhetorical commonplaces in natural theology arguments.

It was in this context that Paley selected his astronomical examples. In light of this situation, it is easy to understand why Paley uses commonplaces taken from accepted Newtonian Mechanical Laws and planetary astronomy. Paley does not present these commonplaces systematically. He makes a statement about gravitation here, an assertion about comets there, never tying all of the information together like other natural history writers (like Buffon) might do. This essentially makes the chapter (and the entire book for that matter) one giant intellectual jigsaw puzzle where the reader is left to assemble the bits and pieces of scientific information into one cosmological scheme. Furthermore, this format proves even more enigmatic and frustrating when attempting to identify the underlying natural philosophical commitments of the chapter. Therefore, the rest of this section collects together related cosmological jigsaw pieces and assembles them into three related categories: general information about matter, cosmology and the earth. Naturally, the assembly of such categories is arbitrary, but this approach offers a conceptual grasp over the scientific information inserted into the 'Astronomy' chapter and other parts of *Natural Theology*.

Matter Matters

As a gentleman whose mind was shaped by the later eighteenth century intellectual climate, Archdeacon Paley's foundational philosophical and mechanical disposition was Newtonian (and thus, implicitly British). In light of this general assertion, it is interesting to note 'The Elements' chapter that immediately precedes Paley's 'Astronomy' chapter. This chapter is not about chemistry, rather, it is about the earth's climate. It states that there are four elements, "AIR", "WATER", "FIRE", and "LIGHT" and it describes them in regard to their utility to living creatures. Considering the advances in chemistry being

made at the turn of the nineteenth century, such a statement about the elements that influence the climatic and topographical state of the earth would seem to smack of Aristotelian elements.[200] But, in the mainstream literature of the time, the poetical division of natural history into animal, vegetable and mineral was still common.[201] In his poetry Erasmus Darwin took the liberty of using air, water, fire and light and the Greek mythological creatures associated with them to present his version of natural history. Like 'nature' and 'law' Paley's understanding of these 'elemental' terms is rather loose. For instance, Paley conflates the word "air" with the word "atmosphere". For him, "AIR" is permeable and he discusses its ability to interact with light rays and evaporated water. Also, "AIR" is polluted by "respiration, flame," and "putrefaction" and is purified by plants. In his discussion of "WATER", Paley opts to describe the obvious and states that it is insipid, ubiquitous and necessary for life—the latter quality being a point stated by many natural theologians whose works preceded Paley. "FIRE" is a dissolvent and "Were it not for the preference of heat, or of a certain degree of it, all fluids would be frozen. The ocean itself would be a quarry of ice: universal nature stiff and dead." Paley pays much more quantifiable attention to "LIGHT". He states that it "passes from the sun to the earth in eleven minutes", "it might seem to be a force sufficient to shatter to atoms the hardest bodies",[202] and it is a particle that has its own velocity and is made up of seven different rays when subject to a prism.

In addition to Darwin, these comments about the cosmological importance of the elements are also similar to two other works contemporary with *Natural Theology*. The first is James Hutton's *Theory of the Earth with Proofs and Illustrations*. Though well known today its famous quote about the age of the earth, "No Vestige of a Beginning: no Prospect of End", this 1795 work did not fare very well on the British book market. Its long French quotations did not appeal to the English during a time when it was at military odds with France. Its turgid prose is enough to put even the determined scholar asleep. But, for our purposes, it was written by an eminent British natural philosopher and it should be noted that he uses the terms "light", "heat" and "water" to describe the forces that initially shaped the face of the earth. In fact, Hutton has a rather high opinion about the power of heat: "[O]ur judgement with regard to the efficacy of this power of heat is positive, and contains not any thing that is doubtful or uncertain."[203] Not only did Hutton

[200] In the last chapter on anatomy we witnessed Paley's aversion to contemporary French chemistry. For more information about that context of 1790 chemistry see David M. Knight, "'Conquering the Prejudice adopted from the French School of Chemistry": the Science in Britain in Gay-Lussac's Time', *Science in the Romantic Era*, (Aldershot: Variorum, 1998), pp. 110-119. It must also be remembered that at this time chemistry was becoming closely linked with industry, especially food preservation and dyes for clothing.

[201] Aristotelian elements were also included in Lorenz Oken's *On the Value of Natural History, especially for the Education of Germans* (1809). This was one of the more influential works of the German *Naturphilosophie* movement. Jardine, 'Realization of Questions', 333-337.

[202] Both quotations taken from Chapter XXI, 'The Elements'.

[203] James Hutton, *Theory of the Earth with Proofs and Illustrations*, (Codicote: Verlag von J. Cramer, 1972), p. 38.

use these terms to describe the present state of the earth's surface, so did John Playfair, the man who popularised Hutton's ideas in his 1802 *Illustrations of the Huttonian Theory of the Earth*. This book was published in exactly the same year as *Natural Theology* and even though it specifically states it is not interested in cosmogony,[204] it uses the terms "FIRE" and "WATER" to describe the earth's formation. "It is sufficient to remark, that these systems are usually reduced to two classes, according as they refer to the origin of terrestrial bodies to FIRE or to WATER...To the former of these DR. HUTTON belongs much more than the latter."[205]

Paley's Representation of Newtonian Planetary Astronomy

Let us now turn to Paley's representation of Mechanical Laws in his 'Astronomy' chapter. As with most eighteenth century writers, Paley's physics are Newtonian. When reading *Natural Theology*, one encounters the basic Newtonian laws of motion, law of attraction, law of inverse proportion and the supporting principles of gravity and centripetal force. Let us investigate what Paley's commonplaces assert about these concepts. Paley describes the law of motion to be "the simplest law imagined" and defines it to be when, "a body *continues* in the state in which it is, whether of motion or rest; and, if in motion, goes on in the line in which it was proceeding, and with the same velocity, *unless* there be some cause for change." The law of inverse proportion is defined in the following manner: "The actuating cause in these systems, is in an attraction which varies reciprocally as the distance: that is, at double the distance, it has a quarter of the force; at half the distance, four times the strength; and so on." He writes that if the inverse law had been more than the cube of the distance, "the planets, if they once began to approach the sun would have fallen into its body." Similarly, had the gravitational law been a "*direct* law", the earth would spin out of orbit into space. Naturally, this exposition of the inverse law fits nicely into his design argument.[206]

In regard to the Newtonian law of attraction, Paley explains that it "prevails between each particle of matter, the *united* attraction of a sphere, composed of that matter, observes the same law." When the law of attraction and the distance of a planet from the sun is fixed, the elliptical orbit of a planet "depends on two things, the velocity with which, and the direction in which, the planet is projected." Gravity is inferred to be an invisible agent of attraction. But this attraction is not an inherent force unilaterally exerted

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[204] This statement was directly influenced by the political and religious context of Edinburgh. See J. B. Morrell, 'Professors Robinson and Playfair, and the *Theophobia Gallica*: Natural Philosphy, Religion and Politics in Edinburgh, 1789-1815', *BJHS* (1971) **26**: 43-63.

[205] John Playfair, *Illustrations of the Huttonian Theory of the Earth* (New York: Dover Publications Inc., 1964), p. 3.

[206] *All* of these astronomy points can be found in preceding *natural theology* books written in the seventeenth and eighteenth centuries. For a comparison to a work on planetary astronomy that was contemporary with Paley, see the chapter on Hutton and Playfair in Stephen Jay Gould, *Time's Arrow, Time's Cycle – Myth and Metaphor in the Discovery of Geological Time* (Cambridge: Harvard University Press, 1987).

by matter itself. Rather, it is "controlled or suspended by a superior agent". Here Paley departs from his perception of Cotes and "many other Newtonians" that hold attraction to be a "primordial property of matter" or that it emanates from an attracting body. Likewise, centripetal force is appointed by the Deity to matter. It occurs when gravitational attraction, "incessantly drawing a body towards a centre, but keep it in eternal circulation around it." Paley openly admits that he is mystified by this theory. But, because of the presence of absolute space, he is quick to point out that centripetal force cannot be explained by "æthereal fluids". "By calculations drawn from ancient notices of eclipses of the moon, we can prove, that, if such a fluid exist at all, its resistance has had no sensible effect upon the moon's motion for two thousand five hundred years." Moreover, because of centripetal attraction "the *apsides*, the returning points, or points of greatest and least distance from the centre, are *quiescent*, and, therefore, the body moves every revolution in exactly the same path relative to the attracting centre."

In addition to basic Newtonian planetary concepts, Paley also touches upon two perplexing issues that created conceptual and mathematical havoc for eighteenth century Newtonian astronomy: irregular cometal orbits and perturbing forces. Paley asserts that comets have different paths that possess a "great degree of eccentricity." In this matter, they are different from obits of planets. In their irregular revolution, they are brought "very near to the sun, and carried away to immense distances from him." Regarding perturbation forces, Paley states that they continually change the dimensions of the earth's ellipse. But the reader can be assured that divine providence allows us to endure these "Small irregularities" about which "It has been rightly also remarked, that, if the great planets Jupiter and Saturn had moved in lower spheres, their influences would have had much more effect as to disturbing the planetary motions than they now have. While they revolve at so great distances from the rest, they act almost equally on the Sun and on the inferior planets."

Silly Theories and Globes of Fire: Paley's Primary and Secondary Cosmogony

For Paley, the sun was eternal and was "the source of light and heat in the *centre* of the system." He believed there is no antecedent for this order and gives no indication as to how the sun came into existence. Paley does write that, "The sun might have been an opaque mass: some one, or two, or more, or any, or all, of the planets, globes of fire." At the beginning of the nineteenth century, the composition of the sun was by no means a settled matter. Only eight years prior to *Natural Theology*, Herschel himself attempted to answer this question.[207] Nevertheless, it is rather unclear whether Paley makes this vague statement about the sun because he believes it, or because he feels that the reader should at

least be familiar with the theory. What is clear, is that this statement about the sun follows Paley's characteristic avoidance of discussing primary causes and the genesis of matter. But, this does not stop Paley from writing about what I term *secondary* cosmogony—the actual *formation* or *shaping* of the sun and the planets.[208] We will see several examples of this practice in the upcoming discussion on the earth and the above quotation about the sun provides an excellent example of this practice. Paley omits information about where the "opaque mass", "planets", or "globes of fire" came from, but includes information about the physical formation of the planets and the sun. Paley is quite happy to talk about the placement of the seven planets, but when it comes to explaining how they ended up in their present spatial distribution, he exempts himself by stating "It requires more astronomy than I am able to lay before the reader".[209] This statement, however, does not prevent Paley from describing the orbits of the planets. Nor does it prevent Paley from mentioning the aforementioned perturbation forces.

In the last four pages of the 'Astronomy' chapter, Paley criticises what his friend Bishop Law once called Buffon's "silly" cosmogony hypothesis.[210] Likewise, earlier in the chapter, Paley refers to a cosmogony promulgated by "those who reject an intelligent Creator." He describes their system to hold that the planets are "cooling masses" that were once red hot like the sun. These unnamed "philosophers" also believe that the planets were struck off in a "state of fusion" from the sun by a comet. Although this smacks of Buffon, Paley does not mention his name. It is though he wants to discredit the theory before mentioning whose theory he is criticising—a rhetorical pre-emptive poisoning so to speak. Paley knew that Buffon was a recognized name in the realm of natural history. By not initially associating his name with the cosmogony, Paley creates space for his critique. Paley's main objection to the "cooling masses" proposal is that if the planets are cooled suns, then the sun is itself cooling towards planet status. For Paley this is not possible because he understands the sun to be "from eternity" and in a state of "eternal duration"—

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[207] Angus Armitage, *William Herschel*, (London: Thomas Nelson and Sons Ltd, 1962), pp. 51-56.

[208] This idea of *shaping* the earth into its present form is actually consistent with the definition of the Hebrew verb (*bara'*) used to describe the 'creation' of earth in the Pentateuch. *Creatio ex nihilo* was a theological development of the Western Christian church. The writings of the Hebrew bible were just beginning to be studied in detail by English Christians during the eighteenth century and Paley could have known scholars who were at least familiar with the language. Yet , there was a negative aura associated to the Hebrew scriptures due to their association with Hutchinsonianism. See David S. Katz's article, '"Moses's Principia": Hutchinsonianism and Newton's Critics', in Force's and Popkin's *The Books of Nature and Scripture*, (London: Kluwer Academic Publishers, 1994), 201-211.

[209] Some of Paley's ambiguity on this subject is probably linked to his culture's general ignorance about deep time. For more on this context, see Martin J. Rudwick, 'The Shape and Meaning of Earth's History' in David C. Lindberg and Ronald L. Numbers, eds., *God and Nature – Historical Essays on the Encounter between Christianity and Science* (London: University of California Press, 1986), 296-321.

[210] Law wrote to Paley: "As to Buffon's silly hypothesis, there cannot be a better refutation of it than your own. None but Frenchmen (and those very weak ones) ever give the least credit to it." This is taken from a letter included in Edmund Paley's *An Account of the Life and Writings of William Paley* (London: 1825; Reprinted with Hants: Gregg International Publishers Limited, 1970), 334-335.

even though he gives no scientific or biblical reason as to why he believes this to be true.[211]

Expanding away from the solar system, like his primary cosmogony, Paley has few words about sidereal astronomy. Throughout the 'Astronomy' chapter, Paley uses terms like "heavenly bodies", "Enormous globes", "bright points", "luminous circles" and "globes of fire" to implicitly refer to the stars. In the first paragraph of the chapter, Paley asserts that, save for Saturn's rings, it is not possible to study the "compounded parts" of "heavenly bodies". He does not state whether he is writing about "heavenly bodies" inside or outside of the solar system. Then, Paley makes a crucial statement about his approach to astronomy: "This [inability to observe "compounded parts"], which may be perfection in them, is a disadvantage to us, as enquirers after their nature. They do not come within our mechanics." Not only are they mechanically elusive, their motion is unobservable and therefore would be impossible to subject to Newtonian principles. It is probably because of this portrayed mechanical and motile liability that Paley vaguely refers to sidereal astronomy. Near the end of the chapter, Paley hints at his conception of the universe by writing, "But many of the heavenly bodies, as the sun and fixed stars, are *stationary*." But, in reality, he does not include this assertion to explain stellar astronomy.[212] He includes it to demonstrate that God hampers the universe from collapsing in upon itself by preventing gravity from acting over vast distances.[213] This reasoning was common during the eighteenth century, but was replaced early in the next century with theories like that of Herschel that hypothesised that the universe was in motion on a spiral-like spin. Consequently, it was this movement, not the direct intervention of God, that prevented matter from collapsing in upon itself.

An Orange in the Moderating Hand: Paley's Description of the Earth

The first scientific commonplace Paley mentions about the planetary physics of the earth is an explanation of its axis of rotation. To explain the physics of rotation, Paley first states that the earth is not an "exact globe," rather, it is an "oblate spheroid, something like an orange." Paley then capitalises on the orange metaphor by using it to

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[211] Paley was by no means alone in his opposition to Buffon's hypothesis/theory. It was frequently attacked in France and in England on the grounds that it was not founded on empirical evidence. In the words of his contemporary C. G. Lamoignon-Malesherbs, "I believe that...M. de Buffon...has come to believe that with the aid of this metaphysics he can dispense with learning from facts, which are the foundation of most sciences." This statement occurs at the end of a long argument in which Malesherbs is attacking Buffon's hypothesis regarding the earth's formation. Although written in 1749, it was published in 1798 by Paul Abeille. This essay from which this quotation was translated by John Lyon as 'Observations of C. G. Lamoignon-Malesherbs on the Natural History of Buffon and Daubenton' in *From Natural History to the History of Nature* (London: University of Notre Dame Press, 1981), 328-345.

[212] By "stellar astronomy" here I mean, "objects lying beyond the solar system undertaken for the sake of finding out about the objects themselves—their structure, their distances from the Earth and from one another, if and how they change, if and how they are related to another." Stellar astronomy during this time period is discussed in M. E. W. Williams, 'Was There Such a Thing as Stellar Astronomy in the Eighteenth Century?' *History of Science* (1983) **21**: 369-388.

[213] This argument is basically a restatement of Richard Bentley's 1692 Boyle Lectures entitled, 'The Folly and Unreasonableness of Atheism'. In many cases, the many pieces of Paley's astronomical argument are similar to arguments presented in the Boyle Lectures. For an account of the general content of these lectures, see Larry Stewart, *The Rise of Public Science – Rhetoric, Technology, and Natural Philosophy in Newtonian Britain, 1660-1750*, (Cambridge, Cambridge University Press, 1992).

explain that the permanent axis of the earth is the line "which passes through the heart of the orange from the place where the stalk is inserted into it." The diameter which is determined by the two points of this "stalk" line is the shortest diameter (as opposed to the diameter of the larger, thick centre of the orange) and "is that upon which in fact the earth turns; and it is, as the reader sees, what ought to be a permanent axis." Paley asserts that the earth's current rotation was set in motion by the "intelligent interposition" of God. He justifies this claim by arguing that this situation is the best for the "sensitive natures" inhabiting and being sustained by planet earth.[214] Paley was far from alone in attributing divine causation to the origin of the earth. Most of Paley's audience had no problem with this assumption. Even a proto-geologist like James Hutton makes the following statement: "We shall thus also be led to acknowledge an order, not unworthy of Divine wisdom, in a subject which, in another view, has appeared as the work of chance, or as absolute disorder and confusion."[215] Playfair omits such a statement in the initial chapters of the book that he based upon Hutton's work. Like Paley, Hutton also defers to an anthropocentric argument about the formation of the earth. At the end of his *Theory of the Earth*, Hutton states that the book used scientific principles to create a system that explains "those particular operations to a general end" regarding to the formation of the earth. On the two last pages he goes on to state: "This end, the subject of our understanding, is then to be considered as an object of design; and, in this design, we might perceive, either wisdom, so far as the ends and means are properly adapted, or benevolence, so for the benefit of beings who are capable of suffering pain and pleasure, and of judging good and evil."[216]

Once Paley finishes his remarks about the earth's axis, he goes on to explain the earth's density. He reasserts that the earth is an oblate spheroid. He accurately states that there is "limited information" about the density of the earth. Indeed, Toulmin writes that "Only between 1810 and 1830 did the modern geological picture of the Earth's history at last crystalise out rapidly".[217] Paley asserts that it is "a mixed mass somewhat fluid" that took its present form "by the joint action of the mutual gravitation of its parts and its rotary motion." After Paley makes this secondary cosmogony reference, Paley turns his eyes to the physical composition of the earth and asserts, "For a very small depth below the surface (but extremely small, less, perhaps, than an eight thousandth part, compared to the centre) we find vestiges of ancient fluidity." He further proposes that this fluidity goes

[214] An anthropocentric view of the natural world was common during this time. For example see the letter, 'The Animal Creation formed for the Use of Man' in *GM*, Feb. 1801, 129-30.
[215] James Hutton, *Theory of the Earth with Proofs and Illustrations Vol. I*, (Codicote: Verlag von J. Cramer, 1972), p. 6.
[216] James Hutton, *Theory of the Earth with Proofs and Illustrations Vol. II*, (Codicote: Verlag von J. Cramer, 1972), pp. 566-577.
[217] Steven Toulmin, 'The Discovery of Time', in Claude C. Albritton, Jr., ed., *Philosophy of Geohistory: 1785-1970* (Stoudsburg: Dowden, Hutchinson, & Ross, Inc., 1975), 19.

down deep into the earth and possibly allows the earth to take its oblate form. Since proving this theory was virtually impossible, Paley refers to "Calculations made a few years ago of the mean density of the earth."[218] He propounds that the result of these calculations was that the earth was twice the density of granite and about five times that of water. For Paley, this proved that the earth was not a hollow shell, nor was its internal composition made of a "central fire" or water. Rather, the earth is made of a "solid mass throughout," composed of "ponderous" substances. This opinion was consonant with several theories created in the later decades of the eighteenth century that attempted to determine the earth's composition. Even popular gentlemanly naturalist books like Sir William Hamilton's *Observations on Mount Vesuvius, Mount Eta, and Other Volcanoes* admitted that the earth's internal composition was still unknown. Hamilton stated, "This phænomenon is well worthy of a curious inquiry, which might give some light into the theory of the earth, of which, I believe, we are very ignorant."[219]

Paley's explanation of the earth's density is followed by yet another reference to secondary cosmogony: "Nevertheless, we may conceive the present face of the earth to have originated from the revolution of a sphere, covered with a surface of a compound mixture, the fluid and solid parts separating as the surface became quiescent." Immediately following this sentence Paley argues that it is the "*moderating* hand" of the Creator that allowed this soup of water and land to form into the continents and oceans that we know today. By this reference to a rotating, solidifying earth, Paley seems to accept the theory of a slowly forming earth—and in this sense he actually agrees with authors like Buffon and James Hutton. This aspect of Paley's argument is crucially important because it provided the possible opportunity for future readers to extend Paley's argument to account for the formation of any other planet or moon in the solar system or beyond. Theologically, Paley's position was still consonant with *creatio ex nihilo* and scientifically, it provided room for theories addressing the *formation* (not the genesis) of the earth. This is interesting, because contextually, many people still held to a young earth hypothesis, like that of Ussher, based on the Biblical narrative.[220] As was noted above, what Paley does not do is to give a viable explanation as to how the solar system, or even the universe, came into existence—which was an act of astute rhetorical omission. He simple left this problem up to the reader to decide in the privacy of his or her own mind.

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[218] The aforementioned John Hellins and Charles Hutton articles printed in 1776 and 1796 editions of the *Philosophical Transactions.*

[219] William Hamilton, *Observations on Mount Vesuvius, Mount Eta, and Other Volcanoes: In a Series of Letters Addressed to the Royal Society, from the Honorable Sir W. Hamilton, K. B. F. R. S. His Majesty's Envoy Extraordinary and Plenipotentiary at the Court of NAPLES,* (London: T. Cadell, 1773), ff. p 9. For an informative encapsulation of geology at this time, see Martin Guntau's chapter 'The Natural History of the Earth' in N. Jardine, J. A. Secord and E. C. Spary, eds., *Cultures of Natural History* (Cambridge: CUP, 1996), 211-229.

[220] "WHEN the pains taken by infidels to assign to this globe an antiquity beyond which the Scriptures and the writings of Moses admit are so repeatedly obtruded upon us, does it not call upon the sons of true science amoung us to refute this presumption by well founded and authentic astronomical *data*?" 'False Astronomical Hypothesis', *GM*, Apr. 1801, 306.

Chapter 5 Conclusion

Chapter 5 focused on the picture Paley's inanimate commonplaces painted about the natural world. Paley was not writing a textbook and, therefore, his references to inanimate nature are not systematically inserted throughout *Natural Theology*. Before discussing Paley's actual empirical commonplaces, the first part of this chapter explained Paley's conception of 'nature' and 'law'. The importance of these two overarching concepts cannot be underestimated because they inform us as to how Paley, and more importantly, how his anticipated readership, perceived the natural world. During Paley's time, both the terms not only had empirical implications, but they also had moral associations. Paley's usage of these words is sometimes ambiguous. The word 'nature' could either be *Natura naturans* or *Natura naturata*. The word 'law' could refer to scriptural, moral or mechanical conceptions. When attempting to understand the intellectual implications of *Natural Theology*, one must be astutely aware of how Paley is using all of these terms.

The second part of this chapter detailed Paley's presentation of planetary astronomy as represented by his astronomy commonplaces. Paley did not include speculative information. He utilised established examples. This is why he used the Aristotelian conception of the elements air, water, fire and light. These terms were commonly known to those who read polite literature and served to make his argument more familiar. When Paley gives empirical examples of planetary astronomy, they are only taken from the observable 'is' of nature. Paley does not speculate on the earth's origins, nor is he that concerned about its distant future. As an orator, he was more concerned about addressing an audience concerned with the established fact at hand. When read in 1802, *Natural Theology* would have offered basic Newtonian laws of motion, the law of attraction, the law of inverse proportion and principles of gravity. But, realistically, Paley's readers probably already had a basic familiarity with this information and Paley's commonplaces only served to remind them of concepts with which they were already familiar. Likewise, commonplaces about the arc of the earth and its rotation would only compliment the basic Newtonian information known by many gentlemen. *Natural Theology* would have appealed to these men because they were educated enough to appreciate how the examples refreshed their gentlemanly commitment to competently converse about the natural world.

Chapter 6
A SYSTEM OF RELATIONS
Paley's Animal and Vegetable Commonplaces

Chapter 6 Introduction

Chapter 6 investigates the natural history commonplaces that Paley inserted into his argument. As I pointed out in my investigation of Paley's inanimate commonplaces in the last chapter, there are many ways that I could approach this topic. I have chosen to address Paley's natural history examples by detailing the underlying classification system into which he grouped living creatures. I call this attempt at morphological classification Paley's system of *relations*. It was probably *ad hoc* on Paley's part, but, in the end, it does tell us a great deal about how Paley viewed the concept of change in the natural world. Part I of this chapter is dedicated to describing the different components of Paley's system of relations. I argue that within this system, Paley offers two ways of viewing an organism. This first major relation category is what I call an animate-relation. It is concerned with how the body parts of an organism relate to the organism itself and to other organisms. Since Paley was concerned with the telicity of an organism's body parts, this type of relation was more expedient to his argument. This is why almost all of his examples are taken from this sort of relation. Paley subdivides his animate-relation category into five subcategories: general relation, partial relation, inverse relation, instinct relation and compensation relation. The second major relation category is an inanimate-relation. It is concerned with how an animal's body parts relate to the world around it. Because of the possible evolutionary connotations of such relations, Paley shies away from such examples.

Part II of this chapter concerns Paley's conception of telic change in regard to his system of relations. Because Paley was writing about divine design, he needed at least to demonstrate that random chance and change were inconsequential to his argument. Even though his treatment of these two concepts is noticeably short, it does become clear that he feels the reader must agree that the basic assumptions of his argument do not allow for chance. His comments on change are initially a bit more ambiguous. It seems that for some reason Paley did not want to commit himself to an overtly negative view of change. Closer investigation reveals that Paley does indeed allow for change. It is a specific sort of change and I call it a *telic change*. It is a change in an organism's morphological part that modifies a pre-existing part but does not create a new part. This concept of change is included under the compensation-relation subcategory of animate-relations. Paley knew he would damage his argument if he used inanimate-relation commonplaces to discuss change because these types of examples were concerned with how an organism related to

its environment. This is why the concept of telic change is found within his comments about the commonplaces he takes from animate-relations.

Part I
Ontic Creation, Telic Relation

Paley's General Relation System

As discussed in the previous sections, Paley's commonplaces are taken from *Natura naturata*. Thus, when discussing animal and vegetable proofs, he presents the observable, fixed and mechanical 'is' of nature. Like many philosophers before him, Paley further narrows his telic examples by specifically concentrating on the morphological 'parts' of organisms. He believes these types of commonplaces will convince the "ignorant" spectator and he details this approach in Chapter VII, appropriately named 'Of the Mechanical and Immechanical Parts and Functions of Animals and Vegetables.' There he states: "Is it not necessary that this man, in order to be convinced of that design, that intention, that contrivance has been employed about the machine, should be allowed to pull it to pieces, should be enabled to examine the parts separately, explore their action upon one another, or their operation, whether simultaneous or successive, upon the material which is presented to them?" Paley's entire collection of natural history commonplaces consists of his pulling organisms to pieces to demonstrate their design.

Each part he pulls apart has an ontic 'form' which was designed to fulfill a telic function. The morphological form of an organism's parts is fixed. Paley does not deviate from this stance. He asserts that it is "too absurd" to entertain the assumption that a specialised morphological part, like the eye, appeared over a long period of time, "merely because something must have occupied those points in every animal's forehead—or, that all this should be thought to be accounted for, by the short answer, 'that whatever was there, must have had some form or other.'"[221] Thus, Paley considers an organism's ontic form to be determined by the telic function intended by God. Such a teleological view of the natural world had been the standard approach of most Western natural philosophers for the past two thousand years. The subordination of mechanism to teleology was defended by Aristotle and continued to be a dominant factor in the writings of Cuvier, Blumenbach, and Kant, all of whom were contemporaries of Paley.[222]

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[221] Chapter V, 'Application of the Argument Continuted'.

[222] For Aristotle's teleological convictions see Ernst Mayer, *The Growth of Biological Thought: Diversity, Evolution, and Inheritance* (London: Belknap Press, 1982). Sec. 305-307; Martha Craven Nussbaum, *Aristotle's De Motu Animalium* (Princeton: Princeton University Press, 1978), 59-100; and Allen Gotthelf and James G. Lennox, eds., *Philosophical Issues in Aristotle's Biology* (Cambridge: CUP, 1987), 199-275. Regarding Cuvier's teleology, David Knight writes: "Cuvier took from Aristotle the principle that all parts of creatures are made to work together, and with this teleological principle of correlation (as he called it) he was able to make the dry bones respond to his word and come together into the various creatures that they had composed." David M. Knight, *Ordering the World – A History Classifying Man* (London: Burnett Books, 1981), 86. For Kant and Blumenbach's teleology see Jardin, 'Relaizing the Questions', 327-350; especially page 330.

Paley groups the morphological parts of organisms into what he calls a 'Relation'. It is the central presupposition that governs Paley's telic conception of a morphological part. In his chapter entitled 'Relations', Paley defines the term:

> *When several different parts contribute to one effect; or, which is the same thing, when an effect is produced by the joint action of different instruments to one another, for the purpose of producing by their united action the effect, is what I call* relation*; and wherever this is observed in the works of nature or of man, it appears to me to carry along with it decisive evidence of understanding, intention, art. In examining, for instance, the several parts of a* watch... *It is the suitableness of these parts to one another; first, in the succession and order in which they act; and, secondly, with a view to the effect finally produced.*

Note that the organism's ontic form is combined with its telic function. Paley does not separate form and function like many where beginning to do at the beginning of the nineteenth century.

For Paley, the 'relation' of body parts can be divided into two subcategories. The first category asks how the parts of an organism relate to the other parts of the same organism or to the parts of a similar organism. The second category asks how the organism's morphological parts are related to the environment in which it lives. Because Paley references such relations, but fails to name them, let us call the former an animate-relation and the latter an inanimate-relation. It also must be noted that these relation categories are not logically exclusive and often overlap each other. Classifying organisms at the beginning of the nineteenth century was still a messy business and even the emerging taxonomists of this time, such as Cuvier and Lamarck, created notably dissimilar classification systems.[223] Is was not until after *Natural Theology* was published that Cuvier begin to write the essays which would become *Researches on Fossil Bones* published in 1812.[224] Note the following diagram:

RELATION

↙ ↘

'Animate-Relation'
Body Part Related to the Animal

'Inanimate-Relation'
Body Part Related to the Environment

Let us first discuss Paley's animate-relations. In this view, the morphological part is telic because of its function in relation to the organism's own body parts as a whole. It is "the relation of parts to parts, of the parts of an animal to other parts of the same animal, or of another individual of the same species."[225] A foot on a body without a leg to move it is no good at all. Therefore, for Paley, not only is it amazing that the swan's webbed feet

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[223] For more on this context see, Karl M. Figlio, 'The Metaphor of Organization: An Historiographical Perspective on the Bio-Medical Sciences of the Early Nineteenth Century', *History of Science* (1976) **24**: 17-53.

[224] Martin J. S. Rudwick, *Georges Cuvier, Fossil Bones, and Geological Catastrophes – New Translations & Interpretations of the Primary Texts* (London: The University of Chicago Press, 1997), 60. For a general outline of Cuvier's and Lamarck's classification context, see Peter J. Bowler, *The Environmental Sciences* (London: Fontana Press, 1992).

(a part) enable it to paddle through water, it is equally amazing that these webbed feet work together with its other parts like the spoon-bill, long neck, its insulating feathers, its intestinal system, its membranous stomach and its gizzard. Building on the same teleological conception of morphology, Paley's idea of an inanimate-relation holds the morphological part to be telic because of its function in relation to the organism's environment. "But the bodies of animals hold in their constitution and properties, a close and important relation to natures altogether external to their own; to inanimate substances, and to specific qualities of these; e. g. *they hold a strict relation to the ELEMENTS by which they are surrounded.*" Paley then avers, "Can it be doubted, whether the *wings of birds* bear a relation to air, and the *fins of fish* to water? They are instruments of motion, severally suited to the properties of the medium in which the motion is to be performed."[226]

Relation Subcategories

Moving onward, in his chapter on relations, Paley states, "As hath already been observed, there are different ways of stating a relation, according as we set out from a different part." These different types of relation fall under the animate-relation subcategory and Paley calls them *general*, *partial*, *compensation*, *inverse* and *instinct*.[227] The following paragraphs are devoted to presenting Paley's definition of these subcategories. Let us first examine general relations. Paley defines a general relation to be: "[T]he relations of parts which are found, either in all animals, or in large classes and descriptions of animals." For example, a general relation would be the presence in most animals of teeth to masticate food for the stomach. Another subcategory of relation is that of a particular-relation. This sort of relation "subsist[s] between the particular configuration of one or more parts of certain species of animals, and the particular configuration of one or more other parts of the same animal." For instance, "The long neck without the web-foot would have been an encumbrance to the bird; yet there is no necessary connexion between a long neck and web-foot. In fact, they usually do not go together. How happens it, therefore, that they meet only when a particular design demands the aid of both?" After stating this definition in his 'Relations' chapter, Paley then introduces compensatory-relation. "Compensation is a species of relation. It is relation when the *defects* of one part, or of one organ, are supplied by the structure of another part, or of another organ." Thus, "The short unbending neck of the *elephant* is compensated by the length and flexibility of his *proboscis*... To a form, therefore, in some

[225] Chapter XVII, 'The Relation of Animated Bodies to Inanimate Nature'.
[226] All quotations in this paragraph are taken from Chapter XV, 'Relations'.
[227] At the end of this section I have created a diagram which illustrates how these relations correspond to each other. It may be helpful to look at this chart while reading the following description of Paley's 'relations' and their corollaries.

respects necessary, but in some respects also inadequate to the occasions of the animal, a supplement is added, which exactly makes up the deficiency under which he laboured."[228] Next, is inverse-relation. Paley mentions this distinction near the end of the book and it is a rather vague category. The "relation of inversion" is "the law of contrariety: namely, that whereas, in other animals, the bones to which the muscles are attached lie *within* the body; in insects and shell-fish they lie on the *outside* of it."[229]

The last relation is that of instinct, which Paley considers to be "a species of relation". In chapter XVIII, entitled 'Instincts', Paley gives the following definition: "An INSTINCT is a propensity prior to experience and independent of instruction." The distinctions "prior to experience" and "independent of instruction" firmly place instinct along side the telic, *a priori* subcategories of animate-relation. This is why instincts "contribute, along with the animal organisation, to a joint effect, in which view they are related to that organisation. In many cases, they refer from one animal to another animal; and, when this is the case, become strictly relations in as second point of view." The rest of the chapter is filled with examples. "We contend, that is by *instinct* that the sexes of animals seek each other; that animals cherish their offspring; that the young quadruped is directed to the teat of its dam; that birds build their nest." Instinct is not to be equated or linked with sensation, as was promoted by some eighteenth century physicians who had expanded upon Haller's writings on the subject. "I am not ignorant of the theory which resolves instinct into sensation: which asserts, that what appears to have been a view and relation to the future, is the result only of the present disposition of the animal's body, and of pleasure or pain experienced *at the time*." The distinction "*at the time*" makes the sensation theory *a posteriori* and inconsistent with Paley's *a priori* view of instinct.[230]

This position is consonant with the general commitments on instinct in eighteenth century moral philosophy. To support his argument, one of the authors that Paley quotes is Joseph Addison. Without naming the book from which he quotes, Paley inserts the following: "'A chymical operation,' says Addison, 'could not be followed with greater art or diligence, than is seen in hatching a chicken; yet is the process carried on without the least glimmering of thought or common sense. The hen will mistake a piece of chalk for an egg; is insensible to the increase or diminution of their number; does not distinguish between her own and those of another species; is frightened when her supposititious breed of ducklings take to the water." Paley uses this chicken example as a central illustration throughout his entire instinct chapter. With some diligent research, I found that this quotation comes from an essay on instinct written by Addison in *The Spectator* on July 18,

[228] Chapter XVI, 'Compensation'.
[229] Chapter XXV, 'The Unity of the Deity'.

1710. Like Paley, the essay argues that instinct is inherently found in animals and humans. It is not learned. At the end of the essay Addison concludes that instinct is mysterious and "cannot be accounted for by any properties in matter". Moreover, he likens it to "the principle of gravitation in bodies, which is not to be explained by any known qualities inherent in the bodies themselves." Addison further states that instinct is "an immediate impression from the first mover, the Divine energy acting in the creatures."[231] Not only does this explanation agree with Paley's stand on instinct, it also agrees with his view that matter contains no inherent organising principle.

Additionally, it is important to point out that Paley does not consider instinct to be the same as a habit. Paley avers there are two types of habit: active and passive. Paley argues that active habit is a result of willed actions taken by an organism. For example, the assertion that a stork's pouch gets bigger because it takes in water is unacceptable for Paley. He argues that passive habit is alleged to occur when an organism is acted upon by an outside force. One example he gives is that of a camel developing a hump from a lump placed on its back from carrying burdens. Paley only makes a distinction between active and passive habit once. He opposes both of them and so this is probably why he simply uses the word 'habit' in the rest of the book. As an ethicist, Paley takes care to inform the reader that, unlike *a priori* instinct, habit is learned, and is consequently *a posteriori*. Since instinct is created to coincide with the fixed morphological parts of an designed organism, there is no need for change. Since habit is learned, this means that it came into existence after the organism's morphological part and, therefore, cannot induce morphological change. Thus, when dismissing views of morphological change, Paley uses the concept of habit to criticise the "unauthenticated" theories of those "philosophers" who advocate such changes. A good example of this is when Paley disagrees with Goldsmith's use of the word "adapted" to describe the pelican's bill. He disagrees by writing, "Now this extraordinary conformation is nothing more, say our philosophers, than the result of habit; not of the habit or effort of a single pelican, or of a single race of pelicans, but of a habit perpetuated through a long series of generations."[232] For Paley, this proposal directly contradicted his definition of habit and could therefore be dismissed.

Now that the nuances of Paley's conception of 'relation' and its corresponding subcategories have been explained, let me illustrate this system by using the much cited and abused example of a watch. A general relation would consider several different watches and then identify 'related' parts, e.g., chains, wheels, fusees, barrels, etc. As an aside, I must state that it is unclear if this relation is one of similitude, analogy or

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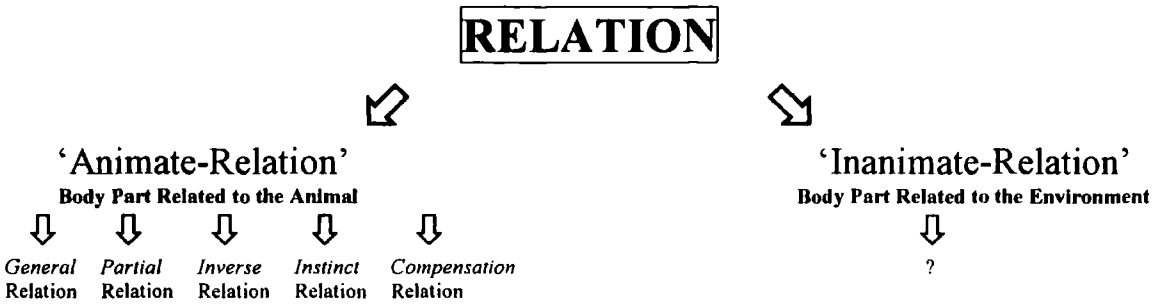
[230] All Paley quotations in this paragraph are taken from Chapter XVIII, 'Instincts'.
[231] *The Spectator*, No. 120, Wednesday, July 18, 1710. Addison also addresses instinct in *The Spectator*, No. 25 and No. 519.

homology. A partial relation would look at one watch and identify how the watch parts work together. How, for instance, one spring turns a wheel, how that wheel turns another wheel and so forth. An inverse relation would be the existence of a wheel on the outside body of a watch when that same wheel is located on the inside of the other watches. All of these relations fit well within the fixed machine metaphor. However, because of its behavioural implication, the machine metaphor breaks when referring to an instinctual relation and this is why the instinct chapter is devoid of mechanical examples. Note the progression of the diagram:



Latter Eighteenth Century Taxonomy and Irregularities

Admittedly, it does take some serious reading to figure out this system of relations. Perhaps if Paley specifically stated what taxonomy system he was using, his concept of relations could have been more clearly defined. But, to assume that there was a unified 'taxonomy system' at this time would be erroneous. The basic Linnæan concept of genus (or genera) and species was usually accepted by natural historians, but the overarching organising principles of these two concepts were far from established. The Cuvier-Lamarck debates were yet to be written. In England, the genus and species distinction had been readily accepted ever since John Ray's works were written at the end of the seventeenth century. Despite the fact that Paley states "I am not writing a system of natural history", he does use the Linnæan genus and species distinctions and he uses the word "tribe" which was associated with the taxonomical category of order at the time.[233] Note the following taxonomy from Withering's "Easy Introduction" of his *Botanical Arrangement* published in 1796.[234]

VEGETABLE KINGDOM	KINGDOM OF ENGLAND	POPULATIONS	MILITARY
CLASSES	to the COUNTIES	resemble NATIONS	to an ARMY
ORDERS	to the HUNDREDS	resemble TRIBES	to a REGIMENT
GENERA	to the PARISHES	resemble FAMILIES	to a COMPANY
SPECIES	to the VILLAGES	resemble INDIVIDUALS	to a SOLDIER
VARIETIES	to the HOUSES	same as INDIVIDUALS in different circumstances	[none given]

[232] Chapter XXIII, 'Of the Personality of the Deity'.
[233] The word 'tribe' is also used by Derham as a division for Animals in his *Physico-Theology*.
[234] William Withering, *An Arrangement of British Plants; According to the Latest Improvments of the LINNÆAN SYSTEM: To which is Prefixed an Easy Introduction to the Study of Botany, Vol. I* (London: M. Swinny, 1796), 5-6.

Withering's *Botanical Arrangement* was "An Arrangement of British Plants; According to the Latest Improvements of the LINNÆAN SYSTEM". This was one of the most widely read botany books in England at the very time that Paley was writing *Natural Theology*. Many of Paley's descriptions could even fall under the "VARIETIES" category listed in the above taxonomy analogies. As with other contemporary natural historians in England (both popular and practising), Paley uses the terms "tribe" and "species" colloquially at times to simply connote a general group of similar animals. For instance, in his popular and scholarly zoology books published in 1806, George Shaw refers to wasp tribes, bee tribes and butterfly tribes but also refers to snails and worms which "belong to a different tribe of beings".[235] For the scope of the book, the intended gentlemanly audience and the popular natural history works of the time, Paley's references' usage of the Linnæan taxonomy fell far within the bounds of accepted practice. Paley's concept of general relation and inverse relation would be concerned about comparisons between species, genera and tribes. Because a partial relation is concerned about comparing parts of a single organism, it would only be relevant for the species category.

Lastly, before we proceed to Paley's concept of telic change, his stance on morphological irregularities needs to be explained. In the very first chapter of *Natural Theology*, Paley asserts: "It is not necessary that a machine be perfect, in order to shew with what design it was made: still less necessary, where the only question is, whether it were made with any design at all".[236] Returning to the watch analogy, Paley argues that if someone found a broken watch, he or she would still recognise that the parts were created to work together. He holds that, "When we are inquiring simply after the *existence* of an intelligent Creator, imperfection, inaccuracy, liability to disorder, occasional irregularities, may subsist in a considerable degree, without inducing any doubt into the question." Why is this the case? Paley's answer is: "Just as a watch may frequently go wrong, seldom perhaps exactly right, may be faulty in some parts, defective in some, without the smallest ground of suspicion from thence arising that it was not a watch; not made; or not made for the purpose ascribed to it." Paley did realise that his audience might perceive the appearance of animal parts being fit for their environment. For this reason he states: "Irregularities and imperfections are of little or no weight in the consideration, when that consideration relates simply to the existence of a Creator."

In addition, many animal and vegetable parts remained unexplained in Paley's day. He mentions this state of affairs and cautions against ignorant, anti-teleological

[235] George Shaw, *General Zoology or Systematic Natural History, Vol. VI. Part I. Insecta* (London: G. Kearsley, Fleet Street, 1806).
[236] Chapter I, 'State of the Argument'.

morphological judgements. "Thus it is with the lungs of animals. It does not, I think, appear, that we are acquainted with the action of the air upon the lung...In this case, therefore, we may be said to know the use, nay experience the necessity of the organ, though we be ignorant of its operation."[237] So, even though Paley admits the existence of irregularities, he does not think that they damage his design argument. But, it is important for our discussion and for those interested in Paley's approach to natural history, to note that Paley does acknowledge the existence of irregularities. Because, if there is an irregularity in a fixed, designed world, this implicitly means that something has *changed*—either the original environment, or the organism. Paley realised this fact and this is probably why he included the concept of compensatory relation in *Natural Theology*. Let us now investigate the nuances of this idea.

Part II:
Telic Change

Appetencies and Compensatory Relation

Simply stated, Paley's subcategory of compensatory relation is how Paley accounts for change within the animate natural world. More specifically, it refers to minor adaptations in *a* body part of an organism. It was essentially what could be called a *telic change*. It does not refer to broad sweeping adaptations (e.g. "silly Buffon") because such adaptations are inconceivable in the perceived ordered world of the eighteenth century. Most gentlemen who read the first editions of *Natural Theology* would have known that even Linnæus held that basic morphology of an organism does not change. Moreover, eighteenth century British philosophers believed in a fixed chain of being and in explaining the 'is' of nature.[238] The detailed and large-scale study of fossils was still waiting for the onslaught of geological investigation that occurred after Paley's death.[239] In this intellectual context, what kind of order could be maintained if giraffes took the place of recently extinct whales? Furthermore, if this disorder could take place in the natural world, what type of repercussions would this have on the political order that was also perceived to be 'natural'? The outcome would resemble the disorder currently

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[237] Save for the first, all quotations in this paragraph are taken from Chapter V, 'Application of the Argument Continued'.

[238] Or in a scale of being that, in Addison's words: "The whole chasm of nature, from a plant to a man, is filled up with diverse kinds of creatures, rising one over another, by such a gentle and easy ascent, that the little transitions and deviations from one species another are almost insensible." *Spectator*, No. 519. This cultural context of this 'order' is discussed in the 'Taxonomy' of Lorin Anderson, *Charles Bonnet and the Order of the Known* (London: D. Reidel Publishing Company, 1982), 31-58. Near the end of the eighteenth century, some variations upon the chain of being were taking form, but the fundmental concept of fixity was still the prevailing concept that governed natural historical investigation. For one of these variations see W. D. Ian Rolfe, 'William and John Hunter: breaking the Great Chain of Being', in W. F. Bynum and Roy Porter, eds., *William Hunter and the Eighteenth Century Medical World* (Cambridge: CUP, 1985), 297-322.

[239] Fossils were a subject of interest during the eighteenth century, however, accepted overarching classification systems and understanding of deep time had not been developed. As implied above, this had to wait until the first decades of the nineteenth century when natural philosophers began to develop theories of morphological change on a much larger scale. For an interesting article on the eighteenth century's study of fossils, see N. A. Rupke, 'The Study of Fossils in the Romantic Philosophy of History and Nature', *History of Science* (1983), **21**: 389-413.

demonstrated in the horrifying actions taken by the French Republic, and obviously, nobody wanted this to happen.[240]

In this cultural milieu, concepts that involved large-scale change were not entertained as serious options. This is why Paley found it unintelligible that "parts were not intended for the use, but that the use arose out of the parts."[241] This is also why an idea like extinction was, in Paley's words, "a misfortune which seems to be studiously guarded against." If, in an extremely unlikely event, an organism became extinct, that was the end of the discussion. The slot assigned to that organism in the chain of being would simply remain empty. Why would another organism want to move into the empty slot when its morphology was suited for another slot? Not only did this type of change seem illogical and required unnecessary intellectual effort, it was dangerously linked to sedition. This is why Paley's conception of change is limited to specific morphological parts already created to fulfil a specific purpose. "Though there be the appearance of failure in some of the details of Nature's works, in her great purposes there never are. Her species never fail. The provision which was originally made for continuing the replenishment of the world, has proved itself to be effectual through a long succession of ages."[242]

When referring to telic change, Paley most often calls it *compensation*. Again, "Compensation is a species of relation. It is relation when the *defects* of one part, or of one organ, are supplied by the structure of another part, or of another organ." Thus, "To a form, therefore, in some respects necessary, but in some respects also inadequate to the occasions of the animal, a supplement is added, which exactly makes up the deficiency under which he laboured."[243] Since Paley allows for telic change in specific body parts, but does not allow for larger changes in an organism's fixed morphological design, he fits within the British gentlemanly culture's largely static conception of nature. When scholars write about Paley's conception of morphological change, Paley's concept of telic change is sometimes overlooked because they usually concentrate on what he calls *appetencies*. Since his concept is often confused by modern readers, I must plainly state that appetency is *not* compensation because an appetency *creates* new parts. Compensation simply *modifies* pre-existing parts. Furthermore, compensation is a supplement, not a replacement. Paley explains appetency, "which has lately been brought forward, and with much ingenuity", to happen when:

> *Pieces of soft, ductile matter, being endued with propensities or* appetencies *for particular actions, would, by continual endeavours, carried on through a long series of generations, work themselves gradually into suitable forms; and at length acquire, though perhaps by obscure and almost imperceptible improvements, an organization fitted to the action which their respective prospective*

[240] Peter Bowler, *Evolution – The History of the Idea* (London: University of California Press, 1989).
[241] Chapter V, 'Application of the Argument Continued'.
[242] Both unfootnoted quotations in this paragraph are taken from Chapter XXIV, 'Of the Natural Attributes of the Deity'.
[243] Chapter XVI, 'Compensation'.

propensities led them to exert. A piece of animated matter, for example, that was endued with a propensity to fly, *though ever so shapeless... would, in a course of ages, if not a million years... acquired* wings. *The same tendency to locomotion in an aquatic animal, or rather an animated lump which might happen to be surrounded by water, would end in the production of* fins; *in a living substance, confined to the solid earth, would put out* legs *and* feet; *or, if it took a different turn, would break the body into ringlets, and conclude by* crawling *upon the ground.*[244]

This self-development of wings, fins and legs was obviously not acceptable to Paley. It involved the formation of a previously non-existent morphological part and this was contrary to Paley's conception of body parts being telic.

Paley's Concept of Change Contextualised

As noted in the last chapter, an appentency-like material theory was promoted by one of Paley's major botanical sources, Erasmus Darwin. His theory revolved around the concept of a *filament* that operated in the same fashion as Paley's description of an appetency. It was precisely this possibility of innate change in matter that Canning was attacking his 'The Loves of the Triangles' poem parody of Darwin's work in the *Anti-Jacobin, or Weekly Examiner* published in 1798. Compare Paley's above description of appetency to the following quotation taken from Canning's footnote describing a filament. He states the material world formed with the help of filaments and then the following happened:

In this state of things, the FILAMENT of Organization *would begin to exert itself... This FILAMENT, after an infinite series of ages, would begin to* ramify, *and its viviparous offspring would diversify their forms and habits, so as to accommodate themselves to the various* incunabula *which Nature had prepared for them.—Upon this view of Things... VEGETABLES, and that these being abandoned to their own* energies, *by degrees detached themselves from the surface of the earth, and supplied themselves with wings or feet, according as their different propensities determined them, in favour of aërial and terrestrial existence. Others... in time, would restrict themselves to the use of their* hind feet: *their* tails *would gradually rub off... In the mean while, the* Fuci *and* Algæ, *with the* Corallines *and* Madrepores, *would transform themselves into* Fish, *and would gradually populate all of the sub-marine portion of the Globe.*[245]

This journal was self-described as patriotic. One only needs to look at its name to realize that at its heart it was a political publication. Darwin's filaments were being mocked because of the political connotations inferred in the theory's concept of change. Darwin's empirical natural history examples were not really the issue for the *Anti-Jacobin*. Rather, it was how Darwin *interpreted* the information and the potential social consequences *inferred* by the theory behind the interpretation.

Paley frequently practices the acceptance of empirically based natural commonplaces with the simultaneous rejection of the theory that uses the commonplaces. He did this not only with the scientific information taken from the writings of Darwin, but several other of his sources. In *Natural Theology's* plant chapter, Paley is quite happy to

[244] Chapter XXIII, 'Of the Personality of the Deity'.
[245] George Canning, *The Loves of the Triangles*, published in three editions of the *Anti Jacobin*: 16 April, 23 April and 7 May 1798. Collected and republished in George Canning, ed., *The Anti-Jacobin; or, Weekly Examiner in Two Volumes, Volume II*, (London: J. Wright, 1799), 171-2.

use Darwin's description of the *vallisneria*, "as it has been observed in the river Rhone", even though he does not subscribe to Darwin's theory. In an astute rhetorical move of omission, Paley takes care not to directly attack the theory. He simply "removes it a little farther back" by concentrating on *adaptation*, Darwin's principle of change. He transforms Darwin's seemingly non-telic version of change into a telic version of change, which is perfectly acceptable for Paley. He asks: "Who, to use our author's own language, "*adapted* the objects? Who gave such a quality to these connate parts, as to be susceptible of *different* 'stimulation;' as to be 'excited' each only by its own element, and precisely by that which the success of the vegetation requires?" Paley is so confident that his reader realises the answer to this question that he simply lets it stand as it is.

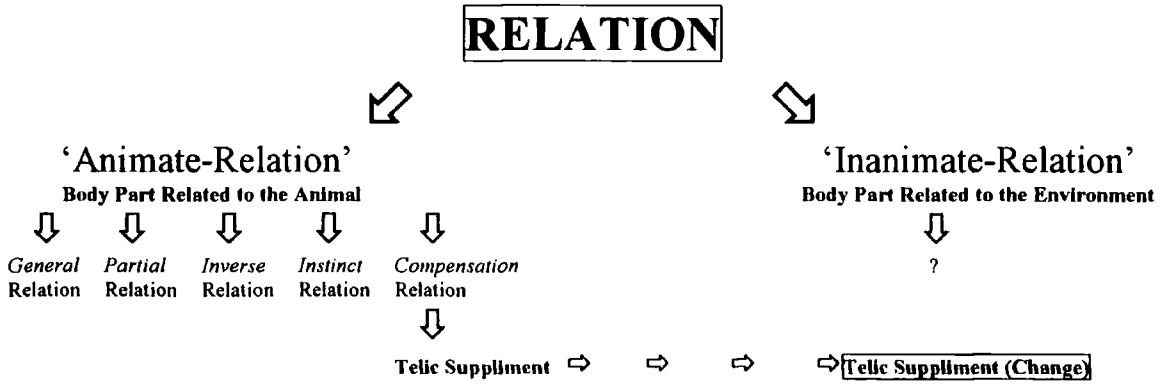
As with the previously mentioned lack of a universally accepted taxonomy system, such proto-evolutionary theories, as they are sometimes called, often represented the individual opinions of the author. For most scholars, using the chain of being to describe the natural world was still the norm and such theories like Darwin's, though entertaining, were disregarded. This was the case for two reasons. First, the new systems of change were not founded on any sound empirical evidence. Paley nails this point home: "The scheme under consideration is open to the same objection with other conjectures of a similar tendency, viz. a total defect of evidence. No changes, like those which the theory requires, have ever been observed." Second, conceding inherent organising properties to matter forced one to consider a gradation of living forms that challenged the fixedness of the chain of being and the final causes that governed it. As we saw in the 'Astronomy' section above, Paley adamantly holds that there is no organising force inherent in matter. Because Paley recognises that it could be argued that appetencies are divinely placed in the natural world as an instrument of change used by God, Paley is "unwilling to give it the name of an *atheistic* scheme". But he cogently warns of the slippery slope that "does away with final causes". "Give our philosopher these appetencies; give him a portion of living irritable matter (a nerve, or the clipping of a nerve) to work upon; given also to his incipient or progressive form, the power in every stage of their alteration, of propagating their like, and, if he is to be believed, he could replenish the world with all the vegetable and animal productions which we at present see in it."[246]

Chapter 6 Conclusion

To briefly summarise this chapter, the past two subsections have explained Paley's conception of morphology and the general system that Paley used to explain the form and function of an organism's body parts. Paley calls this system *relations*. There are two different types of relation. *Animate-relations* refer to comparisons made between body

parts of an organism to itself, or to a similar organism. Animate-relation consists of five subcategories: *general*, *partial*, *inverse*, *instinct* and *compensation*. *Inanimate-relations* refer to comparisons made between the body parts of an organism and its environment. Because of Paley's concern about the telicity of an organism's ontic body part, he concentrates more on the animate-relation category. He avoids directly addressing inanimate-relations because to do so might be to admit that an organism's environment might have an effect upon an animal's morphological parts. To admit this type of change would undermine the telic fixedness that is one of the foundational assumptions of his rhetorical argument. Thus, the majority of Paley's commonplaces emphasise the fact that an animal's parts are fixed and work well in relation to itself and to the parts of similar animals.

But, as I have pointed out many times in this thesis, Paley was writing a rhetorical argument. This allows him to make illogical jumps and to include commonplaces that do not necessarily support claims made earlier in the argument. This is the case for Paley's conception of *telic change*. Paley wanted his audience to assent to the claims of his argument based on an emotional agreement with the facts presented. As a writer at the beginning of the nineteenth century, he realised that there was a growing belief that an organism's environment just might have an effect on its body parts. To add more credibility to his argument, Paley would have to address this sentiment *and* maintain the fixedness of the natural world. Paley accomplishes this by vehemently arguing against a unilateral conception of change and by arguing for the development of a telic supplement that might possibly occur in a few minor instances. Paley's references to this sort of change are few, but would have appeased those who knew the nuances of the types of change at hand. Note the final diagram of Paley's relations:



By using the compensatory relation category as a platform to discuss telic change, Paley is essentially slipping in the back door of inanimate-relations (i.e. the environment's effects upon a body part). This telic change is more of a modification than a creation of a

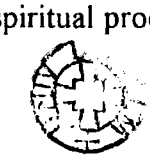
[246] Quotations in the paragraph taken from Chapter XXIII, 'Of the Personality of the Deity'.

new part. But, it is a change nonetheless. With this concept of telic change, Paley falls firmly within the contemporary conception of change in the natural world, both on the continent and in Britain. One only needs to read Cuvier's writings from around 1800 to realise the similarity between his and Paley's teleological conception of fixed body parts. Paley's conception of change was merely a reflection of his intellectual context. This only makes sense, because as an orator, Paley had to know his audience. The very inclusion of telic creation and telic change further serves to confirm that the audience would have accepted Paley's natural philosophical commitments. Furthermore, even though Paley's change is telic, it is important to recognize that he does indeed allow for change.

AN ORANGE APPLE?
CONCLUSION OF THESIS

Paley's inductive rhetorical argument in *Natural Theology* was a product of the eighteenth century and he used data and terms that were acceptable to his gentlemanly reading audience. Because of *Natural Theology's* success in the nineteenth century, I cannot overstress that the scientific authors and data that Paley used as commonplaces targeted an eighteenth century genteel class that was already familiar with the basic information that Paley was presenting. In this sense, Paley knew his audience well. But, what Paley did not know was how fast British society would change after his death in 1805. *Natural Theology's* audience in the early and mid nineteenth century was not the same as those educated by the Enlightenment who read the book in 1802. The times were changing, both socially and scientifically. Science was becoming increasingly specialised. Astronomy was turning away from planetary physics towards the seemingly endless possibilities of sidereal astronomy. Natural history was to be divided into the disciplines of geology, biology, zoology, botany, and palaeontology. In this context, public perceptions of the natural world also changed. The middle class was becoming much more interested in education and cheaper printing made it possible for books like *Natural Theology* to be disseminated on a much wider scale. For many of these middle-class Christians, Paley's argument was spiritually appealing, even if the scientific information was dated. It is because of this situation that new editions of *Natural Theology* appeared with extensive footnotes and diagrams that amended and, to use Paley's word, 'supplemented' his argument.

In regard to Paley's representation of 'inanimate matter', the rapid growth and interaction of sidereal astronomy, chemistry and geology in the beginning of the nineteenth century quickly dated and severely crippled the usefulness of the scientific information used in the astronomy chapter by Paley. Likewise, Paley's approach to 'animate matter' was increasingly being compared to the new systems of morphological change that were based upon the data provided by newly discovered fossils and living specimens. To offset this problem, the *Bridgewater Treatises* were commissioned to bolster the credibility of the design argument. Their fate was similar to that of *Natural Theology*. When considering the dated scientific information of these and other natural theological arguments, it is sometimes easy for historians, theologians, scientists and philosophers to dismiss their importance. The high publication numbers of such books demand a different assessment of the situation. Even *after* Paley's design argument lost its scientific credibility, the book continued to be published until the end of the nineteenth century. This is because it appealed to the religious or spiritual proclivities of its readers.



It was these proclivities that continually exposed successive generations to the *scientific* information available in natural theological books. For those authors who do address the cultural significance of these books, it has often been argued that natural theology was an agent of secularisation.[247] When considering this proposal, this essay demonstrates that it must not be forgotten that as the nineteenth century audience read Paley, they were being educated by an eighteenth century scholar who advocated eighteenth century concepts of law, nature and morphological change. Because of this link to the eighteenth century intellectual milieu, these conceptions were much more meaningful and gave purpose to the general cultural perception of meaninglessness and timelessness that came to be associated with nineteenth century science's description of the natural world.[248] Moreover, the conflation of moral and mechanical laws and the specific type of telic morphological change promoted by natural theology is a relatively unexplored subject waiting for investigation. It is only in the context of these ideas can that we can see natural theology as an agent of secularisation.

In regard to this situation, this thesis's exposition of Paley's usage of scientific sources and data as commonplaces will be helpful to those wishing to understand the basic natural philosophical information that was being popularised to those who read *Natural Theology*. Even if this information seems to convey a patchwork approach to natural philosophy, Paley had the unique ability for creating or procuring metaphors and succinct definitions that made the general contours of the information easier to grasp. With a few lines, Paley could turn the shape of the earth into that of an orange. Yet, even though he does not quote any scripture, his entire program was theological and anthropocentric. In his pages, we do not read about Adam and Eve taking bites from an apple, but Paley's argument that the world *needs* a sustaining creator is simply a continuation of the Bible's assertion that humanity needed a sustaining and guiding Deity after the events in the Garden of Eden—so in this sense, there is really an apple beneath Paley's orange. This being the case, historians of ideas would do well to take a bite of Paley's hybridised intellectual fruit.

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[247] This is succinctly addressed by John Hedley Brooke in an article entitled, 'Science and Theology in the Enlightenment' in W. Mark Richardson and Wesley J. Wildman, *Religion and Science – History, Method, Dialogue* (London: Routledge, 1996), 7-28. This idea is also addressed by Owen Chadwick, *The Secularization of the European Mind in the Nineteenth Century* (Cambridge: CUP, 1995).

[248] Gillian Beer, 'Origins and Oblivion in Victorian Narrative' in her *Sex, Politics, and Science in the Nineteenth Century Novel* (Baltimore: Johns Hopkins University Press, 1986).

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