THOMAS HOBBES AND HIS MECHANISTIC PHYSIOLOGY:
FACTORS IN THE RECEPTION OF THE MECHANICAL PHILOSOPHY
IN SEVENTEENTH CENTURY ENGLAND

BY

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ABSTRACT

Thomas Hobbes is the generally acknowledged pre-eminent English political philosopher in the seventeenth century, and the political areas of his work have been much studied. His contribution in the field of physiology has remained largely unappreciated, and in fact has been deemed to be largely negative by those scholars who have examined it. By examining Hobbes' physiological theory and comparing it to that of other contemporary physiological scientists, this study reaches the conclusion that Hobbes was working very much as a part of the developing mechanical physiological tradition. Furthermore, the basis for making a case for a positive constructive role for Hobbes in the encouragement and dissemination of mechanical physiology in England is formulated. The reasons why such a positive role is not at first apparent are found to include the theological objections to any materialistic doctrine and Hobbes' reputation as an atheist entailed by his philosophy. The climate of scientific and clerical opinion surrounding Hobbes' ideas is also examined. The seemingly paradoxical situation in which Hobbes could make a significant contribution to English science and yet gain no overt recognition for that contribution is discussed.
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## CHAPTER

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"I know already, by experience, how much greater thanks will be due than paid me, for telling men the truth of what men are."

Hobbes
INTRODUCTION

In an important article published in 1977, T.M. Brown discussed the development of physiological theory in England from 1640 to 1660, with particular reference to the reception of the new mechanical philosophy—a philosophy of nature which Brown identified with Descartes. He found that England experienced a "multiply ambivalent incursion" of Cartesian mechanical philosophy. He found that "even within university physiology enthusiasm was qualified to a considerable degree, and the role of the mechanical philosophy was carefully circumscribed." Several explanations for such an ambivalence toward mechanical philosophy were offered, including the conservative influence of the neoclassical medical tradition, especially William Harvey's orthodox authority, and contemporary theological objections to materialism. As a final possible reason for the hesitancy on the part of the English scientists to embrace a physiology based on the mechanical philosophy of nature Brown suggested that this philosophy had become associated with the ideas of Thomas Hobbes. Hobbes had published _Leviathan_ (1651) and _De Corpore_ (1655) and in that and the next decade received much adverse reaction to his moral and political philosophies. As Hobbes was also a fervent proponent of the mechanical philosophy, Brown argued that it may have become difficult for anyone to accept freely the mechanical philosophy without risking censure by association with Hobbes.
It is difficult to assess the influence of Thomas Hobbes in the physiological context, for the recently increased interest in Hobbes' studies has centred overwhelmingly on the political, moral and religious aspects of his philosophy, for the most part omitting discussion of his biological and physiological thought. The few authors who have discussed Hobbes' natural philosophy have for the most part done so in order to explicate some moral or political point. The only notable exception to this is Frithiof Brandt who gave a meticulous and invaluable account of the development of Hobbes' thoughts on natural philosophy and of his relationship to contemporary natural philosophers. Unfortunately, for our purposes, Brandt did not examine Hobbes' physiological theories.

It seems clear that the discussion of Hobbes in his contemporary philosophical and intellectual environment is incomplete. There are perhaps several reasons. The image of Hobbes as the bête noire of English moral and political critics as outlined by Samuel Mintz may have become something of a self-perpetuating truism. The ideas for which Hobbes was denounced with such asperity in his own time seem to have generated most of the discussion in the present century as well. Hobbes' theories of biology have been largely neglected by his contemporaries, and this is a response that modern writers have seen fit to follow.

Whereas several authors have dealt with Hobbes' thought in the seventeenth century context, most recently and notably Quentin Skinner, none have properly examined his physiological and psychological ideas.
In this fashion. This is surely a lacuna that should be filled. A first reaction to the suggestion that Hobbes' physiology and psychology are an important part of his thought and of the development of these disciplines in the seventeenth century, might be that he no more made a contribution to biology than he did to mathematics, and, in any case, the political sections of his writings are the truly important ones. To ignore these poorly explored areas of Hobbes' thought as trivial or as philosophically isolated would be an error for several reasons. To do a truly complete contextual analysis of Hobbes and his works, all portions of that work must be considered on Hobbes' own terms, as all part of a developing whole. Not only is Hobbes' mechanical philosophy important to the history of seventeenth century physiology in the manner suggested by Brown, but it is important for its relationship to the other portions of his philosophy according to Hobbes himself.

In order properly to compare Hobbes' work with that of his contemporaries, it is necessary first to closely examine these works and summarize his thoughts on mechanical physiology, sensation and psychology. These conclusions will then be compared with those of other philosophers and medical scientists of the latter seventeenth century in order to see if Hobbes has any part in the incursion of so-called 'Cartesian philosophy' in England. It will be shown that Hobbes' thought was important not only for its contribution to the development of physiology and psychology, but also to the methodological development of English science.

A case will be made that contrary to Brown the development of seventeenth century mechanistic trends in English physiology was in a significant way due to Hobbes. While Brown is correct in stating that Hobbes may have had a part in the ambivalence of the incursion
of mechanism into English thought, he stresses only the negative contribu-
tion of Hobbes. The positive effects of Hobbes' thought on his fellow
scientists may outweigh the negative, and much of the so-called Cartesian
doctrine or Epicurean theory adopted by these scientists could just
as aptly be described as Hobbesian. The reasons why such an appellation
was almost unthinkable to Hobbes' contemporaries will also be discussed.

Thomas Hobbes was as exceptional for his longevity as for his ideas.Born in the year of the Spanish Armada, 1588, he lived to
see his ninety-second year, dying in 1679. Hobbes was educated in
a traditional scholastic manner and received his B.A. from Oxford
at the age of nineteen. His life for the next three decades was an
itinerant one, as he served as companion and tutor to noblemen's sons
taking the grand tour of the Continent. Although he spent some time
as Francis Bacon's secretary, none of the chancellor's ideas seem to
have impressed Hobbes greatly. His personal enlightenment came late
in life, when in 1629, at the age of 42, he was abroad on his second
trip to the Continent. Aubrey described how Hobbes chanced upon some
Euclidean geometric demonstrations and was much taken with the mathem-
the incident in which he became cognizant of the importance of sens-
ation to philosophy, and he had formulated a theory of sensation by
1630, using mechanistic explanations. These two elements, deductive
logic and an interest in human psychology, were to form the basis
for the development of Hobbes' philosophical system.

Although somewhat a solitary man, Hobbes nevertheless made a
few important friends in scientific circles. After 1630, Hobbes was
the instructor and friend of William Cavendish, Earl of Newcastle
(later Marquis and Duke) and of his brother Sir Charles Cavendish. When in the autumn of 1640, Hobbes fled to France, he renewed his acquaintance with the intellectual circle in Paris organized by Father Marin Mersenne. Hobbes had frequented this group on his previous continental sojourn (1634-1637) in the course of which he also met Galileo in Florence. While back in England he had been a member of another group of scientific and philosophical amateurs centred around Newcastle and his brother. When some of the other members of the Newcastle circle fled England in the early 1640s, it was natural that they would convene once more in Paris, where Hobbes played a part in the exchange of ideas between English and French thinkers.

Pierre Gassend (Gassendi), for instance, was a good friend of Hobbes, and in 1644 showed him the manuscript of the first major presentation of his physics. Hobbes saw more merit in Gassendi's Epicurean mechanistic atomism than in Descartes' work which Hobbes repeatedly criticized. Gassendi believed (contrary to Descartes' opinions) that it is only through the senses that knowledge of the natural world can come. This view was basic also to Hobbes' theory, and their philosophical agreement had important implications for the reception of Gassendi's work in English circles. Hobbes is probably responsible for first interesting the members of the Newcastle circle in Epicurean atomism, and in introducing his friend Walter Charleton to this philosophy. Charleton was later to become an avid exponent of Gassendi and an influential man in circles of learning in Restoration England.

Hobbes took far less interest in Descartes as a friend or philosopher than as a geometer. Although Hobbes castigated him for pandering to religious orthodoxy and for details of theory on which the two
differed, he seems nevertheless to have had an open mind on the subject of the mechanical philosophy and was willing to consider the Cartesian version on its merits. He could never agree on the necessity of postulating a rational soul to explain rational or psychological phenomena. By his very disagreement, Hobbes instigated discussion of Descartes as well as of Gassendi among his intellectual circle.

Thus the 1640s saw in Paris the formation of an unofficial university, (an 'invisible college') concerned with the new mechanical philosophy, centred around Hobbes, Mersenne, Descartes, and Gassendi, including both English and continental components. The task here includes the determination of the later effects of this 'university' on English physiology and psychology, and, in particular, the role that Thomas Hobbes was to play in the physiological speculation of the latter half of the seventeenth century.
FOOTNOTES

INTRODUCTION


7. This theory is the Short Tract on First Principles which Hobbes never published. The revised ideas of this tract were published in Elements of Law, in English Works, ed. Sir. W. Molesworth (London: John Bohn, 1839) vol. IV. The Short Tract itself was first published by Ferdinand Tonnies in 1889, Elements of Law (London: A. Frank Cass & Co. Ltd., 1969).

8. While Hobbes, Newcastle, Charles Cavendish and others lived in Paris, some of their associates resided in other areas, such as John Pell in the Netherlands.

9. This work was Animadversiones in Decimum Librum Diogenis Laertii, published in 1649. Cavendish noted the friendship of Hobbes and Gassendi in a letter to Pell, 10 October 1644 (Halliwell, Collection of Letters Illustrative of the Progress of Science in England (London: Historical Society of Science, 1644 p.85) and Robert Kargon, discusses this relationship in Atomism in England, 1966 p.60ff.


12. A notable work by Charleton is Physiologia Epicuro-Gassend-Charltoniana (1654), an updating of Gassendi's theories. Hobbes may also have introduced William Petty to Gassendi's writings.


CHAPTER I

HOBBES' MECHANICAL PSYCHOLOGY

The question of the place of Hobbes' mechanistic physiological psychology within the grand scheme of his philosophical corpus has been a controversial one. Hobbes himself envisioned a tripartite whole which he described as follows:

"In the first part I would have treated of body and its general properties (i.e., the 'physics'), in the second of man and his special faculties and affections (i.e. physiology and psychology); in the third of civil government and the duties of subjects."

C.B. MacPherson has stated that most of Hobbes' interpreters and critics "have proceeded by breaking up what Hobbes had presented as a monolithic structure...as often as this has been done to Hobbes, the results have been inconclusive, and it may be doubted whether the process has furthered the understanding of Hobbes's theory." The case for studying Hobbes' physiological philosophy appears doubly strong. Such a study would not only serve to place Hobbes in the context of seventeenth century mechanistic physiological and psychological speculation, as is the aim of this paper, but also an understanding of the physiological theory in its own terms may allow a better understanding of the significance that Hobbes intended it to have to the other two parts of his work.

Hobbes considered the "science of man's body (to be) the most profitable part of natural science," and yet he was destined to spend an amount of effort in developing a fully articulate physiology less than commensurate with the apparent significance of physiology to
his philosophy. The earliest evidence of Hobbes' thought on physiology is the Short Tract, written about 1630, in which, after laying down the elements of a theory of optics, Hobbes discussed sensation and the basics of a psychology. The earliest work involving physiology to be published by Hobbes was The Elements of Law, the first part of which deals with man and nature. Although Hobbes wrote this treatise before 1640, it was not published until 1649-1650, and then in a corrupt version. This work was not primarily involved with the second part of the philosophy of man, but with the third, of civil men. It thus also marks the first deviation from a systematic exposition according to his own plan. The political situation in England between 1637 and 1640, during which time Hobbes composed the Elements, was dire; the widening rift between King and Parliament caused Hobbes to neglect the first two parts of his philosophy, the physics and psychology, and instead to provide a brief treatise on political theory which would be of most immediate use to England.

The precedent of deferring a fuller consideration of natural philosophy was to be followed through much of the English political crisis. Hobbes published a translation of De Cive in 1651, the same year that he published Leviathan. In order to meet the requirements of the English political situation, he composed the Leviathan, his greatest political work and renovated and translated De Cive, first published in Latin 1642, which included his earlier political thought. Once more the natural philosophy had to be deferred. De Corpore, the first part of Hobbes' philosophical system, was not finished until 1654, and was published in Latin in the following year. De Homine, which Hobbes said included the most profitable part of natural science,
and upon which he had worked since at least 1646, was not published until 1658, again in Latin. The Latin works were available to scholars and scientists; the political works were published in English in order to reach a larger and less educated audience.\(^7\)

The first section of Hobbes' *Elements of Philosophy*, *De Corpore*, deals only briefly with sensation and animal motion. *De Homine*, in which Hobbes had promised his long deferred physiological and psychological discussion of man, proved to be a collection of his early optical theory with, according to Robertson, "a few chapters on topics of human nature appended in excuse of the title" in which "there was little if anything, to which he had not given repeated expression before."\(^8\) It is possible that Hobbes had deferred work on *De Homine* far too long. While he likely started this section of his work as early as 1646, nothing was really accomplished for almost ten years, by which time Hobbes was not only a palsied old man, but he was also using much of his energy debating and defending his political theory against his many critics, and his mathematical theory against his opponent Dr. Wallis.\(^9\) It is not so surprising then, that the work on human nature and the demonstrations of the relationship of human nature to civil government do not appear to fulfill Hobbes' earlier promises. In order to gain some understanding of the psychology and physiology, it is necessary to glean the parts of this theory from the various works in which they repose. This is not to suggest that such sections are insignificant or too sparse however, for even in his most politically didactic work, *Leviathan*, Hobbes remained true to his original intentions and gave a description of physiology that is very direct and unambiguous,
if far from complete.

The Short Tract on First Principles shows Hobbes using mechanistic axioms and proceeding logically to conclusions about physics and about man. The third section of this short paper offers ten principles concerning sensation and ten conclusions based on these principles. He theorizes that the motion of the bodies of living things, ('animate motion'), must result from some interior motions, and he calls these material internal motive agents 'animal spirits'. Since the (human) body moves sometimes but not always, the motions that the animal spirits impart come not from an inherent power to move, but rather from somewhere else, that is the animal spirits are moved by some external matter and in turn move parts of the body. Hobbes concludes that it is the 'species' of external objects, that is, the material emissions from objects that make contact and collide with the bodies' substance and cause motions in the organs of sense which is sensation and variously with as well as without the mediation of the brain cause motion of the animal spirits. Sensation, in fact, is the motion of the spirits. Similarly, comprehension or understanding is defined in terms of motion only since comprehension and understanding are nothing more than sensations. Good and Bad (Mallum) are defined as motions; something is good which causes motion toward itself, something is bad which causes a repulsion in the body. Motion toward an object is called appetite. Hobbes has, in the Short Tract, developed the mechanistic basis of his psychological theory. He began with the postulate that sensation is merely local motion, the animal spirits moved by external objects, and since, Hobbes says, understanding and comprehension are simply combinations
of ideas which are in turn merely combinations of sensations, understanding is local motion in the body. He had taken the first step toward explaining all of human mentation and 'soul' in terms of matter in motion.

The pervading theme of the Short Tract may be summed up thus: "both the external and the internal act of sense and the higher, psychic functions derived there from are local motion and nothing but local motion."^{15}

It is interesting to note that Hobbes had developed these conclusions at an early stage in his philosophical career, perhaps by 1630, and prior to his enlightening third trip to the Continent (1634-1637) on which he met Galileo.^{16} The basis for Hobbes' mechanical conception of nature was likely arrived at about ten years before the production of his first political work.

The mechanical foundation of Hobbes' philosophical plan is apparent in the Elements of Law, dated in the dedicatory letter May 9, 1640. Hobbes described in detail the mechanical progression of events that results in sensation. A lucid object contracts and dilates physically (Hobbes said), and moves the medium around it, which motion proceeds to the eye, the spirits in the optic nerve, and thence the brain. From the brain these motions of fluids rebound outward through the nerves and thus, because of the rebound, although the motion is actually within our bodies, the sensation seems to have a source outside, the object of sense.^{17} The subjectivity of sensation is summarized in this way:^{18}

Whatsoever accidents or qualities our senses make us think there be in the world, they are not there, but are seemings and apparitions only. The things that really are in the world without us, are those motions by which these seemings are caused.
Hobbes next carries mechanism into the explanation of the higher faculties of the mind. He explained imagination as "conception remaining, and by little and little decaying from and after the act of sense." The motion within our bodies was thought to reverberate, decaying slowly, sometimes overwhelmed by fresher motions or sensory stimuli, and other times, as in sleep, appearing as dreams. He explained memory as repeated sense:

When the conception of the same thing cometh again, we take notice that it is again; that is to say, that we have had the same conception before; which is as much as to imagine a thing past; which is impossible to sense, which is only of things present.

The succession of conceptions in the mind, when orderly in manner, is discourse of the mind. When such discourse is remembered it is called experience, and from experience conclusions may be made. Hobbes went on to outline his theory of knowledge and language, a nominalistic theory which depends upon mechanistic bases. This theory will be discussed in a later section.

Of more immediate importance to physiological psychology is the description of appetite and aversion. This idea, outlined in the Short Tract, is expanded and used to describe human motivations. The motions which cause conception or sensation are thought not to stop in the brain, but to follow a path to the heart, and once there either help or hinder "that motion which is called vital." If vital motion is enhanced, the sensation is pleasurable, if it is hindered then pain is felt. The tendency to draw physically toward pleasurable and away from painful 'objects of sense' is termed (as in ordinary speech) 'appetite' or 'aversion'. All of the feelings or passions
of man can be explained in terms of the various aversions or appetites, and Hobbes goes on to describe shame, courage, anger, love, lust and many other human passions and emotions in these terms, reducing them all to appetite and adversion, which is itself reduced to the actual physical enhancement or inhibition of vital motion. It is this mechanistic basis of the life of men and the workings of men's minds that Hobbes uses to formulate a science of human interaction or politics in the latter half of *Elements of Law.*

Thus in the *Elements of Law*, Hobbes demonstrated for the first time his full philosophical plan. Just prior to 1640, writing contemporarily with Descartes, Hobbes had formed his own theory in the emerging tradition that Boyle would later name the "mechanical (or corpuscular) philosophy of nature," in which all natural phenomena would be explained in terms of the "two catholic principles," matter and motion.

There are some philosophically important developments in Hobbes' thought from 1630 to 1640. In 1630 Hobbes was taking his first steps away from scholasticism, still using some scholastic language and traditional logical methods but rejecting Aristotelian forms and qualities. By 1640 Hobbes had taken the important logical step (not yet clearly stated in the *Short Tract*), of extending mechanism to all phenomena of animate bodies including life, thought and mind.

Whereas Hobbes' contemporaries such as Descartes and Gassendi maintained the existence of an immaterial soul, for religious as well as philosophical reasons, Hobbes saw no need for such constructs and was apparently unafraid to say so. Furthermore, while Descartes gave us the description of a mechanical analog of Man inspired by the hydraulically operated automatons at St. Germain-en-Laye, he reserved
for the soul the governing, animating role in the bodily economy. Hobbes gave a simpler mechanical description of man by describing a mechanism as self-governing; an organism will move toward stimuli which enhance its vital motion and away from those that reduce this motion. Like a machine with feedback mechanisms, organisms seek to enhance their vital motions.

Chronologically, *Leviathan* was the next published of Hobbes' works dealing with physiology. This work was written primarily as Hobbes' political *magnum opus* in response to the increasing strife in England in 1651. Hobbes called it a "discourse of civil and ecclesiastical government, occasioned by the disorders of the present time" intended "to set before men's eyes the mutual relation between protection and obedience." Although Hobbes stated in the conclusion to *Leviathan*, "I hope to return to my interrupted speculation of bodies natural," he had nevertheless included in *Leviathan* a brief outline of his mechanistic physiology as the basis for his science of human nature and politics.

The introduction begins with the axiom that "life is but a motion of the limbs" and discusses as having an artificial life automata similar to those mentioned by Descartes. "What is the heart but a spring and the nerves but so many strings; and the joints, but so many wheels, giving motion to the whole body." The language used by Hobbes is familiar; he has taken the macrocosmic clock metaphor of a clockwork universe constructed and run by the master Artificer, and applied it to the microcosm of man's body. This in itself was not a novel innovation.
Descartes had used the language of the clock metaphor in much the same fashion when describing bodily animate motion. Descartes' definition of a living thing required three things: first the corporeal structure, that is, a suitable arrangement of matter; second the motion of the parts of particles of that body involved in certain 'life function' (e.g. digestion, respiration etc.); and, finally, an internalized principle of motion of these particles which might be likened to the internalized principle of motion of a wound clock spring.  

Thomas Hobbes' conception of a living thing is similar: "life is but a motion of limbs, the beginning whereof is in some principal part within." There are some very significant differences between the conclusions of Hobbes and Descartes, however. For both, the entity that, so to speak, winds the mainspring of both man and universe is God. For Descartes, God not only constructs but also regulates and maintains the universe that He built. For Hobbes, God must exist since there must be a first cause, but He merely assembled the universal machine and then gave the macrocosmic pendulum its first push, thenceforth allowing the universe to proceed on its mechanical way.  

Descartes wrote to Henry More in 1649, and said "There are two different principles of our movement—viz., one which is plainly mechanical and corporeal, ...the other incorporeal, that is to say, mind...." Hobbes took the philosophically consistent but religiously dangerous and philosophically difficult stand that only matter and motion are needed to explain all things; there is no necessity to postulate a soul or any other immaterial entities. This belief set Hobbes apart from contemporary philosophers who were unwilling to follow the logic of the mechanistic philosophy to such an unpalatable conclusion, an ideological recalcitrance that will be seen, in the next section, to influence physiologists.
as well,

Hobbes proceeded to give a concise account of sensation and thought in *Leviathan* which is substantially the same as that given in the *Elements of Law*. The nominalistic account of speech and names is more fully described, and the section of passions is expanded. The prose of *Leviathan* seems more polished, and some of the descriptions of passions are engagingly apt. 37 There is a section on knowledge which was not a part of *Elements of Law* and which seems to have had some effect on discussions of scientific methodology late in the seventeenth century. The major explanation of psychology was intended for *De Homine*, however, and since Hobbes thought the political theory most important at the time, a fuller articulation of natural philosophy was again deferred.

When the first part of Hobbes' philosophy was published in 1654 as *De Corpore*, the epistle dedicatory cited physicians, "the only true natural philosophers, especially of our most learned men of the College of Physicians in London" as the instruments of advance in the science of human bodies. 38 For his own part, however, Hobbes once again deferred most of his discussion of man. He did include six chapters on optics which he had written six years previously and of the remaining portion still to be accomplished he said: 39

The rest shall, as soon as I can, be added to it; though by the contumelies and petty injuries of some unskilful men, I know already, by experience, how much greater thanks will be due than paid me, for telling men the truth of what men are. The description of human nature that Hobbes had given in *Leviathan* had already brought much criticism from his peers.

In chapter 25 of *De Corpore*, Hobbes once more states his mechanistic
principle of the self-preservation of living beings. He said that vital motion, the motion of blood circulated by the heart was affected by sensory input and that the organs 'will be disposed to guide the spirits in such manner as conduceth most to the preservation and augmentation of that motion.' This striving to enhance vital motion and thus minimize pain, (appetite and aversion), is the governing force in all animal motion. Men are set apart not by a soul but by possessing speech and the ability to name things which entails passions not shared with other animals. For Hobbes, the so-called human soul is the same as life, that is the collective faculties and motions and make-up of an individual.

The doctrine that men are ruled by appetite and aversion in a strictly mechanical fashion had dire implications for any belief in free will. Hobbes said that man had no greater freedom in willing or not willing than animals, that is, have no free will, and such arguments had brought intense criticism from clerics like Bishop Bramhall. Hobbes stood by his conclusions in the face of all criticism, however, and defended his views in Of Liberty and Necessity (1654) and An Answer to Dr. Bramhall, reiterating in each the materialist and mechanical bases for his psychology.

Finally, in 1658, Hobbes published De Homine, the second part of his philosophy. It contains nothing new from the physiological viewpoint and, in fact, the first half of the work consists of essentially the same optical theory as was included in De Corpore. The second half is concerned with religion and authority and a chapter on emotions which repeats earlier work. The dedicatory letter to De Homine is worth quoting at some length for the light it casts on Hobbes' attitude
to his work and the necessity for his continued active advocacy of his theories:

The first part of this section was long since ready for the press. "Why then," you may ask, "since the remainder was easy, have we had to await publication so long? What have you been doing in the meantime?" I reply, "I have been fighting the beasts." For I too have my Demetriuses and Alexanders, whose trifling works I am thought, though falsely, to wish to oppose. Yet since I had to answer their clamorings and insults, the long, drawn-out controversy hath caused excessive delay in publication. I had decided that, when these Elements were finished, I would cast my pen aside. But when I see the current manners of those that teach science, I cast this hope aside and retain my pen; for peradventure these things may also have to be defended.

Hobbes, by 1658, had embarked upon the disputes with Wallis over mathematics that would continue for twenty years, and he had become involved in the current reform controversy in the universities. Hobbes' mathematics was doubtful, and the reasons for his ill-founded but dogged defense are a matter for speculation. He may have felt that to be found in error in one area would impugn his reputation in other areas, a reputation which he always jealously, if immodestly guarded. In any case, it is clear that Hobbes felt very strongly about these matters in his later life, and while political expediency had for so long deferred his final work on psychology, so may the distraction of his latter debates have caused an abridgement of the final publication.

If the final demonstration of the link between biological and civil theory is wanting, however, Hobbes nevertheless was consistently faithful to his general plan of mechanistic biology. His view of mind and soul as consisting of matter and motion brought understandable criticism. Since the soul must cease to exist when vital motion ceases
(i.e. death), to be reconstituted by God on judgement day according to Hobbes, Hobbes was patently a mortalist. 48 Since Hobbes thought that an 'immaterial spirit' was a contradiction in terms and that God is substantial and material, he was openly a sadducist. 49 In spite of the furor caused by his philosophy, "Hobbes attempted a task which no other adherent of the new mechanical philosophy conceived, nothing less than such a universal construction of human knowledge as would bring society and man within the same principles of scientific explanation as were found applicable to the world of nature." 50 That the philosophical and religious reaction engendered by Hobbes' theory inhibited the wider public acknowledgement of the merit of his physiology but not the realization of that merit will be shown in the following section.
FOOTNOTES

CHAPTER I

HOBBES' MECHANICAL PSYCHOLOGY


5. Hobbes had distributed The Elements of Law by circulating it in manuscript before he fled to the continent. It was next published in two parts in London and this corrupt version was the basis for Molesworth's edition in Hobbes, English Works Vol. IV. The first version published from the original manuscript was that of Tonnies in 1889. Tonnies' edition was used for the purposes of this paper.


7. An English version of De Corpore published in 1656 was only partially checked by Hobbes, and De Homine appeared, in part, for the first time in English translation in 1972 in Gert, Man and Citizen.


9. Hobbes in 1658 was seventy years old. He was involved in a controversy with many churchmen such as Seth Ward and Bishop Bramhall, Filmer, Ross and Lucy, and the imbroglio with Wallis over geometry was beginning to heat up. The last polemic shot in this latter debate was not to be fired until Hobbes' ninetieth year, 1678.

10. Only the first three principles are used to produce conclusions; this may indicate that this section is incomplete or unfinished. c.f. Brandt, Thomas Hobbes' Mechanical Conception of Nature (Copenhagen: Levin & Munksgaard, 1928) p.32.

11. Hobbes' animal spirits are substantial fluids which performed the task of moving the body's muscles, and are essentially the same as Descartes' hydraulic fluids.
12. Though Hobbes later changed his theories of optics from an emission to a mediumistic one, the principle of the sense organs being physically moved from outside remained unchanged.


16. If Brandt's dating of the short tract is correct, i.e. c.1630, then MacPherson's attribution of the discovery of the basic theory that everything is matter in motion to the period of 1634-1637 in Paris with Mersenne and in Florence with Galileo is incorrect. See Brandt, Thomas Hobbes'; c.f. MacPherson ed. Leviathan, p.18.

17. This notion of the external seeming of sensations being the result of a rebound in motion within the body is a novel one and perhaps is original to Hobbes. Willis noted that sense is mistaken by us to be a peripheral process when it really takes place in the brain, but doesn't give an explanation for this. Cerebri Anatome, 1664, cited by H. Isler, Thomas Willis, New York, 1968, p.93.


20. Ibid. p.11.

21. Ibid., p.28 Vital motion, although it is not stated in the Elements of Law, is identified with the flow of the blood. Hobbes states this explicitly, giving due credit to Harvey in De Corpore, English Works Vol. 1, p.407.

22. Hobbes even framed the necessity for a prime mover or cause for the universe in mechanistic terms, thus God must be material and spirits may not be insubstantial. Hobbes, Elements of Law, pp.53-55.


25. It may be noted that Hobbes did not state this belief in any important public way until he had safely fled to France. Elements of Law was published in 1649 and 1650, probably without Hobbes participation, p.vi.

27. Of Liberty and Necessity was first published in 1654, and bore the date of 1646 in its introduction, though later editions changed this to 1652. This work will be discussed after Leviathan.


29. Ibid., p.729. Hobbes said that he included the account of sensation to "fill each part of my present method," Ibid., p.85.

30. Ibid., p.81.


35. For reference to the argument for the necessity of a material prime mover, see above n.22.


37. For example, fear of invisible power, feigned by the mind or imagined from publically allowed tales is 'religion', if imagined from tales not allowed, 'superstition'." Hobbes, Leviathan p.124. Laughter is a grimace caused by a realization of 'sudden glory' when one sees deformity in another, by comparison whereof they suddenly applaud themselves. p.125.


39. Ibid., p.xii.


41. Ibid., p.410. Hobbes cites scripture to support his idea that soul is the same as life. T. Hobbes, Leviathan, p.484.

42. Ibid., p.409.

44. Hobbes referred to his complete work i.e. De Corpore, De Homine, and De Cive collectively as the Elements of Philosophy. With the completion of De Homine, Hobbes felt his philosophical system was accomplished. While De Homine has nothing of physiology not contained in earlier works, some of Hobbes' thoughts on the particulars of psychology are an advance and elaboration of previous work. B. Gert, Man and Citizen (New York: Doubleday & Co. Ltd., 1972) p.3.

45. B. Gert, Man and Citizen, p.35-36.

46. Hobbes was discussed in Vindiciae Academiarum (1654) in this context.

47. Consideration upon the Reputation, Loyalty, Manners and Religion of Thomas Hobbes, London, 1662 is a notable example of such defensive essays. T. Hobbes, English Works Vol. IV.

48. Harvey was similarly accused of mortalistic beliefs.


CHAPTER II

HOBBES AND THE ENGLISH PHYSIOLOGISTS

The centres of physiological thought in England in the period 1640-1680 were institutionally well defined. When English physiology began to grow in the 1650s, it blossomed particularly at the university at Oxford and under the auspices of the Royal College of Physicians in London. Physiological study grew in parallel with the acceptance of the new mechanical philosophy.

William Harvey, an authority cited by Hobbes in support of a point in mechanistic physiology, on the heart and circulation, was certainly not a mechanist, though he used some mechanical explanations and language in his study of the circulation of the blood. Harvey had been a Galenist when first writing in about 1616, and when he changed his attitude in conjunction with the publication of De Motu Cordis in 1628, he changed not to mechanistic philosophy but to Aristotelianism. The Aristotelian metaphor of the heart as sovereign in the body was central to Harvey's theory, and he also used an astronomical allusion to the priority of the heart when he compared it to the sun. If he was neither for nor against mechanism in the early years, by 1649-1651 Harvey had become a devoted anti-mechanist when that increasingly popular philosophy challenged Aristotelianism. While the authority and influence exerted by Harvey was not inconsiderable, the direction of the future involved mechanism. This trend Harvey could only hope to inhibit temporarily.

It became clear that almost every physiologist after Harvey tried to work out some positive relationship to the latest
development in physical science, and it was this relationship, not the attempted solution of a set of continuing research problems, that determined the pattern of development of English physiology in the late seventeenth and early eighteenth centuries. The key to post-Harveian physiology...lay...in the evolving relationship of the mechanical philosophy to the understanding of the 'animal oeconomy'.

In 1648, many of the members of Boyle's 'invisible college,' a group of scientific amateurs, were appointed to Oxford chairs. These included John Wilkins, John Wallis, Jonathan Goddard, Seth Ward, and William Petty, who, when joined by Boyle, called themselves the 'virtuosi'. This was at least partially a blow to the established church by the puritan parliament; the new appointees generally eschewed Aristotelianism and were anti-clerical in attitude. After 1650, under the Commonwealth, the writings of Descartes, Gassendi and other philosophers became more generally available in England, and the enquiries into respiration and neurophysiology at Oxford began to include Cartesian (mechanical) explanations, though a mixed attitude toward mechanism was apparent.

The flourishing of mechanical philosophy at Oxford was brief; by 1667-1668 most of the leading lights of the research there had left for London and the Royal Society. By the late 1660s and early 1670s, the Royal Society had members whose attitudes ranged from traditional Harveian through frankly uncommitted like Boyle to avid mechanist like Willis or Charleton.

The Royal College of Physicians was in a somewhat more insecure position than the Royal Society. First created in 1518 to regulate medical practice in London, by the 1650s the College was under attack and under threat of losing their monopoly by a group called the
Company of Apothecaries. This Company was a group of pharmacists who wished to expand their business to fill the void left by the woefully insufficient numbers of physicians. The College demanded that:

Every apothecary must take an oath to confine his practice to dispensing the prescriptions of the physicians of their College and that he would not presume, except in emergencies to offer service or administer treatment to patients.

During the Civil War, the Royal College was unable to enforce the usual strictures and the Company (later Society) of Apothecaries became stronger. There was an important group of Helmontain chemical physicians, including Marchamont Nedham, who allied themselves with the Apothecaries in an attempt to break the monopoly of the College.

This amorphous but influential coalition of chemists and druggists included in their polemic armamentarium, the arguments that the College was tradition-bound and scientifically conservative, as well as the allegation that its members were intellectually incapable of proper enquiry. One of the leaders of the College of Physicians was Thomas Willis. Willis was an acquaintance of Boyle, a member of the old Oxford group in the fifties, and an associate of the Royal Society in the sixties and seventies. He himself was a devoted mechanist and iatrochemist and his strategy of defense against the Apothecaries was to turn their own arguments against them and demonstrate that it was the members of the Royal College who were most able and willing to carry out medical enquire, and that this enquiry was best performed by iatrochemical methods. By showing that the Royal College could perform research in the new mechanical idiom, the members of the College hoped to buttress their flagging reputation against their critics. This mode of defense became established College
policy, and Willis wrote that "mechanical means" would save the medical art from the "vilest scum of the people who bark against and fling dirt upon Physick."12

The Royal Society and the Royal College were thus two principal foci of mechanistic physiological discussion in the latter half of the seventeenth century. There were also, of course, a number of men who were not closely associated with either of these centres and yet participated in furthering the mechanical philosophy. Some of these men were scientific amateurs, others were medical men, and still others were religious men propounding mechanism to further their theological beliefs.

Sir Kenelm Digby (1603-1665) was one of the scientific philosophers who influenced the early development of the mechanical philosophy in England. He was a Roman Catholic virtuoso, serving at one time or another as privateer, philosopher, royal councilor, and playwright. He was also a good friend of Hobbes, and a member of Mersenne's group in Paris. Digby's friendship with Hobbes transcended their basic philosophical differences; to one God was merely the primum mobile and architect of the world machine; to the other God was the architect of man's divine soul.13 Their common ground, however, was their interest in Gassendi's atomistic philosophy and in Descartes' new philosophy. While Digby may have been an important figure in the establishment of the new philosophy in England though his influence in the Royal Society and his association with the Mersenne and Newcastle circles, this importance is certainly out of proportion to the worth of his
publications, which were of a consistently amateurish quality.  

Digby was fundamentally an Aristotelian who incorporated the mechanical philosophy into a synthesis which allowed, in the Hermetic tradition, occult elements and immaterial substances such as the soul. While an immaterial soul would certainly be defended by Mersenne and many other philosophers, the magical elements of Hermetic philosophy had been attacked by many churchmen, including Mersenne. In Two Treatises (1644), Digby undertook to prove the existence of an immortal soul using his theory of bodies as a basis. He does this by first showing the principles governing motion of bodies, and then attempting to show that the operations of the soul cannot be explained by these principles, and therefore the soul is immaterial, and, since not subject to decay, immortal. In other words, Digby argued that since functions of the soul like thought and imagination did not (contra Hobbes) seem to follow physical laws, then the soul, which Digby never questions the existence of, must be immaterial. This sort of tautological argument was a pitfall of many who regarded for one reason or other the existence of soul to be axiomatic.

Digby treated biology and physiology in a mechanistic, atomistic fashion. Human sensation is explained in an unrefined manner somewhat reminiscent of Hobbes in the Short Tract. Hearing is thought to function by a mediumistic motion, but the other senses are all thought to function by reception of atoms from the perceived object in the sense organ. The sense organs themselves do not sense, says Digby, but channel the small atoms or particles to the brain, helped and carried by "vital spirits,"
wherein they thenceforth reside. Digby is a little vague as to how sensation is related to bodily action, but he thinks that the particles cause some sort of messages to be sent from the brain to the body. The passions are explained in a strikingly Hobbesian manner. Particles travel to the heart and make it expand (joy) or contract (fear, hate, etc). Digby thus agreed with Hobbes that the heart has an important role in passions, but disagreed on the specifics of that role. For both men the passions are linked to motion of heart and blood, but only for Hobbes was sensation and passion linked to the driving force of the being, the vital motion of the blood. Digby describes the original particles of sense as the vehicle of memory, which somehow repose in the brain, and which when stirred up again cause the original sensations once more.

Digby thus far was in agreement with Hobbes; the further step of mechanical soul was, however, unthinkable. In this he stood with Descartes, saying that the soul "apprehends" objects in some indefinable spiritual manner. To the question of how this can come to pass without the mediation of the senses Digby replies,"I confess I shall not be able to satisfy you, but must answer that it is done, I know not how, by the power of the soul." Digby's explanations are as unsatisfying to us as they were to his contemporaries. Faced with the theological necessity for an immaterial, immortal soul, Digby was forced to admit that he could not explain any connection between the soul and the body in terms of his rather poorly articulated mechanical theories.

Devout Catholics were not the only ones to insist upon the existence
of an incorporeal soul, of course. Representative of the group called the 'Cambridge Platonists' is Henry More (1614-1687), an early English convert to Cartesian doctrine. In his early enthusiasm for the new philosophy in the 1640s, More may have been quite important in its dissemination in England. He corresponded with Descartes in 1648 and 1649, mostly about the issue of animal motion and automatism and animal soul, and it was this issue which greatly contributed to More's later volte-face and his subsequent vehement derogation of his former idol's theories. This issue of animal motion and soul, bears directly upon the relations of Hobbes and the Cambridge Platonists.

Descartes had described animals, and to a degree man, as mechanical automata. In the animals, which lack a divine soul, the process of sensation is completed when the sensible motions reach the brain; in man, it is the soul which is the final receptor of sensation, and the brain merely the agent or medium of the passage of that sensation. Thus for Descartes' animal machine, sensation consists entirely of matter and motion, whereas in man there is the problematic involvement of the insubstantial soul in the process of sensation. The following quotation shows that Descartes and Hobbes agreed completely on what sensation and motion in animals is; Hobbes carried this on to apply to man as well. Descartes stated in 1649, that he:

had given heed that there are two different principles of our movements to be distinguished--viz., one which is plainly mechanical and corporeal, which depends upon the sole force of the animal spirits and the configuration of the various parts of the body,...the other incorporeal... I sought quite diligently whether animal movements arise from these two principles, or simply from one. When I had clearly perceived that all movement could originate from the one principle, that is to say, the corporeal and mechanical one, then I held for certain and proven that we can in no way demonstrate any rational soul in brutes.

For More, the Platonist, spirits and soul have priority over the
physical world, and matter is 'sentient'.\(^{25}\) While the Cartesian dualistic coexistence of material world and spiritual world at first seemed attractive to the Cambridge Platonists,\(^ {26}\) it became apparent that the two philosophies were metaphysically at variance with each other. More finally concluded that Descartes' theories were basically prejudicial to religion and that no phenomenon could be properly explained in purely mechanical terms.\(^ {27}\) In this Platonic rejection of mechanism More was echoed by his friend and compeer Ralph Cudworth who said that the Cartesians "have an undiscerned tang of the mechanically atheistic humour hanging about them."\(^ {28}\)

The neo-Platonist repudiation of mechanistic philosophy came in the 1660s and 1670s, after Hobbes' major works were published, and one must wonder how much the criticism was due to Descartes and how much was a result of Hobbes showing them clearly in what direction such mechanistic reasoning could lead. It was perhaps Hobbes who was the major enemy, and who caused most of the reaction, while Descartes reaped the criticism thus due any mechanist. The criticism of Descartes was enhanced perhaps by a feeling of betrayal on the part of those Cambridge men who had championed his philosophy in the 1640s and 1650s, only to find to their dismay that mechanism was not compatible with theology as they had first thought. It was certainly Hobbes' statement that spirit is "a body natural... that filleth up the place which the image of a visible body might fill up\(^ {29}\) that elicited the response from More that "to root out this sullen conceit" of Hobbes was of high priority.\(^ {30}\) The Cambridge Platonists might agree with some of Hobbes' theories on sensation
and natural philosophy, but the materialism which denied the ruling spirits of the world, the *vitae mundi*, which were a vital part of neo-Platonic doctrine, must be deplored, just as the Cartesian mechanical man must be deplored for its materialistic implications. While Descartes could not, of course, carry the mechanistic explanation to the extent of explaining all things including mind, the Platonists saw this logical step, or rather, had it forcefully pointed out to them by Hobbes.

Joseph Glanvill (1636-1680) was not a member of the Cambridge group, but was nevertheless an admirer of Henry More. He was also a churchman and member of the Royal Society. In 1661 Glanvill published his first philosophical work, *The Vanity of Dogmatizing*, ostensibly intended as a rebuke to scholastics. In fact this work pursues a somewhat ambivalent course, on the one hand pointing out the state of ignorance of contemporary thought and on the other hand championing the new mechanical philosophy and the knowledge gained from it. It is written in a generally sceptical vein, however, and this attitude is apparent as much in the discussion of the new mechanical philosophy as in the criticism of the ancients' philosophies.

Glanvill is representative of a number of seventeenth century thinkers caught on the horns of the Hobbist-Cartesian dualistic dilemma. Descartes' pure mind-body dualism became increasingly irreconcilable with the mechanical philosophy which he himself had propounded. Many philosophers (and certainly Glanvill, as an orthodox churchman) were unwilling to accept the extreme Hobbist view that there is no immaterial soul, and yet the alternative presented imposing logical
problems. If an immaterial soul exists, how can it influence the material body, and vice versa? No matter what theory of sensation is put forth, the point is always reached where one cannot logically bridge the gulf between matter-in-motion and immaterial mind (or soul). The new mechanical philosophy had brought with it a problem which men such as Descartes couldn't solve. If one is committed to the mechanical explanation of all phenomena, one is faced with the problem of what to do about soul. This is a problem which didn't exist for non-mechanical philosophers.

Glanvill was very involved in this problem, and stated it rather clearly in The Vanity of Dogmatizing:

For body cannot act on anything but by motion; motion cannot be received but by quantitative dimension; the soul is a stranger to such gross substantiality, and both nothing of quantity...and therefore how can we conceive it under a passive subjection to material impressions?

He says that if soul is considered as pure mind and knowledge, as by Digby, or as a thinking substance, "une chose qui pense", as by Descartes, it makes it "as hard to apprehend as that an empty wish should remove Mountains". Similarly, he denies his friend Henry More's neo-Platonist idea that soul has extension, that is location, since if soul indeed is everywhere, penetrating all bodies, how could it impart motion to bodies?

Glanvill was clearly interested in mechanical psychology. He singled out for discussion and criticism the major contemporary theories of memory. Both Descartes' theory involving paths in a porous brain and Digby's idea that the original sensible particles somehow lay about in the brain he found 'unconceivable'. It is noteworthy
that Glanville gave Hobbes the same serious consideration as he did the esteemed Descartes, when he discussed Hobbes' theory of memory. This theory held that memory (and imagination) were 'decaying sense', the persisting vibration in the brain caused by a sensory stimulus. Glanvill did not think that the substance of the brain was of such nature as to maintain such vibrations like a quivering mental jelly, and even if this precondition was granted, he thought that such a situation would resemble trying to "play a thousand tunes on a lute at once".

Glanvill propounded his belief in man's necessary ignorance, saying "We are ignorant of some things from our specific capacity, as men; of more from our contracted [incapacity] as sinners: and it is no fault in the spectacles that the blind man sees not." In this last allegorical phrase Glanvill was using the spectacles to represent science, and the blind man to represent all men, blinded to a degree by their nature. His support of the method of the new philosophy by such apt similes and by his belief in parts of that philosophy were sufficient to cause charges of atheism to be attached to him in spite of his fervent anti-sadducist opinions.

Glanvill's Plus Ultra (1668) was written in part to defend the author against charges of atheism, an indictment of which the virtuosi of the Royal Society were exceptionally wary. He did this by defending the legitimacy of the mechanical philosophy and its reconcilability to religion, using Robert Boyle as a model of the Society's achievements. This work did not receive its intended reaction.
from all quarters. Meric Casaubon, a learned divine, responded to
Plus Ultra and Glanvill by deploring the tendency to disregard ethics
and to define advancement of knowledge in purely materialistic terms.
He felt that such an amoral attitude would lead to an increase in the
atheism attached to Hobbes' materialism.43

To prevent such criticism from mitigating the effects of his defense
of the Society, Glanvill, when he next rose to that defense, pointedly
separated Hobbes from the Society virtuosi. He noted that a "Modern
Sadducee [Hobbes] pretends that all things we do are performed by
meer matter and motion and consequently that there is no such thing
as an immaterial being."44 He further stated that the majority
of the mechanical philosophers admitted the existence of an immaterial
soul: "Thus far I dare say I may undertake for most of the
Corpuscularian Philosophers of our times, excepting those [men] of
Mr. Hobb's way."45 The fury stirred up by Hobbes had thus affected
all adherents of the mechanical philosophy, particularly that concentration
of such thinkers in the Royal Society.

William Petty (1623-1687), was another member of the Royal Society
who was interested in mechanical philosophy. In the 1640s Petty
had been introduced to the Newcastle circle by his friend John Pell,
a mathematician. It was here that he first developed an interest
in physics; he became a good friend of Hobbes, and drew the diagrams
for Hobbes' optical treatises.46 When in 1674 Petty presented his
only notable work on mechanical philosophy to the Society, he dedicated
it to his old patron and friend William Cavendish, Duke of Newcastle.
This treatise, *A Discourse...Concerning the Use of Duplicate Proportion...*, was written to encourage members to apply mathematics, Petty's forte, to the understanding of matter. The interesting point in the Discourse is his justification of his philosophy to the theologians. Petty was as much concerned with church opinion as any of the virtuosì, and he was careful to try to legitimize his view of the universe as mechanical.\(^47\) By attributing to atoms a sexual quality, 'maleness' or 'femaleness', he tried to show that atoms were indeed mentioned in Genesis in the Bible (male and female created He them).\(^48\) Though he was dissatisfied with all current physical theories for their lack of mathematical precision, he drew his theories in large part from the men who originated them and who influenced him in the 1640s, Descartes, Gassendi and Hobbes.\(^49\) Hobbes is cited as a serious competitor to Gassendi and Descartes.

A discussion of the members of the Royal Society and their relations with Hobbes cannot be considered complete without mentioning Robert Boyle (1627-1691). Although primarily interested in chemistry, Boyle probably gained a certain interest in physiology during a visit to Ireland in 1653-1654 with William Petty. In Ireland they found chemical tools and apparatus "so unprocurable that it was hard to have any Hermetic thought" and the two men turned to anatomical dissection.\(^50\) Boyle was also somewhat disenchanted with the current accounts of mechanical philosophy, not only because they lacked a firm mathematical basis, as Petty had remarked, but particularly because the theories of Descartes, Gassendi and Hobbes...
were tentative, possible explanations which none of the philosophers had sought empirically to test. Boyle himself retained a good 'Baconian' attitude, using the mechanical philosophy "primarily as an heuristic instrument to lead to new experiments and observations." Of the particulars of the various versions of the philosophy he was sceptical, and he was wary of openly supporting a doctrine so associated in the public mind with atheism. When he did express an opinion of mechanical philosophy, it was a neutral one, combining elements of Gassendi and Descartes, yet refusing to differentiate between them or to take a stand over the differences in detail between the two. Boyle was very much associated with the new mechanical philosophers in England, however, and in particular with the Newcastle group. He was a correspondent of John Pell, a friend and pupil of Petty, an admirer of Kenelm Digby, and an early initiate to Gassendi's philosophy through the correspondence of Samuel Hartlib, a merchant and scientific amateur.

Boyle's objection to Hobbes seems, on the surface, to be an epistemological one. While he lauds the men like Descartes and Gassendi for publishing general principles that may aid scientific endeavour, that is, Baconian natural histories, he says that some men seem constrained to write either complete systems or nothing at all, and that when these men lack particular knowledge they nevertheless feel that they must write something rather than say nothing at all on a subject. While Boyle did criticize Hobbes for some of his ideas on vacuum and for his method, there seems to be a distinct undercurrent of religious political objection which Boyle held in common with other critics like Wallis. Boyle did not directly attack Hobbes'
physiology or psychology, yet there is reason to suspect that it was the implications of the derivative political theory that helped motivate his general criticism of Hobbes. Boyle was a powerful figure in the early Royal Society and was concerned with building and securing the reputation of that Society. In order to do this, he opposed the inclusion of Hobbes in the Society and denigrated Hobbes and his theories for two reasons. He did not want a materialist and accused atheist to be seen as representative of the Society, and he did not want him to represent English science abroad.

This attitude was not universal in the Society, however. Walter Charleton, (1619-1707), an old friend of Hobbes, was an early convert to Gassendi's mechanical Epicurean philosophy, possibly due to his association with Hobbes and the Newcastle circle. As an early member of the Royal Society and the President of the Royal College of Physicians, he spans the two centres of physiological endeavour discussed earlier in this essay. Boyle and Charleton were quite similar in many areas of thought. Charleton, responsible in large part for the introduction of Gassendi to England, attempted to cleanse the Epicurean corpuscular philosophy of its Greek pagan elements which he felt would menace religion and hinder its acceptance as a theory. It was to the revised Epicurean philosophy, published by Charleton as Physiologia Epicuro-Gassendo-Charltoniana (1654), that Boyle later adhered.

Although his association with Hobbes may have been an embarrassment to Charleton in his attempt to legitimate the mechanical philosophy in England, there are many congruent points in the philosophies of
the two men. Charleton, like Hobbes, saw God as the First Cause, the universal prime mover. Everything after the first 'divine push' could be explained in terms of matter and motion. Charleton's account of sensation is remarkably similar to Hobbes and he cited Hobbes as a source for his description of the passions. He stated that "all effects which external objects can possible exist in us... may be...referred to two general heads, namely pleasure, and pain", which he associated with good and evil. Charleton gave an account of human psychology based on matter and motion which differs only in detail from that of Hobbes. He said that sensation proceeds as motion to the brain and if weak, decays, if strong continues to the heart. If a sensation is pleasurable, "it immediately puts the spirits therein reserved into brisker but regular motions..., if displeasing it puts them into confusion." Thus the passions, exactly as in Hobbes theory, affect the motions of the spirits and blood.

The significant departure from Hobbist theory by Charleton is, of course, over the matter of soul. He divided soul into rational and sensitive components, as did Digby; the sensitive soul consists in motion, being like a 'lucid fluidum' composed of vital flame and animal spirits, "subject to undulations or waving motions throughout." Thus far Charleton is in agreement with Hobbes (and Descartes). He maintains, however, that the rational soul must be immaterial for religious reasons, in order to be immortal, though he saw the problems inherent in a Cartesian dualistic view. "I as little understand how Intuition [thought] can be ascribed to an immaterial, that hath no eyes, as I do how feeling of strokes can be ascribed to a thing that cannot be touched." But Charleton goes a step farther than most of his intellectual contemporaries when, with a somewhat
atypical candour, he admits his lack of understanding and suspends judgement on the subject. "Wherefore having confessed my ignorance, I refer the matter to your arbitration; allowing you as much time as you shall think fit, seriously to consider the same; and in the interim contentedly suspending my curiosity, which hath often perplexed me." 67

Charleton's thoughts on human psychology and the soul hold important clues to explain the positions taken on these subjects by other less forthright writers. To interpret these thoughts in the seventeenth century setting requires some grasp of the political and theological environment of England in the 1640s to 1670s.

During the troubled times of the Civil War, non-conformists, sectarians, and free-thinkers flourished, attacking the doctrines of both 'Puritan' and High Church orthodoxy. Among these must be counted Richard Overton, a friend of John Lilburne and a pamphleteer for the Levellers. Aside from his political publications, Overton published in 1643 a religious tract entitled *Mans Mortalitie* in which he revived the doctrine of 'soul-sleeping', the 'Arabian error' of mortal soul. 68 This issue had been first raised in the previous year by Sir Thomas Browne's *Religio Medici* (1642). 69

Browne described mortalism and rejected it on grounds of faith, saying that philosophy had not yet disproved the doctrine. 70 This statement was in part responsible for the renewed debate on an old controversy, 71 and Overton's publication added fuel to the polemic fire, although the respectable physician Browne was to be considered more worthy of response than the radical Overton. 72 Overton whole-heartedly
propounded his mortalistic doctrine, producing conclusions which are very similar to those of Hobbes, if antedating him by eight years. He saw no basic difference between animals and men: "Brutes...have our most noble and faculties scattered among them, though in an inferior degree." Proceeding on the assumption that "all that is created is material", he took Aristotle's (and Hobbes') concept of soul as the faculties of man jointly considered and showed that each faculty is corporeal and that thus the soul must be corporeal and mortal.

In response to the mortalism controversy, the House of Commons ordered an investigation of publishers of mortalistic pamphlets. In 1646 legislation was passed for the suppression of such heretics and blasphemers. Although Overton's tract was not intentionally Epicurean, it was identified as such by his contemporaries, and to quote Kargon, it "became the lightning rod for criticism of Epicureanism". The connection between atomism and atheism became fixed at least in the contemporary religious mind, and Gassendi's Epicurean synthesis came under attack. Thus Charleton himself was criticized for his revision of Gassendi's philosophy, and in the 1650s he published several tracts denying mortalism and confirming the existence of an immortal soul.

To properly understand Charleton's avid attempts to purify Epicurean philosophy of its atheistic connotations it is necessary to remember that he was in the 1650s, and to some extent in the 1660s, still working under the dark cloud of criticism engendered by men like Overton in the previous decade. In 1656 Charleton published Epicurus's Morals, specifically to discuss these problems, and in an appended "An Apology for Epicurus," to defend Epicurus (and thus Epicureans)
from charges of atheism. To add to the desire of Epicurean philosophers for a disassociation with mortalism and heresy, there was the connection with Thomas Hobbes and his much criticized philosophy. It was the materialism associated with Epicurus that Charleton had to excuse, and to many observers this was equivalent to the materialism of Hobbes.

Hobbes derived his mortalism in two different ways, first from his natural mechanical philosophy as has been shown, and secondly by scriptural exegesis. He did not differ in any important way from the views of Overton, Milton, and Browne on mortalism. Thus, after 1651, to be associated with mortalism was to be seen as Hobbist.

Hobbes was not, by his own admission an Epicurean. When Seth Ward accused Hobbes of restating the sensation theories of Descartes, Gassendi, and Digby, thus attempting to belittle Hobbes' contribution to physiology, Hobbes indignantly responded that Descartes' theory was nonsense, and Gassendi and Digby held the opinion of Epicurus "which is very different from mine." The major differences between Epicurean theory and Hobbes' thought centre on the existence of vacuum and on Hobbes later mediumistic theory of light as opposed to the neo-Epicurean emission theory. To most observers, however, Hobbes and Epicureans were, by dint of their common materialism and mechanical corpuscular physics, collaborators in single dangerous dogma. Thus Cudworth and More tended to include any Epicurean philosophers and scientists with Hobbes in their responses to Leviathan.

The admission by Walter Charleton in 1675 that he did not after all understand how an immaterial soul could function was the more remarkable given the continued anti-mortalist climate of the 1670s.
His skepticism would be saved in the eyes of religious critics only by his insistence, whether through sincere Christian belief or by social necessity, on the existence of an immortal immaterial soul.

For other men like Thomas Willis, champion of the Royal College and, like Charleton, also a member of the Royal Society, the question of Hobbes' materialism and Cartesian dualism also arose. Willis was involved in two not dissimilar activities: he sought to prove that the Royal College was the proper seat of medical research and learning in London by exhibiting the mechanical and iatrochemical expertise of College members; and he also carried out his own studies there, mostly on neuroanatomy. In his work *De Anima Brutorum*, Willis dealt with the question of the souls of animals and men. Willis divided souls into sensitive soul and rational soul. The sensitive soul functions through animal spirits which travel the nerves and brain and are involved in sensation and a certain degree of thought. A third, subsidiary, soul, the body-soul, is postulated to govern unconscious, autonomous bodily functions such as digestion and respiration. The rational soul is present only in man.

It is clear that for Willis, the soul of brutes consists of matter in motion, and the animal spirits which power it are chemical principles. This soul, really a body soul and sensitive soul composite, is accorded a limited ratiocination, sufficient to explain animal functions and actions. To avoid difficulty with theological questions Willis separated such basic cognition from higher intellection, which he said, was the function of an immaterial rational soul which was somehow (Willis is unclear as to precisely in what manner).
connected to the body-soul for its sensory input. This solution to the dualist problem was essentially the same as that offered in the same year, 1672, by a French Jesuit writer, Father Ignace Gaston Pardies, in his *Discours de la Connaissance des bests*. Like Willis, Pardies said that beasts have a sensitive kind of cognition, but not an intellectual one.

Willis was the physician to the Archbishop of Canterbury and in this capacity as well as in his responsible positions in the Royal College and Royal Society, he was constrained to maintain at least the facade of theological orthodoxy. His compromise of a bipartite soul was sufficient to satisfy his critics, and yet allowed Willis to talk about the mind and soul in materialistic terms. The frankly materialistic assertion which the church failed to comment on was that matter could reason. The communication between the body soul and the rational soul in man allowed Willis to treat the rational soul as if it were a part of the material body soul in his enquiry into mental illness. Being very much aware of the atheistic dangers of a materialistic or Hobbesian doctrine, Willis prefaced *De Anima Brutorum* with the following statement:

*I know not whether it will be pleasing to all that instituting the something paradoxical doctrine of the animal soul, that I should assign to that soul, by which the brutes as well as men live, feel, move, not only extension, but members, and as it were organical parts....Moreover, that the corporeal soul doth extend its sicknesses not only to the body, but to the mind or rational soul...I think is clear enough.*

When he described the rational soul as "a particle of a divine breath", "*divinae particulam auras*", he was using precisely the same language as he had used to describe the subtlest of chemical principles in
a prior discussion of fermentation. Hansreudi Isler comments, "It seems that Willis could not always hold on to his theological footing when he was being carried away by the trends inherent in his theories." This assessment nicely sums up an attitude which has been shown to exist in a number of Willis' contemporaries such as Charleton.

Willis was a scientist who was seriously interested in mechanical physiological psychology. He wanted to explain the workings and illnesses of the mind and the most potent instrument at his disposal was the mechanical philosophy, which is only effective when applied to material entities. By proceeding in such an enquiry, Willis was in an important way a follower of Hobbes, but for obvious reasons could not admit to this influence. He thus typifies 'followers' of Hobbes or physiologists who took Hobbes seriously yet could not acknowledge that fact.
FOOTNOTES

CHAPTER II

HOBES AND THE ENGLISH PHYSIOLOGISTS


4. T. Brown, Mechanical Philosophy, p.29,p.48. In the early part of the century, of course, there didn't really exist a 'mechanical philosophy' for Harvey to either accept or disavow.

5. Ibid., p.v. The 'animal oeconomy' was the seventeenth century term for physiology.

6. Professor of Medicine at Gresham College

7. H. Isler, Thomas Willis, p.13


10. Nedham was the author/editor of Mercurius Britanicus (sic.) the most continuous Parliamentarian news-sheet during the war.

11. Iatrochemistry is the name given to the application of corpuscular mechanical theory to medicine in the late seventeenth century.

12. T. Willis, Pharmacaetice Rationalis, (1674).


15. Ibid.

16. The Hermetic tradition was attacked as a threat to religion in the late sixteenth century by the Jesuit del Rio and Protestants like Erastus. In the seventeenth century, Mersenne himself condemned it as threatening the status of miracles, and moderates in the War condemned it with the accompanying threat of the sectaries. See P. Rattonsi, "The Social Interpretation of Seventeenth Century Science"


18. Ibid.


20. Digby had been interested in the heart and circulation since his early days at Gresham College (1633-1635). He tested and finally agreed with much of Harvey's circulation theory.


31. Glanville was Chaplain-in-Ordinary to Charles II and Rector of Bath Abbey.

32. Basil Willey, *Seventeenth Century Background*, p. 173

34. J. Glanvill, *Vanity of Dogmatizing*, p. 22.

35. On More's idea of universal extension for soul see his *True Notion of Spirit* (1671), reprinted in Glanville's *Sadducismus Triumphatus* (1681).


40. Glanvill's support of immaterial spirits, miracles and witchcraft is best outlined in *Philosophical Considerations Touching Witches and Witchcraft* (1666).


42. Oldenburg meant Plus Ultra to be an unofficial supplement to Sprat's *History of the Royal Society*, (1667) the first apologist to attempt to allay the fears of the religious about the Society's atheistic materialistic tendencies. Sprat used Christopher Wren as a model for the Society.


47. Petty was so concerned with opinion that he finally chose not to publish a treatise that dealt with some points of natural religion rather than expose himself to the displeasure of "the censorious and envious, the sciolus, etc." Petty to Southwell, August, 1677; Petty-Southwell Correspondence p. 31, c.f. Westfall, *Science and Religion*, (New Haven: Yale University Press, 1958) p. 114.


49. Ibid., p. 66.

51. Kargon, R. Atomism, p.95

52. An early manuscript, "Of the Atomical Philosophy" bears the message: "These papers are without fail to be burned." R. Kargon, Atomism p.96.

53. R. Kargon, Ibid., p.95.

54. The major direct confrontation between Hobbes and Boyle was over the study of air. Boyle felt that Hobbes had little right to an opinion in such matters, eschewing active experimentation as he did. Hobbes had attacked Boyle's views on vacuum in Dialogus Physicus (1661)


58. Charleton was previously Royal Physician to Charles. Dual membership in both the Society and the College was common to nearly fifty other men. Boyle was not among these.

59. On Boyle's acceptance of Charleton's doctrine see R. Kargon, Atomism, p.97ff.


61. Charleton; Natural History of the Passions, (London, 1674), epistle prefatory.

62. Ibid., p.82.


64. Charleton admits a third category of sense--neither pleasure nor pain, good nor evil but neutral: "if the soul at that time, both for her object, not good or evil, but only knowledge...she converts all her power upon the brain alone, wherein all sense is performed." Ibid., p.90


66. Ibid., p.66
67. Ibid., p.67.


69. This popular book saw eight editions by 1646 and made Browne famous.


73. Hobbes first explicitly stated his mortalist thought in Leviathan.

74. Overton, R., Man Wholly Mortal, (London, 1675). p.17. This was a later edition of Mans Mortallitie.


76. Ibid., p.5ff.


78. Kargon, R., Atomism, p.81. For Kargon, Epicureanism is any thought which was identified with Epicurus, e.g. Gassendi, Charleton, Hobbes, and even Boyle.


80. These tracts include Charleton, W., Darkness of Atheism (London, 1652) and Immortality of the Human Soul, (London, 1657).

81. Hobbes, T., Leviathan, chapters 38,44.


85. Lady Margaret Cavendish's somewhat nugatory materialistic essays on Epicurean philosophy added to the furor. Thus the Newcastle circle was intimately involved with Epicureanism in England.


88. Ibid., p.158.

89. Willis agreed with Hobbes that man could know only what his senses allowed him.


91. The passive acceptance by the church of this Hobbesian idea may have set the precedent for acceptance of Locke's similar ideas some decades later, T. Willis, *Dr. Willis's Practice*, p.154.

92. T. Willis, "De Anima Brutorum", preface in *Dr. Willis's Practice*.


One must be cautious when trying to show some relationship between the development of science and religious beliefs. The acceptance and reputation of a man like Hobbes has much to do with the degree to which his thought challenges religious orthodoxy and on the political power wielded by the representatives of that orthodoxy. In the 1930s an attempt was made to connect "Puritanism" and the rise of science in the seventeenth century.\footnote{One major problem to be encountered in this endeavour is the difficulty in defining the term 'Puritan'.} For such a connection to make any sense, the category, 'Puritan', must be so broad as to be almost meaningless; a substantial part of the English population of all sorts of philosophical leanings must be labelled Puritan, and the Civil War devolves into Puritan fighting Puritan. Any attempt to show that only a part of these people, the most moderate or least radical of Puritans was involved in science is doomed similarly to failure. A moderate Puritan makes as much sense as an immaterial substance did to Hobbes; they are contradictions in terms.\footnote{To say that the most moderate Puritans were most involved in Science is to say that the most scientifically oriented men were the least Puritan. It is much more meaningful and useful to say that scientific development was affected by a group of moderates who were neither High Church Laudians nor Puritan, but who represented a consensus of orthodoxy against which scientific doctrine must be gauged.} It was from this somewhat amorphous body of men that included clerics and scientists alike, that the scientific philosophers of the seventeenth century had to gain approval. The Royal Society
and the Royal College of Physicians were institutionally dependent upon Royal support and public opinion, and were thus particularly sensitive to any public criticism over published doctrine. One of the prime objectives of these institutions and of many scientific amateurs not associated with either body, was as far as possible to dissociate themselves from the stigma attached to the Greek materialists who were in many ways their own true forebears. In the 1660s and 1670s, there was an increasing body of opinion in England that the new science was equivalent to materialism which was in turn equivalent to atheism. That Thomas Hobbes was intimately involved in the formation and persistence of this opinion is incontestable. His mortalist thought in *Leviathan* followed on the heels of Overton and Browne's rather invidious work in the 1640s, and criticism for this and for other parts of his philosophy caused Hobbes to be accused of atheism. When the Restoration brought a spate of 'libertinism,' Hobbes was even accused of sponsoring this, both by his free thinking and because of the link between Epicureanism and libertine hedonism. Furthermore, despite Hobbes' own denial of being an Epicurean philosopher, opinion sponsored particularly by the Cambridge Platonists did tend to see him that way, and indeed the differences were small enough to make such a classification seem quite reasonable.

The mechanical philosophy in Restoration England was perhaps not so much a result of any Cartesian incursion as the offspring of both Descartes and Gassendi. Although Hobbes later adopted a plenist stand, his early work was atomistic. This early atomism had several consequences. Since he only published his plenist thought in 1655
in De Corpore, four years after Leviathan and right at the time of
most heated debate over political and religious matters, that thought
seems to have had much less impact than it might otherwise have had. It
was the early atomistic work that Hobbes was most noticed for, and
this was the work that most resembled Gassendi's Epicureanism. This
is not to suggest that the two philosophies were structurally very
similar; Gassendi's Syntagma is a variegated hodge podge of ancient
thought melded together as a modern Epicurean doctrine whereas Hobbes
had no less a purpose than the creation of a system which would explain
all things in terms of matter and motion. Nevertheless the two
systems had the same basic materialism and the same sort of corpuscular
mechanism as integral parts. The Epicurean philosophy had a certain
odour of atheism attached to it due to its pagan origins, and the
connection with Hobbes only exacerbated this problem. Thus the task
of Charleton, Willis and other proponents of mechanistic philosophy
became not only the purification of that philosophy from ancient
atheism but a complete denial of any Hobbist connection as well.
This was a formidable task, for the Royal Society had to explain the
difference between Charitonian-Gassendist-Epicurean mechanism and
Hobbist mechanism, and in this task the Society failed to the extent
that they too were attacked as atheistic materialists.

It was shown in the previous section that many of the virtuosi
were in fact following paths in physiology and psychology very close
to Hobbes' philosophy, but drawing the line at explaining soul in
similar mechanical terms. Samuel Mintz, in The Hunting of Leviathan,
said that it was this difference between Cartesian dualism and the
Hobbist monism that would help us define the Cartesian and Hobbist
spheres of influence. The conclusion based upon the findings of this paper must be that Mintz was making a fundamental mistake. If monism is used as a criterion for Hobbism then the only supporters of Hobbes to be found will be religious and political radicals like Overton, and the occasional person who openly agreed with Hobbes on some minor point like Henry Stubbe. This situation results in a particularly clouded view of Hobbes' reception in England, and in fact Mintz does paint just such a picture. The true relationship of Hobbes to mechanical philosophy is far more subtle than the role of a mere figurehead of atheism against which his opponents were forced to formulate and organize other theories would allow. When Kargon said that "The battle for atomism was begun in the shadow of Hobbes," he was only partially stating the truth. The development of mechanical philosophy progressed in part because of Hobbes encouragement and dissemination of that philosophy to his friends like Charleton, and his influence and reputation as a serious scientist.

Hobbes had a small but real part in the trend to English hypothetico-icalism, influencing his peers in the method as well as the content of their theories. As early as 1636, Hobbes had a definition of hypothesis in mind, had given the method of testing it, and had noted its inability ever to be more than probable. For Hobbes, the world consisted of things which were demonstrable, that is geometry and mathematics, and things not demonstrable "as depending upon the motion of bodies so subtile as they are invisible." Of the things which are not demonstrable, he said that "the most that can be atteyned unto is to have such opinions, as no certain experience can confute and from which can be deduced by lawful argumentation no absurdity."
This was very similar to Descartes' idea of a universal world clock, the face of which we can see but the workings of which are hidden from us. 16

Robert Boyle adapted Descartes' use of the clock metaphor to justify a hypothetical view of science and knowledge. 17 He shared with Descartes and English sceptics like Glanvill the idea that any hypothesis can involve only a possible mechanism for the clock-work and that man cannot demonstrate true mechanisms. This is, in general terms, the hypothetical theory which was popular in England in the late seventeenth century. Hobbes, however, was drawn to the theory that those things involving insensibly small objects are in principle demonstrable, could we but see their parts and how they move.

In the 1660s there was a general reaction against hypotheticalism in science which offered the contrary opinion that the truth of the natural world could indeed be fathomed in one manner or another. Some held that experimentation was the path to proper knowledge, like Boyle who had criticized Hobbes for his apparent unwillingness to experiment, and some thought like Petty and Newton that mathematics was the tool which would explain physics. One avid microscopist, Henry Power (1623-1688) suggested that the microscope was the instrument which, given enough elaboration of technique, would allow men to see corpuscles and their mechanisms and break into the works of Descartes' world-clock. 18 Whether they wished to renovate hypothetical physics, like Boyle, or to replace it with certainty like Newton and Hooke, the revisionists had their way, and English hypotheticalism declined with the end of the century.

The hypotheticalism of both Descartes and Gassendi was essential to their philosophies. For both men natural philosophy had to remain
conjectural. Of the three important variants of the mechanical philosophy in England, only Hobbes admitted the possibility of demonstrable mechanisms in nature. In this Hobbes foretold more accurately than Boyle the trend of science in Newton's time, even if his active part in that trend was small.

Hobbes' monism was the statement of the logic of the mechanical philosophers carried to its extreme, and it is in this that Hobbes has had his greatest significance and paradoxically was given least credit and reputation by his contemporaries. Hobbes addressed himself to a problem which existed for every mechanist since Descartes, that of how to explain the existence of an immaterial soul and reconcile that with a material body. Some men resorted to strange and elaborate devices to explain away the problem. One Arnold Geulinex (1625-1669) proposed a creed called Occasionalism, in which God Himself was the active link between body and mind and every communication between them required miraculous divine intervention. Others admitted that the problem was beyond human knowledge. "How the purer spirit is united to this Clod is a knot too hard for fallen Humanity to unty... to hang weights on the wings of the winde seems far more intelligible." Others ignored the problem, and Walter Charleton articulated the perplexity of many when he said that he would shelve the matter indefinitely, conveniently "suspending my curiosity, which hath too often perplexed me." Even though they might consciously or subconsciously tend to agree with Hobbes in this matter, the social pressure against any such admission was so strong as to prevent any such admission or allocation of credit from being made. These same pressures caused many books to
be published anonymously and other manuscripts to remain hidden.\textsuperscript{22} The men who rail against Hobbes for his monism do so because of the reasonable nature of that monism; if Hobbes theory was plainly nonsensical it would not be dangerous nor worthy of repudiation. Even those who see merit in parts of his physiology or who follow fairly closely his scheme of psychology could not openly give credit to Hobbes.

The attitudes of Hobbes' contemporaries is admirably summed up by an excerpt from a letter describing an interchange between three men:\textsuperscript{23} 'How', sayd one, 'I would sooner renounce smoaking, then I would follow that Hobbes.' 'Nay' said another, 'I would smoake for ever rather than imitate what such a varlet has done--He Logician! Why did not our Dr. Wallis kick his Algebra about his eares, and outdoe him too even at Plaine Rayling?' But a third was more sedate, for he distinguished the matter saying: 'Gentlemen, we are present not uppon Mr. Hobbs Divinity but his Logic. The man had parts, tho proud and perhaps ungrateful.'

Thus while many deplored Hobbes and his philosophy, others were able to separate the content of his thought from the necessity for public denial of it, and, at least in a semi-private situation, to discuss seriously the ideas of the proud obstreperous mechanist.

The responsibility for the waning of Cartesian doctrine in England cannot be held due to Hobbes, yet Hobbes was the only outspoken critic of Cartesian dualism who was also a respected scientific philosopher. The decline of Cartesianism was rather due to the opinions after the 1690s of an increasing number of men that the newer Newtonian physics was a more attractive and consistent formulation of mechanical philosophy and furthermore (partially due to its smaller compass) more easily reconcilable with religious orthodoxy. The swan-song of Cartesianism in England was the publication in 1694 of Antoine Le Grand's \textit{Entire}
Body of Philosophy According to the Principles of the Famous René Des Cartes, in which Le Grand attempted a renovation of Cartesianism much as Charleton had revised Gassendi's Epicureanism. A large section of this work was necessarily devoted to the very issue of differentiation between Hobbes and Descartes, that of animal soul or animal automatism. If Hobbes was dualism's most outspoken critic, it is plain that even the supporters of Cartesianism to its very end saw the problems which formed the logical basis of Hobbes' objections. Faced with two categories of apparently sensible beings, man and animals, Cartesians had the dual tasks of showing that man has an immaterial soul and animals do not. Ironically, this situation poses a logical dilemma. If one admits that animals have souls then they are no different in this from man, and will go to heaven. If on the other hand one shows that all of the functions performed by animals can be explained mechanically, and then can find no characteristics to distinguish animals from man, then one is led to the logical and Hobbesian conclusion that men too are automatons without immaterial souls. Either course involves one in clear heresy.

Le Grand answered Hobbes directly, saying:  

But methinks I hear Mr. Hobbes crying out, that there is no necessity I should have recourse to an immaterial principle for the producing of cogitation, since motion itself, or the reaction of one part of matter against the other, or at least a due continuation of the said reaction can as well effect the same. 

He countered by simply stating that if only matter and motion existed, Hobbes' account would be correct, but that since that basic premise is wrong, the argument is meaningless. The problem here is once again one of a lack of comprehension. Le Grand cannot conceive of
matter, which is defined as an unthinking substance, as ever, even in any sophisticated arrangement, thinking.26

There all too easily may be a tendency to view Hobbes-the-psychologist in the same manner as Hobbes the political theorist has been often characterized, as a thinker somehow isolated from his time, or ahead of his time.27 He might seem even more isolated in his psychological thought than in his political thought, for no one but fanatics and radicals openly agreed with him in the former area, whereas at least a few men agreed with portions at least of the latter.28 This study has attempted to show that such a conclusion would be erroneous and detrimental to the understanding of Hobbes and his philosophy. Hobbes was not a lone figure mooting an unpopular doctrine to a hostile audience. He was stating a logical conclusion that others could not or would not admit to yet which many had come to realize for themselves; the mechanical conception of nature does not require the postulation of an immaterial soul. That many men knew the truth of this conclusion is implicit in their painstaking avoidance of the publication of it. Hobbes represented the conscious thought of men like Charleton and Willis and a number of other practitioners of the mechanical philosophy, who were engaged in the mechanical explanation of the world and of man. The difference is that all of these men, whether through religious belief, or from simple prudent etiquette, included in their work the immaterial soul. Hobbes alone did not do this.

When Brown attributed to Hobbes a negative role in the spread of mechanical philosophy in England he was describing the superficially apparent case against Hobbes. There is however, much more to the
relationship between Hobbes and contemporary physiologists than Brown's suggestion would lead one to expect. It has been indicated here that Hobbes was not working in isolation in terms of physiological theory but rather was functioning very much in the mainstream of contemporary thought. While public acclamation of Hobbes' work was obviously impossible, private acknowledgement was certainly permissible. One of the more significant examples of such covert approval may be found in a letter from Thomas Sprat to Christopher Wren. Sprat was the author of *History of the Royal Society of London*, an official history intended to excuse the Society from accusations of materialism and atheism. Sprat, writing about Sorbière's opinion of Hobbes said:  

He [Sorbière] wounds him [Hobbes] in the most dangerous place, his Philosophy, and his understanding. He very kindly reports of him, that he is too dogmatical in his Opinion...But however, to comfort Mr. Hobbs for this affront, I dare assure him that as for Monsieur de Sorbière's part, he understands not his Philosophy. Of this I will give an unanswerable testimony, and that is the resemblance that he makes of him, to the Lord Verulam:...I scarce know two men in the World, that have more different colors of speech, then these two great Witts: The Lord Bacon short, allusive, and abounding with Metaphors: Mr. Hobbs round, close, sparing of similitudes: but ever extraordinary decent in them. The one's way of reasoning proceeds on particulars, and pleasant images, only suggesting new ways of experimenting... The other's bold, resolv'd, setled upon general conclusions...

Sprat had read Hobbes and obviously was willing to give his ideas serious consideration.

It is established fact that men like Charleton and Willis knew and even corresponded with Hobbes and the other members of the Newcastle circle in the years when the mechanical philosophy was being introduced from the Continent. To conclusively prove that the works of such physiologists borrowed directly from Hobbes, or
to substantiate a widely held good opinion of Hobbes would require both extensive textual analysis and primary sources unavailable to this writer. That such a conclusion is at least plausible and that it can be supported by some available evidence has been shown.

The causes for the problematic nature of such a quest have also been indicated. In a time when Hobbist meant atheist, the followers of the new mechanical philosophy such as Charleton were publicly labelled Hobbist. Thus, for there to be any future for their pursuit of mechanical explanations of nature, even Charleton was forced to dissociate himself from Hobbes, who may well have nurtured mechanistic philosophy in him, and even to join the attack against materialism. Meric Casaubon, discerning the trend of English science and the ends to which men like Hobbes might lead it, published a letter in 1669 in response:

Now I crave leave to tell you that it [experimental philosophy] is very apt to be abused and to degenerate into Atheism. Men that are much fixed upon matter and secondary causes and sensual objects, if great care be not taken, may in time (there be many examples) and by degree forget that there be such things in the world as Spirits...forget I say, and consequently discredit supernatural operations: and at last, that there is a God, and that their souls are immortal.

Casaubon was writing to chastise Joseph Glanvill for his *Plus Ultra*, the second and unofficial history of the Royal Society intended by Henry Oldenburg, President of the Society, to revise Sprat's apologist efforts on behalf of the Society. Casaubon, though he does not name Hobbes, is essentially telling Glanvill that if he is not careful, the mechanical philosophy will lead him to the same sort of heretical materialistic conclusions as those reached by Hobbes.
Hobbes was not the progenitor of the monistic version of the mechanical physiology, nor certainly was he its only adherent. This same strain may be seen in the next century in the works of men such as La Mettrie and David Hartley. Hobbes was, however, an outstanding spokesman for these ideas, and as such he has an important if heretofore little appreciated place in the history of physiology as well as in the history of political theory of the seventeenth century.
CHAPTER III

HOBBES' ROLE IN THE DEVELOPMENT OF PHYSIOLOGY

1. The connection between Puritanism and science was first suggested by Robert K. Merton and Dorothy Stimson. A list of their articles and those of more recent writers in the same vein may be found in Barbara Shapiro's, John Wilkins, (Los Angeles: University of California Press, 1969), p.253. Christopher Hill is a more recent proponent of this theory.

2. Puritan allows no precise definition. The term was used by contemporaries as a pejorative label for one who had stricter views on religion than the speaker, that is a radical (e.g. someone who attended church service more often than the speaker did).

3. On the argument for a new 'moderate' definition see Shapiro, John Wilkins, pp.5-11.


6. Hobbes personally was certainly far more ascetic than many of his critics. On the links with libertines, see Mintz, S.J., The Hunting of Leviathan, (Cambridge: Cambridge University Press, 1962), chapter VII.

7. It was for this very universal aspiration of Hobbes' system that Boyle criticized him.

8. See footnote 43, chapter II. See also M. Reik, Golden Lands, p.184.


10. Stubbe published a book defending points of Hobbes' grammar and because of this was himself criticized.


15. Ibid.


18. Ibid., p.700ff.


25. Le Grand also misinterpreted Hobbes, objecting that in a Hobbist view, all matter could sense. Hobbes had answered that objection in De Corpore when he said that certainly objects had a basic sort of sense but unless they were constructed so as to retain the sensible motion (e.g. animate beings) there could be no memory and that such individual acts of sense were "nothing to do with that sense which is the subject of my discourse." English Works, vol. I p.393.


28. Ibid.


Digby, Sir Kenelm, Two Treatises, London, 1644.


Foster, Sir Michael, Lectures on the History of Physiology During the Sixteenth, Seventeenth and Eighteenth Centuries, Cambridge.


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