THE MEDITATIONS OF RENE DESCARTES AND THE LEGITIMATION
OF THE PROJECT OF MECHANISM

DAVID ANDREW CRAGG

A Thesis submitted to the faculty of Emmanuel College
and the Department of Theology of the Toronto School of Theology.
In partial fulfillment of
the requirements for the degree of Master of Arts in Theology
awarded by the University of St. Michael’s College

Toronto 1997
The author has granted a non-exclusive licence allowing the National Library of Canada to reproduce, loan, distribute or sell copies of this thesis in microform, paper or electronic formats.

L’auteur a accordé une licence non exclusive permettant à la Bibliothèque nationale du Canada de reproduire, prêter, distribuer ou vendre des copies de cette thèse sous la forme de microfiche/film, de reproduction sur papier ou sur format électronique.

The author retains ownership of the copyright in this thesis. Neither the thesis nor substantial extracts from it may be printed or otherwise reproduced without the author’s permission.

L’auteur conserve la propriété du droit d’auteur qui protège cette thèse. Ni la thèse ni des extraits substantiels de celle-ci ne doivent être imprimés ou autrement reproduits sans son autorisation.

0-612-25198-5
# TABLE OF CONTENTS

## Introduction

**Chapter 1: The Project of Mechanism**

<table>
<thead>
<tr>
<th>Mechanism’s concept of matter</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Four aspects of the inertness of matter in mechanism</td>
<td>7</td>
</tr>
<tr>
<td>A fifth characteristic of mechanism</td>
<td>12</td>
</tr>
<tr>
<td>God, nature, and human knowledge</td>
<td>15</td>
</tr>
<tr>
<td>Fulfilment of a Project: <em>The World and Treatise on Man</em></td>
<td>19</td>
</tr>
<tr>
<td>God, nature, and human knowledge in <em>The Meditations</em></td>
<td>28</td>
</tr>
<tr>
<td>God and mechanism</td>
<td>31</td>
</tr>
</tbody>
</table>

**Chapter 2: Theology and the Need to Legitimate Mechanism**

<table>
<thead>
<tr>
<th>Mersenne’s synthesis of science and theology</th>
<th>41</th>
</tr>
</thead>
<tbody>
<tr>
<td>Galileo: a challenge to theological-scientific synthesis</td>
<td>45</td>
</tr>
<tr>
<td>The ideal of knowledge-by-construction and its challenge to theology</td>
<td>50</td>
</tr>
<tr>
<td>The theological challenge to mechanism</td>
<td>59</td>
</tr>
<tr>
<td>Descartes’ new synthesis</td>
<td>62</td>
</tr>
</tbody>
</table>

**Chapter 3: *The Meditations* as a Legitimation of Mechanism**

<table>
<thead>
<tr>
<th>Part I</th>
<th>67</th>
</tr>
</thead>
<tbody>
<tr>
<td>The theological audience and the stated purpose</td>
<td>69</td>
</tr>
<tr>
<td>The unspoken purpose of <em>The Meditations</em></td>
<td>71</td>
</tr>
<tr>
<td>The genre</td>
<td>73</td>
</tr>
<tr>
<td>Part II</td>
<td>75</td>
</tr>
<tr>
<td>A criticism of aristotelian science</td>
<td>77</td>
</tr>
<tr>
<td>The transcendence of God reframed epistemologically</td>
<td>77</td>
</tr>
<tr>
<td>Clear and distinct perception and the reality of ideas</td>
<td>78</td>
</tr>
<tr>
<td>Part III</td>
<td>84</td>
</tr>
<tr>
<td>The geometrical construction of God’s existence</td>
<td>85</td>
</tr>
<tr>
<td>Completing the construction</td>
<td>85</td>
</tr>
<tr>
<td>Part IV</td>
<td>89</td>
</tr>
<tr>
<td>God’s relationship to the self: the criterion of truth</td>
<td>89</td>
</tr>
<tr>
<td>God’s relationship to the corporeal world: transcendance reasserted</td>
<td>91</td>
</tr>
<tr>
<td>Rebirth into the new world of mechanism</td>
<td>94</td>
</tr>
</tbody>
</table>

**Conclusion**

100

**Endnotes**

101

**Bibliography**

113
INTRODUCTION

Rene Descartes (1596-1650 c.e.) is the individual credited most with ushering in the age of thought entitled the modern age. In the present intellectual climate this earns Descartes more criticism then it does praise. Philosophically his work has recently been superseded according to such thinkers as Norman Malcolm by the language philosophy of Ludwig Wittgenstein.¹ Theologians as well have been very interested in the legacy which Descartes’ philosophy has left for Christian thought. Among these John Paul II, has judged Descartes’ work to be of particular theological significance:

Though the father of modern rationalism certainly cannot be blamed for the move away from Christianity, it is difficult not to acknowledge that he created the climate in which, in the modern era, such an estrangement became possible.²

The present importance of Descartes’ writing for both philosophy and theology is undeniable.

Research and interest in the writings of Descartes is ongoing. Contained within the recent research on this man’s thought important new insights have been proposed that change the way we understand his philosophical and scientific contribution. This essay takes its genesis and principal inspiration from one such insight, found in a recent intellectual biography of Descartes by Stephen Gaukroger. Recent reviews in Isis³ and in The Journal of Philosophy⁴ have acknowledged the achievement of this book. Gaukroger’s thesis links Descartes’ metaphysics to his work in the area of natural philosophy and provides a new hermeneutical context within which to interpret Descartes’ later writings. The result is a re-interpretation of The Meditations such that

¹...

²...
new light has been thrown on the relationship between Descartes' science and his
metaphysics.

The problem that Descartes started off with was that of building up a
natural philosophy, mechanism... Mechanism on his interpretation
required a particularly unyielding conception of God's transcendence,
however, and this raised the question of what kind of relation we stand
in to a transcendent God. Descartes realized that both aspects of
mechanism could be dealt with in terms of an epistemologized
metaphysics. ...[I]n the Meditations he sets out a more metaphysical
version of mechanism...  5

According to Gaukroger's thesis, then, The Meditations serve as a legitimation of his
project of mechanism. The present essay will adopt this new insight and relate it to
issues of theological interest. Furthermore, it will attempt to show how exactly
Descartes' Meditations perform the task of legitimating his science, something which
the review by Stephen Nadler claims was not done sufficiently well in Gaukroger's
book.

This new context replaces "the challenge of scepticism" as the starting point for
understanding the metaphysics, an assumption presented by interpreters since
Malebranche.  6 This basic assumption is true for most philosophers today 7 and the
Meditations are often taught and studied on their own as the place where the essence of
Descartes' thought is manifested. In preparation for this thesis many authors were
studied who have worked to develop an understanding of the connection between
Descartes' philosophy and theology. These authors include Etienne Gilson, Jaques
Maritain, and Edward John Kearns. 8 Their interpretation of Descartes, however,
focuses primarily upon problems of metaphysics and involves primarily the Discourse
on Method and The Meditations. Our new understanding, to the contrary, proposes that The Meditations ought not to be taken on their own without an understanding of their context within Descartes' life long project in natural philosophy. This context in turn sheds new light upon the theological issues at stake within them.

Far from standing on their own as the pinnacle and essence of Descartes' thought, The Meditations must be seen more closely interconnected with the developments of his science and with the need to justify this science before the Church. Gaukroger suggests that the condemnation of Galileo convinced Descartes that the Church would not accept the new approach to natural philosophy unless it were accompanied by some sort of metaphysical legitimization. The metaphysics as worked out in The Meditations can no longer be assumed to be logically prior to the physics. Rather, their content can plausibly be seen to arise out of a subsequent necessity which faced Descartes to justify his mechanist science by means of a metaphysics that would be acceptable to the Church.

The thesis, therefore, will provide an account of Descartes’ science and an account of why that science might not be welcome in the eyes of the Church. These will be the key interpretive tools used in understanding The Meditations rather than a history of medieval metaphysics. Descartes himself was worried that people were spending too much time analysing The Meditations and not enough time on the important matters of science.

A point to note is that one should not devote so much effort to the Meditations and to metaphysical questions, or give them elaborate treatment in commentaries and the like. Still less should one do what
some try to do, and dig more deeply into these questions that the author did; he has dealt with them quite deeply enough. It is sufficient to have grasped them once in a general way, and then to remember the conclusion. Otherwise, they draw the mind away from physical and observable things, and make it unfit to study them. Yet it is just these physical studies that it is most desirable for people to pursue, since they would yield abundant benefits for life.\textsuperscript{10}

The present thesis will attempt to be true to Descartes' primary interest in its interpretation of \textit{The Meditations}. It will do so by asking three questions: What was Descartes' science?, Why did it need legitimation?, and How do \textit{The Meditations} serve this purpose?
CHAPTER 1: THE PROJECT OF MECHANISM

The project of mechanism\(^1\) was a new attempt to come to terms with problems of natural philosophy. Mechanism rejected the traditional aristotelian approach to natural philosophy yet maintained many of its concepts. Chief among these was the concept of matter which it transformed, described as inert and established as the fundamental explanatory principle of science. Mechanism’s description of the world had four characteristics and in these Descartes proves himself to be as consistent as any other mechanist of his age. These characteristics include, the use of the machine analogy, the conviction that phenomena should be picturable, the aversion towards animistic principles in matter, and the mathematization of nature. Along with these four there is a fifth characteristic of mechanist science which is a break with the traditional place accorded to God in natural philosophical discussions.

Descartes’ project of mechanism was given its greatest expression in the works of *The World* and *Treatise on Man*. These two works demonstrate compatibility with all the general characteristics of mechanism which are mentioned above. Furthermore, they develop a concept of a transcendent God upon which the intelligibility of the world depends. This notion of God, however, had too many problems to stand up to theological scrutiny and left Descartes’ project vulnerable to the accusation of atheism.

**Mechanism’s concept of matter**

Mechanism was an approach to the natural sciences that grew out of and away
from an aristotelian approach to physics. A general feature of seventeenth-century scientific thought was a distancing from aristotelian physics and mechanists energetically contributed to this. However, mechanists also retained much of Aristotle's philosophical terminology while applying it in very different ways. "Matter", "form" and "substance" are three particularly important examples of this. Mechanism's commitment to the inertness of matter is, for our purposes, the most important general feature of this reconceptualization.

In an aristotelian world matter and form are correlative terms. They are dependent, rather than independent realities. The fundamental entity of the corporeal world was not matter but individual corporeal substances, entities composed of both matter and form. According to Thomas Aquinas' scholastic-aristotelianism, matter is the principle of individuation of a substance. Form, for example, decided what a thing is (e.g. a cat, or catness) whereas matter contributes to the particular instance of that thing (e.g. this cat). Matter, according to Aristotle, does not exist in the world except in combination with form, it is always only one component of a composite, corporeal substance.

Aristotle held that form was that which endowed corporeal substances with particular qualities, of which there are two kinds: essential and accidental. The essential qualities are those that flow from the thing's essence such that a thing would cease to be the thing it is without them. A cat's essential qualities, for example, are four footedness, furriness, warmbloodedness, etc. Accidental qualities, on the other hand, are those which do not belong to a substance's essence. Whether a cat is grey,
fat, or unfriendly are examples of accidental qualities. What becomes an important question in aristotelian science is distinguishing which qualities are essential and which merely accidental. Establishing the essential qualities formed the basis for the aristoteliens' and scholastics' demonstrative science.\(^5\)

Mechanism's alternative centred around the transformation of the concept of matter. It sought to interpret matter simply as that which is identical with the physical world, the fundamental component of the universe. Matter became "free standing", identical with substance, and needing no explanation beyond being created by God; it was no longer understood to be correlative with and dependent upon form. Mechanists did not all agree on the basic characteristics of this matter but there was a general understanding that its two fundamental qualities were extension and impenetrability. All other perceived qualities were said to be a function of the interaction between different bodies involving these fundamental qualities.\(^6\)

Four aspects of the inertness of matter in mechanism

Following E.J. Dijksterhuis in the epilogue of *Mathematization of the World Picture* we can identify four characteristics of mechanism. All four of these characteristics shed light on the kind of interpretations of physical phenomena made possible by a concept of matter as inert. The inertness of matter and the general characteristics of mechanism formed the basis of the scientific ideals for which all seventeenth century mechanists strove but which few achieved with unwavering consistency. Descartes, however, was far more consistent than most and a helpful
comparison is made to Isaac Newton who while less consistent on these principles is considered to have given “classical” mechanism its fullest expression.\textsuperscript{7}

The first characteristic of mechanism is its use of the analogy of the world as 'machine', a word whose presence in natural philosophic discussion goes back to the greek word \( \mu \varepsilon \chi \alpha \nu \eta \) (mechane). The analogy interprets the universe as one great machine but also on a smaller scale understands natural phenomena in terms of mechanical examples. This latter tendency developed into a practice called transdiction, interpretation of phenomena at the microcosmic level by means of inference from macrocosmic phenomena which bear resemblance to mechanical devices.\textsuperscript{8}

The overarching use of the machine metaphor is found in the example of the interpretation of the world as analogous to the mechanical clock. This was a very powerful metaphor in the seventeenth century.\textsuperscript{9} The clock was a fine example for mechanists because it is a complex system of moving parts which, being inert, derive their motion not from themselves but from some outside source, the person who winds the clock for example. Transdiction is an example of the machine analogy on a smaller scale and was a practice developed by a number of different mechanists during Descartes’ time. Isaac Beeckman, who had an important influence on the development of Descartes' thought, is someone who mastered this technique while working in the family construction business.\textsuperscript{10} Transdiction used instruments such as pulleys, levers and gear wheels to demonstrate the hidden mechanisms in nature.\textsuperscript{11}

This characteristic of mechanism, though generally adhered to, was subject to a
number of inconsistencies. Funkenstein tests the application of this analogy by pointing out that medieval scientists were able to construct machine models which were believed to simulate celestial motions accurately. The world as described by the mechanists such as Newton, however, defied such construction based upon the fact that inertial and gravitational forces could not be mechanically represented.\textsuperscript{12} Descartes' explanation of celestial motion, however, relied entirely upon the mechanical forces of collision and therefore in a sense could literally be reproduced as a machine in a way that the Newtonian universe couldn't.

The second characteristic of mechanism is the conviction that phenomena should be picturable. This notion is closely related to the above machine analogy but the emphasis is on our ability to grasp the phenomenon clearly rather than on the mechanical structure of the phenomenon \textit{per se}. Picturability means that a phenomenon is considered machine-like by virtue of its ability to be graphically represented, that is by virtue of its being something one can visually imagine. This was an important characteristic of mechanism for a number of prominent mechanists. Isaac Beeckman, whose scientific explanations "rested on the appeal to a clear picture of the structure and interaction of constitutive parts of an apparatus"\textsuperscript{13}, is a prime example. Beeckman firmly believed that "there was no point in talking about effects if you cannot imagine how they are produced."\textsuperscript{14} Descartes too insisted that matter and all effects produced from its motions could be clearly understood and imagined. This was in part to distinguish mechanical phenomena from the natural phenomena as described by aristotelian philosophy whose descriptions of qualities, forms and
processes had a nebulous and mysterious quality about them.¹⁵

Picturability, then was an important characteristic of mechanism, guaranteeing comprehensibility in explanation of natural phenomena. Again, however, there were exceptions to this rule. Newtonian gravity, for example, was an aspect of a mechanical system which is not picturable.¹⁶ The strong role of picturability as an element of mechanical philosophy is testified to by the fact that Newton’s theory was rejected by Huygens and Leibniz and other scientists like them who placed utmost importance on the ability to picture a phenomenon.¹⁷ Descartes, however, proves himself to be consistent, once again, in his mechanistic approach. His theory of vortices gave an account of planetary motion and the pull of gravity simply in terms of the mechanical impact of matter in motion.

A third characteristic of mechanism was the rejection of "animistic" or "organic" principles in matter.¹⁸ Here the lifeless aspect of the machine is stressed. The world is described in terms of the non-animation proper to a machine, namely the thing’s inability to function without an agent, and its status as having been set and kept in motion from without.¹⁹ An explanation of a machine does not involve innate forces produced and deployed by some of its parts. "No mechanic," for example, "would appeal to teleological processes, occult virtues or immaterial causes to account for the functioning of a simple mechanical device."²⁰ The nature of a machine is that its parts are inert until set in motion from an outside source.

The anti-animistic element in mechanism is of key importance for understanding Descartes' mechanism and its theological import as shall be shown in the next chapter.
The opposition to animism is closely connected to the fundamental feature of mechanism which we have been discussing, that is the inertness of matter. Here, once again, Descartes proves himself to be more mechanical than Newton. Newton's principle of inertia indeed closely resembles an internal power contained within a body. Descartes' version of the law of inertia, by contrast, is based on God's direct action and a tendency to motion rather than an internal property of an object.

The attempt to mathematize nature is the final of the four characteristics of mechanism suggested by Dijksterhuis. For the scientists of this period mathematics was emerging as the great code through which the world could be understood and expressed. Johannes Kepler (1571-1630) often spoke of his conviction that the world was created in accordance with mathematical principles and Galileo's famous dictum was "the book of nature is written in mathematical language." Slowly there arose out of the middle ages the consciousness which had existed since ancient Greek times that the Great Architect of the world must have been a pure mathematician as nature came to reveal mathematical order and harmony throughout the universe. The result was that scientists began to see a new simplicity and coherence in the world and to express their discoveries in exact mathematical terms.

Mathematics, applied as a language to describe natural phenomena, transformed natural philosophy. Aristotle had believed that mathematical entities were an abstraction from material bodies and the chief physical property, namely change. For this reason he believed that there was little use for mathematics in physics. Until this understanding began to erode in the fourteenth century, mathematics, when used in
matters of physics, had dictated which constructs had to be used according to its own internal principles of simplicity and perfection. Physics in the seventeenth century, however, turned to mathematics with concrete problems to be solved for a formula or figure, but not necessarily the formula or figure that the discipline of mathematics would suggest by virtue of its simplicity or perfection. Though mathematical figures such as the circle were still used to describe celestial phenomena, the phenomena were no longer expected to conform to the perfection of a mathematical definition. Instead mathematical equations were permitted to describe approximations to geometrical figures based upon the evidence at hand. Kepler had been among the first to succeed in doing this by his description of planetary motion in terms of an ellipse. Mathematics was thus transformed from a catalogue of ideal forms into a language, a language capable of describing natural phenomena on its own terms. Descartes, Gaukroger states, was the first fully to transform the use of mathematics in physics. A key aspect of this accomplishment was the complete quantification of nature by virtue of a concept of inert matter. On Descartes' understanding, matter could be completely described in terms of the relations and proportions of its parts rather than in terms of its inherent and ambiguous qualities.

A Fifth Characteristic of Mechanism

Mechanism's new approach to understanding the world ran into resistance not only on account of its break with older, established ways of thinking in philosophy and physics. In theological matters as well its end effect was a displacement of God from
the traditional role which the divine had played in the explanation of physical phenomena. Mechanism provided a description of the world at times opposed traditional understandings of biblical revelation. Mechanists sensitive to theological controversy were therefore required to present their ideas very carefully in order not to create any unnecessary controversy for mechanism's theological opponents.

As a mechanist Descartes, too, found himself treading upon traditionally metaphysical and theological ground without in any way making appeal to theology. As Gaukroger says, "One gets the strong impression that [he] thinks that questions that had traditionally been treated in metaphysical terms - and to some extent even theological terms - can be dealt with almost as scientific matters of fact."29

In an earlier work entitled The Rules Descartes gives an account of human cognition which is a typical example of a mechanistic description. It attempts to demonstrate that cognition proceeds very much along the analogy of simple mechanical devices such as a seal imprinting a piece of wax or such as the motion transferred from the writing end to the opposite end of a pen. These examples were used to describe how sense impression become recorded in our minds. Transdiction and picturability are plainly evident here but what would be equally noteworthy to the eye of a seventeenth century natural philosopher would be the fact of what is not there, namely any sign of metaphysical or theological content. The soul and its immortality was a vigorously debated topic in the seventeenth century and closely related to the problem of cognition as Gaukroger attests in various places. A person who influenced Descartes religiously as well as philosophically was Cardinal Berulle who held an Augustinian
view of cognition as divine illumination.30 In Descartes' account of cognition there is, however, no mention of material, organic, and rational souls such as those one would find in an traditional Aristotelian account, and neither does it deal with the personal immortality of the soul.

There was a literary technique in use by mechanical scientists of the seventeenth century that helped them get around the theological and metaphysical tensions that inevitably resulted from the application of mechanism.31 It is a technique that Galileo used (albeit unsuccessfully) in his Dialogue Concerning Two World Systems and we are introduced to it early on in Descartes' writings immediately preceding the above example of his discussion of human cognition. The technique was to frame the given mechanist explanation in terms of a hypothetical account of the phenomenon. "My aim," said Descartes,

is always to write in such a way that I make no assertions on matters which are apt to give rise to controversy, without first setting out the reasons which led me to make them and which I think others may find convincing too.

But since I cannot do that here, it will be sufficient if I explain as briefly as possible what, for my purposes, is the most useful way of conceiving everything within us which contributes to our knowledge of things. Of course you are not obliged to believe that things are as I suggest. But what is to prevent you from following these suppositions if it is obvious that they detract not a jot from the truth of things, but simply make everything much clearer?32

To place his contentious description of human cognition in the context of a hypothetical account of the phenomenon shows a sensitivity to the theological issues that are at stake. In this way, Descartes and the other mechanists of his day made a disclaimer while stating that the assumptions they will make "do not detract from the truth, and
are designed simply to help one to see that truth more clearly."

Where such a technique of framing an account hypothetically is used it is an indication that his account of the given phenomenon is going to have implications in the area of metaphysics and theology. Furthermore, the existence of such a technique for introducing contentious topics in the field of physics alerts us to what I would like to call a fifth characteristic of mechanism: that is the role God does not play in the explanation of natural phenomenon.

God, Nature and Human Knowledge

God was by no means entirely expelled from mechanist explanations of the world and in fact continued, in some respects, to play a crucial role. Mechanism's reinterpretation of God's role was motivated by the rejection of an aristotelian grounded naturalism that had appeared during the period of the Renaissance. Naturalism, broadly defined, is the doctrine that God does not have to be invoked in any way to explain a whole range of phenomena which had traditionally required some reference to the divine. More specifically, renaissance naturalism as an approach to natural philosophy which made use of magic, the occult, and other mysterious powers in its explanations of phenomena and was known for its credulity as well as for its fuzzy distinction between the natural and supernatural. Mersenne was one important seventeenth-century mechanist who attempted to draw a clearer line between God and nature. Out of mechanism emerged a concept of God as both transcendent and fundamental to the general explanation of the universe. Descartes, in accordance with
this position, described God as having created the eternal truths by which the world
was both governed and made intelligible.

Philosophers of the Renaissance had used aristotelian philosophy to develop a
highly animistic interpretation of the world. All things were characterized by their
sympathies and antipathies, acting at a distance and endowing the material world with
its own innate activity. The root of the problem was that Aristotle's physics assumed
to explain change by means of some internal principle inherent in a given body.35 This
endowed bodies with internal tendencies to move in various ways. For example, the
heaviness of a stone and its tendency to fall was explained in terms of its essential
form, the form of heaviness contained in its stoneness.36

Mersenne was the first person to systematically describe mechanism, and who in
matters of science and theology shared a great deal in common with Descartes. "In
criticizing the various forms of naturalism," Gaukroger tells us, "Mersenne points to
the credulity of many forms of renaissance thought, and he extols the virtues of
mechanism for a quantitative understanding of nature[.]"37 Against the Renaissance
version of aristotelian science, mechanists believed that nature and the changes
occurring within it could be described mathematically, that is according to the rules of
mathematics. Such a view relied heavily upon a concept of matter as inert, a concept
that allowed nature to be quantified. Everything in the natural world, according to the
mechanical approach, was to be explained in terms of the motions, relations,
proportions and collisions of the one natural substance, matter.38 All changes in a
mechanical world must be understood in terms of these external, quantifiable
influences. The reduction of natural phenomena to a function of the interaction of particles of inert matter in simple mechanical terms meant that things could be explained without reference to internal properties or action at a distance, concepts that were not easy to explain or even imagine.

For Mersenne, "what is fundamentally at issue, however, is not the triumph of quantitative science over credulity, but the defence of the supernatural against appropriation by the natural." Mersenne, the mechanist-theologian draws a connection between establishing an important place for God in the realm of natural philosophy and the effective explanation of the world via the concept of matter as something inert. The notion of a God separate from, yet engaged in ruling over, a world comprised only of inert matter put mechanism in a position to explain the world much more effectively than the aristotelian science of the Renaissance ever was.

God, then, was retained in the mechanist account of Mersenne and Descartes as a transcendent reality, remaining outside of nature but still active as that which sustains motion and governs change. Hutchison explains that "if the mechanical philosophy is right in stripping all matter of its aristotelian qualities and leaving motion as the sole remaining principle of corporeal activity, God must be intimately involved in every event in the corporeal universe." The notion of a transcendent God continuously acting upon the world acted as guarantee for those mechanists like Mersenne and Descartes that the world around them could be truly understood in mechanist terms. The key to understanding how this works in Descartes' mechanism is to examine how God's "intimate involvement" in the world was interpreted by him.
Descartes gives expression to his version of the relationship between God and the intelligibility of the world in a letter to Mersenne dated 15 April, 1630. The letter was written to report the beginning of a scientific treatise that was to become *The World* and to share some thoughts he had had on metaphysical matters. Descartes writes:

> in my treatise on physics I shall discuss a number of metaphysical topics and especially the following. The mathematical truths which you call eternal have been laid down by God and depend on him entirely no less than the rest of his creatures.\(^1\)

God's "intimate involvement" in the world included for Descartes the creation of the truths by which the world was governed. In the above context eternal truths include the truths of mathematics such as, for example, the essence of a triangle, but they also include truths of physics which Descartes calls the "laws of nature."

Though eternal truths are created no less than everything else in the world and depend no less upon God for their existence, Descartes holds that they are still as solid and immutable as if they were eternal in an uncreated sense. His position resembles that of Thomas Aquinas on the question of the absolute and ordained powers of God:

> Now the fact that God is said to have produced things voluntarily, and not of necessity, does not preclude His having willed certain things to be which are of necessity and others which are contingently, so that there may be an ordered diversity of things. Therefore, nothing prevents certain things that are produced by the divine will from being necessary.\(^2\)

The necessity of created truths is important because it is this which establishes the human's ability to understand the world. Therefore, in Descartes' mechanism God is said to have established the means by which the human is able to understand the world.
The most important consequence of this interpretation of God's role for mechanism was the confidence it gave human beings in their ability to understand the world.\textsuperscript{43} It created what Robin Briggs has called a mood of materialistic self-assurance, a new confidence in the human's ability to understand.\textsuperscript{44} Mechanism offered its adherents a clear and distinct perception of natural phenomena in accordance with the simplicity and coherence of a mathematical and law governed description of the world. Dijksterhuis explains with regards to mechanism that

\begin{quote}
\textit{in principle the medium was created which was necessary - and for nearly two centuries was to prove sufficient- to systematize the whole wealth of physical experience brought to light by the developing experimental investigation of nature, and to describe it accordingly.}\textsuperscript{45}
\end{quote}

Fulfilment of a Project: \textit{The World} and \textit{Treatise on Man}

In 1629 Descartes made an inspirational discovery in the area of mechanism\textsuperscript{46}. The discovery was in the area of meteorology, the product of research into the rare phenomenon of parhelia or mock suns, one of which had recently been witnessed in Rome. Descartes became excited when he realized the similarity between this phenomenon and the phenomena of rainbows. The problem of rainbows was something that had mystified the greatest minds since Plato and before and would have been considered one of the greatest challenges for scientific explanation.\textsuperscript{47} As a consequence Descartes dropped everything else that he was working on and focussed completely on this with intention to produce a small treatise on meteorology.

According to a letter to Mersenne dated March 1629 this soon expanded from a
description of parhelia and rainbows to all sublunary phenomena and then by November to a "complete physics" concerning all natural phenomena. Descartes had determined to test the mettle of mechanism.

*The World* together with *Treatise on Man*, Gaukroger tells us, was the most ambitious systematic project that Descartes ever undertook. Descartes dedicated three years to the project from 1630 to 1632. It was intended to have three parts: a description of inanimate nature, *The World*, a description of animals and the human body, *Treatise on Man*, and finally and explanation of the 'rational soul' or mind, a section which is not extant and which was perhaps never written. All together it presented a new world system with enough to recommend it as a replacement of the aristotelian version which Descartes had taken care to match in the areas of celestial, sublunary and terrestrial phenomena point by point.

*The World* consists in fifteen chapters, beginning and ending with a description of light and light emitting bodies and dealing in between with such things as the phenomenon of burning, matter and the non-existence of the void, cosmology, planetary motion, a description of the sun, moon, stars, comets, and planets, including earth, a description of weight, and an account of the ebb and flow of the tides. The *Treatise on Man* is a general description of the human body as a machine, including the circulation of the blood, the function of the nerves as channels of communication between the brain and the muscles, and an account of vision. Though it will undergo slight change in the later *Principles of Philosophy*, the *World* and *Treatise on Man* contain the basic and unchanging principles of Descartes' mechanism.
The following quote from *The World* brings together the principles found generally in Descartes' project of mechanism.

Note, in the first place, that by 'nature' here I do not mean some goddess or any other sort of imaginary power. Rather, I am using this word to signify matter itself, in so far as I am considering it taken together with all the qualities I have attributed to it, and under the condition that God continues to preserve it in the same way that he created it. For it follows of necessity, from the mere fact that he continues thus to preserve it, that there must be many changes in its parts which cannot, it seems to me, properly be attributed to the action of God (because that action never changes), and which therefore I attribute to nature. The rules by which these changes take place I call the 'laws of nature.'

We can see here a basic summary of Descartes' mechanism. He alludes to the inertness of matter, the mathematical "qualities" that allow his descriptions of the world to be mathematized, the separation of God from nature, and the laws that govern the world and make it intelligible.

The above quote makes clear that nature and matter are co-terminus. Matter is the fundamental explanatory entity in Descartes' universe. *The World* describes matter as having three qualities. First, matter is the same in all bodies, it is homogeneous. Second, "its extension... [is] its true form and essence," and connected to this "the quantity of matter... does not differ from its substance any more than number differs from the thing numbered." Matter, then, is essentially quantifiable. Third, "there is nothing [no matter] anywhere which is not changing [i.e. moving]." And, that different bodies of matter "change and diversify their motions by colliding with one another." Thus matter is described as essentially inert and subject to change on the basis of mechanical collision.
Examples of the application of Descartes' mechanist understanding of matter can be classified under the four characteristics of mechanism that we described earlier. First is the use of the machine analogy. Transduction is evident in Descartes' mechanism. In chapter 13 of *The World*, for example, Descartes uses sticks, converging tubes, and pulleys in an attempt to describe light. The *Treatise on Man* gives detailed descriptions of the human body in terms of different machines or mechanisms. For example nerves and brain cavities are compared to pipe organs and air conducts, motor operations are compared to complicated fountains where levers and water channels control the flow of water and the movement of its parts. Indeed, for Descartes, physiology consists in presuming "the body to be nothing but a statue or machine made of earth, which God forms with the explicit intention of making it as much as possible like us." 

On a more general level, Descartes' over-arching cosmological system in both *The World* and *Treatise on Man* is also based on a machine analogy. This is true by virtue of the fact that all change is accounted for through the collision of particles. This stipulation Descartes followed as closely as possible and, as we have seen, he adhered to it more closely than such mechanists as Isaac Newton. Newtonian physics as we have mentioned before appealed to action at a distance in the phenomenon of gravity. Descartes, on the other hand, used the concept of collision of particles to explain even the circular nature of planetary motion. What made this possible and set his mechanism apart from that of many others was his rejection of the void and commitment to the universe as a plenum of matter. Gaukroger describes Descartes'
approach as hydrostatic as opposed to kinematic. Instead of studying the motion of bodies as they float around in space, as in the kinematic approach, Descartes' description is modelled after the motions of particles within a body of water. Take the following example from Chapter 4 of *The World*:

> We do not usually notice these circular motions when bodies are moving in the air, because we are accustomed to conceiving the air only as empty space. But look at fish swimming in the pool of a fountain: if they do not come too near the surface of the water, they cause no motion in it at all, even though they are passing beneath it with great speed. From this it clearly appears that the water they push before them does not push all the water in the pool indiscriminately: it pushes only the water which can best serve to perfect the circle of their movement and to occupy the place which they vacate.\(^\text{57}\)

The hydrostatic model assumes that matter is at all times in contact with other matter, thus there is no possibility of a void and no possibility of the motion of one particle to occur which does not directly affect the motion of another. Instead all motion is a product of collision and pressure not unlike that which we find occurring in a body of water. In Descartes' mechanism,

> The point seems to be not so much to analyse the behaviour of a body under various kinds of constraint in terms of how it behaves when not under constraint [as in the kinematic approach of Newton and others], but rather to account for what happens when a body moves from one system of constraints to another, where the constraints that Descartes is interested in are collisions.\(^\text{58}\)

Since Descartes posited that material bodies were in constant contact with one another they were therefore subject at all times to the effects of mechanical interaction. Descartes' description of the motion of the planets whose circular motion he explains in terms of vortices is a good example of the extent to which Descartes' cosmology was
mechanical in the sense of being dependent upon the forces of collision. Gaukroger explains:

Because the universe is a plenum, for any part of it to move it is necessary that other parts of it move, and, as he has explained earlier, the simplest form of motion which takes the form of displacement is going to be a circle..., although we have no reason to think that the universe turns around a single centre: rather, we may imagine different centres of motion.59

The second feature of mechanism is adherence to the ideal of picturability and this also forms an important aspect of Descartes' mechanism. In Treatise on Man bodily processes are vividly described in mechanical terms, and the matter which Descartes describes in The World is such that it can be known "as perfectly as possible."60 Clarity is what Descartes thinks will secure the credentials of his mechanism as a legitimate and superior approach to natural philosophy.61

In The World, Descartes denies the essential properties of bodies such as hotness, dryness, heaviness, sweetness, loudness, blueness, etc., because he argues these "are not clearly known by everyone."62 Every body we encounter and the qualities that we perceive in it Descartes attributes to particles of matter whose one essential quality is that of extension. Instead of being the end of explanatory process, then, all perceptual phenomena such as the sensations of hot, dry, cold, wet, light, heavy, sweet, sour, loud, quiet, Descartes explains in terms of motion and collision of particles of matter. Such an explanation in terms of matter-in-motion, he argues, commends itself as superior to other aristotelian explanations by virtue of the fact that it can be easily conceived.63 Since the nature of our perceptions must be understood in

24
tems of the arrangement and collision of particles, they are described in a way that can be pictured. For Descartes, then, mechanism is the means by which we can know things clearly. There is nothing "obscure" in the world of mechanism, instead Descartes says "everything I propose here can be distinctly imagined[.]."

The third aspect of mechanism is its anti-animistic character. Descartes addresses the question of animism explicitly in the quote which we started with. Nature is not spoken of as if it were a goddess. "All the qualities" of matter which Descartes refers to are simply two, extension and the tendency to motion. Matter, which is co-terminus with 'nature', is inert, that is it possesses no special power of its own outside of its capacity to be in motion. Its motions and changes are governed by rules ordained by God, not by powers, or animating principles within particular bodies. The subject of antianimism will be dealt with more extensively in the next chapter on theological issues.

The fourth characteristic of mechanism is its use of mathematics to describe nature. *The World* as a project in mechanism began and ended with the problem of the nature of light. In fact it was Descartes' discoveries on this question that determined the fundamental characteristics of mechanism in *The World*. Gaukroger tells us that

[Descartes'] general account [of light] was a milestone in optics, and it is not surprising that he will later hold it up as a sample of his method. It is a model of mechanistic mathematical physics of the kind that no other mechanist was near achieving: no other mechanist - Hobbes, Gassendi, Mersenne, or Beeckman - had even approached such a successful quantitative approach[.]."

Since the description of light is complex we will be better served to skip to the
problems of cosmology which are also examples of matematization in Descartes' project of mechanism and are more closely related to the theological issues that will be important for this essay.

Though Descartes did not in fact get into any detailed quantification of planetary motion beyond a brief account of lunar motion and the tides, Gaukroger points out that "this should not blind us to the significance of Descartes' success in presenting a thoroughly mechanist cosmology which takes as its foundations a strictly mechanist conception of matter and the three laws of motion." Descartes' descriptions of planetary motions and vortices were based, as we have seen, on hydrostatics. In the seventeenth century this was a mathematically developed discipline which meant that Descartes' cosmology and astronomy were open to thorough quantification. *The World* and *Treatise on Man* succeed, then, in producing a thoroughly mechanist and thoroughly matematizable description of the world.

The fifth characteristic of mechanism which I have suggested is also exemplified in *The World* and *Treatise on Man*. Traditionally metaphysical and theological discussions in the area of natural philosophy are absent in these works. As we have seen "there must be many changes," Descartes wrote, "...which cannot, it seems to me, properly be attributed to the action of God..., and which therefore I attribute to nature."

In a letter to Mersenne dated 18 December, 1629, Descartes laments that theology "has been so deeply in the thrall of Aristotle that it is almost impossible to expound another philosophy without its seeming to be directly contrary to the Faith."
Under the pretence, then, of making "a long discourse less boring", Descartes clothes his mechanist description of the world in "the guise of a fable."\(^67\) "For a while, then," he asks his reader, "allow your thought to wander beyond this world to view another world - a wholly new one which I shall bring into being before your mind in imaginary spaces."\(^68\) But this is not to say that what he describes has no bearing upon reality.

I might be supposing something impossible. Instead, since everything I propose here can be distinctly imagined, it is certain that even if there were nothing of this sort in the world, God can never-the-less create it in a new one. For it is certain that he can create everything we can imagine.\(^69\)

What this has freed Descartes to do is to describe a world that can be known in very different terms than has previously been the case without challenging the traditional theological understanding. The first sign that this is something radically different is shown by the fact that Descartes proceeds to describe a history of the cosmos completely independent of Biblical accounts of creation. Descartes asks us to suppose that from the first moment of creation God causes some [particles of matter] to start moving in one direction and others in another, some faster and others slower... and he causes them to continue to move thereafter in accordance with the ordinary laws of nature. For God has established these laws in such a marvellous way that even if we suppose he creates nothing beyond what I have mentioned, and sets up no order or proportion within it but composes from it a chaos so confused and muddled as any of the poets could describe, the laws of nature are sufficient to cause the parts of this chaos to disentangle themselves and arrange themselves in such good order that they will have the form of a quite perfect world - a world in which we shall be able to see not only light but also all the other things general as well as particular, which appear in the real world.\(^70\)

Another hint with regards to the theological problems facing the new mechanist
approach to natural philosophy is detected in this comment:

we shall, if you please, suppose in addition that God will never perform any miracle in the new world, and that the intelligences, or the rational souls, which we might later suppose to be there, will not disrupt in any way the ordinary course of nature.71

Descartes' *The World* and *Treatise on Man* cover a lot of natural philosophical territory and constitute a bold attempt at a systematization of his thought in this field. In identifying matter with nature, assuming that it is inert and using it as the fundamental explanatory principle of science these two works are thoroughly consistent in their adherence to the fundamental principles of seventeenth century mechanism. Descriptions of natural phenomena are made in terms of analogy to a machine, picturability, anti-animism, and mathematization, and traditional references to God are absent. Though this flies in the face of an established approach to physics and theology, the role that God plays generally in Descartes' mechanism is, as we shall see, fundamental.

God, Nature, and Human Knowledge in Descartes' Mechanism

As we have seen Descartes held that it was the eternal truths that made the world intelligible. These were truths about the world which were also contained in our minds and they involved the laws of mathematics as well as the laws governing nature. Together these truths made it possible to understand the world apart from any appeal to God.

According to Descartes, as found in the letters written around the same time as
The World and Treatise on Man, the truths whereby the universe is ordered are the same truths that make it possible for the mind to understand the world. In his letter to Mersenne on the 15 April, 1630 he writes,

The mathematical truths which you call eternal have been laid down by God and depend on him entirely no less than the rest of his creatures.... Please do not hesitate to assert and proclaim everywhere that it is God who has laid down these laws in nature just as a king lays down laws in his kingdom. There is no single one that we cannot grasp if our mind turns to consider it. They are inborn in our minds just as a king would imprint his laws on the hearts of all his subjects if he had enough power to do so. 72

Curiously Descartes states that these truths can be known very easily since, "they are inborn in our minds." No other discussion on this subject is given and we will have to wait until we deal with The Meditations to see how it was elaborated epistemologically. In the context of The World and Treatise on Man this statement can only be taken to mean that the eternal truths involved in the ordering of the world exist also at the same time in our minds, simultaneously as it were. They are truths about the world as much as they are modes of knowing dependent upon the mind.

First then let us examine the nature of eternal truths about the world that are called mathematical. The discipline of mathematics, Descartes thought, was superior to all the other sciences by virtue of the fact that its problems underlie the problems of all others and because it is superior in both utility and simplicity. 73 Descartes' work in mechanism helped to transform mathematics from an inventory of ideal entities, as found in Plato, into a formal language of relations and proportions. It was this new language of relations and proportions that allowed non-mathematical relations and
proportions to be described mathematically and to be understood mechanically.74

Descartes, in *The World*, does not wish to suppose any others [truths about the world] but those which follow inevitably from the eternal truths on which mathematicians have usually based their most certain and most evident demonstrations - the truths, I say, according to which God himself has taught us that he has arranged all thing in number, weight and measure.75

"The knowledge of these truths," he goes on to say, "is so natural to our souls that we cannot but judge them infallible when we conceive them distinctly."

The "laws of nature" can be seen as a second subdivision of truths by which the universe (and likewise the mind) is able to untangle that chaos of matter-in-motion. There are three rules or laws governing matter-in-motion which Descartes gives in *The World*. "The first is that each individual part of matter continues always to be in the same state so long as collision with others does not force it to change."76 The second, "is that when one body pushes another it cannot give the other any motion unless it loses as much of its own motion at the same time; nor can it take away any of the other's motion unless its own is increased by as much."77 The third and final rule in *The World* is that

when a body is moving, even though its motion for the most part takes place along a curved path and, as we said above, it can never make any movement which is not in some way circular, yet each of its parts individually tends always to continue moving along a straight line.78

Descartes makes it clear that all change that we observe through the motion of the particles of matter can be explained in mathematical terms without recourse to God explicitly. An understanding of natural phenomena is taken to be purely a function of
number and the laws governing the motion of matter. As we have seen, Descartes argues that

it follows of necessity, from the mere fact that he continues thus to preserve it, that there must be many changes in its parts which cannot, it seems to me, properly be attributed to the action of God (because that action never changes), and which, therefore, I attribute to nature.⁷⁹

Descartes' mechanist concept of matter along with the rules that govern its motion provided the conceptual means whereby knowledge of the world could be achieved.

[T]hose who are able to examine sufficiently the consequences of these truths and of our rules will be able to recognize effects by their causes. To express myself in scholastic terms, they will be able to have a priori demonstrations of everything that can be produced in this new world.⁸⁰

To sum up, knowledge of the world, according to Descartes' mechanism, depended upon the eternal truths which both governed nature and existed in our minds. These truths can be subdivided into mathematical truths and "laws of nature". Descartes believed that all things had been arranged in number, weight and measure.

His work helped to transform mathematics into a very effective language for describing the world. The laws of nature were a description of the rules governing the motion and collision of particles of matter. Once perceived, these rules alone without involving any appeal to God were said to suffice for an explanation and understanding of all physical phenomena. God is, however, the one directly responsible for all truths about the world. These truths, Descartes believes, flow out of God's very nature.

God and Mechanism

Though not needed directly in the explanation of natural phenomena, God still
acted as the most fundamental principle of Descartes' mechanism. God's identity is central to the account Descartes gives of every one of the principles governing the mechanical universe. Who God is, is that which makes Descartes' mechanistically understood world possible. Basically God's identity in *The World* and *Treatise on Man* can be summed up in three attributes: agency of movement, immutability, and greatness. It is Descartes' account of the last of these attributes which leaves his mechanism especially vulnerable to theological attack.

Descartes' position is very clear during the period in which he wrote *The World* and *Treatise on Man*.

I think that all those whom God has given the use of this reason [i.e. the reason that enables humans to know God] have an obligation to employ it principally in the endeavour to know him and to know themselves. That is the task with which I began my studies; and I can say that I would not have been able to discover the foundations of physics if I had not looked for them along that road.81

A little later he writes, "the existence of God is the first and most eternal of all possible truths and the one from which alone all others proceed."82 Not only does Descartes believe that God is the first of all truths but God is said to be more evident than even the truths of geometry (in a letter to Mersenne of 15 April, 1630).83 At no time during the period in which he is writing *The World* and *Treatise on Man* does Descartes develop this position into an argument. He told Mersenne that he has dedicated much time to metaphysics and the proof of God's existence but he is unwilling to share this work because he feels it to be too hard to give expression in a satisfactory way to what he has found.84 The knowability of God, however, is the problematic cornerstone of
his mechanism and Descartes will not be willing to publish any of his scientific work until he has worked out a satisfactory argument for it.

The importance of God for his physics is not something, for Descartes, that is important in a merely formal sense. In fact it is foundational for his mechanism since God's existence and identity bears directly upon the nature and knowability of mechanical phenomena. In saying that he could not have discovered the foundations of his physics without looking for them in the knowledge that human reason is able to provide about God, Descartes seems to be saying that his physics relies upon our ability to know God. All truths about the physical universe, on this account, are a direct consequence of God's identity and activity. For this reason a description of the world cannot take place, for Descartes, without a description of God.

According to what we have already seen, the rules of physics and the truths of mathematics, for Descartes, are based on the same foundation, i.e. that at every moment God preserves each thing by God's continuous action. What is it about who God is that from a mechanist point of view makes knowledge about the world in mechanical terms possible? There are three parts to the answer.

First of all Descartes describes God as the "Prime Mover." God's action as mover is said to be of a particular sort. First, God maintains the same quantity of motion in the universe at all times, thus providing the fundamental principle of the law of the conservation of motion (the second law governing the motion of matter that we discussed above). Change in the world takes place as a result of the redistribution of this motion, but the total quantity of motion remains constant, an important principle
for the development of a quantitative mechanics. Second, God provides the force of motion in a very uniform and predictable way, that is in effecting movement in a straight line (the third law of nature). "God alone is the author of all the motions in the world in so far as they exist and in so far as they are rectilinear." Thus the simplicity of and tendency towards rectilinear motion in his third rule governing the motion of matter is directly dependent upon God. In Gaukroger's words "God is the ultimate causal agent, and He acts through [simple, rectilinear] forces."

Second, God is immutable. The second and the third law of nature depend upon God's identity as mover but also upon God's immutability, a feature which is highlighted by the first law. The law of collisions of particles states "that each individual part of matter continues always to be in the same state so long as collision with others does not force it to change." Because the world is a plenum of matter, modelled after a body of water the collisions of particles will render the God-given, rectilinear motion irregular and curved. That collisions between particles will affect motion in this way, even though it changes the original tendency to move in a straight line, is a product especially of God's immutable will. It will be the law governing the collision of particles that accounts for the circular motion which is so fundamental to Cartesian mechanism. That God causes matter so governed to move and preserves the same quantity of motion from creation on points to the absolutely essential role God plays in the explanation of phenomenon. It also shows why the immutability of God's will with regards to these laws is so important. Thus Descartes says, that these laws follow manifestly from the mere fact that God is immutable and that,
acting always in the same way, he always produces the same effect.
For, supposing that God placed a certain quantity of motion in all matter
in general at the first instant he created it, we must either admit that he
always preserves the same amount of motion in it, or not believe that he
always acts in the same way. Suppose in addition that from the very
first instant the various parts of matter, in which these motions are found
unequally dispersed, began to retain them or transfer them from one to
another, according as they had the force to do so. Then we must
necessarily think that God causes them to continue always doing so.
And that is what these two rules contain.90

Once we have acknowledged the truth of God’s immutability, the eternal truths
of nature seem to emanate from this and allow us to explain and understand the world
and its motions in accordance with its own principles, without recourse to goddesses,
internal aristotelian principles or divine intervention. Immutability, then, is an
essential characteristic of God in the mechanistic world, "For what more firm and solid
foundation could one find for establishing truth, even if one wished to choose it at will,
than the very firmness and immutability of God?"91

Last but not least of the aspects of God’s identity is God’s greatness. We have
quoted before Descartes’ line to Mersenne that "[t]he greatness of God… is something
which we cannot grasp though we know it."92 This aspect of God’s identity will be the
one which in the end does not receive sufficient justification by Descartes to ward off
the threat of ecclesiastical reproach and it will force him back to the drawing board in
order to conceive a metaphysics adequate to legitimize his project of mechanism to the
Church. Speaking of those in danger of becoming atheists, Descartes wrote to
Mersenne on 6 May, 1630, that

because they perfectly comprehend mathematical truths and do not
perfectly comprehend the truth of God’s existence, it is no wonder they
do not think the former depends on the latter. But they should rather take the opposite view, that since God is a cause whose power surpasses the bounds of human understanding, and since the necessity of these truths does not exceed our knowledge, these truths are therefore something less than and subject to the incomprehensible power of God.  

As we mentioned above with regards to the creation of eternal truths such as we find in mathematics and the laws of nature, Descartes understands God to be all powerful, capable of creating them and thus independent of them. In *The World* Descartes tells us that there are no limits to the works that God can do compared to what we can conceive and God is capable of creating anything we can imagine and in fact God is quite capable of doing far more than we can imagine.

It will be said that if God had established these truths he could change them as a king changes his laws. To this the answer is: Yes he can, if his will can change. 'But I understand them to be eternal and unchangeable.' - I make the same judgement about God. 'But his will is free.' - Yes, but his power is beyond our grasp. In general we can assert that God can do everything that is within our grasp but not that he cannot do what is beyond our grasp. It would be rash to think that our imagination reaches as far as his power.  

This imagined dialogue makes two important points. The first is that God created the world so as to adhere to the logic of certain truths such as are found in mathematics and the laws of nature and that God is also free to change those truths at will. Once having exercised this absolute freedom in creating the world, Descartes held, God cannot alter the eternal truths that have been created. Descartes held that there was perfect unity between the intellect and the will of God.

From all eternity [God] willed and understood [the eternal truths] to be, and by that very fact he created them.... In God, willing, understanding and creating are all the same thing without one being prior to the other even conceptually.
For this reason it would be against God's nature to change God's will and thus also God's mind. The reason why we as humans can depend with confidence upon the truths that God has created freely is that God's will is immutable.96

The second point which is made in the above quote, and herein lies the problem for Descartes, is that God's power lies beyond the grasp of our intellect. In fact God seems to operate in a way which is totally foreign to us and thus in a way which is essentially unknowable. As we have seen, Descartes relies upon the position that God's will and intellect are one. "In God willing and knowing are a single thing in such a way that by the very fact of willing something he knows it and it is for this reason that such a thing is true."97 Therefore, God knows things in a way very different than ourselves. As Gaukroger puts it, this God is not merely omniscient but "cognitively omnipotent: He knows all truths because it is something He wills to be true."98 This is very different from the way we know something to be true. And what's more this fact has parallel implications in the area of morality. If the right thing for God to do is the very thing that God wills to be right, thus equating what God wills with what is right, then God is not morally constrained in the way we are either. "Truths for God" and "goodness for God" thus become quite different from "truths for us" and "goodness for us."99 But if human cognition bears no relationship to God's cognition such that it is to all intents and purposes independent of God then this is the same as living in a world where there is no God.

This extreme view of God's power is linked to the issue of God's transcendence. It posits, in a very radical way, God's separation from creation by
making God no more dependent upon 'eternal' truths than upon empirical truths. However, "God's transcendence," as Gaukroger points out, "cuts both ways. It can make us completely dependent on Him, or it can make Him so distant and remote from us that our dependence on him begins to lose content." But if our dependence in God for what we know is undermined then according to Cartesian mechanism it is not only God that we loose but also our understanding of the world. The foundations of Descartes' physics depends upon the existence and identity of God. It is God that provides *The World* and *Treatise on Man* with the ultimate conditions for the possibility of knowing anything about the world.

Descartes attempts to bridge the gap between God and the human with a distinction between knowing God and grasping God.

...I know that God is the author of everything and that these [eternal] truths are something and consequently that he is their author. I say that I know this, not that I conceive it or grasp it; because it is possible to know that God is infinite and all powerful although our soul, being finite, cannot grasp or conceive him. In the same way we can touch a mountain with our hands but we cannot put our arms around it as we could put them around a tree or something else not too large for them. To grasp something is to embrace it in one's thought; to know something, it is sufficient to touch it with one's thought.

This, however, would not be enough to provide the legitimization required to defend mechanism against the growing apprehension of the Church, bound as it was by centuries of contrary minded aristotelianism and biblical interpretation. God, described as radically transcendent to the point that even eternal truths come under the absolute, divine powers of creation, is a God that simply cannot be known in a sense that has any meaning. Nevertheless it is a transcendent God upon whom Descartes' project of
mechanism relies.

Descartes' project of mechanism depends for its intelligibility on its concept of God. God according to *The World and Treatise on Man* is first mover, immutable, and great to the point of absolute transcendence. Because Descartes is not able to give an adequate account of the last of these qualities his mechanism remains vulnerable to criticism from the Church. The vulnerability which is evident here will become more pronounced as we examine the problem of the relationship between mechanism and the Bible and the challenge of scepticism in the next chapter.

Mechanism, as we have understood the term, was a form of scientific explanation that became important in the seventeenth century. It was an approach that broke with traditional aristotelian natural philosophy while retaining much of its vocabulary. Most important among those which were retained was the concept of matter which was transformed to mean something independent of form and identical with the corporeal world. Mechanism's four important characteristics, namely its use of a machine analogy, its insistence upon the picturability of phenomena, its rejection of the principle of animation in matter, and its commitment to a description of the world in mathematical terms, and a fifth, its dismissal of the traditional role natural philosophy had accorded to God, resulted from this new concept of matter and created an ambiguous relationship with the Church. The research which Descartes began in 1629 culminated in 1633 with *The World and Treatise on Man* and brought to fulfilment his project of mechanism, a project accomplished with rigid consistency in its mechanist principles. God as first agent of motion, immutable creator and sustainer,
and absolutely free and powerful being played a fundamental role in Descartes' mechanism but, being unable to make intelligible the absolute nature of God's powers, leaves it without adequate legitimation. The importance of making intelligible God's transcendent nature and the further challenges which faced mechanism will be dealt with next.
CHAPTER 2: THEOLOGY AND THE NEED TO LEGITIMATE MECHANISM

The biggest problem facing Descartes’ project of mechanism, then, was the question of how it is possible to know a transcendent God. As the argument of the first chapter suggests the notion of a transcendent God was inextricably linked to mechanism. The writings of Marin Mersenne (1588-1648) confirm this and also shows that natural theology was essential for the reconciliation of mechanism with the Church. The trial and condemnation of Galileo, however, created increased tension between science and religion and made it clear that only the most carefully worked out argument was going to be able to legitimate the mechanist understandings of God and the world. Descartes’ mechanism was an attempt to hold science and theology together but two major difficulties can be seen. The first is that the new ideal of scientific knowledge found in mechanism challenges revelation to an unprecedented degree. The second is that there are in the seventeenth century strong sceptical arguments which favour revelation and discount natural philosophy and natural theology as legitimate sources of knowledge. Galileo’s condemnation forced Descartes to find a solution which he does by showing that God is directly responsible for human knowledge and by making knowledge of God conform to his scientific ideal.

Mersenne’s synthesis of science and theology

The writings of Marin Mersenne are an illustration of an attempt at a scientific-theological synthesis and provides us with some understanding of the challenges facing
Descartes in his attempt to make mechanism acceptable to the Church. Mersenne's theology was, like Descartes' science, grounded in the concept of the inertness of matter. His was a theological battle first and foremost and his enemy was not the natural philosophy of aristotelians or scholastics but rather the questionable theological doctrines of the renaissance naturalists. In order to counter the ideas of the latter, however, Mersenne needed to find an alternative to the aristotelian philosophy which served as a source for these. Mechanism was that alternative. Mersenne's works develop arguments for the existence of a mechanist, that is to say transcendent, God in accordance with the teachings of revelation. Establishing God's existence was important for providing a rationalistic verification of faith as well as a theological legitimation of science by means of a divine principle by which the world is made intelligible.

Mersenne, as has already been said, played an important part in the development of Descartes' thought. In the years that Descartes spent in Paris, in close company with Mersenne, between 1626-8, we can see the first explicit developments of Descartes' thinking in metaphysics and theology in *The Rules*. Mersenne, himself, was first and foremost a theologian¹ and the mechanism which he developed had for its main purpose to distinguish between the orthodox and the heretical doctrines of God and God's role in nature.² He was also, however, no stranger to matters of purely scientific concern and played a pivotal role in the scientific developments of the seventeenth century, corresponding with people such as Galileo, Hobbes, Gassendi, Huygens, and of course Descartes. Mersenne's first work perfectly exemplifies these two aspects of his thought.

It was a commentary on Genesis which served double duty as a theological exegesis of the
Bible and as a scientific encyclopedia. This was a largely polemical work aimed at countering "atheism", a term used loosely to describe, not those who did not believe in a god, but rather those whose belief was seen to be counter to orthodox teaching. It also, however, took the opportunity to organize the sciences of the seventeenth-century: music, mathematics, physics, astronomy, agriculture, and linguistics are all listed and discussed.3

Mersenne saw a number of important theological implications tied up with the project of mechanism and thus his close juxtaposition of science and theology was a very natural move. 'Renaissance naturalism' was the alternative natural philosophy with which Mersenne was principally concerned. This philosophy contained elements of neoaristotelian and neoplatonic thought and was associated with such practices as sorcery, cabbalism, astrology, alchemy, and such beliefs as in the doctrine of the "World Soul".4 Naturalism, then, contained elements of magic and other beliefs with which Mersenne would be uncomfortable for obvious theological as well as scientific reasons. Renaissance naturalists, for example, saw magic in the activities of naturally occurring phenomena, and interpreted them in terms of hidden and occult powers. Naturalist understandings of occult powers such as the power of different combinations of herbs to heal wounds, or the alignment of stars where used in various forms of medicine and practices of divinization. Mersenne as a theologian was compelled to reveal the true nature of these heretical practices and beliefs and undertook to show that they arise both out of an improper understanding of nature and an improper understanding of God.5 The root of the problem he perceives as the blurring of the distinction between the natural and the supernatural.

The resulting confusion is the perception that nature is full of all kinds of powers such that
the truly supernatural, that is God, is unneeded in the explanation of anything and thus could easily be left out of the world picture all together. Mersenne saw this exclusion of God, for obvious reasons, as a threat to established religion and therefore something to be opposed as strongly as possible.

Mersenne's perceived enemy was different than that of his friend Descartes. Aristotelianism was not something he chose to reject as Descartes did. In fact a number of its tenets, for theological reasons, he was concerned to defend, such as the clear separation between the natural and the supernatural, the personal immortality of the soul and the rejection of determinism. Mersenne was also aware, however, that this older way of thinking was not going to be effective against the problems of naturalism. The reason for this was that many of these were defensible on aristotelian grounds. Aristotle's understanding of physical change, for example was modelled on biology. Processes were in part governed by a final cause, a teleological property giving physical change an organic feel. Nature could thus be conceived as something with inherent activity, and easily susceptible at times to the interpretation that strange hidden powers were at work within it. The Stoics, using the same principle, had gone farther and had suggested that the cosmos itself be understood as a living organism, something that was adopted in many renaissance treatments of nature.

Fundamental Christian doctrines about God and the human were affected by renaissance naturalism. God, within such a world view was open to be conceived as part of nature not unlike the pagan "Mother Nature." Highly unorthodox doctrines such as pantheism were also free to develop and even more sensitive issues such as the miraculous
and the sacraments of the Church, things which offered personal, human communion with God, became open to purely naturalistic explanations. The doctrine of the immortality of the soul came into question as well since it could be posited that the soul is not a separate substance from the body, that instead it is something wholly immanent in the matter of the body and thus subject to death even as the body is. Mersenne saw this whole state of affairs as a consequence of the construal of nature, or more precisely matter, as being in some way active. Mechanism, whose explanations of nature were grounded in the principle that matter is inert, was therefore a philosophy with real potential to serve the Church.

Mersenne's development of a theology based upon mechanist principles is an attempt to eliminate the heresies of Renaissance Naturalism at their very source: the conception of matter as active. Because of its concept of matter, mechanism was able to make a clear distinction between the natural and the supernatural. This distinction suggests that both nature and God, who exists separately from it, can be clearly known and clearly distinguished. Thus Mersenne worked to show God's existence and God's separateness from creation through a number of proofs: ontological, deontological and teleological (via 'le bel ordre que est au Monde'). His efforts in the area of mechanistic science committed him to the knowability of nature as well and thus it was important for Mersenne to show that the human intellect is quite capable of knowledge in both these areas.

In 1624, one year after the completion of his commentary on Genesis, Mersenne published a book which dealt with his theological concerns in a more condensed and
organized way. The title was *L'Impiete des Deistes, Athees, et Libertins de ce temps*, and it was a dialogue between theologians and deists.\textsuperscript{12} It begins with an examination of the human body, its parts and its marvellous design, it then moves on to a discussion of the world and all that is external to the human, next is developed an understanding of the moral law and the existence of God from which it follows, and finally Mersenne seeks to demonstrate the existence of that God. The God which Mersenne argues for is a God who is at one and the same time the Mover and Creator of the Universe. He merges the cause of motion with the cause of the creation of all things and thus merges the Aristotelian God, that is the God of the deists, with the Christian God, the God of the theologians.\textsuperscript{13} Mersenne thus hopes to refute atheism and provide a case that will persuade the Dietes of the validation of revelation’s account of God.

There are a number of proofs in *L'Impiete* whose aim is to establish both the existence and nature of God in accordance with mechanism’s need for a transcendent creator. The second of these arguments is a good example because it establishes both the existence and transcendence of God and demonstrates a certain confidence in the human intellect and the knowability of the world. It proceeds as follows: "It is necessary that there be a being which is independent and which has no limits."\textsuperscript{14} Mersenne argues for the independence of God via the fact that everything that has being is dependent for that being on something else. The world and everything in it must be dependent. The world and all dependent things derive their intelligibility from that upon which they depend. But this dependency cannot stretch on for ever and therefore the real source of dependent being must be something independent, namely God. Thus God as independent being
guaranteeing the intelligibility of the world is established.

As to the question of God's infinity, Mersenne argues it must be so due to the fact that though we know the things around us, it is possible to imagine things that infinitely surpass what we know. If no infinite being existed this movement in our thought would then constitute a movement from what is real to what is not real. It is impossible to maintain that the infinite does not exist since the mind strives towards it with such enthusiasm and since this would ultimately mean that the only thing greater than the intellect, i.e. infinite being, did not exist. In the previous argument Mersenne had established the necessity of being as prior to and greater than non-being and thus the impossibility the ultimate existence of the privation of being.

There are in fact nine arguments in total that Mersenne develops from a wide ranging knowledge of natural philosophy. These arguments identify God as the necessary and supreme good, as one who is outside time and who caused the beginning of time, as the author of all order, as "the divine Orpheus who touches the cords of the great lute of the Universe", and as the architect of celestial motion. While there is a shift in the last three arguments to more classical strains of argument going back to such people as Plato, Augustine and Anselm, the first six, Buckley tells us, build directly upon the method and mechanics which are the dynamic behind the new science. 15 Separating God from the world and establishing the knowability of both made use of a mechanist approach to nature and satisfied both his theological and scientific inclinations. There is "a very strong sense of transcendence in Mersenne, coupled with a comprehensive principle by which the world is finally made intelligible." 16 To establish at one time the existence and
transcendent nature of God along with the necessary principles guaranteeing the intelligibility of the world will also be what Descartes has in mind in writing *The Meditations*.

**Galileo: a challenge to theological-scientific synthesis**

The event of Galileo Galilei's condemnation in 1633 raised the question of whether or not a synthesis between science and faith was in fact possible. It set up a dynamic in which science seemed to need to justify its claims against the claims of the Bible. Mechanism could thus easily be seen as a philosophy in radical disagreement with the Church and God's revelation. The Galileo affair was developed out of Galileo's defense of the Copernican world view against seemingly contradictory Bible passages. Descartes, however, realized that the issue went much deeper. His reaction to Galileo's condemnation and his attempts to address the theological problems in his own work reveal this.

Galileo's *Dialogue on the Two Chief World Systems, Ptolemaic and Copernican* was published in 1632 and brought to a head many of the issues that were swirling around the new science. One among these issues was a concern for the role of the Church in deciding between what was true in natural philosophy and what was not. But religious sensibilities were not the only thing Galileo's new theories upset. Galileo's methods of reasoning from effects to causes, his use of a telescope (the first artificial instrument ever used to learn new truths about the world), and his willingness to go against the commonly held views of physics all challenged older ways of thinking philosophically and
scientifically and raised questions in the minds of many about the legitimacy of his science. The geokinetic world view that had been suggested by Copernicus and published under the title *On the Revolution of the Heavenly Sphere's* in 1543 was indeed wrought with all kinds of problems, philosophical and scientific, that Galileo in large measure had not immediately been able to solve. It was, however, its apparent contradiction of the Bible that seems to have touched off the most intense opposition to his view that the earth travelled around the sun. Indeed as the scientific argument got stronger and the religious arguments became the last line of defense against the new view of the world, the controversies became much more focussed on this problem. It was Galileo's attempt to defend his position against objections on biblical grounds that touched off the strong reaction of the Church and which eventually led to his condemnation in 1633. Descartes was greatly disturbed by this condemnation and immediately ceased work on *The World and Treatise on Man* and stopped plans to have it published. He writes to Mersenne in the November of 1633, having heard of the condemnation

I was so astonished at this that I almost decided to burn all my papers or at least to let no one see them. For I could not imagine that he - an Italian and, as I understand, in the good graces of the Pope - could have been made a criminal for any other reason than that he tried to prove that the earth moves.... I must admit that if the view is false, so too are the entire foundations of my philosophy, for it can be demonstrated from them quite clearly. And it is so closely interwoven in every part of my treatise that I could not remove it without making the whole work defective. But for all the world I did not want to publish a discourse in which a single word could be found that the Church would have disapproved of...

It was something more than the apparent disagreement between the Bible and Copernicanism (with the consequent threat of ecclesiastical retaliation) that made
Descartes stop in his tracks and with hold the publication of *The World* and *Treatise on Man*. In fact Descartes never in any letter or work mentions the apparent conflict between the Bible and Copernicanism. Furthermore, being a Frenchman and living in Holland Descartes had little to fear from the Church as the inquisition's power lay outside these countries, mainly in Italy and Spain. The issue of the conflict between Bible and Copernicanism is just the surface of something much bigger, something that Descartes knew was intimately connected to "the entire foundations of my philosophy."

The Ideal of Knowledge-by-Construction and its Challenge to Theology

Indeed there are deep issues beneath the surface of mechanism's ability to establish that the earth moves which are of a more general intellectual and theological nature. Mechanism was in a position to go well beyond the proof of the motion of the earth. In fact "[t]he mechanical account of the present state of the solar system... assumed eo ipso a potential history of the Universe." The scientists of the seventeenth century who held a mechanist view felt themselves in a position of such epistemological strength that it was not beyond their reach to suggest a scientific explanation and description of the origins of the cosmos, something that had obvious implications for the Church's doctrine of Creation reaching far beyond the comparatively simple disagreement between Copernicanism and the odd passage in the Bible.

Descartes' account of the formation of the world provides an archetypal example of the new power of scientific knowledge claims and the theological problems that stemmed from this. The following quote from the *Discourse on the Method*, published in
1637, three years after Descartes had dropped *The World* and *Treatise on Man*, sums up nicely the key principles in his earlier project of mechanism and draws some connections to the theological issues at stake though denying their significance. I will enumerate from A to B the principles earlier developed in *The World* and *Treatise on Man* (noting with a "!") Descartes’ use of the hypothetical account in his mechanist description of the world which alerts us to the fact that there are underlying theological issues). The numbers 1 to 3 then list these underlying theological issues as Descartes perceived them. Briefly and in order these issues will be as follows: 1. the creation and conservation of the world, 2. the doctrine of *creatio ex nihilo* and 3. the nature of human knowledge according to mechanism.

[A] I therefore supposed that God now created, somewhere in imaginary spaces, enough matter to compose such a world; [B] and that he then did nothing but lend his regular concurrence to nature, leaving it to act according to the laws he established.... [C] Without basing my arguments on any principle other than the infinite perfections of God, I tried to demonstrate all those laws about which we could have any doubt.... After this, I showed how, in consequence of these laws, the greater part of the matter of this chaos had to become disposed and arranged in a certain way, which made it resemble our heavens; and how, at the same time, some of its parts had to form an earth, some planets and comets, and others a sun and fixed stars.... [!] Yet I did not wish to infer from all this that our world was created in the way I proposed, for it is much more likely that from the beginning God made it just as it had to be. [1] But it is certain, and it is commonly accepted among theologians, that the act by which God now preserves it is just the same as that by which he created it. So, even if in the beginning God had given the world only the form of a chaos, provided that he established the laws of nature and then lent his concurrence to enable nature to operate as it normally does, we may believe [2] without impugning the miracle of creation that by this means alone all purely material things could in the course of time have come to be just as we now see them. And [3] their nature is much easier to conceive if we see them develop gradually in this way than if we consider them only in their completed form.24

Let us quickly review the principles of Descartes' mechanism. [A] The
fundamental stuff of the universe is matter. [B] Change occurs in concordance with the fixed laws of nature and can be understood in these terms. [C] The first principle is God. [!] Descartes gives a disclaimer, stating that the world he proposes is only a hypothetical one, and alerting us to the fact that there are underlying theological issues. Then Descartes alludes to what these theological issues are.


A significant factor in the differing assumptions between mechanism and more traditional approaches concerning our knowledge of the universe has to do with the distinction between the doctrine of the creation and the doctrine of conservation that Descartes mentions in the above quote. This distinction is "most important", Funkenstein points out. He adds that the position "that the logic of creation is the same as the logic of the preservation of the order of the universe... is not at all accepted 'by all theologians'”, as Descartes had suggested.25 In fact it had a history as a doctrine that made possible the peaceful co-existence of seemingly contradictory scientific and biblical accounts of the world.

In the medieval period theologians drew a sharp line between these two doctrines. The distinction had allowed them to accommodate an aristotelian cosmology that taught of an eternal world with the Christian belief in creatio ex nihilo. In medieval commentaries on the book of Genesis, for example, the doctrines of the creation and preservation remain separate and thus allowed them to incorporate aristotelian philosophy by a weeding out of contradictory doctrines. The eternity of the world, for example,
which was a part of Aristotle's physics and metaphysics, was corrected by the Christian teaching about creation but the view of the static nature of the world was retained. The static nature of the world did not conflict with the story of creation in Genesis again because this distinction allowed philosophers to keep the account of creation, and the nature of the world separate. That God created in six days was not considered a matter necessary for understanding creation as there was no intrinsic order or logic involved, and God could have created the world all at once if God had chosen to do so. At any rate, the medievals believed that once the process of creation was finished it was finished for all time. Thus the distinction between creation and conservation needed to be maintained if an aristotelian cosmology was to be easily grafted onto the plain sense of scripture.26

[2] The Doctrine of Creation out of Nothing

Mechanism does not challenge the Christian doctrine of creation out of nothing. As we have already seen with Mersenne it was important to maintain a Christian understanding of God as creator in accordance with the teachings of the Bible.27 In this respect then, mechanism has no troubles. Lying beneath the surface, however, we have in the above passage from the Discourse a challenge to the biblical account of creation of a different order than that which had come to light in the Galileo affair.

Descartes' approach marks a break with ancient and medieval cosmologies which had never sought scientifically to give an account of the creation of the Universe. Aristotle's cosmology, as we have seen, involved the position that the world was eternal and the medieval philosophers had learned how to accommodate this view with the
Christian doctrine of creation out of nothing, *creatio ex nihilo*. No medieval thinker, however, ever found it necessary to reconstruct the history of the universe in order to understand its present state.28

The ancient and medieval conception of the cosmos had been of an essentially static world. All change was seen to be essentially accidental. The philosophers of these periods were confident that they possessed real knowledge of the structure of this static world. The knowledge of how this world came to be or how it was first put together was, however, believed to be the exclusive knowledge of God. Descartes' understanding and the understanding of the mechanists of the seventeenth century radically departed from this view in that they understood motion-in-time, that is change, to be a fundamental principle in the formation the universe.29


The difference between medieval and mechanist descriptions of creation can also be understood in terms of shift in the understanding of the nature of human knowledge itself. Funkenstein describes this shift in terms a change in the ideals of what constitutes knowledge. "The transition from medieval to early modern science and thought was not only a transition of ideas, methods, and arguments; the very ideals of science changed."30 The ideals of a science or philosophy indicate how a given community imagines knowledge of its subject as it ought to be if ever completed. The ideals, in other words, chart science's goals.

The ideal of knowledge in the middle ages was a contemplative one. It emphasised
knowledge through sense perception, illumination, and introspection. The knower was understood to be more like a passive spectator who gained knowledge by beholding truth in a contemplative fashion. This was an ideal that fit very well with the belief in a static universe. In contrast to this, however, the ideal of science in the seventeenth century was that of knowledge by doing, an ertetic ideal. This new ideal assumes that we know only that which we can literally construct or reconstruct in our minds. Descartes, for example, believed he had understood physics once he could reconstruct the making of the universe based upon the principles of mechanism. This ideal, then, can properly be named the ideal of knowledge-by-construction.

The clock metaphor is a useful way to demonstrate the transition which occurred between the medieval and seventeenth century cosmologies and the ideals of knowledge that accompanied them. For both periods the clock was considered the archetypal machine and was a model for understanding the Universe. In the first instance, in fact, clocks were developed from complicated astronomical clocks or models of the celestial motion. Celestial motions according to an aristotelian system were in fact possible to duplicate with reasonable accuracy with clock-like, mechanical devices and in this respect Medieval cosmologies could literally be mechanized. The reason for this is that all planetary motion at this time was thought to conform to perfect circles which remained fixed, uninfluenced by neighbouring orbits. The perfect circular motion of celestial bodies was thought to be due to the soul, or final cause belonging to each individual planet or star. As they were conceived these fixed motions were extremely clock-like with one essential difference: The soul or final cause of each was, in the clock-universe model,
represented by artificially coerced motions. In other words, clock-like models of the universe relied upon an outer force to influence the motions of each model planet or star rather than relying upon an internal property to supply their trajectory and movement. In this respect then, clock-like universes were not able to be more than purely metaphorical representations of the world for the medievals.\textsuperscript{34}

It is precisely at the point where the medieval philosophers abandon the clock-like universe as an exact model that the mechanists of the seventeenth century take it up. With the elimination of all but efficient causes from the universe the clock became, for mechanism, the paradigm model in the realm of celestial motion. Mechanism believed that the principles which helped to create the system would be the same principles that determine its continued motion.\textsuperscript{35} The clock became a perfect analogue of nature, for the mechanists, since when wound up and left on its own it functions according to its own construction, a construction exhibited by the very regularity of its motions.\textsuperscript{36}

Against the ancient and medieval concept of a static universe, motion-in-time became an essential part of the description of the foundations of the universe. Mechanism made use of motion-in-time to describe the very constructing principles which underlie the world.\textsuperscript{37} Describing the process by which things came to be, then, became an essential part of describing how they are in the present. And this is exactly what Descartes has done in \textit{The World}; reconstructing the mechanical processes governing the first random motions of the universe he uses this to provide an explanation for how things are now.\textsuperscript{38} The combination of the principles of the conservation of motion and the laws of motion made it possible for Descartes to offer a reconstruction of the universe, a thing which the
medievals before him had never presumed to be able to do. It is the ideal of knowledge-by-construction, then, that Descartes is expressing when he says above that despite the fact that theologically we know the world was created all at once the nature of things in the material world "is much easier to conceive if we see them develop gradually... than if we consider them only in their complete form."39

That we know only what we can construct was not a view held only by natural philosophers like Descartes and Newton. It was also held by political and social theorists such as Giambattista Vico and Thomas Hobbes. Indeed Vico had felt that we can only have true knowledge in the realm of society and politics since these are features of our world that we do literally construct ourselves where as only God knows nature in the manner of knowledge-by-construction.40 Descartes would obviously have disagreed with Vico and under this disagreement lies an issue of profound theological importance.

Funkenstein traces this issue from the positions of Duns Scotus and William of Ockham who held that the human intellect "was made to share with the divine the same kind of immediate existential knowledge," that is an intuitive knowledge of singulars without the mediation of species.41 Human knowledge came to be understood by seventeenth century philosophers such as Spinoza and Malebranche as a direct knowledge of things as they are in themselves, a position that applied even when it came to our knowledge of God. It was therefore assumed that we do know things just as God knows them. The difference between our knowledge and God's knowledge is seen to be one of degree only, a quantitative difference rather than a qualitative one. Since our ideas of things can be taken to correspond exactly to things in reality the question of right
knowledge becomes one that focusses not on the nature of ideas but on the relations between them.

We see this clearly in Descartes' method, a method that starts with simple intuitions, that is ideas, and combines them according to infallible rules. Descartes understands ideas in the human mind to be identical to "the forms of perception belonging to the divine mind." It is the combinations of these ideas wherein lies the key to human knowledge. Upon examining the nature of mathematical knowledge he had found that it consisted "in considering nothing but the various relations and proportions that hold between these objects," and he felt that such an approach to knowledge could be applied more generally. The discipline of mathematics as it is envisioned in geometry, then, was extended by mechanists such as Descartes to apply to every other disciplines as a science of relations and structures. Thus the ideal of knowledge becomes more mathematical in nature and results in a more mechanical explanation of the world.

A contemporary of Descartes who, referring to the platonic Geometre-God, said "the Universe must be known by the Art whereby it was made." The combination of mathematical method and direct intuition of reality had indeed made this ideal a reality in the minds of the seventeenth century mechanists. It followed that humans could know the world exactly as God knows it with the exception that we don't know as much. No longer was the knowledge of the construction of the universe the knowledge of God alone, Descartes and his fellow mechanists presumed to take a cognitive seat at the right hand of the Creator. Applying knowledge-by-construction to the whole world was theologically suspect. It bore a scary resemblance to the original sin, presuming to make humans "like
God, knowing good and evil."

The Theological Challenge to Mechanism

But there was another obstacle in the way of a fusion between science and theology. This obstacle was a theological challenge to mechanism in the form of scepticism. Scepticism played very easily upon the tensions between mechanism and theology and its negative assessment of rational knowledge made it very useful as a theological weapon against science. Montaigne's scepticism, for example, dismissed rational knowledge and insisted that the Church's knowledge of God through revelation was essentially non-rational and the only true knowledge because it came directly from God.

A commitment to mechanism, as we have already seen, was a commitment to a very positive assessment of human knowledge. For mechanists, such as Mersenne and Descartes, it was important to establish the "natural light" of human reason as a legitimate source of understanding. But the question remained: in matters of natural philosophy, should one ultimately be guided by the light of reason or by the light of faith? This was the issue at stake in Galileo's trial. The dynamic of the Galileo affair set the Copernican world system, a system whose only legitimation lay with a new and particularly optimistic assessment of human reason, against the Church's authoritative interpretation of the Bible. This inflamed the tension between human reason (with mechanism on its side) and revelation (with the Church on its side). Mechanists were therefore in a very difficult position since it was not clear that reason and revelation were compatible.
Scepticism was a position that developed some time before the Galileo affair and which served the cause of the Church very well in establishing the primacy of revelation over reason. Indeed a sceptical stance combined with belief in revelation produced a devout Catholic faith, holding that direct divine communication was the only source of real, indubitable knowledge. It was a position used against rational and natural theologies that believed that natural reason could provide certain knowledge about God. Scepticism argued that there is nothing about this world that can be known for certain except God, but that such knowledge comes only through divine revelation. Not just where God was concerned but in all things scepticism held that we could know nothing for sure based upon our own faculties. In its attack on the human's ability to know, scepticism posed a real threat to the project of mechanism. From the point of view of theology, however, it provided a very strong stance in support of revelation of a fideist, anti-rational sort.

Michel de Montaigne (1533-92) was the most famous of the sceptics in Descartes' day and embodied what was most dangerous to mechanism. Montaigne argued that the only certain knowledge comes not from philosophy but from revelation alone. Montaigne believed that he would best be able to defend the Church if he could establish that there is no such thing as an innate, self-evident core of theological truths. Rather, he argued, the human absolutely needs a supernatural source of guidance in all aspects of life. Funkenstein's comment accompanies this quote from Montaigne's *Apoloigy for Raymond Sebund*:

The only plausible proof for the veracity of Christianity that Montaigne
elaborates at length is taken from the irrational rather than rational
domain,..."I have often marvelled to see, at a very great distance in time
and place, the coincidence between a great number of fabulous popular
opinions and savage customs and beliefs, which do not yet seem from any
angle to be connected with our natural reason.\textsuperscript{51}

Montaigne believed that natural reason would not lead to any truths but only to a
confusion. There are, in fact, two strains of scepticism in Montaigne's thought: one
pyrrhonian, one epistemological.\textsuperscript{52} Pyrrhonian scepticism was a form that had been used
theologically before in the form of a Catholic defense against Protestantism and certain
forms of scholasticism.\textsuperscript{53} Pyrrhonian scepticism is a form of relativism. It maintains that
all truth claims are relative and strives to show the futility of the search for knowledge
rather than address whether there is any knowledge at all. Its chief aim is to achieve
tranquility of mind, by a suspension of judgement based on the perception that all claims
to truth are equally valid. Its method does not involve the assertion of any truth. Rather it
uses the truth claims of others and strives to show that the opposite truth equally holds,
thus questioning the possibility to make such claims. Pyrrhonian scepticism accepts the
equal strength of opposite assertions and thus accepts that any set of beliefs when taken
on their own is as good as another.\textsuperscript{54} Another feature of pyrrhonian doubt is that it does
not perceive its subject as separate or removed from the world as it is ultimately directed
towards a state of being at peace with the world through the suspension of all beliefs,
opinions, and judgements. Its object is to show that we are completely integrated with the
world, making it impossible to transcend our context by trying to find optimal conditions
for cognition.

Epistemological scepticism on the other hand is a form of scepticism which
engages Descartes' project of mechanism more directly. Epistemological scepticism concerns itself with the nature of knowledge rather than the relativism of our beliefs. It challenges the opponent to provide the conditions under which he or she is justified in saying that his or her beliefs constitute knowledge. The epistemological sceptic then aims to show that the opponent will never satisfy these conditions whatever they may be. Rather than being the demise of mechanism, however, epistemological scepticism, became the very tool Descartes uses to legitimize it. The reason Descartes will be able to do this is that epistemological scepticism never doubts that there is something to be known and it asserts our inability to know over against this. The assumption that there is something real to be known dovetails with scepticism's use as a tool to defend theological faith, since what is required is the belief in an objective reality apart from whether or not we are capable of achieving some knowledge of it. So long as scepticism remains unresolved, however, human reason will not be able to provide any knowledge of this reality on its own and the project of mechanism is therefore thwarted.

Descartes' new synthesis

Descartes needed to resolve the conflict between mechanism and theology and the Galileo affair made that very clear. The solution he found was a synthesis between the ideal of knowledge-by-construction and an epistemologically oriented scepticism. The former provided the method, the later provided the material to build an indubitable proof for the existence of God and God's necessary relation to the project of mechanism.

For Descartes, a key feature of the fideistic construal of sceptical reason was its
assertion that there was an objective reality even if it cannot be known. Scepticism denies that the human is able to attain any knowledge of this reality by virtue of human reason and this denial is justified for the very same reason that Descartes' doctrine of a transcendent God in *The World* fails to do what he needs it do to: it fails because the distance between ourselves and the objective reality, that is God, is so great that rational enquiry on its own is unable to bridge the gap. Descartes was convinced of the ability of the human mind to know the world through mechanist principles but at the time of *The World* and *Treatise on Man* had still not been able to show that we are also able to know God using our cognitive faculty.

Scepticism's assumption that there is something real apart from whether or not we know it is very important for Descartes' project. Beginning with the premise that there is something to be known even if we don't know it meant that Descartes was free to focus his energies on the question of whether we are able to say that we know anything about this reality.57 Descartes must now explain how human reason bridges the infinite gap between ourselves and a transcendent God. The Galileo affair has clearly demonstrated that he can no longer afford to let the question go unanswered if the project of mechanism was to go forward.58

Descartes accomplishes this task by turning the sceptic's position on its head and using its sceptical approach, "not as something problematic that needs to be answered but as something that directs us inexorably towards the metaphysical question of how we can bridge the gap between a transcendent God and human cognition."59 In this way the metaphysical problem of God's distance from us is put in purely epistemological terms.
The question becomes, what knowledge of God are we capable of having? The epistemological reformulation of the doctrine of God's transcendence becomes the key to the defense of Descartes' mechanism. The catalyst for the entire reformulation of Descartes' metaphysical issues into epistemological terms is scepticism in its most extreme form, namely hyperbolic doubt.

Hyperbolic doubt pushes the would-be-knower into the realm of subjectivity by focusing attention upon the perspective of the subject. The subject of hyperbolic doubt, however, is different than the self of pyrrhonian scepticism, something immersed inexorably in the world. Rather, "Descartes deploys [a] view of the self in an epistemological context so that the locus of knowledge of the empirical world is now something removed from the empirical world."60 A view of the self which is separate from the world becomes the point upon which the whole question of the legitimation of our knowledge turns. The search for the foundations of knowledge goes forward, not on the basis of human cognition generally but rather on the basis of "my" cognition. One experiences one's own cognition as a subjective process separate from the cognitive process of others and separate from the empirical world. A gap is thus opened up between the self and what can now be termed the 'external' world.61

Descartes seeks to establish the foundations of his metaphysics by mean of the self cognitively removed from the world via hyperbolic doubt. The aim of metaphysics is thus transformed from an attempt to understand how the world is to an attempt to understand how the world is independently of us.62 This obviously makes an investigation of "us" necessary to any investigation of reality and in this way builds in an epistemological
ingredient. How the world is independently of us is established by exploring the nature of the subject’s experience and deciding which features of that experience allow us to make claims to knowledge. Ideas, as the most basic of our cognitive experiences, become the link between ourselves and reality. The explanation that Descartes gave of the creation of eternal truths as a means of securing the intelligibility of the world thus became epistemologically reframed. Eternal truths became identified with our ideas about the world, ideas with which God has supplied us from our birth. In this way the priority which was given in 1630 to truth as something manifested in the world was replaced by the priority of the truth of innate ideas. With ideas now constituting the primary reality of human knowledge it became possible for Descartes to employ the new ideal of knowledge to mathematically construct a metaphysics based upon the relations between these ideas.

Descartes never addresses the issue of equating divine and human knowledge via the ideal of knowledge-by-construction. He does not seem to have been aware of it in a precise way (though his later disciple, Malebranche certainly was and tried his best to get around the problem). However, he is at least intuitively aware of the profound consequences of the new scientific ideal and this is shown both by the fact that his discussion of physics in The World goes forward under the guise of an imaginary construction and also by his comment to Mersenne that he will not publish his work because the rejection of Galileo's scientific findings effects "the entire foundations of my philosophy."

Although the theological problem of knowledge-by-construction is not directly discussed in The Meditations I want to suggest that it is dealt with nonetheless. It is, I
argue, addressed very effectively and in a very disguised manner, even more disguised than it was by a hypothetical discussion of natural philosophy in *The World*. What Descartes does is to use the same principles involved in the ideal of knowledge-by-construction combined with the sceptical technique for identifying fundamental ideas to score the crucial theological points that he needs to legitimate mechanism. In other words, the very the ideal that puts us on a cognitive level with God is mobilized in *The Meditations* to prove God's existence, transcendence and necessary place within a mechanistically understood world.
CHAPTER 3: THE MEDITATIONS AS A LEGITIMATION OF MECHANISM

Before 1637 and the publication of *Discourse on Method* Descartes had not been able to formulate a concept of a transcendent God that was able to retain meaningful content under close scrutiny. Because of this and because mechanism was a rejection of aristotelian philosophy, a philosophy with a long standing tradition and closely tied to theological commitments, Descartes' mechanism was left vulnerable to the charge of atheism. Galileo's condemnation made it clear to Descartes that if he was to pursue mechanism with the blessing of the Church and free from the threat of ecclesiastical disapproval he would have to address certain issues in mechanism that seemed fundamentally at odds with traditional theological and philosophical commitments. The position of scepticism as well as mechanist knowledge claims via the ideal of knowledge-by-construction highlighted this danger. Following Mersenne's example *The Meditations* developed the fundamentals of a natural theology which combine the concept of a transcendent God with the principles by which the world can be made intelligible in mechanist terms. Descartes takes on the issue of scepticism specifically and also incorporates the mechanist ideal of knowledge-by-construction into the ground work of a natural theology, a theology which allows him to claim that mechanism does not threaten belief in God or promote atheism but rather promotes the Church's cause in both these areas.

This chapter will proceed in four parts. First, it will explore the audience and genre that Descartes chose for addressing *The Meditations*. Second, it will shown how
scepticism is used to criticize aristotelian science and how, providing the key itself for unlocking the sceptical dilemma, it yields in the process the conceptual tools Descartes needs to develop a mechanist account of the world. Scepticism reframes the problem of God's transcendence in epistemological terms and sets the stage for a proof for the existence of God according to the ideal of knowledge-by-construction by introducing clear and distinct perception as the criterion of truth and clear and distinct ideas as the fundamental building blocks of knowledge. Third, the chapter will show how Descartes constructs an account of the relationship between our minds and God in the third meditation. Finally, an exposition of mechanism as found in the final meditations will be provided.

Part I

*The Meditations* are dedicated to the masters of theology at the Sorbonne and written in the genre reserved for devotional literature. These two aspects help to shed light upon the nature and purpose of this work but also in some sense serve to disguise its principal goal which is to defend and further the project of mechanism. The opening letter of *The Meditations* states that the work was written for the purpose of defending and establishing the truth of the Christian faith but makes it clear that the author intends to deal with matters on the basis of philosophical rather than theological reasoning, thereby establishing in essence the fundamentals of a natural theology. The form, being of a theological genre, confirms this. Furthermore it serves as an effective means of addressing a central concern for both the Church and for Descartes' mechanism, namely God, and
thus provides a context that allows Descartes to address the key theological issues in his mechanism very efficiently.

**The Theological Audience and Stated Purpose**

Descartes stated the purpose of *The Meditations* very clearly to the masters of theology at the Sorbonne: to prove the existence of God and the immortality of the soul. The letter names three reasons why he has taken this task on. The first is to take up the battle against the unbelievers. As we have seen in the second chapter, the accusation of atheism was not reserved simply for those who did not believe in a God but was rather a term used rhetorically to denote people of wrong belief. On the most fundamental of these doctrinal issues, namely the existence of God and nature of the soul, Descartes says that he is able to provide arguments based on reason alone to convince people who refuse to believe. "The glory of God", is another reason Descartes cites for writing but little was said concerning this.

The cause of the Church is also named as a reason for writing *The Meditations*, one which is closely related to the concern with unbelief. Descartes refers to the cause of the Church as being of "vital importance," and cites the Lateran Council of 1513 which, under Pope Leo X, had enjoined Christian philosophers to use all their powers to establish the truth against certain heresies prevalent in that day. Descartes tells the masters of theology that he feels he can serve this cause best by conducting a careful search, once and for all, for proofs for the existence of God and the immortality of the soul that have
already been provided by "the great men" of the past and to present the best of these. The hope is that this exercise will provide the future generations with a demonstrative proof that will be generally agreed upon. Descartes feels that he can present these proofs in a way that is clear and evident such that no human mind will ever discover better ones. Furthermore, Descartes tells his audience, that together with their support, this work will ensure "that all the errors which have ever existed on these subjects would soon be eradicated from the minds of men."¹

These are no doubt real concerns for Descartes. In earlier correspondence, Descartes on occasion expresses outrage at the so called atheists for their lack of belief. He tells Mersenne at one point "I am enraged when I see that there are people in the world so bold and impudent as to fight against God."² His concern for the glory of God is not out of character either; reverence for God is something that appears throughout his writings. For example, in a letter to Antoine Vatier of 22 February, 1638 he writes concerning *The World* and *Treatise on Man* and with regards to his hopes for *The Meditations* and *Principles of Philosophy*:

Knowing it is that providence which gave me the small beginnings of which you have seen the samples, I hope that the same providence will give me the grace to complete it, if it is useful for its glory, and if not, I wish to give up all desire to do so.³

As for the cause of the Church, it is the case that Descartes had intended to address the issue of God and the human soul as early as 1626 in *The Rules* and with the encouragement of Cardinal Berulle had undertaken and abandoned other projects to write a treatise on metaphysics prior to *The Meditations*. It is, however, unlikely that the three
reasons mentioned in his letter to the Sorbonne are a complete list of his reasons for undertaking to write *The Meditations* and I suggest that it is at least likely that the principal object of this work is actually the legitimization of the project of mechanism.

**The Unspoken Purpose of the Meditations**

Reasons for suspecting that the real purpose for writing *The Meditations* is the legitimization of mechanism stem from the fact that these are the only work of their kind in the entire corpus of Descartes' writings. They are unique in two important ways. First, they are the only complete and extant work that does not explicitly include work in the area of mechanism. Even the *Discourse on Method*, includes in the last two parts an apology for his project of mechanism. Second, they are the only writings that Descartes addressed to a theological rather than secular audience. These facts suggest that *The Meditations* are unique in their approach but not in their aim which is likely connected to the furtherment of mechanism just as almost everything else in his corpus.

Descartes' purpose in *The Meditations* is one which for specific reasons involves the avoidance of any explicit mention of mechanism. This likely derives from Galileo's condemnation and Descartes' realization that mechanism was vulnerable to the charge of atheism and thus in danger of condemnation by the Church. Descartes may have felt that by taking his case directly to the theologians and developing an argument for an orthodox stance on questions of God and the soul without mentioning mechanism he could avoid the same fate Galileo suffered. There is evidence to show that this is the case.

The benefit of framing his legitimization of mechanism in terms of a proof for the
existence of God and the immortality of the soul is that it allows Descartes to use the very principles of mechanism that are in question to develop an orthodox stance on the important issues under debate and it allows him to do it incognito as it were. Descartes wrote to Mersenne on 4 March 1641, giving him the headings of each meditation and confiding,

These are the things that I want people mainly to notice. But I think I included many other things besides; and I may tell you, between ourselves, that these six Meditations contain all the foundations of my physics. But please do not tell people, for that might make it harder for supporters of Aristotle to approve them. I hope that readers will gradually get used to my principles, and recognize their truth, before they notice that they destroy the principles of Aristotle.4

Given that the philosophy of Aristotle was intimately connected with theological positions at the time it is not surprising that Descartes should want to proceed this way. If it were done well, an orthodox theological position developed using the principles of mechanism would make it hard for anyone to accuse mechanistic science of being threatening to established religion. What Descartes is doing is very much like Mersenne's natural theology, a fact that has been recognized by others as well5.

The importance of a natural theology is that it gets around the problem of mechanism's apparent contradiction of Scripture, the issue that had touched off the Galileo affair. Furthermore, against scepticism a natural theology establishes human reason's credentials as a legitimate form of knowledge. Accordingly Descartes is very concerned to show that the proofs he is about to offer derive from philosophical rather than theological arguments. He argues in the letter to the Sorbonne that human reason will be more effective in convincing unbelievers of the truth than the Holy Scriptures. The reason
for this is that the Scriptures teach a belief in God but we only believe the Scriptures because they come from God and thus unbelievers would judge this to be a circular argument. On the other hand, Descartes cites passages from the Bible that God ought to be and can more easily be known through creation and the use of human reason than through revelation itself. The Book of Wisdom, Chapter 13 is quoted: "Howbeit they are not to be excused; for if their knowledge was so great that they could value this world, why did they not rather find the Lord thereof?"; and also Romans Chapter 1: "that which is known of God is manifest in them." Descartes noted as well "that you and all other theologians asserts that the existence of God is capable of proof by the natural reason." Descartes thus secures the credentials of a natural theology, whose authority is itself legitimized by Holy Scripture and the verdict of theologians.

The Genre

What we have said above sheds light on the choice of the genre for The Meditations. Meditations were a popular genre of religious literature with precedents in people such as Ignatius Loyola. The Meditations read like a spiritual journey. There is a kind of purging followed by a rebirth, a journey into the human mind, letting go of all that is false and a journey out again into the world of truth, a kind of reversal on Plato's allegory of the cave. Descartes seems to have intended it to be a somewhat experiential exercise, saying to Mersenne of Antoine Arnauld that he seemed to have "entered into the sense of what [he] wrote" better than most, taking the time to "pause and meditate." There is something very deliberate and genuinely contemplative in its composition,
proceeding at the pace of one meditation per day, and taking moments to pause in the contemplation of important or awe inspiring insights. The choice of meditations as a genre for Descartes' philosophical arguments is, in light of the fact that he has a natural theology in mind for establishing the legitimacy of his mechanism, not as curious as it might be. *The Meditations* are very suited to the contemplation of things divine and a very effective means of convincing his readers of the orthodoxy of his views while at the same time providing a route whereby they might cast aside the philosophy of the past and be reborn into the new light of mechanism.

In sum the genre and the audience to whom it was written suggest that *the Meditations* played a unique role in Descartes' corpus. They claim a single minded concern for the issues of the existence of God and the immortality of the soul and are addressed to and tailored for a theological audience. However, it can also be shown that their purpose is not separate from the context of mechanism and its need for legitimation.

**Part II**

Second, it will be shown how scepticism is used to criticize Aristotelian science and how, providing the key itself for unlocking the sceptical dilemma, in the process yields the conceptual tools Descartes needs to develop a mechanist account of the world. This further functions to reframe the problem of God's transcendence in epistemological terms and sets the stage for a proof for the existence of God according to the ideal of knowledge-by-construction by introducing clear and distinct ideas as the criterion of truth.
A Criticism of Aristotelian Science

In the synopsis Descartes describes the first meditation as the place where he will provide the reasons which will give possible grounds for doubting all things. It is a move that can be compared to his earlier attempts to frame contentious arguments in terms of a hypothesis or fable. It is Descartes’ intention in this first meditation that we let go of all our preconceived opinions, especially in the area of "material things" (read natural philosophy). Doubt, he says, is not valuable in itself but is useful as a means to an end; its use may not be apparent at first sight but he asks the reader to go along, "the result will be to make it impossible for us to have any further doubts about what we subsequently discover to be true."9

Doubt is used in The Meditations, Descartes tells us, because it provides the easiest route to lead our mind away from the senses. Behind Descartes' discussion of the senses there is likely a more specific target, namely Aristotelian natural philosophy, mechanism's nemesis. The senses played a much more fundamental role in Aristotelian philosophy. Aristotle had held that the senses each had a special object which they were designed to perceive. In the case of sight for example that special object would be colour. The senses, he held, when functioning properly, are perfectly designed to perceive their object, and in doing so provide the fundamental description of how things are. If, for example, one with perfect eyesight were to perceive the colour red under optimal conditions it would make no sense to distinguish between a thing's really being red, and its merely looking red.10 On an Aristotelian account, the material that is gained through the corporeal faculties is the basic material that our intellects use in understanding. Aquinas,
developing this position had held that the material with which the intellect works must be
derived from the corporeal faculties. For those of the traditional philosophical position,
the reliability of the senses is of fundamental importance since it is the senses which
provide the material which is the basis of all knowledge.\textsuperscript{11} Thus when Descartes says that
"whatever I have up till now accepted as most true I have acquired either from the senses
or through the senses,"\textsuperscript{12} he is referring, in all likelihood, not merely to a general human
condition but also to the tradition of aristotelian natural philosophy.

In claiming to have been deceived by the senses Descartes says, he is not referring
only to individual "falsehoods", isolated incidents of deception, but also to the falsehood
of "the whole edifice I had subsequently based them on."\textsuperscript{13} The aristotelian position relied
upon a metaphysics involving a distinction between form and matter whereby the form of
the special object was transferred directly to the sense organ designed to perceive it.\textsuperscript{14}
Descartes's mechanism, as we have seen, made no such distinction between form and
matter. Instead it relied upon a theory of matter of various sizes and shapes in motion to
explain such things as the perception of colour and light as well as all other sense
perceptions. In mechanism there was a real difference between the way a thing appears
and the way it really is. This is a function of the different conceptual edifice upon which it
is constructed. Descartes was looking for the foundations of this edifice, foundations that
would allow him to establish something "in the sciences that is likely to last."\textsuperscript{15} Doubt,
then, was the tool that he used to demolish the old edifice and uncover the true foundation
upon which he was able to construct something more true, a mechanist science rather than
an aristotelian one.
The Transcendence of God Reframed Epistemologically

The use of hyperbolic doubt, apart from allowing Descartes to dispense with aristotelian science, serves another purpose as well and that is to reframe the problem of God's transcendence epistemologically. Descartes' correspondence with Mersenne in 1630 concerning God's ability to create eternal truths including those of mathematics, highlighted the degree to which he sought to establish the concept of a transcendent God. We examined in the first chapter the issues that this raised with regards to the knowability of God. Here we find the problem stated epistemologically in terms of hyperbolic doubt.16 It is stated not that God could have created different eternal truths but that God might have chosen to deceive us about those truths. The example given is the proposition that 2 plus 3 equals 5 which we might be deceived by God into believing as true when it is in fact false. God's power is now understood in terms of what God can get us to believe rather than in terms of what God actually has made to be the case. In both cases, however, God's power is absolute. Apart from maintaining the absolute nature of God's powers and thus God's transcendence, this problem, as it is now posed, also maintains a sense that what we can assert as the truth depends on something other than ourselves. We are not able to meet hyperbolic doubt by relying wholly on our own resources.17 Understanding the nature of God will still play a central role in the search for truth as it did in The World and Treatise on Man. Therefore, the crucial step in the argument of The Meditations will be to "examine whether there is a God, and, if there is, whether he can be a deceiver. For if I do not know this, it seems that I can never be quite certain about anything else."18
Clear and Distinct Perception and the Reality of Ideas

Having completed the demolition of his previously held opinions Descartes is like a man fallen unexpectedly into a deep whirlpool not knowing even which way is up. He finds himself looking for some Archimedean point, some reference upon which to rebuild the edifice of knowledge. In fact he will not discover this until he is into the third meditation. The swirling waters of doubt will not vanish entirely except in the presence of God. Something, however, emerges here in the second meditation that provides Descartes with what he needs to orient himself. This is the *cogito ergo sum* whose expression, while not found in this exact form in *The Meditations* is nonetheless expressed as "I am, I exist," a perception that cannot be doubted so long as the mind conceives it. This discovery will be used by Descartes to define the self, to establish the fundamental aspects of his mechanist concept of matter, and to solve the problem of God's transcendence setting the stage for the proof he will use to establish the cognitive relationship between the human mind and God.

The account which I will give concerning the *cogito* will, for the sake of the argument, accept uncritically Gaukroger's findings on this topic. Gaukroger argues that the *cogito* does not serve as a first principle in Descartes' philosophy the way that God does, that is as a conceptual foundation of his philosophy. Rather the *cogito* has two functions: first to block off the regress of doubt and second, to act as the paradigmatic form of cognitive grasp, the model for clear and distinct ideas. Descartes uses the *cogito* to defeat the onslaught of hyperbolic doubt by introducing the paradigm of clear and distinct perception to turn the tables on scepticism. The method of scepticism is to avoid
making any claims about reality using the protagonist's own truth claims to show that they
do not stand up to scrutiny. It is Descartes in The Meditations, however, who will require
of scepticism its reasons for believing that everything can be doubted and in the end show
that the position is contradictory.\textsuperscript{22} Can you doubt of your doubt and be uncertain as to
whether you doubt or not? The answer is evidently "No."

Though it is not elaborated upon anywhere in Descartes' writings, the ability of the
cogito to halt the regress of hyperbolic doubt seems to reside in the fact that it is a case
where appearance and reality clearly coincide.\textsuperscript{23} As we have seen, there exists, for
Descartes, a gap between sense perception and what is perceived. Likewise there is a gap,
however small, between it appearing that 2 plus 3 equals 5 and its really being true, this
being the only thing that makes our deception in this matter possible. There is no gap,
however, between it appearing that I am thinking and my really thinking. What is involved
is an immediate perception or intuition. This intuition takes place on the level of the
intellect and so the immediate perception that takes place, takes place in the intellect. "I
now know that even bodies are not strictly perceived by the senses or by the imagination
but by the intellect alone and that this perception derives not from their being touched or
seen but from their being understood."\textsuperscript{24} It is then this immediate intellectual perception
which serves as the paradigm of true cognitive grasp. "Is there anything which cannot be
doubted?" may be interpreted as "is there anything whose appearance and actuality can
together be immediately intellectually grasped?" "Yes," Descartes answers, "thought; this
alone is inseparable from me. I am, I exist, this is certain."\textsuperscript{25}

The relation between my thinking and my existing is so immediate that our
perception of it cannot help but be clear and distinct. The notion of clarity and distinctness will play a key role in the argument of *The Meditations* as Descartes trades on his readers' intuitions about clarity and distinctness and secure agreement that we have a clear and distinct grasp in the *cogito*.²⁶ The perception of the self in the second meditation, Descartes argues, gives us confidence that what is perceived clearly and distinctly as in the case of "I think, I exist" is true.

I am certain that I am a thinking thing. Do I not therefore also know what is required for my being certain about anything?... So now I seem to be able to lay it down as a general rule that whatever I perceive clearly and distinctly is true.²⁷

According to this criterion for truth, ideas, in so far as they are modes of our thought, are things that we have a certain knowledge of. These, as opposed to the perception we gain of material things through our senses, become the building blocks of our knowledge of God and of the external world. In summing up Descartes' position Gaukroger states, "We must start from our ideas, and discover whether there is any extramental reality that corresponds to them. But we can only start from those ideas that are clear and distinct,"²⁸ that is, directly intuited. Of the ideas we can have clear and distinct perceptions of we are introduced to three in the first half of *The Meditations* and these will be fundamental. In order of their appearance the first is the idea of the self as a thinking thing, the second is the nature of the corporeal world as extended, and third is the idea of God as something that exists.

Descartes uses a process of elimination to come up with a clear and distinct idea of the nature of the self. Descartes proposes to concentrate on the thoughts that
spontaneously and naturally come to mind when thinking about the nature of the self and discern from among these those which can be said to be its essential idea. Among the thoughts that he examines is the thought of a body but since he has assumed that he has been deceived about everything he can no longer assume that this really exists. Likewise, all perceptions, sensations and activities associated with the body cannot be relied upon. Sense perception is not something that can be used to define the self either since it too relies upon the body and we are not sure yet whether the body is anything real. Descartes, however, is aware that he thinks. The fact that Descartes thinks is just as true and immediately related to the fact that he exists. Thinking requires a mind to occur, and thus by the fact that Descartes has thoughts and that these necessitate his existence he knows that he is essentially a mind, that is a thing that thinks.

The second of these ideas, that of matter as essentially extended, raises an issue which is not developed in *The Meditations*, no conclusions about the explanation of material phenomena are drawn up here, but it is unmistakably aimed at establishing a mechanist concept of matter. Descartes' use of the example of a piece of wax is the first place it shows itself. What was it, Descartes asks, that I was able to perceive distinctly in the piece of wax? None of the things I perceive with the senses, its colour, taste, hardness, etc.. So what is left? Only the understanding that it is something extended, flexible and changeable something not perceived with the senses but with the mind, clearly and distinctly. The quality of extension is the one quality that we have seen is essential to Descartes' mechanist concept of matter. Likewise, the qualities of flexibility and changeableness fit with the mechanist project to describe material phenomena in terms of
the change of the position and relation of matter. Descartes' concept of matter will be expanded upon slightly in the last two meditations.

The idea of God is the final of the three ideas. Descartes says that without knowledge of God's existence and nature he will never have knowledge about anything else. This is the point at which "idea" as a term is defined such that the following construction is made intelligible. Descartes tells us that ideas are a class of thoughts which consist in images of things and when considered in this strict sense contain nothing additional to these images. For example no volition, emotion, or judgement is associated with a pure idea. Ideas, therefore, when considered on their own, that is as modes of our thought not necessarily connected to anything external, cannot be considered false. Ideas as modes of thought, then, do not differ one from the other.

As representations of different things, however, ideas differ enormously by virtue of the things they represent. Earlier on in his exposition of ideas Descartes dismissed the ideas which we receive from the senses or the imagination as unreliable representations of the things they pretend to represent. The reliable ideas he says are not those which are perceived by the senses but, rather, those which are revealed by the natural light. What Descartes means by this has to do with the above discussion of intellectual perception and immediate intuition, namely that things revealed by the natural light are things which are apprehended directly by the intellect and in which there is no gap between appearance and reality. Using the example that from the fact that I am doubting it follows that I exist, Descartes asserts that, "Whatever is revealed to me by the natural light... cannot in any way be open to doubt." The difference between ideas then is something that will be
determined by that which links an idea to the object which it represents and which will be perceived immediately by the intellect by virtue of the natural light.

That which truly differentiates between ideas Descartes calls "objective reality". This reality is a reality that ideas are said to possess by virtue of their being representations of things beyond themselves. The amount of reality in an idea depends upon that which it represents. Therefore, Descartes tells us that the more reality an object contains in a formal or eminent sense, the more reality the idea will contain in an objective sense. He gives the example of accidents and substances. The ideas of an accident will contain less objective reality than that of a substance because the accident contains less formal reality than does a substance. Likewise, he says, "the idea that gives me my understanding of a supreme God, eternal, infinite, omniscient, omnipotent, and creator of all things that exist apart from him, certainly has more objective reality than the ideas that represent finite substances."31 With this Descartes is ready to begin constructing his proof.

Part III

It is no secret that Descartes constructed his argument in The Meditations according to the form of a proof in geometry in which the arguments "are accepted by everyone as evident and certain because they contain absolutely nothing that is not very easy to understand when considered on its own, and each step fits in precisely with what has gone before[

]32 Descartes tells his readers that "I have tried not to put down anything which I could not precisely demonstrate. Hence the only order which I could follow was that normally employed by geometers, namely to set out all the premises on
which a desired proposition depends, before drawing any conclusions about it. In the third set of replies Descartes even took the trouble to lay out the argument of *The Meditations* in the format of a geometrical problem. The ideal of knowledge-by-construction then is very near the surface. It is in the proof for the existence of God in the third meditation that this ideal is most evident. One can see it not only in the clearly logical steps of the argument but also in its concern for the relations of the ideas to one another. Constructing an account of how the human mind and God relate to one another is necessary before Descartes can be satisfied with his proof.

**The Geometrical Construction of God's Existence**

Descartes asserts by virtue of the natural light "there must be at least as much *<reality>"* in the efficient and total cause as in the effect of that cause." What is more perfect, for example, must contain more reality and, therefore, cannot be caused by something less perfect. This is true where formal reality is concerned, that is, the reality intrinsic to an object. It is also true of objective reality, that is, the reality in the representation. Ideas must derive their reality from something else with at least as much reality in itself. The objective mode of being, he says, belongs to ideas whereas the formal mode of being belongs to the causes of ideas. "[I]n order for a given idea to contain such and such objective reality, it must surely derive it from some cause which contains at least as much formal reality as there is objective reality in the idea." Furthermore, Descartes asserts, there cannot be an infinite regress of causes. Therefore, there must be a primary idea which contains formally all the reality which exists only objectively in the object.
Descartes then makes the following assertion: If he does not contain the formal or eminent reality found objectively represented in the primary idea then he cannot be its cause and there is therefore another reality in the world that is its cause. He notices that the ideas he has consist of the representations of himself, God, corporeal and inanimate things, angels, animals, and other humans. Of these the latter three could easily have been formulated by the former three. As for corporeal things, he says, they might easily have originated from himself since they are conceived as participating in a (finite) substance just as the self is. (The description of corporeal substance as something essentially extended in length, breadth, and depth and subject to motion, shape, duration, and enumeration which Descartes elaborates here falls exactly in line with the mechanist concept of matter developed elsewhere.) Since the thought that he was the origin of the idea of himself had been ruled out earlier, Descartes is left with the idea of God. The idea of God is the idea of a substance that is infinite, eternal, immutable, independent, supremely intelligent, supremely powerful and who created both himself and everything else. These attributes, as contained in the idea, Descartes says, could not have come from himself. It must have originated from something other than himself, and that something must be God. Therefore, it is established that God necessarily exists by virtue of the idea and that we, therefore, cannot be alone in the world.

Completing the Construction

With this proof for the existence of God, however, the construction is not complete. Descartes must further reconstruct the cognitive relationship between the self
and God and everything else before knowledge is truly acquired. The main relationship upon which Descartes focuses is the relationship between the self and God. As a finite substance the idea of an infinite substance could not have come from him since there is more reality in an infinite substance than a finite one. For this reason, he says, his perception of the infinite, that is of God, must be prior to my perception of myself. "For how could I understand that I doubted or desired - that is lacked something - and that I was not wholly perfect, unless there were in me some idea of a more perfect being which enabled me to recognize my own defects by comparison?"37

In a passage reminiscent of an earlier statement made to Mersenne contrasting the notion of grasping and knowing God and comparing this to embracing and touching a mountain, Descartes says

it does not matter that I do not grasp the infinite, or that there are countless other attributes of God which I cannot in any way grasp, and perhaps cannot even reach in my thought; for it is in the nature of the infinite not to be grasped by a finite being like myself. It is enough that I understand the infinite, and that I judge that all the attributes which I clearly perceive and know to imply some perfection - and perhaps countless others - are present in God either formally or eminently.38

"This," Descartes goes on to say, "is enough to make God the truest and most distinct of all my ideas." What Descartes feels will save him this time around from the trouble of establishing the link between the human knower and a transcendent God is his definition of ideas as images containing objective reality whose source is the formal or eminent reality contained in the thing they represent. This reality is ensured by the fact that the thing is clearly and distinctly perceived. The idea of God is "utterly clear and distinct, and contains in itself more objective reality than any other idea; hence there is no idea which is
in itself truer or less liable to be suspected of falsehood."

As to his existence Descartes asks whether he could exist if God did not exist. If he derived his existence from himself, Descartes argues, he would not doubt or want or lack anything at all, instead he should have made himself like God. Furthermore, if he had created himself, Descartes says, he would have to sustain himself as well. Gaukroger points out that the argument here "is a particularly strong form of mechanism in which nature is even stripped of the power to persist from instant to instant." As we have seen in the second chapter the unity of creation and preservation is something that allows Descartes to give an account of the history of the cosmos, holding that the laws at work in creation are the same as those by which God preserves the world. Here it is used to emphasize our complete dependence upon God for as Descartes says next he is aware of no power within himself that would allow him either to create or sustain his existence. God on the other hand is the only being with the power to cause itself and therefore must be the first cause of every other being, an infinite regress of causes being impossible as concluded earlier.

Having established our cognitive and existential dependence upon God, Descartes feels there remains only to show how he received the idea of God from God. It is, he reflects, not from the senses since it does not arise unexpectedly as is the case with ideas from the senses. Nor is it an idea invented by the imagination because he finds he cannot take away or add anything to it. "The only remaining alternative is that it is innate in me, just as the idea of myself is innate in me." It is no surprise, he tells us, that God should have left God's imprint upon us, as a craftsman leaves the his mark on what he has created.
"[T]he mere fact that God created me is a very strong basis for believing that I am somehow made in his image and likeness and that I perceive this likeness, which includes the idea of God, by the same faculty which enables me to perceive myself."\footnote{42}

The last three arguments I have summarized serve as proofs of God's existence and do so, first, by means of the nature of the idea of God, second, by means of God's unique power to create and sustain, and third, by means of the existence of the idea of God in us, respectively. In addition, however, these proofs also serve to establish our relationship to God. That relationship is described as on of cognitive and existential dependence is defined by means of our possession of innate ideas. These ideas make possible a proof of the existence of God in accordance with the ideal of knowledge-by-construction allowing Descartes to define and clearly demonstrate each in terms of its relation to the others. The ideal of knowledge-by-construction becomes apparent when we see the form Descartes' argument takes. Using the nature of the ideas of self and to a lesser extent the external world as co-ordinates, he proceeds to construct an account of God's nature and existence and ends in the contemplation of the finished product. That he is unable to contemplate God until the construction is complete is confirmation of the ideal of knowledge-by-construction, an ideal that assumes that something is not known until it is constructed.

Part IV

A brief exposition of mechanism is provided in the final three meditations. Descartes moves from the contemplation of God back out into a new understanding of the corporeal world, one that is different from that of aristotelian science and is formulated in
accord with the principles of mechanism as outlined in the first chapter. It does so first by reiterated the priority of the mind’s relationship to God to establish the criterion of true knowledge in the form of clear and distinct perception. Next it formulates God's relationship to the corporeal world in terms of another proof for God's existence, a proof that also establishes God's transcendence. Lastly it puts forward an account of the mind’s relationship to corporeal matter and illustrates this using mechanist doctrines and descriptions.

The nature of the relationship between God, human, and world in *The World* and *Treatise on Man* is maintained in *The Meditations*. As in Descartes’ earlier work in mechanism, in *The Meditations* God still plays a fundamental role in establishing the rules by which the world is made intelligible. God is the first thing required in order to establish a true understanding of the world. Likewise *The Meditations* maintain God's transcendence with regards to creation. Finally, in both earlier and later works the same basic concept of matter is used along with a commitment to understanding the material world in mechanist terms. Sense perception is described mechanically and is shown to be unreliable as a means for truly understanding the corporeal world. The result is something that does not at all resemble the traditional aristotelian approach to natural science.

God’s relationship to the Self: the Criterion of Truth

The fourth meditation is concerned to establish not only the criterion for truth and falsity as the heading in *The Meditations* suggests but also to elaborate upon the priority of God in all human understanding. Descartes states that there is very little about
corporeal things that can be truly perceived where as on the other hand much more is

known about God and the human mind. This is so because when we perceive things
correctly, that is, by means of the intellect, there is nothing more evident to us than the

fact that God exists. From our understanding of this God we work our way out to a true

knowledge of the world: "And now, from this contemplation of the true God, in whom all
the treasures of wisdom and the sciences lie hidden, I think I can see a way forward to the
knowledge of other things." In contemplating God it is impossible to go wrong, all is

truth. Where the difficulty lies is when I turn to contemplate other less perfect things such
as myself. Perfection, according to Descartes, is a function of being a completely real and
positive reality. Imperfection is a function, not of something positive but of something
negative, namely a lack of reality or perfection.

Now from the fact that God is a perfect being and thus not a deceiver, it follows,

Descartes says, that God would not have given him a faculty that would cause him to go
wrong if he were to use it properly. What will determine the proper or improper use of
this faculty is whether we stick to the perceptions we have that contain the most
perfection and reality. Clear and distinct perceptions are those perceptions which are the
most real. Therefore, they can be seen as coming from God and can be completely
trusted. If we rely entirely on clear and distinct perceptions we will be able to achieve true
and certain knowledge. Thus the criterion for truth and falsity is established by means of
the knowledge of God and the relationship between that Being and our own cognition.
God’s relationship to the Corporeal World: Transcendence Reasserted

Having established the relationship of mind and human knowledge to God, Descartes turns to the relationship between God and creation. Meditation five begins by stating that before we can establish whether there is anything outside of us that exists we must first examine the ideas of these things and determine which of these is clear and distinct. In the realm of the corporeal Descartes has a clear and distinct perception:

Quantity... I distinctly imagine. I distinctly imagine the extension of the quantity (or rather of the thing which is quantified) in length, breadth, and depth. I also enumerate various parts of the thing, and to these parts I assign various sizes, shapes, positions and local motions; and to the motion I assign various durations.44

All these things, Descartes says, “are very well known and transparent to me,...[b]ut I think the most important consideration at this point is that I find within me countless ideas of things which even though they may not exist anywhere outside me still cannot be called nothing; [things that] have their own immutable natures.”45 The idea of a triangle is such an idea. Whether or not it exists outside of him, Descartes can see that it still has a determinate nature which "is immutable and eternal, and not invented by me or dependent on my mind."46 This determinate nature is something with is clearly and distinctly perceived and therefore, according to Descartes' argument thus far, must be true. There is no arguing, then, that the nature of a triangle is both real and independent of the mind. By defining corporeal reality in terms of mathematics and mathematical principles as things independent of the mind Descartes establishes that, should it turn out that the corporeal world actually exists, it would then participate in a reality independent of him.
Descartes now turns the same principle used to prove the independence of the reality of a triangle to a proof of God's transcendence. "Certainly," he says, the idea of God, or a supremely perfect being, is one which I find within me just as surely as the idea of any shape or number. And my understanding that it belongs to his nature that he always exists is no less clear and distinct than is the case when I prove of any shape or number that some property belongs to its nature. Hence, even if it turned out that not everything on which I have meditated in these past days is true, I ought still to regard the existence of God as having at least the same level of certainty as I have hitherto attributed to the truths of mathematics.

The argument proceeds by pointing out that the very concept of God like the concept of a triangle contains certain properties that can be clearly and distinctly perceived and hence must also be true. Since the idea of God is within him just as is the idea of a triangle, says Descartes, and since the idea of God necessarily includes the idea of existence just as the idea of the sum of the angles of a triangle is equal to two right angles, therefore, God's existence is necessarily true in the same way and with the same level of certainty that the truths of mathematics are necessarily true. Thus it is clearly and distinctly perceived that God's existence is a feature of God's true and immutable nature, a nature which is independent of our knowing it or not.

While this appears to be simply another proof for the existence of God, in fact a case can be made for its main purpose being to serve to establish God's transcendence. In his conversation with Burman, Descartes distinguishes between the two proofs. He points out that while one is inferred from its effect, that is from the idea of God, the other is established a priori. While the first is a good enough proof of God's existence it is not able to definitively establish God's transcendence because it works from an effect to a
cause not considering God on God's own. The latter a priori argument, however, establishes God's existence from God's very nature, a nature which is not dependent upon anything else. Gaukroger sums up as follows:

We need to have an idea of God to be able to go through the a priori proof, but God's necessary existence is not dependent on my ability to prove it and hence not dependent on the existence of my idea of God, or indeed the existence of anything other than Himself, where as the proof of His existence as cause [of my idea of Him] depends on His having caused something, and hence on something other than his existing. 49

Descartes admits to the reader that "it does not seem to follow that from the fact that I think of God as existing that he does exist. For my thought does not impose any necessity on him." But this is the very point he wants to make. "It is not that my thought makes it so, or imposes any reality on any thing; on the contrary, it is the necessity of the thing itself, namely the existence of God, that determines my thinking in this respect." "Now admittedly," he goes on to say,

it is not necessary that I ever light upon the thought of God; but whenever I do choose to think of the first most supreme being, and bring forth the idea of God from the treasure house of my mind as it were, it is necessary that I attribute all perfections to him, even if I do not at that time enumerate them or attend to them individually. And this necessity plainly guarantees that , when I later realize that existence is a perfection, I am correct in inferring that the first and supreme being exists. 50

Therefore, God, whose very nature necessitates God's existence, is a reality completely independent and transcendent from our own and from anything else.

Descartes sums up his position near the end of the fifth meditation.

Now, however, I have perceived that God exists, and at the same time I have understood that everything else depends on him, and that he is no deceiver; and I have drawn the conclusion that everything which I clearly and distinctly perceive is of necessity true. 51
The points he is making here are as follows: First, God exists. Second, we are dependent and God independent and transcendent. Third, God's nature guarantees that the world is intelligible. Fourth, clear and distinct perception is the criterion of truth. Thus the principles which played a fundamental role in the mechanism of The World and Treatise on Man, namely God's existence and transcendence, and the intelligibility of the world, have been established with the addition of an epistemological doctrine about how we come to know things truly and certainly. "And now," Descartes goes on to say, "it is possible to attain full and certain knowledge of countless matters both concerning God himself and other things whose nature is intellectual, and also concerning the whole of the corporeal nature which is the subject matter of pure mathematics."{52}

**Rebirth into the New World of Mechanism**

The last of the meditations seeks to establish, on the basis of what has come before, that the mechanist interpretation of the world is the true one. The sixth meditation makes a case for why our mathematized idea of corporeal substance can be trusted where as we must still be leery about the information we gain strictly through the senses. Having died to the older way of doing science we are here reborn into a new understanding of the material world and Descartes provides examples of this new understanding that come straight out of a mechanist's textbook.

Descartes begins by proposing to establish whether the material world exists or not. Again it is useful to recognize that what Descartes says he is attempting to do may be a disguise for what is in fact going on. The existence of the world was never a real
problem for Descartes, neither was its explanation in mechanist terms. In Gaukroger's words,

the point of the exercise was never to discover metaphysically that mechanism provides the only true basis for natural philosophy, but to legitimate mechanism, something which motivated Descartes' work long before it even occurred to him that a metaphysical legitimation was necessary.53

What is important is that mechanism be presented as something which is derived from the orthodox position developed on the existence and nature of God and the human soul. The movement feels like a rebirth into a new understanding of the world very different from the one which we had when we trusted in an aristotelian account of natural philosophy. In fact this is not a new experience for Descartes at all but rather the very truth he began with and sought to establish.

Descartes' argument runs as follows. He knows that it must be possible for the corporeal world to exist in accordance with the clear and distinct ideas of pure mathematics which he perceives because there is no doubt that God is capable of creating anything that he perceives in this manner. The conception of the corporeal world, then, begins as something mathematized and mathematizable. By starting from these genuinely clear and distinct ideas of the corporeal world Descartes arrives at a fundamentally mechanist understanding of the world and he arrives at this not by natural-philosophical or empirical arguments, as he had done in earlier writings such as The World, but by purely metaphysical ones.54 The very mechanist nature of the world is thus established, not through natural philosophy, but rather as something which follows purely from his construction of the relationship between God and the human mind. The true
understanding of the world, then, emerges as something quantifiable, not something primarily for the senses to comprehend.

If this is the case then what of the qualities of matter that were so important to an aristotelian understanding of the world? Besides corporeal nature, says Descartes, which is the subject matter of pure mathematics, there is much else that he imagines such as colours, sounds, tastes, pain and the like. The ideas of these are not so distinct but instead they are perceived much better through the senses. He decides to examine the nature of these sensations.

First of all then, Descartes examines his perception of having a body and the perceptions of other bodies which affect his body in good or bad ways. Besides extension, shape and movement in other bodies he observes tactile qualities as well such as hardness and heat. He notes that he is able to perceive a myriad of sensations. All these, he notices, came to him without his consent and were more lively and vivid than the ideas of these things that he had in his memory. It is impossible, he then reasons, that they should have come from within himself, and they must therefore have come from somewhere else. It appears then, he says, that he possesses a faculty of sense perception, that is a faculty of perceiving and recognizing the ideas of sensible objects. The objects of the senses, he concludes, come from a substance distinct from himself, a substance which contains at least as much reality either formally or eminently as is contained in my idea of it. This substance is either a body or a God or a being like God producing the sensations in such a way that they resemble bodies. However, since it appears very clearly that these sensation do in fact come from bodies and since we have already established that God is not a
deceiver it follows that sensations are produced by and through a corporeal substance which constitutes a body or bodies.

Descartes goes on to discuss how different bodies affect his own body in different ways.

"From the very fact that I perceive by my senses a great variety of colours, sounds, smells and tastes, as well as differences in heat, hardness and the like, I am correct in inferring that the bodies which are the source of these various perceptions possess differences corresponding to them, though perhaps not resembling them." Our senses seem, then, to be able to recognize differences in different bodies though the picture they give us of what these differences are is not terribly accurate. There are many things, Descartes says, which we have been taught by nature to believe are true which are in fact not the case. The list of phenomena which he gives in support of this point are taken from previous works in mechanism:

Cases in point are the belief that any space in which nothing is occurring to stimulate the senses must be empty; or the that the heat in a body is something exactly resembling the idea of heat which is in me; or that when a body is white or green, the selfsame whiteness or greenness which I perceive through my senses is present in the body; or that in a body which is bitter or sweet there is the selfsame taste which I experience, and so on; or finally, that stars and towers and other distant bodies have the same size and shape which they present to my senses, and other examples of this kind.

The corporeal substance does not exist in exactly the way that his senses perceive it, Descartes argues, because the senses often deceive.

Descartes notes that although the senses do teach us to seek what gives us pleasure and avoid what gives us pain they do not teach us to draw any conclusions about these things until the intellect has examined the matter.
For knowledge of the truth about such things seems to belong to the mind alone, not to the combination of mind and body.... For the proper purpose of the sensory perceptions given me by nature is simply to inform the mind of what is beneficial or harmful for the composite of which the mind is a part; and to this extent they are sufficiently clear and distinct. But I misuse them by treating them as reliable touchstones for immediate judgements about the essential nature of the bodies located outside of us; yet this is an area where they provide only very obscure information.57

Essentially, then, matter is left with the properties which the intellect clearly and distinctly understands, that is all those properties comprised within the subject matter of pure mathematics.

The final section of the sixth meditation is able to put the finishing touches on the construction of the relationship between mind and world with a mechanist explanation of how the senses, when taken on their own, can deceive. He compares the body to a clock which when working badly still functions in accordance with the basic principles of its construction (an example of the machine analogy). In the case, for example, when a person has dropsy they feel thirsty though in fact water would be bad for them. Descartes notes that corporeal substance by its very nature is divisible, and that bodies are comprised of different parts. The mind on the other hand is indivisible and affected by only one part of the human body, namely the brain. Every time the brain is in a given state "it presents the same signals to the mind, even though the other parts of the body may be in a different condition at the time."58 Descartes describes how one point in a body such as the brain can be affected in the same manner under a number of different circumstances the same way the end of a cord can be affected in exactly the same way regardless of where along its length it is pulled (an example of picturability and transdiction). The deception of the
senses, in this sense, is natural, concludes Descartes, "because a given motion in the brain must always produce the same sensation in the mind," and the given sensation is more often then not going to be trustworthy. Because we can examine these things by means of the intellect we are able to perceive when our senses lead us astray and thus to correct and avoid the difficulties that arise. Thus Descartes is able to prove the effectiveness of the new, mechanist way of understanding things and do so under the guise of putting the finishing touches on the description of the relationship between the mind and the corporeal world.
CONCLUSION

It has, then, been shown how *The Meditations* serve as a legitimation of mechanism. They do so under the appearance of being a proof for the existence of God and immortality of the soul. Their disguise is effective. They establish a legitimate role for reason in matters concerning God and the soul and by association in matters concerning natural philosophy as well. Using hyperbolic doubt *The Meditations* transform the problem of God's transcendence into a question about how it is possible to know anything. They answer this question effectively, first, by providing a paradigm example of clear and distinct perception in the *cogito* and, second, by allowing the argument for God's existence to be constructed in accordance with the ideal of knowledge-by-construction on the basis of clear and distinct ideas. Finally having abandoned the old aristotelian way of understanding the world they reconstruct science according to the principles of mechanism. These include the priority of God in knowledge, God's absolute independence and thus transcendence from creation, and an account of matter which allows it to be conceived as inert and described in a way analogous to a machine, in line with the criterion of picturability, without appeal to any internal animation and entirely in terms of mathematics.
ENDNOTES

Introduction


6. Ibid. 5.


Chapter 1

1. Mechanism is here used to denote the seventeenth centuries expression of an approach to natural science. Mechanism has antecedents in ancient greece and current expressions in modern culture. Dijksterhuis in *The Mechanization of the World Picture* uses the term "classical mechanics" to refer to the specific period of mechanist science which we will be discussing. On the question of an exact definition of "classical mechanics" Dijksterhuis'...
interpretation is open to question (see Cohen's *The Scientific Revolution*). Our use of the term "mechanism" will not follow Dijkerhuis but will refer to a pre-Newtonian expression of this approach to science as discussed in Gaukroger’s *Descartes: An Intellectual Biography*.


4. Osler 172.

5. Osler 172.

6. Osler 175.


8. Osler 177.


11. Dijksterhuis 497.


15. Dijksterhuis 497.


18. Ibid.

20. Gaukroger 70.


22. Funkenstein 30.


25. Ibid. 312.

26. Ibid. 315.

27. Gaukroger 150.

28. See the discussion in Funkenstein's *Theology and the Scientific Imagination* for a background to the issue of God's role in the explanation of natural phenomena, especially the concept of "the body of God" for a description of the shift from the Thomistic doctrine of analogy to the seventeenth century's insistence upon unequivocal language in the realms of both theology and science. See also Salvatore I. Camporeale's discussion of Aristotle's categories of being and their relationship to Renaissance theology in "Origins of Humanist Theology" found in *Humanity and Divinity in Renaissance and Reformation*, as well as Richard Soragii's article "Infinite Power Impressed: The transformation of Aristotle's Physics and Theology" in *New Perspectives on Renaissance Thought*.

29. Gaukroger 158.

30. For a further discussion on this topic see F. Edward Cranz's article "A Common Pattern in Petrarch, Nicholas of Cusa, and Martin Luther" in *Humanity and Divinity in Renaissance and Reformation*. See also Jean Luc Marion's *La theologie blanche de Descartes*.

31. Ibid.

32. CSM I 40.

33. Gaukroger 141.

34. Ibid. 149.

35. Dijksterhuis 498.


37. Gaukroger 149.
38. Osler 171.
43. Osler 178.
44. Briggs 89.
45. Dijksterhuis 500.
46. CSMK III 6.
47. Gaukroger 220.
48. Ibid. 226.
49. An example of this slight change is the reformulation of the law of inertia in Principles of Philosophy.
51. CSM I 85.
52. Ibid. 92.
53. Ibid. 85.
54. Ibid. 93.
55. Gaukroger 259-61.
56. CSM I 99.
57. Ibid. 86-7.
59. Ibid. 249.
60. CSM I 90.
61. Gaukroger 239.
62. CSM I 91.
63. CSM I 89.
64. Gaukroger 239.
65. CSM I 92.
66. Gaukroger 269.
67. CSM I 90.
68. Ibid.
69. CSM I 92.
70. Ibid. 91.
71. Ibid. 97.
72. CSMK III 23.
73. CSM I 17.
74. Funkenstein 296-7.
75. CSM I 97.
76. Ibid. 96.
77. Ibid. 94.
78. Ibid. 96.
79. Ibid. 92.
80. Ibid. 97.
81. CSMK III 22.
Chapter 2

2. Gaukroger 147.

3. Buckley 57.


5. Ibid. 148.

6. Aristotle 1650 [Metaphysics 1045b17].


9. Ibid. 149.

10. Ibid. 150.

11. Buckley 63.

12. Ibid. 58.

13. Ibid. 61.


15. Buckley 64.

16. Ibid.


18. Ibid. 27.

19. Ibid.

20. CSMK III 40-1.


22. CSMK III 40.

23. Funkenstein 325.
24. CSM I 132-3.
25. Funkenstein 322.
26. Ibid. 324-5.
27. Buckley 61.
29. Ibid. 321-3.
30. Ibid. 18.
31. Ibid. 298.
32. Ibid. 297.
33. Ibid. 317.
34. Ibid. 319.
35. Ibid. 320.
36. Ibid. 323.
37. Ibid. 322.
38. Ibid. 321.
39. CSM I 133.
40. Funkenstein 298.
41. Ibid. 294.
43. CSM I 120-1.
44. Funkenstein 296.
45. Ibid.

108
Chapter 3

1. CSM II 6.

2. CSMK III 29.

3. Ibid. 88.
4. Ibid. 173.

5. Gaukroger 198.


7. CSMK III 175.


10. Gaukroger 159.

11. Ibid. 151.

12. CSM II 12.

13. Ibid.


15. CSM II 12.


17. Ibid. 340.

18. CSM II 25.

19. Ibid. 17.


22. Ibid. 341.

23. Ibid.

24. CSM II 22.

25. Ibid. 18.

27. CSM II 24.
28. Gaukroger 344.
29. CSM II 25.
30. Ibid. 27.
31. Ibid. 28.
32. Ibid. 5.
33. Ibid. 9.
34. "<>" brackets in CSM(K) indicate a word or phrase added in the French version of this work.
35. Ibid. 28.
36. Ibid.
37. Ibid. 31.
38. Ibid. 32.
39. Ibid. 31.
40. Gaukroger 344.
41. CSM II 35.
42. Ibid.
43. Ibid. 37.
44. Ibid. 44.
45. Ibid.
46. Ibid.
47. Ibid. 45.
48. CSMK III 337.
49. Gaukroger 198.
50. CSM II 46-7.
51. Ibid. 48.
52. Ibid. 49.
53. Gaukroger 352.
54. Ibid.
55. CSM II 56.
56. Ibid. 57.
57. Ibid.
58. Ibid. 60.
59. Ibid. 61.
BIBLIOGRAPHY

Primary Sources:


Secondary Sources:


----------------. The Unity of Philosophical Experience. New York: Charles Scribner's and Sons, 1937.


