JAMES GREGORY (1753-1821) AND SCOTTISH SCIENTIFIC METAPHYSICS, 1750-1800

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DECLARATION

This thesis has been composed by myself, and the research on which it is based is my own work.

M. B

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ABSTRACT

This thesis is a study of some aspects of James Gregory's philosophical and medical thought. Gregory's work is discussed in relation to its local intellectual context of later 18th-century Scottish scientific metaphysics. I show the importance of his writings for understanding how the relationships between epistemology, natural knowledge and religious belief were perceived by some members of the Scottish scientific metaphysics community. This is done empirically by considering Gregory's responses to several other writers. In particular, I show that Gregory's views on causality were put forward to counteract what he perceived as the dangerous influence of Hume's philosophy upon Scottish scientific metaphysicians. This subject is also approached thematically, through what is called the epistemological interiorisation of nature, or the search for the conditions of men's judgements about causes and effects. I identify two principal strategies for epistemological interiorisation. These are termed 'voluntarist' and 'necessitarian'. I show that while Gregory was a severe critic of what he perceived as the necessitarianism of Hume's philosophy and some other forms of scientific metaphysics, Gregory also rejected forms of voluntarism found in the writings of John Stewart, Robert Whytt and Thomas Reid. Finally, Gregory's concern with the nature of cause and effect in physics is related to John Robison's reformation of mechanical philosophy.

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FOR MY LATE FATHER,

ERNEST CORNELIUS HENRY BARFOOT

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Abbreviated titles used in thesis

A. WORKS BY JAMES GREGORY

(i) Motive and action, Aberdeen University Library MS.2206. 15
Read: Introductory essay.

(ii) Power, Edinburgh University Library MS.LaIII 789.
Read: Power.

(iii) Activity, Aberdeen University Library MS.2206. 15 (in three sections).
Read: Activity 1, 2 and 3.

(iv) "Essay on the difference between the relation of motive and action and that of cause and effect in physics, on physical and mathematical principles", in Philosophical and literary essays, 2 vols. (Edinburgh, 1792).
Read: Essay.

(v) The Essay also contains an "Introduction" and an "Appendix".
Read: Introduction.
Read: Appendix.

(vi) Gregory conceived of (i) - (v) as separate parts of one work entitled "An essay towards an investigation of the exact import and extent of the common notion of cause and effect in physics and of the real nature of that relation".
Read: Project.

(vii) "A theory of the moods of verbs", Transactions of the Royal Society of Edinburgh, 2 (1790), 193-250.
Read: Theory.

(viii) An answer to Messrs Crombie, Priestley and Co., Edinburgh University Library MS. Gen 788G.
Read: Answer.

(ix) Letters from Dr. James Gregory with replies by the Rev. Alexander Crombie (London, 1819).
Read: Letters.

(x) Conspectus medicinae theoreticae, 2 vols. (Edinburgh 1778-82), translated as A view of the theory of medicine, 2nd ed. (Edinburgh, 1844).
Read: Conspectus.

(xi) Lectures on the institutes of medicine, Edinburgh University Library MS. Dc3.
Read: Lectures.

B. OTHER AUTHORS

William Cullen, The Works of William Cullen, M.D., ed. John Thomson, 2 vols. (Edinburgh, 1827).
Read: Works, and including "Physiology" and "Lectures"

David Hume, A treatise of human nature, ed. P.H. Nidditch, 2nd ed. (Oxford, 1978).
Read: Treatise

David Hume, An enquiry concerning human understanding, ed. P.H. Nidditch,3rd ed. (Oxford, 1975).
Read: Enquiry

Isaac Newton, Sir Isaac Newton's mathematical principles of natural philosophy and his system of the world, translated by Andrew Motte and revised by Florian Cajori (Berkeley, 1946).
Read: Principia.

Thomas Reid, The works of Thomas Reid, D.D., ed. W. Hamilton (Edinburgh, 1846).
Read: Works, and including "Inquiry"; "Intellectual powers" and "Active powers".

Robert Whytt, The works of Robert Whytt, eds. Robert Whytt (jnr.) and Sir John Pringle (Edinburgh, 1768).
Read: Works, and including "Essay" and "Observations".

'Tis evident, that all the sciences have a relation, greater or less, to human nature; and that however wide any of them may seem to run from it, they still return back by one passage or another. Even Mathematics, Natural Philosophy, and Natural Religion, are in some measure dependent on the science of MAN; since they lie under the cognizance of men, and are judged of by their powers and faculties.

Hume, Treatise, xv.

If inquisitive men can be brought to the same unanimity in the first principles of the other sciences as in those of mathematics and natural philosophy ... this might be considered a third grand era in the progress of human reason.

Reid, Works, 713.

It is necessary likewise, as far as reasoning is concerned that a person be, in some sense, a logician before he be an orator; since it is by the rules of logic, that we judge everything relating to arguments, their perspicuity or confusion, their fallacy or their force. More especially, it is of consequence to every orator whose business is with men to be acquainted with human nature.

Priestley, Lectures on oratory and criticism, 3-4.

CHAPTER 1

A MANIFESTO FOR SCIENTIFIC METAPHYSICS:

GREGORY'S INTRODUCTORY ESSAY ON CAUSE AND EFFECT IN PHYSICS

1. INTRODUCTION
2. CAUSATION AND LINGUISTIC ANALYSIS
3. PRIVATE DEFINITIONS AND PUBLIC NOTIONS OF CAUSATION
4. DEMONSTRATION AND THE THREAT OF HUME'S PHILOSOPHY
5. CONCLUSION

1. INTRODUCTION

This thesis is a study of the metaphysical and medical writings of James Gregory M.D. (1753-1821). He was descended from a family which figured prominently in the intellectual life of Scotland from the late 17th to the early 19th centuries. He was the son of John Gregory (1724-1773), Professor of the Practice of Medicine at Edinburgh University, cousin of Thomas Reid and founder member of the Aberdeen Philosophical Society. After spending some time at King's College, Aberdeen and Christ Church, Oxford, James Gregory began his medical education at Edinburgh University in 1767. He took his degree in 1774, having been taught by Cullen, Monro *secundus*, Black and John Hope. Gregory completed his studies on the Continent; he returned to Edinburgh in 1776, and was elected Professor of the Institutes of Medicine in the same year. In 1790, Gregory succeeded Cullen as Professor of the Practice of Medicine. As well as being a teacher of international repute, Gregory also had a very successful private practice, becoming First Physician to the King in Scotland in 1799. A list of the chief biographical sources for Gregory's life, together with a simplified genealogy of his family are provided in Appendix 1.

In view of Gregory's eminence as a doctor, it is perhaps surprising how little he actually published on medicine. Besides his obligatory medical dissertation,[1] his only other work was a small textbook on the theory of medicine, the *Conspectus*, which was originally published in two parts between 1780 and 1782. This was no doubt partly due to Gregory's repeated involvement in controversies with medical colleagues, with the Royal College of Physicians and with the Managers of the Royal Infirmary. However, most of these occurred after 1800, and will not be considered here. Instead, this thesis is largely based upon several essays which Gregory wrote on the subject of causation during the 1780s and early 1790s. These are referred to collectively as parts of Gregory's *Project* on cause and effect in physics. The purpose of this thesis is to locate an intellectual context for Gregory's concern with causation, which permeated his medical writings as well as the *Project* itself. This entails a close examination of Gregory's texts and a reconstruction of the local community of texts to which they refer. In this first chapter, a hitherto unknown and undiscussed essay by Gregory is examined in order to provide an introduction to Gregory's concern with causation and its significance in the context of later 18th century Scottish scientific thought. To assist the exposition in this and subsequent chapters, a diagram illustrating the various parts of the Project and the dates they were read to the Literary Class of the Royal Society of Edinburgh is provided in Appendix II.

Gregory did not give his first essay a specific title. Instead, on the first page he simply designated it as "part 1" of an Essay towards an investigation of the exact import and extent of the common notion of the relation of cause and effect in physics and of the real nature of that relation. This title is typical of Gregory's generally verbose and inflated style. However, it does convey two central aspects of his project on causation. Firstly, Gregory restricted himself to a discussion of cause and effect in "physics", rather than treating causation in general. Although he subsequently examined the concepts of "power", "activity" and "motive" in other essays, Gregory's primary aim was always to clarify the nature of physical causation, or the kind of change characteristic of inanimate nature. Secondly, the precise wording of the title indicates that Gregory's enquiry was primarily epistemological. He was concerned to investigate "the common notion of the relation of cause and effect in physics", and then assess the reality of that relation.

Gregory's general sense of the problematic character of natural knowledge is informative. It indicates that he considered a philosophical investigation into the status and condition of the human mind to be a necessary precondition to the acquisition of natural knowledge. Viewed in its 18th century Scottish context, Gregory's attempt to develop an epistemological and metaphysical propaedeutics for natural knowledge was not in any way unusual. Rather, it was definitive of the 18th century Scottish attitude to natural knowledge as a whole. Although members of the Scottish scientific literati disagreed continually over what sorts of philosophical presuppositions were to be employed as part of the framework to guide the interpretation of nature, they were virtually unanimous about the importance of epistemological considerations. This fact has been noted with varying degrees of emphasis by Buckle, Davie and Olson.[2] It has also informed the work of historians of science such as Morrell, Shapin, Emerson and Christie[3] who have discussed the local institutional factors which nurtured the development of Scottish science during the Scottish Enlightenment.[4]

The interaction between Scottish philosophy and forms of natural knowledge during this period is central to understanding both Gregory's writings and the distinctive cognitive style of Scottish science as a whole. The phrase I use to convey this theme here is the epistemological interiorisation of nature. It describes the distinctive attitude which Gregory and his peers took to the relationship between natural knowledge and metaphysics or, more specifically, between natural philosophy and the philosophy of mind. The central feature of this attitude was determined by a shared belief that a sound knowledge of nature was only possible on the basis of a correct understanding of the nature of mind. It was assumed that if men could understand the conditions of and constraints upon their perception of events in nature, then they could map the order of nature on to an order of thoughts in the mind. The necessary order of such thoughts would, in turn, determine the structure of men's understanding and explanation of the natural world. The means of understanding change in nature was through a correct understanding of the nature of causation. Therefore causation was perceived to be the central concept to be mastered in order to successfully accomplish the epistemological interiorisation of nature.

In speaking of a search for the epistemological interiorisation of nature, the aim is to convey this as a process in which historical actors actively engaged for a variety of moral and religious as well as purely intellectual reasons. Hence, I do not treat the epistemological and scientific writings of Gregory and his contemporaries in a solely philosophical way, but also in terms of their perceived social significance. What is referred to here as 'Scottish scientific metaphysics' can be understood as a community of mutually referring texts by Gregory and others. Together, these formed a discourse which specified the means for attaining the epistemological interiorisation of nature. In practice, this meant referring men's perception of nature to the conditions which underlay their judgements about causes and effects in the physical world. As a result, causation was a prominent and important subject in Scottish scientific metaphysics during this period. In particular, Hume's views on this subject were a standard reference point for most writers. In Gregory's case, his perception of the dangerous nature of Humeian metaphysics underlay the concerns of the Project as a whole. It is argued that the account of causation developed by Gregory was put forward largely to counter the perceived influence of Hume's ideas on members of the later 18th century Scottish scientific literati.

The taken-for-granted emphasis on the theory of knowledge shared by Gregory and his contemporaries requires careful handling. Although epistemological interiorisation will be treated as a general theme uniting the activities of Gregory's contemporaries, many of them displayed quite different intellectual loyalties from Gregory himself. It will be shown that the interaction between Scottish philosophy and natural knoweldge cannot be interpreted within the confines of a unified and coherent tradition of common sense philosophy. This is a limitation of Olson's recent book.[5] Thus although Gregory's principal loyalties lay with Stewart, Reid and Robison, differences among common sense philosophers are as much a part of the story as the antagonism between common sense and other schools of thought such as Humeian scepticism, Monboddo's revived Aristotelianism and Hutton's science of wisdom.[6] Also, it must be emphasised that this is a study based largely upon one individual. Even though an important aim is to situate Gregory's thought firmly within his local intellectual community, this is not the same as a comprehensive survey of Scottish scientific metaphysics as a whole. As a result, some notable figures are omitted from consideration. Others who deserve independent treatment for their contribution to the epistemological interiorisation of 18th century Scottish natural philosophy are treated here only in terms of their relationship to Gregory's thought. Nevertheless, it is also important to note that Gregory was a prominent member of the later 18th century scientific literati. Among his professional colleagues were Cullen, Black, Daniel Rutherford, and John Playfair, all of whom he referred to either directly or indirectly in his writings. Through his family connections, he was also on intimate terms with Thomas Reid and Lord Monboddo. Gregory also dealt with the writings of Hume, Kames, Hutton and Joseph Priestley, one of the few English scientists to receive any widespread consideration during this period. In view of these manifold connections, Gregory's writings on causation provide a convenient and useful access point to several aspects of the Scottish scientific metaphysics community in later 18th century Scotland.

The choice of the time frame 1750 to 1800 is largely dictated by the nature of the subject matter. Although Gregory lived until 1821, he wrote the Conspectus and the Project in the 1780s and 90s. Many of his concerns emerged out of disputes about mechanics and physiology which occurred in Edinburgh during the 1750s and early 60s. The community of thought in which Gregory's ideas make sense is to be found in the later 18th century. The authors he was familiar with and referred to such as Hume, Reid, Cullen, Hutton, Kames, Monboddo and Robison, had either died or were soon to die by the early years of the 19th century. These are the men with whom his thought will be compared and contrasted. The possible exception to this is Dugald Stewart, whose thought belongs largely to the next century, in which common sense philosophy came to occupy a pre-eminent place in the Scottish university curriculum. Therefore where Stewart is discussed, this is done with reference to part one of his Inquiry into the human mind and not part two published much later.[7] Finally, no attempt is made to relate Gregory's work to either the "Leslie Affair"[8] or the subsequent writings of Thomas Brown.[9] This is because apart from some incidental and allusive evidence, there is no indication of Gregory's involvement in the events surrounding John Leslie's election to the Professorship of Mathematics at Edinburgh in 1805.[10] Similarly, while Gregory enlisted Brown as a junior assistant in his medical practice, there is no indication of any collaboration between them. Although Brown may constitute the best case for Gregory's impact upon 19th century Scottish metaphysics, apart from the relatively insignificant work of R E Scott,[11] Gregory's writings, on causation at least, were largely ignored.

2. CAUSATION AND LINGUISTIC ANALYSIS

Gregory's introductory essay on cause and effect in physics was devoted to showing that men actually had a common notion of cause and effect, which they routinely applied to the processes of change evident in inanimate nature. Once this was shown to be the case, the scientific metaphysician could proceed to carry out two other important tasks identified by Gregory. One of these was clarifying how the common notion of cause and effect in physics differed from other notions such as "power", "motive" and "action". The other was showing how this notion functioned in explanations of change in nature. In his preliminary investigation, Gregory sought to show that:

(i) there is, and always has been, a notion of a certain relation between things and events expressed by the term cause and effect;

(ii) this notion has been distinctly and uniformly conceived among mankind;

(iii) despite the opinions of philosophers, there must be one or more circumstances common to the relation of cause and effect and the contrary opinion is false and absurd;

(iv) such common circumstances can be termed the common notion of this relation;

(v) this notion cannot be termed just or erroneous until its exact import and extent is ascertained;

(vi) this cannot be done by definition until it is shown that the definition is a good one. The only way for this to be decided is by evidence of language - by attending to the use and application of the terms expressing this notion as employed by men of good sense;

(vii) this approach is shorter, more methodical, and leads to more distinct and satisfactory conclusions than a separate consideration of different circumstances said to make up cause and effect;[12]

To assist his treatment of these points Gregory divided the rest of his essay into four sections. The first gave observations, arguments and illustrations to prove the truth of aims (i) - (iv). The second considered the means by which such a common notion of cause and effect could be ascertained (vi). The third dealt with possible objections to the approach put forward in the previous section and compared the role of definitions in different disciplines. Finally, Gregory's fourth section contained a wider methodological justification of his approach (vii). Point (v) received no independent treatment under any section, although Gregory made several references to the problem of validity throughout.[13]

Gregory posed two related questions which he planned to consider successively. The first was: how do we know that we have a common notion of physical causation? The second was: what characteristics does it have? In actual fact, the Introductory essay only dealt with the first of these questions, although Gregory gave some hints about the second in several places. What is significant about his answer is that Gregory did not make a routine appeal to common sense in order to ground man's belief in physical causation. Rather than saying that men were constitutionally predisposed towards the notion of physical causation, Gregory explicitly stated that he did not want to make "the common and popular notions of mankind founded on common sense the standard and test of truth".[14] Instead, he claimed to answer the questions inductively "in the common way of physical observation and experiment" by making use of "a species of philological investigation". This, he claimed, made it possible

> to discover and demonstrate what people have thought on certain subjects; and especially to ascertain what their simple natural, uniform notions or conceptions have been with respect to subject of cause and effect.[15]

By focussing upon the evidence of ordinary language, Gregory claimed to have found a way of applying principles of observation and induction which guided physical science to a metaphysical question. Furthermore, he considered this avoided appeals to common sense which might be challenged or even dismissed as deductive introspective dogma. In this sense, Gregory claimed that his enquiry was partly physical, partly metaphysical and he hoped that his analysis of physical causation would actually reconcile the provinces of metaphysics and physical science.

The epistemological grounding of natural knowledge was a shared imperative among members of Gregory's intellectual community. This implied some form of achieved rapprochement between natural knowledge or science, and metaphysics or philosophy. Yet Gregory significantly referred to their current alienation from one another. In one way or other, Scottish intellectuals who wrote on scientific metaphysics were continually attempting to marry natural philosophy and metaphysics into one comprehensive system. Gregory was no exception. His own strategy involved accommodating the study of mind to the logical forms and procedural techniques he considered characteristic of physical science. The immediate result of this process was envisaged to be a correct understanding of physical causation. This could then be applied correctly in physics. Thus the reform of natural philosophy and the philosophy of mind were perceived to be closely connected, although not all Scottish scientific metaphysicians subscribed to the particular study of mind commended by common sense philosophers such as Reid, Stewart and Gregory himself.[16]

It has been noted that Gregory was committed to some form of linguistic analysis; the precise form this took has yet to be explained. On the basis of the evidence of language, Gregory undertook to prove that men had a common notion of physical causation. Therefore he needed an argument or assumption which connected together the linguistic evidence or expressions of physical causation with its mental representation, the concept or common notion of causation. Gregory's solution was

> that language <u>must be</u> expression of thought, and that every word and phrase in common use <u>must</u> have that <u>meaning</u> which it is employed and understood <u>to</u> denote.[17]

Gregory made it absolutely clear that this proposition was the basis of all his subsequent arguments and demonstrations. He sought to give it axiomatic status by commending it as true, not only as a matter of fact, but also as intuitively self-evident. Furthermore, he undertook to demonstrate it was necessarily true in the manner of mathematical truths. This was a departure from conventional common sense wisdom which held that the axioms of any system of reasoning, or for that matter, the constitutional givens of the human mind, such as the common notion of physical causation, could only be assumed and not proved. This point was an important source of disagreement between Gregory and Reid and will be treated in chapter four. For now, it is sufficient to note that Gregory's proposed demonstration consisted of an argumentum ad absurdum. For example, Gregory stated that if the identity between language and thought did not subsist at all or even if it was only occasional, then men used words in everyday discourse without comprehending their meaning at all; or they comprehended such words at one moment but not the next. This was an absurd consequence - "as if one were to speak of iron as a wholesome food, and of bread as the best metal to make".[18] Logically, if such absurd consequences were false, then by implication their contraries were true. Hence it was demonstratively true that there was an identity between thought and language. Gregory was in effect saying that men's use of language had to be underwritten by stable and consistent common notions to which words referred. Otherwise communication would be impossible. This general argument applied to particular instances such as physical causation. Thus men employed a uniform and consistent language of physical cause and effect which referred to an underlying common notion in men's minds.

Gregory's perception of the relationship between things, language and mental representations was succinctly expressed by means of a comparison:

> Now common words or phrases are to general notions or conceptions and to the subjects of these precisely what proper names are to the notions which we have of particular persons, and to such persons themselves.[19]

This is an important statement for several reasons. The account of Gregory's philosophical methodology given so far indicates that it actually resembles 20th century post-Wittgensteinian language philosophy. Gregory's emphasis upon the close relationship between meaning and usage can appear broadly post-Wittgensteinian. Such parallels have been stressed by Wiener;[20] and they are further apparent in Gregory's analysis of power which is based upon the distinction between the use of active and passive verbs. However, to view Gregory as something of a precursor to modern philosophy is misleading.[21] In fact he had a very orthodox 18th century view of the relationship between language, concepts and things. It is useful to briefly recount this because it provides a more immediate and relevant context for Gregory's ideas. Also, it helps to specify four. For now, it is sufficient to note that Gregory's proposed demonstration consisted of an argumentum ad absurdum. For example, Gregory stated that if the identity between language and thought did not subsist at all or even if it was only occasional, then men used words in everyday discourse without comprehending their meaning at all; or they comprehended such words at one moment but not the next. This was an absurd consequence - "as if one were to speak of iron as a wholesome food, and of bread as the best metal to make".[18] Logically, if such absurd consequences were false, then by implication their contraries were true. Hence it was demonstratively true that there was an identity between thought and language. Gregory was in effect saying that men's use of language had to be underwritten by stable and consistent common notions to which words referred. Otherwise communication would be impossible. This general argument applied to particular instances such as physical causation. Thus men employed a uniform and consistent language of physical cause and effect which referred to an underlying common notion in men's minds.

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Gregory subscribed to a standard account of the role of experience in learning causal relationships. He emphasised that it was "in that great and silent school of things, not words, that men acquire[d] the notion of cause and effect".[22] By experience, Gregory understood repeated patterns of human action and he explicitly contrasted this with knowledge acquired by a purely reflective analysis of the necessary logic of ideas. Speaking in this empirical and psychologistic fashion, he suggested that children acquired the notion of cause and effect at a very early age, before they were proficient language users. He cited experiences like whipping a top, whistling ("playing at jaw"), or avoiding being burnt by fire. He referred to the receptacle which contained such experiences as the "great school of nature"[23] and held it responsible for the evident uniformity of human beliefs. In this account of the genesis of the common notion of cause and effect, and presumably of other fundamental concepts, language very much played the role of second fiddle. Men acquired notions by their interaction with things; subsequently, they learned language by an analogous process of repetition or habit, whereby words were uniformly and consistently applied to the things they denoted.[24]

Having thus redressed the balance and situated Gregory firmly in an 18th century context of thought which took some aspects of Locke's empiricism for granted, the question remains: why did Gregory develop a philosophical methodology which emphasised the role of language usage? Although other writers such as Kames, Reid and Robison made reference to the evidence of language, their remarks always gave it a secondary corroborative role rather than thrusting it into the forefront of the analysis of mind.[25] So there is a case for viewing Gregory's methodology as unusual and in need of clarification. The argument put forward here and in following chapters is that Gregory's use of linguistic evidence and indeed the whole thrust of his philosophy of causation was designed to oppose Hume and to counter the influence of Humeian philosophy upon Gregory's colleagues and contemporaries. The next two sections of this chapter are devoted to showing how Gregory's perception of Hume's philosophy structured the metaphysical standpoint found in Gregory's earliest essay on cause and effect, regarding the nature and role of definitions and demonstration in scientific metaphysics.

3. PRIVATE DEFINITIONS AND PUBLIC NOTIONS OF CAUSATION

Gregory expressed considerable pride that his philosophical methodology appealed to "matters of plain observation or direct and easy experiment".[26] He explicitly contrasted his approach with others which were hypothetical, metaphysical and analogical.[27]

His criticism of philosophers who followed the latter path was that they reasoned from vaguely employed words and phrases and then arrived at "conclusions equally repugnant to the direct consciousness of every individual untutored by them".[28] Hume epitomised such philosophers who wielded the "science of words" because he undertook

> To explode as groundless and foolish the common notion of the relation of cause and effect and to give a just account of the nature of that relation, and a good definition of the notion which we <u>ought to have</u> of it, nay of that very notion which we <u>always had of it</u>.[29]

Gregory objected to the fact that Hume's view of causality was based upon "various arguments founded chiefly on his own philosophy" maintained in defiance of the evidence of direct consciousness and the structure of language.[30] As a result, Gregory argued, Hume and others had confounded common notions and relations which even "the rudest Boar that Dwel[t] in a forest never failed to distinguish." Gregory's stance is further confirmation that he was interested in common usage in order to get to those common notions and relations which had been misrepresented by philosophical systems such as Hume's. His methodology was a means to an end. He used it to reassert the natural and universal nature of the human mind against those he considered to have appropriated and distorted it. In pursuing this aim, Gregory chose to give a critique of the role of definitions in metaphysics and other subjects. In a sense, Gregory argued that Hume had appropriated the concept of causation by re-defining it and thus developing what in Gregory's eyes was a 'private language' of causation. Gregory opposed this by emphasising the limitations of definitions and reasserting the centrality of the common notion of causation. By using his principle of the necessary identity between thought and language, Gregory claimed to have demonstrated that men had a common notion of physical causation, which was consistent and uniform. This conclusion followed whatever the contents of the common notion. Any attempt to define such contents presupposed Gregory's own argument; he pointed out that this was because it was absurd to define anything which either did not exist or which was intrinsically variable. Therefore the first stage in Gregory's critique of definitions of causation was to show they were themselves parasitic on their underlying common notion.

Gregory pushed his argument yet further. He contended that as the common notion of physical causation was grounded in the everyday use of the terms cause and effect when applied to inanimate events, then definitions of cause and effect could be tested according to their correspondence with common usage. Thus,

> the evidence of language and attention to the use and application of the terms denoting the notions defined, enable us to appreciate the definitions offered; to perceive their merit, to correct their errors, to supply their defects, or to lop off their redundancies.[31]

This provided a means of correcting or extirpating bad definitions of causation, such as Hume's, which deviated from the common notion of physical causation. However, the result of this process was not necessarily a perfect definition; rather it culminated in a clearer idea of what the common notion of physical causation actually consisted of, when freed of "all disguise, all ornament, all covering"[32] provided by bad definitions, hypotheses and philosophical embellishments. Gregory was, in effect, suggesting that a definition of physical causation was not necessary to understanding it as a common notion. He made a revealing analogy between investigating the common notion of causation and a person learning a foreign language. The latter discovered the meaning of terms by examining the use and application of new words without the help of definitions or dictionaries. It was this prior skill that actually made men able to compile dictionaries and construct definitions in the first place. He went on to compare the necessary knowledge of good usage which enabled people to compile dictionaries with an equivalent knowledge of "the fundamental notions of mankind", which enabled men to become good philosophers.[33]

Gregory was attacking a time-honoured way of arriving at knowledge. By speaking of the bad definitions of causation by Aristotle and

Hume, he implied that Hume followed discredited scholastic methods. He repeatedly referred to such methods as esoteric and artificial, whereas common notions arrived at through a study of linguistic usage were publicly accessible and resulted in the comprehension of the "natural relations" of the human mind. However, Gregory could not leave his general denunciation of definition without qualification. Definition had an honourable role in many sciences and was crucial to mathematics, which was held in high regard by 18th century Scottish intellectuals and treated as an exemplar of exactness and precision.[34] In order to substantiate his claim, Gregory felt compelled to enter into a discussion of the comparative role of definition in mathematics, natural science and the philosophy of mind.

Gregory emphasised the importance of a discussion of this kind. It presented an opportunity to point out differences in the kinds and origins of men's notions. The ordering and classification of men's notions was an essential part of the epistemological interiorisation of nature in general because arranging the different types of human notions was the necessary prelude to determining the boundaries of disciplines. In particular, it informed the relation of natural knowledge to the philosophy of mind and to other subjects.

Olson has referred to the variety of positions taken up by Scots about the foundations of mathematics, especially geometry. Both he and George Davie have emphasised that the Scots seem to have favoured an intermediate view of the origin and nature of geometrical entities known as "abstractionism". Abstractionism mediated between pure formalism or mathematical Platonism in which mathematical objects were unconnected to physical reality, and empiricism, in which all mathematical statements were founded upon physical measurements. Scottish abstractionists such as Reid and Stewart held that fundamental mathematical concepts derived originally from our experience of everyday objects but were rendered general and abstract by an operation of the human intellect. From Gregory's various remarks, it appears that he subscribed to the formalist position. However, as we shall see, he nevertheless retained a vew of mathematics as a cultural subject, dependent upon the nature of mind.[35]

Gregory stated that the items defined in geometry which became the basis of subsequent mathematical reasoning, such as lines, angles, parallels, proportionals etc, were "fictions of their own" as imaginary as "ghosts and faeries".[36] Such notions as defined by geometers were in no way common or universal and where men had the power of comprehending their meaning, this was only achieved by a voluntary and perceptible effort. They were not implanted by nature, or nurtured by experience. The crucial difference about such geometrical objects was that the subjects of definition in geometry were all general. As a result, particular descriptions of individual geometrical objects such as a triangle or a circle would not provide the learner with the general notion of such figures. This was the role of geometrical definitions. A definition of a geometrical object revealed

> the full nature, and intimate constitution of it whence all its properties and relations may be deduced and demonstrated not as matters of fact or contingent truths which are or were or will be, but as necessary truths which ever must be[37]

Because of the constitutive role that definitions played in geometry, they were indispensable: reasoning and communication between geometers would be impossible without them.[38]

In contrast to geometrical notions which Gregory presented as essential, general and artificially invented by mathematicians, he argued that the notions at the basis of other subjects were of a quite different nature. These were natural, universal and formed by experience. Their very familiarity precluded adequate and precise definition. Rather, the nature of a common notion could only be evinced by pointing to the particular instances in which it was deployed, as in the use of words which referred to it. This form of ostensive identification and subsequent classification through repeated experience gained in the "great school of nature", was presented by Gregory as a natural and public alternative to the role of artifical and private definition. Men understood notions of existence, consciousness, memory, identity and, of course, causation independently of philosophical definitions.

To bring home the central point that definition was not always essential to precise thinking and good reasoning, Gregory returned to the foundations of mathematics. His former arguments were based upon the geometrician's apparatus of representation - lines, angles, shapes etc. - which were human inventions rather than natural objects. When viewed in terms of the axioms and definitions which specified this apparatus, geometry was justly seen as a paradigmatic, exact and certain science. However, he asked:

> do not these very definitions and axioms refer to rest upon other preconceived and undefined and undefinable notions?[39]

Gregory was referring to notions such as space, extension, figure and divisibility[40] which were natural, real and universal among men. Yet he pointed out that conceding this did not mean rejecting geometry's claim to exact reasoning and certain demonstration. He added:

> If in any other science and with respect to any other objects of thought, whether simple or compound, men's notions were distinct and uniform, might they not reason in that science without perfect precision, without the help of any definitions?[41]

Thus while not an abstractionist as such, Gregory did subscribe to the search for the epistemological basis for mathematical knowledge. Like his contemporaries, he believed that ultimately it and all other forms of human knowing depended upon mind and its internal order and arrangement. Gregory's apparatus of epistemological interiorisation consisted of common notions or natural relations of the mind which were accessible through the structure of their linguistic significations. However, Gregory went further and argued that some such notions, like causation, were not actually to be discovered through definition. His argument was that whether the common notion of causation was simple or compound, it was distinctly and uniformly conceived by men. Therefore it was evident that

> a definition or description of it must be superfluous at least if not nugatory or bad; and that we may reason about it clearly and accurately, as we may do about our friends John and James, or about number or time, a man or a horse, a tree or a ship, without the help of any definitions of it.[42]

To summarise Gregory's position thus far, he argued that definition was constitutive and necessary in geometry but misleading and redundant in metaphysics. However, this did not mean that the philosophy of mind was any less scientific than mathematics. Although mathematical reasoning had a deductive form which could not be emulated with such strict precision in metaphysics, both disciplines were nevertheless founded upon common notions which resisted any formulation in terms of definitions and axioms. This dependence of mathematics upon the philosophy of mind implied a dilemma for those who wished to deny metaphysics scientific status unless it could be ordered deductively according to strict axioms and definitions. Either scientific status had to be withdrawn from mathematics because it too was embarrassed by undefinable common notions, or it had to be accepted that metaphysics was capable of scientific truth without having to exhibit the formalised structure of mathematical reasoning.[43]

Having discussed Gregory's attitude to the role of definitions in mathematics and metaphysics, it remains to account for his views on definition in natural science. Unfortunately, Gregory dealt with this briefly and in passing. Nevertheless his remarks are worthy of consideration as they give a provisional sense of how Gregory thought natural science should be conceived of and carried out. Gregory emphasised that his strictures on bad and nugatory definitions were not a plea for their elimination from all knowledge. He accepted they had an important role to play in "Newtonian physics", chemistry, medicine and natural history.[44] But Gregory still maintained that definitions in these subjects were quite different from those found in mathematics. In many cases, what passed as definition in the natural sciences was based upon ostensive description. Thus a new natural object or a discovered property of a known substance was identified by pointing out a specimen of it and subsequently describing its features. This process and the schemes of classification developing from it were entirely acceptable in natural science and medicine which dealt with particulars. Mathematics, as Gregory had pointed out, was concerned with generals. This brief view of the logic of natural science is instructive. Gregory was apparently committed to a classificatory view of natural knowledge, rather than any theoretical form of explanation. Gregory placed natural limits upon the role of theory and explanation in science. Therefore, when he claimed to be applying the logic and methodology of natural science to metaphysics, the resulting science of mind was itself based on natural classifications. Common notions were to be distinguished and not collapsed into one another. Gregory contended that Hume's metaphysics was artificially based on impressions and ideas and therefore to be repudiated. Gregory's alternative position is reflected elsewhere in his choice of language to articulate his conception of causality. He spoke of different "species" of cause and effect.[45] Similarly, because the mind had natural relations, it was amenable to natural classification. But Humeian metaphysics and the science which made use of his theory of causation as an explanatory principle developed artificial classifications of mind and nature.

4. DEMONSTRATION AND THE THREAT OF HUME'S PHILOSOPHY

Gregory's arguments for an investigation of cause and effect which did not require definitions have been considered. Gregory's presentation of the common notion of physical causation emphasised its natural self-evidence to all men. Yet Gregory had to explain why, to some men, Hume's definitions of causation seemed just. How could Hume have persuaded himself and his followers that his conception of causation was correct, when several of its characteristics were actually counter-commonsensical?

Gregory had several answers to this question. One was based upon a particular view of language which emphasised its power to distort the direct evidence of consciousness. The self-evident nature of causation and other common notions was often obscured by "a thin but very dark covering of words".[46] This was because language had its origin in the distant and barbaric past, and forms of expression bore the legacy of the savage's anthopomorphism. A second answer lay in man's nature. He was perennially tempted to find similarities between words and natural relations which actually bore no real resemblance to one another. This resulted in similar expressions being used to describe quite different relations of thought.[47] However, Gregory placed most emphasis upon the peculiar character of the men who went astray. Absurd definitions of causation could never mislead anyone who had acquired a solid grasp of those "common and natural notions" universal among men. But they did have the power to disturb and unsettle one who was already "restless" and over-inquisitive. Because of his contempt for "vulgar notions", this sort of person might well be tempted to believe that he knew how to acquire a more accurate notion of causation from which he could then draw infallible conclusions. Gregory pointed out that he then fell into the error of believing his own definitions of causation had an equivalent status and role to those employed in geometry.[48]

Gregory convicted Hume's metaphysics of making this last sort of error and endowed it with the power of leading others into the same mistake. He therefore denounced it as scientifically pretentious[49] or as a "science of words".[50] In the closing pages of his

Introductory essay Gregory returned to this persistent theme and expressed the opposition between Hume's philosophy and his own on a broader canvas. He contested Hume's empty science of words and his philosophy which championed that "solid and useful knowledge of things which [was] acquired in the great school of nature". Having decried the dangers of metaphor and analogy throughout his essay, and praised plain speaking, Gregory used some equally figurative language in his own concluding remarks. In a passage similar to MacLaurin's rhapsodic conclusion to his Account of Sir Isaac Newton's philosophy,[51] he dwelt upon the comparative merits of two attitudes towards human knowledge, or rather two epistemological pathways to the understanding of nature. One way of epistemological interiorisation led to solid and useful knowledge because it followed nature itself. On this pathway, men were guided by

> the goodness of our great unseen teacher who first by ways of his own, imparts to us the useful knowledge of ourselves and then by secret but not dark, nor yet thorny paths, leads us to that, happy station whence we have a clear and delightfull, though no doubt very limited view of the order and beauty of Nature.....[52]

Gregory then surveyed the alternative path by means of a rhetorical question. Shall we, he asked,

> as a proof of great knowledge and an effort of superior wisdom, close our eyes on that engaging, that glorious prospect, and forsaking our first, our sure Conductor, turn away our steps from the cheerfull ways of men, and these gay fields where ten thousand charms on every side atract our eyes and warm our hearts, to follow an untimed and much suspected guide, through many a dark and rugged path, into an unknown world of spirits and beings, if such there be, yet more visionary; a dreary and desolate waste, haunted, not peopled, by a race of spectres, ghastly to our eyes, and horrible to our thoughts, which either our own wayward fancy, or some magic power, still deceiving and still misleading us had called into being.[53]

These quotations, together with many other remarks found in the texts of Gregory's contemporaries, indicate that the search for the correct epistemological principles which would guarantee a sound knowledge of nature was a profoundly moral and even a religious enterprise for many participants. Viewed from this perspective, Humeian philosophy and Gregory's linguistically-based common sense philosophy were rival metaphysical technologies for securing the order of nature in men's minds. A key resource for achieving this was the concept of causation itself. Wider considerations of this kind fed directly into Gregory's own discussion and showed that he was not engaged in a disinterested and technical exercise, but with issues which were perceived to have consequential repercussions for human moral conduct. At one point, he spoke of the common notion of causation as "an instructive and usefull companion on [his] journey through life".[54] He continued this personification of the notion of causation saying that he would not want such a "companion" if half of the falsities attributed to it by Hume and others were actually true. Rather he would

> like a good citizen of the Republic of Science, renounce all private considerations and gladly tend my assistence to bring him justice.[55]

Gregory commended the relation of physical causation and spoke of it being as "real and as natural as that of father and son".[56] Or again, when referring to its self-evidence he added:

> I will not fight for it; it must fight for itself: if it cannot stand on its own legs it must ever be in vain to attempt to support it; and if it cannot fight its own battles it does not deserve a champion.[57]

Despite Gregory's statement to the contrary, he was very much the champion of the common notion of physical causation and his job was to parade its self-evidence and so establish a secure connection between the order of things in nature and the manner in which men's mind perceived the connection between physical events.

In Gregory's first essay he repeatedly expressed his reservations about Humeian causality. From his perspective, sceptical doubts about physical causation or misleading statements of its nature, were revealing indications of men pursuing mistaken pathways to the epistemological interiorisation of nature. It was largely in opposition to Hume's and other rival systems of metaphysics that Gregory felt compelled to offer a demonstration of the common notion of causation. Hume's assault on the bastions of common sense had made it necessary to make the self-evidence more evident. This is why Gregory ultimately sought to ground his inductively orientated and factual examination of linguistic truth deductively, on the basis of a proposition which necessarily connected language and the common notions represented by it.[58] In this manner he hoped to reform the dangerous opinions of

> some men, whose judgement and knowledge on other subjects entitle all their opinions in science to some regard at least, so far as not to be disregarded without a reason given, have acquiesced in Mr Hume's reasoning and conclusions.[59]

5. CONCLUSION

This introductory chapter has used Gregory's earliest essay on cause and effect to outline the main features of his manifesto for scientific metaphysics. Gregory's attitudes to linguistic analysis, the role of definition and the nature of demonstration have been considered. This has been done in relation to Gregory's concern to oppose Hume's philosophy, which he perceived as a rival philosophy of mind with dangerous implications for a morally sound knowledge of nature. Throughout, the clash between Humeian and Gregorian metaphysics has itself been interpreted as particular expressions of a wider search for the epistemological interiorisation of nature. This, in Gregory's case at least, had a moral and perhaps even a religious significance, as well as having a technical importance within natural philosophy. It is also important to note that Gregory and other writers, such as Monboddo, illustrate the perceived importance of the role of language in some forms of later 18th century Scottish scientific metaphysics. In the search for the epistemological interiorisation of nature, the close interaction between the philosophy of mind and natural knowledge was often mediated by a concern with men's understanding of language. Gregory's emphasis upon the corrupted state of men's language is found in Locke, together with exhortations to eschew metaphor, analogy and figurative language in scientific discourse.[60] During this whole period, there was a sustained interest in the nature and significance of language for the study of human understanding. This has been noted by Aarsleff in the broader British and European contexts of the Enlightenment generally.[61] However, there was an important Scottish sub-community within this, which is also deserving of independent consideration. It includes Smith's essay on language, Monboddo's <u>Of the origins and progress of language</u>, together with the work of Beattie, Blair and the various comments by Reid and Dugald Stewart, as well as Gregory's own work.[62] Viewed against this background, Gregory's concern with language is entirely comprehensible. Yet his own distinctive approach to the philosophical import of linguistic usage is less easily accounted for. Most discourse of the period addressed the issue of the sacred or secular origins of language; or it dealt with the understanding of grammatical structures and etymologies.[63] Gregory certainly treated language in a wholly secular way rather than for theological purposes. Yet his use of linguistic evidence was based upon current usage, not on the origin and evolution of language. Certainly, the use of language in metaphysics was hardly new; but the particular form this took in Gregory appears to have been unusual, and worthy of further study. One of the aims of this thesis is the more limited task of understanding the importance of linguistic evidence for Gregory's scientific metaphysics in its local intellectual context of use.

In subsequent chapters, further aspects of Gregory's metaphysical and medical writings are considered. In each case, the major themes of the perceived threat of Hume's philosophy, the nature and role of demonstration, and the importance of linguistic evidence will recur and the general notion of epistemological interiorisation will be expanded. The chief emphasis is always upon the detailed content of Gregory's ideas about causation. But these are not described or evaluated according to purely philosophical criteria. Instead, attention is given to the ways in which Gregory used his scientific metaphysics within a wider moral and religious context. From this perspective, Gregory's and other rival systems of scientific metaphysics are viewed as socially significant representations which had a culturally important meaning within the local community of Scottish scientific thought during this period.[64]

In chapter two, a dispute about the foundations of mechanics in the 1750s between John Stewart and Henry Home, Lord Kames is examined in order to provide an intellectual context for Gregory's subsequent discussions of cause and effect in physics. In chapter three, Gregory's texts Power and Activity are discussed in relation to the concern to justify the distinction between the passivity of matter and human action. In chapter four, Gregory's critique of Reid and Hume is examined. Some features of the deployment of key concepts such as physical cause, efficient cause, power and necessary connection are considered. In chapter five, Gregory's views on the nervous system are explored. This is done by comparing them with those of Robert Whytt and William Cullen in order to show how different conceptions of causality informed some aspects of physiology. In the final chapter, Gregory's persistent opposition to necessitarianism is considered in order to show his view of the role of human judgement in the identification of physical causation. Gregory's concerns in the _Project_ are related to John Robison's reform of natural philosophy at the close of the 18th century.

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3. J.B. Morrell, "The University of Edinburgh in the late eighteenth century: its scientific eminence and academic structure", Isis, 62 (1971), 158-71; Steven Shapin, "Property, patronage and the politics of Science: the founding of the Royal Society of Edinburgh", The Britsh journal for the history of science, 7 (1974), 1-41; Roger L. Emerson, "The Philosophical Society of Edinburgh, 1737-1747", ibid., 12 (1979), 154-91; "The Philosophical Society of Edinburgh, 1748-1768", ibid., 14 (1981), 133-76; "The Philosophical Society of Edinburgh, 1763-1783", ibid., (forthcoming); J.R.R. Christie, "The origins and development of the Scottish scientific community", History of science, 12 (1974), 81-94.

4. For two recent overviews of the intellectual and social roots of the Scottish Enlightenment see Nicholas Phillipson, "The Scottish Enlightenment", in R. Porter and M. Teich, eds., The Enlightenment in its national context (Cambridge 1980), 19-40; George Davie, "The Scottish Enlightenment", Pamphlet of the Historical Association, general series 99 (London, 1981). For an account of the main historical developments during the latter part of the 18th century see Bruce Lenman, Integration, enlightenment, and industrialisation: Scotland 1746-1832 (London, 1981).

5. Olson's book is subtitled "A study in the foundations of the Victorian scientific style" and the greater part of its contents is directed towards the 19th century rather than the 18th. Nevertheless, he does treat common sense philosophy as a general term for 18th century Scottish philosophy and even omits any serious consideration of 18th century figures such as Hutton and Robison.

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7. Dugald Stewart, Elements of the philosophy of the human mind, part 1 (Edinburgh, 1792). For Stewart's own account of the delay between part one and part two, see his preface to the continued 1843 London edition prepared by the Rev. G.N. Wright and to which all subsequent references are made. For the Scottish university curriculum in the 19th century, see Davie, Democratic intellect (ref. 2), and the standard histories of the universities themselves, especially Edinburgh. Unfortunately, there is no single work on the scientific curriculum in the 18th century. But see C. M. Shepherd, Philosophy and science in the arts curriculum of the Scottish universities in the seventeenth century (Ph.D. thesis, University of Edinburgh, 1975).

8. The "Leslie Affair" refers to the furoré which surrounded John Leslie's election as Professor of Mathematics at Edinburgh University in 1805. The best introduction to it is Ian D.L. Clark, "The Leslie controversy, 1805", Records of the Church History Society, 14 (1963), 179-97. See also J.G. Burke, "Kirk and causality in Edinburgh, 1805", Isis, 61 (1970), 340-54. For the local politics of the disputes see J.B. Morrell, "The Leslie affair: careers, kirk and politics in Edinburgh in 1805", Scottish historical review, 54 (1975), 63-82.

9. Thomas Brown, Observations on the nature and tendency of the doctrine of Mr. Hume concerning the relation of cause and effect (Edinburgh, 1805). See also John A. Mills, Thomas Brown's theory of causation (unpublished paper).

10. The various pamphlets surrounding Leslie's election were collected and published as Tracts historical and philosophical, relative to the important discussions which lately took place between members of the University and the Presbytery of Edinburgh respecting the election of Mr Leslie to the Professorship of mathematics in that university, 2 vols. (Edinburgh, 1806).

11. Robert Eden Scott was Professor of Moral Philosophy at Kings College, Aberdeen. A letter from Gregory to Mrs Scott, National Library of Scotland MS 2521, 17th October 1815, indicates that Gregory sent Scott his essays on cause and effect. Scott apparently died while some of these were still in his possesion which probably accounts for why the parts of the Project became divided between Aberdeen and Edinburgh University Libraries. Scott made use of Gregory's linguistic approach in his Inquiry in to the limits and peculiar objects of physical and metaphysical science; tending principally to illustrate the nature of causation and the opinions of philosophers ancient and modern, concerning that relation (Edinburgh, 1810).

12. Introductory essay, 18-20.

13. Ibid., 5, 24, 60-64.

14. Ibid., 7.

15. Ibid., 6.

16. Once again, Monboddo and Hutton are good examples of scientific metaphysicians committed both to the reform of natural philosophy and the philosophy of mind outside the confines of common sense.

17. Introductory essay, 9-10.

18. Ibid., 46.

19. Ibid., 43, 111-12.

20. "James Gregory: on power", edited with an introduction by Philip P. Wiener, Journal of the history of ideas, 24 (1963), 241-68.

21. Wiener actually attributed Power to the wrong James Gregory, a fact subsequently pointed out by John Dunn, "Authorship of Gregory's critique of Hume", ibid., 25 (1964), 128-29.

22. Introductory essay, 116.

23. Ibid., 131,138.

24. A contemporary expression of this viewpoint can be found in George Campbell, Philosophy of rhetoric, new ed. (London, 1850), 256-62(first published, 2 vols. London, 1776).

25. John Robison's use of similar arguments to Gregory's is considered in chapter six.

26. Introductory essay, 9.

27. Ibid., 7, 12, 17, 77-80, 133-34.

28. Ibid., 136.

29. Ibid., 50 (emphasis in original).

30. Ibid., 51, 136-37.

31. Ibid., 69.

32. Ibid., 80.

33. Ibid., 69-71.

34. See Davie, Democratic intellect (ref. 2), 105-68; Olson, Scottish philosophy (ref. 2) 3, 55-93; also his "Scottish philosophy and mathematics 1750-1830", Journal of the history of ideas, 32 (1971), 29-44; Norman Daniels, Thomas Reid's Inquiry: the geometry of visibles and the case for realism (New York, 1974).

35. Olson cites Beattie, Brown and Hamilton as anti-abstractionists or at least formalists of some kind. To this list must be added Monboddo and Hutton; as well as Gregory.

36. Introductory essay, 87.

37. Ibid., 105.

38. Ibid., 106-08.

39. Ibid., 128.

40. Ibid., 86.

41. Ibid., 129.

42. Ibid., 130.

43. It was fairly common for metaphysical works to emulate the presentation of reasoning found in geometrical texts and, of course, in Newton's Principia. Notable Scottish examples include George Cheyne, Philosophical principles of natural religion (London, 1705); and Andrew Michael Ramsay, Philosophical principles of natural and revealed religion, 2 vols. (Glasgow, 1748-49).

44. Introductory essay, 126-27.

45. Introduction, ccxiv.

46. Introductory essay, 17.

47. Ibid., 133-34.

48. Ibid., 121.

49. Ibid., 52.

50. Ibid., 138.

51. Colin MacLaurin, "Of the supreme author and governor of the universe, the true and living God", An account of Sir Isaac Newton's philosophy (Edinburgh, 1748), 377-92.

52. Introductory essay, 139.

53. Ibid., 140-41.

54. Ibid., 47.

55. Ibid., 48.

56. Ibid., 75.

57. Ibid., 80.

58. Over a century ago, Buckle cast doubt upon the claims made by common sense philosophers like Reid and Stewart that they proceeded inductively in their investigations of the mind. Buckle contended that the reverse was true because of the propensity of Scottish writers to reason from first principles in a deductive fashion. This kind of tension can be readily seen in Gregory's work. However, the terms "deduction" and "induction" are very difficult to apply to philosophical systems when considered as a whole. Nevertheless, Buckle perceived that the commitment to strict experiment and induction in the philosophy of mind put forward by common sense philosophers often had a rhetorical, and even an ideological import rather than a substantive one. See Buckle, Scotch intellect (ref. 2), 235-404.

59. Introductory essay, 21.

60. John Locke "Of words", An essay concerning human understanding, abridged and edited by A.S. Pringle-Pattison (Hassocks, Sussex and Atlantic Highlands, New Jersey, 1978), 223-54. This concern with the role of language in scientific metaphysics is also found in Berkeley. For its relevance to Berkeley's philosophy of science see Richard J. Brook, Berkeley's philosophy of science (The Hague, 1973), especially 6-36; Gerd Buchdahl, Metaphysics and the philosophy of science: the classical origins, Descartes to Kant (Oxford, 1969), 275-317.

61. Hans Aarsleff, The study of language in England, 1780-1860 (Princeton, 1967), especially chapter 1, "Eighteenth-century doctrines concerning language and mind", 13-43. See also his From Locke to Saussure: essays on the study of language and intellectual history (London, 1982), 3-41.

62. Adam Smith, "Considerations concerning the first formation of languages", Philological miscellany (London, 1761), 440-79; James Burnett, Lord Monboddo, Of the origin and progress of language, 6 vols. (Edinburgh, 1773-92); James Beattie, "Theory of language, new ed. (London, 1788); Hugh Blair, Lectures on rhetoric and belles lettres, 2 vols. (London, 1783). Reid did not write separately on language but some of his views are considered in chapter four: also see Aarsleff Study of language (ref. 61), 97-101; Stewart's views are also scattered throughout his publications, but see "On the tendency of some late philological speculations", The collected works of Dugald Stewart, ed. Sir William Hamilton, 11 vols. (Edinburgh, 1854-60) vol. 5, 149-88; and his "Life of Adam Smith", ibid., vol. 10, 32-37; also see Aarsleff, Study of language (ref. 61), 101-12.

63. For a contemporary view of this debate, see the article "Language" in The Encyclopaedia Britannica, 3rd ed., 18 vols. (Edinburgh, 1797) vol. 9, 529-60.

64. Some indication of the kind of results this approach can bring may be found in the collection of articles in Barry Barnes and Steven Shapin, eds., Natural order: historical studies of scientific culture (Beverley Hills and London, 1979).

CHAPTER 2

METAPHYSICS AND THE MANAGEMENT OF MATTER IN THE KAMES-STEWART CONTROVERSY

1. INTRODUCTION

2. THE KAMES-STEWART CONTROVERSY

3. IMAGES OF NATURAL ORDER IN KAMES AND STEWART

4. RESPONSES TO HUME AND KAMES IN THE 1750s

5. CONCLUSION

1. INTRODUCTION

In the previous chapter, the central importance of causation for the epistemological interiorisation of nature was emphasised. In order to know nature, men had to understand the mind's perception of change. An internal mental landscape had to be surveyed and mapped in conjunction with investigating the cartography of external nature. In his Introductory essay, Gregory put forward a metaphysical manifesto for accomplishing just this. Some central features of it have been described, but little has yet been said about the contents of Gregory's actual analysis of cause and effect in physics. This is only considered obliquely in his Introductory essay. However, the scattered remarks to be found there provide a useful preliminary to more detailed analyses of the content and significance of Gregory's conception of physical causation presented in chapters 3 and 4.

As we have seen, in Gregory's view "the great school of nature" operated on men rather like a programmed-learning device which told them about the common notion of cause and effect in physics. But what exactly did it teach men? Gregory's answer was that it instructed men to distinguish cause and effect in physics from other relations concerning men and the world. For example, physical causation was not like the relation between a human agent and the acts he performed. Nor did it resemble the relation between motives, or final causes, and the actions of men. Finally, Gregory reiterated that the natural relation of physical causation was quite unlike Hume's philosophical definition of causation, considered solely in terms of uniform priority and succession among events. But within Gregory's careful classification of philosophical relations he placed most emphasis upon the fact that

> above all we learn to distinguish uniformly and precisely between the active operation of mind and the changes which occur in inanimate matter.[1]

All Gregory's various essays on cause and effect in physics, in one way or another, maintained this boundary between human agency or volitional acts of mind and inanimate nature or processes of physical causation. On one side of this divide stood man, an essentially active being capable of producing change. On the other stood passive nature which possessed no intrinsic or ontological power to produce change. The categorical distinction between physical change and human activity was the bulwark of Gregory's dualism. He regarded any deviations from this preferred ontology as perversions of common sense and sound reasoning, and repeatedly laid the blame upon the careless use of vague words and phrases. The hypothetical, analogical and metaphorical language used by some scientific metaphysicians led them to blur the boundary between the behaviour of men and the activity of matter. They were then prone to a dual mistake. If they applied the concept of power or activity to non-human events, then they endowed inanimate nature with activity. Or, if they applied conceptions of physical change to man, then they robbed him of his intrinsic activity. Gregory considered that these two "errors" lay at the basis of all defective philosophies of nature which he opposed.

In asserting the absolute distinction between the activity of men and the passivity of matter, Gregory put forward views which can also be found in the broadly-based Christian apologetic tradition of natural theology.[2] Clerical intellectuals routinely used stipulations about the nature of matter and spirit to articulate perceptions of the relations between God, man and nature. Such writers can be thought of as voluntarists in so far as they emphasised God's free and active role of superintending events in nature. If matter could be shown to be passive, then some form of God's power was required to sustain nature's processes. On the other hand, if matter was inherently active, then nature became self-sufficient and God became relegated to the status of a "first mover". Or he was denied a role in nature altogether and replaced by matter which, since it was active, might also be self-organising and capable of intelligence and thought. The issue of 'thinking matter' is itself an indication of the close connections made in natural theological discourse between the nature of matter and the nature of man.[3] Voluntarists placed a parallel emphasis upon man's will, acting in harmony with God's will. Because God had endowed men with an immaterial spiritual substance or soul, they were capable of acting freely. Consequently, those who viewed men as subject to a physical necessity, based on the activity of matter, were perceived to disrupt this preferred account of the relationship between man and God, and challenge the soul's immateriality.

The revealed, scriptural and doctrinal dimensions of voluntarism lie outside the scope of this thesis. However, it is germane to note that throughout this whole period, there was a considerable overlap between the natural theological work done by members of the literate clergy and natural philosophers, who also displayed sensitivities to the nature of matter and spirit and their theological uses. Perhaps the most well known instance of the interaction between natural philosophers and clerics within the voluntarist tradition is the Boyle Lectures.[4] Samuel Clarke and Richard Bentley pressed a particular version of Newton's natural philosophy into the service of providentialism.[5] In particular, they paid considerable attention to the nature and status of gravity and to the concept of a law of nature. Both men emphasised that gravity was not an inherent active power of matter, and that the means of explaining gravity as a law of nature conformed to the notion of a voluntarist law-maker, who sustained the active powers of nature by his free will.

The configuration of the opposition to voluntarism in the later 17th and early 18th centuries is less well known. But recent research has begun to chart the alternatives to the Newton-Clarke-Boyle Lecturers axis, which variously made use of the writings of Stubbe, Hobbes, Toland, Leibniz and others.[6] Perhaps the most familiar clash between voluntarism and writers in this group is the Clarke-Leibniz dispute.[7] However, it is evident that the range of rival philosophies, of which Leibniz was just one, is remarkably complex. Nor is it possible to classify them all as protagonists of active matter. They included men branded by the voluntarist opposition as "mechanists", "materialists", "deists", "sceptics" and "atheists". But, significantly, they also included men who considered themselves better apologists for orthodox Christianity than "Newton's men". For example, the Hutchinsonians claimed that Newton's philosophy gave comfort to the deists because he had not asserted the passivity of matter in a manner that was to their satisfaction.[8] Such considerations have led to a much closer examination of the complex legacy of Newton's natural philosophy to the 18th century. This involves the development of approaches which do not presuppose either Newton's theological propriety, or that the institutionalisation of his views were unproblematic and uncontested by alternative philosophies of nature.

Despite these complexities, which are themselves matters of dispute among historians of science, it is evident that ontologies of matter and spirit do seem to have been central to the natural theological uses of natural knowledge.[9] Furthermore, the most important boundary stressed by the actors themselves was between the behaviour of matter and the action of God and men. This was the case even for those who wished to break it down. From this perspective, the notions of active matter and passive men were both perceived as infringements of that boundary. It therefore becomes important to focus upon the different ways historical actors actually sought to mobilise and justify accounts of matter and spirit within coherent philosophies of nature, and how others perceived their achievements.

A concern with the manner in which matter was to be managed is very apparent in Gregory's work, especially his attention to the evidence of language. In his account of the ways in which the boundary between human activity and passive matter was blurred by misuses of language, Gregory did not cite many examples of this. But of the two he explicitly mentioned, both were drawn from local developments in Scottish scientific metaphysics. One of these was the philosophical doctrine of the necessity of human actions recently "aserted with the utmost confidence by Mr. Hume and Dr. Priestley". This is considered subsequently in chapters four and six. The other was Kames's essay "Of the laws of motion", which was published as the outcome of a dispute over the foundations of mechanics in the Edinburgh Philosophical Society during the late 1740s and early 1750s.[10] Kames's opponent was Dr John Stewart, Professor of Natural Philosophy at Edinburgh University. His own essay, "Some remarks on the laws of motion and the inertia of matter", was published alongside Kames's own in the Philosophical Society's Essays and observations physical and literary. This appeared in 1754.[11]

Gregory made it quite clear that Stewart's distinction between the motion of bodies and the action of men was basically correct. However, Gregory also considered that, despite being 'right', Stewart's views somehow appeared "obscure" in contrast to Kames's ingenious and superficially plausible position, which was nevertheless 'wrong'. Stewart actually perceived that the fallacy of Kames's whole position was hidden by an ambiguity of language. But, in Gregory's view, Stewart had failed to capitalise upon this. Gregory considered that by attending to the evidence of language more carefully, he would be able to articulate the case for the passivity of matter in a better way. However, the link between the evidence of language and the maintenance of the passivity of matter was not a direct one. Rather, the significance of linguistic evidence for Gregory was that it assisted men to develop a more adequate conception of causality, which could then be used to maintain matter's passivity. But how was this to be accomplished?

Precisely how Gregory used linguistic evidence in conjunction with an account of physical causation appropriate to passive matter is the subject of the next chapter. However, before the detailed contents of this are examined, it is useful to take a general look at how ideas about causality could be used not only to defend the passivity of matter, but also to assert its activity. Examining the Kames-Stewart debate is a suitable way of doing this for several reasons. Firstly, Gregory appears to have framed his own views specifically in relation to it. Secondly and more generally, the nature and content of the debate is representative of the particular place the Philosophical Society occupied in the development of Edinburgh's scientific society and club culture. It stood midway between the technical and specialised concerns of the Medical Society, reflected in the contents of its Medical essays and observations,[12] and the much more broadly-based interests of the Royal Society of Edinburgh, evident in the Transactions of the Royal Society of Edinburgh.[13] Shapin has noted that the evolution of these three societies reflects developments in

Edinburgh's cultural climate of improvement, in which there was a general broadening of the audience for the consumption of natural knowledge ss the 18th century progressed.[14] University professors of science successfully elicited the patronage of the landed and legal classes for their activities. Also, a small but significant number of lawyers and gentlemen became performers themselves. Notable examples included James Burnett, Lord Monboddo, James Hutton, and of course, Henry Home, Lord Kames.[15] Thirdly, the divergence of views expressed during the debate are indications of different orientations to the nature and status of natural knowledge among various elite groups of Edinburgh society, who responded in a variety of ways to Hume's philosophy. Fourthly and finally, it offers many insights into the nature and status of the kind of discourse referred to here as Scottish scientific metaphysics. In fact, the Kames-Stewart debate was probably the most important local progenitor of subsequent discussions of the metaphysics of motion found in the writings of Monboddo, Hutton, Dugald Stewart and John Robison.

2. THE KAMES-STEWART DEBATE

Kames's discussion of mechanics was presented rather as one might expect an experienced lawyer to proceed. On topics such as resistance, the communication of motion, and gravity, he cited the views of Newton, John Keill and MacLaurin as precedents for current explanations of these phenomena. However, he also subjected the evidence put forward by natural philosophers to critical cross-examination. An example of this process can be found in Kames's discussion of gravity. Kames introduced his discussion by a brief description of its properties. He then went on to analyse and explore Newton's account of the metaphysical significance of the concept of gravity. He cited crucial passages from the General Scholium of the <u>Principia</u> in which Newton claimed that he had not found the cause of gravity; but the nature of its effects seemed to imply that its cause penetrated all the bodies of the universe.[16]

Kames began his cross examination subtly by applauding Newton's circumspection and reserve about the cause of gravity. But he went on to suggest that Newton's claim to have discovered a fact rather than a cause was a pretence on his part. Kames was unsympathetic to Newton's apparent refusal to assign a cause to gravity. "For my part," he wrote,

> I cannot see any difficulty of explaining the cause of attraction, or gravity more than of explaining the cause of a body's continuing in the same degree of motion with which it begins to move.[17]

Kames accepted that such explanations were theoretical and that this could be dangerous. For example, men might become enamoured of their own preferred explanations and forsake more painstaking methods of enquiry in favour of shortcuts which were only imaginary solutions to problems. Nevertheless his attitude to theory was much more than an endorsement of its limited utility: it was actually indispensable. Theory was "vain without experiments and experiments [were] best understood by applying them to theory".[18] If experiments were not the basis for subsequent reasoning then, like all facts, they were "useless lumber". But most important of all, Kames argued that men were constitutionally disposed to theorising:

> In all our operations, we may have an eye to theory: nay we must have it; for such is the constitution of our mind.[19]

But what exactly did such theorising entail?

Kames's theorising about the motion of bodies put forward an interpretation of the laws of mechanics based upon two central features:

(i) matter was intrinsically active and self-moving;

(ii) all the operations of matter were subject to strict invariable laws.

In Kames's view, matter possessed a variety of distinguishable innate powers such as the vis insita, resistance, gravity and attraction and repulsion, to which the known laws governing the observed motions and collisions of bodies must be referred. It should be emphasised that Kames's discussions of topics such as gravity, inertia, resistance, action and reaction, the ether and the notion of force were non-mathematical and, in some senses, non-technical. This was itself very typical of the kind of discussion these concepts received by Scottish intellectuals. Notable examples include Monboddo, Hutton, Gregory and Cullen. Even where men such as Reid and Robison were mathematically competent, their discussions were usually pitched at a non-mathematical level. Although Kames used the term "force", he paid no attention to the quantitification of the various forces itself, using, on the whole, the language of powers and causes. Viewed out of context and with only mathematical and technical concerns in mind, Kames's theorising can seem pretentious and over simplistic. But his qualitative and discursive approach can also be found in other contemporary discussants of mechanics and motion such as Andrew Baxter, and was actually not far removed from the more mathematically competent opinions of Colin MacLaurin.[20] What was important to Kames and his Scottish audience was the rational foundation of the laws of mechanics, and not their factual and mathematical expression. The predictive successes of mechanics in the 17th and 18th centuries had an emblematic status as symbols of man's intellectual conquest of nature's hidden secrets. If these discoveries could be systematised and their foundations displayed,then the moral value of this body of knowledge could be impressed upon a wider audience who were not necessarily mathematical sophisticates. But precisely because of the perceived cultural value attached to the systematisation of mechanics, disputes about it were endemic. Like all important cultural resources, some men sought to appropriate it and use it for their own ends; other men perceived themselves as guardians of its achievements and rejected the interpretations of rivals.

From this perspective, it is clear that Kames's way of theorising was actually much more sophisticated than is usually thought. His particular competence did not lie in mathematics or skilled experimentation. Instead, it was Kames's distinctive approach to the epistemological issues at the basis of understanding concepts such as "force", "power", "cause" and "matter" which informed his account of mechanics. Thus Kames's importance lies in the way he "interiorised" traditional problems in mechanics such as the status of the vis insita, the communication of motion, action and reaction, resistance etc. These issues were henceforth to be referred to the contents of men's minds and the nature of human understanding. Kames considered that men were constitutionally predisposed to theorise and he argued that the epistemological constraints imposed upon their minds actually determined the kind of theorising men could legitimately engage in.

At the heart of Kames's epistemological interiorisation of the science of mechanics lay a particular view about the constraints imposed upon men's conception of causation or power. His attitude to these constraints informed his views about the philosophical status of motion and rest, the meaning of the terms "material" and "immaterial", and the status of inherent and external forces. Kames's starting point for his whole discussion was to insist that were it not for the senses of touch and sight men would be wholly unable to perceive rest or motion. Both these concepts were simple ideas, derived from our sensations and therefore, he argued, motion and rest could not be defined. Similar difficulties confronted men when they sought the causes of motion. It was necessarily true that everything which moved implied a cause or a power. But human understanding could never comprehend its exact nature or mode of operation:

> In general, as we have no means to discover power in any being but by the effects produced; so the nature and operation of the power are only to be discovered by the same means.[21]

This nescience regarding 'real' causes or powers was not unique in the 18th century; rather it was a taken-for-granted assumption of orthodox sensationalist epistemology. It is evident, for example, in Locke.[22] The general theme that men's knowledge of nature was limited to appearances and facts which were only signs of underlying causes was a persistent feature of much scientific writing in the 17th century. Stipulations about the limits to explanations in natural philosophy can be found in the writings of Boyle, Barrow, Newton and other prominent figures of the Scientific Revolution.[23] So, insisting upon man's causal nescience and emphasising the constraints this placed on the perception of change in nature, was not new in itself. However, the particular uses Kames put this to and the drastic conclusions he drew from it were novel.

Kames considered that causal nescience applied to men as well as inanimate nature. Men had no direct experience of their power to produce change either in their own bodies or in other objects. It was only upon the basis of such experiences that men inferred they did have power as a matter of fact, and not through some privileged inner awareness of it. The situation was precisely the same for men's knowledge of power in nature. By observation, they saw effects of the operation of bodies on one another that were in principle the same as the effects they produced by their own power. And by the same process of inference they concluded there was power in bodies too. Thus, although men could not know a priori that either men or nature had power, experience suggested that both did. The experience of men led them to conclude that "power may be equally applied to animate and inanimate beings, supposing them to be equally self movers".[24] In particular it was clear that matter was "endued with certain powers and faculties".[25]

From the apparent insistence upon causal nescience, or man's inability directly to perceive power, or the productive means of change, Kames refused to draw a sceptical inference. Instead, he made the naturalistic step of endowing matter with power or causal efficacy. Kames's subsequent defences of this position indicate he was acutely aware of how his arguments would be perceived. By making matter intrinsically active, he had transgressed the sanctioned boundary between men's activities and nature's processes, which orthodox dualist philosophers still endorsed. Kames referred to the orthodox position as one according to which

> matter is altogether incapable of active powers; that activity is confined to immaterial substances, and that inertness is implied in the very conception of matter.[26]

Here he could use his epistemology to good effect, arguing that the distinction between material and immaterial substances was itself founded upon "the limited nature of our external senses". In fact, immateriality was "a merely negative term, comprehending everything that [was] not matter".[27] Kames did not deny the existence of immaterial substances, although he came perilously close to doing so. The force of his reasoning was that man's incapacity to know power directly through the senses left him unable to conclude that it was only an attribute of spirit, not matter:

> Power is a property or quality, of which none of our external senses afford us the perception; and therefore our want of perception of power does not more conclude a negation of power to matter, than to spirit.[28]

Kames exploited his monistic, nescient and empirical philosophy of power to discredit dualism generally.[29] In particular, he used it to secure a foundation for mechanics which was liberated from dualistic assumptions about matter and spirit. Some instances and examples of this are given below.

The starting point for Kames's discussions was always that the only way the "force of any power" could be estimated was by the effects it produced. This was because:

> in general, as effects must always correspond with their causes, every force which is uniformly exerted without diminution or augmentation, must produce an equable motion, without acceleration or retardation: and, on the other side, every varied effect which is gradually diminished or augmented, must proceed from a varied cause.[30]

Therefore, Kames argued that the impulsive power of gravity was not itself constant but continually increasing when a body was accelerated by it. Kames disagreed specifically with MacLaurin on this point[31] and affirmed that

> in the perpendicular descent of a body, the force of gravity varies every instant, and turns greater in its progress downward. And indeed gravity cannot otherways produce acceleration.[32]

For Kames, the rules by which men deduced causes from their effects determined how men represented the underlying powers of nature. If gravity produced acceleration which increased according to the inverse square law, then its cause, the power of gravity, must also increase similarly. Mapping the nature of the effect to the cause meant that the power was itself variable.[33]

This form of reasoning can also be found in Kames's discussion of the vis insita, the power responsible for a body's perseverance in a straight line or at rest unless affected by some external cause. Kames argued that as the vis insita produced a continuing effect, it was necessary to view it as a power which acted continuously. In Kames's mechanics the vis insita was virtually equivalent to the general cause of all motion in nature. It was nature's workhorse, inherent to matter, and operating in conjunction with other powers such as attraction and resistance. The vis insita

> by the very conception of it, is action. While a body is in motion, it is in continued action; and as action implies power, there must be a power continually exerted to preserve a body in motion.[34]

The vis insita continuously acted to preserve motion which was its perceived and continued effect. Similarly, Kames did not agree with the dual nature of the vis insita as the power responsible for the resistance of bodies as well as the perseverance of a body in motion. Rest and motion were categorically different for Kames. They could not be accommodated together under the principle of inertia expressed in Newton's first law. Rather, resistance was "a positive effect" "which requir[ed] a positive cause".[35] Kames summarised this position in the second proposition of his essay:

> As matter resists a change from rest to motion, as well as from motion to rest, this resistance is not to be accounted for by the mere negation of a cause, but is a positive effect to require a cause as much as motion does.[36]

Therefore the vis resistantiae and vis inertiae were different powers and conceptually quite distinct from one another. One accounted for the tendency of an impulse to produce motion in a body; the other tended to prevent it. Once again, men's conception of the powers of nature inherent to matter was dictated by what they must necessarily believe about causes on the basis of their effects. This, Kames contended, had far-reaching consequences for Newton's third law of action and reaction which Kames dismissed as counter-commonsensical, if offered as a universal principle of mechanics. At best it was a tautological restatement of the more restricted law of colliding bodies in which as much force was lost by the impelling body as gained by the impelled.[37]

To summarise, Kames's theorising about motion was a search for its causes, expressed in terms of the inherent powers of matter. How such powers were to be conceived and employed to account for the behaviour of bodies depended upon the nature and circumstances of their perceived effects. The forces of nature had to be referred to an interior epistemological world. The dimensions of this world were fixed by the rules or maxims which expressed the ways in which the human mind made causal inferences. Chief among these was the maxim that from similar effects men inferred similar causes. This had been commended by Newton in rule 2 of his "Rules of reasoning in philosophy" at the opening of Book 3 of the Principia.[38] But Kames's application of it to the problem of discrete and continuous change led him to argue that the continuous effect of motion observed in a body, implied a continuously acting cause. This produced profound consequences for Kames's views of mechanics, some aspects of which have been discussed. Before the significance of such developments can be estimated, it is necessary to hear the other side of the story and consider Stewart's response to Kames's essay.

In his essay "Some remarks on the laws of motion and the inertia of matter", John Stewart set about defending the passivity of matter against the counter-assertions of Kames. Like his opponent, Stewart also sought support by an appeal to Newton's motives and intentions:

> It seems to have been far from Sir Isaac's intention to ascribe activity to matter in any shape; tho' his meaning has sometimes been mistaken. To do so, would be a manifest contradiction to the primary laws of motion, delivered by himself in the beginning of his Principia.[39]

Yet the defensive, often belligerent tone of Stewart's essay suggests that by the 1750s, Newton's legacy was hotly contested and that a large number of litigants were currently suing for exclusive rights to control the estate of natural philosophy.[40] Furthermore, Stewart identified problems in Newton's own writings which may have been indirectly conducive to misunderstandings. For example, Newton's use of the term "vis inertiae" which, Stewart pointed out, when it was literally translated meant "active inactivity" or an "impotent power". While insisting that Newton's meaning and the use of this term was nevertheless clear, Stewart did suggest that new terminology might be helpful.[41] Also, there was the difficulty of harmonising Newton's suggestions regarding an etherial mechanism for gravity with continued assertions about the passivity of matter.[42]

In view of such difficulties, Stewart proposed a task for all those philosophers who were committed to the inactivity of matter. Inactivity was a general property of matter and all Newton's laws were founded upon this assumption. Yet "at the same time everyone [knew] that active powers [were] continually employed through all the parts of nature". Therefore the shared task was to explain and justify why matter was a "passive instrument" under the dominion of some superior being, rather than in "the free possession of such powers in its own right".[43] But how was it to be accomplished, and what sort of metaphysical technology could be used to secure this objective?

Stewart's first strategy was to reclaim the passivity of matter as a proposition consistent with the common sense of mankind. This meant proposing counter-arguments to Kames's opinion that this common sense was in fact "ready to declare in favour of the activity of matter". For example, Stewart argued that Kames's use of the analogy between the continued activity of walking, and the continued action of the vis insita responsible for rectilineal motion was open to an opposite interpretation. Experience indicated that men often had to exert a considerable force to stop their bodies once in motion. Stewart used example of skating on ice as an illustration that even human bodies were subject to the vis inertiae.[44] In Stewart's view, the problem was that because men had experience of the gradual loss of force after a body was put in motion, they naively assumed that rest was the natural state of all bodies to which they would return unless sustained actively. However, even this did not provide a warrant for common sense to conclude that the matter of which bodies were composed was active. Instead men were disposed to believe "that as long as the motion continue[d], it [was] only an effect of the first impulse".[45]

Stewart's alternative appeals to a counter-common sense, supporting the passivity of matter opposed all Kames's examples tit-for-tat. He accused Kames of simply illustrating the activity of matter by first presupposing it, and then interpreting favoured examples in conformity with it.[46] But on this point, Stewart's own counter-examples were subject to similar criticisms. Therefore, he sought to clarify the principles upon which the inertia of matter depended.

The true nature of the distinction between the vis inertiae and what Stewart called "active force" was this: one class of "beings" in the universe, which included inanimate bodies, had the property of motion only as a result of being acted on by an external cause. However, another class could begin motion where none existed before, either in themselves or in other "beings" of the former class. This class of self-movers were "ACTIVE BEINGS" and:

> the genuine characteristic of an active being, is a power of beginning motion either in itself or another, without the means of preceding motion.[47]

Stewart held that it was by virtue of their vantage point as active beings that men acquired the idea of force because when, "by exertion of our own activity":

> we endeavour to communicate motion to ... a substance, we must be conscious of some kind of feeling; and these feelings must be different in different cases.[48]

Such feelings were the basis of men's experience of the resistance of matter; and they could only be explained by assuming the "sluggishness and inactivity of matter", or its inertia. But:

> when people talk of the resistance of matter at rest as of an active power, struggling against any agent, and actively opposing it, they surely frame to themselves some notion of force antecedent to all experience; and they would do well to inform the world in what manner this idea was suggested to them.[49]

Thus men's understanding of motion in nature was constrained by their conception of action and passion. The difference between these two categories was evident through men's experience in the world as active rather than passive beings. Stewart's own programme for the epistemological interiorisation of nature depended upon the strict segregation of these two classes of being. His metaphysics served to manage the distinction between them.

Kames either promoted the activity of matter directly, or he discussed the inertia of bodies in a way which implied that it was an active power intrinsic to matter. Stewart argued that he had been misled by a fatal ambiguity of language, which resided in the way men described the action of one body on another.[50] When it was said that the impelling body acted and the impelled body reacted, this way of speaking about resistance signified real activity in bodies. If understood literally, it was inconsistent with inertia. He cited several examples of how inertia, operating as resistance, was misleadingly described. Typical cases included a man pulling a boat towards the shore using a rope; a man in a boat using a pole to punt it; and a man rowing. In all of these, it was commonly asserted that respectively the shore, pole and oar somehow reacted to the force exerted upon them by men.[51] But Stewart maintained that

> The only immediate cause of the motion (is) the active force of the animal which presses the medium one way and its own body the other way.[52]

Errors of language of this kind had led to serious misunderstandings in other areas of mechanics such as the communication of motion during impact, the nature of resistance, and crucially, the operation of gravity.

In his discussion of the first and second of these subjects Stewart put forward a distinction between the resistance of inertia and the resistance due to what was called the "attraction of cohesion". The latter possessed real activity because it opposed the motion of an impelling body until all the particles of the impelled body acquired a common velocity. However, while the attraction of cohesion was truly active, it did not contribute to the motion of a body because the attraction between the particles of a body was mutual and therefore it opposed motion in one direction as much as in another.[53] Stewart used this distinction both to give an account of the correct measure of forces during collisions between bodies, and to dismiss Kames's proposed "treaty of peace" between philosophers.[54] Stewart saw Kames's discussion as a "new modelling" of old facts and accused him of misrepresentation. He scathingly remarked at one point that

> Greater stretches might well be permitted for the accomplishment of so desirable an end, as a compleat union and harmony amongst philosophers.[55]

To summarise, Stewart had 'deactivated' inertia and placed constraints upon the activity of the attraction of cohesion by denying it any power actually to begin motion. As a result,it lay in an intermediate category somewhere between active beings and inert things. But Stewart still had to face the problem of the power of gravity which certainly did seem to begin motion. How could it be shown that it was not an intrinsic active power of matter itself?

Stewart's initial strategy was always to invoke reasoned common sense. This amounted to the claim that the categorical distinction between active beings and passive things was the reasonable position to adopt. The attributes of active beings were intelligence, feeling and the power to begin motion. Matter as a passive thing was literally mindless, had no feelings and could only communicate motion rather than inaugurate it. In the light of this dualistic classification of all beings, Stewart rhetorically asked:

> Is it then conceivable that an unthinking being should be endued with an activity which it regulates in proportion to the situation, distance and magnitude of another body, or any other being whatsoever?[56]

No, it was not. The "voice of nature loudly declar[ed]" that gravity was "the effect of the continued and regular operation of some other being upon matter", acting either immediately or perhaps mediately. Nor could the issue be evaded by referring gravity to a law originally impressed on matter because

> law, that is to say a mere abstract name or complex notion, which is no real being, cannot impel a stone, and cause it to begin to move. Law by itself, with submission to be spoken, will avail nothing, unless either the subjects of it have understanding to yield a willing obedience, or they be compelled to it by external force.[57]

Only active beings were real causes, not laws or matter, and such beings were the originators, supervisors and, above all, the guardians of the active powers of nature.

The significant point in Stewart's exposition is that he left open the possibility of the mediate action of active beings upon matter. This meant that, in principle, gravity might be accounted for by some form of mechanical explanation. He cited Newton's gravitational ether as an exemplar of this kind of restricted secondary explanation, because it had an intermediate status somewhere between a wholly mechanical account of the course of nature, and the resolution of all events into the immediate operation of active beings. One thing was certain to Stewart: Newton did not want his ether to be active in the Kamesian sense.[58] In support of his case, Stewart cited natural phenomena such as smoke, vapour and the phenomena of magnetism and electricity. He stated these had all been initially interpreted as indications that matter was active. However, these had subsequently been at least partly explained, using intermediate mechanical cases such as magnetic effluvia and electrical fluids. The message for explanations of gravity was made abundantly clear:

> Why then should it be accounted "whimsical" or unphilosophical to demand, a cause for the attractive power of gravity? Tho' all the mechanical accounts

> hitherto given should be found unsatisfactory; may it not still be owing to some unknown mechanism, or the intervention of matter moving other matter?[59]

Stewart described causes which accounted for the action of matter upon matter as "secondary", and commended their investigation as the chief task of natural philosophy. The realm of secondary causes was where natural philosophers were to take their stand between two alternatives. One of these was the resolution of all natural processes into the immediate operation of the deity. This involved excluding secondary causes altogether "as some over-zealous friends to religion [had] done". While Stewart regarded this as a danger, he did have some limited sympathy for it as a favoured position.[60] However, Stewart identified the real danger as one which followed from the Kamesian position of active matter because

> If all the motions and changes of bodies are performed immediately by those bodies themselves, without the influence of other matter, or any other power, there is an end of all enquiries into causes and effects philosophy must be degraded into a bare knowledge of facts, a history of nature.[61]

Some of the issues evident in the Kames-Stewart debate have been outlined and discussed to show how, on the one hand, Kames sought to break down the boundary between physical change and human activity while Stewart sought to maintain it. Each used a preferred ontology and an epistemological distribution of the powers, forces and causes in nature to sustain his respective position. It is now possible to take a second look at their conflict over this boundary in order to uncover the wider attitudes and values they articulated in the use of their philosophies of nature. This involves identifying the different images of natural and divine order which permeated their essays and how these informed their preferred strategies to achieve the epistemological interiorisation of nature itself.

3. IMAGES OF NATURAL ORDER IN KAMES AND STEWART

Kames and Stewart were exponents of two antithetical conceptions of natural order. These may be described as 'necessitarian' and 'voluntarist' respectively.[62] Each represented a particular view of the relationship between the creator and the created world, expressed in terms of the kinds of causal processes which were considered to occur in nature. Interestingly, both images of natural order began from two apparently similar starting points. Firstly, man was generally nescient. Secondly, the consequence of such nescience was that man's perception of the causes of change was restricted to the observation of effects. But despite these common starting points, Kames and Stewart proceeded to radically different conclusions about the order of nature.

Stewart's voluntarism emphasised the providential nature of God's continued superintendence of nature. In Stewart's view

> The contemplation of every part of nature, furnishes us with irresistable proofs of intelligence, counsel and design still employed in actuating, moving, conducting and governing the universe.[63]

Kames, on the other hand, instead of emphasising God's will, emphasised his wisdom. Active matter "acting according to general and invariable laws exhibited a more beautiful and complete system"[64] was perceived by men as "a beautiful chain of causes and effects".[65] Kames favoured analogies which represented the universe and its creator related to one another like an elaborate engine and its engineer, rather than an intelligent overseer regulating and controlling the motion of its parts.[66] Furthermore, he sought to ridicule the image of natural order which led its apologists to ascribe all the activity discovered in matter to "some invisible agency". Kames referred to this as a "whimsical doctrine", in which an immaterial deity preserved all activity in nature, so that

> when a plague infests the world, it is the deity who spreads the infection, and directs inert matter to ravage and destroy. Arsenic is not of itself a poison; it is the immediate finger of the deity which makes it so.[67]

Kames eschewed voluntarism because it presented nature as "a deformed and crude scene". He sought to collapse all forms of voluntarism into extreme occasionalism.[68] His own radical epistemology of power left no room for secondary causes. Instead, the course of nature was governed by strict necessity and the intrinsic powers of matter conformed to unalterable laws. In his essay, Kames was circumspect about the implications of this image of order for human conduct. But in his Essays on the principles of morality and natural religion he discussed such matters more openly.[69] For Kames, unless there could be a necessary order to human thought and action, then the necessary order of physical nature could not be known.

As Kames's original discussant, Stewart had the advantage of responding directly to the views in Kames's essay. From what has already been stated, it is clear that Stewart perceived himself as a voluntarist, although not an occasionalist. Yet close attention to his justification of voluntarism shows that it oscillated between the endorsement of secondary causes as a basis for explanations of natural events in terms of mechanisms; and a more occasionalist perspective. His programme for natural philosophy was ambiguously balanced between these two alternatives. For example, he stated that the question of the immediate concurrence of the deity in natural events was difficult to determine, given men's limited capacities. Yet he added:

> If however, it could be demonstrated that body cannot continue to move in a straight line, by virtue of the first impulse, what more rational solution will be found than to have recourse to the efficiency of an intelligent principle?[70]

Having made this occasionalist concession about inertia, it is hardly surprising that Stewart strongly associated the operation of gravity with the "superintendence of an intelligent being". Similar statements endorsing a more extreme voluntarism can be found side by side with others reiterating the importance of secondary causal processes. Yet secondary causes were problematic precisely because they occupied a mid-point between action and passion. Critics might argue that beings either acted or they did not, and charge Stewart with the very ambiguities he found in Kames's essay.

Stewart was on much safer ground when he turned to the offensive and displayed his reading of the presuppositions and consequences of Kames's position. Just as Kames sought to collapse voluntarism based on secondary causes as disguised occasionalism, so Stewart sought to push Kames's philosophy of nature towards radical materialism. Stewart argued that the powers Kames accredited to matter when he explained gravity meant, in effect, that matter could think:

> If bodies are not sensible of the neighbourhood of other bodies, of their quantities of matter, and of their precise distance from them is it to be imagined that they will have themselves with such determined degrees of force, corresponding to the different quantities of matter and different distances?[71]

Also, Kames's comparisons of the universe with a machine operating according to strict necessity, implied that the universe would keep going "without any further interposition of the author of nature or any other being".[72]

It is quite clear from the general nature of Stewart's attack on Kames and his emphasis upon a voluntarist conception of the universe that he adopted a position very like Samuel Clarke's. Stewart mustered support from Clarke's writings at crucial points in his essay. For example, he referred to Clarke's letters to Leibniz to back up his point that self-motion was a necessary attribute of a genuinely active being. Furthermore, he allied himself with a tradition in which Clarke was perceived of as something of a figurehead:

> Dr. Clarke, Wollaston, and others, have so fully proved that matter is incapable of any degree of thinking, that it is impossible to confute their arguments but by scornfully denying the force of all metaphysical demonstrations whatsoever.[73]

The central features of Kames's philosophy of nature - dynamic matter and necessitarianism - have analogues in Leibniz. However, on the two occasions he mentioned it, Kames was very critical of Leibnizian natural philosophy.[74] Certainly, he made no explicit identifications with Leibnizian metaphysics. Although Stewart may have implied that Kames's views resembled Leibniz, he actually identified them as part of a much more radical and damning tradition which included "Mess. Hobbs, Toland and Collins".[75] Moreover, he considered that this deist-freethinking tradition culminated in the work of Hume.[76] Stewart proceeded to connect both Hume's and Kames's philosophy together.

In Stewart's view, Kames indicated his contempt for Clarke's philosophy by denying the force of Clarke's demonstrative metaphysics. In its place, Kames had erected an epistemology where

> in judging the qualities of matter, we are in every case to rely upon the report of our external senses, and never to employ our reason in comparing one thing with another, in order to correct our first impressions.[77]

As examples, he cited Kames's cavalier treatment of immateriality as a mere negative term; his refusal to accept that innate gravitating matter necessarily had to be granted other sentient attributes; and, in particular, his attitude to causal inference and power found throughout "Of the laws of motion". Kames's extreme empiricism emphasised that power could only be known through its effects. Stewart agreed in general, but denied Kames's specific application of this rule to indicate that continued effects implied continuing causes:

> The trite maxim sublata causa tollitor effectus is not to be so literally interpreted, as that an effect may not continue, after its cause ceases to act.[78]

Furthermore, Kames had used his epistemology to argue that power was an attribute of matter as well as of active beings precisely because, by experience, men could not know causes except by their effects. Unlike the dualists, Kames applied the principle of causal nescience without exception. If one could not know power except by the rules of causal inference by which men proceeded, then there was no reason to maintain a boundary between active beings and inert matter. Kames's epistemology rendered both equivalent because both produced similar effects; therefore both had power. However, Stewart perceived this quite otherwise. Operating with a different kind of epistemology which preserved this boundary, he stated that

> the production of motion from an internal inanimate principle is entirely without foundation; and seems to be much the same thing as to allow that motion may begin without any cause at all.[79]

Stewart then proceeded to ascribe this latter viewpoint to Hume:

> That something may begin to exist, or start into being without a cause, hath indeed been advanced in a very ingenious and profound system of the sceptical philosophy*; but hath not yet been adopted by any of the societies for improvement of natural knowledge.[80]

In a footnote to these remarks, Stewart explicitly mentioned Hume's Treatise, the Philosophical essays, the Essays moral and political and finally, what he called "that useful commentary": Kames's Essays on morality and natural religion. Stewart referred to the perceived amalgam of Hume and Kames's philosophy as based on "sublime conceptions" which were "far above the reach of an ordinary genius". He regretted that such "universal philosophers [were] not always well skilled in the elements of mathematics and natural philosophy":

> Men who puzzle themselves with self-evident axioms, and stumble at the plainest demonstrations, raise a shrewd suspicion that they may be liable to the human infirmities in other matters, and can have no pretensions to be received as infallible guides.[81]

Finally, he suggested that such writers should either school themselves in Euclid if they genuinely sought the truth about natural phenomena or "throw away the rule and compass altogether", depart the arena of natural philosophy and enter other areas where simple mistakes could not be so easily detected.

Stewart's general response to Kames and Hume reveals that he saw their metaphysics as a threat to the correct understanding of natural phenomena. He repeatedly cast doubt on Kames's credentials for engaging in natural philosophy and dismissed his irenic aspirations for the science of mechanics. Kames, and other similarly minded writers, corrupted the evidence of nature to further their own preferred metaphysical beliefs. As a result, natural philosophy could no longer fulfil its role and "beget in the mind a well-grounded piety with comfortable hopes".[82] Incorporated within heterodox systems of metaphysics which questioned the testimony of nature, it could no longer serve the ends of natural religion.

Yet for all Stewart's invective, his own account actually made little use of the "rule and compass" of mathematical proof either. Instead, it relied heavily on metaphysics. Stewart sought to ground the notion of force in man's sense of his own activity. He commended man's self-evident status as an active being and contrasted him with passive natures such as matter. Also, he endorsed the language of secondary causes which was ambiguously poised between action and passion. Then, unable to develop this further in the face of the problematic status of concepts such as the force of cohesion and the ether, Stewart toyed with occasionalist explanations of change for basic phenomena such as inertia. Despite using a very different metaphysical technology to the one found in Hume and Kames, Stewart also referred scientific concepts to the nature of human understanding. In this sense, he also sought the epistemological interiorisation of nature. By examining aspects of the response to Hume and Kames by members of the Edinburgh clerical literati during the 1750s, it is possible to locate the wider role for the kind of metaphysics which informed Stewart's justification of mechanics. It also indicates the perceived importance of metaphysical resources for articulating the voluntarist image of natural order and setting it to work in opposition to perceived necessitarianism.

4. RESPONSES TO HUME AND KAMES IN THE 1750s

The publication of the first volume of the Philosophical Society's Essays and observations, physical and literary in 1754 coincided with a wider campaign against Kames and Hume in Edinburgh during the mid-1750s. Doubts about Hume's moral and religious orthodoxy had been raised as early as 1745 when Hume was an unsuccessful candidate for the moral philosophy chair at Edinburgh University. As M.A.Stewart has shown, the local micro-politics of this episode are remarkably complex.[83] They are not less so for a whole series of clashes which occurred between the church and university throughout the 18th century, including the campaign to get Kames and Hume censured for atheism at the General Assembly in 1755. Although no treatment of this episode comparable to Stewart's exists, the basic details of this dispute and the inevitable pamphleteering which followed in its wake can be found in Ross's biography of Kames and Sher's thesis on the moderate literati of Edinburgh.[84] In this section, the aim is to take a more general look at the response of members of the clerical literati who opposed Kames and Hume. This is in order to observe the precise grounds upon which they connected both men's philosophies together and also to see if the general metaphysics of nature found in Stewart had more widespread support.

There is considerable evidence that Stewart's Remarks was itself very much a part of the wider reaction to Kames and Hume within certain sections of Edinburgh's clerical literati. It appears that Stewart re-wrote part of his contribution in order to attack Kames more ferociously, for holding a heterodox philosophy of nature which had atheistic implications. In an undated letter Hume referred to Stewart's "remarkable alterations in the printed copy" and expressed a wish that Stewart had been "more reserved in his expressions". However, Hume would not allow Monro secundus, as Secretary of the Philosophical Society, to remove the passages where Stewart had attacked him; nor could anything be done about the attacks on Kames which were "so interwoven with the whole discourse".[85] Interestingly though, Hume seems to have sided with Stewart's justification of inertia rather than Kames's view.

Also, he sought to correct Stewart's misapprehensions about his own philosophy:

> Allow me to tell you, that I never asserted so absurd a proposition as that anything might arise without a cause, I only maintained that our certainty of the falsehood of that proposition proceeded neither from intuition nor demonstration, but from another source.[86]

Despite Hume's reassurances in private correspondence and his evident disagreement with Kames's reformulation of mechanics, other publications at this time continued to couple their philosophies together as Stewart had done. For example, the anonymous author of An analysis of the moral and religious sentiments contained in the writings of Sopho and David Hume[87] also made this connection. He excused his method of simply compiling a list of Kames's and Hume's quotations under a number of heterodox propositions because others including George Anderson, chaplain to George Watson's Hospital,[88] James Balfour, Professor of Moral Philosophy at Edinburgh;[89] and Dr. John Stewart "in his very masterly reply to the Essay on motion",[90] had already produced successful refutations of their works. This pamphlet was produced on the eve of the General Assembly of 1755 and was clearly intended to influence the voting of its members.[91] Because of its format of selective quotation under particular headings, it reads like a metaphysical laundry-list of heterodox items to be found in Hume's and Kames's work. Kames in particular was accused of asserting "there [was] no necessary relation betwixt cause and effect" and that "matter [was] possessed of self-motion".[92] Several other accusations followed, focussed around the idea that Kames had laid the "very groundwork of atheism", culminating in the belief that "nature was God".[93] However, the common factor linking the philosophies of each author was that both had attacked "the great principles and duties of natural and revealed religion".[94] Precisely how they were perceived to have done so was discussed in Anderson's An estimate of the profit and loss of religion.

Anderson's lengthy book is a suitable antidote for any attempt to dismiss the clerical reaction to Hume's philosophy as a hysterical response of "wild" Calvinist enthusiasts of the evangelical party. Rather, Anderson's views were 'moderate', in so far as he was prepared to put Clarkean metaphysics to moderate uses. He emphasised the role of reason in morality and maintained a parallel emphasis on human and divine liberty in a voluntarist providential universe.[95] He perceived that Kames and Hume had drawn their metaphysics from an antithetical tradition to Clarke's own, which had developed out of the emphasis upon sense and feeling, according to which:

> Feeling is perception, feeling is taste, feeling is knowledge, feeling is a notion, feeling is conscience, and feeling is light within. Then there is a feeling of approbation, and a feeling of disapprobation, a feeling of property, a feeling of duty, a feeling of justice, a feeling of merited punishment, a moral feeling, and a metaphysical feeling; ... 96

Despite some differences of opinion, Hume and Kames were both perceived to use a shared epistemology of feelings which Anderson described as "Epicurean" because it appealed to sensations as the supreme judge of truth and falsity.[97] He identified this kind of epistemology as contributing to the marked rise in atheism from 1710-50[98] and traced its consequences for standard presentations of _a priori_ and _a posteriori_ arguments for the being and attributes of God,[99] "by which the belief of a Deity stood established in the religious and learned world". Arguments about causation were a crucial part of justifying the existence and superintendence of God over his creation. Their subversion in heterodox systems of metaphysics could "take away the influence which the belief of God ought to have upon the conduct of men".[100]

In a subsequent pamphlet against Kames, Anderson drew out the consequences of Kames's epistemology of feeling for orthodox justifications of the existence and attributes of God. In the place of _a priori_ and _a posteriori_ arguments, Kames

> substitutes his own feelings. And these are sometimes true and genuine, and sometimes false and deceitful; and because his feelings admit of counter feelings, he cannot give implicit trust. And thus the Being and attributes of God, the foundation of all religion, instead of supported by reason, is by the author established on his fanciful, false and inconsistent feelings. The author says (parag. 21) That in man are accumulated all the prerogatives both a necessary and a free agent. In return, (if we may judge of him according to his writings) in him are accumulated all the vanity, weakness and wickedness of an Enthusiast and an Atheist.[101]

The comments found in Anderson, in the anonymous pamphlet, An analysis, in Stewart's Remarks and in Balfour's subsequent publications reveal the systematic nature of the discourse which wove together beliefs about God, man and nature into a comprehensive whole. The metaphysical apparatus for securing and maintaining it depended upon the passivity of matter, the superintendence of active intelligent causes and the soveieignty of human reason by which men could be certain that the order of the natural world was both proof of divine moral government and the basis of human virtue. Balfour's posthumously published Philosophical dissertations[102] is a typical illustration of this metaphysical apparatus at work. Balfour also perceived the chief aim of "Epicureans" such as Hume and Kames was to dismantle this discourse, to break down the connections between nature, religion and morality in the mind of man.[103] Once again the theme of epistemological interiorisation re-emerges fully. As part of his apologia to John Stewart, Hume had written:

> There are many different kinds of certainty; and some of them as satisfactory to the mind, though perhaps not so regular as the demonstrative kind.[104]

Remarks such as this in both Hume and Kames could be, and were actually, used to put the counter-view of the benignity of their philosophies. It could be argued that they had sought merely to shift the criterion of certainty in men's minds away from the demonstrative evidence of reason, not necessarily to destroy it altogether. However, in the eyes of their opponents, the whole complex structure of natural theological justification had shifted its foundations and was in imminent danger of collapse.

From the various responses found among the clerical literati, it is clear that technical issues of natural philosophy were not at the heart of the wider reaction to Hume and Kames in the early 1750s. Nor would one expect them to be. Their clerical opponents were typically worried about the foundations of morality, the grounds of human action and the perceived threat to religious belief. However they were vitally concerned with the epistemological maintenance of the voluntarist dualism which infused their natural theological justifications. It is also very evident that these same men perceived close connections between broader images of nature which permeated natural philosophy and questions of religious orthodoxy. For these men, the voluntarist image of nature found in Stewart could be pressed into service to uphold a basically providential view of natural and moral order in which inert matter was made to move under the guidance of spiritual agencies. Stewart's vacillation between secondary causes and the occasionalist option of an immediately superintending deity has been noted. Balfour in his Philosophical dissertations also made it clear that

> the agency of the Deity is a principle which natural philosophers cannot lose sight of, without danger of falling into the grosest absurdities; a principle as certain as it is certain that matter cannot possibly move itself.[105]

From their vantage point, the response of this group of clerical literati within the Church of Scotland is entirely intelligible. They were not particularly responsive to any sophistications in Hume's epistemological position which might be cited to distinguish Hume from Kames. For them, it was enough that both philosophers had departed from the orthodox standard of dualism and seemed to supplant providence, reason and liberty by self-sufficiency, feeling and necessity. Both men's epistemologies were regarded as dangerous, precisely because they were perceived to have grave consequences for the evidences of natural religion. They were seen to cast doubt upon the basis of inferences which connected together men, God and nature within a benevolent theistic framework. Furthermore, when this epistemology was applied to natural philosophy, it could be used to free natural philosophy from its theological obligations and give it the kind of self-sufficiency which Kames contended was a property of matter itself.

5. CONCLUSION

The attempt to censure Kames and Hume at the General Assembly came to nothing. This was largely due to the protection both men received from a small group of clerical literati who eventually developed into an ecclesiastical party known as the "moderates".[106] They included William Robertson (1721-93), Hugh Blair (1718-1800), Adam Ferguson (1723-1816), John Home (1722-1808) and Alexander Carlyle (1722-1805). Under the early leadership of Robertson, the moderate literati took their stand upon the enforcement of patronage appointments to the ministry at the Presbyteries of Linlithgow and Dunfermline.[107] The moderates have been characterised by Sher as "Whig Presbyterian Conservatives" who were insistent upon the enforcement of church government, in favour of religious toleration, and concerned to moderate more extreme forms of evangelical fervour within the Church of Scotland. The author of An analysis closed his attack with a direct challenge to this newly emerging moderate caucus who recently

> deposed a minister who disowned your authority, but enrol, as a member of your courts, an elder who has disowned the authority of almighty God; and that some of you at least live in the greatest intimacy with one who represents the blessed Saviour as an imposter and his religion as a cunningly devised fable - May your conduct be such as fully to wipe off all these reproaches; and testify to the world, that you will have no society with the workers of iniquity.[108]

Moderates such as Blair were certainly active in the joint defence of Kames and Hume. They countered the attack in An analysis almost immediately with Observations upon a pamphlet entitled "An analysis" etc. This was followed by the more substantial Objections against the essays on morality and natural religion examined. Typically, the former of these emphasised freedom of thought and toleration. It also stressed that Kames's conception of moral necessity was sanctioned by the founders of Calvinism.[109] The latter maintained that whatever might be the implication of Hume's position, Kames's writings sought more secure foundations for the arguments of morality and natural religion, not their complete demise. Instead of being devisive, the epistemology of feelings could be commended as suitable for popular consciousness, rather than the educated sensibilities of the few who understood a priori arguments. Thus

> The Deity has displayed himself to all men by means of an internal sense, which is common to all men, the ignorant as well as the learned. We have an intuitive perception of him, as we have of our own existence.[110]

After all, both pamphlets contended, metaphysics merely perplexed the understanding and did not have the power to impair morality itself. Therefore Kames should not be attacked simply because he had "deserted the beaten track, and followed a new train of speculation".[111] Hence, Kames too could be successfully enlisted on the side of theism. In fact

> Convinced by his enquiries that religion and morality have a firm establishment in human nature, and finding at the same time loose and sceptical opinions spreading he flattered himself that his lucubrations might be of some use in preventing the infection.[112]

If the "perfection of religion" was "the spirit of moderation", as one of these pamphlets suggested,[113] then it was a spirit broad enough to accommodate Kames's writings and possibly even Hume's. However, if one steps aside from the mutual accusations made by the "moderates" and 'anti-moderates' or "evangelicals", it is evident that the standard view of both groups' religious persuasions do not match their epistemological preferences. On the one side, we have the so-called "evangelicals" backing what appears to be a standard rationalistic natural religion. On the other, the moderate caucus fell into line with the new epistemology of feeling promoted by Hume and Kames; they even urged its suitability for popular consumption. One way of resolving the evident asymmetry here is to view both these groups as competing for a moderate religious stance. This certainly corresponds to the general picture of modernising Enlightenment Edinburgh in the latter half of the century. From this perspective, the intra-elite conflicts within Edinburgh at least, should not be viewed simply as involving religious enthusiast and secularised moderate. Rather, each group was committed to some form of rapprochement of metaphysics, natural knowledge and religious belief that was itself reasonable and justifiable. In many ways, it was the convergence of outlook which necessitated the clear demarcation of respective positions. What appears to be missing in the latter half of the century, is the insistence upon revealed religion either among the clerical literati or more widely in the intellectual community. It is hard to find an equivalent to men such as Thomas Halyburton, Robert Riccaltoun, or even Duncan Forbes of Culloden.[114]

In the ensuing intellectual climate, often referred to as the "Age of Improvement", natural theological justification was the norm, rather than the exception.[115] As a result, metaphysics was proportionally more important because it was the philosophical technology by which men could connect together (or break apart) connections between man, God and nature. Epistemological questions about men's perception of power in nature and his sense of causal connections between phenomena were issues which had to be confronted in order to develop a theologically sound philosophy of nature. Naturally, men differed about what a sound knowledge of nature consisted of and over the grounds upon which it was to be secured in man's minds. The Kames-Stewart debate illustrates that natural philosophy was perceived to have an important role to play in the articulation of wider belief systems. In particular, it could serve as a vehicle for the expression of voluntarist or necessitarian images of natural order which did important cognitive work in the general search for the epistemological interiorisation of nature. Furthermore, accounts of causality and power were crucial resources for negotiating the boundary between physical change and human activity, the central bone of contention between necessitarians and voluntarists. However, the dispute between protagonists of these rival images of natural order was not a simple dichotomy between челsecular iser and theist. Also, conceptions of causation and power were ambiguous tools capable of being given diverse interpretations in the search for the epistemological interiorisation of nature. This is epitomised by the subsequent uses of Hume's theory of causation by Gregory and others later in the century.

As a postscript, it is significant that subsequent attempts to prosecute Hume and Kames also failed. The opposition lacked a powerful figurehead after Anderson's death and the later departure of John Witherspoon[116] for America. The 'unholy alliance' between the moderate literati, Hume, and his circle, went from strength to strength. The period from 1760 to 80 was one in which they exerted a hegemony over Edinburgh's cultural life. Hume dominated the Select Society;[117] Kames boasted of his control over the Philosophical Society[118] and continued to promote his views on natural philosophy in his private correspondence with Reid.[119] What Phillipson has called the culture of "polite determinism" came to dominate Edinburgh during this period.[120] However, a reaction was afoot during this time which kept alive the opposition to necessitarianism, expressed largely in doubts about the nature of Humeian causality and its implications for a theologically sound knowledge of nature. Monboddo sought to find an alternative philosophy of nature based upon theistic Aristotelianism. In medicine, Robert Whytt, John Gregory and others continued to attack monistic accounts of physiological processes and the aetiology of disease. Yet the most significant reaction to Humeian metaphysics was to come from Thomas Reid and other members of the Aberdeen common sense school. Gregory's primary intellectual and family loyalties lay with Reid's circle. By the 1780s the time was ripe for a second major assault on Hume. The philosopher had recently died. But, as we shall see, his influence was perceived to be still very much alive among members of Edinburgh's scientific literati.

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12. Medical essays and observations, revised and published by a society in Edinburgh, 5 vols. (Edinburgh, 1737).

13. See Steven Arthur Shapin, The Royal Society of Edinburgh; a study of the social context of Hanoverian science (Ph.D. thesis, University of Pennsylvania, 1971); and his "Property, patronage and the politics of science: the founding of the Royal Society of Edinburgh", The British Journal for the history of science, 7, (1974), 1-41.

14. Steven Shapin, "The audience for science in 18th century Edinburgh", History of science, 12 (1974), 95-121. On clubs and societies generally see D.D. McElroy, The literary clubs and societies of 18th century Scotland (Ph.D. thesis, University of Edinburgh, 1952).

15. Ian Simson Ross, Lord Kames and the Scotland of his day (Oxford, 1972) is the best contemporary biography of Kames. Also see Alex. Fraser Tytler, Memoirs of the life and writings of the honourable Henry Home of Kames, 2 vols. (Edinburgh and London, 1807). Very little is known about John Stewart. He was the son of Sir Robert Stewart, who replaced Andrew Massie as a regent at Edinburgh University in 1703, eventually becoming Professor of Natural Philosophy when regenting was abolished in 1707. John Stewart was a Fellow of the Royal College of Physicians of Edinburgh and was made joint professor

with his father in 1742. Stewart was himself succeeded by Adam Ferguson in 1759. For details see A. Bower, *The history of the University of Edinburgh*, 3 vols. (Edinburgh, 1817), vol. 2, 336.

16. Kames, "Of the laws of motion" (ref. 11), 42-43.

17. *Ibid.*, 44.

18. *Ibid.*, 3.

19. *Ibid.*

20. Andrew Baxter, *An enquiry concerning the human soul* (London, 1732); *Matho*, 2 vols. (London, 1740); *An appendix to the first part of the enquiry* (London, 1750); Colin MacLaurin, *An account of Sir Isaac Newton's philosophy* (Edinburgh, 1748).

21. Kames, "Of the laws of motion" (ref. 11), 44.

22. Locke, *Essay* (ref. 3), 135-50. Locke's remarks in the section entitled "Of power" formed the starting point for most subsequent 18th century discussions, including Kames's and Gregory's own. See [Kames], *Essays on the principles of morality and natural religion* (Edinburgh, 1751), 271-305 (originally published under the pseudonym "Sopho"). See also R.M. Mattern, "Locke on active power and the obscure idea of active powers from bodies", *Studies in the history and philosophy of science*, 11 (1980), 39-77.

23. Dugald Stewart made this point in his *Short statement of facts relative to the late election of a mathematical professor in the University of Edinburgh*, 2nd ed. (Edinburgh, 1805), 52-76. For a historical discussion of 17th century natural philosophy and the logical status of its explanations see Barbara J. Shapiro, *Probability and certainty in seventeenth-century England* (Princeton, 1983), 15-73.

24. Kames, "Of the laws of motion" (ref. 11), 6.

25. *Ibid.*, 13.

26. *Ibid.*, 10.

27. *Ibid.*, 12.

28. *Ibid.*, 13.

29. The same theme runs through Kames's *Essays* (ref. 22), especially 170-71, 271-99. See also David Fate Norton, "The providential naturalism of Turnbull and Kames", in *David Hume: common-sense moralist, sceptical metaphysician* (Princeton, 1982), 152-91.

30. Kames, "Of the laws of motion" (ref. 11), 54.

31. See MacLaurin, *Account* (ref. 20), 248.

32. Kames, "Of the laws of motion" (ref. 11), 55.

33. For the rest of Kames's discussion of gravity see *ibid.*, 42-60; also Kames's views as related by Reid in his letters which can be found in Ian Ross, ed., "Unpublished letters of Thomas Reid to Lord Kames, 1762-82", *Texas studies in literature and language*, 7 (1965), 17-65; and Reid, *Works*, 50-61. Many of the issues discussed by Kames in his essay, in his letters, and his article "On evaporation", also published in the *Essays and observations, physical and literary* (Edinburgh, 1771), 80-99, cannot be considered here.

34. Kames, "Of the laws of motion" (ref. 11), 19.

35. *Ibid.*, 21.

36. *Ibid.*, 18.

37. *Ibid.*, 39-40. MacLaurin, *Account* (ref. 20), 144-46, laid great stress on the law of action and reaction as a universal principle of mechanics.

38. Newton, *Principia*, 398.

39. Stewart, "Some remarks" (ref. 11), 70-71.

40. Like Kames, Stewart was equally critical of MacLaurin and Baxter; see *ibid.*, 74-75, 118. He also cited Needham, Buffon and Bishop Clayton's *An essay on spirit wherein the doctrine of the Trinity is considered*, 5th ed. (London and Dublin, 1753) as other publications which had made concessions to the activity of matter.

41. Stewart, "Some remarks" (ref. 11), 84.

42. Ibid., 129. Kames also discussed this point, see "Of the laws of motion" (ref. 11), 47-50.

43. Stewart, "Some remarks" (ref. 11), 70-71.

44. *Ibid.*, 80-81. For a further discussion of difficulties with accounts of inertia see the letter from Dugald Stewart to Lord Monboddo, 2/4/1778, reprinted in William Knight, *Lord Monboddo and some of his contemporaries* (London, 1900), 96-104. Also, James Hutton, *A dissertation upon the philosophy of light, heat and fire* (Edinburgh, 1794), and *Dissertations on different subjects in natural philosophy* (Edinburgh, 1792), especially dissertations 1 and 2.

45. Stewart, "Some remarks" (ref. 11), 106.

46. *Ibid.*, 81.

47. *Ibid.*, 86.

48. *Ibid.*, 74.

49. *Ibid.*, 76.

50. _Ibid_., 84.

51. _Ibid_., 77-78.

52. _Ibid_., 79.

53. _Ibid_., 88-89.

54. _Ibid_., 90-100.

55. _Ibid_., 98.

56. _Ibid_., 115.

57. _Ibid_., 120.

58. _Ibid_., 129.

59. _Ibid_., 112.

60. _Ibid_., 127-28.

61. _Ibid_., 133-34.

62. I have used the term 'necessitarian' to describe the collective positions which opposed voluntarism in preference to the terms, 'intellectualist' or 'rationalist' which are favoured by other commentators. See, for example, Carolyn Iltis, "The Leibnizian-Newtonian debates: natural philosophy and social psychology", _British journal for the history of science_, 6 (1973), 343-77, on 346-54; Edwin Arthur Burt, _The metaphysical foundations of modern science_ (New York, 1927),280-299, on 290; F.E.L. Priestley,"The Clarke-Leibniz controversy", in Robert E. Butts and John W. Davis, eds., _The methodological heritage of Newton_ (Toronto, 1970), 34-56, on 43-44. This is partly because necessitarianism was Gregory's own usage which he applied to both Hume and Priestley. Also the concept of reason is far less applicable to developments in Scottish philosophy during the 18th century, which emphasised the role of feelings rather than intellect. See G.E. Davie, "Hume and the origins of the common sense school", _Revue internationale de philosophie_, 6 (1952), 213-21. The major sources for Scottish philosophy generally are James McCosh, _The Scottish philosophy, biographical, expository, critical, from Hutcheson to Hamilton_ (London, 1875), George Elder Davie _The Scotch metaphysics_ (D.Litt.thesis, University of Edinburgh, 1954); S.A. Grave, _The Scottish philosophy of common sense_ (Oxford, 1960).

63. Stewart, "Some remarks" (ref. 11), 127.

64. Kames, "Of the laws of motion" (ref. 11), 14.

65. _Ibid_., 11. See also Ross, _Lord Kames_ (ref. 15), 60-66; 173-74; and Gordon McKenzie, "Lord Kames and the mechanist tradition", _University of California publications in English_, 14 (1943), 93-121.

66. Kames, "Of the laws of motion" (ref. 11), 7, 15.

67. Ibid., 10.

68. The term 'occasionalism' also presents difficulties. It is used here in the sense of an extreme form of voluntarism in which God is the sole agent in nature. In actors' usages during this time, it had a largely pejorative intent and was used as a general term rather than to describe the specific account of perception developed by neo-Cartesian philosophers such as Malebranche. For a contemporary account of Malebranche see Reid, "Intellectual powers", Works, 264-67. See also Thomas M. Lennon, "Occasionalism and the Cartesian metaphysic of motion", Canadian journal of philosophy, supplementary vol. 1 (1974), 29-40. Other sources for occasionalism connected with medicine and Stahl are discussed in chapter five. One consequence of the emphasis upon God's will in sustaining gravity by Clarke and others who identified themselves as "Newtonians" appears to have been a movement away from the limited voluntarism professed by Newton himself, towards a general denial of any role to matter in natural processes. See Arnold Thackray, "'Matter in a nut shell': Newton's Opticks and eighteenth century chemistry", Ambix, 15 (1968), 29-53. A development of this nature is also evident in Baxter's writings (ref. 20), which were widely known in 18th century Scotland, and were re-published several times. The issue of occasionalism also raises the question of the role of Berkeley's philosophy during this period as well as the contentious issue of Berkeley's influence on Hume. See G.E. Davie, "Berkeley's impact on Scottish philosophers", Philosophy, 40 (1965), 222-34; and his "Berkeley, Hume and the central problem of Scottish philosophy", in David Fate Norton, Nicholas Capaldi and Wade L. Robison, eds., McGill Hume Studies: studies in Hume and Scottish philosophy (San Diego, 1979), vol. 1, 43-62. See also Harry M. Bracken, The early reception of Berkeley's immaterialism, 1710-1733 (The Hague, 1959) especially "Andrew Baxter: critic of Berkeley", 62-85. Generally, I have not emphasised the influence of Berkeley on later Scottish scientific metaphysics. This is for the pragmatic reason that Gregory does not refer to him. While the impact of Berkeley's philosophy is clearly relevant to the general theme of epistomological interiorisation presented here, the focus of concern during this period in Scotland was almost always Hume. For a similar viewpoint see two articles by Richard H. Popkin, "Skepticism and anti-skepticism in the latter part of the eighteenth century" and "The early critics of Hume" both in his The high road to pyrrhonism: studies in Hume and Scottish philosophy (San Diego, 1980) No.2, 55-78 and 197-212 respectively. Regarding the question of Berkeley's influence on Hume, it seems to me that the notion of "influence" on an individual level is profoundly problematic. Here I have preferred to speak, where relevant, of 'reception' and 'use' of Hume's ideas which was widespread but is typified in particular historical actors, such as Gregory. Popkin's other articles on the relationship between Hume and Berkely collected in The high road to pyhrronism provide some indication of the difficulties which can arise in trying to pin-down the influence of one individual upon another.

69. Kames, Essays (ref. 22), "Of liberty and necessity", 151-218; Sketches of the history of man, 2 vols. (Edinburgh and London, 1774), vol. 2, 293-312. Considerable care is required in interpreting Kames's position on liberty and necessity, as he continually modified his stance in successive editions of the Essays (1758), (1779). However, the general trend was towards a more consistent assertion of necessity in conjunction with an increasingly more detailed attack upon Arminian-inspired accounts of the liberty of indifference. See chapter six for a further discussion of liberty and necessity.

70. Stewart, "Some remarks" (ref. 11), 109.

71. Ibid., 121.

72. Ibid., 131. For the next two pages, Stewart discussed the use of machine analogies to describe the perceived order of nature. In particular, he was concerned to refute Kames's own use of Boyle's A free inquiry into the vulgarly received notion of nature to support necessitarianism. See Kames, "Of the laws of motion" (ref. 11), 14. An identical gambit reasserting Boyle's own voluntarism can be found in Burtt, Metaphysical foundations (ref. 62), 290.

73. Stewart, "Some remarks" (ref. 11), 122.

74. Kames, "Of the laws of motion" (ref. 11), 47, 63-68.

75. Stewart, "Some remarks" (ref. 11), 139.

76. The general concern with the continuing rise of deism, atheism and free-thinking in mid-18th century Britain is well illustrated in John Leyland, A view of the principle deistical writers that have appeared in England ... , 2 vols. (London 1754), especially vol. 2, 7-11 for his views on Hume. The second edition (1755) and the third (1757) each devoted successively more space to the refutation of Hume's position.

77. Stewart, "Some remarks" (ref. 11), 124-25.

78. Ibid., 83.

79. Ibid., 116.

80. Ibid., 116-17.

81. Ibid., 139.

82. Ibid., 128.

83. M.A. Stewart, "Hume, Wishart and the Edinburgh chair", Journal of the history of philosophy, (forthcoming).

84. Richard B. Sher, Church, university, enlightenment; the moderate literati of Edinburgh, 1720-1793 (Ph.D. thesis, University of Chicago, 1979).

85. John Hill Burton, <u>The life and correspondence of David Hume</u>, 2 vols. (Edinburgh, 1846), vol. 2, 454-55.

86. <u>Ibid</u>., vol. 1, 97-98. See also vol. 1, 427, where in an undated letter to Michael Ramsay, Hume wrote: "Philosophers must judge of the question; but the clergy have already decided it, and say [Kames] is as bad as me."

87. <u>An analysis of the moral and religious sentiments contained in the writings of Sopho and David Hume. Addressed to the consideration of the reverend members of the Church of Scotland</u> (Edinburgh, 1755).

88. George Anderson, <u>An estimate of the profit and loss of religion personally and publicly stated</u> (Edinburgh, 1753).

89. James Balfour, <u>A delineation of the nature and obligation of morality with reflections upon Mr Hume's book "An enquiry concerning the principles of morals"</u>. 2nd ed. (Edinburgh, 1758).

90. <u>An analysis</u> (ref. 87), 3.

91. Sher, <u>The moderate literati</u> (ref. 84), attributes this to the Rev. John Bonar and dates it May 23rd 1755.

92. <u>An analysis</u> (ref. 87), 528.

93. <u>Ibid</u>., 25.

94. <u>Ibid</u>., 49.

95. Anderson, <u>An estimate</u> (ref. 88), 34-55.

96. <u>Ibid</u>., 10-11.

97. <u>Ibid</u>., 29.

98. <u>Ibid</u>., 59. It is significant that Anderson broadened his attack subsequently to include Bolingbroke whose works had recently been published. See <u>A remonstrance against Lord Viscount Bolingbroke's philosophical religion addressed to David Mallet Esq., the publisher</u> (Edinburgh, 1756).

99. Anderson, <u>An estimate</u> (ref. 88), 208-10.

100. <u>Ibid</u>., 78.

101. George Anderson, <u>The complaint against the Presbytery of Edinburgh verified</u> (Edinburgh, 1756), 19-20.

102. James Balfour, <u>Philosophical dissertations</u> (Edinburgh, 1782).

103. Balfour, <u>Delineation</u> (ref. 89), 223-30.

104. Burton, <u>Life</u> (ref. 85), vol. 1, 98.

105. Balfour, <u>Dissertations</u> (ref. 102), 44.

106. Ian Duncan Linsay Clark, Moderatism and the moderate party in the Church of Scotland, 1752-1805 (Ph.D. thesis, University of Cambridge, 1963).

107. See Nathaniel Morren, Annals of the General Assembly of the Church of Scotland (Edinburgh, 1838), 54-61.

108. An analysis (ref. 87), 49.

109. Observations upon a pamphlet entitled "An analysis" etc. (Edinburgh, 1755) 2, 22.

110. Observations against the essays on morality and natural religion examined (Edinburgh, 1756), 57-58.

111. Ibid., 63.

112. Ibid.

113. Observations (ref. 109), 14.

114. On Thomas Halyburton see George Davie "The Scottish Enlightenment", The Historical Association, general series 99 (Saffron Walden, 1981), 9-14; Robert Riccaltoun, Works, 3 vols. (Edinburgh 1771-72); Duncan Forbes, Works (London, 1810).

115. The notion of Scotland's ideology of improvement is best developed in the writings of N.T. Phillipson, especially his "Culture and society in the 18th century province: the case of Edinburgh and the Scottish Enlightenment", in Lawrence Stone, ed., The University in society, 2 vols. (Princeton, 1974), vol. 2, 407-48. See also N.T. Phillipson and Rosalind Mitchison, Scotland in the age of improvement (Edinburgh, 1970). No attempt is made here to relate Gregory's work to this body of literature, which is largely concerned with the origins of the Enlightenment as a cultural movement.

116. John Witherspoon, Ecclesiastical characteristics (Edinburgh, 1753).

117. Roger L. Emerson "The social composition of enlightened Scotland: the Select Society of Edinburgh", Studies on Voltaire and the eighteenth century, 114 (1973), 291-329.

118. Emerson, "Philosophical Society" (ref. 5), part 2, 145.

119. See ref. 35.

120. Nicholas Phillipson, "Towards a definition of the Scottish Enlightenment", in Paul Fritz and David Williams, eds., City and society in the 18th century (Toronto, 1973) 125-48.

CHAPTER 3

GREGORY'S PLURALISTIC THEORY OF CHANGE: A NEW METAPHYSICAL TECHNOLOGY FOR MAINTAINING THE BOUNDARY BETWEEN PHYSICAL CAUSATION AND HUMAN ACTIVITY

1. INTRODUCTION

2. GREGORY'S PLURALISTIC THEORY OF CHANGE

3. POWER, ACTIVITY AND THE STRUCTURE OF LANGUAGE

4. COMMON NOTIONS, THE CLASSIFICATION OF VERBS AND THE STRUCTURE OF SCIENTIFIC DISCOURSE

5. DEMONSTRATION AND RELATION IN GREGORY'S SCIENTIFIC METAPHYSICS

6. CONCLUSION

1. INTRODUCTION

In the previous chapter some aspects of the Kames-Stewart debate were discussed. It was shown that the search for the epistemological interiorisation of nature operated on several levels. In mechanics, the specification of the conditions under which men perceived the powers of matter was central to the Kames-Stewart debate. More generally, epistemology was a major resource for maintaining wider conceptions or images of natural order which were routinely used to articulate perceived connections between man, nature and God. For both these tasks, theories about the nature of causality were perceived to be of central importance. It is clear that Gregory completely supported Stewart's aim to defend the passivity of matter against writers such as Kames. Stewart had emphasised the role of active powers acting throughout nature which men, as active beings, could know through their privileged access to the notion of efficient causality. But Gregory regarded this as an inappropriate and anachronistic means of maintaining the passivity of matter. Given that Gregory rejected this voluntarist legitimation of natural philosophy, the question is: what did Gregory put in its place? The purpose of this chapter is to describe and discuss Gregory's alternative metaphysical technology for maintaining the boundary between physical change and human activity.

In the first part of Gregory's Project, the Introductory essay, his self-appointed task was to show that men had a common notion of cause and effect in physics. But he did not enumerate its characteristics in any detail. Despite the fact that all the essays written in the 1780s and 90s were conceived of as parts of an investigation into the nature of physical causation, none of them dealt exclusively with the relation of cause and effect in physics. Therefore Gregory's views must be gathered together from various parts of the Project as a whole. The organisation of this chapter reflects the continuing importance of the interconnected themes of the relation of causality, linguistic evidence, and the role of demonstration in Gregory's search for the epistemological interiorisation of nature. In particular, Gregory's attitude to the certainty of truths in both the philosophy of mind and natural philosophy is considered. This is done with respect to Gregory's aim to demonstrate the distinction between men's knowledge of the relation of cause and effect in physics and human activity, and hence, erect a boundary between matter and man. Finally, in the conclusion Gregory's new metaphysical technology is briefly compared and contrasted with the form of scientific metaphysics put forward by Lord Monboddo which also sought to re-assert the passivity of matter using different philosophical resources to those associated with the voluntarism of active powers.

2. GREGORY'S PLURALISTIC THEORY OF CHANGE

Throughout the Project, Gregory developed a distinctive vocabulary for talking about causality which structured all his subsequent remarks. This vocabulary emerged from a fundamental attitude to the limits of the human understanding. Gregory wrote:

> We know little indeed, of what anything is in itself; but much of what many things are with respect to one another; wherein they agree, wherein they differ and how they stand related.[1]

The connected disciplines of natural history, natural philosophy and metaphysics were all subject to such limitations. Natural history classified material kinds according to the various resemblances and differences between them. Natural philosophy made use of resemblances and differences; but it specifically "treat[ed] of physical events".[2] The natural philosopher determined the precise nature of events which occurred in the physical world by identifying causes and effects. Finally, the metaphysician discerned the similarities and differences between what Gregory called "relations of event", one of which was physical causality. As we have seen, Gregory held that all men had a common notion of the relation of physical causation. However, men's love of analogy and use of ambiguous words and phrases to denote it, led them to conflate physical causation with other relations such as activity or motive.[3] The task Gregory set for his particular kind of scientific metaphysics was to undertake a careful comparison of men's common notions in order to distinguish the precise nature of the relation of cause and effect in physics. Among those to be examined and classified were existence, substance, quality, state, event, change, effect, action, cause, power, instrument, necessity, force, mind, body, faculty and motive.[4] These notions were to be compared with one another and also with the different objects to which they referred. By this method, it was possible to assess the justness of men's common notions because

> If we find, on careful examination, that there is among other things and events a relation, corresponding to our common notion of cause and effect, this notion may with sufficient propriety be pronounced just and rational.[5]

In Gregory's view, men could only understand the world by comparing their common notions and the objects to which they referred. This procedure necessarily involved a complex process of interiorisation, in which perceived relations between things were examined, rather than any independent evaluation of the things themselves. Gregory's search for the epistemological interiorisation of nature is epitomised in his investigation of differences in the relations between things fashioned in men's minds according to the laws of human thought.

What made the language of cause and effect so important was that it constituted the main vehicle for expressing what Gregory called the perceived "relations of event" between things. In the informal use of this language, "cause" usually denoted the principle of change; whereas "effect" denoted the change itself, considered in relation to the principle of change preceding it. Gregory emphasised this indicated that cause and effect were entirely relative terms. Substances, qualities or events themselves could all be considered as causes or effects.[6] Despite the relativity that was built-in to the common usage of the language of causality, it was nevertheless evident to all men that no event occurred without being related to something else. Gregory noted this was both an important general fact and a law of human thought which found expression in the maxim "For every effect there must be a cause; nothing exists or nothing comes to pass without a cause".[7]

Were this maxim untrue, Gregory stated, the foundations of both natural philosophy and geometry would be undermined. Yet despite its obvious importance, Gregory argued that its precise meaning needed clarification. Gregory stipulated that the common notion of causation always referred to change or event, rather than to existence. Therefore he argued that the maxim was formally incorrect and he censured most other philosophers for conflating rather than distinguishing the relations of causation and existence.[8] Suitably modified, the maxim read:

> It is universally admitted that there is no event, that is, no beginning or existence, no end of existence, no change of state or mode of existence, not even the action of a living sentient being, without a cause.[9]

But unless one fixed the precise meaning of cause, men could not yet assent to this proposition as either true or false. Gregory discussed four possible meanings. Two were Aristotelian, consisting of the typology of efficient, formal, final and material courses and Aristotle's general notion of causation. The other two were the contemporary notions of efficient and physical causes. Gregory actually made very short shrift of both Aristotelian options upon the precise meaning of causality. For example, he referred to the four-fold Aristotelian typology as an attempt "to make a false and unnatural genus" which violated "the laws of human thought".[10] This narrowed down the meaning of causation to either physical causes or agent causes. Gregory proceeded to argue that in either of these senses the maxim was still false. The problem with the maxim was that it did not specify the precise sense of causation referred to. But if one specified that there was "no physical event without a physical cause", "no creation without a creator" and "no work of design and intelligence without an intelligent author",[11] then all men would consent to it as necessarily true.

Throughout his Project Gregory argued for just such a pluralism of relations of change to which different kinds of events between things referred:

> There are among things and events several different relations all of which have occasionally been expressed by the terms cause and effect; that there are not only very different kinds of events or effects (which is indeed self-evident), but also different kinds of causes or principles of change; and that between each of these and its corresponding event there is something peculiar or specific in the relation besides what is general or common in all such relations.[12]

In particular, Gregorian metaphysics sought to demonstrate the difference between relations such as cause and effect in physics, human activity and motive and action by specifying at least one characteristic peculiar to physical causation and not found in other relations. It is significant that when Gregory spoke of such distinctions he referred to different relations of event as "specimens" which were representative of the different "genera" and "species" of causes.[13] By attending to differences to be found in the epistemological kingdom of causal relations, Gregorian metaphysics came

> as near as the very different nature of things intellectual and things material will permit, to the exhibitions of well chosen and well arranged specimens in natural history, or well conducted experiments in natural philosophy.[14]

Although men could not know the exact nature of the relation of cause and effect in physics, they could know that it was different from others such as a man and his actions (agency and power), motive and action and the kind of change occurring in animated bodies. But what precisely distinguished physical causes from these other principles of change?

Gregory considered his account of cause and effect in physics to be a restricted application of Hume's general analysis of causation. Thus Gregory stated that between physical causes and effects there was a "uniform, regular or inseparable connection or conjunction".[15] For Gregory constant conjunction implied three principal things. Firstly, men were ignorant of any necessary connection between particular causes and their effects. Thus the precise manner in which the effect proceeded from a cause could not be known.[16] Secondly, the influence of causes in physics was constant. This meant that causes always had their full effects:[17]

> The full physical causes are constantly conjoined with their respective effects; which accordingly correspond to them, not only in kind but in quantity.[18]

Thirdly, the operation of physical causes never implied they had power or activity. There was no "reason to believe that what [was] called power in the common and strict and literal acceptation of that term belong[ed] to physical causes".[19] Gregory made it equally clear that his sense of constantly conjoined physical causes and effects was not synonymous with mere uniform priority and succession of events.[20] Rather, all that was meant by the constant conjunction of physical causes was that

> When the cause is applied to the subject, its effect will always and inevitably take place; and that a body has no power either of changing its own state, or of preventing that change which the cause applied was fit to produce.[21]

The consequence of the absence of power in bodies was that all effects in physics passed inevitably. However, in conformity with his denial of necessary connections between physical causes and effects, Gregory refused to confirm any stronger sense of necessary connection other than a regular, uniform and constant conjunction. It remained the case that the constant conjunction of physical causes was an established matter of fact whether or not the relation was maintained necessarily, arbitrarily, or contingently.[22]

Gregory's second implication of constant conjunction was an important criterion for him to distinguish further between different "species of physical cause".[23] Only causes and effects in physics always had their full effects. This was evident, for example, in the comparison between mechanical and chemical causes, where there was enough of a difference:

> to show that in the production of chemical phenomena something else is concerned besides the obvious external cause applied as, for example, heat.[24]

It also seemed that physiological changes in plants and animals resembled change in physics. Yet:

> It appears, however, on giving due attention to the changes observed and to all the circumstances connected with them, that the relation between the changes and the external circumstances is not the same with that of cause and effect in lifeless bodies; that the external circumstances are not the sole causes or principles of the changes observed, but only partial and accessory causes of them, though perhaps indispensably requisite for them; and that there is in the subject another principle of change, the concurrence of which is no less requisite for the production of those changes than the application of the external causes.[25]

Gregory referred to such external causes as "partial", "exciting" or "occasional". What distinguished them was that they were not constantly conjoined with those changes in living bodies excited by them. As a result such changes did not "always correspond to them in degree or quantity, not even in kind".[26]

The third implication of constant conjunction between physical causes and effects was the most important in Gregory's view. This was because it emphasised the complete difference between this kind of relation and others such as activity. Activity always implied a being producing change "by means of a voluntary exertion of its own power doing something, in consequence of which, change occurs or is produced".[27] Inanimate things merely displayed

> such relations that they may be mutually causes or principles of change to one another without any exertion of power, or any operation of an agent strictly so called.[28]

Gregory was so insistent upon the separation of physical causation and activity or power that he usually reserved the term "cause" for cause and effect in physics only. Because of the real difficulty of discussing intellectual objects without ambiguity, Gregory entertained the possibility of a philosophically pure language which would be "as perfect as algebraical notation".[29] In such a language, the distinction between various relations of event would be marked by different words. As an example of what might be achieved Gregory pointed to the utility of new nomenclature in chemistry:

> In this science, many new notions have lately been introduced, many old abolished, and many disjoined which were formerly associated most intimately, and expressed by vague and otherwise inadequate terms.[30]

Yet there were also problems concerning the introduction of neologisms into metaphysical discourse. How were such new words to be used and understood? As a compromise, Gregory employed a pragmatic restriction of the term "cause" to applications involving mechanical events. But he could hardly avoid using the generic term "causation" to denote any principle of change.

Gregory regarded the denial of any power in physical causation as synonymous with the impossibility of bodies moving themselves.[31] However, direct appeals to the nature of bodies or matter were almost entirely absent in Gregory's work. Rather the nature of matter was dependent upon men's understanding. Therefore, he wrote

> the question is not whether body can act, either where it is, or where it is not; but simply whether it be consistent with the laws of human thought to believe that such relations many subsist among bodies... that they shall, in certain circumstances, be mutually causes or principles of change to one another.[32]

Gregory always sought to establish and maintain the passivity of matter indirectly by uncovering the necessary conditions which underwrote this belief in men's minds. Thus the nature of cause and effect in physics could not be resolved inductively. It was to be displayed by referring it to "some fundamental principle of the human understanding".[33] Gregory's analysis of the various relations of change in nature all served to elucidate the structure of the common notion of cause and effect in physics. If this could be described and demonstrated, then metaphysics would be of legitimate use and assist the natural philosopher in the correct resolution, classification and explanation of natural events.

The strictures Gregory imposed upon his own metaphysical practice made the task of display and demonstration difficult. He eschewed introspective appeals to common sense. He was sceptical concerning men's knowledge of objects in themselves. Direct statements of the passivity of matter were displaced in favour of appeals to human understanding. Gregory's ontologically denuded vocabulary of "relations of event" and "principles of change" emerged out of these strictures. It was idealistic, interiorised, unwieldy and, above all, indirect. Gregory presented himself as an inductive, factual scientific metaphysician. He was a natural historian of species of change. Yet how was the intellectual object of his discourse, viz. the relation of cause and effect in physics, to be realised in conformity with this language of the natural historian with its attendant emphasis on the accessible, the external and the publicly demonstrable object? Gregory's response was that the natural historian of metaphysical relations of change should attend to the structure of language. There the distinction between cause and effect in physics was manifest and could be demonstrated. Gregory's strategy for doing just this is considered in the next section.

3. POWER, ACTIVITY AND THE STRUCTURE OF LANGUAGE

Gregory's use of linguistic analysis to show that men had a conception of cause and effect in physics has been discussed in chapter 1, section 2. The central features of Gregory's approach can be usefully reiterated here, this time in relation to the notion of power.

Gregory's starting point was to clarify the aim of his discourse on power. It was not a phylogenetic enquiry into how men acquired the notion of power. Nor was it concerned to define or explain the concept in terms of how effects were produced by power. Instead, Gregory posed the question:

> have we, or have we not, any meaning or notion which we understand and express by the word power or by synonymous or convertable words and phrases?[34]

Gregory claimed that by attending to the "explicit" and "impartial" evidence of language, men had "incontrovertible" and "decisive" proof, they had a distinct notion of power. He also maintained the following two points:

(i) Though men often applied the term power to physical causes and effects, this was a metaphorical and analogical use of language because power had no share in this relation.

(ii) Men considered power was an attribute of mind only.[35]

As we have seen, Gregory rendered the public evidence of language demonstrable, by means of his principle that language was necessarily the expression of men's thought. Because men routinely used the expression "power" and its derivatives in a fashion that was intelligible, then they must have some notion of power. This principle continued to serve as the crucial link which rendered the evidence of language a demonstration of the notion of power in men's mind.

In order to confirm his other points, Gregory discussed four sentences, each of which illustrated a particular kind of power. He called these "animal power", "political power", "physical power" and the "moving power in machinery". Gregory stated that the diversity of these applications indicated the word power was ambiguous. It was therefore necessary to explicate its various usages "to show the differences of the things or notions which it [was] on different occasions employed to denote".[36] Gregory in fact identified animal power as the radical or root meaning of power when used correctly in particular instances. This was expressed for example, in the sentence "A man has the power of moving his hand, of eating, drinking, speaking, walking, riding etc."[37] Power was

> a general or abstract term employed to denote that state, condition, or predicament of a being, which is expressed in particular cases by the verb can, or by the corresponding verbs in different languages as in Latin by possum.[38]

Thus the strict and literal meaning of power made it an attribute of mind. The power to do something implied with it "the optional or discretionary power not to do it".[39] Gregory argued men never considered lifeless beings possessed any power not to act. Therefore when men applied the term power to inanimate nature, they were guilty of an impropriety of language which was evidence for an underlying absurdity of thought. Gregory discussed the example of saying "a statue can (has the power to) stand upright". The verb "can" linked the subject to a predicate that was inconsistent with it. This therefore constituted a metaphorical rather than a literal use of language.

Gregory applied the distinction between the metaphorical and literal use of the term power to the problematic cases of "physical power" and "the moving power of machinery". An example of the former was the statement that "Heat has the power of melting lead".[40] To say that heat can melt lead simply meant that "if lead be heated to a certain degree, and for a sufficient length of time, it will melt".[41] But it never meant heat can, if it chose to, melt lead.[42] The "moving power of machinery" was a particular case of physical power in which animal power was transferred by "a distant and fanciful analogy" to account for the beginning of motion in a mechanical device. Again, this never meant that the machine had the power of beginning motion, of not beginning it, or doing whatever it pleased.[43]

Gregory raised the question of whether his stipulation of the radical meaning of power as animal power *per se* was not in fact a _petitio principii_. He saw it as a self-evident truth,[44] but gave the following justification in order not to be accused of indulging in hypotheses. If men considered the nature and import of language, then it was evident they understood power _qua_ animal power rather than in another sense. Power expressed a "familiar and well known thought", which could not be articulated in a different way without circumlocution and metaphor. Gregory stated that this was the only basis upon which men could decide whether the meaning of a word was literal or metaphorical. Common usage was the sole criterion one could appeal to. In Gregory's view, common usage indicated that men used the term "power" literally when they denoted an optional power of living beings to act or not act.

The use of power in a metaphorical sense to denote other kinds of events and relation was among

> the chief sources of all the errors, ambiguities, and perplexities, which have prevailed either in physics or in metaphysics with respect to the relation of cause and effect.[45]

This ambiguity was perpetrated in men's use of language when it was said that "a magnet _attracts_, that certain acids _dissolve_, and that heat _melts_ iron". The use of active verbs implied something was actually done by the magnet, acids, and heat to the iron. Gregory sought to

> make it appear, that the notions expressed by the neuter verbs _to move_, _to melt_, _to dissolve_, and a certain relation between the events and the magnet, the acid and the heat, are all that we have any reason to believe with respect to the cases in question, either from the natural suggestions of our faculties, or from careful observation and experiment, and just induction.[46]

Throughout _Power_, Gregory continued his covert appeal to men's "natural faculties" and "common notions" which underlay the common usage of language. He considered men had separate and distinct notions of causation and power. By attending to the differences between phrases employing active and neuter verbs, Gregory sought to make these notions 'appear' in their correct form. Thus the evidence of language could serve to substantiate "a very important distinction in physics and metaphysics" by acting as a sort of honest broker between the scientific metaphysician and the notions of the human mind he wished to demonstrate and display. This task was taken up in Gregory's essay Activity, the third part of his Project on cause and effect in physics.

In his introductory remarks to section one of Activity, Gregory discussed the apparently contradictory, or at least paradoxical,[47] nature of his position. Gregory maintained, despite the evident fact that notions of activity and cause and effect were regularly confused, they were nevertheless completely independent relations. The common and natural suggestions of the human faculties confirmed this. Yet

> Some kind of activity or agency has, in words at least, been attributed to physical causes, by almost all, mankind, as their language abundantly testifys and in thought too, has by many of them been conceived, to form a part of the relation of cause and effect.[48]

The difficulty for Gregory's analysis lay in the fact that common language had a dual role. It was evidence for the correctness of men's common notions (activity and cause and effect relations distinct). At the same time, ordinary usage was embarrassed by repeated characterisations of cause and effect in terms of activity (activity and cause and effect relations indistinct). The purpose behind Activity was to specify the precise conditions under which language served as a correct indication of men's underlying common notions.

As a propadeutic to analysing the linguistic means by which activity was expressed in language, Gregory followed the procedure found in the Introductory essay and in Power. The consistently understood usage of words and phrases denoting activity, confirmed men had a common notion of it, even if they sometimes applied it inconsistently in particular instances. He stated that activity was probably the most familiar common notion. It could be understood in two ways. In one sense, activity was "a generic term" which denoted a being either doing something or apprehending something to be done. Gregory stated this sense was implied in the meaning of all phrases involving transitive, intransitive and passive verbs. Because of its extreme generality, the exact signification of activity could not be defined accurately. Therefore Gregory confined his analysis to a second and more restricted sense of it. Activity denoted some change produced by an agent in the subject of any particular action.[49] Gregory referred to this sense of activity as only a "species" of the generic sense of activity. But it was useful precisely because it provided an accurate means of comparison with the relation of cause and effect in physics. Gregory defined the restricted sense of activity as

> The common notion ... of a being producing change ... by means of a voluntary exertion of its own power doing something in consequence of which change occurs or is produced.[50]

The philological basis of Gregory's argument throughout Activity was as follows. The complete distinction between the notions of activity and physical causation was evident in the fact that different forms of speech could be used to characterise each relation. In its strictly literal signification, activity was always expressed by active transitive verbs. The relation of cause and effect in physics entailed the use of neuter verbs implying event or change without any activity in the objects concerned. However, Gregory's problem remained because it was "very plain that we every moment employ transitive verbs either in the active or passive voice, in speaking of instances of cause and effect".[51] How was this to be explained? The fact that men thought no activity was present in the relation of cause and effect in physics could be shown

> By proving that it is merely in a figurative and analogical sense, and not in their proper, literal, and common meaning, that all words and phrases expressive of activity or implying that anything is done by a cause, are employed in speaking of the relation of cause and effect in physics.[52]

To do this, Gregory had to extend the scope of his linguistic analysis. In his Introductory essay and in Power, the evidence of linguistic usage was presented largely as proof of men's underlying common notions. The use of the words "cause and effect", "power" and "activity" indicated men's underlying common notions to which these referred. But to substantiate the distinctions between cause and effect in physics and activity, Gregory had to specify the import of language for determining not just the existence of common notions but their contents as well.

Gregory made it clear that he was developing a "philosophical investigation" of the structure of language in which attention was given to "the information and evidence which the usage and constitution of it afford".[53] This approach emphasised

> the import of the particular instances suggested in illustration of the words, and not to the various and ambiguous import of the words themselves considered apart from the instances employed in the different cases to explain them.[54]

What Gregory required was a clear case where a particular form of speech was consistently and routinely used to discriminate between the different cases of activity and causation. If this could be found, then, he argued, this proved that

> at least one, if not more than one, important circumstance, common to all the instances of cause and effect that are known to us, which does not occur in any one of those, of activity and vice versa.[55]

Unfortunately English, as Gregory noted, did not display this required distinction. In fact, the reverse was rather the case. In English, the want of proper inflections, the profusion of little words with ambiguous denotations, and a variety of other linguistic features "tend[ed] rather to conceal than to exhibit, those differences of thought which [it was Gregory's] object to point out".[56] Therefore Gregory chose to investigate the evidence provided by another more suitable language. He spent the whole of Activity 2 illustrating "proper instances of the different ways of expressing in Latin the relation of activity and that of cause and effect".[57]

The meticulous detail of Gregory's investigation need not be replicated here. All his numerous examples cohered around a particular rule of Latin syntax. This involved the use of passive verbs which demanded a different syntax according to whether the noun to which the verb referred, was considered an agent or cause. In the case of agents, the passive voice was marked with the preceding preposition "a" or "ab". Thus it was correct and literal usage to say "Hic liber scriptus est a me".[58] But in cases where the noun was considered as a cause, it took the ablative case without any governing preposition. Therefore the construction became "Hic liber scriptus est meâ manû".[59]

Thus even in the metaphorical usage, in which a book was spoken of as written by an author's hand, there was an evident syntactical difference. Therefore, Gregory concluded it was

> impossible to express in Latin by any neuter verb, except it be employed metaphorically, or even by a passive verb with the simple naked ablative, anything done by a living, sentient, intelligent active being.

However

> every instance of mere effect that is every event and occurrence in the material world, every phenomenon in physics, and its relation to its supposed cause may be accurately and without metaphor expressed in Latin either by a neuter verb, or by a passive verb with that naked Ablative.[60]

Having thus identified a consistently expressed difference in the language of activity and causation, Gregory could modify his former argument about the existence of common notions. A difference in linguistic realisation indicated a difference in the content of the respective notions of activity and a physical causation.

The whole of Gregory's argument rested upon the presumption that distinctions of linguistic usage referred to mental distinctions in common notions. As language users men must presuppose and understand these 'interior' differences, even if they did not raise them to consciousness. In this case, Latin was exemplary because it expressed

> simple and general notions, which are rational and common to all men and those plain and obvious differences and distinctions which all men are capable of conceiving and understanding.[61]

Although this was the case, Gregory also emphasised that no language was a perfect expression of men's exact thoughts.[62] Languages such as English were flawed. Therefore, the scientific metaphysician was at liberty to draw his evidence from a variety of languages to show what men were all capable of perceiving, understanding and thinking.[63] In <u>Activity 3</u>, Gregory applied his preceding argument analogically to English usage. The results of his analysis can be presented by means of a table.[64]

	ENGLISH USAGES RESEMBLING LATIN	GREGORY'S EXAMPLES
(i)	Relation of activity may be accurately expressed by:	
	(a) active verbs	(a) God created the heavens and the earth.
	(b) passive verbs	(b) The heavens and the earth were created by God.
	(c) circumlocations and the use of nouns derived from transitive verbs.	(c) God was the creator of the heavens and the earth.
(ii)	An event, occurrence or matter of fact may be considered independently of causation or activity by the use of neuter verbs.	The tower fell.
(iii)	The relation of events or matters of fact considered as effects to their causes, can be .literally expressed without the use of active or passive verbs or nouns derived from such verbs.	The ship overset with the wind.
(iv)	The relation of cause and effect may be expressed by the same words and phrases employed to denote activity, especially using transitive verbs in the active voice.	The earthquake overthrew the tower.
(v)	It is absurd and improper to combine both actions and causes in a sentence with respect to one verb, even though such sentences were syntactically correct.	Troy was burned by the Greeks and fire.
(vi)	Both the relation of the agent and the cause may be properly expressed using one verb by means of different forms of speech to distinguish the relations.	Tiberius killed Germanicus with poison.
(vii)	It is absurd to confound causation and activity by expressing an action by a neuter verb followed by the name of the agent governed by the same proposition.	Troy burned with the Greeks.

ENGLISH USAGES RESEMBLING LATIN		GREGORY'S EXAMPLES
(viii)	Neuter verbs and the prepositions used to denote causation may be used to express activity. But such usages are universally held to be metaphorical.	Abel fell at the hand of his brother.
(ix)	It is improper to confound causation and activity in certain phrases.	This book was written by my hand, or by my pen, or by my study or labour.

The main difference between English and Latin usage occurred when transitive verbs in the passive voice were used to express the relation of cause and effect. Thus using the passive equivalent of case (iv) given in the table, it was good English to say "The tower was overthrown by the earthquake." English usage, although strictly incorrect in Gregory's view, enabled the same preposition and the same phraseology to be used to express either activity or causation. In Latin, such phrases, when they denoted causation rather than activity, omitted the preposition which was only properly used in cases of genuine activity.[65]

Gregory explained this deviation of usage between the two languages as follows. In English the "analogical or figurative use of the proper expression had gone further". This was particularly true in cases involving what Gregory termed "mechanical power". Thus men were likely to use an expression like "The tower was overthrown by the earthquake" because of the analogy between it and the actions of a living person. As the analogy between the causal process and the actions of men diminished, then they were less likely to conflate the two in common usage. For example, there was less of an analogy between the operation of fire and human action. Therefore, Gregory stated, it was commonly regarded as ridiculous to say, for example "Fire was the burner of Troy."[66]

4. COMMON NOTIONS, THE CLASSIFICATION OF VERBS AND THE STRUCTURE OF SCIENTIFIC DISCOURSE

In the last section, Gregory's appeal to the structure of language to segregate the notions of power and activity from cause and effect in physics has been described. However, precisely what significance Gregory perceived this to have for natural philosophy has yet to be discussed. The purpose of this and the next section is to probe further into this question. It is important to emphasise that neither Power nor Activity in its original three section manuscript form was ever published.[67] Once again, material dealing specifically with natural philosophy is important but not prominent. Therefore it has to be brought to the forefront in the exposition.

Gregory considered that the different usages of active, transitive and neuter verbs was an important linguistic fact both for the nature of scientific discourse and the nature of the human mind generally. Yet the current recognition of its significance was hampered by an inadequate linguistic analysis of the structure of verbs. The first task Gregory set himself in Activity 1 was to develop a classification of the various kinds of verb. Gregory pointed out the utility of this by emphasising that both the notions of activity and power were expressed by verbs except in a small number of cases. He also criticised other accounts of the nature of verbs for regarding all verbs as expressing either being, doing or suffering. In his own classification Gregory included another class of verbs which he called neuter verbs. These verbs were related to becoming, waxing or growing and were implied in descriptions of physical causes and effect. Gregory's full classification was as follows:[68]

(i)	SUBSTANTIVE VERBS	:	those verbs expressing existence
(ii)	NEUTER VERBS	:	(a) those verbs expressing mere state or condition (b) those expressing event or change
(iii)	INTRANSITIVE VERBS	:	those verbs which imply something done by the subject of an action
(iv)	TRANSITIVE VERBS	:	(a) those verbs expressing a relation between a subject and the object of an activity in which no change takes place in the object

(iv)	TRANSITIVE VERBS (Cont'd)	:	(b) those verbs expressing a relation between a subject and the object of an activity in which change takes place in the object. This class are ACTIVE TRANSITIVE VERBS and express the relation of activity in its restricted sense
(v)	PASSIVE VERBS	:	those verbs expressing (iv)(a) and (b) in the passive form, thus altering the focus of attention in a sentence

In his description of the second class of neuter verbs ((ii), (b)), Gregory gave a number of Latin examples including "_calesco_" and "_albesco_" which meant to become hot or cold. Generally though, this class of neuter verbs expressed event or change "such, for instance, as is implied in the notion of change which we always regard in physics, when it occurs in an inanimate being".[69] Thus, in effect, Gregory stipulated his second class of neuter verbs as that one which always denoted the kind of change expressed by cause and effect relations in physics. Although event or change was implied in the meaning of all verbs, Gregory regarded it as evident

> that neither the substantive verbs nor any of the neuter verbs denote any kind of _activity_, or anything done, either by or to the being whose name is the antecedent or nominative to them.[70]

Given that Gregory's classification was itself determined by what he regarded as correct usage vis-a-vis the relations of causation and activity, what purpose could it serve? On purely analytical and critical grounds, it is difficult to see how Gregory's classification of the structure of language was not in fact a _petitio principii_, or question begging. However he did not perceive his classification of the structure of verbs as an independent proof of the distinction between causation and activity. Instead it was a piece of linguistic apparatus which helped men to attend to their common notions. For intransigent men who would not admit a distinction between causation, activity and power, Gregory suggested the following procedure to convince them of it:

> For this purpose let them attend carefully to those cases of activity where no change is produced, except in the active being; such cases are expressed by the intransitive and by the first class of transitive verbs. When they have learned to make activity, independently of any change being produced in a subject, a familiar object of thought, let them attend to the meaning of the second class of transitive verbs ... Lastly, let them attend to the import of the phrases where neuter verbs occur such as salt dissolving in water, or ice melting with heat. There they will find the notion of change occurring, but nothing like the activity which they conceived and understood in the other cases.[71]

Ultimately, language was made and perceived by men. Men's strict usage of language always corresponded to common notions in the human mind. In Gregory's view, attending to the evidence of correct linguistic usage actually guided the recovery of these notions:

> It is chiefly as an assistance in this attempt to attend to our most simple and fundamental notions with regard to the subjects of my enquiry, ... that I am disposed to attend minutely to the information and evidence which the usage and constitution of [language] afford[s].[72]

The recovery of men's notions through the practice of language was regarded by Gregory as very important. Despite their paramount importance to human life, such notions were actually little known or attended to. This was to be the function of Gregory's metaphysics of linguistic usage. The consequence of re-acquainting men with their "natural, simple and fundamental notions" was that men liberated themselves from the opinions and systems "held and taught by philosophers, from the days of Pythagoras, to those of Mr Hume". Common notions were

> parts, and very essential parts too of human nature; and may be regarded as the immediate operation, or inspiration of that power which hath made us what we are: while the systems formed of them are fabrications of our own, perhaps ingenious, or at least pleasing, but too often visionary and foolish.[73]

Nevertheless, such philosophical systems were predicted upon the same common notions shared with ordinary men. They could be combined in new ways but no man "could by any exertion or contrivance of [his] own create or form, new and simple notions". Thus:

> These simple, natural and fundamental notions, we must attend to likewise, not merely for their own sake, but in order to understand, and judge of those philosophical systems, of which they are the basis.[74]

Men were not only misled by a love of analogy and by ambiguous words. Philosophical systems were an effective barrier to understanding the structure of the human mind. This made direct appeals to men's consciousness ineffective. Therefore Gregory sought to reclaim what he regarded as the universal features of the mind by a circuitous appeal to language which had the additional advantage of appearing empirical and in conformity with the inductive scientific method.

The immediate field of application of Gregory's new linguistic technology for segregating physical causation and human activity was scientific discourse where such confusions were legion. Gregory pointed to the paradigmatic example of Newton's Principia to show that Newton was aware of the difference between the import of neuter and transitive verbs. For example, in his definition of centripetal force, Newton had substituted the neuter verb "tendo" for the passive verbs "trahor" and "impellor" because he wanted to exclude even the slightest notion of activity from the concept of a centripetal force. In this, and in other examples where he did have recourse to passive verbs, Newton

> effectually excluded all thoughts of the moving body being acted on by any agent from our conceptions of the motions which he was considering, leaving only the notion of a certain state or condition, which stands opposed to rest.[75]

However, Gregory noted that Newton "in some of his speculations" lost sight of the distinction between active and neuter verbs "as indeed most of his followers [had] done, perhaps deceived and misled, as all mankind [were] apt to be, by the unsuspected ambiguity of words".[76] The absence of a clear syntactical marker in English to differentiate whether activity or causation was denoted in sentences utilising passive verbs, contributed to this state of affairs. Gregory's classification of verbs gave him an authoritative means of policing scientific discourse and so maintaining the passivity of inanimate nature.

This was a particularly useful asset in relation to the English language. Gregory noted that in scientific reasoning, English had the advantage of brevity because the same word may be used on occasion as an active transitive verb, a transitive one or a neuter verb.[77] But this ambiguity could also mislead. Gregory's classification enabled the correct meaning to be aligned with its appropriate instance. For example, when it was said "The earth moves in an elliptical orbit"[78] the sense of "to move" was neuter. And when it was said "The earth is attracted by the sun",[79] this was only a metaphorical use of an active transitive verb. In this manner Gregory discussed the important example of the verb "to move" which was routinely used in mechanics. "To move" or the passive form "to be moved" could serve as a neuter verb or an active transitive verb. What determined whether it was deployed literally or metaphorically was always the particular instance of use. Gregory's classification of verbs was a metaphysical resource which enabled him to stipulate whether a literal or metaphorical use was actually the case. Thus when "to be moved" was deployed in denoting a cause and effect relation in physics, Gregory stated this was a metaphorical use. Or he stated that in this particular usage, the verb actually lost "the peculiar meaning of a passive verb, retaining only what [was] in common between neuter and passive verbs; to wit the expressing of event or state".[80] Gregory developed his classification of neuter verbs to determine what particular usages were valid in the science of mechanics. The meaning men were to understand from usages of "to move" or "to be moved" in mechanics could be interpreted as either neuter verb meanings or their equivalent phrases. In this fashion, Gregory aimed to expel any notion of the activity or power of bodies from scientific discourse and render mechanics the legitimate province of cause and effect relations.

5. DEMONSTRATION AND RELATION IN GREGORY'S SCIENTIFIC METAPHYSICS

Gregory's account of the constant conjunction between causes and effects in physics has been discussed in section two. His new metaphysical technology for distinguishing between physical causation and human activity has been extensively discussed in sections two and four. These aspects of Gregory's Project had two fundamental and persistent features in common. The first was that, throughout his work, Gregory made a careful discrimination about the epistemological limits of his enquiry. In almost all cases, he carefully and steadfastly distinguished between what all men must conceive to be the case about causation and activity, and the reality of both relations. This was a crucial distinction because, as we shall see, it was intimately connected to the demonstrative role Gregory considered his scientific metaphysics to have. The second and perhaps more important feature, was that Gregory always analysed the perceived relations between things and not the things themselves. In his discussion of constant conjunction, Gregory stressed he was concerned with the relation between those things and events that men considered to be causes and effects respectively. In his analysis of activity, Gregory emphasised that it was a relation between an agent and the change he produced in the subject of his action. In both these cases relations took analytical precedence over things related. This feature is important because Gregory's use of the concept of relation was closely connected to the central role that language played in his thinking, which distinguished his work from other writers who also utilised the concept of philosophical relations. Of course these major themes of demonstration and the analysis of relations were actually closely connected with one another. But for convenience of exposition, they will be treated consecutively here.

In Power and Activity, Gregory continued to emphasise the need for his scientific metaphysics to be demonstrative. The Introductory essay and Power were largely concerned to demonstrate men had common notions of physical causation and power. Activity took this a stage further because it attempted to demonstrate the difference between the relations of cause and effect in physics and activity. Gregory summarised the steps of this proposed demonstration in Activity 2. As the passage is rather lengthy, it can be paraphrased into a number of consecutive points which formed the parts of a three-stage argument developed by Gregory.

STAGE 1

(i) Language must be the expression of thought.

(ii) Therefore the Latin language must have expressed the thoughts of the people who used it.

(iii) Every word and phrase in common use must have just that meaning in every application of it, which it is employed and understood to denote.

(iv) Therefore the phrases employed in Latin to express the relations of activity and cause and effect must have expressed the thoughts of the Roman people with respect to these two relations.

(v) But those phrases are not in general convertible; therefore the thoughts expressed by them must have been different.

(vi) Those phrases employed occasionally to express either activity, or cause and effect cannot be employed to express both relations at once without a confusion of thought, incongruity and absurdity.

(vii) Therefore the thoughts expressed by them in these different applications must be incongruous as well as different.

STAGE 2

(viii) These rules and phrases of Latin which express the distinction between activity and causation are equally fit to express the thoughts of all mankind.

(ix) The thoughts so expressed by the Romans can be understood by others and accurately expressed by corresponding phrases in other languages.

(x) Others have actually learned to express the difference between activity and causation in Latin.

(xi) Therefore the peculiar phrases and syntax employed in Latin in speaking of activity and causation must express varieties of thought and distinctions real or supposed, between the two relations which all men either:

(a) must have perceived and acknowledged

or (b) must be capable of perceiving such distinctions when instructed.

STAGE 3

(xii) But it is impossible that all men should perceive and understand a distinction in order to be able to apply it uniformly and consistently to its proper objects where there is no difference among the things distinguished.

(xiii) Therefore there must be a real difference between the relation of activity and that of cause and effect.[81]

Thus Gregory's acknowledgement of the ambiguity, arbitrariness and contingent nature of language did not preclude his claim to have demonstrated point (xiii). However, he did express some doubts about the final stage of his argument. Gregory considered there were "certain necessary relations" between words and thoughts, which were either self-evident or demonstrable from those that were self-evident. Also there were certain necessary relations between thoughts and things. But Gregory was only prepared to say "there may be certain necessary relations between words and things".[82] Yet without this axiom Gregory could not proceed validly to stage three, which was the transition from what all men perceived, supposed and acknowledged was the case to what was really so. Almost everywhere else in the Project, the analysis to determine the existence of the common notion of physical causation and how it differed from other relations took precedence over the assessment of the validity of relations itself. The presuppositions of Gregory's scientific metaphysics ruled out any independent access to what was actually the case in nature. Instead nature had to be interiorised epistemologically. From this process, what men might reasonably believe about it emerged. The role of demonstration then, was to construct what men must believe about the world, based upon the constraints of the human mind, not to show what the world was really like. This emerges clearly in Gregory's discussion of the nature and constraints of demonstration itself.

Gregory's model for his demonstrative metaphysics of relations of change was founded upon parallels with the role of demonstration in both geometry and natural philosophy. For Gregory, geometry was always a paradigm example of a demonstrative science. However, there was a strong analogy between the role of demonstration in geometry and physics because:

> The simple ultimate facts in physics correspond to the axioms in geometry: a series of such facts, or as we commonly call it, a chain of causes and effects, corresponds to demonstration in geometry: the final result of such a series in physics corresponds to a complex proposition in geometry.[83]

Of course, Gregory noted, the difference between the two, lay in the status of their end products. In geometry, axioms and deductions from them were all necessary truths; whereas, for all men knew, their analogues in physics were only contingent. Yet this was ultimately irrelevant because "the limits of [men's] enquiries [were] the same in both: the knowledge of the simplest truths which are, or which must be".[84] The same applied to scientific metaphysics. It sought simple self-evident necessary truths about the human mind and from thence drew conclusions about what men must think and believe about nature. Thus, if men could consent to the existence and nature of their common notions, then they must consent to the deductions made from them. Gregory's scientific metaphysics had to be demonstrative in order to secure consent. In fact, as we have seen in the previous section, Gregory actually perceived his scientific metaphysics as a device for producing and securing consent in men's minds.

The second feature of Gregory's Project was the unremitting emphasis upon relations, not things. Different "species of change" perceived in nature displayed particular "relations of event" which characterised them. But how were men to know the relation of activity and physical causation and successfully distinguish between them? In Gregory's view, men knew activity and causation because they had common notions which referred to "being done by an agent" and "occurring, or coming to pass in consequence of a cause".[85] But the chief means of acquaintance men had with the common notions of activity and causation was through their realisation in language. This was the role of transitive and neuter verbs in their literal acceptations. Transitive verbs signified relations of activity; neuter verbs signified relations of causation. Thus the relations of language were representations of the cognitive relations men perceived according to their common notions:

> Those different forms of expression, appropriated to instances of activity and of causation, denote and plainly relate to differences real or supposed in the relations between the persons, things, and events, that are mentioned, and not by any means to the difference of the persons, things and events that are related, and are the subjects of discourse.[86]

Gregory acknowledged the emphasis on relations as the distinctive feature of his analysis at the close of Activity 3. Playing the devil's advocate, he proposed the following objection:

> It appears from the evidence of language that the natural suggestions of our faculties teach us to distinguish between the relation of any occurrence to mind, and the relation of any occurrence to any inanimate being that we regard as the cause of it: but may not this distinction depend entirely on the thing related not on the relation between them?[87]

In his reply, Gregory pointed to instances where agents were actually regarded as causes or, as Gregory put it, a person standing in the relation "of causes or occasion, to any event".[88] However, he also drew an example from physiology to show that some operations of the mind did not necessarily imply activity:

> Many remarkable occurrences or changes in our own bodies and some important functions of our animal oeconomy depend upon, and proceed from, certain states of the mind: yet such occurrences ... never were nor ever could be regarded by mankind as any actions of theirs.[89]

Thus the fact that agents' minds could sometimes be causes, indicated that it was not intrinsic natures of things that always determined the kinds of change associated with them.

From these and other similar remarks, it is clear that the general direction of Gregory's analysis of relations of change was away from the view that causes, in physics at least, were in any way productive of their effects. It might be objected, he said, that nothing could legitimately be called a cause that was not active in the production of its effect. But Gregory insisted that however the word "cause" was derived from the idea of production; or however men arrived at the notion of causation by the exertion of power, the evidence of language indicated that the term "cause" was "applied to certain things conceived to stand in a peculiar relation to the occurrences which happen in the material world". And that relation was expressed by the phrase "constant conjunction".[90]

Aspects of this 'de-ontologised' account of physical causation were actually carried over into Gregory's analysis of activity. Activity in its broadest sense was not confined to change produced in the object acted on, as denoted by active transitive verbs. 'There was another kind of activity in which change only occurred in the active being himself often denoted by intransitive verbs. So again different kinds of activity were determined by the relation in which active beings stood to other things. However, Gregory did not enter into any detailed analysis of the nature of a philosophical relation. It is clear that, in keeping with most of his contemporaries, he considered men's knowledge of relations was more reliable than knowledge of the things so related. Indeed, the emphasis upon philosophical relations was a standard feature of sensationalist epistemology.[91] Hume's own analysis of relations was presented in the Treatise but is less immediately apparent in the Enquiry.[92] Yet despite some similarity between Hume's and Gregory's use of the concept of relation, it does not follow that Gregory also viewed relations as a kind of complex idea. In fact Gregory explicitly denied this. An indication of Gregory's alternative position can be found in his Theory of the moods of verbs in which he connected the concept of a philosophical relation to a linguistic relation between words.

To reiterate, Gregory's essay Activity was the least complete part of the Project. It was certainly never published and it is not clear whether it was ever read to the Literary Class of the Royal Society of Edinburgh. Instead, it was something of a pilot study for his Theory, as Gregory revealed in his opening remarks:

> In the prosecution of certain philological and philosophical speculations, very ample specimens of which have already been submitted to the consideration of the Royal Society of Edinburgh, I had occasion to consider more minutely than I believe had ever been done before, many particulars relating to the nature the structure and the import of verbs.[93]

In Activity, Gregory dealt only with the various classes of verbs. His analysis was limited to their infinitive form only. Gregory argued that infinitives conveyed what he called the different "accidents" of verbs such as existence, state, event, intransitive action or transitive action.[94] He therefore ignored the "inflections" of verbs which Gregory classified into moods, tenses, persons and numbers.[95] In the Theory Gregory increased the power of his philologico-metaphysical microscope to consider the import of the moods of verbs. This change of direction appears to have led Gregory away from producing a detailed analysis of the role of neuter and active transitive verbs in natural philosophical discourse. However, Gregory's Theory does offer a considerable insight into how he perceived the general relationship between language and thought. Throughout Activity this was never really made explicit. Gregory merely insisted that language was necessarily the expression of thought. But how precisely did language express thought? Gregory's answer to this question reveals how completely he rejected the doctrine of ideas and with it the conventional apparatus for articulating the concept of a philosophical relation.

Gregory was critical of all former accounts of the moods of verbs, including one recently published by Lord Monboddo in The Origin and progress of language, volume 2.[96] However, Gregory's criticisms concerned the incompleteness and undue restriction Monboddo had placed upon such moods which he reduced to three: affirming, wishing and commanding.[97] What Gregory endorsed was much more significant. This was that the moods of verbs expressed what Gregory and Monboddo referred to as "energies" or "modifications" or "moods of thought".[98] Thus every grammatical mood was evidence of a corresponding energy of thought.

Gregory stated that all language was deficit in its capacity to express the variety and combinations which occurred in thought and this applied as much to the inflections of verbs as much as any other feature of grammar. Yet the moods of verbs expressed

> much better than any succession of words do, the intimate connection and the relation of various thoughts, which are not successive, but simultaneous or coexistent, and which appear unnaturally disjointed, and in some measure altered, when they are expressed by a series of words denoting each of them separately and in succession.[99]

Because of their capacity to be inflected, verbs were of vital importance in the expression of thought. Gregory noted it was often very necessary to break-down the simultaneous mass of human thoughts into regular trains of succession. For this the grammatical arrangement of words was eminently suitable. But it remained the case that

> many single words, for example prepositions, and most sentences, denote some kind of relation but we cannot, I think, conceive a relation, without thinking at once of the things (two or more) that are related, as well as of the relation (both in its generic and in its specific nature) that subsists between them.[100]

In this process, verbs played a crucial role by conveying relations such as cause and effect and activity, in which a number of thoughts were represented simultaneously.

In his discussion of the simultaneity of thought and its linguistic realisation in the inflections of verbs, Gregory emphasised that thoughts were never arranged in an order of place. This was self-evident to anyone who could

> shake off the long established philosophical hypothesis of ideas, or images of things in the mind, as subservient to thought; or even who will take the trouble to distinguish between such supposed images, which like those of a magic lanthorn, may be conceived to be arranged in place, and the thoughts corresponding to them.[101]

Similarly, the simultaneity of thought would only be questioned by adherents of the doctrine of ideas who had imbibed the dogma that a person could only have one thought at once. Gregory clearly opposed the ideal theory of mind. Furthermore, he argued that the complex energies of thought denoted, in the main

> the social operations of mind as they have been very properly termed by Dr. Reid; that is to say, such as to imply the belief of some other intelligent being to whom they are related and which cannot be supposed to take place in a solitary being.[102]

In the final part of the Theory, Gregory returned to his favoured comparison with the nature of mathematics to bring out the fundamental importance of moods of verbs and the inflections of language generally. Gregory stated that mathematical propositions expressed "co-existent thoughts which bore no relation at all to time".[103] "When such propositions were contained in a complex theorem, they represented "masses of co-existent thoughts". Whereas all men could readily conceive of an axiom or simple mathematical proposition, many often had great difficulty in thinking of a number of co-existent mathematical objects and relations simultaneously. This was not easily overcome by examining individual items serially in words. Instead, men had to develop the "comprehensiveness of mind" by which good mathematicians comprehended a set of mathematical relationships at a glance without going through all the laborious stages of demonstration. Mathematicians and ordinary men could be helped in this matter by the astute use of diagrams and mathematical formulae in algebra. Gregory maintained that there was an analogy between the role of such diagrams and formulae in mathematics and the role of moods of verbs and inflected language in common discourse. Both expressed

> infinitely better than any succession or arrangement of words can do, combinations of thoughts which are almost perfectly co-existent and which by means of them, are apprehended more justly, more quickly and more forcibly than otherwise they could be.[104]

If anything, the use of such verbs in ordinary language served to express "masses of co-existent thoughts" which were more complicated than those to be found in mathematics, even though the latter were more abstruse.

The glimpses of Gregory's otherwise unarticulated theory of language found in the Theory indicate further aspects of how Gregory perceived the themes of language usage, philosophical relations and demonstration to be connected. Firstly, Gregory considered common notions such as cause and effect in physics and activity were simultaneous groups of thoughts which were instantly self-evident to men. Secondly, the evidence of language and verbs in particular, were indications of and evidence for relations of thought which made up men's common notions. Thirdly, Gregory perceived demonstration as a kind of serial unfolding of the simultaneously self-evident relations of thought by attending carefully to the structure of language itself. Thus by showing the structure of verbs, Gregory was at the same time uncovering and demonstrating the nature of thought and the contents of men's minds.

6. CONCLUSION

The material presented in this chapter as a whole has shown how Gregory developed his new metaphysical technology for maintaining the boundary between physical causation and human activity. Gregory perceived that this boundary had been infringed during the Kames-Stewart debate. This had cast into doubt men's understanding of mechanics. In particular, Gregory considered that Kames used his necessitarianism to assert the activity of matter. But, although he was generally sympathetic to Stewart's defence of inertia, he criticised the precise form this took. Thus Gregory agreed with Stewart that the aim of the "Newtonian" philosopher was to show that all Newton's laws were in fact founded upon the passivity of matter. But he rejected the second part of Stewart's task, which was to justify why matter should be considered a passive instrument under the dominion of higher active powers. In place of Stewart's insistence on the role of active beings as the superintendent agents of the deity, Gregory developed his relational account of cause and effect in physics. Instead of the metaphysical hegemony of mind-based efficient causes, Gregory tried to demonstrate that the relations of causation and activity were categorically different. Furthermore, this difference was apparent in the structure of language. In this way, Gregory ceased to emphasise the role of mind as the sole underlying efficient causes of all physical processes. However, he continued to maintain that men rightfully possessed power, the free exercise of which distinguished them from physical nature. This led Gregory to an unusual two-way defence of his position. He had to assert that power existed and was correctly known as an attribute of mind, not matter. But he also had to uphold the view that physical causation did not imply any activity, produced either by the powers of matter, or by mind-based efficient causes.

Significantly, Gregory was not alone in rejecting the form the defence of matter took in the writings of John Stewart, Thomas Reid and Robert Whytt, who are also discussed in subsequent chapters. Lord Monboddo expressed severe doubts about the role of active powers in Newton's philosophy and in the writings of those who called themselves "Newtonians".[105]

In his volumes of Ancient Metaphysics, Monboddo discussed both Newton and Newtonian natural philosophy. Like contemporary historians of science, Monboddo was greatly interested in Newton's writings. He did not have access to the manuscripts from which present-day commentators extract the 'real' Newton's views. But he did subject Newton's published texts to critical scrutiny. While he failed to appreciate all the changes present in successive editions of the Principia, he used Coates's Preface to the second edition containing the General Scholium. Also, he compared the Latin 3rd edition with its English translation three years later. He followed a similar procedure and compared statements in the Principia with the Queries in the Opticks; he also made use of Newton's correspondence with Bentley. Monboddo examined the writing of 18th century Newton commentators, such as John and Samuel Clarke Whiston, Derham and their Scottish counterparts Baxter and MacLaurin, as well as the French commentary by Le Seur and Jacquier. Monboddo corresponded with Richard Price and Samuel Horsley, the 18th century editor of Newton's Works. He discussed Priestley's views with both of them. Finally, Monboddo was on familiar terms with members of Scotland's scientific literati, including Dugald Stewart, Playfair, Robison, Black, Hope, John Steadman, and Hutton. In these various ways, Monboddo's views provide a valuable perspective on the nature, status and propriety of Newton's natural philosophy in the later 18th century.

Monboddo argued that Newton's first law conflated the distinction between motion and rest. This blurred the more fundamental distinction between mind and body, which formed the basis of Monboddo's conception of a theologically sound scientific metaphysics. Rather like Gregory, Monboddo developed his arguments by examining the language of both the English and Latin 3rd editions of the Principia. He contended that even in Latin, the distinction between moving and being moved was not always maintained, and he contrasted this with the perfect denotation evident in Greek.

Monboddo considered that Newton's natural philosophy raised problems about the powers of matter and the eternity of motion which could not be solved by mechanical philosophy and geometry. Instead, they were metaphysical questions. Because of Newton's ignorance of the philosophy of mind and its role in producing and sustaining motion, his astronomy had opened the way for a thoroughly mechanical and materialistic philosophy of nature. In particular Newton failed to distinguish what, for Monboddo, were two fundamentally different kinds of motion. These were motion produced by the operation of body on body, and that produced by mind on body. Monboddo contended that the former was exclusively the concern of the Principia, and that the formulation of the first law of motion referred only to motion which resulted from body operating on body, or what he termed mechanical motion. This was because, for Monboddo, mind-produced motion required the constant agency of mind to sustain it. Thus when mind acting as efficient cause ceased to maintain it, the motion also stopped. But Newton's law predicted that motion was propagated indefinitely after impact:

> In short, through the whole Principia, he treats of no other motion but that which is produced by body operating on body. And his notions appear to me to have been so gross, and so little raised above matter, that he had no idea of any moving power, except that alone which is perceived by sense; I mean body.[106]

Monboddo used his analytic classification of different kinds of motion to undermine the status of mechanical motion produced by impulse and confine its role in natural events to impacts only, after which mind-based efficient causes took over. In his view, this account of motion supported and maintained:

> That all the great motions in the world are caused by some Immaterial Power ... perpetually and actually exerting itself every moment, in every part of the world and that the Original Laws of Motion themselves cannot continue to take place, but by something superior to Matter, continually exerting on it a certain force or power, according to such certain and determinate laws.[107]

Monboddo systematically worked through Newton's writings on the subjects of gravity, elliptical motion, comets' tails, planetary perturbations, subtle etherial fluids in magnetic and chemical phenomena, and God's sensorium of space and the role of the nervous ether in perception. In each case, instead of interpreting such instances as indications of Newton's providential, voluntarist and active philosophy of nature, he regarded them as indications of mechanism and materialism in Newton's thought. He therefore connected the development of Newtonian natural philosophy in the 18th century to sensationalist epistemology in the hands of Locke, Berkeley and Hume.[108]

To oppose what Monboddo regarded as the 'unholy alliance' of Newton's natural philosophy and sensationalist epistemology, he sought to develop an alternative philosophy of nature. This was based upon a rehabilitation of Aristotelian metaphysics. He considered that nature was animated by a hierarchy of minds which men could progressively know because of innate ideas planted in their minds by God. When such ideas were awoken by the senses, they became progressively free of what Monboddo regarded as the corruption of matter, and so offered the possibility of demonstrative knowledge.[109]

It is important to emphasise that Gregorian scientific metaphysics was not just criticial of forms of necessitarianism developed by Hume and Kames which sought to understand the actions of men by analogy with the behaviour of bodies. He regarded ambiguities about the role of mind in nature which were evident, for example, in Monboddo to have been equally detrimental to natural philosophy and metaphysics. In contrasting both necessitarian and voluntarist positions with his own, he noted the range of views about body and mind in nature. Some writers denied body, some denied mind, while others denied both. Gregory added:

> One author at least may be found, who holds, that there is in every living person, and even a vegetable, a plurality of minds, of different kinds of orders; nay, there is a mind of a certain kind, in every particle of matter, which is the principle of motion, or of every change whatever in it; without the agency of which, motion could not begin, nor even continue in a body.[110]

By emphasising relations of event and men's indirect knowledge of mind and body through their attributes, Gregory considered that many of the ontological ambiguities which hindered the reform of natural philosophy could be avoided. Epistemological interiorisation involved justifiable claims about what men must believe about body and mind. Hence Gregory stated that despite being "in the dark" about the real nature of such substances, the infinite differences in their respective attributes led "the wisest and best men to believe they were essentially different".[111]

From a lengthy note appended to Activity 2, it is evident that Gregory had Monboddo's Ancient Metaphysics as well as his work on language very much in mind while developing his own linguistic technology for maintaining the passivity of matter.[112] Gregory's remarks make it clear that he perceived Monboddo was attempting a similar task to his own, based on the distinction uniformly observed in Greek being moving and being moved. However, Gregory considered that the definitions of mind as that which moves, and matter as that which is moved were insufficient:

> If every thing which is in motion yet does not move itself be moved, in the literal sense of the passive verb, it will follow according to the proposed definition that what at one time is Mind, at another time may be matter; nay, that the same thing may be at once both mind and matter; which I am sure was very far from the thoughts of the learned Author whose reasonings I am at present considering.[113]

Gregory did not discuss Monboddo's views any further. Instead, the critique of Ancient Metaphysics was developed more fully by Robison.[114]

Overall, this exposition has brought out Gregory's emphasis upon the analysis of relations. It was also suggested that the whole of Gregory's analysis tended away from the notion of causes being in any way productive of their effects. However, it is equally important to note that Gregory still had recourse to an ontological criterion to distinguish what actually was an active being. This was that active beings possessed the power to act or not. Thus power, unlike activity and physical causation, was not a relation as such, but "an attribute of mind" which, ex hypothesi, was not present in matter or body. Gregory stated that in all cases of physical causation it was rational to enquire how a cause exerted its power, if and only if, men conceived something was actually done by a physical cause. Buf if:

> it be true, or conceived only, that iron moves or tends to move towards the magnet, that it dissolves in the acid, and that it melts with heat, it would be very foolish to enquire about the power of the magnet, the acid, and the heat to attract to dissolve or to melt the iron: for we should then have no reason to think that they do anything; and where being is not conceived to do anything, there is no occasion to attribute power to it.[115]

Gregory's analysis and his pluralistic theory of change embraced two positions simultaneously. On the one hand, physical causation implied no power, nor any relation between a being with power and a subsequent event. Thus physical causes had nothing to do with agents at all. On the other hand, activity was a characteristic of beings possessing power, which they exerted to produce change, either in themselves or in objects they acted on. To maintain the boundary between physical causation and human activity Gregory insisted that, speaking literally, it could not be said "that a man [was] the cause of his own voluntary actions".[116] Nor, - and here the implications were yet more startling - could it even be said "that the Deity [was] the cause, the first cause of the universe".[117] Thus according to Gregory there was no activity in causation and there was no causation in activity.

In articulating the claims for his pluralistic theory of change, Gregory persistently criticised what he perceived as contemporary forms of voluntarism and necessitarianism. Though Gregory also considered other forms of scientific metaphysics such as Monboddo's, he was mainly concerned with Reid and Hume as the major protagonists of these images of natural order. In fact, Gregory put forward many of the claims of the Project in the form of a critique of Reid and Hume, perhaps the two most important metaphysicians of the period. Because of Gregory's interiorised metaphysics of "relations of event" and his emphasis upon the role of language, the discussion centred upon the vocabulary of causation and the deployment of key concepts such as physical cause, efficient cause, power and necessary connection. The nature and significance of Gregory's critique is the subject of the next chapter.

REFERENCES TO CHAPTER 3

1. Introduction, xxv.

2. Ibid., x-xi.

3. Ibid., cxxi.

4. Ibid., cxxxvii.

5. Ibid., xxi.

6. Ibid., xii.

7. Ibid., xiii.

8. Essay, 38-39. Gregory actually censured Hume for endorsing this maxim, despite Hume's remarks in the Treatise, 78-82. This was probably because Gregory confined his analysis of Hume almost exclusively to the Enquiry, where Hume omitted much of the detailed discussion found in the Treatise. Gregory's treatment of Hume is discussed in the next chapter.

9. Essay, 41.

10. Introduction, xviii.

11. Essay, 51.

12. Introduction, xxi-xxii.

13. Ibid., ccxiv.

14. Ibid., clxxxiii.

15. Essay, 25,30; Activity 3,38.

16. Introductory essay, 3.

17. Introduction, ccxl.

18. Essay, 298.

19. Power, 3.

20. Introductory essay, 132.

21. Essay, 29.

22. Introduction, cxx.

23. Ibid., ccxxiv.

24. Ibid., xvii-xviii.

25. Essay, 278-79.

26. _Ibid._, 282-83, 298.

27. _Activity 1_, 34.

28. _Introduction_, ccxviii.

29. _Ibid._, cxxxix.

30. _Ibid._, cxliv.

31. _Ibid._, ccxviii.

32. _Introduction_, ccxxii-iii.

33. _Essay_, 185.

34. _Power_, 4-5.

35. _Ibid._, 22-23 (my paraphrase).

36. _Ibid._, 11.

37. _Ibid._, 8.

38. _Ibid._, 13.

39. _Ibid._, 20.

40. _Ibid._, 9.

41. _Ibid._, 17.

42. _Ibid._, 21-22.

43. _Ibid._, 19.

44. _Ibid._, 25.

45. _Ibid._, 29-30, note opposite.

46. _Ibid._, 29.

47. _Introductory essay_ 16.

48. _Activity 1_, 48.

49. _Ibid._, 33. Strictly speaking, Gregory noted that activity was closely connected to the verb "to do", just as power was connected to "can" or "to be able". Thus there were forms of activity where an agent did something, but not relative to an object which was the subject of his action. Gregory referred to this kind of activity as intransitive activity and virtually excluded it from consideration in his analysis.

50. *Ibid.*, 34. Gregory did not explicitly clarify the distinction between activity and power. But the difference lay in the fact that whereas activity was a relation, power was an attribute of mind. Thus, in order to be agents, men had to possess power; but power was not itself a relation.

51. *Activity 2*, 1. Throughout *Activity* and *Power*, when Gregory used the phrase "cause and effect", he made it clear he was referring to cause and effect in physics or physical causation.

52. *Ibid.*, 3.

53. *Ibid.*, 3-4.

54. *Introduction*, cxliii-iv.

55. *Activity 2*, 2-3.

56. *Ibid.*, 8-9.

57. *Ibid.*, 16.

58. *Ibid.*, 30.

59. *Ibid.*, 30-31.

60. *Ibid.*, 30.

61. *Ibid.*, 10-11.

62. *Ibid.*, 39.

63. *Ibid.*, 12.

64. *Activity 3*, 2-12 (my summary and paraphrase of main points).

65. *Ibid.*, 6,10.

66. *Ibid.*, 6-8.

67. See appendix II.

68. *Activity 1*, 35.

69. *Ibid.*, 18.

70. *Ibid.*, 20-21.

71. *Activity 3*, 33-34.

72. *Activity 2*, 3-4.

73. *Ibid.*, 5.

74. *Ibid.*, 6.

75. *Ibid.*, 48.

76. *Ibid.*, 46.

77. *Activity 3*, 3.

78. *Ibid.*, 3 and 4.

79. *Ibid.*, 5.

80. *Activity 2*, 53-54, note opposite.

81. *Ibid.*, 36-38 (my paraphrase).

82. *Ibid.*,

83. *Power*, note AB (unpaginated).

84. *Ibid.*

85. *Activity 2*, 69.

86. *Ibid.*, 31.

87. *Activity 3*, 34, "Objection 3rd". This was one of five hypothetical objections that Gregory considered. He noted these as principal difficulties of his position. He stated they were either proposed by himself, or suggested to him by "different persons for whose judgement and knowledge [he] entertain[ed] very great respect."

88. *Activity 2*, 31.

89. *Activity 3*, 35.

90. *Ibid.*, 32, "Objection 2nd".

91. See, for example, the discussion in John Locke, *An essay concerning human understanding*, abridged and edited by A.S. Pringle-Pattison (Hassocks, Sussex and Atlantic Highlands, New Jersey, 1978), 175-203.

92. Hume, *Treatise*, 13-15. For an account of the technical details of Hume's philosophy of relations see R.W. Church, "Hume's theory of philosophical relations", *Philosophical review*, 50 (1941), 353-67; Alan Hausman, "Hume's theory of relations", *Nous*, 1 (1967), 255-82; and his "Some counsel on Humean relations", *Hume studies*, 1 (1975), 48-65, which summarises present-day disagreements between philosophers over this issue.

93. *Theory*, 193.

94. *Ibid.*, 197.

95. This explains why Gregory's analysis of verbs in Activity was confusing when it came to discussing specific examples. For having denominated the verb "to move" as a neuter verb when used in physics, then Gregory insisted it remained so, even in reflected declensions such as "The earth moves in an elliptical orbit".

96. James Burnett, Lord Monboddo, Of the origin and progress of language, 6 vols. (Edinburgh and London, 1773-92), vol. 2, 117-73, especially 161-73.

97. Theory, 206, Gregory's expanded list included affirming, denying, testifying, foretelling, asking, answering, wishing, hoping, expecting, believing, knowing, doubting, supposing, stipulating, being able, commending, praying, requesting, supplicating, loving, hating, fearing, warning, swearing, advising, refusing, exhorting, dissuading, encouraging, promising, and threatening.

98. Ibid., 204.

99. Ibid., 216.

100. Ibid., 243.

101. Ibid., 241.

102. Ibid., 215.

103. Ibid., 243.

104. Ibid., 245. See also Essay, 94-95.

105. Lord Monboddo, Ancient metaphysics or the science of universals, 6 vols. (Edinburgh, 1779-99). The chief discussions of Newton are to be found in the appendix to volume 1, "Dissertation on the principles of Newtonian philosophy", 497-555; and book five of volume 2, "Of the principles of Sir Isaac Newton's astronomy", 316-461. However, there are important comments throughout. See also William Knight, Lord Monboddo and some of his contemporaries (London, 1900) for Monboddo's correspondence. The only book on Scottish philosophy which discusses his philosophy in any depth is Henry Laurie, Scottish philosophy in its national development (Glasgow, 1902), 181-201. The most recent study is E.L. Cloyd, James Burnett, Lord Monboddo (Oxford, 1972); but see also Joseph P. Blickensderfer, A study of Lord Monboddo and his works (Ph.D. thesis, Harvard University, 1926). The chief manuscript source for Monboddo is National Library of Scotland Acc 5738, which contains 22 boxes of material. See box 6, item 162, "Observations on the Newtonian philosophy".

106. Monboddo, Ancient metaphysics (ref. 105), vol. 1, 526.

107. Ibid., vol. 2, 356.

108. *Ibid.*, vol. 2, 448 and passim. Monboddo also discussed Locke's philosophy in National Library of Scotland, Acc 5738 (ref. 105), box 8, 267; box 9, 280. The material in box 9 is of particular interest because it also considers Reid's response to Locke and Hume as found in the "Inquiry".

109. Monboddo's views on causality, ideas, and demonstrative knowledge may be found in "Containing the principles of science and of truth and certainty", *Ancient metaphysics* (ref. 105), vol. 1, 373-496.

110. *Essay*, 156.

111. *Ibid.*, 158.

112. *Activity 2*, 49-62, note AB opposite.

113. *Ibid.*, 49-51.

114. See for example "Physics" in the *Encyclopaedia Britannica*, 3rd ed., 18 vols. (Edinburgh, 1797) vol. 14, 637-59, especially 640.

115. *Power*, 29-30, note opposite (emphasis in original).

116. *Activity 3*, 35, "Objection 4th".

117. *Ibid.*, 36, "Objection 5th".

CHAPTER 4

GREGORY'S CRITIQUE OF REID AND HUME

1. INTRODUCTION

2. THE CRITIQUE OF REID: EFFICIENT CAUSE AND PHYSICAL CAUSE

   2.1 The nature of Gregory's objections

   2.2 Reid's response to Gregory

      2.2.1 The nature and scope of efficient causes

      2.2.2 The status of physical causes

      2.2.3 The evidence of language in metaphysics

      2.2.4 Nescience and the operation of efficient causes

3. THE CRITIQUE OF HUME: POWER AND NECESSARY CONNECTION

   3.1 The problem of reading Hume

   3.2 Gregory's criticisms of power

   3.3 Gregory's criticisms of necessary connection

4. HUME, NATURAL KNOWLEDGE AND THE PROBLEM OF CAUSATION

5. CONCLUSION

1. INTRODUCTION

In the previous chapter, Gregory's pluralistic theory of change was described and discussed. Gregory continually emphasised the need to differentiate between relations of event, such as physical causation, and activity. The evidence of language was presented as an empirical confirmation of the distinction between such relations in human thought. But language was also perceived by Gregory as the means of demonstrating, and maintaining the distinction between physical causation and human activity in the discourse of scientific metaphysics itself.

In Gregory's view, two principal difficulties impaired the development of scientific metaphysics. One was fallacious appeals to the evidence of consciousness; the other was men's instinctive predilection to discover analogies, or similarity relations between things. The ambiguous and metaphorical use of language was detrimental to metaphysics and led to the mistaken belief in natural philosophy that inanimate bodies were active and possessed power.[1] Gregory commended his own scientific metaphysics precisely because of the strictures it imposed upon analogical reasoning.[2]

The discovery of similarity relations had its most damaging consequences in the analysis of causation itself. What Gregory called the current "perplexity" of scientific metaphysics was due to the practice of referring "every kind of event or effect which [men] observed to one kind of cause".[3] Thus necessitarians emphasised the hegemony of physical causes to the detriment of other relations of change. Voluntarists emphasised the hegemony of efficient causes in an equivalent fashion. Gregory considered that Hume and Reid were representative of these necessitarian and the voluntarist orientations respectively. The common factor was that both men advocated forms of causal monism:

> It appears to me that Dr. Reid and many philosophers who hath thought and argued nearly as he hath done, have gone just as far wrong as one side as Mr. Hume, Dr. Priestley or Mr. Leibniz, or, in general, all assertors of the doctrine of necessity have done on the other.[4]

Gregory sought to ameliorate what he perceived as the stark contrast between these positions by maintaining that, just as there were many events which men had no reason to refer to activity or efficient causes, there were also other events which could legitimately be understood in this way; and vice versa, for physical causation or cause and effect in physics.

Gregory developed and defended his pluralistic theory of change by means of a critique of Reid and Hume. The purpose of this chapter is to document and discuss the nature and significance of these exchanges. However, no attempt is made to stipulate what either Reid or Hume 'really said' and then compare this with Gregory's version. Rather it is to focus upon what issues emerged as important when Gregory compared and contrasted his views with Reid's and Hume's. Thus in the next section, Gregory's criticisms of Reid are outlined. Then Reid's various responses to Gregory's Project are considered. In section three, a similar procedure is followed for Gregory's criticisms of Hume, which concentrated upon Hume's use of the terms "power" and "necessary connection". Then Gregory's reading of Hume is discussed in relation to a more general problem of interpreting Hume's philosophy. This problem is also very evident in present-day philosophy and concerns whether Hume should be considered as a negative, sceptical and destructive, or as a positive, naturalistic and constructive philosopher. The currently accepted view is that Hume's 18th century Scottish critics read him as an unremitting sceptic. However, it is shown here that Gregory does not correspond to this simple picture. Gregory perceived naturalistic as well as sceptical tendencies in Hume's philosophy. In fact Gregory placed more emphasis upon the dangers of Hume's naturalism, or what Gregory called Hume's necessitarianism. In section four, what is termed the Janus-faced nature of Hume's metaphysics is discussed and illustrated by an analysis of Enquiry 7 and 8. It is argued that Hume's new-modelled necessitarianism did not entirely conform to that found, for example, in Kames's writings, or in Scottish scientific metaphysics generally. The distinctiveness of Hume's position stemmed from his relative lack of concern with the ontological categories of matter and spirit, for which he substituted an account of the nature of causal inference in human judgements about the world. Thus Hume's distinctive programme for attaining the epistemological interiorisation of nature was itself instrumental in shifting discussion about the powers and laws of nature to prior questions about the powers and laws of the human mind. In conclusion, the discussion returns to Gregory. It summarises the similarities and differences between Gregory's, Reid's and Hume's deployment of the key concepts of constant conjunction, power and necessary connection.

2. THE CRITIQUE OF REID: EFFICIENT CAUSE AND PHYSICAL CAUSE

2.1 The nature of Gregory's objections

Gregory's major published work, The philosophical and literary essays, was prefaced with a dedicatory letter to Reid. In it Gregory acknowledged his obvious debt to Reid, whom he regarded as the chief saboteur of the ideal system or theory of ideas: "that false system of science" which Reid "so happily exploded as dangerous to the best interest of mankind".[5] Yet in the same brief letter Gregory also made reference to a difference of opinion between them. Gregory 'glossed' this by stating that Reid had taken a more remote and general view of a number of points which he "had occasion to examine very minutely". He also cautioned readers not to either mistake the nature and significance of their disagreement or to disregard the agreement between them on other important principles.[6] Later, Gregory emphasised that what he regarded as Reid's errors and short-comings did not affect Reid's fundamentally correct philosophy of mind where it dealt with men's active powers and moral responsibility.[7] Evidently, this disagreement between them was something of a sensitive subject. Reid certainly sought to play it down at several points in his letters and remarks.[8] Several years later Dugald Stewart returned to the subject with a similar aim during the "Leslie Affair" in 1805.[9] What, then was Gregory's assessment of their differences?

Gregory characterised Reid as an advocate of a particular kind of causal monism where

> every change which we observe always proceeds (as many of them unquestionably do) either immediately or ultimately, from the agency of some living being, perhaps from the immediate operation of the supreme being himself.[10]

Gregory regarded this as a metaphorical usage of the term "cause"; it was like saying God was the father of all things. Yet Reid and many other philosophers considered the manner of God's actions in nature, a fit subject of scientific enquiry.

Some even held the notion of efficient causation to be a law of thought. By efficient causation Gregory understood what he termed "activity", or that relation of change in which a man stood "to his own voluntary actions, or to those changes which he produce[d] directly in himself, and by the occasional exertion of his own power".[11] In his search for terminological exactitude, Gregory strove wherever possible not to describe activity as a kind of causation at all. Gregory certainly regarded it as self-evident that agents such as men and the Supreme Being existed. What he objected to was that all events should be referred to efficient causes, which always implied the operation of such agents and powers. Gregory argued that, while all men must believe in the existence of such beings, it was not a necessary truth that all events had to be referred to them.[12] From Gregory's remarks, it is clear that he had reservations about the scope of Reid's voluntarist image of nature and its applicability to natural philosophy.

To support this evaluation of Reid's position, Gregory gave a number of exemplary quotations, all of which were taken from the Essays on the active powers:

1. The exertion of active power we call action; and as every action produces some change, so every change must be caused by some exertion, or by the cessation of some exertion of power. That which produces a change by the exertion of its power we call the cause of that change; and the change produced, the effect of that cause.

2. From this principle it follows, That everything which undergoes any change, must either be the efficient cause of that change in itself, or it must be changed by some other being. In the first case, it is said to have active power, and to act in producing the change. In the second case, it is merely passive or is acted upon, and the active power is in that being only which produces the change.

3. A constant antecedent or concomitant of the phenomenon whose cause is sought, may answer the purpose of the inquirer, as well as if the real cause were known. Thus a sailor desires to know the cause of the tides, that he may know when to expect high water. He is told that it is high water when the moon is so many hours past the meridian: and now he thinks he knows the cause of the tides. What he takes for the cause answers his purpose, and his mistake does him no harm.

4. Thus we say, the sun rises and sets, and comes to the meridian; the moon changes; the sea ebbs and flows; the winds blow. Languages were formed by men who believed these objects to have life and active power in themselves. It was therefore proper and natural to express their motions and changes by active verbs.

5. But as to the real causes of the phenomena of nature, how little do we know! All our knowledge of things external must be grounded upon the informations of our senses; but causation and active power are not objects of sense; nor is that always the cause of a phenomenon which is prior to it and constantly conjoined with it; otherwise night would be the cause of day, and day the cause of the following night.

6. It is to this day problematical whether all the phaenomena of the material system be produced by the immediate operation of the First Cause, according to the laws which his wisdom determined, or whether subordinate causes are employed by him in the operations of nature; and, if they be, what their nature, their number, and their different offices are? And whether, in all cases, they act by commission, or in some, according to their discretion.[13]

From Gregory's perspective, these representative quotations and indeed the "whole tenor of his reasoning" showed that Reid had not "attended to the many important differences among several kinds of causes; especially between agent and physical cause".[14] He noted that Reid was entirely right in his analysis of human active power, and that Reid had, on occasions, supported his position with evidence from linguistic usage. But he accused him of failing to attend to the difference between literal and metaphorical uses of transitive verbs in both the active and passive voice. Reid also disregarded the evident differences between active and neuter verbs. Reid had

> on many occasions made an admirable and truly philosophical use of the evidence which language affords with respect to thought. But on this point I think his observations inaccurate and inconclusive, and his induction imperfect and consequently erroneous.[15]

Finally, Gregory stated that the maxim "Every change or effect must have a cause"[16] when understood in Reid's sense of efficient cause was not acceptable to natural philosophers who commonly adopted a very different conception of causation. Many metaphysicians would also reject it, especially Hume, Priestley and their necessitarian disciples.

The remarks contained in Gregory's <u>Philosophical and literary essays</u>, some of the objections posed at the end of <u>Activity 3</u>, and a very important note amended to <u>Power</u> form all that is known of Gregory's criticisms of Reid. Gregory's letters to Reid appear no longer extant. A similar fate seems to have befallen Reid's original letters to Gregory. Fortunately, they were arranged and published beforehand by Sir William Hamilton in his 19th century edition of Reid's <u>Works</u>. This is probably now the only source for them.[17] Reid's letters to Gregory, and to Kames, have become a major source for understanding Reid's conception of physical causation and his philosophy of science generally.[18] This is understandable because although Reid continually deployed ideas about physical causation in his books, his discussions were almost invariably intertwined with other tasks, for example, with natural theological arguments about first causes or with polemical refutations of the ideal theory of perception.

Despite the greater accessibility to Reid's views that Gregory's letters offer, a number of problems attend their use. These concern Hamilton's editorial arrangement. He was certainly aware that Reid's commentary referred to Gregory's work. However, he mistakenly considered all Reid's remarks dealt with the *Essay* and the *Theory*, the only parts of the *Project* to be published. In fact the comments concerned the *Project* as a whole, including the unpublished essays presented to the Royal Society of Edinburgh. From various remarks in the letters, it is clear that Reid sent Gregory (and Dugald Stewart) drafts of essays making up the *Intellectual powers* and *Active powers*.[19] Both younger men made comments and suggestions. They also assisted with the details of publication. Reid's earliest surviving letter was written to Gregory early in 1783, a few months after Kames's death. For the next ten years, Gregory became Reid's replacement philosophical correspondent and Gregory's name appeared, along with Stewart's, as a co-dedicatee of the *Intellectual powers*. Not to be outdone, Gregory reciprocated by sending Reid virtually all of his essays and by dedicating the *Philosophical and literary essays* to him.[20]

The general importance of the letters has been acknowledged by McCosh.[21] By careful cross-referencing with the consecutive parts of Gregory's *Project*, they can be rearranged in a more logical way which is probably closer to their original order. The full details of this new arrangement is given in appendix III. However, for the sake of convenience all references in the text here are to Hamilton's edition.

Reid's letters to Gregory overlapped with Reid's drafting of the *Intellectual powers* and the *Active powers*. At one point, he referred to views put forward in chapters 1, 2 and 3 of essay 4 in the *Active powers* ("Of the liberty of moral agents"), which he had already sent to Gregory for comments.[22] In fact all but one of the representative quotations Gregory eventually published in the *Introduction* were drawn from this source. The views expressed in them cover the major themes of Reid's philosophy of causation. Thus quotations one and two deal with the nature and scope of efficient causes. Quotation three concerns Reid's attitude to the status of physical causes, while number four reveals Reid's use of the evidence of language in metaphysics. Finally, quotations five and six reveal aspects of Reid's attitude to man's nescience about the nature and operation of efficient causes and human power.

In what follows, each of these themes will be treated consecutively using material from Reid's letters. The letters themselves are representative of views which can be found elsewhere in his writings. This is entirely to be expected, given that Reid was drafting and revising his mature works during the course of his correspondence with Gregory.

2.2 Reid's response to Gregory

2.2.1. The nature and scope of efficient causes

According to Reid there was a strict, literal and proper philosophical meaning of cause. This was "a being that produce[d] his effect by his will and power".[23] Reid expressed the same point in relational terms. Thus a cause was "that which [had] the relation to the effect which I have to my voluntary and deliberate actions".[24] Reid termed the exertion of this power "efficiency"; therefore the only real causes were efficient causes.[25] The consequence of this view of causality was that "mind onely can be a cause in the strict sense" because power and activity were not attributes of corporeal substances.[26] The second consequence was there was no efficiency or active power without will and understanding. "Therefore nothing [could] be an efficient cause in the proper sense, but an intelligent being".[27] Finally, agents' possession of power meant there were no constant conjunctions between efficient causes and their effects, because power continued to exist as an attribute of mind without always being exerted. Reid insisted that the power to produce an effect also presupposed the power not to produce it. Otherwise it would be a necessity rather than a power.[28]

According to Reid, man's conception of active power and efficient causation derived from something men felt in themselves.[29] The first awareness of it came from a consciousness of their own exertions. As he wrote to Gregory,

> I see not how mankind could ever have acquired the conception of a cause or of any relation, beyond a mere constant conjunction in time and place between it and its effect, if they were not conscious of active exertions in themselves, by which effects are produced. This seems to me to be the origin of the idea of production.[30]

The theme of conscious willed action was central to Reid's thought because it was man's only access to the notion of divine power, and to the conception of God as a being that could do whatever he willed.[31] According to Reid, when it was said that "every change or event must have a cause", then

> the only distinct and true meaning of this maxim is, that there must be something that had the power to produce the event, and did produce it.[32]

Thus the concept of efficient cause was at the heart of Reid's voluntarist image of natural order. Reid himself underlined this point about the strict meaning of cause as efficiency:

> In this sense we ought to use it in the question about liberty and necessity, and I think, in all metaphysical reasoning about causes and effects; for when, in metaphysical reasoning we depart from this sense, the word is so vague that there can be no clear reasoning about it.[33]

This sense of cause was prior to all other kinds, so that when the word cause was used without prefixed additions such as "efficient", Reid stipulated it was always to be read as a productive cause.[34] In support of the position that "efficient cause" was the most common sense of a cause in metaphysics and theology, Reid cited "the authority of Des Cartes, Locke, Dr. Clarke, Bishop Butler and many other".[35] But then what did it mean to say that something was a physical cause?

2.2.2. The Status of Physical Causes

Throughout their correspondence, Reid always insisted that the strict metaphysical meaning of causation and the related conceptions of activity and power implied efficiency or production by free intelligent beings. Therefore, Reid argued, the term physical cause was "a kind of abuse of the name" cause, because "the thing most essential to causation - to wit efficiency - was wanting".[36] An immediate consequence of maintaining the metaphysical reasoning of causation was that matter

> cannot be the cause of anything; it can only be an instrument in the hands of a real cause. Thus when a body has a certain force given it by impulse, it may communicate that force to another body, and that to a third and so on. But, when we trace back this notion to its origin, it must have been given not by matter, but by some being which had in itself the power of beginning notion - that is, by a proper efficient cause of motion.[37]

Also, this meant that in physics the effect was a measure of the power of the cause because men conceived there was no "power" in inanimate causes but what was exerted.[38]

Although the term physical cause was technically an oxymoron and in Reid's view "improper", he stated that in physics or natural philosophy it had a clear and distinct meaning which could be reasoned upon. Competent users of the term "cause" in physics meant by it "some law of nature, of which the phenomenon called the effect is a necessary consequence".[39] Reid's insistence on the virtual identity betwen the meanings of a physical cause and a law of nature is the most characteristic feature of his correspondence considered as a whole.[40] A typical example is his statement that

> When a phenomenon is produced according to a certain law of nature, we call the law of nature the cause of that phenomenon ... The whole business of physics is to discover by observation and experiment the laws of nature, and to apply them to the solution of phenomena: thus we call discovering the causes of things.[41]

Reid emphasised that, like physical causes, laws of nature were not efficient. They had no agency because they were not existent beings, but things conceived by men, which could neither act nor be acted on. Reid said that a law of nature was analogous to a motive, which could not be an efficient cause either. A law of nature was also a purpose or resolution of the deity according to which, either he or subordinate intelligent beings, or instruments under his direction, acted to produce causes according to the law. Thus it always remained the case that an agent of some kind was required to produce phenomena in accordance with laws.

The notion of laws of nature "according to which" effects were produced had, in Reid's view, "new modelled our notion of physical causes". He praised Newton's formulation of the relationship between laws and physical causes, describing it as one of Newton's "great discoveries". It circumscribed "the utmost that natural philosophy [could] reach, leaving what could be known of the agent or efficient cause to metaphysics".[42] Yet Reid also noted that the ironical consequence of Newton's "discovery" was that Newton's 'new-modelling' of the notion of physical cause removed its meaning yet further from the original notion of cause or agent. According to this meaning, a physical cause and its appropriate effect were related in the manner of a law of nature and a necessary deduction from it.[43]

Reid's account of the identity between physical causes and laws of nature was also articulated using the vocabulary of constant conjunction between antecedents and consequents derived from Hume:

> What D. Hume says of causes, in general is very just when applied to physical causes that a constant conjunction with the effect is essential to such causes, and implied in the very conception of them.[44]

Hume's notion of causality with its emphasis upon priority and constant conjunction was that most commonly found in physics:[45] "Between a physical cause and its effect, the conjunction must be constant, unless in the case of a miracle, or suspension of the laws of nature".[46]

The notion of constant conjunction had utility for Reid because it could be rendered consistent with his conception of a law of nature which guaranteed a voluntarist law-maker God. Upon this basis Reid was even prepared to admit that "there may be such a nature and state of things which have no proper activity, as that certain events or changes must necessarily follow".[47] A further reason why Reid was able to make this concession to physical necessity without subverting his own voluntarism emerges in the following remark:

> Physicks, in all its branches, is conversant about the phenomena of nature, and their physical causes; and I think it may be admitted as a maxim that every phenomenon of nature has a physical cause. But the action of men or of other rational beings, are not phenomena of nature, nor do they come within the sphere of physicks. As little is a beginning of existence a phenomenon of nature.[48]

Thus the disciplines of physics and metaphysics referred to two totally different domains, nature and mind. In nature, as understood by Reid, physical causes could be endorsed, provided they were not accredited efficiency and interpreted as laws of nature or rules according to which the Deity chose to operate. Minds existed outside nature in an incorporeal domain, but they somehow operated in nature as the only real efficient causes. Men's only understanding of how they did so was also derived from laws of nature. Reid insisted upon the separation of physics and metaphysics. Yet it was also clear that metaphysics completely dictated what could meaningfully be said in physics, just as intelligent beings controlled the inanimate world in Reid's voluntarist image of God and nature.

From what has been said, it is evident that Reid incorporated aspects of Hume's analysis of constant conjunction into his own view of men's perception of change in physical nature. However, it is also important to emphasise that Reid was highly critical of what he perceived to be Hume's own usage of constant conjunction. In fact, Reid was totally opposed to the use of constant conjunction to characterise the world of mind and to deny men their rightful possession of human power. Reid made this very clear in various remarks to Gregory:

> Mr. Hume holds it for a maxim no less applicable to intelligent beings and their actions, than to physical causes and their effects, that the cause is to be measured by the effect. And from this maxim he infers, or makes an Epicurean infer that we have reason to ascribe to the Deity, just as much of wisdom, power and goodness, as appears in the constitution of things, and no more.[49]

Or again:

> That nothing can happen without a cause is a maxim ... never brought in doubt till the time of D. Hume. If this be not understood of an efficient cause, it is not true of any other kind of cause; nor can any reason be given why it should have been universally received as an axiom.[50]

And finally:

> You have good reason to dispute the maxim about causes, as laid down by Mr. Hume, in whatever sense he takes the word cause. It is a maxim in natural theology universally admitted that everything that begins to exist must have a cause, meaning an efficient cause; and from this maxim we easily deduce the existence of a Being who neither had a cause nor a beginning of existence, but exists necessarily.[51]

In many ways, Reid and Gregory had a similar attitude to Hume. Although Gregory was less strident about the theological deficiencies of Humeian causality, like Reid, he endorsed constant conjunction as an appropriate representation of men's perception of physical change. Gregory's pluralism of relations of change also left room for efficient causation, albeit in the restricted field of human activity. Yet Reid's letters are full of reservations about what he called Gregory's "system".

During the course of their correspondence, Reid made several attempts to formulate the precise difference of opinion between himself and Gregory. A typical example occurs in letter XIV. He noted Gregory's explicit denial that every change required an efficient cause in the sense understood by Reid. In such cases, Gregory argued, change was effected by physical causes. By a physical cause Reid made it clear he understood merely "The necessary consequence of things unintelligent and inactive".[52]

Because this notion of a physical cause implied no activity, and because Reid could not conceive of change without an efficient cause which brought it about, Reid also thought Gregory agreed "that every physical cause must be the work of some agent or efficient cause".[53] Reid actually wrote:

> I suspect you use the word cause in this sense for a law of nature, according to which a phenomenon is produced. If so, it should appear distinctly that you do so.[54]

Reid specified that laws of nature always required a being who formulated them and made some provision for their enactment. He stated that if Gregory agreed with Reid on the equivalence between law of nature and physical cause, then there were no differences between them.[55] Yet, a careful analysis of Gregory's Project on cause and effect in physics reveals that he did not actually equate laws of nature and physical causation. Although Gregory often spoke of laws of human thought, he rarely referred to physical laws of nature, precisely because of their voluntarist associations. By conceding the vocabulary of laws, Gregory would have accepted the notion of matter as an instrument in the hands of a law-giver or his agents. But whereas Gregory regarded matter as passive, he did not endorse either the vocabulary of secondary causes found in John Stewart, or Reid's theistic nomology of physical events. Reid, on the other hand, considered there were no other alternatives and actually put it to Gregory that everything he called a physical cause was actually only an instrument.[56]

Reid's voluntarist monism of efficient causes involved a persistent reformulation of the language of physical causation in terms of laws of nature. This emphasised the distinction he sought to maintain, between events in nature and the action of real, intelligent and free beings. He perceived that Gregory's Project subverted this boundary by talking about species of the genus "change", of which an efficient cause was merely one among other kinds. Reid continually questioned the basis for this classification of relations of event which informed Gregory's whole Project:

> If you have found, as you seem to say, that the different relations of things, which we call cause and effect differ only as species of the same genus, and have found the general notion which comprehends them all under it - this, indeed, is more than I am able to do.[57]

Reid stated that a physical cause and an efficient cause should not have been given a common name because they differed "toto genere".[58] Now Gregory had sought to distinguish them by calling physical causes "causes" per se, and efficient causes "agents", or relations of activity. In a way, this was precisely the kind of demarcation Reid himself insisted upon. Yet Reid was critical of the means by which Gregory sought to achieve this, describing it as "too bold an innovation in language". This raises the question of Reid's attitude to Gregory's philologico-philosophical technology for maintaining the boundary between physical causation and activity. From Reid's various remarks, it is evident he was largely unsympathetic to Gregory's distinctive appeal to the evidence of language in order to specify men's common notions of physical causation and activity.

2.2.3. The evidence of language in metaphysics

On the positive side, Reid certainly agreed with Gregory that confounding distinct relations such as physical causation and activity was a common philosophical error. Reid also approved of Gregory's fundamental principle or law of thought that

> every distinction which is found in the structure of language is a real distinction, and is perceivable by the common sense of mankind.[59]

Reid went even further, noting he made good use of it himself and that others should do so because "the whole system of metaphysics, or the far greater part [might] be brought out of it."[60] Finally, Reid considered that Gregory's demonstration of the difference between causation and activity on the grounds of Latin syntax was basically sound, if in need of wider corroboration.[61]

Where Reid differed with him was over Gregory's stipulation that all uses of the word "cause" when applied to things other than physical events, were always metaphorical. According to Reid, physical causes and efficient causes were simply "two different meanings of the same ambiguous word".[62] Reid, on this matter at least, was content to "bear with the imperfections of language".[63] Particular uses of each meaning became clear because "the things of which they [were] predicted explain[ed] sufficiently what relations [were meant]".[64] Far from holding that the evidence of language showed physical causation was a distinct relation from activity, Reid stated that power and activity had a share in the relation of cause and effect. This was apparent in men's use of active verbs to characterise events in nature which, strictly speaking, implied no activity because they were inanimate. Both "cause" and "agent" had what Reid called a "lax and popular meaning" and a "strict philosophical" one, which were frequently substituted for one another. Thus all the evidence of language actually showed was that causation and activity were ambiguous words.[65]

Reid regarded language as "a huge and complicated machine" which had been gradually perfected over time.[66] Thus some meanings of causation current in the past had disappeared. He cited the example of Aristotle's four meanings of cause, some of which had subsequently been discarded. Other meanings such as Newton's 'new-modelling' of physical causes in terms of laws of nature had emerged and men now understood this as correct usage in physics. Natural philosophers spoke the common language and suited it to their new notions as well as they could, "just as the philosophers say with the vulgar, that the sun rises and sets, and the moon changes".[67] If not,

> Will they affirm that the sun does not shine nor give heat, that the sea never rages, nor do the winds blow, nor the earth bring forth grass and corn? If any bold spirit should maintain such paradoxes, he would probably repent his temerity.[68]

Reid held that the evidence of language did not support the position that cause was only used literally in instances of physical change. He therefore criticised Gregory's appeal to it as evaluative. Also, he questioned Gregory's appeal to common notions as similarly normative rather than descriptive. To summarise, Gregory had argued that the evidence of language indicated all men had a universal and unchanging notion of cause and effect in physics, which excluded all other notions such as power and activity. But by the term "notion" Reid understood a "simple conception" of the meanings of efficient and physical cause. He noted that Gregory sometimes used the terms "notion" in this way, for example, in the Introductory essay, where Gregory sought to show men had a common notion of cause and effect in physics. However, Reid said that Gregory, on other occasions, spoke of common notions as opinions which were either true or false, just or unjust.[69] Thus for Reid the "seed of language [was] the natural signs of our thoughts which nature [had] taught all men to use and all men to understand".[70] But it could not actually be appealed to for a discrimination about the common notions men ought to have. Also, men's notions changed over time.

In view of this difference over the reliability of language to indicate the justness of men's common notions, Reid reformulated the issue between himself and Gregory. The question was:

> Whether the words cause, and the corresponding words in other languages has, or has not, from the beginning, to express, without a figure, a being that produces the effect by his will and power?[71]

Reid actually answered his own question several times during the correspondence.[72] His position was founded upon a historical and anthropological appeal to the origins of language. He argued that men had first acquired the philosophical meaning of the word "cause" as efficiency or activity. This stemmed from men's consciousness of power in themselves. However, the strict philosophical sense of cause was then corrupted because of men's anthropomorphic tendency to ascribe such powers to other things. Subsequently, men discovered through experience that there was no reason to attribute power and activity to nature. But:

> language was formed on a contrary supposition before this discovery was made, and we must give a new, and perhaps a very indistinct, meaning to words which before had a clear and distinct one.[73]

So men continued to deploy active verbs in their descriptions of change in physical nature. Yet although men spoke with the "vulgar" after this fashion, they nevertheless thought with the natural philosopher.

For Reid, the notion of production was built into the language of causation, because of men's fundamental awareness of themselves as active beings capable of producing change. Commenting more generally on the history of men's usage of the language of causality, he wrote:

> It is remarkable that the philosophical meaning of these two words, and of the others that depend upon them, must have been the first, and the popular meaning a corruption of the philosophical, introduced by time, but so deeply rooted in the structure of all languages, that it is impossible to eradicate it; for [something] external to us could introduce into the human mind the general notion of priority and constant conjunction, but nothing farther.[74]

Thus the evidence of language was dependent upon the fundamental and prior experience of willing, around which all of Reid's philosophy of mind ultimately revolved. Neuter verbs had no special significance for Reid precisely because they were used "to express an event, without any signification of its having a cause or not".[75]

Where Reid commended the evidence of language as a guide in metaphysics, it was always with a very important qualification. It was useful, but only as an accessory to the process of "accurate reflection by the mind upon itself".[76] The evidence of consciousness indicated that power and activity were implicated in the metaphysical meaning of causation. This was confirmed in men's use of active verbs to express change brought about by active beings. Reid was even prepared to uphold his perspective in the face of other difficulties. For example, explaining how the savage was originally philosophically correct is his conception of the meaning of causation; but then he entertained lax and popular meanings of the word, until finally corrected by modern natural philosophers.

From these and many other remarks made to Gregory it appears that Reid's chief justification for his voluntarist image of mental and natural order was based upon a fundamental point concerning men's consciousness of power. Confronted with Gregory's attempt to restrict the literal meaning of causation to physical events, Reid insisted that causation and power were mutually implicated in the notion of efficiency. Also, he perceived that Gregory's stipulations confining the language of causality to inanimate nature would have dangerous consequences for natural theology. To maintain that the deity was no cause at all - as Gregory in fact did in "Objection 5" of Activity 3 - was "too shocking" and to say that the world existed without a cause was "atheism".[77] Reid wrote to Gregory that only if

> I were convinced that it cannot be said, in a plain, literal sense that I am the cause of my own actions, or that the Deity is the cause of the universe, if I were convinced that my actions, or the production of the universe, are not effects, or that there must be a cause of these effects distinct from the agent, I should in this case agree to your reasoning.[78]

2.2.4. Nescience and the operation of efficient causes

The final theme identified by Gregory was Reid's profession of nescience regarding the real causes of natural phenomena and the nature of the spiritual agencies superintending the material system. This is perhaps the most under-represented theme in the correspondence and probably the most important. Implicit assumptions about man's nescience informed accounts of causality throughout Scottish scientific metaphysical discourse during this period. However, Reid's references to nescience during the correspondence are allusive. This is because his major discussion of it in Letter XVII was prompted by a specific passage in Power. Without the context of Gregory's own discussion it is difficult fully to appreciate the depth of Reid's profession of nescience, which included man's knowledge of the operation of power as well as the manner of production of physical causes and effects. Hence it is useful briefly to review this topic in Reid's other writings before going on to the views expressed in his exchange with Gregory.

In section 2.2.2. it was noted that a significant part of Reid's discussion of physical causation utilised Humeian causality as an appropriate description of men's perception of change in physical nature. Because men only perceived constantly conjoined antecedents and consequents and never the connection between them, Reid's profession of nescience was implied in his whole discussion of physical causation. This insistence upon men's ignorance of any necessary connections between natural phenomena can be found in many places throughout Reid's Works. For example in the Inquiry when he discussed men's perception of smell, Reid stated that

> The rose is considered as a cause, occasion or antecedent of the sensation; the sensation as an effect or consequence of the presence of the rose; they are associated in the mind, and constantly found conjoined in the imagination.[79]

Or again in the Intellectual powers, where Reid discussed the exact nature of the connection between the vibration of air and the sensation of sound:

> We know that such vibrations do really exist ... that they tally exactly with the most remarkable phenomena of sound. [But] we cannot indeed show how any vibration should produce the sensation of sound.[80]

Finally, Reid summarised his position more generally in the Active powers when he said "we see an established order in the succession of natural events, but we see not the bond that connects them together".[81]

It is clear that Reid regarded men's confession of causal nescience as the most commendable aspect of natural philosophy, which he sometimes described as "Newtonian".[82] As we have seen, the denial of necessary connections in nature was a standard feature in some forms of scientific metaphysical discourse. Similar sorts of denials can be found in Dugald Stewart, John Stewart, and, of course, in Gregory himself. However, what is more surprising in Reid is the extent to which he also denied the existence of necessary connections in mental phenomena as well, including the exercise of power.

For Reid, men's accountability depended upon an assessment of what actions lay within human power in specified circumstances. But when it came to understanding the manner of operation of active power when agents acted as efficient causes, Reid stated there was a "darkness which [his] faculties [were] not able to penetrate."[83] In fact Reid cosistently professed nescience regarding the operation of active powers, either directing the operation of thought, or producing motion in the human body. Regarding the former, Reid stated that it was difficult to determine whether the mind was actually the sole efficient cause of voluntary changes in the direction of its thinking "or whether it requir[ed] the aid of other efficient causes". Reid took an identical position regarding the connection between mind and body. In the movement of a limb,

> Whether this act of the mind have any physical effect upon the nerves and muscles; or whether it be only an occasion according to established laws of nature is hid from us so dark is our own power when we trace it back to its origin.[84]

Finally, Reid gave a general summary of his nescience regarding the operation of efficient causes in the conclusion of the first essay of the <u>Active powers</u>:

> We perceive one event to follow another, according to established laws of nature, and we are accustomed to call the first cause, and the last the effect without knowing what is the bond which unites them. In order to produce a certain event we use the means, which by laws of nature are connected with that event, though other efficient causes may have had the chief hand in its production. Upon the whole, human power, in its existence, in its extent and in its exertions is entirely dependent upon God, and upon the laws of nature which he has established.[85]

According to Reid, men's experience of power was the only access-point for comprehending the real nature of cause and effect as a change produced by an active being. Yet men could never know how power operated. Nor could power be defined. Men only had a relative conception of power because power was not an operation of mind as such, but something presupposed in all its operations. Despite all these constraints and restrictions Reid imposed upon men's knowledge of power, unlike Hume, he maintained it could be known and reasoned about. This was because power was a constitutional belief underwritten by God - just as for Reid, nescience was a positive resource in order to maintain God's providential presence in nature as the first and foremost agent of all change.

It has already been shown that Gregory's conception of cause and effect in physics sought to eliminate the conception of production from the causal relationship. In other words, the manner in which causes proceeded from their effects was to be disregarded. In Power Gregory developed his position through an analysis of the manner in which a man moved his hand. Gregory acknowledged there were two different processes at work in this operation. One was the effort or power exerted by the mind; the other was the chain of physical causes and effects consequent upon it which eventually resulted in the movement of the hand itself. Gregory argued that the question of how a man moved his hand could only be answered by a careful enumeration of all the parts concerned in it. Gregory suggested that the mental effort or power was probably simple and resistant to further analysis; but the chain of causes and effects could, in principle, be documented by an exhaustive list of all the bones, ligaments, nerves and muscles etc. implicated in it. Thus an enumeration of all these parts and steps in their proper order would constitute "a kind of explanation of the manner in which a thing was done".[86] However, with respect to the original exertion of power, or the simple steps enumerated in the physical explanation, the question of the manner in which a man moved his arm was no longer relevant. Gregory then generalised this argument for all causes and effects in physics:

> in the conception of an explanation of the manner in which an effect proceeds from its cause, or of a specification of that very circumstance in a cause by which it is enabled to produce its effect, is implied the belief that a cause is something compound comprehending many circumstances; and that in every instance of cause and effect besides the cause, and the subject, and the occurrence of the change or effect, there is something else concerned which may be called the manner of its occurring, and may be an object of knowledge.[87]

Gregory considered that questions about how causes produced effects when applied to perfectly simple operations were "nugatory and absurd".[88] Although men were able to move their hand, "neither [they], nor any other being, [could] know how [they] did it".[89] Gregory reemphasised this point about "any other being" in "Note A" alongside this passage. Even "omnipotence could not define a simple notion, or explain how a perfectly simple operation was performed", or "explain that circumstance in a physical cause on which its effect depends, when the cause [was] simple and the connection [was] immediate: that is without any intervening chain of causes and effects".[90] Thus Gregory professed a kind of nescience himself. But this form of nescience was the result of a kind of 'operationalism' which totally excluded the role of the deity as the productive cause of physical events and men's exertion of power. All such explanations in physics were to be based on "simple ultimate facts", or physical causes which had an equivalent status and role to axioms in geometry.[91]

Reid's commentary upon Gregory's views found in Power reveal that he denied men's knowledge of the manner in which causes produced their effects for a very different and opposite purpose to the one found in Gregory. Reid maintained the same views found elsewhere in his writings. Thus like Gregory, he began by stating that in the operation of moving a hand, it was "one thing to know that such a thing [occurred], and another to know how it [occurred]".[92] Thus men knew there was a constant conjunction between volition and the motion of their hands but did not know the connection between them. But Reid added:

> Nay, I am uncertain whether I be truly and properly the agent in the first motion; for I can suppose that, whenever I will to move my hand, the Deity or some other agent, produces the first motion in my body.[93]

The same applied to men's intellectual operations: other efficient beings besides men may have produced the sequence of thoughts in their minds. Finally, Reid emphasised that men's nescience regarding the manner in which effects were produced from causes did not extend to the deity, as Gregory suggested. In all these cases, Reid's insistence upon nescience tended to increase the superintending role of the deity in all kinds of change mental and physical.

3. THE CRITIQUE OF HUME: POWER AND NECESSARY CONNECTION

3.1 The problem of reading Hume

In previous chapters the perceived importance of Hume's philosophy has been emphasised. In chapter one it was shown that Gregory acknowledged Hume as the principal threat to Gregorian scientific metaphysics. Also in chapter three, it was indicated that despite Gregory's use of a Humeian vocabulary of philosophical relations, Gregory sought to distinguish the presuppositions of his own analysis from Hume's philosophical apparatus of ideas and impressions. Finally, in chapter two it was shown that John Stewart and members of the Edinburgh clerical literati considered that Kames's scientific metaphysics drew its inspiration from Hume. All these and many other circumstances prompt the question of the precise role Hume's work actually played in the development of Scottish scientific metaphysics during this period.

The problems one encounters in trying to specify Hume's actual role in the Kames-Stewart controversy are representative of his relationship to the period generally. Hume was one of the secretaries of the Philosophical Society, but there is little surviving evidence of his participation. He read at least one paper, wrote all or part of the preface to the Society's first publication, and corresponded with John Stewart about the debate with Kames. Apparently, Hume considered publishing an essay on mathematics and natural philosophy, but did not.[94] No drafts have survived. Therefore to search for Hume's direct engagement with 18th century Scottish scientific metaphysics is quite fruitless.

In the face of such difficulties, it is inevitable that Hume's texts play a prominent role in any account of the relationship between Humeian metaphysics and natural knowledge during the period.[95] The problem here is that there is currently considerable disagreement about the interpretation of Hume's philosophy. This problem emerged in the 20th century through the writings of Norman Kemp Smith. In a pioneering article called "The naturalism of Hume",[96] Smith put forward an alternative interpretation to the orthodox viewpoint that Hume was simply a sceptical thinker. In his subsequent study of the Treatise, Kemp Smith argued that his viewpoint had been transmitted uncritically into the 20th century through the earlier writings of Mill, Bain, Stephen and Green. In its place Smith argued that Hume was a positive, naturalistic and constructive philosopher who sought merely to specify the grounds upon which probable knowledge was possible, not to rule out the possibility of all knowledge whatever. This view has been expanded in a number of works following Smith's original lead. Among these, the most significant for historical purposes are those which have put forward the "naturalistic" interpretation of Hume in relation to Newton's natural philosophy. These works fall into more or less two groupings. One includes an earlier group of commentators commencing with Kemp Smith himself and including Hendle, Passmore, Chapple, Jessop, Flew and others.[97] All of them consider Newton's science to have had a profound effect upon Hume's own philosophical programme. They invariably allude to Hume's famous remark on the title page of the Treatise about it "being an attempt to introduce the experimental method of reasoning to moral subjects". They also refer to his comparison between the importance of the association of ideas for metaphysics and the significance of the principle of attraction in physics.[98] Such writers are discussed by James Noxon in Hume's philosophical development. He shows the very slender and unanalysed basis upon which it became standard practice to couple Newton and Hume as parts of one continuous enterprise. This emerges clearly in the phraseology used by these earlier commentators. Thus Hume is referred to as "the Newton of the moral sciences" who developed "a truly Newtonian system of mental mechanics".[99]

The second grouping includes recent writers such as Capaldi, Hurlbutt, Battersby and Noxon himself, who have sought to analyse the connections between Hume and Newton more substantially.[100] As a result, they have paid more attention to the 18th century historical context of Hume's thought, a feature of recent Hume scholarship as a whole.[101] However, in these works there is an unusual mixture of attention to the common context of scientific and religious ideas in the 18th century; and judgements about Hume's and Newton's philosophical 'correctness' on various issues. Noxon's book can serve as a representative example of this clash between historical and evaluative approaches.

Noxon emphasises that an examination of the relations between Newtonian and Humeian philosophy must pay close attention to contemporary scientific conceptions and achievements. He gives a detailed account of Newton's methodological writings.[102] Newton's twin denial and profession of hypotheses is explained by referring the Principia and Opticks to different kinds of science. Noxon points out that unlike mechanics, other areas of science were experimental and less well understood. In these areas, there was a legitimate role for hypotheses. So Newton's denial of hypotheses in the "Rules of reasoning" was not inconsistent, but justifiable in relation to a particular kind of science. Noxon's aim in his discussion is largely to exonerate Newton from errors and inconsistencies.

The best instance of this comes in Noxon's distinction between Newton and different kinds of Newtonianisms. Thus Halley, Black, Franklin, Priestley and Cavendish all utilised Newton's "suggestions" for empirical work. This, in Noxon's view, is sufficient to "confer the name of Newton upon the mainstream of 18th century English thought". These men are to be sharply distinguished from a group including Bentley, Clarke, Whiston, Cheyne and others, who sought to work out "the moral and theological implications of Newtonian science", Noxon actually acknowledges that Newton belonged to the latter group as well as the former. But instead of this leading him to question the utility of the division in the first place, he gives a wholly rational and intellectual reason for Newton's own theism.

> Newton's assurance that discourse of God belonged to experimental philosophy presumably rested on his confidence that the strength of analogical arguments would be unimpaired by extensions into the religious domain.[103]

Armed with these various analytical distinctions, Noxon considers what sort of a Newtonian Hume actually was. He concludes that Hume was essentially a Newtonian methodologist. This was evident in the way he used the rules of reasoning precisely to eliminate the "pretentious" theological "speculations" of the Newtonians. Thus, because Hume was a 'real Newtonian', his adherence to the essential meaning of the rules of reasoning stopped him from subscribing to theistic Newtonianism.[104] In short: Hume was actually a better Newtonian than Newton was himself. Once Hume's methodology has been classified as genuinely scientific and therefore hostile to theology, Noxon proceeds to explain Hume's subsequent problems in the realisation of his science of human nature. Noxon argues that all Hume's difficulties arose because he dealt with mental phenomena, rather than objective scientific facts. Hume was forced to rely upon unverifiable introspection instead of the experimental approach definitive of science. Once again, potential inconsistencies are justified in terms of the kind of enterprise historical actors are perceived to be engaging in.

Noxon's general analysis of Newton and Newtonian science will be familiar to contemporary historians of science. It corresponds largely to the view of Newton found in the work of I. B. Cohen and A. Koyre.[105] But Noxon does not merely accept their view of Newton. He also incorporates the historiographic assumptions which underlie it. For example, Cohen identifies a "two Newtons" problem. He then sets out to harmonise different usages of key terms found in the _Principia_ and the _Opticks_. This kind of interpretive task has already been illustrated in Noxon's reiteration of the different senses Newton gave to the term hypothesis. What lies behind this approach generally is a commitment to the analysis of texts, in which their meaning is considered to lie, in the internal logic of the concepts they discuss. The essential relations of concepts such as hypothesis or gravity is recovered, often in the face of imprecise language found in Hume or Newton. Once purified through conceptual analysis, these recovered meanings become the base-line for assessing misunderstandings by contemporaries, successors and, indeed, other present-day commentators.

The Koyré-Cohen tradition has recently been criticised in the history of science, concerning the way some of its exponents have made stipulations about the meaning of Newtonianism.[106] But its great merit lies in the fact that historians of science now routinely accept that scientific concepts are to be interpreted and understood within a context which transcends purely formal considerations.[107] In the 18th century at least, discourse about nature interwove technical and mathematical explanations of phenomena, metaphysical views about matter and spirit, causality and apologetic statements concerning God's existence and role in nature.[108] Approaches such as Noxon's have begun to locate Hume's thought within this broader field. However the problems of evaluation and judgement confronting the Koyre-Cohen tradition are, if anything, more apparent in the work which attempts to deal with Hume's Newtonianism. This is because philosophers largely assume Hume's critique of religion was devastating and that the whole enterprise of natural theology was a rationally misguided form of discourse.[109] Thus science and theology are segregated rather than interpreted in a common context. This is certainly evident in Noxon.[110] Alternatively, the kind of approach advocated here pays close attention to the situated understandings of historical actors. The ways in which Hume's contemporaries perceived and interpreted Hume's philosophy are studied in relation to their assumptions, purposes and background knowledge. From this perspective, Gregory and others are viewed as doing active interpretive work on Hume's texts.

The original sceptical-destructive interpretation of Hume which dominated the 19th century actually originated from criticisms put forward by common sense philosophers, such as Thomas Reid, James Beattie and Dugald Stewart. Kemp Smith gives a number of quotations from Reid's Inquiry to illustrate how common sense philosophers responded to Hume. He was viewed as the heir to and culmination of, a philosophical tradition derived from Descartes and passed on by Locke and Berkeley. This was called the "doctrine of ideas", or "ideal system" and has recently been termed the "way of ideas".[111] For common sense philosophers, the ideal system was virtually synonynous with scepticism itself. Another remark of Reid's from the Intellectual powers brings this out quite dramatically. Reid stated that the result of Hume's use of the doctrine of ideas was

> that there is no material world; No abstract ideas or notions: That the mind is only a train of related impressions and ideas, without any subject on which they may be impressed: That there is neither space nor time, body nor mind, but impressions and ideas only.[112]

Further indications of Reid's perception of the dangers underlying Hume's philosophy of causation have been discussed in the previous section.

The purpose here is to show that Gregory's own response to Hume cannot be accommodated to the standard view of the 18th century reception of Hume's thought.[113] To be sure, at times Gregory accused Hume of scepticism. This is evident on occasions in the Introductory essay and Power. However, Gregory also perceived that Hume was advocating a more positive philosophy. Gregory called this Hume's necessitarianism, which can be broadly thought of as a historical equivalent to what contemporary commentators now call Hume's naturalism. In his criticisms of power and necessary connection it is evident that, if anything, Gregory was less concerned with Hume's scepticism and its threat to morality and religion than the dangers Humeian philosophy posed for science. Gregory attacked Hume's necessitarianism because it contravened what Gregory considered to be the criteria for a genuinely scientific metaphysics. This emerges clearly in Gregory's various criticisms of the key concepts of power and necessary connection.

3.2 Gregory's criticisms of power

Gregory understood a correct application of the word power to denote an attribute of intelligent beings by which they were able to carry out or not carry out certain actions at their own discretion.[114] To Gregory, power was an irrefragable matter of fact known on the basis of consciousness, common sense and linguistic usage. Gregory regarded power as self-evident, but because Hume denied that men knew or could ever know power, some kind of a demonstration of it was necessary. Gregory said that Hume's followers and other like-minded philosophers still maintained "that the common notion and belief of optional or discretionary power belonging even to animals or to mind [was] a mere vulgar prejudice and error".[115]

Gregory's ensuing criticisms of Hume lacked that casuistical quality always found in Beattie and often present in Reid.[116] Instead, Gregory was actually prepared to state that Hume had sought to deny power "in a very reasonable like and scientific manner",[117] and in the process of his investigations had collected some "just and valuable observations".[118] In fact, Gregory's remarks at the beginning of <u>Power</u> suggest he viewed Hume as a rival exponent of a shared methodology for discussing issues in metaphysics. As a result, it was imperative for Gregory to show in what ways Hume had been unscientific and unreasonable in his denial of power. Gregory used a number of strategies to achieve this end.

Gregory cited a remark by Hume in which the latter emphasised that the use of words such as "power", "force", "energy" etc., in everyday conversation did not amount to a proof that men were "acquainted in any instance with the connecting principle between cause and effect or [could] account ultimately for the production of one thing by another". Hume went on to state that this was because such words had "very loose meanings attached to them and their ideas [were] very uncertain and confused".[119] If this were actually the case, Gregory argued, a "rational" philosophical enquiry would then proceed to discern the different meanings the word "power" had in its different significations. But Hume had "set about proving that [power] had no meaning and expressed no idea at all".[120] To Gregory, this seemed absurd because it attempted to prove certain ideas evident to common sense were not really ideas at all. Hume had gone about his philosophical analysis in the wrong way. Instead of attending to the matter-of-fact evidence afforded by language, Hume ignored this in pursuit of his concern to deny power altogether.

Gregory was aware that the term "idea" had a specific and technical sense within Hume's doctrine of ideas and impressions.[121] Thus when Hume denied the idea of power, this was based upon a theory according to which all ideas were derived from impressions, either external or internal. Therefore Hume argued it was impossible to think anything that had not been antecedently felt. Gregory had deep reservations about Hume's doctrine of ideas and impressions which he regarded as a "hypothesis concerning the operation of thought". As in the Theory, Gregory sought to discredit Hume's apparatus of ideas and impressions. Gregory argued that however ideas were to be regarded in themselves, as "images, models, copies, phantasms or representative beings of some kind",[122] it still followed that to understand something, it was necessary to have an idea of the thing in question. Thus, although Hume did use ideas in a specific sense and according to a distinctive theory of mental representation, nevertheless Hume conceded that to think of something was roughly synonymous with having an idea of the thing so thought. Therefore Gregory treated Hume's denial of the idea of power as a general one, rather than simply a denial based upon the absence of any preceding impression.

Gregory's second tactic regarding Hume's use of the doctrine of ideas and impressions to deny the idea of power was to argue that it conflated the distinction between inductive reasoning and demonstration. Gregory said that Hume's writings gave ample evidence that he understood the status of a mathematical demonstration. In fact all forms of demonstration showed why necessary truths must be so and could not be otherwise without absurdity or contradiction. But Gregory doubted whether Hume was equally conversant with induction or "understood the limits, and the first principle of all reasonings from experiment and observation: that is, of all reasonings that relate merely to things that are, and not to things that must be".[123] It was, he continued

> an established principle that every inference of induction is subject to the trial of observation and experiment, as an Englishman is subject to trial by a jury of his peers[124]

Having emphasised the complete distinction between induction and demonstration, Gregory applied this to Hume's denial of power. The question was: did Hume's use of the doctrine of ideas and impressions conform to the canons of inductive reasoning? Gregory contended that it did not and proceeded to show why.

Gregory argued that in Enquiry 7, Hume strayed from his original insistence on the inductive basis of the doctrine of ideas, when he stated that it was "impossible for [men] to think of any thing which [they] have not antecedently felt". In Enquiry 8, Hume stated that the only way the doctrine could be falsified was to produce an idea not derived from a corresponding impression. Faced with such a candidate idea, Humeians then had to find a corresponding impression and so confirm the derivation thesis of ideas from impressions.[125] But in the case of power

> Mr Hume instead of producing the corresponding impression as he had promised to do so in every such case, sets about proving that there is not such impression, and therefore concludes that the supposed idea of power is no idea at all.[126]

In short, Gregory accused Hume of misunderstanding the relationship between the doctrine of ideas and impressions and matters of fact. Hume had attempted to adjudicate the latter on the basis of the former rather than vice versa. Common sense evidence for the idea of power left Hume with three legitimate options in Gregory's view. Either Hume had to admit that there was indeed an impression of power from which the idea derived. Or he must concede that every idea was not derived from an impression. Or finally, Hume had to acknowledge that there were other objects of knowledge besides ideas and impressions. But

Hume adopted none of these because he had defended the denial of power on a priori grounds. This was Gregory's assessment of Hume's philosophy of power: Hume was not an empiricist because he used the doctrine of ideas and impressions in a systematic way rather than according to the rigorous demands of scientific induction.

From the evidence presented so far, it is clear that Gregory's criticisms do not correspond to the standard image of the Scottish 18th century philosopher who viewed Hume as an out-and-out sceptic. Gregory did not challenge Hume's views on the casuistical grounds that they had pernicious moral and religious consequences. Rather, he analysed the logical form of Hume's denial of power. Gregory primarily viewed Hume's metaphysics as unscientific. At best it had a shallow commitment to genuine matters of fact and induction. Having dismissed Hume's denial of power founded upon the doctrine of ideas and impressions, Gregory turned his attention to Hume's second major argument against the idea of power. This was an ad absurdum argument which reasoned from the supposition that men knew power to conclusions that were false or absurd. Gregory analysed the details of Hume's reasonings because he considered they revealed an ambiguity about the meaning of power which helped to clarify why the concept of power could not be applied to physical changes as well as mental events.

Hume's doctrine of ideas and impressions was a general and philosophical one. It was not restricted solely to perception of the external world. Impressions could be sense data external to the mind; or they could equally well be internal impressions. Hume devoted the beginning of Enquiry VII to denying that power could ever be perceived among external objects. In the remainder of part 1, he set about the task of showing that internal impressions could not give knowledge of power either. Hume marshalled his arguments against internal impressions of power into two groups, those which dealt with the will's control over the human body, and those which concerned the will's control over the mind itself. Gregory quoted those dealing with the former group in great detail.[127] The extract which Gregory analysed is too long to reproduce here; but the details of Hume's argument can be rehearsed briefly. Hume stated that man's knowledge of willing his body to move was subject to the same restrictions applicable to knowledge of any other natural event. It depended solely upon experience. The consequent movement of the body could not be foreknown because it was impossible to discover the power in the cause by which it produces its effect. This latter information was the condition of knowing power. In Hume's view, if men knew power, then they knew the necessary connection between a cause and its effect. Men could not know necessary connections; therefore they could not know power. Hume applied this to the power of the will in three reductio arguments. If men knew the power of willing, then they would also know the nature of body, soul and the connection between them. If men knew power, then they would know a priori why willing could move some organs of the body but not others. If men knew power, then all the intermediate causal connections between willing and moving the body would also be known. In each case, men knew nothing of the matters in question. Therefore, Hume contended men did not know power from the experience of willing movement in the body. Experience merely taught "how one event constantly follow[ed] another without instructing us in the secret connection, which bind them together, and renders them inseparable".[128]

Whereas Gregory saw Hume's doctrine of ideas as a visionary hypothesis, he regarded his subsequent reasonings about power as another illustration of the danger of ambiguous terms in metaphysical reasoning.[129] Hume had confused two senses of the term power and treated them as the same. One was the power of acting or not acting according to one's discretion, or what Gregory called "animal power". The other was a metaphorical sense applicable to a series of natural causes and effects, or what was sometimes called "physical power".[130] Gregory emphasised that

> These two circumstances or kinds of power comprehended in the seemingly simple operation of moving the hand by a voluntary effort, must be carefully distinguished. The making of the effort is an exertion of optional or discretionary power: the effort when made is a physical power or cause, which as usual in physics is followed by its proper effect.[131]

Because Hume showed no respect for Gregory's demarcation between optional power and physical causation, his reasonings were viewed as unintelligible. This is apparent in Gregory's assessment of Hume's criteria for knowing power. Hume demanded knowledge of necessary connections for both mental and physical power to be known. Gregory considered that this was an absurd demand for mental power. To know power did not rest upon knowing the circumstances upon which the exercise of it depended. The very fact that Hume demanded these criteria to be fulfilled was evidence for the fact that Hume regarded mental power as a physical cause. But even in the latter case, Gregory regarded the demand for demonstrative knowledge of the exact circumstances of a causal relationship as a mistaken basis for men's knowledge of causes. Thus Gregory actually criticised Hume for making the same error as Reid.

Both Reid and Hume denied that men knew necessary connections in nature. Reid argued that men still had an idea of productive or efficient causation. Hume stated they did not. However, what Gregory persistently attacked was the appeal to the absence of perceived necessary connections as a means of either denying knowledge of power in Hume's case; or for introducing the deity as an omnipresent productive principle, as in Reid's. Thus Gregory spoke of Hume's denial of necessary connections between causes and effects as if it were a continuation of "all such speculations concerning the circumstances by which a cause is enabled to produce its effect and the manner in which an effect proceeds from its cause".[132]

At first sight, this might seem a simple misunderstanding of Hume. However, Gregory's reading is also entirely intelligible. Gregory interpreted Hume's denial of necessary connections perceivable between events as the ground for Hume's subsequent nescience regarding power, whether mental or physical. As a matter of fact, Gregory endorsed the position that there were no necessary connections between physical events and that because of the nature of human power as optional and discretionary, there could be none for mental events. However, from Gregory's perspective, Hume was not simply denying the existence of necessary connections in nature, he was using this to deny men's knowledge of power, just as Reid used it to assert the superintending role of the deity. In keeping with his former stipulations of Hume as non-empirical, covertly deductive, and conceptually ambiguous, Gregory read Hume as resurrecting the misplaced demand for necessary connections as a basis for a sound knowledge of nature. Such discriminations only make sense as part of a strategy according to which Gregory sought to distinguish his position from Hume's, precisely because there were perceived similarities between them, as there were between Hume and Reid. In particular, these similarities seem to converge around the concept of necessary connection, to which we now turn.

3.3. Gregory's criticisms of necessary connection

Clearly, Gregory considered Hume's demands for knowledge of the idea of power to be misplaced. He therefore regarded Hume's scepticism about power as unfounded. However, Gregory did not stop at denunciation of Hume's negative-destructive views. He perceived that Hume denied men's idea of power for a purpose. This was evident from Hume's subsequent treatment of liberty and necessity in Enquiry 8. Having reduced power to a constant conjunction relation, equivalent to men's knowledge of cause and effect in physics, Hume had paved the way for his "reconciling project" concerning liberty and necessity. Gregory considered Hume had 'new-modelled' the argument for necessity by contending the relation of motive and action was precisely the same as cause and effect in physics. In both cases, there was a constant conjunction such that men's knowledge of motives preceding actions was precisely the same as their knowledge of causes and their effects in physics. Gregory completely opposed Hume's necessitarianism which he regarded as repugnant to "the natural suggestions of the human faculties" and "the irresistable conviction of mankind".[133]

Gregory made his own position quite clear. According to his pluralistic theory of change, there were different species or relations of event. One was physical causation, characterised by the constant conjunction of causes and effects. Another was activity, characterised by the exertion of optional power by active beings in order to produce change. Gregory's account of these relations have been extensively discussed. His published Essay dealt with a third relation of event between motives and actions. Again, his purpose was to confine motive and action within its proper sphere and so segregate it from other relations men had confounded it with, such as the relation of cause and effect in physics. He regarded this as Hume's chief error and the characteristic feature of the 'new-modelled' necessitarianism advocated by men such as Priestley. It was made possible by what Gregory regarded as the misappropriation of the notion of constant conjunction.[134] Thus Gregory announced the aim of the Essay was to show that the relation of motive and action was not constantly conjoined like cause and effect in physics but entailed

> a certain independent self governing self-determining power which [a man] may at his own discretion exert by acting either according to motives or in opposition to motives, or without any motives at all.[135]

Gregory's first task was to refute Hume's argument put forward in Enquiry 8 that, despite men's protestations of liberty, they were really practical necessitarians. This was because men always believed and acted upon the basis of a constant conjunction between motives and actions. Hume offered an explanation of why most men nevertheless repudiated necessity. This was as follows. Men always felt there was some kind of necessary connection between physical causes and their effects instead of a mere constant conjunction. When they reflected upon the connection between motives and actions, they could not find an equivalent feeling to physical necessity. Therefore men mistakenly concluded that there was a different basis for the connections between motives and human actions and physical causes and effects. Furthermore they attributed this difference to men's freedom of will and contrasted it with the necessity of nature.[136]

As we have seen, Gregory regarded the common and vulgar perception of liberty as irrefragable evidence for its reality.[137] Gregory perceived and completely opposed Hume's naturalistic approach in which, for example, the feeling of liberty or power was seen as "a phenomenon or matter of fact" to be accounted for in terms of Hume's principles.[138] Hume was one of

> those philosophers who have thought fit to erect themselves into a tribunal of higher authority than the voice of nature or the common sense of mankind.[139]

The "tribunal" in Hume's case was the doctrine of ideas and impressions.[140] Gregory adopted the same argument used in Power to show how Hume explained fallacious or misplaced feelings of liberty or necessity, by stating there was no corresponding impression from which they could be derived. As before, Gregory argued that Hume's restricted sense of an idea as something derived from a precedent impression enabled him to deny the existence of some ideas which men undoubtedly had, irrespective of whether such ideas were justifiable.[141]

Gregory challenged all Hume's stipulations about what men really thought and felt. Yet Gregory continued to stress that appeals to the evidence of consciousness counted for little in the face of counter-claims about men's common sense. Therefore, in his Essay, he sought to demonstrate the difference between motives and actions, and causes and effects in a way that commanded men's assent. Only demonstration could give immunity from the politicisation of experience and consciousness, which had emerged in the clash between necessitarianism and voluntarism or Humeian metaphysics and Reid's philosophy of active powers. The exact details of Gregory's proposed demonstration are considered subsequently. However, as a preliminary to demonstration, Gregory sought a clarification of the meaning of necessary connection.

Gregory's discussion of Hume's usage of necessary connection concentrated upon a passage from Enquiry 8:

> Let anyone define a cause, without comprehending, as a part of the definition, a necessary connexion with its effect; and let him show distinctly the origin of the idea, expressed by the definition; and I shall readily give up the whole controversy.[142]

Gregory found Hume's use of necessary connection here a puzzling, ambiguous and contradictory one. He stated that Hume could not mean that it was impossible to define cause without any necessary connection between cause and effect, because in Enquiry 7, Hume had actually given two such definitions.[143] Surely it was the whole purpose of that section of the *Enquiry* to show the relation of cause and effect did not imply any such necessary connection? Yet in this passage, Hume said it was impossible to define cause *without* necessary connection.[144] Gregory was not alone in being puzzled by Hume's use of necessary connection. Gregory drew Reid's attention to it, who discussed it twice in his letters. According to Reid, Hume "meant to say the contrary of what he said [but] the word *without* ha[d] slipt into the sentence by an oversight of the author or printer":

> For does not he himself define a cause, without comprehending as a part of the definition, a necessary connection between the cause and the effect? Does he not maintain that we have no idea of necessary connection?[145]

Both Reid and Gregory found it contradictory that Hume could say most men considered events in nature were necessarily connected, while at the same time, he denied men ever had any idea of necessary connection. But whereas Reid made no attempt to probe into Hume's meaning of necessary connection in *Enquiry 8* as opposed to *Enquiry 7*, Gregory pursued the matter further.

For Gregory, necessary connection was a particular kind of relation and as the self-appointed natural historian of all relations of change, he sought to define it as a species distinct from others. In its common usage:

> The phrase *necessary connection* may be supposed to mean a connection which from the nature of things *must* take place, or more accurately speaking, according to the laws of thought, *must* be conceived by us to take place; the contrary of it, or any supposition inconsistent with it being not merely false, but either intuitively or demonstrably impossible and absurd.[146]

Necessary connection was a characteristic of all geometrical relations and some relations in various other subjects to which Gregory alluded but did not specify. Gregory maintained that this was the sense of necessary connection which Hume used when he said men had a tendency to believe there were necessary connections in the matter of fact operations of nature. In *Enquiry 7*, Hume always contrasted this sense of necessary connection with constant conjunction, attacking the former in order to establish the latter.

In Enquiry 8, Gregory noted another and different usage of necessary connection. This sense

> is what Mr Hume has with much greater propriety called regular, uniform, constant conjunction. Other words might easily be employed to denote the same meaning; such as inseparable connection, or more strictly speaking, a connection which men cannot separate.[147]

It was Hume's contention that necessity, as a constant conjunction between motives and actions, had never been rejected by philosophers or ordinary men in the relation of motives to actions. Thus in the passage cited above, Hume actually meant: let anyone define a cause without comprehending a constant conjunction with its effect and he would give up the controversy. Gregory saw Hume advocating that either there was a constant conjunction between all causes and their effects, including motives and actions; or there was no connection at all. Gregory stated that in the proper sense of necessary connection,it was impossible to demonstrate that necessary connections existed between either physical causes and effects or motives and actions. He quoted the following challenge made by Hume in order to show that Hume had set libertarians such as himself the wrong task:

> It may only perhaps be pretended that the mind can perceive in the operations of matter some further connection between the cause and the effect; and a connection that has not place in the voluntary actions of intelligent beings - And it is incumbent on these philosophers to make good their assertion, by defining or describing that necessity, and pointing it out to us in the operation of material causes.[148]

From Gregory's perspective, liberty was not to be defended by demonstrating necessity in physical nature. He endorsed Hume's analysis of constant conjunctions between physical causes and effects. Instead the task for the libertarian was to demonstrate, not that there was any more than constant conjunction in material nature, but less than constant conjunction between motives and action. In other words, Gregory perceived his task to be a demonstration that the behaviour of inanimate bodies on the basis of constantly conjoined physical causes and effects was not analogous to the actions of men on the basis of their motives. Precisely how he did so is considered in chapter six.

4. HUME, NATURAL KNOWLEDGE AND THE PROBLEM OF CAUSATION

In the last section it was shown that Gregory perceived Hume's necessitarianism as well as his scepticism regarding causation. In this sense, he was untypical of most other 18th century commentators and critics. However, Gregory's particular attempt to understand and resolve the meaning of Humeian causality is representative of the severe problems of interpretation Hume's metaphysics posed for his contemporaries and successors. The purpose of this section is to bring out more clearly the possible foundations for divergent interpretations of Hume's philosophical 'message' about causation. The analysis is largely restricted to Enquiry 7 and 8, because these sections formed the basis of Gregory's own critique. As we shall see, understanding the 'Janus-faced' nature of Hume's philosophy of causation provides the key to its importance in the discourse of Scottish scientific metaphysics generally.

In the new-modelled and streamlined version of his earlier Treatise, Hume contrasted his own "abstract" and "profound" philosophy with another kind which was more "easy" and "obvious".[149] But, at the same time, he presented his own metaphysics as "carrying the war into the secret recesses of the enemy" and also offering a challenge to rival systems of abstract philosophy.[150] Hume considered his metaphysics could undertake this critical role because it was accurately founded upon the nature of human understanding. This is nowhere more apparent than in Hume's analysis of causation. The limits Hume imposed upon man's knowledge of cause and effect also circumscribed the limits of human understanding and confined the practice of metaphysics within its proper bounds. What were those limits?

Hume argued that all reasonings about causes and effects were founded upon customary past experience and inferred future expectation. Men were hostages to analogy. The applauded virtues of experience and observation ultimately come down to the statement "From causes which appear similar we expect similar effects".[151] This relied upon a taken-for-granted assumption about the uniformity of nature. Beyond the assignment of mundane causes, the "ultimate springs and principles [were] totally shut up from human curiosity and enquiry". These limitations upon the knowledge of causal inference, had direct implications for both natural philosophy and metaphysics generally. The most perfect kind of natural philosophy "only stave[d] off our ignorance a little longer; the most perfect metaphysics serve[d] to discover larger portions of it."[152]

In spite of Hume's professed causal nescience, he actually used his conception of causality in a very positive way to solve, or rather dissolve, a number of standard topics in 18th century thought. As we have seen, he attacked received conceptions of power and necessary connection, and put forward a view of philosophical necessity based on the constant conjunction of causes and effects. He also identified a common instinctual basis for reasoning and applied it to both animals and man. He questioned the existence of miracles, particular providence and a future state. In all these cases Hume made direct use of his theory of causality to attack metaphysical orthodoxy in crucial institutionalised areas of discourse. It is significant that Hume did not specify the exact nature of the metaphysics he wished to destroy. Where he cited authors, they were Aristotle, Malebranche and Locke. From the diversity of this admittedly brief list, it is likely that Hume did not even have a particular school of thought directly in view, much less an individual writer. Instead, Hume attacked the grounds of inference by which metaphysicians connected events together. He undermined their sense of necessary connection between the succession of events in the natural world. But he also applied this to the necessary connections asserted between natural events and divine events.[153]

To balance what has just been said, it is important to emphasise that Hume did not necessarily deny the existence of connections of either sort. What he attacked were misconceptions about the nature of causal inference which lead to false assessments of the certainty of human knowledge. Hume held what present-day philosophers now describe as a regularity theory of causality which operated in conjunction with a theory of belief that was itself causal. The technical details of this do not require elaborate discussion here.[154] The significant point is that alongside his professed causal nescience and emphasis on perceived regularities, Hume repeatedly made reference to a philosophy of nature which had important connotations and resonances for his contemporaries. Hume supplemented his account of regular customary causes with continual references to the "powers", "forces" and "principles" of nature which were variously described as "natural", "hidden" or "secret".[155] These intrinsically unknowable powers and principles were ultimately responsible for all human belief based upon the customary constant conjunction of causes and effects:

> Here then, is a kind of pre-established harmony between the course of nature and the succession of our ideas; and though the powers and forces, by which the former is governed, be wholly unknown to us; yet our thoughts and conceptions have still, we find gone on in the same train with the other works of nature.[156]

Hume referred to the capacity by which the associations of ideas produced beliefs that actually corresponded to events in nature as "a species of natural instinct".[157] How it operated was wholly beyond the capacity of human reasoning, thought and understanding.

It is difficult unproblematically to assess the image of natural order hinted at in Hume's Enquiry. However one thing is clear: it was not the kind of voluntarism endorsed by John Stewart. Hume in fact made several references to occasionalism in Enquiry 7, all of them highly critical. He attacked the theism of occasionalism, in which all activity in nature was attributed to divine intervention of one sort or another. Hume actually wrote in a manner which suggested this viewpoint had been gaining ground. In a footnote he asked, "By what means has it become so prevalent among our modern metaphysicians?"[158] Hume located the origin of occasionalism in Cartesian philosophy, but he stated that it had no previous authority in England. Rather, Locke, Clarke and Cudworth had always insisted that matter had a "real, though subordinate and derived power". By also citing Newton's use of "an etherial active fluid" to explain gravity[159] Hume revealed his familiarity with debates about the powers of matter. Unfortunately, he did not expand upon the upsurge in occasionalism which seemed to be occurring in the 1750s.

Interpreting the significance of Hume's footnote about occasionalism is beset with difficulties. It could be read as evidence for Hume's support of Stewart's limited voluntarism. Or on the other hand, it might appear that Hume was sympathetic to active etherial fluids, an interpretation favoured by Christie.[160] Neither of these alternatives is entirely convincing. This is because Hume's metaphysics did not directly raise the problems of the nature of matter and spirit, the ontological staple of Scottish scientific metaphysics as a whole. Instead Hume's epistemology placed severe strictures on this form of discourse. He explicitly denied the cogency of accounts which emphasised different kinds of causes in nature based upon the existence of different kinds of ontological substances such as matter and spirit. In their place he put a causal monism founded on the mind's constant conjunction of perceived customary successions of events. Thereby, Hume gave the debate over the powers of nature, mental and physical, a further epistemological twist which further interiorised the whole problem of natural knowledge for his contemporaries and successors.

Hume developed a sophisticated form of anti-occasionalism or necessitarianism, in which the order of nature could only be known as an order in the succession of ideas and impressions in men's minds. By definition, occasional events could not be known. At the same time, all causes were themselves necessary connections. Hume expressed the positive aspect of his philosophy in Enquiry 8. It was also the nearest he came to discussing the nature of matter. Hume argued that the meaning of necessity lay in the way the idea was actually applied to the behaviour of bodies:

> Our idea, therefore, of necessity and causation arises entirely from the uniformity observable in the operations of nature where similar objects are constantly conjoined together, and the mind is determined by custom to infer the one from the appearance of the other. These two circumstances form the whole of that necessity which we ascribe to matter.[161]

For Hume, necessity was something men granted matter based upon the constant conjunction of similar objects and the inference from one to another. But the necessity itself was actually in men's minds. This is why Hume moved so readily between ideas and objects in his definitions of cause and the same sort of thing can be found in his discussions of matter. Thus

> It is universally allowed that, matter, in all its operations, is actuated by a necessary force, and that every natural effect is so precisely determined by the energy of its cause that no other effect, in such particular circumstances, could possibly have resulted from it.[162]

Taken at face value, this statement was a direct contradiction of other views held by Hume. Matter possessed a necessary force; yet Hume denied power. Every natural event was determined by the energy of the cause; yet causes had no "energy". No other effect could have resulted; yet anything might follow from anything else.[163]

Many other statements found elsewhere in the Enquiry and in the earlier Treatise are subject to a similar dilemma associated with Hume's Janus-faced approach to scepticism and naturalism. However, the resultant interpretive problems are more apparent in the Enquiry. This is because Hume compressed or even omitted sections from the Treatise which might have helped to clarify his position. Apart from the material on ideas and impressions, probability and the external world which all received less treatment, Hume's most significant and puzzling omission was any independent discussion of the "Rules by which to judge causes and effects".[164] In the Treatise, Hume made it much more apparent that he regarded his rules as a philosophical species of probability. However, he held that they were the best available means of correcting human judgement, which was continually subject to the detrimental effects of superstition, natural and supernatural, all acting on the imagination of man.[165] Thus the analogical rules of causal reasoning were a pragmatic, if fallible means of connecting evidence and belief, through which the inevitable antinomies of human reasoning could be, to some extent, ordered and controlled.

Despite widespread hostility to his philosophy, Hume's Scottish contemporaries all accepted the importance of the issues that Humeian metaphysics addressed. These can be expressed by two connected questions which had enduring significance for members of the Scottish scientific metaphysics community: They were: "where does the power of nature lie?" and "how is the order of nature to be discovered and known in men's minds?". Hume's contribution was to reformulate the meanings of key terms routinely used in the vocabulary of scientific metaphysics such as "cause", "power", "necessary connection", "law", "rule" etc. In so doing, he transposed the debate from the analysis of the causes and powers of nature, and the rules and laws they obeyed, into a parallel one about the causes and powers of men's mind and the rules and laws it obeyed. Suggesting some of the grounds for divergent readings of Hume's philosophy provides a way of understanding rather than dismissing the variety of responses to him made by Scottish scientific metaphysicians.

Hume's epistemological sophistication and lack of ontological commitments posed problems of interpretation for his contemporaries. Hume's Scottish commentators and assessors had to 'make out' Hume. For example, Hume could be re-processed as an occasionalist because he had denied the existence of necessary connections between causes and effects. This approach can be found in Dugald Stewart.[166] Or, his conclusions about causation could be regarded as appropriate for physical events but not human activity. As we have seen, this was Gregory's and Reid's position. Alternatively, continuities could be found between Hume's radical epistemology of causation and its use by materialists later in the century such as Priestley. Precisely this sort of a connection was perceived to exist between Hume's philosophy and Kames's necessitarian materialism in the 1750s. Whatever the strategies of appropriation to be found in this period, one thing is abundantly clear: Hume's philosophy was itself an effective strategy for the epistemological interiorisation of nature which had either to be endorsed or confronted.[167] At the same time, the relationship between Hume's philosophy and Scottish scientific metaphysics as a whole was a 'Janus-faced' one. Hume was both a participant in Scottish scientific metaphysical discourse and its principal subversive element.

5. CONCLUSION

In the preceding sections, Gregory's criticisms of Hume and Reid have been extensively documented and discussed. Some indications of Reid's and Hume's views upon the nature and importance of causality have also been given. Now is remains to assess the general significance of Gregory's attempt to drive a wedge between what he perceived as their voluntarism and necessitarianism. It is important first to note the apparent similarity that exists between Reid, Hume and Gregory about men's knowledge of causality. All three were emphatic in the denial of men's perception of necessary corrections in nature. Similarly, they endorsed the appropriateness of constant conjunction as a description of how men actually perceived the connection between physical causes and effects.

It is equally necessary to note that this apparent similarity between Reid, Gregory and Hume masks a more fundamental disagreement over deployment of necessary connection and constant conjunction as limiting conditions of men's perception of change in nature. This concerns what might be called the 'directionality of nescience'. It is most evident in the contrast between Hume and Reid. Hume's denial of necessary connections was a means of re-establishing man's central role as the productive and necessary architect of his own experience. But Reid's apparently similar denial pointed in a quite different and opposite direction. For Reid, the protestation of nescience was a means of establishing God's central role as the productive and free architect of men's experience. Thus Hume reintroduced a necessary connection into constant conjunctions in the form of a customary transition of the imagination from causes to effects and vice versa. This was why in Hume's view, a cause was always necessary. Reid reintroduced necessary connection in the sense of the deity acting as an efficient principle producing the order of nature according to his laws, which men only perceived as constantly conjoined causes and effects. The obvious question is: where does Gregory fit in here?

In Gregory's case, the attempt to drive a wedge between Reid's voluntarism and Hume's necessitarianism resulted in the directionality of nescience disappearing altogether. Denying necessary connections between physical events was not a means of reintroducing it under the aegis of man's or God's efficiency. Rather, it was a consequence of Gregory's attempt to eliminate the idea of production from physical causation altogether. For Gregory, the question of how a complex cause produced its effect was pragmatically answered by an enumeration of the simple parts involved. But in the case of simple causes or relations of event, the further question of production was "nugatory and absurd". This applied to both senses of efficiency emphasised by Hume and Reid.

Differences between Reid, Hume and Gregory over the deployment of constant conjunction and necessary correction were not just confined to physical causation. There were also disagreements over how these concepts should be used to convey and circumscribe the conditons and constraints of men's knowledge of mental events. For Hume, power was itself a synonym for necessary connection and on a par with other words such as "force", "energy" or "productive quality". Therefore to know power, Hume claimed men had to know the means of either, how thoughts were connected together; or how the mind controlled the body. These were necessary preconditions if power was to be foreknown independently of experience. In this sense, Hume made no distinction between knowledge of physical and mental phenomena. As we have seen, Reid also denied that men knew the productive quality of mind called power as a necessary connection. But he maintained men nevertheless knew power, through the internal experience of willing gained in childhood. Historically, this experience of willing had become sedimented in the roots of language through active verbs. Thus Reid certainly did not accept Hume's criterion that to know power either speculative or active, one had to know the means by which such power produced its necessary effect. For Reid, power meant something that was intrinsically optional; it could not be foreknown in advance. Because of the close analogy between human and divine power, Reid was prepared to see men's experience of willing eroded to the extent that other agents might be the real productive means of change when men exerted their power. This was because Reid held that men's knowledge of power was underwritten by his second metaphysical principle of necessary truth "That whatever begins to exist must have a cause which produced it".[168]

When we turn to Gregory, we find that he certainly considered men knew power without needing to enumerate all the means by which power produced its effect. Also power was intrinsically optional. But what also occurs in the Project is an attempt to put men's knowledge of power upon a new footing, by appealing to the demonstrative evidence of language usage, rather than upon the perhaps questionable introspective experience of willing. He was not explicit about whether power implied a means of production men actually possessed. Gregory certainly never sought to justify men's knowledge of power on the basis of their direct experience of it. Instead, he substituted analyses of the relations of activity and motive and action in which power was always implicated, but never analysed directly. In both these cases, Gregory placed correspondingly more emphasis upon relations than productions. The final consideration is that Gregory continually strove to segregate the idea of power from the common notion of cause and effect in physics, in which production had no part. Hence Gregory's reluctance to equate constant conjunction between physical causes and effects and laws of nature as Reid had done.

By looking at the fine detail of negotiations about concepts such as "efficient cause", "physical cause", "necessary connection", "constant conjunction", "law of nature", "power", etc, one cannot fail to take account of the remarkable latitude and diversity of their application and use in Hume, Reid and Gregory. This makes any generalisations about their deployment in particular instances very difficult. However, one way of approaching this difficulty is to see that in Reid and Hume, the overall use of these concepts served to maintain their respective voluntarist and necessitarian orientations. In other words, conceptual deployment was goal directed in order to maintain systematic and different images of natural order. In particular, the philosophical metaphors of necessary connection and constant conjunction can then be understood in relation to the search for the epistemological interiorisation of nature. They functioned in Scottish scientific metaphysics as expressions of the conditions under which men perceived relations between objects or events. Thus the denial of necessary connection in physics was an expression of men's nescience about the physical world. The protestation of nescience confined the manner in which men could know how things occurred in nature. Knowing how things occurred implied knowing causes. To deny necessary connections in nature meant that men could not know the manner in which physical causes produced their effects. All they knew was that causes seemed constantly conjoined with their respective effects.

Alongside the professions found in Reid, Hume and Gregory were a series of counterclaims about men's certain knowledge of the probable. This is evident in the different ways each writer sought to transpose men's knowledge of the succession of events away from perceived constant conjunctions and towards various kinds of necessary connection. Reid's fundamental distinction between mind-based efficient causes and body-based constant conjunctions upheld his voluntarism and was an expression of common sense dualism. This was ultimately underwritten by the view that men's beliefs were guaranteed by the deity, who was responsible for men's constitutional dispositions, including power itself, and the propensity to believe that men's perceptions corresponded to a real state of affairs in nature. In Hume we find the profession of a different kind of certainty, based upon men's propensity to make causal inferences about nature. Gregory on the other hand, rejected both a voluntarist justification of men's knowledge of cause and effect in physics based on introspection and the broader claims of necessitarianism. He therefore sought to erect new criteria for demonstrating the probable, such as the evidence of linguistic usage. But, as we shall see in chapter six, Gregory's search for the certainty of demonstration was not confined to the evidence of language alone. In the _Essay_, Gregory eliminated men's sense of necessary connections from nature, in order to reintroduce it as the awareness of a logically valid inference from axiomatic propositions.

REFERENCES TO CHAPTER 4

1. Introduction, clxxviii.

2. One of the reasons why Gregory suppressed the argument of Activity may well have been that at a crucial point he had to rely upon an analogy between Latin and English usage, rather than a direct presentation of the evidence of language itself.

3. Introduction,ccxiv-ccxxix.

4. Ibid., ccxii.

5. Ibid., v-vi.

6. Ibid., iii-iv.

7. Ibid., ccxxiii-iv.

8. See Reid, Letter VIII, Works, 67 where Reid remarked: "You say, you fear we shall never agree with respect to the notion of cause and effect. I am at a loss to know wherein we differ". Or again in Letter XIV, ibid., 74: "If we agree in these things, I see not wherein we differ, but in words".

9. See Dugald Stewart, A short statement of some important facts relative to the late election of a mathematics professor in the University of Edinburgh, 3rd ed. (Edinburgh, 1805), 114, where Stewart commented:

> far from exciting on either side the most distant suspicion of a disagreement between them on those great and fundamental principles ... this speculative difference of opinion never for one moment interrupted the cordiality of their friendship.

10. Introduction, ccii.

11. Ibid., ccxi.

12. Ibid., ccxi-ii.

13. Ibid., ccvii-ccx (emphasis in original). The sequence of quotations presented here differs from Gregory's in order to facilitate the exposition of this chapter. The quotations themselves may be found in Reid, "Active powers", Works, 515; and ibid., 603-07.

14. Introduction, ccxxiii.

15. Ibid., ccxxiv-v.

16. The only one of Reid's letters I have been able to trace is Letter VI, Glasgow University Library, MS Gen. 502, 17, and this is only a very brief business note.

17. Reid, *Works*, 62-88.

18. See L.L. Laudan, "Thomas Reid and the Newtonian turn of British methodological thought", in R.E. Butts and J.W. Davis, eds., *The methodological heritage of Newton* (Toronto, 1970), 102-31. Laudan cites Reid's letters on no less than twelve occasions, whereas he refers to Reid's published writings only once. For an indication of current Reid scholarship and further bibliographic details, see the collections of articles in Stephen F. Barker and Tom L. Beauchamp, eds., "Thomas Reid: critical interpretations", *Philosophical Monographs*, 3 (1976) and "The philosophy of Thomas Reid", *The monist*, 61 (1978).

19. Each of Reid's first four letters begins with details of forwarding essays which Reid sent along with his correspondence. These were drafts of the "Intellectual powers".

20. It is probable that Gregory did not send Reid the final part of *Activity* in which he considered possible objections. See "Dedicatory letter to Reid", *Introduction*, i-x. In Letter XIV, *Works*, 73, Reid attempted to dissuade Gregory from his intention, suggesting he should dedicate the book to his "great friends".

21. James McCosh, *The Scottish Philosophy, biographical, expository, critical from Hutcheson to Hamilton* (London, 1875), 265.

22. Reid, Letter XVII, *Works*, 81. Reid also wrote that if he had seen Gregory's papers before writing these chapters he would have rewritten them more explicitly.

23. *Ibid*. See also "Active powers", *ibid*., 515, 603.

24. *Ibid*., Letter XVI, 77.

25. *Ibid*., Letter VII, 65.

26. *Ibid*., Letter XVI, 77.

27. *Ibid*., Letter VII, 65.

28. See also *Ibid*., "Active powers", 514, where Reid gave a general discussion of the concept of power.

29. *Ibid*., Letter XVI, 78.

30. *Ibid*., Letter XVII, 81. See also "Active powers" *ibid*., 523-24.

31. *Ibid*., Letter VII, 65-66. See also "Intellectual powers", *ibid*., 455-56.

32. *Ibid*., Letter XV, 75.

33. *Ibid*., 66.

34. *Ibid*., 82.

35. *Ibid*., Letter XIX, 84.

36. *Ibid*., Letter XV, 76. See also "Inquiry", *ibid*., 199.

37. *Ibid*., Letter VII, 66.

38. *Ibid*., Letter XV, 77-78.

39. *Ibid*., Letter XIX, 84. See also "Inquiry", *ibid*., 188; and "Intellectual powers", *ibid*., 484.

40. See *Ibid*., Letter VII, 66; Letter VIII, 67; Letter IX, *ibid*.; Letter XIV, 73; Letter XV, 76; Letter XIX, 84.

41. *Ibid*., Letter VII, 66. See also Reid's *Lectures on natural philosophy*, Aberdeen University Library MS.2131, 5. These lectures were delivered at King's College during the 1757-58 course. They were given to the tertian class and taken down by a student, possibly William Knight. Apart from Reid's brief introductory remarks, the lectures are of limited use in understanding Reid's views on causality and his philosophy of science. Generally, Reid organised his regenting so that "pneumatology" was taught after "somatology", or natural philosophy, in the fourth year of the course. However, in his introductory remarks, Reid made his general position quite clear. For example on pages 5-6 he wrote that laws of nature were rules according to which God governed the world. He also reminded his students that men could not "account for the laws of nature or assign any other causes of them than the will and agency of the author of nature, or some inferior being". While the contents of his lectures were mathematical and factual, Reid nevertheless emphasised the wider hegemony of metaphysics over natural philosophy which determined its aims and the form of its explanations.

42. Reid, Letter XV, *Works*, 76. See also "Letters to Lord Kames", Letter VI, *ibid*., 58-59, where Reid grouped together Kames, Monboddo and Priestley as men who were misguided in seeking efficient causes as part of natural philosophy. As an antidote to this Reid wrote:

> Let the mathematician demonstrate the relation of abstract quantity; the natural philosopher investigate the laws of the material system by induction, and the metaphysician, the final causes, and the efficient causes of what we see and what natural philosophy discovers in the world we live in.

43. In his *Lectures* (ref. 41), 7, Reid emphasised that deductions from laws of nature to the phenomena ought to be "strictly mathematical [and] demonstrative, otherwise it cannot be trusted, or ought to be admitted in philosophy". This was also reflected in the general organisation of the lectures themselves where Reid strove to follow the deductive format of consecutive axioms, definitions, propositions and corollaries found in the *Principia*.

44. Reid, Letter IX, Works, 67.

45. Ibid., Letter XV, 76; Letter XIX, 84.

46. Ibid., Letter IX, 67.

47. Ibid., Letter XIX, 73.

48. Ibid., Letter XIX, 84. See also his Lectures (ref. 41), where Reid emphasised that "pneumatology" was knowledge of spirits and wholly distinct from knowledge of bodies. Again, in a letter to David Skene, Aberdeen doctor and fellow member of the Aberdeen Philosophical Society, Reid wrote "the immaterial world had swallowed-up all his thoughts", since he arrived in Glasgow. See "Letters to Drs. A. and D. Skene, Works, 50. By "physics", or "physicks", or "somatology", Reid and Gregory understood its synonym "natural philosophy". There was no consistent usage of such terms by members of the Scottish scientific community. However, there is some evidence for the gradual decline in the term "natural philosophy" in some writers. See for example the group of articles by John Robison in The Encyclopaedia Britannica, 3rd ed., 18 vols. (Edinburgh, 1797), "Experimental philosophy, vol. 7, 70-74; "Natural philosophy",vol. 12, 670-71; and "Physics", vol. 14, 637-59. Compare the usages of "natural philosopher" and "experimental philosopher" found in James Burnett, Lord Monboddo, Ancient metaphysics or the science of universals, 6 vols. (Edinburgh, 1777-99), vol. 1, Introduction, 433, 461.

49. Reid, Letter XVII, Works, 81.

50. Ibid., 82.

51. Ibid., Letter XIX, 84. For other substantial discussions of Hume see "Intellectual powers" ibid., 452-62; "Active powers", ibid., 520-22; 608.

52. Ibid., Letter XIV, 73.

53. Ibid., 73-74.

54. Ibid., Letter VII, 66.

55. Ibid., Letter XIV, 74.

56. Ibid., Letter XVII, 81.

57. Ibid., Letter XI, 76.

58. Ibid., Letter XIV, 74.

59. Ibid., Letter XVI, 78.

60. Ibid. See also Reid's appeal to language in ibid., "Active powers", 515-18.

61. *Ibid.*, Letter XVI, 78; Letter XVIII, 81.

62. *Ibid.*, Letter XIX, 84.

63. *Ibid.*, Letter XIV, 74.

64. *Ibid.*, Letter XVI, 76.

65. *Ibid.*, Letter XIX, 74.

66. *Ibid.*, Letter XI, 70.

67. *Ibid.*, Letter XVI, 78.

68. *Ibid.*

69. *Ibid.*, Letter V, 67; Letter XVI, 77; Letter XIX, 83-84.

70. *Ibid.*, Letter XI, 71. On Reid's account of signs, see "Inquiry" *ibid.*, 182-201.

71. *Ibid.*, Letter XVII, 81.

72. *Ibid.*, Letter XI, 70-71; Letter XIV, 74; Letter XV, 78; Letter XVII, 81.

73. *Ibid.*, Letter XIV, 74.

74. *Ibid.* The interpretation of this remark is made more difficult by Reid's use of the negative "nothing" in place of the "something" I have replaced it with in the text. From similar remarks Reid made elsewhere, this substitution conveys his position less ambiguously.

75. *Ibid.*, Letter VIII, 67.

76. *Ibid.*, Letter XVI, 78.

77. *Ibid.*, Letter XIV, 74. The parallels between the phraseology of Reid's letter and the wording of Gregory's "Objection 5th", suggests a direct connection between them. Gregory generally used the locution "a person for whose judgement and knowledge I entertain very great respect" to denote Reid and this appears in the prologue to these objections in *Activity 3*, 36.

78. Reid, Letter XVI, *Works.*, 78.

79. *Ibid.*, "Inquiry", 112.

80. *Ibid.*, "Intellectual powers",253.

81. *Ibid.*, "Active powers", 522.

82. See *ibid.*, 526-27, where Reid compared the explanations of how a mariner's compass was affected by a magnet, put forward by "an unlearned sailor", "a Cartesian philosopher", and "a Newtonian philosopher".

83. Ibid., 528.

84. Ibid.

85. Ibid., 530.

86. Power, 72.

87. Ibid., 76-77, note A opposite.

88. Ibid., 71.

89. Ibid., 73.

90. Ibid., 76, note A opposite.

91. Ibid., note AB, unpaginated holograph note.

92. Reid, Letter XVII, Works, 80.

93. Ibid.

94. See Ernest Campbell Mossner, The life of David Hume, 2nd ed. (Oxford 1980), 321-22; also Lionel Grossman, "Two unpublished essays on mathematics in the Hume papers", Journal of the history of ideas, 21 (1960), 442-49.

95. The standard bibliography of Hume's works is T.E. Jessop, A bibliography of David Hume and of Scottish philosophy from Hutcheson to Lord Balfour (London, 1938).For work on Hume see Roland Hall, Fifty years of Hume scholarship: a bibliographical guide (Edinburgh, 1978), with supplements in Hume Studies, vols. 3-6. Recent major studies of the meaning of Hume's philosophy include David Fate Norton, David Hume: common sense moralist, sceptical metaphysician (Princeton, 1982); John Bricke, Hume's philosophy of mind (Edinburgh and Princeton, 1980) and John Wright, The sceptical realism of David Hume (Manchester, 1983). Unfortunately, this thesis was completed before seeing Wright's book, which also seeks to locate Hume's work in its 18th century historical context, although not an exclusively Scottish one.

96. Norman Kemp Smith, "The naturalism of Hume", Mind, 30 (1905), 149-73; 335-47. See also R.W. Connon, "The naturalism of Hume revisited", in David Fate Norton, Nicholas Capaldi and Wade L. Robison, eds., McGill Hume studies: studies in Hume and Scottish philosophy (San Diego, 1979), No. 1, 121-45.

97. Charles William Hendel, Studies in the philosophy of David Hume (Princeton, 1925); John Passmore, Hume's intentions, revised ed., (London, 1968); V.C. Chapple, ed., Hume (New York, 1966); T.E. Jessop, "The misunderstood Hume" in William B. Todd, ed., Hume and the Enlightenment (Edinburgh and Austin, Texas, 1974), 1-13; A.G.N. Flew, Hume's philosophy of belief (London, 1961).

98. Hume, Treatise, 12-13.

99. James Noxon, Hume's philosophical development: a study of his methods (Oxford, 1973), 28-30.

100. Nicholas Capaldi, David Hume: the Newtonian philosopher (Boston, 1975); Robert H. Hurlbutt III, Hume, Newton and the design argument (Lincoln, Nebraska, 1965); Christine Battersby, Hume's easy philosophy: ease and inertia in Hume's Newtonian science of man (D. Phil. thesis, University of Sussex, 1978). See John Wright, Sceptical realism of David Hume (ref. 95) for an alternative account of Hume's "anti-Newtonianism" regarding the active powers (Ch. 4 "Causal scepticism and necessary natural powers", of which I have only seen a typescript.)

101. See the introductory remarks in David Fate Norton et.al., McGill Hume studies (ref. 96), 3-21.

102. Noxon Hume's development (ref. 99), 33-67.

103. Ibid., 67.

104. Ibid., 76-108, especially 76, 99-100.

105. I.B. Cohen, Franklin and Newton (Cambridge, Mass., 1966); Alexandre Koyré, Newtonian studies (Chicago, 1968).

106. My understanding of current developments in Newton scholarship owes a great deal to Steven Shapin, "Social uses of science", in G.S. Rousseau and Roy Porter, eds., The Ferment of knowledge (Cambridge, 1980), 93-139; and also "Making Newton: on interpreting scientific texts" (unpublished paper). I have also consulted Simon Schaffer, "Natural philosophy", also in Rousseau and Porter, 55-91.

107. See the work of J.E. McGuire, P.M. Heimann, David Kubrin, Martin Tamny, P.M. Rattansi, Richard S. Westfall and Ernan McMullin cited by Shapin in "Social uses of science" (ref. 106), passim.

108. Another group of writers including Margaret C. Jacob, Schaffer and Shapin broaden the context to include political factors in natural philosophy. See for example Margaret C. Jacob, The Newtonians and the English revolution, 1689-1720 (Ithaca, New York, 1976); Simon John Schaffer, The Newtonian cosmology and the steady state (Ph.D. thesis, University of Cambridge, 1980); Steven Shapin, "Of gods and kings: natural philosophy and politics in the Leibniz-Clarke disputes", Isis, 72 (1981), 187-215.

109. Hurlbutt (ref. 100) is a particularly blatant example of this attitude. Also, for some of the difficulties involved in relating Hume to the wider context of 18th century thought see Rom Harré "Knowlege", in Rousseau and Porter, eds. Ferment (ref. 106), 11-54, 30-35, where what is called "the Humean enigma" is resolved by viewing Hume as a kind of providentialist with interests that were just the same as those of Whiston and Clarke!

110. An exception to these tendencies identified in studies of Hume's Newtonianism can be found in the excellent study by Mary Shaw Kuypers, Studies in the 18th century background of Hume's empiricism (Minneapolis, 1930).

111. See John Yolton, John Locke and the way of ideas (London, 1956).

112. Reid, "Intellectual powers", Works, 294; "Inquiry", ibid, 142; and "Active powers", ibid., 520.

113. See D.F. Norton, "Hume and his Scottish critics", in David Fate Norton et.al., McGill Hume studies (ref. 96), 309-24.

114. Power, 4.

115. Ibid., 23.

116. On Beattie see N.T. Phillipson, "James Beattie and the defence of common sense", in B. Fabian, ed., Festschrift für Rainer Gruenter (Heidelberg, 1978), 145-58.

117. Power, 40.

118. Ibid., 31.

119. Ibid., 37; Hume, Enquiry 7, 77-78, footnote.

120. Power, 37-38.

121. See Hume, Enquiry 2, 18-22.

122. Power, 33-34.

123. Ibid., 41-42.

124. Ibid., 43.

125. Hume, Enquiry 2, 19-20, and quoted in Power, 45-46.

126. Power, 46-47.

127. Ibid., 52-55, quoting Hume, Enquiry 7, line 8, 64 - line 2, 67.

128. Power, 66.

129. Ibid., 80.

130. Ibid., 8-9.

131. Ibid., 58.

132. Ibid., 71.

133. Essay, 17.

134. *Ibid.*, 9-10.

135. *Ibid.*, 3.

136. *Ibid.*, 8. See also Hume, *Treatise* 407-09.

137. *Ibid.*, 14-15.

138. *Ibid.*, 18.

139. *Ibid.*, 14.

140. A similar reference to Hume's "dreadful tribunal of ideas and impressions" can be found in Reid, "Inquiry", *Works*, 144.

141. *Essay*, 34-35.

142. Hume, *Enquiry 8*, 95-96 and quoted in *Essay*, 21 and 33 (emphasis in original).

143. Hume, *Enquiry 7*, 76-77.

144. *Essay*, 33.

145. Reid, Letter XVII, *Works* 79, and cited again in Letter XIX, *ibid.*, 83.

146. *Essay*, 22 (emphasis in original).

147. *Ibid.*, 29.

148. *Ibid.*, 31, quoted Hume, *Enquiry 8*, 93.

149. Hume, *Enquiry 1*, 6-12.

150. *Ibid.*, 12.

151. Hume, *Enquiry 4*, 36.

152. *Ibid.*, 31-32. See also David Hume, *The history of England from the invasion of Julius Ceasar to the Revolution in 1688*, new ed., 8 vols. (London, 1822), vol. 7, 321:

> While Newton seemed to draw off the veil from some of the mysteries of nature, he showed at the same time the imperfections of the mechanical philosophy; and thereby restored her ultimate secrets to that obscurity in which they ever did and every will remain.

153. Hume, *Enquiry*, passim. See also *Dialogues concerning natural religion*, edited with an introduction by Norman Kemp Smith (Oxford 1935), especially part 9, 231-36. Hume's *Dialogues* lie beyond the scope of this account but see M.A. Stewart, "Hume and the metaphysical argument *a priori*", unpublished paper presented to the Royal Institute of Philosophy Conference, *Philosophy and its history*, Sept. 1983.

154. For further detail see J.A. Robinson, "Hume's two definitions of cause", in V.C. Chapple, Hume (ref. 97), 129–47; Wade L. Robison, "Hume's causal scepticism", in David Hume:bicentenary papers, (Edinburgh, 1977), 156-66. On Hume and the philosophy of causation generally see T. Beauchamp and A. Rosenberg, Hume and the problem of causation (Oxford, 1981); J.D. Mackie, The cement of the universe (Oxford, 1974) and A.G.N. Flew, Hume's theory of belief (Oxford, 1961).

155. For an excellent discussion of the hidden and ambiguous philosophy of nature in Hume's work see Robert Fendel Anderson, Hume's first principles (Lincoln, Nebraska, 1966), 93-162.

156. Hume, Enquiry 5, 54-55.

157. Ibid., 46.

158. Ibid., Enquiry 7, 73.

159. See also [David Hume], A letter from a gentleman to his friend in Edinburgh, E.C. Mossner and J.V. Price, eds. (Edinburgh, 1967), 28-29. This was first published anonymously in 1745.

160. J.R.R. Christie, "Ether and the science of chemistry 1740-90", in G.N. Cantor and M.J.S. Hodge, eds., Conceptions of ether (Cambridge, 1981), 85-110. Hume's original usage was "active matter" rather than "active fluid". See his Philosophical essays concerning human understanding (London, 1748), 119.

161. Hume, Enquiry 8, 82.

162. Ibid.

163. Of course, there are many ways of rendering Hume's various remarks into a consistent philosophical viewpoint or, for that matter, showing Hume was actually inconsistent. Passmore, in Hume's intentions (ref. 97), seems to do both of these things at once. Similarly, in Jonathan Bennett, Locke, Berkeley Hume: central themes (Oxford, 1971), 257-312, we find successive treatments entitled "Hume on causation: negative" and "Hume on causation: positive". Similar ways of 'making out' Hume are signalled in the titles of recent studies. For example, Norton's David Hume (ref. 95) is sub-titled "common sense moralist, sceptical metaphysician"; while Wright's book is called The sceptical realism of David Hume (ref. 95). In my own exposition of Hume, I have tried to provide some account of why Hume's philosophy posed problems for his contemporaries, but also why it was so germane to Scottish scientific metaphysics as a whole. One of the reasons why I have emphasised the theme of interiorisation is to move away from present-day claims about the nature of Hume's philosophy as a form of realism, scepticism, naturalism, idealism, etc, and concentrate on historical actors' responses. I have framed the language of interiorisation so that it stands independently of those categories and does not foreclose upon any of them as options of philosophical judgement.

164. Hume, Treatise, 173-76. See also T. Hearne, "General rules in Hume's Treatise", Journal of the history of philosophy, 8 (1970), 405-22.

165. Hume, Treatise, 150.

166. Dugald Stewart, Elements of the human mind (London, 1843), note D,554. Also, for the wider use of Hume's ideas by the "evangelical party" of the Church of Scotland later in the 18th century see Ian D.L. Clark, "From protest to reaction: the moderate regime in the Church of Scotland, 1752-1825", in N.T. Phillipson and Rosalind Mitchison, eds., Scotland in the age of improvement (Edinburgh, 1970), 200-24, on 222.

167. For other responses to Hume see Monboddo, Ancient metaphysics (ref. 48), vol. 1, 454-56, 496; vol. 2, preface and passim; James Hutton, An investigation of the principles of knowledge and the progress of reason from sense to science and philosophy, 3 vols. (Edinburgh, 1794), vol. 2, 180-200; Henry Home, Lord Kames, Essays on the principles of morality and natural religion (Edinburgh, 1751), 281-93. For Reid's comments see the material cited under ref. 51. Finally, perhaps the most under-explored response to Hume by a Scottish scientific metaphysician is that of John Robison. See the references to chapter six which document this material.

168. Reid, "Active powers", Works, 455.

CHAPTER 5

KNOWING THE NERVOUS SYSTEM: CONCEPTIONS OF NERVOUS AETIOLOGY IN THE WRITINGS OF WHYTT, CULLEN AND JAMES GREGORY

1. INTRODUCTION

2. THREE PERSPECTIVES ON THE NERVOUS SYSTEM

   2.1 The sentient physiology of Robert Whytt

   2.2 The sceptical physiology of William Cullen

   2.3 The common sense nescient physiology of James Gregory

3. A CASE STUDY IN THE NATURE OF NERVOUS ACTION: THE PROBLEM OF MUSCULAR MOTION

4. VOLUNTARISTIC AND NECESSITARIAN IMAGES OF NERVOUS ORDER, THE PROBLEM OF SYMPATHY AND THE OPERATION OF STIMULANTS AND SEDATIVES

5. CONCLUSION

1. INTRODUCTION

In previous chapters, the principal features of Gregory's metaphysics of physical causation have been analysed and discussed. This culminated in Gregory's critique of Reid and Hume, which was described in chapter four. In the writings of all three, substantial linguistic agreement can be found concerning the nature of physical causation. Each endorsed the philosophical metaphor of constant conjunction as an appropriate characterisation of men's perception of change in the physical world. Also, Gregory,Reid and Hume considered that the discipline of natural philosophy should never concern itself with power or the efficient causes of phenomena.

Yet this apparent agreement also masked more substantial disagreements about the actual meaning, deployment and significance of concepts such as "physical cause", "efficient cause", "power", "law of nature" and "necessary connection". It has been suggested that for Reid and Hume, the meaning of such terms was determined by the way they were used to sustain voluntarist and necessitarian images of natural order which permeated Scottish scientific metaphysics. Gregory was intensely critical of these broader, systematic connotations he perceived in Reid and Hume. He accused each man of advocating particular kinds of causal monism, by means of which they articulated and justified their voluntarism and necessitarianism. In Reid's case it was a hegemony of efficient productive causes which were regarded as the only real causes in nature. In Hume's, it was constantly conjoined antecedents and consequents applied ubiquitously to all phenomena, rather than a unilateral restriction to physical events.

Gregory's disagreements with both men on this issue emerged most clearly over what I have called the 'directionality of nescience'. Reid and Hume denied men's perception of necessary connections in nature with specific goals in mind. Reid's voluntarism emphasised man's nescience in order to reintroduce the deity as the sole productive cause, thus binding God, the mind of man and nature into a hierarchical relationship. In Hume's 'new-modelled' necessitarianism this hierarchy was displaced. Men were determined by a customary transition of the imagination to infer future events upon the basis of past regularities. This placed man's mind at the apex of the hierarchy, followed by the order of nature perceived in men's minds. But it left God in an ambiguous position, perhaps only to be inferred from the questionable evidences of mind and nature. Gregory considered that Reid's and Hume's commitment to particular systems of thought distorted the utility metaphysics had in specifying the object of study suitable for natural philosophy. Therefore he sought a reappraisal of the key concept of physical cause outside the confines of either voluntarism of necessitarianism. In this sense, Gregory's metaphysics of physical causation was an act of demarcation and confinement appropriate to the emergence of natural philosophy as an independent discipline.

Before the analysis of Gregory's work can be developed any further, there is an immediate problem: Gregory was not a natural philosopher, nor did he ever write in any detail about the theory of mechanics. Therefore, his concern to reform physics on the basis of the nature and limits of the human understanding found no expression outside the immediate concerns of the Project itself. However, prior to, and during the time Gregory wrote the Project, he was Professor of the Theory of Medicine at Edinburgh. His views on the current state of physiology and therapeutics were set down in the Conspectus and delivered in his Lectures.[1] The general purpose of this chapter is to explore some features of Gregory's concern with causality within the realm of physiological and medical knowledge. In particular, it will be shown that his aim to develop an adequate account of physiological causation was a central aspect of Gregory's opposition to the use of voluntarist and necessitarian images of natural order within the theory of medicine.

As this is a potentially vast subject, some limits are imposed on the scope of this chapter. Firstly, no attempt is made to consider aspects of the practice of medicine. Gregory never published upon this subject. Surviving copies of his lectures on the practice of medicine indicate that he presented his own opinions as a kind of running commentary on Cullen's textbook, First lines of the practice of physic.[2] Hence, we only have very imperfect accounts of his position. Similarly, reconstruction of how Gregory actually treated individual patients is beyond the scope of this thesis. Therefore all discussion is restricted to the Conspectus and, where relevant, to the Lectures. Secondly, the physiological and therapeutic issues within the theory of medicine which are dealt with here concern the nervous system only. Topics considered in subsequent sections include Gregory's general account of the nervous system; his views on the nature of muscular motion; and finally, his statements about sympathy and the action of stimulant and sedative remedies. Thirdly, these subjects are discussed in comparison with the alternative views of Robert Whytt and William Cullen. This is in order to bring out the salient features of what I refer to as Gregory's 'common sense nescient physiology' within the local context of later Scottish scientific metaphysics.

Whytt, Cullen and Gregory succeeded one another as Professor of the Theory of Medicine during the emergence of the Edinburgh Medical School as one of the foremost centres of medical learning in Europe during the later 18th century.[3] Against this background of institutional change and the emergence of Edinburgh as a fully independent site of medical learning, intellectual changes also occurred. During the period, Scottish medicine showed a pervasive and distinctive concern with the nature of nervous sensibility and the related idea of sympathy. This has been well noted by Lawrence.[4] However, the increased interest in the properties of the nervous system was also part of a much broader intellectual change within British and Continental physiology as a whole. This was from earlier forms of mechanism, in the late 17th and early 18th century, to forms of vitalism which displaced them.[5] As a result of both the circulation of doctors and students between England, Scotland and the Continent, especially Holland, and the wider frame of reference of medical knowledge generally, the emphasis upon an exclusively local Scottish focus here may require amendation.[6] Nevertheless, in keeping with Edinburgh's emerging institutional independence, medical discourse also began to show a parallel autonomy. This is less so in Whytt's case but it is more apparent in Cullen and Gregory. Thus, whereas we find Whytt presenting his account of nervous action within a more international frame of reference, this is less noticeable in Cullen. Indeed, his relative independence from Boerhaavian doctrines is said to have caused concern in case it was detrimental to the developing popularity and esteem of the Edinburgh Medical School.[7] Finally, when we come to Gregory, he seems to have put forward his views largely in relation to Cullen's opinions. Therefore, as Gregory is the principal actor in the thesis, a tight local focus is more appropriate than it might at first seem.

The self-referring nature of later 18th century developments in Scottish physiology and medicine also applies to the precise form that discourse about the nervous system actually took. Once again, an examination of the form of physiological and medical discourse in Britain as a whole indicates it was informed by a common context of disciplines which embraced the philosophy of mind, natural philosophy and natural theology.[8] This common content is reflected in the use of vocabularies of mind and matter, motion and causality to conceptualise processes in the body which were also found in accounts of mechanics and in the philosophy of perception. Crucially, the deployment of key concepts such as physical or proximate <u>causes</u> of physiological change, nervous <u>power</u> and <u>laws</u> of the animal economy gave rise to problems of natural theological propriety similar to those already discussed in mechanics. In the pre-1750 period, Baxter's <u>Inquiry into the nature of the human soul</u> is a concrete example of how these subjects were perceived to be interrelated.[9] However, when we turn to Cullen, it is evident that his preferred metaphysical resources for articulating men's knowledge of the nervous system can be related to local developments which occurred in the Scottish scientific metaphysics community around the 1750s.

In the sections to follow, it is shown that Cullen developed his sceptical physiology using a conceptual framework derived from sensationalist epistemology generally but also one refined by Hume, especially in the central area of the language of causality. The situation with Whytt is less clear. But it will be argued that he articulated his preferred account of the nervous system using a form of voluntarism similar to the kind put to work by John Stewart in the debate with Kames. Finally in Gregory's case, the particular philosophical apparatus he uses to account for the nervous system can be directly related to what he perceived as necessitarian images of natural order popularised by Hume, and used by Cullen. Furthermore, his manner of combatting necessitarian claims about men's knowledge of the nervous system has clear affinities with Reid's views. They can also be found set to work for similar ends in the writings of Dugald Stewart, another second-generation ally of common sense philosophy.

In the following sections,Whytt's, Cullen's and Gregory's accounts of various aspects of the nervous system are viewed in relation to the general theme of the search for the epistemological interiorisation of nature. In this case, it is reflected in each man's articulation of the conditions which underlay men's knowledge of events in the nervous system. The order of presentation is as follows. In the first part of the chapter, I show that their respective accounts of the nervous system were articulated by means of preferred metaphysical views of the nature of mind, matter and the causal relationship between them. Thus Whytt's views were founded upon a traditional philosophy of mind which attributed all processes in the nervous system to a sentient self moving principle or soul. In conjunction with his reliance upon conceptual resources provided by sensationalist epistemology, Cullen also utilised a mechanism for the transmission of sensation based upon a subtile etherial fluid within the nerves. Finally, Gregory expressed a common sense account of the nervous system based upon a purely phenomenal description of the nature of internal and external sensation.

These broader metaphysical positions informed each writer's specific approach to the causation of events within the nervous system. For Whytt, all motion produced in the nervous system was the result of the sentient principle acting throughout the nervous system as a necessarily self-moving efficient cause. Cullen's account was founded upon a theory of causation which emphasised the constant conjunction of uniform antecedents and consequents in nervous processes. Finally, Gregory's professed nescience about the nature and operation of the nervous system was based upon an assumption about the distinctiveness of animate causation, which placed severe limits upon the search for causal regularities in nervous processes at the interface between mind and matter. Of their general orientations to the nervous system, Whytt is referred to as a sentient physiologist, Cullen as a sceptical physiologist and Gregory as a nescient or common sense physiologist. It is argued that despite the use of very different metaphysical technologies for securing the epistemological interiorisation of the nervous system, each writer could present his views as theologically acceptable.

In section three, the comparison is developed further in order to clarify each writer's conception of nervous action in a specific problem area. This is the nature and mechanism of muscular movement. It is shown that Whytt's Cullen's and Gregory's disagreements over men's knowledge of this subject can be understood in relation to their differences over the concept of nervous power. For Whytt, nervous power was coterminous with the self-moving sentient principle; whereas for Cullen, it was referrable to the motion of an etherial nervous fluid. Gregory, on the other hand, rejected any account of nervous power in terms of motions, howsoever produced.

In section four, it is suggested that different images of body order can be found in Whytt's and Cullen's physiological writings about the nervous system which resemble the voluntarist and necessitarian images of natural order identified previously in the Kames-Stewart debate. It is argued that while Gregory's nescient physiology corresponded in some ways to Whytt's voluntarism, it cannot be fully accommodated to it. Gregory's opposition to the use of natural philosophical concepts of motion and causation in physiology made him censorious of both the self-moving sentient principle, and the motile nervous fluid accounts of nervous action found in Whytt and Cullen. This viewpoint is supported with reference to their different conceptions of and attitudes to nervous sympathy and the operation of stimulant and sedative remedies.

2. THREE PERSPECTIVES ON THE NERVOUS SYSTEM

2.1 The sentient physiology of Robert Whytt

The greater part of Whytt's writings dealt with the nature of nervous action and related problems.[10] He considered that the nervous system as a whole, including muscle fibres, was animated by an active "sentient principle", mind or soul. Although the sentient principle was united to the material part of the nervous system, Whytt continually emphasised that it was wholly distinct from matter. He specified its characteristics in relation to existing traditions of medical thought. He was critical both of mechanically inclined physicians and of Stahl, whom he considered to have over-emphasised the hegemony of the soul as a rational agent controlling bodily processes.[11] Against the mechanists, he argued that the behaviour of muscle during contraction did not correspond to any known laws of matter, and could not be accounted for in wholly physical terms. Against Stahl, Whytt maintained that his conception of the sentient principle was not to be associated with the Stahlian rational soul. It did not regulate vital motions according to any process of ratiocination; nor was it conscious. In his attempt to clarify the nature and status of nervous power, Whytt referred to the existing distinction between "anima" and "animus" which paralleled his own between sentient and rational principles of the mind. However, he considered it probable that both were only the same principle acting in different capacities.[12] The essential difference lay in Whytt's characterisation of the involuntary response to stimuli. In this case, the sentient principle was

> determined by an ungrateful sensation of stimulus affecting the organs to exert its power in bringing about these motions as in a scale which by mechanical laws turns with the greatest weight.[13]

Thus, for Whytt the sentient principle, although immaterial, acted necessarily when responding to a stimulus and contracting involuntary muscle in bodily movements.

In considering objections to his notion of a sentient principle, Whytt discussed his underlying conception of causation in greater detail. Whytt stated that if the critic persisted in questioning whether the sentient principle was an aspect of mind, then the question became: 'what else could it be?' Although Whytt believed involuntary responses were necessarily determined by stimuli, he did not think that the cause of motions in the body could be attributed to laws. In fact it was

> vain to attribute them to any law which it may be pretended the Deity has established, since a law can produce no effect of itself and without some agent to execute, it is only a mere name or empty sound.[14]

Because sentient and active substances alone could be causes, only three alternatives were possible. Either motions were produced by the immediate agency of the supreme being. Or by "some general inferior nature which he [had] constituted for this purpose". Or finally, "to the energy of a particular active principle united with the body". Although Whytt conceded that the first two alternatives were possible, he believed the third was probable. He therefore stated that the immediate cause of motions produced by the nervous system was "that sentient and intelligent principle with which the Creator has animated our bodies".[15]

Whytt believed that his notion of "the extensive influence of something in the bodies of animals" wholly distinct from the nature of matter was more suitable to explain muscular motion than one founded upon some modification of matter. This was because the involuntary movements of the body displayed features which were inexplicable on the basis of the inertness of matter.[16] Whytt concluded that in order to effect muscular movement, the sentient principle must be distributed throughout the nervous system. He was aware these views might have implications for the extension and divisibility of the soul. Yet, in the face of a possible accusation of unorthodoxy, he emphasised that

> whoever considers the structure and appearances of the animal frame, will soon be convinced that the soul is not confined to an invisible point but must be present at one and the same time if not in all parts of the body where nerves are found, yet, at least at their origin, i.e. it must be, at least, diffused along a great part of the brain and spinal marrow.[17]

He added that upon these grounds, some writers had thought the soul was extended. He cited More, Newton, and Clarke as examples.

In support of his position, Whytt emphasised that the issue rested upon a complete ignorance of body-soul interaction. However he added the following analogy:

> As the Deity is every where present and, in the infinitely distant parts of space, actuates at the same time a vast variety of different systems, without any inconsistency with his unity or indivisibility; so may not the souls of animals be present everywhere in the bodies, actuating and enlivening, at the same time, all their different members?[18]

To summarise, Whytt stipulated that in order to explain the manifold involuntary motions which proceed from a stimulus, it was necessary to acknowledge that the consequent muscular contractions indicated properties of sensibility or feeling. As these were inconsistent with the known properties of matter, then they must be caused by some other principle. Also, as this feeling was distributed throughout the nervous system, then so was the animate intelligent sentient principle which caused it. Any further difficulties concerning the soul's extension and divisibility were due to ignorance over the precise manner of the soul's existence and its principle of union with the body. Whytt regarded his position as a theory of nervous action and considered it would guide the practice of explaining and curing nervous diseases.[19]

In the conclusion of his Essay, Whytt explicitly connected his physiology of the nervous system to theological considerations underlying the study of nature. Commending his own essay, Whytt stated it was evident "how unjustly the study of physic [had] been accused of leading men into scepticism and irreligion". However

> "If the human frame is considered as a mere corporeal system which derives all its power and energy from matter and motion; it may perhaps, be concluded, that the immense universe itself is destitute of any higher principle: but if as we have endeavoured to show, the motions and actions of our small and inconsiderable bodies, are all to be referred to the agency of an immaterial principle; how much more necessary must it be to acknowledge, as the author, sustainer and sovereign ruler of the universal system, an incorporeal Nature everywhere ... The true physiology, therefore, of the human body, not only serves to confute these philosophers who rejecting the existence of immaterial beings, ascribe all the phenomena and operations in nature to the powers of matter and motion; but at last, like all other sound philosophy leads us up

> to the first cause and Supreme Author of all, who is ever to be adored with the most profound reverence by the rational part of his creation.[20]

For Whytt, "sound philosophy" and the "true physiology" reinforced one another. The correct study of nervous processes within the body also promoted recognition of God's ultimate superintendence of nature. Whytt's sentient physiology and its natural theological role were bound together as a dual enterprise by a theory of causation in which mind alone had causal efficiency.

2.2 The sceptical physiology of William Cullen

Cullen described the nervous system as "the organ of sense and motion".[21] He classified it into four constituent parts. These were the brain, by which Cullen understood the medullary substance of the cranium and vertebral cavity; its continuation in the form of the nerves; the sentient extremities of those nerves fitted for the impulse of external bodies; and finally, the "moving or muscular fibres" of the body. Cullen stipulated that all the parts of the nervous system were fibrous in nature and continuations of the same medullary substance. He referred to it collectively as the "living solid" which displayed the property of facilitating motions propagated from any one part to every other part of the nervous system. Somewhat confusingly, Cullen regarded the condition of the nervous system which facilitated such motion as the "nervous fluid". Therefore the most significant part of the living solid was in effect the nervous fluid.[22] Cullen noted that, while almost all physicians believed nervous action took place by means of propagated motions within the nerves, men differed over precisely how this happened. In his usage of the nervous fluid, Cullen claimed not to pre-judge anything about its source, nature and manner of acting. The term merely conveyed "nothing more than there [was] a condition of the nerves which fit[ted] them for the communication of motion".[23]

A similar profession of nominalism occurs in Cullen's discussion of the relationship between the mind and the nervous system. He stipulated that the mutual interconnection and communication between mind and brain was simply a fact to be taken for granted, not to be understood or explained. Cullen clarified his views in relation to existing traditions of physiological thought. Like Whytt, Cullen aimed to define a middle position distinct from both materialists and Stahlians. However, he populated it with Boerhaave, Haller and Whytt himself. After quoting from these men, Cullen summarised what he considered to be their collective position. Each endorsed the self-evident distinction between mind and body. However, they also emphasised that in the living state, the mutual influence of mind and body was characterised by "a physical necessity". Cullen's strongest criticisms were also reserved for Stahlians, precisely because their conception of an acting rational soul was not determined by a physical necessity. Cullen stated that although the Stahlian spoke of causes, these must always be physical and not arbitrary. Because

> if we do not suppose that the causes acting upon the human body produce their effects from a physical necessity, we can neither judge of the effects of the causes of disease, nor of the operation of remedies.[24]

The direct consequence of Cullen's search for the physical causes of the nervous system was that after conceding immaterial mind operated as a first cause which inaugurated all thought and motion, he then ejected it from the concerns of physiology. As a result, Cullen acknowledged that his mode of expression

> will seem to be the same with the language of the materialists but a very little explanation will always show the difference. I, in using their language, will seem to talk as a materialist; and very unhappily some persons have understood me so. I have however particularly guarded against this.[25]

The language Cullen used derived from the sensationalist epistemology of Locke and Hume. Cullen regarded sensation as a perception of thought, which immediately arose in the mind as a direct result of the motion produced by the impulse of external bodies upon the sentient extremities. He distinguished sensations from ideas, which were recollected sensations or perceptions, adding that "it was Mr Hume who first thought of distinguishing between the first perception arising, and that depending on recollection or memory".[26] Thus Cullen retained Hume's use of "idea", but he considered the term "sensation" more suitable than "impression". Further echoes of Hume's terminology appear in Cullen's subdivision of sensation into "sensations of of impression" and "sensations of consciousness". The former arose from the action of external bodies, the latter from the mind's consciousness of its own action and of the motions it excited. Throughout Cullen's physiology, "impression" served as a general descriptive term for all the various modes of giving or exciting motion.

This emphasis upon motion and contact action is very evident in Cullen's discussion of sensations of impression. He gave the sense of a touch paramount importance and accommodated it to the receptiveness displayed by the nervous system as a whole to certain impressions. Therefore touch became a virtual synonym for feeling itself. Cullen stated that other "genera" of sensations of impression, sight, hearing, smell and taste were "also the organs of touch because in the stricter view, they are organs fit for receiving mechanical action".[27] Even when he discussed "sensations of consciousness", the emphasis was always upon motions, in this case produced by internal circumstances of the body.[28]

Cullen's physiology endorsed a model of nervous action which emphasised the role of impressions, impulses and motions produced in the sentient extremities and perceived in the brain. Thereupon, the will inaugurated a responsive motion which was propagated along the nerves to produce muscle contraction. Within this framework, he put forward his general and theoretical account of the nature of sensation in a manner I described here as 'physiological scepticism'. Cullen maintained there were no necessary connections between objects and the sensations they produced. This absence of any connection between primary and secondary qualities certainly applied to sight, hearing, smell and taste. But even in the case of touch itself - which seemed intimately connected to the idea of extension - Cullen emphasised "we must not be very rash in concluding from sensations as to the nature of the actions occasioning them". Cullen used the example of a fallacious sensation of weight felt in a limb which actually proceeded from a particular condition of the nervous system. Thus "a sense of resistance to the motion of the nervous power in the crural nerve" could be the real cause of such feelings, rather than an external object.[29]

Cullen's use of this and several other examples, indicates the most significant aspect of his physiological scepticism: it was mitigated rather than absolute. The absence of a necessary connection between objects and their representative sensations and ideas opened the possibility of the uncertainty of men's conception of the world. But Cullen always emphasised that there was a pathological causal explanation of misleading sensations. This mitigation is very evident in several of his proposed "laws or general circumstances of sensation". It was evident to Cullen that many sensations were disproportionate to the force of impression which occasioned them. Also, the same stimulus could produce different sensations in different people, or even variations in the same person at different times. How were such circumstances to be explained? Cullen considered these features of sensation were in principle always referable to the state of the nervous system. Therefore he proposed a list of physiological conditions which affected sensibility. Among the general causes were: the original state of the medullary substance; its contingent states such as susceptibility to heat, tension, the state of the brain and nerves; and also the state of attention of the mind itself.[30]

Other laws of sensation dealt with sensations of consciousness. Here the debt to sensationalist epistemology is even more apparent. Cullen considered that sensations were severally combined as "complex ideas", the comparison of which produced new "sensations of relation". In cases where a perception was renewed independently of the occasioning object, and when this was attended with the consciousness of a difference between the liveliness of the two perceptions, it was called an "idea". Where there was no consciousness of such a difference, this was due to the "imagination", while the faculty of renewal itself was "memory". The use of Locke's and Hume's account of these faculties is evident. However in Cullen's physiological account, such faculties were explicitly accommodated to the general model of motions excited in the mind. Indeed, he emphasised that both memory and imagination were dependent upon internal causes in the brain.

Cullen's final laws of sensation dealt with the agreeableness and disagreeableness of sensations and their different effects on the nervous system. In so doing, he stated a key principle which conveys his general approach to the relationship between sensation and the mind. He previously emphasised that "the soul perceive[d] in the brain only and not in the sentient extremities".[31] Here he added that "no sensations [arose] originally in the mind without a previous state of the body".[32] Cullen's approach was neatly expressed in the aphorism "The force of impression is everywhere absolute".[33] Thus, while it was clear that there were numerous instances where the body moved the mind, "in no one case do we see that the mind moves the body".[34] The best illustration of these principles at work occurs in Cullen's discussion entitled: "Of the functions of the brain".

In presenting his account of the brain, Cullen used the starting-point of Stahlian physiology to provide a contrast with his own position.[35] Previously, he had distinguished Whytt from Stahl. This was because Whytt considered the sentient principle was subject to a physical necessity and not the result of an arbitrary and contingently acting rational soul. However, Cullen subsequently noted that Stahlian and "some other physiologists" considered the soul was co-extensive with the nervous system as a whole.[36] This was in fact Haller's criterion for regarding Whytt as a Stahlian.[37] It is probable that Cullen included Whytt in this group. Cullen conceded that without mind, the brain would not be able to perform its various functions. However, he also argued that to emphasise perception took place only in the brain was the necessary first step "towards destroying the Stahlian system in its foundations". Also Cullen claimed to differ from other physicians "with regard to the extent of the powers of the mind, [and] with regard to its manner of action":[38]

> The brain is not only the organ of the soul, but that, in every motion of the soul, some corporeal motion of the brain accompanies it ... and so far as a corporeal organ is employed, all the operations of thought, arising in consequence of sensation are operations of the brain and modified by its various condition. I mean to say that the soul acts by means of the brain, and that it does not act without the brain.[39]

Cullen stipulated that there was hardly any communication between different parts of the nervous system without the intervention of the brain. Therefore, as the control organ of the system, the brain was "fitted to propagate the motions arising in one part to the other parts of the nervous system". Hence the condition of the brain itself had a great effect upon the system as a whole. He identified two fundamental conditions of the brain, which determined the overall condition of the nervous system: a "state of excitement" and a "state of collapse".[40] Both of these referred to the degree of mobility of the nervous fluid. Cullen stated that an examination of the cases of waking and sleeping indicated that the nervous fluid was susceptible to different states of motion.

For example, when the relative absence of sensation induced sleep, this could be accounted for in terms of a "slowing of the mobility of the nervous fluid, whereas, a certain degree of heat induced waking because of a quickening of it". In fact, Cullen took his views much further. He argued that, in so far as it was a corporeal phenomena, life depended upon the excitement of the nervous system and death represented the destruction of that excitement. From these remarks, it is clear that Cullen developed a cephalocentric conception of the living organism in which the nervous system and particularly the brain had paramount importance.

In his account of excitement and collapse, Cullen emphasised he was using such language to express a matter of fact "without intending by these terms to express or determine anything with regard to the nature of the nervous fluid, or wherein its different states consist".[41] Similarly, his discussions of the causes exciting the activity of the brain, and of the various connections between the brain and other organs of the body, emphasised that the particular facts of nervous communication should be attended to:

> In all or any of these cases in which the action of the brain takes place, we cannot perceive the manner that is, the mechanical means, by which the several causes produce their effects; and we perceive only an institution of our Maker establishing a connexion between the several causes and the motions that ensue.[42]

Cullen acknowledged no inconsistency between this viewpoint and his search for causal explanations of the natural function and pathology of the nervous system, based upon the operation of a nervous fluid. He regarded the search for material connections which explained nervous processes mechanically as wholly inappropriate, because the "modus operandi [was] entirely without our reach". As a result, Cullen's position amounted to a denial of the existence of necessary connections within the nervous system. Instead he utilised a theory of physical or "proximate" causation based upon the observed and uniform succession of antecedents and consequents. Cullen's clearest statement of his general position on causation was written with reference to his theory of fever, but it is equally germane to his account of the nervous system. In both cases, Cullen claimed to mean by 'theory' only the "chief facts and laws" with respect to the matter in question:

> for it is no more than saying that there are certain states of the body which are combined together in a certain order of succession and that from this constant combination they are to be considered as a series of causes and effects.[43]

In the Lectures introductory to the course on the practice of physic, Cullen enlarged upon his general view of causal processes in living bodies. The intimate connection of parts meant that

> every action is with regard to some other both a cause and an effect, and the whole turns, in this respect, as in a circle; so that there is no understanding on part without studying in some measure the whole.[44]

However, Cullen added that the best approach to follow was one which "consider[ed] them as regularly as may be, according to the series of causes and effects". Cullen had no doubt that despite difficulties due to the interactive causation of bodily processes, all connections were "determined by a certain mechanism of the body [and] governed by the laws of matter and the motion that affect every part of nature".[45]

Expressed in terms of the philosophical metaphor constant conjunction, Cullen's conception of physical or proximate causality informed his general view of the nature, object and status of medical knowledge. He utilised a vocabulary of impression, sensation, and motion derived from sensationalist epistemology and supplemented by analogies drawn from natural philosophy and chemistry.[46] These combined resources enabled him to generalise aspects of the complex relationship between body and mind implicated in the structure of the nervous system. It also gave him the means of discussing problematic subjects, such as the mechanism of nervous power, the nature of muscular movement, sympathy and the operation of stimulants and sedatives.

In conclusion, it is important to emphasise that neither his theory of causation nor his general reliance upon sensationalist epistemology precluded Cullen from claiming that his conception of the nervous system was theologically acceptable. Cullen took note of Berkeley's views upon the errors of sensation, adding "even the sceptics, who do not carry matters so far, alleged that things were not perceived as they really are". However,

> We can condescend upon many instances of our mistaking on this aspect, from which we might extend the possibility to the whole. But we are not to be disturbed in the least by any subtleties of this sort; it is enough that we unavoidably suppose and conclude the existence of body, and that we do distinguish it in different cases by our different senses. This is the unavoidable practice of the human mind ...[47]

Cullen always remained a physiological sceptic in a mitigated sense. He doubted the veracity of sensation in order to uncover underlying somatic determinants expressed as a causal pathology of aberrant sensations. Elsewhere he stated that men experienced an irresistible propensity to search after causes adding that

> Sceptics and academics may demonstrate the fallacy of the rash presumption of human reasoning but they will never persuade men to give it up, not even to be restrained, in the use of reasoning.[48]

In the absence of perceived necessary connections among observed phenomena, all conjunctions of causes and effects between mind, matter, motion and sensation in the nervous system were ultimately "an institution of our maker" well suited to "the purposes of the animal economy". Cullen noted that this adaption of parts to ends was the foundation of <u>a posteriori</u> proofs of the existence of the deity. He commended his own physiological vision of the "smallest internal functions" of the body as an extension of former proofs offered by writers such as Ray and Derham who relied either upon the external functions of organisms or more widely upon moral causes. In fact Cullen himself made use of a teleological function of the body in his explanations of particular diseases. This was that property by which "nature", or the constitution of the animal economy, preserved itself against injuries and disease. Cullen referred to it as the "vis medicatrix naturae"; and it played a role within his system of medicine analogous to the sentient principle of Whytt or Stahl's rational soul.[49] Cullen actually used the vis medicatrix naturae in a very specific way to explain the operation of stimulants and sedatives. This distinguished his appropriation of the concept from former usages. However, with a suitable theological gloss, Cullen could claim his explanations of nervous diseases were always consonant with the imperatives of "sound theism", given man's ultimate nescience about nature.

2.3 The common sense nescient physiology of James Gregory

The significance of Gregory's relatively brief account of the nervous system lies not so much in his theory about its operation, but in his steadfast refusal to put forward any systematic views about it. Gregory acknowledged that the admirable properties of the nervous system attracted the attention of many philosophers who sought its causes and manner of operation. These were put forward in terms of various "conjectures". However,

> no rational plan has yet been proposed for ascertaining the matter by experiment; and the experience of two thousand years has afforded evidence, more than sufficient, how very seldom it happens that even the wisest men can discover the arcana of nature by conjecture.[50]

Gregory stated that the common feature of all such conjectures about the nervous system was that sensation and muscular action were explained in terms of "certain motions appropriate and peculiar to the nervous system". Thus sensation was the result of a motion communicated from the senses to the brain; in voluntary muscular movement, something was communicated from the brain along the nerves to the muscles.

Gregory considered disputes over the means by which such motions were transmitted in the nervous system had occurred in advance of any experimental evidence. This applied both to vibrations along the nerves, and to the existence of an etherial nervous fluid. He regarded all accounts of the kinematics of sensation as logically inappropriate and therefore nugatory. This was because such motions were "in no respect sensation, neither did they resemble it, nor [were] they ever convertible to it, according to any known laws of nature".[51] Gregory's rejection of the standard vocabulary of sensationalist epistemology played a substantial role in his subsequent description of the properties of the nervous system.

Gregory treated sensation as a simple term, easily understood and therefore requiring no definition. Even descriptions in terms such as "a change in the state of the mind, of which we are conscious, produced by some change in the state of the body" were regarded by Gregory as "tedious, inacurate and trifling circumlocutions". He argued that they confounded two distinct senses of sensation. One referred to sensation in terms of a change in the state of the mind. It related

> to the mind alone, is peculiar to it, in its nature fleeting and perishing, at the same time most simple, incapable of definition or description, entirely dissimilar to the object which excites the sensation, in nature and circumstances extremely different from everything corporeal, so that neither itself, nor anything similar to it, can exist in the external object which we perceive.[52]

But the qualities of objects perceived by means of sensation pertained

> to those things alone, and cannot, by any means, exist in the mind; nor have they anything similar to it, or in common with it, or its various states; in their own nature they are constant and durable, whether perceived by us, or unknown and neglected.[53]

For Gregory, there was a fundamental ontological divide between sensation in the mind and the qualities of bodies. However, in spite of the absolute independence between sensation and the objects represented to the mind, Gregory noted that almost all useful knowledge was easily and unproblematically acquired through the senses.

Therefore it was very evident that "these sentient powers [had] been bestowed on us by the Supreme Author of our frame".[54]

When Gregory discussed the various properties of sensory perception, he briefly listed items such as the force of sensation, its persistence after an external impulse had ceased, and the roles of custom and attention. But there was no attempt to relate to the nature of the nervous system. While Gregory's list of the various properties of sensation actually resembled Cullen's laws, they were always offered as particular descriptions of sensory experience, rather than laws which indicated the nature of an underlying nervous mechanism. For example, Cullen had suggested that the resistance of sensation after an external object was withdrawn implied that sensation took place by an oscillatory motion in the nervous fluid. For Gregory, this was simply a phenomenon to be noted which, if it implied anything, indicated the incorporeal nature of sensation and its unaccountability in terms of physical processes. In some cases, Gregory questioned and rejected other "laws or circumstances of sensation" endorsed by Cullen. He regarded it as an open question whether or not the mind could attend to one or more sensations at once. However, Gregory flatly contradicted Cullen's general physiological scepticism about the intersubjectivity of sensations.[55] He argued that

> we have no evidence, either that the same impression produces a different sensation or perception in the same person at different times; or that the same object or impression produces a different sensation or perception in different persons, unless in some very rare instances.[56]

Whereas Cullen referred to factors such as the status of the medullary substance, the tension of adjacent blood vessels and the state of tissue lying between the nerve and the site of external impression, Gregory treated sensation as substantially unaffected by the status of the nervous system. Instead, the individual differences between people or in one person at different times, only affected the degree of pleasure or aversion which attended sensation itself. Thus Cullen and Gregory both referred the properties of sensation to conventional causes such as custom. But they understood their effects upon sensation in very different ways. Cullen considered various environmental and somatic factors affected the very constitution of sensation itself. Gregory stated that it only affected the accompanying feeling of pain or pleasure; the sensation perceived in the mind remained unaltered. Nor did Gregory make any attempt to explain why certain sensations were accompanied by pleasure or pain. He simply noted that "Such diversities of sensations have not yet been accounted for".[57]

Throughout his general account of sensation, Gregory consistently emphasised the pleasantness of sensations. Where pain occurred, it was often to ensure that the pleasures of sense were not over-gratified, and,

> upon the whole, it seems reasonable to conclude, that nature has provided for man with such benignity and liberality, and furnished him with so many pleasures, that he might not only live but enjoy life which she hath given..[58]

For Cullen, the deceptiveness of sensations lay at the heart of his physiological scepticism based upon proximate causes. Gregory on the other hand, stressed a eudaemonic conception of sensation, consistent with the intentions of a providential creator who framed human sensibility in harmony with external nature. Whereas Cullen used the resources of sensationalist epistemology to ground his physiology, Gregory drew upon the philosophy of mind developed by Reid and the common sense school.

After Gregory's initial chapter on sensation, he devoted the next five to discussion of the various external senses. While the order of treatment varied from Reid's Inquiry, Gregory's descriptive phenomenology of the varieties of sensory experience resembled Reid's own treatment. But instead of discussing the common sense philosophy of mind it was founded upon, Gregory simply took this for granted and proceeded immediately to a symptomatology of the depravities attending particular senses. In keeping with the common sense emphasis of sight over tough, Gregory devoted more discussion to the former; whereas Cullen, in his very brief discussion of the genera of sensation had argued that all the varieties of external sensory experience were ultimately dependent upon touch.[59] In most cases, Gregory added suitable encomia upon the utilities displayed by the various individual senses, for which, again, "the bountiful Parent of all" was responsible. This pattern of description, use, and depravity of the external senses was continued in chapter ten where Gregory discussed the internal senses of memory, imagination and judgement.[60] He stated that these faculties operated without external impulse or assistance and that "the organs most subservient to them being internal, concealed, and inaccessible to external objects, act[ed] by powers peculiar to themselves".[61] Although Gregory regarded the internal senses as wholly incoporeal aspects of mind, he acknowledged they also depended upon "a certain state of the brain for their proper exercise".[62] The brain therefore was the primary organ they should be referred to. But the implications of this for the relationship between body and mind received a very brief notice. Gregory remarked that there were

> philosophers and medical men of considerable celebrity, who deny that any change or conception takes place in the mind, unaccompanied with a definite and corresponding change in the brain. The matter is rather uncertain, of little utility and not easily brought to the test of experiment.

He then continued:

> So far from having any knowledge of the changes which take place in the brain, or of the manner in which its various parts operate during the exercise of memory, imagination or judgement, we have not hitherto been favoured even with a plausible conjecture on these subjects.[63]

Thus Gregory pronounced a deep physiological nescience regarding the relationship between mind and brain. This was not unusual. But Gregory extended this into a general nescience regarding the operation of the nervous system as a whole. For example, where Cullen discussed the functions of the brain in his third chapter on the physiology of the nervous system, Gregory did not devote a single chapter to the brain at all. Given his absolute disjunction between sensation and its physical correlate, the nervous system itself became a wholly unknown mediator between mind and body, about which Gregory's statements were reserved and circumspect. Gregory regarded the relation of event between mind and body in the nervous system to be completely distinct from physical causation. It did not display a uniformity of antecedents and consequents. As a result, this precluded any law-like statements of its nature and operation.

In the opening chapter of the Conspectus, Gregory outlined the conventional types of cause which had been used to characterise and explain the aetiology of disease. These were "proximate" and "remote" causes, the latter of which was further subdivided into "predisposing" and "occasional or exciting", sometimes referred to as "noxious powers". Gregory gave the following definitions of each:

(i) The proximate cause was "that which, being present, removed, or changed, the disease is present, removed, or changed accordingly":

(ii) The predisposing cause was "that which merely renders the body liable to become diseased, namely, on the application of an exciting cause":

(iii) The occasional or exciting cause was "that which actually excites disease in the body already predisposed to it".[64]

Gregory claimed that physicians used "the term 'cause' with great latitude of meaning, and in a sense somewhat different from its ordinary acceptation in the writings of philosophers, or in common speech". Gregory stated that both kinds of remote causes were of great importance for medical practice. Although errors regarding them were often made, in many cases "observation and experiment, and sober reasoning" had led to the correct identification of the remote causes of disease. This however, was not the case for proximate causes which were usually "very confused, obscure, and formed from too hasty a view of facts":

> For medical men, not readily finding the cause for which they are in search invent to themselves some cause of every disease, whence that disease may arise, nearly in the same manner in which the various changes or effects, observable in inanimate objects proceed from their causes.[65]

However, disease processes did not resemble simple effects observed in the physics of inanimate objects. Instead, they were a series of events or sequences of causes and effects which were not regular because interruptions in the chain did not always produce the same effects each time. Thus they did not conform to chains of causes and effects in inanimate nature.[66] Gregory extended this view of the distinctive causation of disease to animate nature generally:

> For in the living body there exists some principle of change ... differing widely from the nature of inanimate matter, a principle not easily defined with the requisite diligence and accuracy. It is with propriety named the vital principle, to which, not less than the causes commonly observed, numerous changes, both morbid and salutary, which affect the body are to be attributed.[67]

Gregory professed a general nescience regarding proximate causes. In practice, the proximate cause of a bodily process could not be unproblematically identified because of the multiplicity of mutually implicated causal processes involved in animate change. Furthermore, conceptions of medical theory and practice based upon proximate causes were so "altogether futile, and not only false, but so confused and obscure, that they scarcely [could] be understood, and probably never were understood sufficiently by their authors themselves".[68] Gregory's nescience regarding proximate causes became a critical weapon to censure views about the nervous system which he considered hypothetical and based upon inappropriate conceptions of causation. It extended not only to Cullen's use of a proximate nervous fluid, but also by implication, to Whytt's necessary sentient principle. His nescience regarding such matters place severe limitations upon what could meaningfully be said about the nervous system. As a result, Gregory restricted his account to a descriptive phenomenology of sensation, largely free of analogies taken from the kinematics of material bodies. The justification for this treatment rested ultimately upon a common sense appeal to God as the guarantor of the connection between men's sensations and the world to which they referred.

In conclusion, it is evident that aspects of both the organisation and content of Gregory's Conspectus owed a great deal to Cullen's "Physiology". However, Gregory did not publicly acknowledge any debts to former writers such as Whytt, or to Cullen himself. It appears that he regarded almost all physiological theories of the nervous system as largely hypothetical and therefore useless. Because of manner of treating the nervous system, 'common sense nescient physiologist' is a very appropriate description for Gregory's general perspective. But in a sense, Gregory was very much more of a physiological 'sceptic' than Cullen. Gregory's rhetorical appeals to the evidence of observation and experiment must ultimately be seen in this light. His emphasis upon the absence of sound experimental evidence was underpinned by a systematic methodological denial of the very possibility of detailed causal knowledge of the nervous system and, indeed, of bodily processes generally.

In this section, Whytt's Cullen's and Gregory's general perspectives on the nervous system have been described and discussed. It is evident that the language of metaphysics was a central resource in accounting for men's knowledge of nervous processes. In particular, concepts of causality were important for two major reasons. Firstly, they had a technical utility in conveying the status of men's conception of change in the nervous system. Secondly, they were perceived to have an important mediating role between the natural and theological dimensions of physiological discourse. It is noteworthy that, despite using quite different metaphysical resources, Whytt, Cullen and Gregory could legitimate their accounts of the nervous system by aligning them with the interests of "sound theism". All three showed ingenuity in accommodating their accounts to natural theological sensibilities. But at the same time, they each displayed sensitivities to the manner in which others attempted this. Hence there were sharp disagreements about the theological propriety and moral soundness of accounts of the nervous system. Also, because of the existence of different metaphysical technologies by which each man articulated statements about the nervous system, they disagreed considerably over what was to count as a 'matter of fact' about it and what constituted a 'sound' account of nervous action. These disagreements about the form, content and validity of physiological knowledge emerge more clearly in their discussion of muscular motion.

3. A CASE STUDY IN THE NATURE OF NERVOUS ACTION: THE PROBLEM OF MUSCULAR MOTION

Unlike Cullen and Gregory, Whytt did not put forward his conception of nervous action in a systematic textbook form. Instead, his foremost concern was "to investigate cause or causes which enable stimuli of various kinds to excite the muscles of living animals into contraction".[69] In particular, Whytt dealt with involuntary muscular motion which he regarded as "spontaneous" because it proceeded without the attention of the "rational mind" directing its operation. Thus his views on the nature and mechanism of nervous power, or the sentient principle, were most frequently put forward in reference to the problem of how muscular contraction occurred.

Whytt regarded involuntary muscular motion to epitomise the operation of the sentient principle. Therefore he expressed very definite views about how contraction occurred and what general significance it displayed. He accepted that various physical processes were necessary conditions for contraction to occur; for example, the distention of muscle fibres with fluid. However, these were by no means sufficient. They were in fact accessory to the sufficient action of the immaterial sentient principle which in a fundamental, though inexplicable, way moved the muscle fibre.

Whytt argued that all cases of muscular action were properly interpreted as extensions of nervous action. This was because the contraction of muscles displayed properties inconsistent with the behaviour of matter. Whytt was intensely critical of accounts which accommodated muscular action to the behaviour of matter. If contraction proceeded in a completely mechanical way, then it was impossible to explain why the power of muscular action was disproportionately greater than the force of the stimulus acting upon the muscle. This was because in cases of wholly mechanical causation

> so long as the cause acts on the organ, the effect must continue to follow; and if the cause becomes gradually weaker, so also must the effect, till it ceases.[70]

But this was manifestly not the case in muscular contraction. Therefore Whytt argued, it must be due to a non-mechanical cause.

One particular opinion Whytt took repeated note of was the performance of muscular contraction by "some subtile etherial or electrical matter residing in the nerves." To explain contraction by oscillations in an elastic ether was fundamentally mistaken because

> these must follow the laws of vibration observed in other elastic bodies, which are yet inconsistent ... with alternative and vibratory-like contractions of muscular fibres occasioned by irritation.[71]

While Whytt was critical of other modes of transmission within the nervous system, such as the vibration of solid nerves, it was the nervous fluid as a preposed vehicle of nervous power which preoccupied his refutations. Whytt did not actually deny the existence of a nervous fluid. He acknowledged nerves were a continuation of the medullary substance of the brain, and it was probable that they derived a fluid from there. However, even if this were actually so, he argued the very size and subtlety of the proposed nervous tubes made it impossible to reach an understanding of its nature and properties. As a result, it could not be known whether the nervous fluid was only a source of nourishment for the nerves or "the medium by which all their actions [were] performed."[72] Whytt regarded further questions about nervous power such as "what [was] the material cause in the brain, nerves and muscle fibres?"; or "how [did] the mind put the muscles in motion?" to be speculative. They lacked either experiments or natural appearances to warrant any opinion about them.[73]

Whytt acknowledged there was some dispute over the ontological status of the nervous fluid and other means of muscle contraction such as an active but latent power lodged in the muscle fibres themselves. He responded to the latter possibility by saying:

> It seems to be improper to attribute active powers to that, which, however, modified or arranged is yet no more than a system of mere matter, powers I say, which are not only confessedly beyond those of mechanism but seemingly contrary to all the known properties of matter.[74]

This and preceding remarks reveal that Whytt's objections to alternative accounts of muscular contraction and nervous power, which did not utilise the sentient principle, were founded upon metaphysical criteria. He regarded his account of an immaterial sentient principle as a complete explanation of nervous power. This was because for Whytt, mind alone was capable of producing motion[75]; whereas a nervous fluid could never account for activity sensibility or reason.[76] He regarded it as gratuitous concession to unknown causes and labelled those who used it "modern materialists".[77]

Whytt considered it was imperative to defend the aetiology of muscular contraction upon the basis of the sentient principle. He therefore cited a series of phenomena and circumstances which would show that his interpretation was factually correct.[78] Although much of Whytt's subsequent defences of the distinctive aetiology of the sentient principle were framed in relation to specific objections raised by Haller, their controversy did not begin until after the "Essay" was published.[79] The Whytt-Haller exchanges fall outside the scope of this account. However, the prior comments made in the "Essay" can serve as a useful introduction to the more general issues at stake.

In a variety of circumstances involving decollation or the excision, Whytt argued that the persistence of contraction and relaxation by the fibres indicated residua of sensibility. Because Whytt held the sentient principle to be active throughout the nervous system, he interpreted this behavious of muscle as a confirmation of its presence. Whytt's reasoning on this matter was syllogistic. Sensibility was referable to the sentient principle as the sufficient cause of all motion in the nervous system. The various limbs, parts and muscles showed signs of sensibility. Therefore, they contained the sentient principle for some time after death or excision. Whytt regarded this as a demonstration that the soul did not leave the body immediately after death Thus all the various phenomena of decollation and excision were regarded by Whytt as experimental proof of the following points. First, sensibility was dependent upon the nerves and brain without which it could not function. Second, the sentient principle or necessary cause of nervous action was diffused through the nervous system generally, otherwise excised limbs would not display residual sensibility. Hence Whytt's experimental results were readily synthesised with his metaphysical predilections concerning the sentient principle.

In his subsequent writings, Whytt interpreted Haller's position as symptomatic of those "modern materialists" who endowed muscles with innate power. This was because he considered that the notion of irritability did not depend upon the sensibility of nerves and therefore on the sentient principle. Instead, the contraction of muscles when subject to a direct stimulus was due to "muscular glue" or the "glutinous matter of the muscles".[80] In criticising Haller, Whytt developed an explicit analogy between Haller's position and those who considered gravity to be essential to matter. In both cases it was evident that gravity and irritability were both ultimately due to some immaterial cause. Whytt commented:

> After all that has been said to show that the motions of irritated muscles are owing to a property of irritability in them, or their glue, ... we are at last obliged to refer them to the active power of an immaterial cause; unless we shall, contrary to sound philosophy, ascribe feeling and spontaneous activity to matter. And as gravity must finally be resolved into the power of that BEING who upholds universal nature; so it is probable, that the irritability of animals is owing to that living sentient principle which animates and enlivens their whole frame.[81]

Whytt found it puzzling that the imperatives of what he called "sound philosophy" and its ally "true physiology" were disregarded by his contemporaries. He pointed to the regularity and uniformity of gravitational, electrical and magnetic phenomena which were at least consistent with the behavious of matter, even though they must also ultimately depend upon immaterial causes. However, he stated that all the motions of bodies responding to a simulus were obviously the result of "an uneasy feeling" and

> their various appearances can be so easily explained upon this supposition, and are so unaccountable on any other, that I am surprised to find so many learned and ingenious physiologists endeavouring to refute this opinion, and to derive these motions from inanimate matter.[82]

Thus the phenomena of muscular motion were accommodated to the action of the sentient principle operating according to the logic of immaterial causes. Whytt's distinctive aetiology of nervous power informed his interpretation of the facts of contraction which were thereby rendered consistent with "sound philosophy" and the "true physiology".

Cullen's general views on the nature and mechanism of muscular movement occur in the second chapter of his Physiology, "Of the action of moving fibres". Cullen wrote in the wake of the Whytt-Haller controversy and his own distinctive views encorporated aspects of both their positions. Cullen was critical of Haller's distinction between irritability and sensibility and, like Whytt, he sought to accommodate muscular action within nervous action generally.[83] However, he did not thereby endorse Whytt's position or make use of any arguments based upon the aetiology of the sentient principle. Cullen articulated his own position in terms of a vocabulary of powers. He distinguished between "nervous power", which represented the contraction of muscle fibre produced by nerves; and the "inherent power" of contraction itself, which corresponded to Haller's own "*vis insita*" of muscles. Finally, because nervous power was itself determined by the will, he called this power of the mind acting in the brain "animal power", or sometimes the "energy of the brain". Cullen contended that the contractility of muscles depended in part upon all three powers. It was probable that:

> the nervous and the inherent powers are somewhat of the same nature; and it is also probable, that in entire and living bodies, both the nervous and inherent powers have a constant dependence upon the animal.[84]

Cullen supplemented his triad of powers with a fourth, "tonic power", which was responsible for the constant tendency of muscles to contract. It was an aspect of the inherent power of muscle and depended upon the animal and nervous power, such that any increase or decrease in them would produce proportional effects in the tone of muscles. To summarise his general position, he concluded with "a little piece of theory in confirmation of the whole" which synthesised his notion of powers with their physical basis, the nervous fluid. If

> the nervous power is an elastic fluid, in common to the whole of the nervous system, such is the nature of elastic fluids, that they will constantly endeavour to restore themselves to an equilibrium; wherever there is a communcation, every part constantly presses upon another, so that there must be a

> constant energy from each part, and more especially from the brain. But this is enough to prove that the inherent power will be, in all cases, in some measure in proportion to the state of the nervous and animal powers.[85]

Cullen described the role of the ether as a general account of the means of motion in nature. He noted precedents for its use in Newton. Also, "several of the foreign of the greatest rank" had argued for "the presence of an elastic fluid", which produced the cohesion of bodies and explained the behaviour or inanimate elastics.[86] With respect to the nervous system, he stated:

> all our theory requires, is to suppose that this subtile elastic fluid is by various means excited to a greater degree: we have some illustration of it in the case of electricity and magnetism which are only modifications of this subtile fluid; and we need only suppose that this elastic fluid can be thus excited upon the nerves ... and that, in consequence of a certain degree of excitement, the nerves are rendered sentient ...[87]

From Cullen's account of the moving fibres of the body, it is clear that his explanatory theory of muscular contraction was dominated by the concept of "animal power", "energy of the brain", or what he generally called "excitability". But Cullen did not explicitly identify the exact nature of animal power; rather he professed a form of nescience about it. Yet at the same time, he linked his vocabulary of powers with the operation of "an elastic fluid common to the whole nervous system" which served as a proximate cause. Because Cullen's powers had what he regarded as a legitimate physical basis, he was prepared to reason about them, even though there was no empirical means of identifying them. He claimed they were merely ways of describing the causal efficacy of the nervous fluid in rendering the nervous system sentient. Cullen also said he did not identify sensibility either as a form of mechanical energy, or as a necessary sentient principle. Instead he expressed its action using the vocabulary of fluid mechanics, and spoke of its mobility. Yet Cullen could contend his language was largely analogical.[88] However, he regarded his theorising upon the basis of a nervous fluid to be ultimately justifiable because the causes he identified were not arbitrary. Instead they had a physically proximate basis within the nervous fluid itself.

Cullen's doctrine of nervous power and its proximate causal basis, the nervous fluid, was central to his system of medicine as a whole. Assumptions about the nervous ether informed his central doctrine of excitability. In putting forward his views, Cullen often made analogies with processes in natural philosophy, especially the notions of excitement in electricity, magnetic power and affinity.[89] In his discussions of sleeping and waking, excitement and collapse, Cullen made repeated references to the condition of the nervous fluid. At one point, he explicitly described the excited state of the nervous fluid in the medullary fibres of the brain as the essence of life itself. Also, he developed a distinctive pathology of tonic power based upon the notion of muscular spasm. Tonic power depended upon a combination of tension in the muscle fibre and the state of animal power. In cases of spasm, Cullen claimed there was an inhibition of animal power which in turn reduced the mobility of the nervous fluid. Upon this basis Cullen gave a distinctive explanation of the nervous aetiology of fever. Thus in a variety of ways muscular motion and its modus operandi, the nervous fluid was central to Cullen's views. Cullen stated that the theory of muscular movement was crucial "for if we knew it more exactly, it would throw light upon every other part of our system."[90]

Gregory's account of muscular motion is a particular instance of his general approach to the nervous system which was pragmatic, descriptive and commonsensical. In the Conspectus, his views were expressed with great brevity. He made use of several concepts developed by Cullen. But they were not deployed in the form of a proximate causal explanation of motions in the nervous system. For example, Gregory stated the vis insita was simply "that state of the muscles, by which their fibres contract themselves on the application of a stimulus".[91] The "nervous energy" of muscles resulted from a stimulus applied to nerves and differed from the vis insita only in terms of its location. Finally, Gregory used Cullen's notion of "animal power", but in a wholly nominal way to denote the control of muscles by volition alone.[92]

In the Conspectus, Gregory referred to the "eager and fruitless inquiry" to account for how muscular action came about; but he did not expand this further. However, in the Lectures he went into greater detail. There, he drew attention to Haller's work and the various opinions on the causes of muscular motion commenting:

> It may appear rather strange that I should declare my total ignorance of this subject; but from that you may find, that near 30 hypotheses have been formed to account for this: yet none of them are founded on facts; nor one of them,tho' admitted would account for the phenomena.[93]

Gregory's approach to nervous action was based upon the absolute disjunction between sensation interpreted as perceptions in the mind, and any form of motion transmitted along the nerves which produced muscular motion. Consequently, he was very critical of proposed mechanisms of nervous power which were dependent on some form of motion. Like Whytt, Gregory rapidly dismissed the option of vibrations of the nerves and discussed in some detail the motions produced by "a subtile and very active fluid" in the nerves, moving "according to peculiar laws" and possessing "many surprising properties and excellencies." Gregory stated that many philosophers had recourse to a "Universal Ether" pervading the universe, assisting and attending all the processes of nature. He made a literary plea for its demise in philosophy:

> Let this ether, extremely useful and active to be sure, but nowhere tangible, nowhere brought to the test of experiment, so that it might disclose its operation, more mutable and fleeting than Proteus himself, so long and so violently agitated and all to no purpose, at length rest in peace. For what hope of catching that "cui in plures jus est transire figuras?[94]

Gregory's opposition to the ether was founded upon his commitment to a strict dualism which discriminated sharply between mind and matter. He considered that uses of the ether to explain sensory processes were all instances of accommodating the action of mind to the behaviour of matter. With respect to the latter, Gregory conceded that it was virtually impossible to conceive of change taking place without some form of motion occurring. However, he stated that the phenomena of external and internal sensation, volition and the effort exerted by the mind to move a limb, were "neither corporeal things, nor to be explained on the principles which are applicable to these".[95] As a strict dualist, it was inconceivable to Gregory how the ether could play any sort of mediating role between mind and body.

Gregory refused to speculate upon the cause of muscular motion. He made no concessions to Whytt's necessarily self-moving sentient principle. He rejected etherial fluid explanations put forward by Cullen. Whereas the latter sought to build analogies between natural philosophy, chemistry, and physiology, Gregory took an opposite viewpoint. He argued that just as the phenomena of chemistry were distinct from mechanical phenomena, so too was muscular action:

> There are no doubt certain laws of nature, common to all bodies; but there are also peculiar laws, and therefore in the investigation of nature, we should not only judge of the uniformity, but the variety of it.[96]

Similarly Gregory endorsed the fact that there were no doubt different powers involved in muscular action; but this did not mean that each had to be distinguished by different names. Thus Gregory's account, although founded upon conception of the distinctiveness of animate causation, was completely lacking in any causal explanations of muscular action. Instead, he simply described the observed phenomena of contraction itself. The whole bundle of muscle fibres in contraction became "shorter, thicker, harder, wrinkled, and sometimes pale, while the muscle contract[ed] then it [was] relaxed, and again [became] plain, smooth, soft and long, and, in short, repeat[ed] its contraction."[97]

Gregory's nescience about nervous action could certainly be harmonised with the kind of providentialism found in Whytt. For example, on the distinction between voluntary and involuntary motion, Gregory wrote:

> The provident Parent of all things seems therefore, to have applied the necessary stimuli to those organs, the actions of which were absolutely necessary to sustain life, to refresh the body, or to the exercise of certain functions of life. He has given man a partial control over those organs, which partly perform some vital function and are partly subservient to other less import and temporary offices: the rest he has subjected to his complete control.[98]

However, Gregory's views also rested upon arguments about the logic of causality applied to animate processes where there was no uniformity of antecedents and consequents. Hence Gregory did not deny the existence of pervasive connections between body and mind in physiological processes such as muscular movement. What he rejected was that they were in any way constantly conjoined, inseparable or necessary, which was a pre-condition for any explanation of the nervous system in terms of physical causes:

> By the constitution of our nature, certain operations of minds are connected with certain changes of body: we have no direct power of moving our body more than of creating one; but there is a connexion between the operations of mind and the contraction of muscles. This is however separable. The nervous power evidently can act and often acts without our efforts, as in disease.[99]

4. VOLUNTARISTIC AND NECESSITARIAN IMAGES OF NERVOUS ORDER, THE PROBLEM OF SYMPATHY AND THE OPERATION OF STIMULANTS AND SEDATIVES

Whytt and Cullen's differences over the causal of the nervous system display strong analogies with features of the Kames-Stewart debate discussed in chapter two. Whytt's approach to nervous action, based upon the sentient principle, corresponds to Stewart's voluntarist account of the foundations of mechanics. Cullen's views in which the nervous fluid played a central role, have continuities with the necessitarian image of natural order favoured by Kames. The voluntarist image of nervous order to be found in Whytt's sentient physiology maintained the hegemony of efficient causes. Cullen's sceptical physiology was necessitarian insofar as it emphasised physical causes and effects,considered as constantly conjoined antecedent and consequent phenomena and subject to a physical necessity.

In chapters three and four, it was shown that Gregory's Project involved a critique of both voluntarist and necessitarian images of natural order in physics. Gregory criticised Reid and Hume because they referred all change to either efficient or physical causes. Gregory's physiological writings on the nervous system also express his opposition to voluntarist and necessitarian images of nervous order, found in Whytt and Cullen. This emerges clearly in the different attitudes each writer displayed to nervous sympathy.

Throughout their discussions of the nervous system, Whytt and Cullen emphasised men's nescience about how nervous power or sensibility was actually produced. Men were ignorant of necessary connections in the nervous system; as a result,they could only make judgements about causes on the basis of effects. This common starting point of men's nescience is also evident in the Kames-Stewart debate. But the best evidence for the parallel lies in the subsequently similar distribution of substances, powers and laws in the nervous system and inanimate nature. For Whytt, the phenomena of nervous sensibility indicated the operation of an active, immaterial, intrinsically self-moving efficient cause. For Cullen, the same properties of nervous action lead him to conceptualise several distinct powers of the nervous system closely associated with the physically proximate nervous fluid. Both positions correspond to Stewart's emphasis upon active beings and Kames's discussion of the powers of matter.

The respective forms of causal reasoning underlying the distribution of substances and powers in the nervous system was also remarkably similar to that found in the Kames-Stewart debate. Whereas Whytt and Cullen seemed to deny the feasibility of action at a distance and favoured the contiguity between causes and their effects, they each emphasised different kinds of causes. For Whytt, the nature of sensibility implied it was a form of mind or spirit. But for Cullen, nervous power had to have a physically proximate basis in the form of a nervous fluid. Thus the quality of their judgements about causes was quite different. Similar sorts of inferences can be found in Stewart's logic of immaterial causes, and Kames's arguments for the location of the powers of inanimate motion within matter. All these features, when taken together, suggest a similar metaphysical technology at work in Stewart and Whytt, one quite distinct from the kind evident in Kames and Cullen. In the former, the directionality of nescience was always towards superintending active beings. Whether they acted mediately or immediately was a matter of some doubt; but they were always interpreted as God's immaterial and intelligent agents in nature. In the latter, nescience pointed towards men and the conditions and constraints of men's perception of change, expressed in terms of customary constant conjunctions of uniform antecedents and consequents.

The rhetoric of justification which each respective pair used was also strikingly similar. Stewart and Whytt drew heavily upon a particular interpretation of Clarke and Newton in order to denounce materialism and preserve a role for secondary causes as the legitimate objects of natural philosophical enquiry. In Kames and Cullen, there was a sustained attack upon the role of mind and immaterial beings as sole agents of change in nature. This was combined with a careful justification of what Cullen called "the language of materialism", which could be glossed as analogical, metaphorical and innocuously conformable to standard _a posteriori_ proofs for the existence of the deity. Also, there was a correspondingly greater emphasis upon the role of reasoning and theorising.

Clearly, some differences of emphasis exist between Stewart and Whytt, Kames and Cullen. These were much less apparent among the voluntarists, where even the forms of expression were remarkably similar in discussions of subjects such as the interpretation of gravity, the inertia of matter, the theological obligations of 'sound mechanics' and 'the true physiology'. In the case of the necessitarians, differences were more evident. Cullen was more explicit in his use of Humeian terminology. This applied both the philosophical metaphor of constant conjunction and the vocabulary of sensationalist epitemology. Kames had a similar orientation; but he did not use the same modes of expression found in Hume. However, the continuities far outweigh any discrepancies and warrant two interim conclusions. Firstly, the Scottish concern with the epistemological basis of natural knowledge is also very evident in the physiological discourse of Whytt and Cullen. Thus the general search for the epistemological interiorisation of nature in Scottish scientific metaphysics had a specific manifestation in the study of nervous sensibility. Each writer made stipulations about how men could know the nervous system consistent with the nature and limits of human understanding. Secondly, there were different and conflicting voluntarist and necessitarian strategies for securing the order of the nervous system in men's minds. This clash is particularly evident in Whytt's and Cullen's accounts of nervous sympathy.[100]

Whytt held that the appropriate theoretical basis upon which to explain and cure nervous diseases was in terms of sympathy, conceived of in its broadest sense as a "nervous consent" which existed between the various parts of the body. Whytt considered that most nervous diseases depended upon "an uncommon delicacy or unnatural sensibility of the nerves" and therefore sympathy was a "subject of the greatest importance in pathology". He rejected all other pathologies of nervous disease founded upon changes in the nature and properties of the nervous fluid; or expressed in terms of a "fight", "repercussion" or "confusion" of animal spirits, which somehow resulted in disease. In his view, this was only to refer nervous disease to more unknown causes. However, it was commonly accepted that the nerves were endowed with feeling and that "general sympathy", or the relationship between organs in the body as a whole, and "particular sympathy" or the consent between specific organs were well known facts. Even if sympathy was considered to be an occult cause on a par with nervous fluids and animal spirits, Whytt maintained it still had a very significant advantage over rival explanations: it showed that sympathy proceeded from exclusively mental causes.[101]

Cullen also accepted that the existence of certain parts of the body with "a common function and peculiar constitution" was of great significance for understanding both health and disease. Such communications between different parts of the body, Cullen noted, "have been called, in general, consent or sympathy". However

> Every term which is like establishing a power exerted between bodies at a distance without contact and motion, and therefore a term for an occult quality if properly rejected I would wish, therefore, that the terms "sympathy" and "consent" were rejected from our system.[102]

These and other remarks indicate Cullen was criticial of sympathy and its use in the writings of Whytt and others. He was particularly critical of the manifold particular sympathies discussed by physicians. For example, he argued that the relation between the sight of food and salivation in a hungry person was not due to a special consent between retina and salivary glands. Instead he stated that such phenomena should be referred to "the general causes of communication" within the nervous system. In practice, this meant acknowledging sympathetic nervous action was always mediated by the brain. He gave the examples of connections between the brain and the alimentary canal (especially the stomach), the circulatory system (especially the extremities of vessels) and the urino-genital system.[103]

Returning to Whytt, it is evident that he also emphasised that "all sympathy must be referred to the brain itself and spinal marrow, the source of all nerves".[104] Whytt put forward a range of evidence to support this. This included experimental findings involving the decollation and destruction of spinal marrow in animals, and the effects of opium upon nervous consent. He also pointed to the effect passions had upon bodily functions and various features of sensory perception. But despite Whytt's marshalling of a variety of experimental, observational and introspective evidence to support the role of the brain in sympathy, two features distinguish his account from Cullen's. Firstly, Whytt kept a host of particular sympathies, including those explicitly criticised by Cullen on the grounds that they were considered independent of brain mediation. Secondly, Whytt's emphasis upon the presence of the sentient principle throughout the nervous system tended to blur any distinction between the brain as a control agency and the nervous system as a whole. This can be seen in Whytt's reluctance to specify how the brain was involved in sympathetic action. Instead, he emphasised men's ignorance about the structure of the brain and its connection with the body. He stated that to suppose sympathy may be

> owing solely to the particular situation arrangements, or connection of the medullary fibres of the brain, or to the union of the nerves proceeding from it, is as unreasonable as to imagine that thought may be the result of a motion among the particles of the animal spirits, or other subtile matters in the brain.[105]

For Whytt the unknown nature of sympathetic nervous action was actually a positive resource for securing the epistemological interiorisation of the nervous system. Its contingent and non-contiguous properties precluded forms of mechanical or material explanations and enabled him to re-emphasise its efficient, immaterial and intelligent aetiology. In doing so, Whytt displayed the theistic directionality of nescience, characteristic of voluntarism:

> The farther we push our enquiries into nature, the more shall we be convinced of our ignorance, and how small a portion is known of the works of the Great Creator.[106]

In Cullen, one finds an equivalent nescience about sympathy. Like Whytt he placed strictures upon explaining the necessary connections which underlay sympathetic processes. Phenomena such as tickling producing laughter, or grief producing tears, even made it uncertain whether all sympathetic connections followed from "communication by nerves". Because there were no perceivable necessary connections between parts of the nervous system, all it was possible to do was learn the factual relations which obtained there. He even acknowledged that such "institutions of our Maker" were, "for the most part", benevolent.[107] Cullen maintained there was

> no other explanation of what may strictly be called sympathy and consent, but the accessory concurrence of certain actions to a volition or propensity, and the concurrence of several motions of the system produced in consequence of these volitions and propensities.[108]

Cullen sought to accommodate sympathetic action to necessary "laws of the economy" based upon uniform antecedents and consequents. This resolution of men's knowledge of nervous communication provided "welcome relief from much of the confusion and appearance of mystery, which the language of sympathy has introduced into our system". By emphasising the role of the brain, Cullen directed accounts of nervous pathology away from views based upon immaterial principles diffused throughout the nervous system and towards a consideration of animal power, or the energy of the brain. On the future of the language of sympathy and consent, Cullen wrote:

> As long as we have no idea on what the connection depends, the term may be used; but if we can find out its foundation, and the means of communication - which ought to be attempted - the term will be no longer be proper.[109]

Should this occur, then sympathy would no longer represent an arbitrary, contingent "occult quality", which Cullen regarded as an embarrassment to his necessitarianism.

The kind of foundation Cullen sought for sympathetic action is suggested in the remarks he made about the process of how pain was referred within the nervous system generally. Cullen noted that when pain was referred from one part of the body to another, it was usually to a more sensible area. This process is somewhat analogous to sympathy. In his proposed explanation, Cullen rejected the notion that sensibility was due to the quantity of nerves present. Rather, it was because of increased oscillations along nerves in more sensitive areas:

> If an oscillation is propagated along a nerve, so long as the course of the nerve is perfectly free, the oscillation will not be accumulated; but if there is a stoppage, the oscillation will be accumulated there, and so its force considerably increased. In this way, I explain the many instances of motions propagated till they arrive at a more sensible part, or to an extremity, where a stop is put to the oscillations.[110]

Cullen presented this as a proximate causal explanation of a particular law of sensation. It is probable he envisaged a similar form of explanation for the laws of sympathy interpreted in terms of the vis medicatrix naturae.

Whytt's and Cullen's divergent attitudes to the nature and operation of sympathy have been discussed. These can be understood in terms of wider commitments to voluntarist and necessitarian images or nervous order, as alternative strategies for knowing the nervous system. This raises the question of whether Gregory's own views on sympathy can be accommodated to either of these positions. Gregory appeared to follow Whytt and Cullen by emphasising that sympathy proceeded from the animal power of the brain. However, he refrained from any speculation upon the actual cause of sympathy. Nor did he propose any general relationships between the energy of the brain and bodily organs. Instead, it was simply a matter of fact and observation that "when the nerve of either of the consenting parts [was] cut ... there [was] no sympathy".[111] Also Gregory did not draw any conclusions that the operation of sympathy might indicate for a systematic nervous pathology. He merely noted that "some consents, or sympathies [were] natural, and other diseased." He ignored Cullen's objections to the proliferation of particular sympathies and showed an eclectic pluralism in his own brief listing of the various features characteristic of sympathetic nervous action. Thus, Gregory did not propose any explanations of sympathy in terms of Whytt's sentient principle, or Cullen's animal power operating in terms of constantly conjointed antecedents and consequents.

In keeping with both of his predecessors, Gregory was equally dismissive of former attempts to explain sympathy in terms of disguised mechanical continguities such as anastomosing arteries which connected sympathetically related parts. However, he was also critical of the view that sympathy depended upon the mind alone. In the Conspectus, he was unforthcoming about who had explained sympathy in this way. But in his Lectures, Gregory referred to Stahl. In itself, this is not particularly significant because Whytt and Cullen both claimed a middle-ground for their own views located somewhere between Stahl on the one hand, and those physicians perceived as mechanists and materialists on the other. However, while discussing Stahl, Gregory added that "others seem to [have meant] the same thing by considering [sympathy] as intelligent."[112] Thus Gregory seems to have been as critical of Whytt's voluntaristic interpretation of sympathy as he was of Cullen's necessitarian reservations concerning it.

It is clear that Gregory's nescient physiology had no directionality in relation to voluntaristic and necessitarian images of nervous order. As in the former example of muscular motion, he endorsed a wholly nominal notion of sympathy because of its utility in demonstrating common sense limitations upon men's knowledge of the nervous system. General consent or the interconnectedness of the body as a whole epitomised the complex integration of living systems. This ruled out explanations of physiological processes in terms of uniform antecedents and consequents characteristic of inanimate nature. Sympathy as a phenomenon was subject to the distinctive logic of animate causation where

> the same causes produce different effects. Motions therefore may be produced by causes very different from what hath been supposed to produce them, or have been formerly observed to produce them.[113]

Because Gregory did not subscribe to either voluntarist or necessitarian images of nervous order, this does not mean that he failed to endorse the search for the epistemological interiorisation of nature. I have repeatedly emphasised that causation was the central theme in the process of interiorisation.

Voluntarism was founded on the hegemony of mind-based productive causes, operating as intelligent agents in nature. In necessitarianism, it was a hegemony of physical causes, treated as related antecedents and consequents. I have shown that Gregory considered each kind of causality to be the legitimate object of mental philosophy and physics or natural philosophy. Gregory's Project was an act of demarcation based upon the distinctive logic appropriate to the object of each discipline. The less apparent third aspect of Gregory's enterprise was the identification of a logic of causality appropriate to physiological knowledge, in order that men might know animate nature.

In medicine, the utility of knowing animate nature was self evident: if physicians could understand the nature of processes in the human body, then they could identify and alleviate disease using remedies. The second part of the Conspectus dealt with therapeutics, considered as the knowledge of the qualities of remedies and their manner of operation.[114] But how precisely were men to make judgements about the aetiology of diseases and so proceed with a therapeutic intention to cure them? Again, this is an enormous subject. Here Gregory's views on the logic of animate causation are discussed in relation to the operation of stimulants and sedatives only.

The operation of stimulants and sedatives was an important subject in 18th century Scottish medicine. This is because their operation was perceived to be closely associated with the transmission of sensibility within the nervous system as a whole. Therefore they were considered as a part of the wider concern to account for the nature and mechanism of nervous action generally. Charles Alston, Whytt, Alexander Monro secundus, and others all wrote upon the subject of opium.[115] Cullen,[116] and latterly John Brown,[117] developed distinctive theories of how stimulants and sedatives operated upon the body. It is evident that Whytt and Cullen developed their accounts of stimulants and sedatives in keeping with their orientations to the aetiology of nervous power discussed formerly.

For Whytt, the manner of operation of opium indicated it produced its effects by means of the nervous system. He argued that the only role the blood had in the transmission of opium was to bring it to the nerves. It did not carry the opium to the brain; instead opium produced its immediate effects upon the parts of the nervous system it touched. Whytt argued that:

> opium, by affecting the extremities of the nerves of the parts to which it is applied, does by means of their connection and sympathy with the brain and spinal marrow, destroy or prevent, through the whole nervous system, the operation of that power upon which depends sensation and motion in the bodies of animals.[118]

Hence opium was accommodated to the sympathetic action of the sentient principle. As with the former case of muscular motion, the operation of opium was a resource for Whytt to maintain the distinctive aetiology of nervous action. The effect of opium was to inhibit the general sympathy of the nervous system. All his explanations pf its operation were based not upon what opium as a physical substance caused to happen, but upon what the causally efficient sentient principle no longer did when affected by opium. Whytt made no reference to the dual nature of opium as a sedative which at a certain dosage could act as a stimulant. However, to Cullen this property was central and in need of theoretical explanation.

Cullen held that because remedies were almost always efficacious in relation to living, rather than non-living, matter, it was reasonable to refer them to the sentient and irritable parts of the body, that is to "motions excited and propagated in the nervous system".[119] Cullen noted that, in practice, it was always difficult to explain how stimulants and sedatives operated. But, in characteristic fashion, he added:

> it seems enough to observe that we know in general that the nervous power may be in different states of mobility and that there are substances which applied to the nerves have a power of increasing or diminishing the mobility of the fluid contained in them. The former we name stimulants, the latter sedatives.[120]

As in the former example of muscular motion, Cullen equated the mobility of nervous power with the operation of a physically proximate nervous fluid. Cullen wrote:

> To be more explicit on this subject, we assume the hypothesis we have before maintained, that there is a subtile elastic fluid inherent in the medullary substance of the brain and nerves upon the motions of which all sense and vital motions depend; and by which, therefore, motions are communicated from every one part to every other of the Nervous System.[121]

In keeping with the search for a proximate causal basis of nervous action, Cullen did not merge the operation of stimulants and sedatives into sympathy, as Whytt had done. Instead, he explained it in terms of physical causes, which either accelerated or retarded the nervous fluid. Like Whytt, he regarded their action in terms of an immediate effect upon the nerves rather than in terms of a prior transmission to the brain via the blood. However, as formerly, he utilised a quite different conception of nervous action itself. Also, Cullen applied this explanation in principle to all remedies.[122]

Cullen discussed what he regarded as the fundamental problem about the operation of stimulants and sedatives with reference to opium.[123] It was evident that although opium was principally a sedative, it frequently acted as a stimulant. But how could the same substance both retard and excite the movement of the nervous fluid? Cullen rejected the view that opium was composed of two substances, one stimulant and the other sedative, in favour of another explanation. The cause of the dual properties of narcotics like opium was to be found in the nervous system itself. Cullen made a distinction between the "direct power" of standard stimulants and what he termed the "indirect stimulant" effect produced by opium, other narcotics and alcohol. The cause of the latter was the vis medicatrix naturae, or "that resistance and consequent activity, which the animal oeconomy suited to oppose to every application that has a tendency to hurt it."[124]

In his various comments about the operation of remedies Gregory emphasised that how particular remedies actually acted upon the body was completely unknown. However this did not matter, as long as the effects were certain and their nature and usefulness sufficiently understood.[125] It has been shown how both Whytt and Cullen used the operation of stimulants and sedatives to highlight and confirm their preferred aetiologies of nervous action. Gregory also drew a lesson from the way they appeared to act. In his view, all proposed accounts of stimulants and sedatives epitomised the peculiarities associated with animate change, which inhibited any explanation of their manner of operation.

Gregory discussed several proposed examples of how stimulants and sedatives were thought to operate. For example, it was agreed that each had a simple and uniform natural effect, but that the subsequently observed contrary effects followed from a defensive response by the body.[126] Gregory considered that all such explanations which made use of the vis medicatrix naturae, or some other term to convey the innate powers of the human body, did not alleviate the fundamental problem. In cases where different and contrary effects proceeded from the same remedies

> It makes no difference whether one or a thousand steps are interposed between the remedy applied to the body, and the ultimate and manifest effect that is discerned in it; since whatever be the number of the steps, every one of them must be accounted the effect of that which preceded it, and the case of that which follows, - so that the same reason which renders the connexion of the first and next step sure and steady, renders the continuation and chain of the whole fixed and immutable.[127]

In particular, the distinctive action of stimulants and sedatives ruled out wholly physical explanations in terms of uniform antecedents and consequents. Many similar remedies produced entirely different effects, while the same effect often resulted rrom different remedies. Also the condition of the nervous system varied from person to person, or within one person at different times. These factors resulted in many unforeseen effects during treatment. However, Gregory argued that the greatest difficulty was

> The magnitude of the effect of such remedies by no means corresponds to the magnitude of the cause; so that the increase of the latter does not always insure the proportionate increase of the former. The circumstances are so far otherwise, that if we increase the dose considerably, the first, and, as it were, natural effect of the remedy, either stimulant or sedative quickly terminates, and passes, as it were, into the very opposite; ...[128]

Thus the action of stimulants and sedatives did not correspond to the characteristic features of cause and effect in physics, which Gregory discussed in his Project. Animate causes were not constantly conjoined such that causes always had their full effects. Hence Gregory's strongest criticisms were reserved for necessitarian claims about the proximate causes of stimulant and sedative action. He maintained that no credible explanations had ever been given of the primary action of chemical remedies. Nor should they be because the medical practitioner had "no interest in the primary, obscure, and almost undiscoverable action of remedies, if such there be, which is so slight and fleeting."[129] Instead, his knowledge rested upon what experience told him were "the ultimate powerful, evident and lasting effect[s] of remedies."[130]

5. CONCLUSION

In section two, it was shown that as a nescient common sense physiologist Gregory was equally censorious of Whytt's sentient physiology and Cullen's sceptical physiology. However, it was emphasised that despite their alternative metaphysical technologies, which utilised different conceptions of causality, each writer could successfully 'make out' his conceptions of the nervous system to be consistent with the natural theological obligations of 'sound' theism. In section three, it was shown that each writer's metaphysical predilections informed his statements about the nature of muscular motion. In section four, Whytt's and Cullen's conceptions of nervous action were equated with the voluntarist and necessitarian strategies for the epistemological interiorisation of inanimate nature found in the Kames-Stewart debate. The divergencies between these approaches was illustrated further in relation to Whytt and Cullen's attitudes to nervous sympathy. It was argued that Gregory's nescient physiology had no directionality in relation to voluntarism or necessitarianism and this was also evident in Gregory's attitude to sympathy. However, because Gregory did not endorse the hegemony of either efficient or physical causes, he did not thereby abandon the search for the epistemological interiorisation of animate nature. Instead he endorsed a conception of animate causation which was neither entirely mind-based, nor did it correspond to the constant conjunction of physical causes and effects.

Gregory's emphasis upon the distinctive logic of animate causes was most clearly and directly expressed in relation to stimulant and sedative remedies. His remarks there applied equally well to other reservations he expressed about knowledge of the nervous system generally and about perception muscular motion and sympathy in particular. In each of these cases, Gregory was more censorious of necessitarian strategies for securing the epistemological interiorisation of physiological knowledge, than the voluntarist alternative. A close comparison between Gregory's remarks and Cullen's writings clearly suggests that Cullen's system of medicine was the target of Gregory's criticisms.

Gregory considered that proximate causal explanations of processes in the nervous system such as perception, muscular motion, sympathy or the operation of remedies rested upon "a philosophy so vain and fallacious which exceedingly corrupt[ed] medical science." This philosophy had no utility; furthermore it distracted "the minds of medical persons, especially students," from more serious matters. He continued:

> Let none, then, rashly confide in those maxims concerning the order of nature, and laws of philosophising in which some who think themselves philosophers, attempt to intrench themselves; since some of these rules are vague and futile, others even utterly false; some, perhaps, are in a certain sense true and useful, but neither so general as some persons believe, nor so certain and fixed as to be assumed for truths in opposition to experience.[131]

The kind of maxims about causal inference which Gregory identified were that "the same cause always produces the same effect"; that "the same or similar effects always proceed from the same or like causes"; and that "the magnitude of the effect is always proportioned to the magnitude of the cause." Gregory challenged necessitarian applications of these rules. Although, it was "probable if not certain, and the principle and foundation of all natural science, that the course and order of nature [was] uniform and unalterable, and therefore that the same cause always produced the same effect." But this remained the case only if all corroborating circumstances remained constant. But this was rarely so in animate nature where:

> the same or, at any rate, very similar effects, often proceed, from causes very different, sometimes quite opposite; and so far from the magnitude of the effect always corresponding to the magnitude of the cause, from a greater cause the effect frequently is less, sometimes new, and sometimes even opposite to what is usual.[132]

By specifying the kinds of causes appropriate to particular disciplines, Gregory considered he was assisting in the general search for the epistemological interiorisation of nature. Only by clarifying the conditions of men's perception of change was it possible to proceed to the legitimate knowledge of nature. Some indication of his attempt to carry this out in the field of medical physiology has been discussed. Gregory's special medical competences led him to consider a range of esoteric topics, rarely treated by other Scottish scientific metaphysicians. However, Gregory certainly was not alone in his general attempt to develop a logic for different disciplines, based upon a legitimate application of the rules of causal reasoning. A similar enterprise received notice in the first part of Stewart's Elements. He also considered the underlying rules of the philosophy of mind should form the basis of a comprehensive logic which would define the objects of study in various disciplines.[133] Stewart commented that, even at the end of the 18th century, far less progress had been made in this area than was usually imagined.[134] He added that a thorough study of the "rules of philosophising" was still necessary in natural philosophy itself, despite its recent achievements. Stewart's own contribution to this enterprise was delayed until he eventually published part two of the Elements, which falls outside the scope of the present study. But he did make some provisional remarks on the crucial distinction between efficient and physical causes,[135] and on the propriety of 18th century theories of perception.[136] On the latter subject at least, Stewart's views correspond very closely to remarks made by Gregory in the Conspectus. Stewart's own discussion of this subject is also representative of the overlapping concerns of the philosophy of mind, physiology and mechanics in later Scottish scientific metaphysics. In particular, Stewart also dealt with the extension of concepts of mind, matter and motion from natural philosophy to the physiology and philosophy of perception. Like Gregory, Stewart opposed this. He sketched the outlines of how the connected problems of accounting for motion in mechanics and explaining the process of perception using kinematic analogies from natural philosophy could be resolved. This involved applying Boscovich's criticisms of motion produced by impulse and contact action generally, to reform men's understanding of the causes of motion in mechanics.[137] If this was accepted in natural philosophy, and action at a distance became the norm rather than the exception, then both physiologists and philosophers would also reform their mistaken theories of perception.[138] This involved rejecting the metaphysical axiom that there could be no action at a distance which Stewart regarded as the underlying feature of both materialist and spiritualist-inspired accounts.[139]

An important consequence of Gregory's concern with causation and epistemological interiorisation generally was to erect boundaries between disciplines. While all knowledge of nature was to be referred to the nature and limits of the human understanding, according to Gregory and Stewart, this process informed men of differences in the objects of study particular to physiology, natural philosophy and the philosophy of mind. However, if we return for a moment to Cullen as a representative of necessitarianism, the same process led to very different conclusions. Cullen's use of the constant conjunction account of causation is an indication of his own particular concern with epistemological interiorisation. Yet the net effect of this strategy for securing the order of nature in men's minds was an opposite one in relation to the creation and maintenance of boundaries between disciplines. If men's perception of change was restricted to the constant conjunction of events, then boundaries between disciplines became less relevant. This was because what some men might call different kinds of causes, were all reducible to men's perception of the constant conjunction between antecedents and consequents. When lecturing to his students, Cullen raised the general problem of the role of philosophy in physiology:

> I must necessarily speak the language of metaphysics [because] there is hardly any phenomenon of the nervous system in which the operations of the mind are not more or less concerned; if therefore, you will call the consideration of these operations metaphysics, their use is altogether unavoidable. I employ metaphysics, because every physiologist has employed them; they have been used to corrupt and destroy physiology to a great degree, and they are not to be counteracted but by means of their own weapons - I think that every part of the history of the human mind may be, on one occasion or another, useful in physic. The physician must at times be the moral philosopher also; and he will sometimes practice with little success, unless he can apply himself to the mind.[140]

In conclusion, it must also be emphasised that the specification of an appropriate logic for men's knowledge of causation also had an important role to play within the realms of physiology and medical theory. Statements about what kind of causes could be reasonably identified in processes of health and disease were clearly relevant to conceptions of the form and object of medical practice. However, Gregory's views on this subject are very difficult to recover for reasons already mentioned. Instead,after writing the _Conspectus_, Gregory appears to have devoted his intellectual energies to the reform of natural philosophy. Enough has been said to show the broad continuity between his physiological writings and the concerns of the _Project_ as a whole. Both were united by the search for the epistemological interiorisation of nature, or the conditions of men's judgements about causes and effects. Gregory's last _Essay_ in the _Project_ involved a comparative assessment of the conditions of human judgement about causes in physics and the motives of men's actions. It was also the final salvo in his attack on necessitarianism and is considered in the last chapter.

REFERENCES TO CHAPTER 5

1. Gregory's Conspectus went through eleven editions by 1851. It was regarded as a standard medical text. References here are to an English edition, A view of the theory of medicine, 2nd ed. (Edinburgh, 1844). See also Lloyd G. Stevenson, "A manuscript translation of Gregory's Conspectus medicinae theoreticae", Journal of the history of medicine, 17 (1962), 182-87. The student lecture notes referred to here are anonymous and undated. But as they follow the organisation of the Conspectus, it is likely they were written somewhere between 1780 and 1790, when Gregory became Professor of the Practice of Medicine. See Lectures on the institutes of medicine by James Gregory, Edinburgh University Library, MS Dc 3, 79-80. Traditionally the theory of medicine consisted of physiology therapeutics and pathology. Gregory seems to have restricted his attentions largely to the former two subjects.

2. William Cullen, First lines of the practice of physic, 4th ed., 4 vols. (Edinburgh, 1784) (vols. 1 and 2 originally published separately, 1777-79). There are numerous student notes of Gregory's lectures on the practice of medicine. Representative examples of the way he used Cullen's text can be found in those taken down by John Lee in 1799-1800, Edinburgh University Library, MS. Dc 8, 147; and by Frederick Goetze in 1803-04, ibid., MS.Dc 10, 145.

3. The exception to this is the appointment of Alexander Monro Drummond for a brief period between Cullen and Gregory. However, he never taught. Although John Gregory was Professor of the Practice of Medicine, he alternated with Cullen lecturing first on the theory and then the practice of medicine. Gregory's father was a founder member of the Aberdeen Philosophical Society. For biographical information on him see Paul David Lawrence, The Gregory family: a biographical and bibliographical study (Ph.D. thesis, University of Aberdeen 1972), 149-71; William Smellie, Literary and characteristical lives (Edinburgh, 1800), 1-118. When John Gregory died in 1773, James Gregory completed his father's lectures for that year. Not only did John teach his son medicine, but James also edited his father's Works which appeared in four volumes in 1788. He also revised the final 1805 edition of his father's Observations on the duties and offices of a physician and on the method of prosecuting enquiries in philosophy (Edinburgh, 1770). On Scottish medicine generally see John D. Comrie, History of Scottish medicine, 2nd ed., 2 vols. (London, 1932); David Hamilton, The healers: a history of medicine in Scotland (Edinburgh, 1981), especially "The rise of the professional: 18th century",91-145. On the rise of the Edinburgh Medical School see J.R.R. Christie, "The origins and development of the Scottish scientific community, 1680-1760", History of science, 12 (1974), 122-41; Vern and Bonnie Bullough, "The causes of the Scottish medical renaissance of the eighteenth century", Bulletin of the history of medicine, 45 (1971), 13-28; R.E. Wright-St. Clair, Doctors Monro: a medical saga (London, 1964); and the collections of articles in Edinburgh's infirmary:

a symposium arranged under the auspices of the Scottish Society of the History of Medicine ... (Edinburgh, 1979); R.G.W. Anderson and A.D.C. Simpson, eds., The early years of the Edinburgh Medical School (Edinburgh, 1976).

4. Christopher Lawrence, "The nervous system and society in the Scottish Enlightenment", in Barry Barnes and Steven Shapin, eds., Natural order: historical studies of scientific culture (Edinburgh and Beverley Hills, 1979), 19-40.

5. See Theodore M. Brown, "From mechanism to vitalism in eighteenth-century English physiology", Journal of the history of biology, 7 (1974), 179-216. For a useful summary of developments in 18th century physiological thought from a sociological perspective see Steven Shapin, "Social uses of science", in G.S. Rousseau and Roy Porter, eds., The ferment of knowledge: studies in the historiography of eighteenth-century science (Cambridge, 1980), 93-139, on 124-130.

6. On medical education during this period generally in its national and international context see A.R. Cunningham, Aspects of medical education in Britain in the seventeenth and eighteenth centuries (Ph.D. thesis, University College, London, 1974); E.A. Underwood, Boerhaave's men at Leyden and after (Edinburgh, 1977). For specific details of the early connections between Newton, Scottish doctors such as Pitcairne, Cheyne and James Keill, and Boerhaave see Arnold Thackray, Atoms and powers: an essay on Newtonian matter theory and the development of chemistry (Cambridge, Mass. and London 1970), 43-82, 106-13.

7. See Thomson, Life of Cullen (ref. 21) vol. 1, 119.

8. Roger Smith, "The background to physiological psychology in natural philosophy", History of science, 11 (1973), 75-123; Karl M. Figlio, "Theories of perception and the physiology of mind in the late 18th century", ibid., 13 (1975), 177-212.

9. See for example Andrew Baxter, An enquiry into the nature of the human soul ... (London, 1732), 36-97, especially 67-79. The multi-disciplinary nature of this kind of discourse is exemplified in Baxter's work. He deserves further study in order to determine the nature and significance of his role in Scottish scientific metaphysics during the period before 1750.

10. For standard biographical sources on Whytt see R.K. French, Robert Whytt, the soul and medicine (London, 1969) and William Seller, Memoir of the life and writings of Robert Whytt M.D. (Edinburgh, 1862). Whytt's notes were edited by his son, Robert Whytt with the help of Sir John Pringle. They consisted of two major essays which Whytt regarded as companion-pieces in the theory and practice of medicine. The full title of the "Essay" was "An essay on the vital and other involuntary motions of animals", and the full title of the "Observations", was "Observations on the nature, causes and cure of those disorders which are commonly called nervous, hypochondriac or hysteric". These were first published in 1751 and 1754 respectively. Also included in the Works were two further

pieces, originally published together under the title Physiological essays (Edinburgh, 1755). Their titles were: "An enquiry into the causes which promote the circulation of the fluids in the very small vessels of animals"; and "Observations on the sensibility and irritability of the parts of men and other animals, occasioned by M. De Haller's late treatise on these subjects". Finally, Whytt wrote a very significant essay on opium called "An account of some experiments made with opium on living and dying animals." This was first published in the Essays and observations, physical and literary (Edinburgh, 1756), vol. 2, 280-316.

11. Under the term "mechanist", Whytt included physicians who had embraced Cartesian principles, and also modern materialists "who referred the sentient principle to the operation of a subtile fluid" circulating in the brain and nerves. Although Whytt usually only mentioned Haller by name in this category, it is clear that it also included most 18th century physiologists who considered themselves part of the Boerhaavian tradition. Among those Whytt perceived as Stahlians were William Porterfield. See William Porterfield, "An essay concerning the motions of our eyes", Medical essays and observations, revised and published by a society in Edinburgh, 2nd ed., 5 vols. (Edinburgh, 1737), vol. 3, 160-263; vol. 4, 124-294.

12. For Whytt, it was irrelevant to the findings of his "Essay" whether or not the sentient and rational faculties were distinct. His objections to Stahl were metaphysical and based upon a particular view of consciousness and reason. For Whytt, if the soul reasoned in the manner described by the Stahlians then it was necessarily conscious. He considered the view that the rational soul could operate unconsciously to be absurd. It was like saying that ideas existed in the mind without consciousness; or that they existed and did not exist at the same time. On Stahl, see also L.J. Rather, "G.E. Stahl's psychological physiology", Bulletin of the history of medicine, 35 (1961), 37-49.

13. Whytt, "Essay", Works 152.

14. Ibid., 159.

15. Ibid., 135.

16. Ibid., 171.

17. Ibid., 201-02.

18. Ibid., 203.

19. Ibid., 207.

20. Ibid., 208 (my emphases).

21. Cullen's "Physiology" was first published as Institutions of medicine, part one, physiology (Edinburgh, 1772). This was intended as the first in a series of textbooks; it was reprinted in 1777 and again in 1785. Cullen planned two other works on pathology and therapeutics; however, he never prepared these for publication. On Cullen see John Thomson, An account of the life, lectures and writings of William Cullen, M.D., 2 vols. (Edinburgh, 1859),(vol. 1 originally published 1832). Cullen has received more attention than either Whytt or Gregory. See, for example, Inci Altug Bowman, William Cullen (1710-90) and the primacy of the nervous system (Ph.D. thesis, Indiana University, 1975); Guenter B. Risse, "Dr. William Cullen, physician, Edinburgh", Bulletin of the history of medicine, 49 (1974), 338-51; R.W. Johnston, "William Cullen", Medical history, 3 (1959), 33-46. The other source for Cullen's views used here is his Works. Throughout his edition Thomson used copious extracts from Cullen's manuscript papers, indicating this in his prepared text by the use of inverted commas. However the precise wordings of such passages often differ from versions which appear in Thomson's Life of Cullen. It appears that Thomson allowed himself considerable editorial license in his use of Cullen's manuscript notes but as there is no other edition of the Works, such anomalies cannot be avoided. A careful study of Cullen's original manuscript lectures held in the Library of the Royal College of Physicians of Edinburgh M.Ss. C.15-37 and at Glasgow University Library, Cullen Collection, M.Ss. 2255, 1-249, would be necessary for a definitive edition of Cullen's writings. Therefore where references are made to Cullen's lectures on pathology and therapeutics here, which, with those on physiology, were given between 1766 and 1773, they are based upon the quotations given by Thomson in his Life of Cullen. A further difficulty is that the second volume of the biography was written in part with the assistance of his son and actually completed by David Craigie, M.D. Although Craigie was broadly sympathetic to Cullen, his part of the text from vol. 2, 401-686, reveals a noticeably different interpretation of some aspects of Cullen's work.

22. See Cullen, "Physiology", Works, vol. 1, 10-17 for use of this terminology.

23. Ibid., vol. 1, 17.

24. Ibid., vol. 1, 23.

25. Ibid.

26. Ibid., vol. 1, 24.

27. Ibid., vol. 1, 29.

28. Cullen included a heterogeneous array of sensations in the category "sensations of consciousness". These included conventional attributes of mind such as self-consciousness in its various modes of thinking, perceiving, willing, judging, existing and identity. But he also included sensations arising

from the vigour or weakness of bodily motions. For example, an awareness of internal functions such as the heart respiration or the stomach when normal functioning was interrupted was classed as a sensation of consciousness.

29. Cullen, "Physiology", Works, vol. 1, 32.

30. Ibid., vol. 1, 37-43.

31. Ibid., vol. 1, 24.

32. Ibid., vol. 1, 49. Thomson included a manuscript addition at this point in which Cullen accredited this principle to Locke and also drew the familiar conclusion from it that there could be no innate ideas. See also the extended quotation given by Thomson in his Life of Cullen (ref. 21), vol. 1, 271.

33. Cullen, "Physiology", Works, vol. 1, 115.

34. Ibid., 42.

35. Cullen added that in writing his textbook, he considered it was "necessary to introduce a very full confutation" of the Stahlian position. In various interleaved notes included in the Works, he referred to the widespread influence, mentioning Nichols in England and William Porterfield as the principal Scottish exponent. Porterfield was made Professor of Medicine at Edinburgh in 1724 and was replaced two years later. Little is known about his life or career. He published his Treatise on the eye in 1759.

36. Cullen,"Physiology", Works, vol. 1, 102.

37. See French, Robert Whytt (ref. 10), 9; also 8-11, 93-168 for the general historical background to the location of the soul.

38. Cullen, "Physiology", Works, vol. 1, 26.

39. Ibid., vol. 1, 104.

40. Ibid., vol. 1, 129.

41. Cullen's doctrine of "excitability" and "collapse" formed the basis of John Brown's system of medicine. The controversy between Cullen and Brown is beyond the scope of this account. But for an introduction, see Thomson Life of Cullen (ref. 21), vol. 2, 223-453, which contains a long discussion of the subject.

42. Cullen, "Physiology", Works, vol. 1, 111.

43. Cullen, "Lectures introductory to the practice of physic", Works, vol. 1, 502. His claim to regard such chains of causes and effects as facts, rather than theories, is echoed in the closing paragraph of his discussion of the nervous system. See "Physiology", Works, 157. There, he urged his students who considered his views too theoretical to suspend judgement until his conclusions were "established as a matter of fact."

44. Cullen, "Lectures" (ref. 43), *Works*, vol. 1, 436; also "Physiology", *Works*, vol. 1, 6 for a similar viewpoint.

45. Cullen, "Physiology", *Works*, vol. 1, 10.

46. In a continuation of the above passage inserted by Thomson from manuscript sources, Cullen added "I do not know where gentlemen have a better opportunity of studying these, in the most fundamental manner, than in this university."

47. *Ibid.*, *Works*, vol. 1, 52.

48. Cullen, "Lectures" (ref. 43), *Works*, vol. 1, 417-18.

49. Cullen, "Physiology", *Works*, vol. 1, 111-121 also "Lectures", *Works*, 404. See also *Cullen collection* (ref. 21), 132, "Observations on the *vis medicatrix naturae*".

50. *Conspectus*, 33.

51. *Ibid.*, 34.

52. *Ibid.*, 36.

53. *Ibid.*, 37.

54. *Ibid.*, 36. Even Gregory could not eliminate all aspects of the vocabulary of motion from his own discussion. However, he was always careful to record his disapproval of it. For example, discussing sensations resulting from external causes he noted these were "said by medical men to take place by impression or impulse."

55. Cullen, "Physiology", *Works*, vol. 1, 37.

56. *Conspectus*, 40.

57. *Ibid.*, 41.

58. *Ibid.*, 44, and the preceding three pages for his general comments.

59. On the general significance of sight and touch in Scottish metaphysics see G.E. Davie, *The Scotch metaphysics* (D.Litt. thesis, University of Edinburgh, 1954).

60. See *Conspectus*, 44-65.

61. *Ibid.*, 65.

62. *Ibid.*, 68.

63. *Ibid.*

64. *Ibid.*, 17-18.

65. *Ibid.*, 19.

66. In contrast, Cullen made no such distinction between chains of causes and effects in disease and those in physics. See Thomson, Life of Cullen (ref. 21), vol. 1, 331-32.

67. Conspectus, 19. See also Lectures, 3, where Gregory used this conception of animate causation to distinguish between the medical and mechanical acts:

> The laws of natural objects are easily known, and the changes they undergo may soon be learned. But in the structure of the human body the parts are minute and the texture delicate, and perhaps hardly ever to be known.

68. Conspectus, 19. See also Lectures, 137.

69. Whytt, "Essay", Works, 122.

70. Ibid., 130.

71. Ibid., 127.

72. Whytt, "Observations", Works, 489, 525.

73. Whytt, "Essay", Works, 172.

74. Ibid., 127.

75. Ibid., 143. Where Whytt used the term "motion", it was usually as a metaphysical rather than a physical concept. He regarded it as an inherent property of mind, rather than a literal description of transmissions in the nervous system.

76. Ibid., 142.

77. Ibid., 147. As a suitable antidote to theologically dangerous materialistic views of the nervous system, Whytt made repeated references to Clarke in his footnotes.

78. Ibid., 183-200.

79. French, Robert Whytt (ref. 10), 63-76.

80. Whytt, "Observations on sensibility and irritability" (ref. 10), Works, 293.

81. Ibid., 294-95. In his comparisons with accounts of gravity, Whytt noted that gravity had been ascribed to two causes. One was the immediate operation of an immaterial being. The other was "the action of some subtile elastic medium on matter." In the latter case, Whytt believed that the elasticity of its parts would also have to be referred to an incorporeal cause.

82. Ibid., 305-06.

83. Cullen's principal objections to Haller's views occur in "Physiology", Works, 66-82. Cullen's main points can be summarised as follows:

(i) He disagreed that all nervous power was extraneous to muscles and all muscular power (vis insita) came from within.

(ii) He disagreed that some parts of the body were without sensibility.

(iii) He disagreed that muscular power was more evident in some muscle fibres than others.

(iv) He disagreed that animals without brains still displayed irritability.

(v) He considered that irritability confounded two distinct concepts; "mobility", or the facility with, which contraction could be excited; and "vigour", or the force with which it could be performed.

Cullen put forward his views on muscular contraction in reference to a number of experiments. But, unlike Whytt, he did not perform these himself. They were carried out by one of his students, Thomas Smith, and eventually published in Smith's dissertation, De actione musculari (Edinburgh, 1767). Smith compared the effects of stimuli applied directly to excised muscles and indirectly to their attached nerve endings. Smith found that the responses were identical in both cases. From this Cullen drew two important conclusions. Firstly, there was a continuity of medullary substance or nervous fluid between nerves and muscles. Secondly, because the duration of contractions in both cases was also the same, it was evident that sensibility and irritability were always equivalent. Cullen presented this as a refutation of Haller's segregation of these concepts.

Despite this disagreement with Haller over the distinction between irritability and sensibility, Cullen agreed with him upon an equally fundamental point: muscular contraction was performed by a power which differed only in degree from inanimate elastics. Cullen acknowledged there were unique properties of muscular contraction, such as its force being stronger than the applied stimulus, or the regular attention of contractions and relaxation of healthy muscle fibre. These were the same phenomena emphasised by Whytt. However, Cullen did not regard such features to be confirmation of the presence of a sentient principle in the muscle fibres. Rather they followed from the peculiarities of muscular contraction itself. For example, the tone of the fibres prior to contraction could account for the disproportionality between stimulus and contractile response.

84. Cullen, "Physiology", Works, 70.

85. Ibid., 83.

86. Ibid., 73. Unfortunately, Cullen did not specify who these foreign philosophers were. However in keeping with Newton, Cullen stated that he considered that:

> the cohesion of bodies depends upon the presence of an elastic fluid, which is more rare in the pores of bodies, and more dense upon their surface, by which the parts are kept together.

87. Ibid. As Cullen considered the ether to be implicated in the phenomena of electricity and magnetism and to be elastic and oscillatory, his vocabulary for the nervous ether drew freely upon all these terms. A good example of this occurs in Cullen's explanation of Newton's "circle of fire" experiment. Because sensations persisted after external stimuli had ceased, Cullen considered that this "law of sensation" showed that "the motion excited in the sentient extremity must be of the oscillatory or vibratory kind, somehow depending upon an electric tremor". On the role of the ether generally in Newton's philosophy see J.E. McGuire, "Force, active principles, and Newton's invisible realm", Ambix, 15 (1968), 154-208; P.M. Heimann, "'Nature is a perpetual worker': Newton's aether and eighteenth century natural philosophy", Ambix, 20 (1973), 1-25; P.M. Heimann and J.E. McGuire, "Newtonian forces and Lockean powers: concepts of matter in eighteenth century thought", Historical studies in the physical sciences, 3 (1971), 233-306, on 240-45; Simon John Schaffer, The Newtonian cosmology and the steady state (Ph.D. thesis, University of Cambridge, 1980), 172-94. For Newton's own remarks on the nervous ether see "General scholium", Principia, 547; Queries 14, 23, 24 and 31, Opticks, 346-403. For the wider role that ideas of perception played in Newton's thought see Martin Tamny, "Newton, creation, and perception", Isis., 70 (1979), 48-58. See also Roderick W. Home, "Electricity and the nervous fluid", Journal of the history of biology, 3 (1970), 235-51; Roger K. French, "Ether and physiology", in G.N. Cantor and M.J.S. Hodge, eds., Conceptions of ether: studies in the history of ether theories, 1740-1900, (Cambridge, 1981), 111-34. For Cullen's use of the ether in a chemical context see J.R.R. Christie, "Ether and the science of chemistry, 1740-1790", ibid., 85-110; and for religious uses of the ether see G.N. Cantor, "The theological significance of ethers", ibid., 135-56.

88. Cullen, "Physiology", Works, vol. 1, 17.

89. Ibid., [illegible]

90. Ibid., 72-73.

91. Conspectus, 71.

92. Ibid., 75. Cullen also referred animal power to the will's government; but he considered volition to be consequent upon previous motions produced by impressions elsewhere in the system ("Physiology", Works, vol. 1, 65). However, Gregory referred it to the will considered as undetermined by prior events in the nervous system.

93. Lectures, 385.

94. Conspectus, 34. Part of the difficulty confronting Gregory, Reid and Stewart over the ether was the citation of Newton by writers such as Cullen who favoured its use. In view of this, Gregory wrote:

> Some writers have very grossly abused even the venerable name of Newton, by referring wholly to his authority the opinion they wish to defend: although, with his accustomed modesty and prudence (which most authors are disposed rather to praise than to imitate) he proposed his ideas on the subject only as a conjecture or question, to be refuted or established by suitable experiments and arguments. But it is not permitted to adopt as truths the conjectures even of a Newton. This were neither to imitate him, nor to promote science.
>
> (Ibid., 33).

For similar problems of 'Newton-management' see Dugald Stewart, Elements of the philosophy of the human mind (London, 1843), 44; Thomas Reid, "Letters to Lord Kames", Works, 58.

95. Conspectus, 35.

96. Lectures, 387.

97. Conspectus, 72.

98. Ibid., 76.

99. Lectures, 405.

100. For an assessment of the wider social significance of the ideas of sensibility and sympathy see Lawrence, "Nervous system and society" (ref. 4).

101. Whytt, "Observations", Works, preface (pages unnumbered, but written 15/11/1764). Whytt was quite explicit about the superiority of his account in this wider sense and made his point using an example. This involved the manner in which grief produced tears. But by attributing this process to sympathy, understood as an exclusively mental or spiritual cause, this ruled out other forms of proposed explanations in terms of "any compression of the lachrymal glands or their ducts by the neighbouring muscles." Whytt also made a further comparison with accounts of gravity, arguing that although Newton did not explain the cause of gravity, nevertheless the principle of gravity was an improvement in natural philosophy, not least because it eliminated fallacious hypotheses such as vortices.

102. Cullen, "Physiology", Works, vol. 1, 155.

103. Ibid., 149.

104. Whytt, "Observations", Works, 510.

105. _Ibid._, 512.

106. _Ibid._, 524.

107. Cullen, "Physiology", _Works_, vol. 1,. 111.

108. _Ibid._, 157.

109. Quoted from Thomson, _Life of Cullen_ (ref. 21), vol. 1, 309.

110. Cullen, "Physiology", _Works_, vol. 1, 52.

111. _Conspectus_, 81.

112. _Lectures_, 439.

113. _Ibid._

114. Gregory's conception of a remedy was not restricted to medicine. It included every change which could effect a salutary change in the body. Other major parts of remedies included "surgery" and "mode of life". After a general opening chapter, Gregory arranged each subsequent chapter according to a particular kind of remedy known by its effect. Among those he included were astringent, emollient, corroborating and lithontriptic remedies.

115. Charles Alston was Professor of Materia Medica at Edinburgh. His death during the 1760-61 session was the occasion of Cullen's secondment to lecture in his place while still Professor of Chemistry. Alston's own lectures were published posthumously in 1770. See also C. Alston, "A dissertation on opium", _Medical essays and observations_ (Edinburgh, 1771), vol. 5, 93-146; Whytt, "Account of opium" (ref. 10), _Works_, 309-27; Alexander Monro, "How opium [acts] on nerves to which [it is] applied [and brings] the rest of the nervous system into sufferance ... by sympathy ..., "_Essays and observations physical and literary_ (Edinburgh, 1771), vol. 3, 292-365; John Clarke, "The effects of a very large dose of opium", _ibid._, 121-28.

116. Cullen did not write separately upon stimulants and sedatives. His views can be found in passages in the "Physiology", and in two general works on _materia medica_. These are _Lectures on the materia medica_ (London, 1771), which was a pirated edition of his original 1760-61 lectures. Shortly before his death, Cullen produced a revised edition, _A treatise of the materia medica_, 2 vols., (Edinburgh, 1789). A more detailed appraisal of Cullen would take into account the original holograph manuscript, _Lectures on the materia medica_, at the Royal College of Physicians of Edinburgh Library (ref. 21), M.S. C15. Cullen also supervised the publication of the sixth edition of the Edinburgh Pharmacopoea in 1774. See also J.W. Crellin, "William Cullen: his calibre as a teacher and an unpublished introduction to his 'Treatise of the _materia medica_', _Medical history_, 15 (1971), 79-87.

117. See Dr. John Brown, Elementa Medicinae (Edinburgh, 1780); An enquiry into the state of medicine (Edinburgh, 1781); Observations on the principles of the old system of physic (Edinburgh, 1787).

118. Whytt, "Account of opium" (ref. 10), Works, 323-24.

119. Cullen, Treatise (ref. 116), vol. 1, 59. In the restatement of the properties of the nervous system in his last work, Cullen seemed more inclined to distinguish between sensibility and irritability than in the "Physiology", written 17 years earlier. However, Cullen restated his former views in a very condensed way and the matter is not conclusive.

120. Ibid., vol. 2, 132.

121. Ibid., vol. 2, 218.

122. Cullen's conception of what a stimulant or sedative actually was, extended far beyond the whole mechanism of sensation itself, to be a stimulant in the broadest sense and upon which the energy of the brain was ultimately dependent. See ibid., vol. 2, 133; "Physiology", Works, vol. 1, 125-31.

123. Cullen, "Physiology", Works, vol. 1, 113-14.

124. Cullen, Treatise (ref. 116), vol. 2, 221.

125. Conspectus, 233.

126. At the time Gregory wrote the Conspectus, there was a dispute between Cullen and Brown over the nature of excitability and the duality of stimulants and sedatives. For an introduction to the matters at issue see Thomson Life of Cullen (ref. 21), vol. 2, passim.

127. Conspectus, 264-65.

128. Ibid., 263.

129. Ibid., 265.

130. Ibid.

131. Ibid.

132. Ibid., 266.

133. Dugald Stewart, Elements (ref. 94), 25.

134. Ibid., 5, 32.

135. Ibid., 39-41. Although Stewart's discussion is brief, it appears that like Reid, he held efficient causes to be attributes of immaterial substances only.

136. Ibid., 43-47.

137. *Ibid.*, 47-49. Stewart was critical of accounts of both the communication of motion in physics and the communication of sensation in perception. He argued that, in discussing the latter, men had made analogies with the former. Thus the transmission of sensations in the nervous system was interpreted as a form of impulse motion. Stewart encouraged the reception of Boscovich's ideas because, if impulse action based upon material contiguity was rejected in physics, then the analogical appeal of impulse-based accounts of perception would also be subverted. Similarly, Boscovich's ideas had a theological utility. Stewart noted that the nature of gravity was usually cited to impress "the mind with a sense of that mysterious agency, or efficiency, into which general laws must be resolved." At the same time, general laws also had a tendency to weaken "those emotions of wonder and curiosity" excited by nature. However, by taking the familiar and habitual facts of impulse and rendering it "unaccountable", then this re-kindles men's "attention" and "curiosity":

> If the theory of Boscovich should ever be established on a satisfactory foundation, it would have this tendency in a still more remarkable degree, by teaching us that the communication of motion by impulse (which we are apt to consider as a necessary truth), has no existence whatever; and that every case in which it appears to our senses to take place, is a phenomenon no less inexplicable, than that principle of attraction which binds together the most remote parts of the universe. (49)

See Richard Olson, "The reception of Boscovich's ideas in Scotland", *Isis*, 60 (1969), 91-103; also the general discussion in Robert E. Schofield, *Mechanism and materialism: British natural philosophy in an age of reason* (Princeton, 1970), 236-41. It was not without prophetic insight that Thomas Melville wrote to William Cullen:

> I have not attempted so much to confute what [Kames's essay] advanced as to shew it leads to mystery [and] scepticism or at last terminates naturally in the system of Boscovich the Roman Professor who denies the existence of Atoms [and] reduces all matter to active [and] moveable points of no magnitude.

See Thomas Mellville to William Cullen, 21/2/1752, *Cullen collection* (ref. 21) and quoted in Roger L. Emerson, "The Philosophical Society of Edinburgh, 1748-1768", *The British journal for the history of science*, 14 (1981), 133-76, on 158.

138. Stewart's remarks in the *Elements* certainly bring out the theological directionality of nescience characteristic of voluntarism. See also his *Notes from a course of lectures delivered at the University of Edinburgh, 1785-86*, Aberdeen University Library MS 190-91, lectures 53-55 for further confirmation. These were written by an unknown student and seem to have been taken down almost verbatim. However what is perhaps more noticeable, is that, where these subjects are discussed in the *Elements*, the treatment is remarkably like

that found in Adam Smith's "The principles which lead and direct philosophical enquiries; as illustrated by the history of astronomy", _Essays on philosophical subjects_ (London, 1869), 325-85.

This was originally edited by Joseph Black and James Hutton and first published in 1795, some years before part one of Stewart's _Elements_ was published. However, as Smith's essay is believed to have been composed during the 1750's, it is possible Stewart may have seen it beforehand. Gregory, on the other hand, did not use this psychologistic language, nor did he make any detailed references to Smith in his work. On Smith's philosophy of science see Josep R. Lobera, "The Enlightenment and Adam Smith's conception of science", in Alun Jones and Henrika Kuklick, eds., _Knowledge and society: studies in the sociology of culture past and present_ (Connecticut, 1981), vol. 3, 109-36; D.D. Raphael, "'The true old Humeian philosophy' and its influence on Adam Smith", in G.P. Morice, ed., _David Hume: Bicentenary papers_ (Edinburgh, 1977), 23-38; Andrew S. Skinner, "Adam Smith: science and the role of the imagination", in William B. Todd, ed., _Hume and the Enlightenment_ (Edinburgh and Austin, Texas, 1974), 164-88.

139. In general, Stewart's frame of reference for discussing this subject was a local one. He referred to Porterfield, to the Kames-Stewart and to Monboddo's various views on motion and perception.

140. Quoted in Thomson, _Life of Cullen_ (ref. 21), vol. 1, 260-61.

CHAPTER SIX

THE BALANCE OF HUMAN JUDGEMENT: GREGORY'S DEMONSTRATIVE REFUTATION OF PHILOSOPHICAL NECESSITY

1. INTRODUCTION

2. THE CONCERN WITH PHILOSOPHICAL NECESSITY IN LATER 18TH CENTURY SCOTLAND; PRIESTLEY'S CRITICISMS OF REID

3. PORTERS, PARALLELOGRAMS AND THE INERTIA OF MIND: GREGORY'S "ABSURD" ARGUMENT

4. RESPONSES AND REPLIES: JUDGEMENT IN THE BALANCE
   - 4.1 Alexander Crombie's criticisms
   - 4.2 The published "Objections"
   - 4.3 John Allen's criticisms

5. THE FORCE OF JUDGEMENTS AND THE JUDGEMENT OF FORCES: GREGORY, ROBISON AND THE REFORMATION OF MECHANICAL PHILOSOPHY

6. CONCLUSION

1. INTRODUCTION

In chapters one, three and four, the principal features and goals of the Project were discussed. In chapter five, it was shown that many concerns in the Project also appeared in Gregory's writings on the theory of medicine. The connections between them were of two kinds. They were thematic because, in both metaphysics and medicine, Gregory sought to specify the nature, constraints and form of human judgements about causes, and so interiorise men's knowledge of nature in terms of the nature and limits of the human understanding. But there were also specific connections because Gregory opposed similar uses of voluntarist and necessitarian images of natural order in both disciplines. However, although Gregory had reservations about forms of voluntarism he perceived in Reid, John Stewart and Robert Whytt, he was consistently more critical of the necessitarianism exemplified in the writings of Hume, Kames and Cullen. His Essay was exclusively devoted to attacking the use of necessitarian accounts of causal judgements to characterise the relationship between men's motives and their actions.

The full title of the last part of Gregory's Project was an "Essay on the difference between the relation of motive and action and that of cause and effect in physics: on physical and mathematical principles". It was eventually published in 1792 as the Philosophical and literary essays. Despite the title, it only contained the single Essay, sandwiched between a lengthy Introduction and a concluding Appendix. More is known about both the pre-publication circulation of the Essay and subsequent responses to it. These details are provided in appendix IV in order to concentrate upon the contents here. Gregory's Essay is the most difficult part of the Project to discuss and evaluate. Therefore it is useful to outline its argument before going into greater detail later.

Gregory's pluralistic theory of change involved specifying different "relations of event" appropriate to different areas of enquiry. His major criticism of voluntarism and necessitarianism was that both collapsed different relations of event into forms of monism based upon a hegemony of either efficient or physical causes. In particular, Gregory noted that besides treating physiological causes on a par with causes and effects in physics, necessitarians also maintained that the relation between men's motives and their actions was also a constant conjunction of antecedents and consequents. In other words, moral necessity was entirely conformable to physical necessity and that, although man had the freedom of choice between two alternatives, his will was necessarily determined by antecedent motives. Gregory's Essay was devoted to falsifying this claim and hence, demonstrating that the relation of motive and action was not equivalent to cause and effect in physics. Gregory considered that man's freedom extended beyond the notion of choice according to the stronger motive and included the exercise of the will independently of antecedent motives. Thus, for Gregory, the relation of motive and action was intrinsically separable.

In reasserting the claims of liberty against necessitarianism, Gregory was merely one historical actor participating in a debate which can be conveniently thought of as commencing with Clarke at the beginning of the 18th century, and culminating in Reid's writings.[1] However, the precise form that Gregory's own defence of liberty took was unusual. To make his case, he made use of intellectual resources drawn from physics itself, rather than the conventional metaphysical apparatus of the moral philosopher. In fact, Gregory's whole argument was built around Newton's first corollary to the laws of motion, commonly known as the parallelogram of forces.[2] The general significance of this in physics is that it offers a mathematical means of representing the behaviour of bodies when subject to the simultaneous action of two forces which are not directly opposed. Although Gregory did discuss some aspects of Newton's own demonstration he did not go into the technical and mathematical issues surrounding the composition and resolution of forces. Instead, Gregory was more interested in the moral purposes he could make the corollary serve in the controversy with necessitarianism. Thus he presented Newton's corollary as a symbolic model of the way in which men made judgements about bodies on the basis of causes and effect in physics. In the Essay, Gregory aimed to show there was no analogy between this process and judgements about motives and actions. Just why Gregory should use this remarkably indirect way of refuting necessity can be provisionally answered by reconsidering the relationship between the search for epistemological interiorisation and the common context of scientific metaphysics in Scotland during this period.

In the 18th century, historical actors routinely made inferences about items of natural knowledge in mechanics, physiology and other areas, conceptions of matter and spirit, views of God's nature and the form of his involvement with the created world, and, finally, accounts of man's own nature and moral status. It has been argued that, in later Scottish scientific metaphysics, these manifold inferences can be understood in terms of two major patterns or images of natural order, voluntarism and necessitarianism. Gregory's own position has been located largely in terms of his opposition to these strategies for securing the order of nature in men's minds. More generally, the argument developed here has been that in the Scottish context, ideas about causality were central to sustaining images of natural order because this was perceived as the means by which men could attain knowledge of nature. In the period after 1750, Hume's account of causality and the responses to it by Gregory and others helped to create a distinctive form of Scottish scientific metaphysical discourse.

Given the nature and goals of Scottish scientific metaphysics, conceptions of the nature of men's minds were probably more important than anything else, precisely because epistemological interiorisation involved referring the evidence of nature to the nature of mind. Thus two different conceptions of man can be found embedded within voluntarism and necessitarianism. In the former, men were considered as active beings, endowed with free will; in the latter man was a being who acted freely in the sense of being able to choose between two alternatives, but this choice was not itself uncaused. Hence within necessitarianism, men's motives determined their actions. This brief characterisation does not take into account the sophisticated negotiations of conceptions of mind which actors displayed in actual controversies between necessitarians and voluntarists. It merely notes the main point at issue.[3] In Scotland after 1750, Hume and to a lesser extent Kames, were both instrumental in the precise form that debates about liberty and necessity took. Although these subjects were discussed before this by Scots such as Andrew Baxter and William Dudgeon,[4] the growing popularity of Hume's and Kames's views during the 1750s and 60s inaugurated a new phase in the debate. It has been suggested by Phillipson that both men fostered a climate of "polite determinism" within Edinburgh's Enlightenment culture.[5]

Hume's and Kames's conceptions of necessity have already been treated in previous chapters. Both men reformulated the central tenets of necessity according to their own preferred philosophical resources but the common ground between them was the emphasis upon the role of experience and feelings, and a mutual concern to accommodate the feeling of liberty to the scheme of necessity. Where they differed was that Hume's commitment to experience and feelings used the doctrine of ideas as its chosen vehicle of expression. Kames, on the other hand, relied upon intuitive principles of belief in a fashion which foreshadowed common sense philosophy.[6] A further difference concerned ontology. Kames's views on necessity appealed to the intrinsic activity of matter in conjunction with a scheme of inevitable law-like causal sequences. Hume, on the other hand, remained in the domain of ideas and impressions and the principle of association. Also, for Kames, philosophical necessity was the means to a reformulation of natural religion on a sounder basis. Hume's account of the nature of causal inference placed severe constraints upon the role of reason in the demonstration of the existence and attributes of the deity. However, despite these divergences, their respective treatments had much in common.[7] Hume and Kames both reformulated and defended philosophical necessity on grounds they considered more scientific. This involved an appeal to the laws of reasoning in philosophy which had been successful in bringing order to men's natural knowledge. Such rules constituted prescriptions about how to judge of causes and effects. Both men sought to apply similar criteria in order to uncover the causes of human conduct. This is most apparent in Hume's "reconciling project" between liberty and necessity, which argued that motives and actions were constantly conjoined exactly in the manner men perceived the connection between causes and effects in physics.

Therefore, Hume argued, men's actions were as necessary as the observed behaviour of inanimate matter.[8]

Gregory's Essay can be situated as part of the subsequent response to Humeian 'new-modelled' necessitarianism by common sense philosophers generally. It was written at the same time Reid was reformulating voluntarism on the basis of the constitutionally given intellectual and active powers of men's minds.[9] However, Gregory did not re-state the claims of liberty by appealing to men's common sense and the direct evidence of consciousness. Instead, he put forward a form of demonstration which he claimed was independent of such considerations. Yet this did not involve a return to the evidence of language used earlier in the Project. The nature and significance of the new metaphysical resources Gregory brought to the task of refuting the claim by modern necessitarians is the subject of this concluding chapter.

Throughout the Project, Gregory continued to attack Hume's philosophy and pointed to its dangerous influence upon members of the Scottish scientific community. However, in the Essay he widened his criticisms to include Joseph Priestley. Gregory considered that Priestley's scientific metaphysics exemplified the pernicious influence of Hume's new-modelled necessitarianism. In fact, Priestley was perceived by Gregory to have used Hume's views on causation in ways that were similar to local Scottish uses by men such as Kames, Cullen and Hutton. Thus Gregory's criticisms of Priestley were also a means of attacking local instances of Hume's influence in Scottish scientific metaphysics. As an English intellectual, Priestley had an important and virtually unique role in later 18th century Scottish debates about necessitarianism. In section two, some details concerning Priestley's criticisms of common sense philosophy are given to provide an intellectual context for Gregory's refutation of necessity on the indirect basis of different kinds of philosophical relations, rather than by immediate appeals to the ontological status of men's minds. In particular, the account concentrates on Priestley's use of the connected concepts of constant conjunction and necessary connection which were central to his own account of philosophical necessity. In section three, more details of Gregory's argument are given. It is shown how Gregory made use of a particular theory of human judgement to sustain his demonstration of the disjunction between causes and effects and motives and actions. This is followed-up in section four, where the contents of three responses to Gregory's Essay are discussed. In section five, I return to the role of judgement in natural philosophy and Gregory's views on the demonstrative basis of physics are compared with similar opinions held by John Robison, Professor of Natural Philosophy at Edinburgh. In conclusion, the central features of Gregory's account of men's judgements about causes and effects are summarised. His opposition to necessitarianism is situated in the context of a shared enterprise carried out by other Scottish scientific metaphysicians who also sought the reform of natural philosophy and the philosophy of mind on the basis of human understanding.

2. THE CONCERN WITH PHILOSOPHICAL NECESSITY IN LATER 18TH CENTURY SCOTLAND: PRIESTLEY'S CRITICISMS OF REID

Priestley published his attack on Scottish common sense philosophy in 1774. Although his Examination of Reid, Beattie and Oswald considered other writers, the exposition here is focused largely on his criticisms of Reid. The most persistent theme of Priestley's critique of Reid's Inquiry was that, despite attacking Hume, Reid had "himself introduced almost universal scepticism and conclusion".[10] Priestley saw Reid as a sceptic because, like Hume, Reid had also denied the existence of necessary connections in nature. By imposing what Priestley called an "impassable gulph" between the mind, the contents of perception and external objects, Priestley suggested Reid was in fact closer to Berkeley than the common sense realism to which Reid laid claim. Firstly, Reid denied things had a "real instrumentality of their own".[11] Secondly, because his theory of mind was founded upon "independent arbitrary instinctive principles",[12] men only had access to a "relative truth"[13] which was wholly dependent upon their constitution. Priestley stated that the aim of his critique was to challenge the claims of common sense by "ascribing a little more to habit, and to the necessary connections and consequences of things".[14]

The kinds of necessary connections Priestley had in mind were those founded upon the association of ideas. He contended that all Reid's instinctive principles were actually acquired through experienced associations between phenomena.[15] Priestley routinely accepted there was an external world to which ideas corresponded by the mechanism of association. He acknowledged this was in fact a hypothesis, but one for which there was "a reasonable degree of evidence".[16] Reid had stumbled over this point. He wrongly considered that scepticism was the inevitable outcome of sensationalist epistemology. Therefore, to oppose Hume's doctrine of ideas and impressions, Reid had sought what Priestley referred to as a "plenary assurance" based upon ultimate principles.[17] Priestley rejected this common sense epistemology of instinctively felt beliefs in favour of a rational belief that "all the connections which had been supposed to exist between the several phenomena, powers and operations of the mind actually had a real basis in nature".[18] However, an opposite viewpoint was evident in Reid. Priestley wrote:

> Where all the rest of the world see the most clearly connected chain of reasoning, [Reid] is always ready to suspect that some link is wanting, and as ready to supply the imaginary defect, not with another link, but with something that is no proper part of a chain, but some invisible power to keep the two parts together.[19]

Priestley's adoption of a relational constant conjunction theory of causality lay at the basis of his system of philosophical necessity. He stated that the aim of his philosophy was to reduce the manifold appearances of nature into classes by inferring similar causes from similar effects on the basis of the association of ideas.

For Priestley, the means of displaying necessary connections between men's minds, ideas, sensations and material objects was Harley's physiology.[20] Priestley criticised Reid's apparent ignorance of Hartley in the Inquiry. He was incensed at Reid's parodying of the doctrine of vibrations which Reid had grouped with other "engines" of the nervous system.[21] Priestley viewed Reid's nescience about necessary connections in the nervous system as another instance of his general philosophical scepticism. Instead of seeing Hartley's work as a reasonable physiological basis for the association of ideas, Reid had dismissed it. Priestley saw Reid as segregating the physiology and philosophy of mind, so that the mind and the nervous system became problematically separated. Hence Reid's need to ground men's belief in the material world by an instinctive principle, antecedent to all experience.

Priestley also attacked common sense philosophy because of its rejection of moral necessity. He criticised Reid and his associates for advocating a corrupted Arminian doctrine of the will.[22] Their voluntarism emphasised that men had the power to do different actions where the antecedent motives and circumstances governing their conduct remained the same. For Priestley, this made morality unaccountable. Unless motives were constantly conjoined with actions, then men were not responsible for their acts. In his alternative system of philosophical necessity, Priestley advocated moral necessary connections, where men had liberty or the power to do what they willed.

Priestley also regarded his commitment to philosophical necessity as an essential basis for rational natural religion. Otherwise it was impossible to provide rational proof of the being and attributes of the deity. Although Priestley placed greater stress upon an equally rational revealed religion, natural religion was also important. He saw it as a shop window to attract the passing philosophical unbeliever. Once inside, he might also be converted to rational Christianity. Therefore Priestley was concerned to develop the best possible arguments and proofs for natural religion. This provided further grounds for attacking the common sense philosophers. Even though Reid made use of arguments about causality in his own defence of natural religion, Priestley considered his denial of necessary connections led him to place too much emphasis upon the wrong "kind of faith"[23] in the deity. In his Examination, Priestley did not rehearse the basis of his own rational reconstruction of natural religion. However, a consideration of his other works reveals that it followed from the same general principles as the rest of his thought.[24] The truths of natural religion were to be resolved with reference to the association of ideas, formulated in terms of a theory of judgement about how men knew causes and effects in nature. The rules of philosophising about causes and effects dictated that men sought a unitary cause adequate to produce the manifold effects of nature, including man himself. Therefore men must infer a single godhead endowed with infinite power and intelligence to design, produce and sustain nature.[25]

As well as Priestley's stress upon ontological, physiological and moral necessary connection, he also embraced a form of logical necessary connection. Priestley considered that human judgements concerning the truth of propositions about nature was a further instance of the association of ideas.[26] Nature, the mechanism of perception and human judgement were all equally necessary and in complete correspondence with one another. All these processes were at bottom the same kind of necessity for Priestley. By departing from the standard of philosophical necessity based upon the association of ideas, the common sense philosophers broke down the links between men's minds, the physiology of the nervous system, external nature and God.

In his Examination, Priestley's insistence upon necessary connections had several interrelated aspects. He variously put forward the claims of ontological, physiological, moral, natural theological and logical necessity. At the centre of his system of philosophical necessity lay a theory of judgement and evidence that was itself causal, necessary and founded upon the association of ideas.[27] On the basis of laws of reasoning, or what Priestley called the "rules of philosophising", men made causal judgements about God, nature and their fellow men. The chief criterion for these judgements was the constant conjunction between analogically similar causes and effects. Because human understanding was so formed, these manifold constant conjunctions were the basis of a reasonable belief in real necessary connections throughout nature:

> For a cause cannot be defined to be any thing but such previous circumstances as are constantly followed by a certain effect; the constancy of the result making us conclude that there must be a sufficient reason in the nature of things why it should be so produced in these circumstances.[28]

Applied to mind, this meant that, although in practice, a man's conduct might not be known in advance, in principle, an acquaintance with his "disposition of mind", "precise situation", and "view of things" would enable a prediction about it to be successfully made. Alternatively, if circumstances remained the same, and a different effect followed from that expected from constant laws of nature, then this would imply an effect without a cause. However:

> if one effect might take place without a sufficient cause, another, and all effects, might have been without a cause; which entirely takes away the only argument for the being of a God.[29]

To illustrate his conception of the necessary determination of the will by motives, Priestley repeatedly compared it to the behaviour of a balance when weights of varying kind were placed in the opposing pans. Like weights, motives acted invariably and mechanically according to human physical laws. Thus:

> Strengthen the motive, and the action is more vigorous; diminish it, and its vigour is abated; change the motive, and the action is changed; intirely withdraw it, and the action ceases; introduce an opposite motive of equal

> weight, and all action is suspended ... As far as we can judge motives and actions do in all possible cases strictly correspond to each other.[30]

Priestley also made considerable use of arguments which appealed to linguistic usage. Common speech showed that men considered motives to be real causes and that this circumstance was implied in the idea of "agency".[31] In this sense, Priestley considered that the "vulgar" actually subscribed to philosophical necessity. Whereas the vulgar were Priestley's allies, common sense philosophers generally, and especially Reid, were perceived as opponents of his evolving system of philosophical necessity. Their views on the freedom of the will disrupted the accountability of men's reasoning and reduced men from being the necessary architects of their own experience to a contingent dependency upon the innate principles of their mental constitution.

An examination of Priestley's philosophical necessitarianism reveals substantial similarities with the views of Hume and Kames. Although Priestley was critical of both men for lacking a scientific understanding of the association of ideas found in Hartley and he also attacked Hume for his religious opinions, it seems likely that his presentation owed much to them. There is probably insufficient biographical information to confirm this directly in relation to Priestley's own non-conformist education and his subsequent role as a teacher in the dissenting academies.[32] But indirect evidence suggests that Priestley's scientific metaphysics may have been derived from Scottish necessitarian sources.[33] Certainly, Kames, Hume and Priestley each endorsed the search for a scientific resolution of necessity. Each writer's willingness to employ forms of causal reasoning in moral subjects which were current in natural philosophy harmonised all three accounts of necessity. Furthermore, Priestley seems to have specifically made use of Hume's vocabulary of constant conjunction and necessary connection to 'new-model' necessitarianism. The central feature of this was the transposition of men's perception of constantly conjoined events into necessary connections of various kinds. Thus despite the limits of men's understanding, men had access to a form of certainty relative to the nature of men's minds.

3. PORTERS, PARALLELOGRAMS, AND THE INERTIA OF MIND: GREGORY'S "ABSURD" ARGUMENT

Reid's public response to Priestley was delayed until the appearance of the "Intellectual powers" and "Active powers" in 1785 and 1788 respectively.[34] Although Reid's various references to Priestley are usually allusive rather than direct, they are frequently pointed out by Reid's editor, Hamilton; or they can be identified on the basis of textual evidence. In the "Active powers" especially, Reid discussed the respective claims of liberty and necessity. Two features of his characterisation of necessity are very relevant to Gregory's particular treatment in the Essay. Firstly, Reid identified the major claim of necessitarianism that motives operated like causes and effects in physics:

> It is a law of nature with respect to matter, That every motion and change of motion, is proportional to the force impressed, and in the direction of that force. The scheme of necessity supposes a similar law to obtain in all the actions of intelligent beings; which, with little alteration, may be expressed thus: Every action, or change of action, in an intelligent being, is proportional to the force of motives impressed, and in the direction of that force.[35]

Reid noted this law of nature about matter was founded on the principle that it was passive. Necessitarians, by applying an analogous law to human action, supposed that intelligent beings were equally inactive. Secondly, he also noted that Hume and Priestley were advocating a form of necessity based on the constant conjunction theory of causation.[36] These two observations were common starting points for Reid's and Gregory's respective attacks on the philosophical necessity.

Despite Gregory's criticisms about the implications of voluntarism for natural philosophy, he declared his complete support for Reid's account of men's active powers.[37] Yet if both writers' accounts of the liberty of human agents are compared, the contrast could not be more striking. In Reid's presentations, we find all the typical worries of the moral philosopher, concerned with what he perceived as the consequences for moral and religious conduct if necessity were true. Reid opposed necessity because he considered that if adopted it made men unaccountable to God and morally ungovernable.[38] But in Gregory's case, these concerns were scarcely raised in the Essay. He certainly never appealed to such criteria in arguing against necessitarianism. Reid persistently referred liberty to a God-given power of men's constitution and manifested in the reasonable, intelligent exercise of men's will. Gregory did not discuss the origin of men's power of willing at all. In fact, he rarely referred to the mental act of willing. Gregory preferred to speak about the contingent relation between motive and action, rather than publicly inaccessible mental acts. However, the most important difference was that, Reid considered the best argument for liberty was "because [man] has a natural conviction or belief, that, in many cases, he acts freely.[39] But Gregory did not base his account on men's conviction of liberty at all. In fact, he explicitly contrasted his own approach with others which relied on introspection and men's feeling of power. In this sense, Gregory endorsed the force of criticisms about common sense justifications of liberty made by necessitarians such as Hume, Kames and Priestley. The clashes between voluntarists and necessitarians who advocated different accounts of mind had, in effect, politicised human experience. Accounts based upon the internal testimony of consciousness alone were now perceived by Gregory to be unacceptable, especially to necessitarians, who claimed men's sense of liberty was actually deceitful. Thus Gregory considered that this kind of evidence no longer had the power to secure consent in men's minds. Therefore his Essay was an attempt to transcend appeals to consciousness and so resolve the debate upon what he regarded as a more objective scientific basis.

In Power and Activity, Gregory developed his views on language and the structure of verbs in order to display the difference between the relations of physical change and human activity. Also, it has been shown how he used aspects of his own position to censure both Reid and Hume. But, significantly, Gregory sought to present his new metaphysical technology of linguistic usage as a demonstration of the "real difference between the relation of activity and that of cause and effect". This demonstration was to be based upon strictly necessary deductions from certain axioms, such as Gregory's self-evident proposition that "language must be the expression of thought". The point of such demonstrations was that if the simple truths of the human mind could be axiomatised, then conclusions from them, if necessary, must command the assent of all men. In other words, demonstrations actually made consent in men's minds. For reasons which are unclear, Gregory did not bring his new metaphysical technology of active and neuter verbs to bear directly on the problem of liberty and necessity.[40] Instead, he put forward a model of strict demonstration based upon the laws of human thought.

As we have seen in chapter four, Gregory perceived that the argument behind Hume's position was founded upon the particular sense Hume gave to necessary connection within his "reconciling project". In Gregory's view, Hume had completely changed the form of the debate by reformulating the doctrine of necessity in terms of the theory of constant conjunction of causes and effects. Hume relocated necessity within the general framework of the association of ideas, where it became the customary inference performed by the mind on the basis of previously conjoined causes and effects. This was adopted by Priestley who represented it as the essence of philosophical necessity. In the face of their "new-modelled" necessitarianism, Gregory redefined the aims of the philosophical libertarian. He had to show that there was no constant conjunction between motives and actions. This then is the general framework within which Gregory's Essay was situated. Gregory was in fact competing for control of the notion of constant conjunction as a key resource. Hume and Priestley made use of it in order to promote the cause of philosophical necessity and to apply it to all the phenomena of nature. Gregory, on the other hand, wanted to restrict its application to physical processes alone, by showing that it did not apply to motives and actions.

Rejecting all appeals to consciousness and reflection, Gregory sought to engage philosophical necessitarians upon their own terms. The principal claim underlying the use of constant conjunction in the necessitarian case was that this offered a scientific account of human nature. Men acknowledged that a constant conjunction between physical events was the basis of all natural philosophy. In so far as there was the same constant conjunction between motives and actions, then the claims of philosophical necessity were as well-grounded as those of science as a whole. Therefore Gregory sought to test the claim that motives and actions were constantly conjoined according to "that kind and degree of evidence which we have in mathematical and physical science".[41] Gregory reiterated that he would make

> no further appeal to the thoughts of mankind, on the subject in question, than is done in geometry; I mean, for the admission of axioms, or self-evident necessary truths, and for the validity of strictly logical inferences.[42]

Gregory emphasised that the presuppositions underlying all reasoning in mathematics, logic and physical science were "laws of thought". For reasoning to be possible, it was necessary to grant two premisses. One was the perception of self-evident necessary truths. These functioned as the axioms from which all subsequent deductions follows. The other was man's irresistible conviction of a necessary connection between successive steps of valid logical reasoning. Without such guaranteed status for axioms and logical inferences, scientific enquiry would be impossible. To Gregory, it was evident that

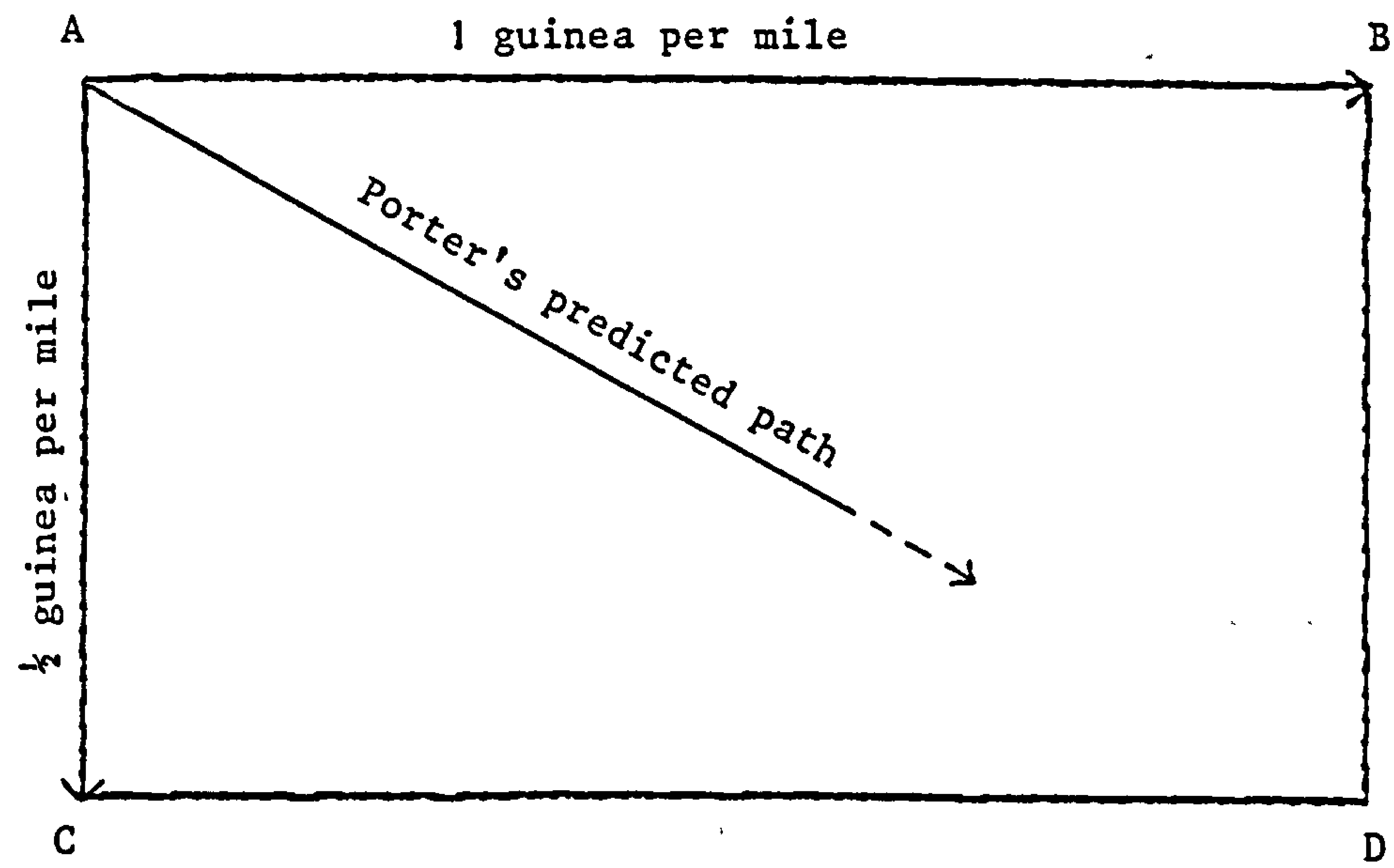
> The doctrine of necessity seems to imply many necessary inferences with respect to the actual conduct of men, on the application of motives, strictly corresponding to the result in similar cases of the application of physical causes to lifeless bodies; but widely different from what might be, and probably would be, the result, on the supposition of liberty or self-governing power in the agents.[43]

If the logical consequences implied by necessitarianism could be shown as palpably absurd, then the supposition that motives and actions were constantly conjoined analogously to cause and effect in physics was false. Hence it could be demonstrated, albeit indirectly, that there was a self-governing power in agents.

The foundation of the necessitarian position was based upon the irresistibility of motives. Gregory called this the "inertia of mind" since, if motive and action was constantly conjoined in the manner of cause and effect in physics, then the behaviour of men was as inevitable as the behaviour of matter subject to forces. Gregory argued that if this were so, then there would be a necessary mechanics of human nature. To test this supposition, he sought to apply Newton's first corollary to the laws of motion to human action, and to see whether what was already known and accepted concerning the behaviour of matter could serve as a model for the actions of men's minds. In his presentation of what is now known as the parallelogram of forces, Gregory made use of a simple diagram and some algebraic notation.[44]

Using this model, Gregory claimed to deduce a number of necessary consequences which followed from the post-Humeian doctrine of the irresistibility of motives. The foundation of this position, or what Gregory called "the inertia of mind", was that motives and actions were constantly conjoined in the manner of physical causes and effect. Or another way of putting this is that the inertia of mind was analogous to the inertia of matter because mental causes were constantly conjoined with their actions exactly as physical causes were constantly conjoined with their effects. If the necessary consequences following from this viewpoint could be shown to be absurd, then the supposition that motives and actions were constantly conjoined was false. Therefore it could be demonstrated indirectly that there was in fact a self-governing power in agents.

The substance of Gregory's case was an ad absurdum argument which involved taking the analogy between motives and actions and causes and effects for granted, in order to show it was absurd and false. If true, the analogy implied the behaviour of men was as regular as the behaviour of bodies in mechanics. Therefore variations in actions caused by motives should correspond to variations in the motion of bodies under the influence of forces. Cases where motives were complementary, opposed and combined should correspond to parallel cases in physics resulting from the additions, subtractions and combination of forces. The respective actions resulting from particular combinations of motives should be analogous to the corresponding behaviour of bodies under the influence of particular constellations of forces.



Gregory considered the case of a porter given a reward to carry a letter in a given direction. If he were offered one guinea a mile to carry it in the direction AB, then, given no intervening motive or physical obstacle, he would go in the specified direction. Further, he would continue to do so until acted on by another motive or cause. Similarly, if, quite independently, he were offered half a guinea a mile to go in the direction AC, the same conditions would apply. Gregory stated that these observations would be agreed by both necessitarians and libertarians, provided they accepted the assumption that the financial incentives were a suitable metric for the force of a motive.[45] The libertarian case did not deny some analogy between causes and effects in mechanics and motives and actions. Necessitarians objected to the constancy of the conjunction between them. Thus in the separate cases of a man going to AB or AC, there was a real resemblance between the behaviour of bodies determined by the first law of motion and the actions of the letter bearer. However, the crucial test occurred when both the above motives were applied at the same time, such that if he earned the guineas, he could not earn the half guineas. The analogy in mechanics was that the body will move in the diagonal AD, describing the distance AD in the same time as it would have described AB or AC separately. If the constant conjunction of motive and action was maintained, then it followed that the porter,

> according to the principle, has nothing for it but to go peaceably, and without murmuring, in the diagonal AD: for in this case both motives are conjoined with their actions, as far as is consistent with their mutual interference and modification: the result partakes of both, and is different from what either action would have been singly, as the application of one of the motives by itself.[46]

But this necessary consequence was self-evidently absurd: it meant that the porter could not earn either reward, or "that for the sake of which" he originally set off. This deduction was an absurd conclusion from a principle which had been assumed true in order to carry out the proof. The principle was the constant conjunction of motives and actions, the heart of 'new-modelled' necessitarianism, and therefore Gregory stated, he had falsified it demonstratively.

This was Gregory's principal argument and proposed refutation of philosophical necessity. The rest of the Essay was taken up with further subsidiary cases which also confirmed want of analogy between the relation of motive and action and cause and effect in physics. These variously took into consideration the opposition and addition of motives as well as their combination. But in all cases Gregory's basic strategy of refutation was identical. He deduced necessary consequences which followed on the assumption of a constant conjunction between motives and actions. These were then shown to be contradictory and absurd. Therefore, Gregory concluded, the principle upon which they were based was false.

Gregory's refutation of necessity was based upon an underlying view about the conditions under which men made judgements about events. This viewpoint is evident in Gregory's conception of metaphysics itself. If the science of human nature gave a just description of the principles and laws of human thought, then this would "appear at once to all men natural and true".[47] This was because all men were subject to the same laws of human thought.[48] Gregory relied upon this assumption in his refutation of philosophical necessity. By avoiding ambiguous language and not appealing to the uncertain and subjective evidence of consciousness, Gregory claimed to draw necessary consequences from axioms and principles admitted by the necessitarians. Consequently, as they perceived the porter's predicted diagonal movement to be absurd, then they were themselves compelled to reject the premisses as false. Hence Gregory viewed his Essay as a kind of public apparatus for manufacturing consent about the truth of liberty in the biased minds of necessitarians.

Gregory emphasised the need for a form of scientific metaphysics that would serve as an irenicon of human judgements about mind and matter. He wrote:

> We want an instrument that shall fairly separate and distinguish all our different thought, as Newton's prism does with respect to the different rays of light.[49]

In support of the claim to have developed precisely this kind of metaphysics, Gregory cited three characteristics of his approach. Firstly, it contained no appeals to consciousness "which might place men of science in the unpleasant situation of contradicting one another in circumstances where one party or the other must be deemed guilty of willful falshood".[50] Secondly, it contained the means of directing any such falsehood "with that same degree and kind of evidence that is held sufficient to convict a person of bearing false witness in a court of justice". Finally, it brought

> a long lasting metaphysical controversy to the test of that kind and degree of evidence which we have in mathematical and physical science; employing only strict mathematical reasoning by necessary consequences, and bringing the result of such reasoning, and every question of fact to the test of open unequivocal experiment.[51]

Gregory presented the necessitarians with two alternatives to his scientific refutation of their position. Either they found an inconsistency in his reasoning, or they accepted his refutation. Since he saw that Priestley and others did neither of these things, he accused them of "mala fides". Because they refused to grasp either horn of Gregory's dilemma of judgement, they were guilty of acting "uncandidly", "unreasonably" and even of promoting "deliberate inconsistency".[52] Gregory considered that his Essay was actually a proof of "mala fides" on behalf of necessitarians. If such men could with "bona fides" deny the necessary consequences of principles they endorsed, then

> demonstration would be impossible, a syllogism would be a kind of absurdity, and the science of logic as arrant an imposition on mankind as magic or judicial astrology.[53]

By failing to respect what Gregory viewed as the logical preconditions of the human understanding which made judgement and reasoning possible, the necessitarians had made common sense itself an absurdity.

In this section, Gregory's proposed demonstration of the difference between the relations of motive and action and cause and effect in physics has been discussed. In the Essay, Gregory presented his account as one in conformity with clear, unambiguous axioms, from which strictly necessary inferences could be drawn, forming a demonstrative chain of reasoning. For Gregory, this was a means of securing men's judgement about the difference between agency and inanimate causation. In the next part of the chapter, three responses to the Essay are considered to illustrate some aspects of the widespread dissent about the nature and constraints of men's judgements. However, before doing so, it is useful to compare Gregory's attitude to demonstration with the views of a friendly critic, Thomas Reid.

It has been noted by recent historians of probability that in the 17th century, there was a systematic erosion of the boundary evident in scholastic thought between knowledge and opinion, or probability.[54] This resulted in the concept of probability gradually losing its pejorative usage and becoming a basis for reasonable belief. Men began to aspire to forms of mitigated or "moral certainty" in matters of fact and observation.[55] Although this tendency was evident in a variety of subjects, developments in natural philosophy during this period were central to the spread of new attitudes to certainty during the 18th century. Members of the English scientific community developed forms of enquiry which emphasised the role of appearances, phenomena and facts. The evident successes they achieved popularised and legitimated more empirical forms of enquiry generally.[56] Many of these changes are evident in Locke's Essay concerning human understanding, and his views were a natural starting-point for subsequent treatments, such as Reid's own in the "Intellectual powers".[57]

A full comparison of Locke and Reid's views is beyond the scope of this account. However, the significant point for present purposes is that Locke broadened the category of certain knowledge to include not just the demonstrative kind, but also what he called "intuitive knowledge".[58] In fact, he regarded the latter as more fundamental, because it was more immediate than that provided by the process of demonstration. Furthermore, Locke also entertained the possibility of extending demonstration to other areas besides mathematics, for example, to moral truths. Reid also discussed the latter point.[59] Reid disagreed with Locke's example, emphasising that particular moral truths were contingent and therefore undemonstrable. But Reid considered demonstrative reasoning in metaphysics was possible. Reid commented that such demonstrations of metaphysical necessary truths were likely to be very short, unlike the long trains of necessary inferences which made up mathematical proofs. He added that such truths, in keeping with all abstract propositions, usually had a degree of evidence which was analogous to a mathematical axiom, rather than actually being amenable to proper demonstration as such.

Reid's particular statements about the Essay which dealt with its claim to be demonstrative are a concrete illustration of the general views found in the "Intellectual powers". Reid wrote to Gregory that the relation of a cause

> to its effect is so self-evidently different from the relation of a motive to an action, that I am jealous of a mathematical demonstration of a truth so self-evident. Nothing is more difficult than to demonstrate what is self-evident.[60]

Despite this, Reid conceded that the reasoning in Gregory's Essay was justified on the basis of the necessitarian hypothesis he opposed.[61] But he suggested that Gregory should express "less confidence" in his mathematical reasoning. Also, Reid continued to have reservations about the use of Newton's corollary.[62] The issue Reid did not raise was Gregory's application of mathematical reasoning. This seems surprising, given Reid's former criticisms of Hutcheson on these grounds.[63] Yet it is also comprehensible in terms of Reid's own distinction between the applicability - even if only in a restricted form - of demonstration to metaphysical truths, but not to moral ones. Presumably, Reid held the difference between causation and activity to be a self-evident necessary truth, whereas statements which specified the duties of men were contingent.[64]

Reid convicted Hutcheson of a double mistake. Firstly, he had tried to demonstrate moral truths. Secondly, he did so in an explicitly mathematical way. However, Gregory's distinction between the relations of physical causation and activity was not a moral truth, although it was clearly perceived to have moral implications. Therefore, Reid was not actually inconsistent in failing to criticise Gregory on such grounds. But what about the second point of applying mathematical reasoning to a non-mathematical subject? Here, Gregory explicitly claimed he could justify his use of mathematical reasoning in the Essay and do so on the basis of criteria specified by Reid himself in "On quantity". He appealed to Reid's distinction between proper and improper quantity, arguing that, while the strength of a motive had no proper quantity itself, it could be assigned a measure.[65] In the case of the porter, this was based on his assumed desire to earn money. This could be measured, provided different sorts of other desires the porter might have were not compared with it, or that different instances of the same kind of desire were subject to the operations of multiplication or division. It could not be said, for example, that the desire to earn a shilling was twice that to earn sixpence. Thus, Gregory considered that the two criteria Reid identified for applying measure to improper quantities had been met: degrees of greater or less, and a relation to something that has proper quantity such that "every degree of the one must have a determinate magnitude or quality of the other corresponding to it".[66] In "On quantity", Reid also said that "tastes, smells, the sensations of heat and cold ... and all the affections and appetities of the mind" had not been reduced to measure and "perhaps" never could be.[67] Gregory's Essay was an adroit exploitation of Reid's "perhaps". But it is also an indication of something more important. The Essay's whole approach suggests that the inclusion of self-evident truths within the category of certain knowledge was more problematic for Gregory that it had been for Locke and especially Reid. Instead of viewing self-evidence as the epitomy of certainty, in effect, he inverted this hierarchy and sought to demonstrate the self-evident. Once again, this suggests that Gregory's perception of the incommensurability of judgements about self-evident truths made by necessitarians and their opponents, led him to resurrect the former ideal of demonstrative knowledge to eliminate dissent and uncertainty.

4. RESPONSES AND REPLIES: JUDGEMENT IN THE BALANCE

In this section further aspects of the dissent that Gregory's own Essay actually produced are considered. Three sets of criticism are discussed, together with Gregory's particular replies. The first to be considered is by Alexander Crombie who attacked the Essay in his An essay on philosophical necessity, published in the following year.[68] The second comprises the anonymous "Objections" to Gregory's views which were included in the Appendix, and very similar views found in Hutton's An investigation of the principles of knowledge and the progress of reason from sense to science and philosophy.[69] The parallels between them suggest that Hutton was himself the author of the "Objections". But because this imputation rests only on textual evidence, it is not made essential to the discussion. Finally, the criticisms of John Allen are considered which were put forward in his Illustrations of Mr. Hume's essay concerning liberty and necessity in answer to Dr. Gregory in Edinburgh by a necessitarian.[70] To assist the exposition, details of the circulation and reception of the Essay are given in appendix IV, while the full text of the "Objections" is provided in appendix V.

4.1 Alexander Crombie's criticisms

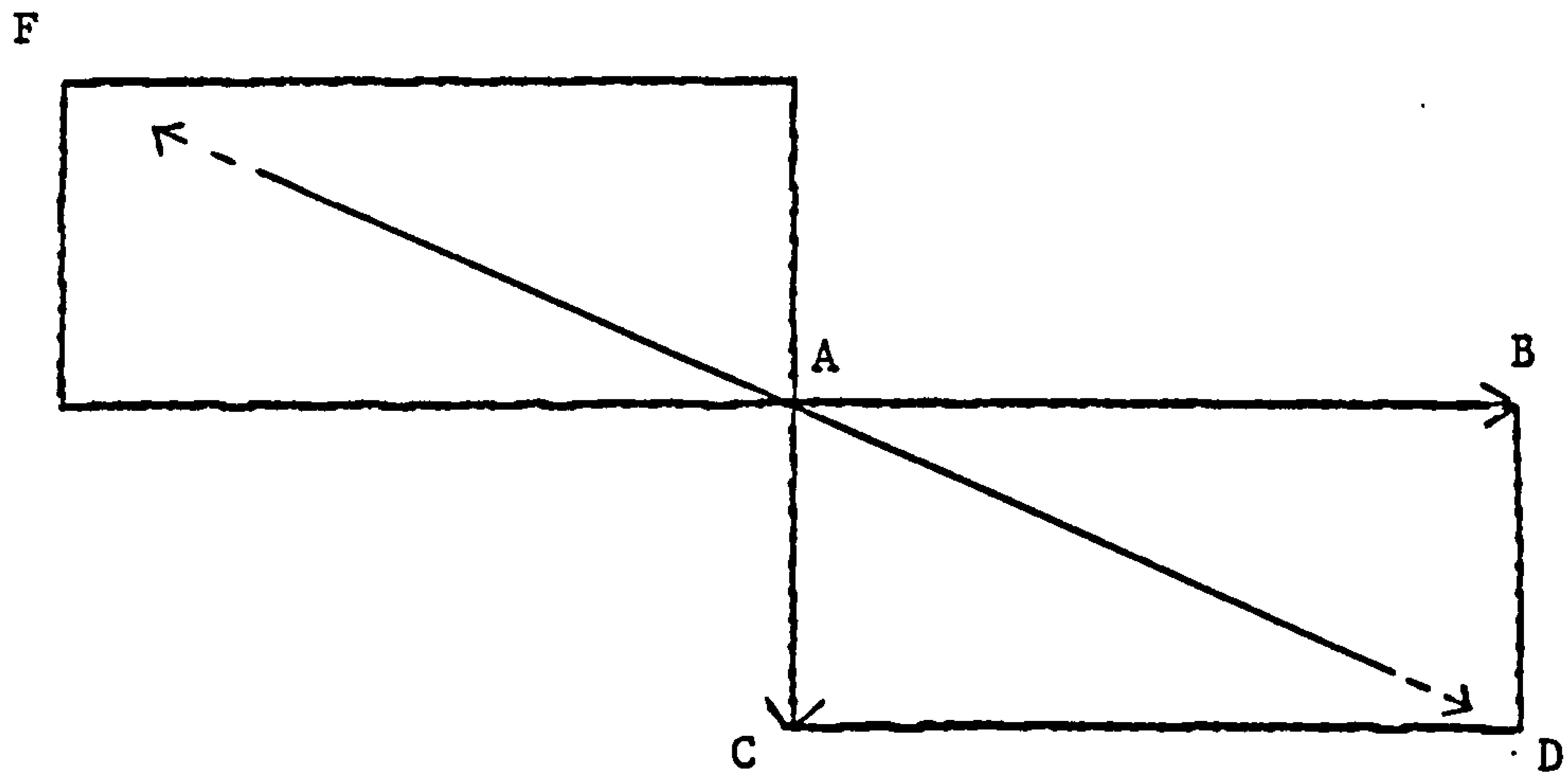
Despite sending his Essay to Priestley and inviting him to reply, Gregory failed to elicit a response from him directly. However it did receive some consideration from other members of Priestley's dissenting circle. In fact, Priestley had passed the job of replying on to Thomas Cooper, who accepted. But all that came of his promised refutation was the following remark:

> The doctrine of necessity has been opposed by Dr Gregory of Edinburgh, but with a weakness of argument, and a petulance of language, that places his work in the lowest rank among the writers who have adopted the same side of the question.[71]

Gregory's work also received short shrift from William Enfield, tutor at the Warrington Academy, who criticised it briefly in The monthly review.[72] However, it was considered in greater detail by Alexander Crombie in his Essay on philosophical necessity, and in the Letters which subsequently passed between Crombie and Gregory. Crombie had been an Aberdeen divinity student, a former pupil of James Beattie, and one-time advocate of the common sense libertarian position. He remained so until reading the writings of Priestley and Hartley. Crombie eventually moved to London and served as an assistant to Theophilus Lindsey, another of Priestley's closest associates.[73] Crombie is a shadowy figure; what further information upon him there exists, can be found in McCosh.[74] Gregory was convinced that Crombie replied to the Essay at Priestley's invitation. He gave his reasons for believing so in the Answer, and these were subsequently disputed by Crombie.[75]

Crombie's first two chapters reiterated the tenets of philosophical necessity, emphasising the constant conjunction of motive and action and quoting Hume's Enquiry VIII. He also made use of Priestley's two rules of philosophising regarding the necessity of causes and similar causes producing similar effects, to argue for "that same necessary conjunction between cause and effect subsist[ing] in the moral and intellectual world, as in the material".[76] Crombie also considered objections to the Hume-Priestley resolution of necessity. He devoted particular attention to Reid's criticisms of Humeian causality and, in keeping with Priestley's use of constant conjunction, he saw Hume's resolution as conducive to religion, rather than contrary as Reid insisted. In the third chapter, "Dr. Gregory's essay in defence of philosophical liberty answered", Crombie put forward his objections to the argument of the Essay.

Crombie devoted many of his criticisms to Gregory's use of the parallelogram of forces applied to a porter given two simultaneous motives to carry a letter in different directions. In order to falsify Gregory's case he sought to find disanalogies between the situation of the porter and the behaviour of a body subject to forces. He argued that Gregory's argument proceeded upon the assumption that the motives for which the porter acted were only indirectly opposed. Crombie maintained that they were directly opposed, and therefore there could be no resultant motive to go in the diagonal AD. Crombie also argued by means of a diagram to show Gregory's presentation was misleading.[77]



If the two motives to go in the directions AB and AC were completely opposed, then there was no motive to go in the diagonal AD. This fallacy in Gregory's treatment was obvious if reapplied to predictions about inert bodies. Given the operation of forces tending to AB and AC, Gregory's position would be analogous to deducing a resultant force tending to AF, instead of AD. Crombie also stated that Gregory ignored what was the most important part of the corollary, because he eliminated the temporal dimension implied in its formulation. Gregory had not specified anything about the time taken to go in the diagonal AD; therefore his application of Newton's corollary was illegitimate.[78]

Crombie was also sceptical of one further aspect of Gregory's treatment of the porter example. Given that it was an absurd deduction for the porter to go in the diagonal, he must go in the direction of either AB or AC. But if he did so, Gregory argued this would mean one motive was separated from its proportionate effect; therefore there was no actual resemblance between the relations of cause and effect in physics and motive and action. Crombie considered that Gregory was mistaken in arguing that "because one motive is overcome by another, the former, therefore, was separated from its effect".[79] This was evident in the analogous behaviour of a loaded balance. If Gregory maintained that by going in the direction AB, the motive for going AC was separated from its effect, as if when one weight preponderated over another in a balance, the lighter weight was separated from its effect. But Crombie pointed out that when fixed weight overcame one lighter in the opposite pan, this result occurred whether or not there was only half, a quarter or three-quarters of its weight in the other pan. The case was identical for motives and actions. Just because the porter went along AD, this did not mean that the other motive to go in AC had no effect. Crombie also drew in a chemical example to make the same point:

> No man will pretend to say, that there is no necessary attraction between an acid and a metal, because there is a stronger attraction between an acid and an alkali.[80]

It was equally absurd then to state that when a motive was overcome by a stronger one, it was not still necessarily connected with the action in question. By disregarding intermediate mental steps between motive and action, Gregory left no role for the mental state which accompanied an action. Crombie argued that this was where to find the effect of the weaker motive. When subject to the counter motive to go in the direction AC, the porter acted with less promptness.Gregory, he argued, confounded action and the desire for which it was done. Because Gregory left the temporal aspect from his account, there was no metric for inclination.

Crombie persisted throughout in this line of argument. He argued that in the case of mechanics, the physical causes operating on body were all external whereas for a man, there was a combination of internal and external causes. Because, in these respective domains, the operating causes were different in kind, one could not reason from one to another. On this basis Crombie rejected Gregory's use of the phrase "inertia of mind" to characterise the necessitarian view-point. Although man acted necessarily, this did not imply he did so mechanically or blindly. The crucial factor to be considered was the person's "state of mind":[81]

> The two physical powers act on a brute material substance, incapable of either perception or volition. The two motives, on the contrary, are addressed to a being, endowed with a capacity, of thinking, judging and willing, and who feels, at the same time, a desire to obtain a proffered good.[82]

When viewed more generally, there is an evident symmetry in the structure of Crombie's and Gregory's exchanges. This revolved around the use of two central analogies, the parallelogram of forces and the behaviour of the loaded balance. Where Gregory made a comparison between the mechanics of matter and the necessitarian "inertia of mind", he used it to re-assert the claims of liberty. As a result, Crombie resisted the analogy and emphasised that this was an inappropriate model to judge human action on the basis of motives. Where Crombie himself used the analogy between the behaviour of a balance and the weighing of motives in men's minds, Gregory strove to refute it. But whereas appeals to the analogy of the balance were a standard resource in necessitarian writings, Gregory's particular adaption of Newton's corollary was unusual.

In his Introduction, Gregory recounted the precise circumstances which led him to consider ways of showing that the relation of motive and action differed from cause and effect in physics. His initial interest was aroused by a passage from Reid's "Intellectual powers". This dealt with necessitarian uses of an analogy which compared the operation of a balance to the behaviour of a mind weighing the motives for an action. The action of the balance according to the distribution of weights in each pan was analogous to the situation of a man weighing the strengths of opposing motives. Both Gregory and Reid shared the view that this analogy was "the most fruitful source of error with regard to the operations of our minds".[83]

In his dispute with Crombie over the balance as a suitable analogy to represent the process of men's minds in making judgements, Gregory wrote:

> The plausible appearance of it will at first be gratifying to those Necessitarians who are unacquainted with real science, which I know well is ... the case with a very large proportion of them.[84]

Gregory argued that the use of the balance to support necessitarian claims was superficial. By failing to take into account the momentum with which the pans moved up or down, they had taken an "inaccurate, partial and false view" of it. The "turn of the balance" was therefore a wholly inappropriate analogue to the operation of the will deciding between relative motives, despite its obvious visual appeal.[85] Gregory stated that "Crombie, Priestley and Co" had overreached themselves by placing too much store in "the ignorance, credibility and cullibility, even of those people for whose edification their Essay seems chiefly intended ... the Dissenters, clergy and laity, disciples and admirers of Dr. Priestley".[86] Gregory was in no doubt why he had been attacked. The dissenters sought to discredit him as:

> The man who had presumptuously shown that their great Apostle in philosophy, as well as in theology, was, in philosophy at least, an arrant mountebank and pretender to science.[87]

By implication Gregory identified 'real science' with the underlying judgements men made about the forces of nature which were formalised and demonstrated mathematically in Newton's corollary. This raises the question of whether Gregory considered natural philosophy to be demonstrable and, if so, in what sense. The significance of Gregory's attitude to the parallelogram of forces in physics and its relationship to his search for the epistemological interiorisation of nature is considered more fully in section five. For now, it is of note that Crombie also found Gregory's views problematic. He repeatedly attacked Gregory's aspirations to demonstration and his particular view of science:

> I will not say, that the Doctor - like the Taylor of Laputa, who when measuring Gulliver for a suit of cloaths, took the gentleman's altitude by the help of a quadrant; or like the Irishman, who went with a candle to a sun dial, to see how the night went - has applied mathematical reasoning to a subject to which it is <u>wholly</u> incongruous, though I think him, in some degree, chargeable with this error; but I scruple not to affirm that the form of mathematical demonstration was never in any instance more shamefully abused and prostituted.[88]

More generally, Crombie remarked that Gregory's mathematical demonstrations were "intended for sage philosophers and mathematicians of this and all future generations". Crombie's own criticisms were "merely for the <u>profanum vulgas</u>, the illiterate herd of common readers".[89] Elsewhere, Crombie referred to "the proud and ostentatious display of mathematical demonstration, the vanity the arrogance and the illiberality" displayed by Gregory's approach.[90] Or again, with heavy irony, "Oh for a ray of your Mathematical Science to illuminate their benighted minds".[91]

4.2 The published "Objections"

Although Gregory received several sets of written criticisms of the Essay, only one writer allowed him to publish them, and then only anonymously. What is known of the circumstances surrounding their publication is discussed in appendix IV. As the contents of the "Objections" are remarkably similar to views expressed by Hutton, who also discussed Gregory's Essay in his Investigation of the principles of knowledge, these are considered together here. Certainly, the textual evidence presented below suggests the "Objections" were probably written by Hutton. However, as I have no independent evidence to confirm this, the matter is by no means certain. Therefore the full text of the "Objections" is provided in appendix V, so that the suggestions made here may be independently assessed, and perhaps corroborated in the future.

A key feature of Gregory's treatment in the Essay was his simplification of the relationship between motives and actions. He eliminated from consideration all intervening mental processes such as deliberating, choosing, willing etc. Gregory considered that necessitarians often had recourse to these private acts of mind in order to bolster their arguments with reference to secret motives or other inaccessible mental operations. Gregory argued it was irrelevant however many mental steps intervened between motives and actions, as long as they made a chain of constantly conjoined causes and effects. Provided necessitarians maintained that motives were irresistible on the basis of the inertia of mind, then the overt act remained the sole consideration and measure of motives. But this reasoning was challenged in the "Objections": Gregory's demonstration was valid only if necessitarians were compelled to concede that every motive

> must have an influence on the understanding, in a manner perfectly similar to that of forces in physics, in order to be entitled to maintain that its operations proceeded by immutable laws; and that the relation of constant conjunction takes place among them, the substance of the argument in the Essay would ... remain solid.[92]

Rather like Crombie, its author maintained that the influence of motives was subject to completely different laws from those found in physics. Nevertheless, necessitarians were still justified in emphasising that these laws were immutable and that the influence of motives on actions was as uniform as the operation of forces in physics. The "Objections" put forward an alternative view of necessity based upon the nature and role of human judgement as an intermediate mental process between motive and action.

All necessitarians endorsed the view that "similar effects will always result from similar causes in the mind".[93] However, the conflicting though not strictly opposing motives applied to the porter bore no analogy to the application of different forces to a body. The author stated that such motives could not be combined to form a judgement because "the intelligence of the mind render[ed] the combination impossible".[94] The porter would always take the greater sum and move in the direction AB. Concerning the effect of the other motive for moving in the direction AC, he commented:

> It had all the effects that by the immutable laws of the understanding it was fitted to have. It was felt, observed, its inferiority to a desire, the gratification of which was incompatible with it perceived, that gratification judged preferable to it accordingly; and it then probably ceased to exist and was forgotten.[95]

This author emphasised that while volition was constantly conjoined with its previous "train of thought", this did not mean that every train of thought was constantly conjoined with a volition. In his view, it was unnecessary to posit a self-governing power to prevent all trains of thought from culminating in their appropriate actions.

The points made in the "Objections" were articulated in terms of the language of constant conjunction. Also, the continued emphasis upon "the laws of the operation of the understanding" and "judgements of the understanding" reveal the author's preoccupation with the same themes discussed by Gregory and his critics generally. But the treatment of them is quite unusual. This was acknowledged by the author himself, who also noted the incommensurabilities of style and language between his views and Gregory's Essay. At some points he even tried to rephrase his own criticisms in conformity with it. For instance, he equated his own phrase "apprehension and desire of attainable good" with Gregory's use of "motive". Like Gregory, he also emphasised that the question of liberty was to be referred to "The nature and operations of the understanding".[96] But his metaphysical technology made use of overtly teleological categories, as his paraphrase for motive might suggest. The interpretation of necessity in terms of men's desire for happiness as the determining factor of judgement suggests a style of Scottish metaphysics found in Monboddo and in the "science of wisdom" put forward by Hutton. In particular, opinions very like those in the "Objections" can be found in Hutton's Investigation of the principles of knowledge. Unlike Monboddo, Hutton also explicitly referred to Gregory's Essay.

In the preface of his book, Hutton emphasised that his concern was with the nature and progress of the human understanding. By revealing the process by which men were "made to know", they achieved the purpose of their existence: happiness and wisdom. The search for the scientific principles of the understanding was possible "only to the enlightened part of mankind" present in every "polished society", and Hutton explicitly identified such men as the audience for his book.[97]

Interestingly, Hutton noted that the role of metaphysics in securing truth, happiness and wisdom for mankind was not shared by even those enlightened thinkers who could engage in it. Hutton held that in order for metaphysics to fulfil its role of guiding men towards wisdom and happiness, it must be capable of discovery. However, he acknowledged that other forms of scientific metaphysics claimed not to discover anything. They contended that only physics produced discoveries; metaphysics dealt with laws of thought already known to men. Hutton cited a passage from Gregory's Essay to illustrate this viewpoint. In fact, Hutton appears to have written the whole preface in contradistinction to Gregorian metaphysics, quoting him at length.[98]

The professed object of Huttonian scientific metaphysics was to display "the various means or conditions of our judgements and to show the evidence and certainty of scientific reasoning".[99] This was a theoretical enterprise which embraced both physical and mental nature. Hutton considered that "the motions or actions of material things" and the "actions or motives of men proceeding upon intellectual and moral principles" were "necessarily related in a general system". This was "devised in wisdom", "founded on benevolence" and, as the effect of a "supreme design", it "proceed[ed] from one cause" and "operat[ed] to one end".[100] The emphasis upon order, necessity, the determination of judgement, the important role of theoretical reasoning and the search for laws of the understanding evident in the Investigation, are all themes of the "Objections". Although Hutton's reference to Gregory in the Investigation may be coincidental, it was also unusual. In the course of his three volumes of over 2,000 total pages, it is rare to find references to anyone other than Locke, Berkeley and Hume.[101] However, the best evidence for Hutton's authorship comes from his own discussion of liberty and necessity in which Gregory again figured prominently.[102]

Hutton regarded the dispute between libertarians and necessitarians as unresolved. It had not been concluded to the degree that "science requir[ed] to command belief". This state of affairs was evident in the recent clashes:

> Such is the case with Dr. Priestley and Dr. Price, who endeavoured to convince each other to no effect. Such is the case with the late David Hume and Dr. Gregory, the most estimable of men, though differing thus in opinion.[103]

A similar orientation is apparent in the closing remarks of the "Objections". The author noted that a just demonstration actually caused belief, as in the paradigm example of a geometrical theorem. Because the critic did not experience any sense of infallible conviction, he suspected some inaccuracies in Gregory's argument.[104] In the Investigation, Hutton argued that Priestley and Gregory had equal claim to bona fides; yet they disagreed. Therefore the whole subject of liberty and necessity had not been "scientifically discussed". Not only was Gregory's claim to demonstration premature; in Hutton's view, it tended to confirm the necessitarian position.

Hutton also re-presented the argument found in the "Objections" about the influence of motives upon judgement prior to resultant actions. These "metaphysical motives"

> are applied to the porter's mind, and they are to have an effect upon his will, through the means also of his

> judgement. His will being thus influenced, he judges again, how far the means are in his power, to attain the end or object of his desire.[105]

Hutton distinguished these "metaphysical motives" from what he called "physical motives". He regarded them as incommensurable such that the latter could not be a test of the former. Indeed, by proposing such an experiment Gregory had begged the question because

> without knowing the rule or order of metaphysical causes and effects, we cannot propose an experiment to try if that order be observed; for nothing can be learned or no reasoning proceed from disorder. But the confessing such an order implies the necessary connection or natural succession, of these things.[106]

In his subsequent chapter "Concerning free will and moral agents", Hutton went on to give a resolution of liberty and necessity very similar to Monboddo's.[107] He distinguished between physical necessity which would obtain if men were wholly determined by sensation, and the necessary determination of the intellect, according to men's ideas. Man's freedom lay in his ability through reason, to choose the good. Therefore:

> A free agent is not a person who governs himself independently of the system of intellectual things in which he is placed; but it is one who, in the progress of his intellect, has obtained the government of his animal affections, so as not to be determined by them in opposition to the dictates of his conscious, that is, of his moral principle.[108]

If men acted in such a fashion, then their actions could be predicted "in like manner as the physical events which proceed[ed] from the inviolable laws of matter". Therefore men were free to judge, but their actions were necessary insofar as wisdom was a science.[109]

From this brief exposition it is quite clear that Hutton's necessitarianism was part of a more general search for the epistemological interiorisation of nature. However, the precise form this took differed appreciably from other accounts of philosophical necessity based upon constant conjunction, which Gregory criticised, despite Hutton's use of the language of necessary connection and constant conjunction popularised by Hume himself. Hutton's necessitarianism was more overtly teleological. The necessary progress of the intellect "from sense to science" was part of God's wisdom. Men's access to the science of wisdom brought them happiness and fulfilment. The order of nature and the order of men's minds were necessarily connected. This manifested itself in the perceived link between the epistemology of natural philosophy and the logic of moral science, between the self sufficient powers of the system of the earth and the equally self-sustaining powers of the intellect.[110]

Gregory persistently claimed that those who dissented from his demonstration misunderstood it. But his subsequent response to the "Objections" indicates an almost total incommensurability of viewpoint over the question of necessity. Gregory's conception of philosophical necessity was founded upon the irresistibility of motives constantly conjoined with actions. He therefore found the formulation put forward in the "Objections" to be a vague, older conception of necessity. This simply asserted that all acts of willing and subsequent actions were caused, and that their causes were to be found in the nature of mind.[111] In his subsequent remarks, Gregory made it clear that the author was attacking a view of liberty which construed the operation of the will as uncaused. However, this was not Gregory's view. He did not claim the will was uncaused, but that it depended upon a "principle of change" dissimilar to physical causes. The model of causation Gregory used to characterise the relation of motive and action was analogous to his earlier treatment of physiological causes. Gregory conceded that physical events were implicated in the operation of the will; but also "something else" was involved which was allied to the vital principle in living bodies.[112] Because of this "something else", Gregory reserved the possibility that the will might act without motives, although he never claimed to prove this in the Essay itself.

The portrayal of the libertarian will as uncaused in the "Objections" was very like views expressed by Kames, Cullen, Hume and Hutton himself.[113] Gregory discussed these accusations much as Reid had done.[114] He argued that men were the cause of their actions, and rather than dispute the necessary consequences of liberty he simply added that he was not "a theologian", and "neither inclined nor qualified to reason about prescience and predestination".[115] By raising such issues, Gregory argued that the "Objections" did not address the central question of the Essay: was the motive of an action in an identical relation to causes and effects in physics?

In his further criticisms, Gregory emphasised the incommensurability of his own position and the viewpoint found in the "Objections". He criticised its language and the use of appeals to consciousness when discussing the relationship between desire, judgement, willing and action. The phenomenology of mind taken for granted in the "Objections" was precisely what Gregory had eliminated from his demonstration in order to bring matters to a decisive test. He repeated that the essence of his position could be:

> ascertained without meddling with the various intermediate steps, or links, of the process of thought, or series of events, between the desire and the ultimate overt act.[116]

This was because if the constant conjunction between motive and action corresponded exactly to physical causation, then however many intermediate mental operations were juxtaposed between them, his own demonstration was still secure.

In conclusion, Gregory rejected the role accorded to human judgement expressed in the "Objections". This emphasised the necessary determination of judgement in every case. Gregory reiterated that in the last act of judgement immediately preceding action, there was an element of willing.[117] Gregory emphasised that his argument revolved on the issue of whether motives were constantly conjoined to actions, not whether desires influenced the will. He argued that if Hume's original position was that actions were determined by "those desires only on the preference of which the understanding has decided",[118] then the dispute between libertarians and necessitarians was absurd. If this was the kind of necessity put forward in the "Objections", then, Gregory argued, it was merely tautologous.[119]

4.3 John Allen's criticisms

At various points in his Essay, Gregory related his view of cause and effect in physics to the discipline of chemistry.[120] He referred to chemical causes as a different "species" of physical causation which demanded some form of independent investigation. However, he stated that both kinds were physical causes dependent upon the constant conjunction of uniform antecedents and consequents. Therefore, in principal, everything known about causation in the laws of mechanics applied to chemical causes as well. The major aim of the Illustrations was to show that Gregory's stipulations about the nature of causal processes in physics were not even applicable to chemistry. In particular, it argued that the simple algebra of constantly conjoined causes and effects Gregory developed in relation to his use of Newton's corollary could not be applied to the combinations of chemical substances according to their affinities. The Illustrations were written by John Allen who received his M.D. at Edinburgh in 1791 and acted as an extra-mural medical lecturer in Edinburgh during the 1790s. As Allen's arguments are quite detailed and technical, it is necessary to return first to some aspects of Gregory's views on causes and effects in physics.

Gregory characterised physical causes as constantly conjoined. In chapter three, it was shown that Gregory drew three implications about this kind of causal relation. Firstly, there were no perceivable necessary connections between physical causes and effects. Secondly, the effects of such causes were constant. Thirdly, that physical causes had no power. In the Essay, Gregory went into greater detail about the second implication of physical causes and effects. He presented his views in the form of simple algebraical formulae, which were then used to state the case against the necessitarians. Gregory's main point was that, because there was a constant conjunction between physical causes and effects, then every variation in the cause necessarily involved a proportional change in the effect. For example, in mechanics, where forces either concurred, opposed or were combined according to the parallelogram of forces, then this was proportionally evidence in their effects. Throughout the Essay Gregory argued that this kind of proportionality was not evident between motives and actions. Therefore this indicated that the relation between them was not a constant conjunction.

As Allen's criticisms were also expressed using Gregory's own symbolism, it is necessary to briefly re-state Gregory's case in these terms:[121]

(1) let X and Y denote physical causes, A and B their respective effects

(2) let the constant conjunction between them be represented by $\equiv$

(3) let the combination of forces neither concurring or directly opposing be represented by $\nwarrow$

(4) it followed that: (a) $X + Y \equiv A + B$ denoted the concurrence of forces

(b) $X - Y \equiv A - B$ denoted the opposition of forces

(c) $X \nwarrow Y \equiv A \nwarrow B$ denoted the combination of forces

(5) if X and Y now denote motives, A and B their respective actions then the argument of the Essay was: if motives and actions were constantly conjoined, as necessitarians maintained they were, then it followed that (4(c)) was true; this was shown to be false in the case of the porter. Therefore motives and action relations were not constantly conjoined.

By substituting various chemical compounds for X and Y, Allen sought to show that all Gregory's formulae representing the logic of causes in physics were "repugnant to everything known in chemistry".[122] For example, Allen said let X stand for the affinity of sulphuric acid and "potasse"; and A represent the effect of that affinity, or "sulphate of potasse". Similarly, let Y and B stand for the affinity of carbonic acid and "potasse", and the "carbonate of potasse" respectively. What then, Allen asked, did the deduction $X \nwarrow Y \equiv A \nwarrow B$ represent, or for that matter, $X - Y \equiv A - B$? All the presence of carbonic acid in the reaction did was render the sulphate more easily decomposed. The implications of these facts for Gregory's claims were apparent:

> Motion is the plain and obvious effect of mechanical force; combination of chemical affinity; A - B is distinguished from A in mechanics by the retardation of the motion; but is the combination less perfect in A - B than in A? Contrary affinities in chemistry are unable to modify the effect of superior affinities;

> they merely facilitate decomposition; Dr. Gregory's formulae are therefore inapplicable, and even unintelligible in that science.[123]

A further attack on Gregory concerned his understanding of constant conjunction itself. Allen argued that Gregory's sense and use of constant conjunction was not in fact Hume's own. Hume's doctrine was that "like objects in like circumstances will produce like effects". In the case of varied circumstances, all Hume argued was that the principle of constant conjunction was then insufficient to determine what would then happen. While it followed that the same causes in the same circumstances produced the same effects, so that if $X \equiv A$ and if $Y \equiv B$, this meant that circumstances being equal, cause X will produce effect A, and likewise for Y and B. However, the consequences deduced by Gregory, $A + B, A - B\ A \nwarrow B$, could not strictly be deduced from constant conjunction because:

> Change the circumstances by introducing X along with Y, and instead of B, the effect may be C or D, or there may be no effect whatever referable to Y ... when a new agent or new circumstance is introduced into the experiment; nothing in that case remaining, but to observe the event.[124]

When this experiment was replicated exactly, the same effects might be expected in the future. This was because like causes produced like effects in the same circumstances. However, Gregory had suppressed that part of Hume's theory of constant conjunction which related to the continued need for more experiment and experience in situations where there were different or changed circumstances. Applied to the issue of Gregory's demonstration, this meant that the combination of motives and actions simply could not be compared to causes and effects because the circumstances were different.

Despite their opposing intellectual loyalties and attitudes to Hume, it is clear that both Allen and Reid repeatedly appealed to the same three criteria in their accounts. These were: the established order and regularity of nature; Hume's theory of constant conjunction; and the legitimate role of experience and experiment in science. However, the differences between them are to be found in the different ways they used these similar resources. Once again, different applications of the concept of constant conjunction were crucial. Whereas Gregory thought the notion of constant conjunction was an unambiguous account of men's perception of physical events, Allen considered it needed more specification in view of men's knowledge of chemical processes. In view of the complexity of reactions between different substances, he argued that the only guide was experience:

> By experiment and observation, we are taught in what combinations of circumstances A is produced; and we expect with confidence, as the result of our uniform experience, that in whatever circumstances A has once been produced, in the same circumstances it will always be produced.[125]

It was this relationship between the necessity of nature and the basis of human experience which Allen commended as the substance of Hume's theory of constant conjunction. He went on to argue that this true Humeian sense of constant conjunction was applicable to the relation of motive and action, and that the human mind "preserv[ed] its analogy to the other works of nature".[126] The pragmatic difference was simply a matter of evidence, in the absence of which the mind was confronted with more apparent irregularities. However, this situation with respect to mind, and analogous to the current state of chemistry, did not lead men to abandon the maxims "That the order of succession of events [was] established on immutable principles",[127] and from "like objects placed in like circumstances, like events may always be expected".[128] Significantly he quoted Hume's remarks in Enquiry 8 that in every part of nature there were hidden causes responsible for the apparent "contrariety of events", rather than "any contingency in the cause[s] " themselves.[129] On this basis, anomalies in the knowledge of mind were equivalent to as yet unexplained processes in sciences such as chemistry.

Allen reiterated that the whole of Hume's argument on cause and effect was founded upon "our experience of the uniformity of human conduct, as evinced by the records of past times, and implied in the daily intercourse of society". This was the only source of our inferences, according to Hume. Allen wrote:

> This is the doctrine of necessity; this is the constant conjunction of cause and effect maintained by Mr. Hume,

> this is the philosophy which has been stigmatised as subversive of moral distinctions, as eradicating the notions of right and wrong from the human breast.'[130]

Therefore, Allen concluded, as this was not the doctrine of constant conjunction actually used in the Essay, then Gregory had not succeeded in refuting Hume's necessitarianism, even though his reasoning was logically unimpeachable.

If these various criticisms are viewed collectively, it is evident that widespread dissent existed about the conditions and constraints of men's judgements about natural and moral events. However both Gregory and his critics were in agreement that the question of liberty and necessity should be resolved scientifically with reference to natural philosophy. Issues about man's moral nature and the nature of the physical world were perceived to be inextricably linked through the central question of the nature and status of men's judgements about causes and effects. Despite their different metaphysical technologies, all the necessitarians considered that the internal order of events in men's minds corresponded, in principle, to the order men perceived in external nature. For men's actions to be accountable, they had to be constantly conjoined to antecedent motives. Hence constant conjunction, as a philosophical metaphor to characterise the condition of men's judgement, was equally applicable to the behaviour of men and matter. However, the way each of Gregory's critics conceived of and applied the notion of constant conjunction differed considerably. Allen, in particular, challenged not only Gregory's attack on the necessitarian use of constant conjunction to characterise the behaviour of men, but also questioned how Gregory conceived it to operate in physics. Allen's criticisms lead back to Gregory's actual use of constant conjunction as an appropriate account of men's judgements about causes and effects in physics. This lay at the basis of his Essay and the Project as a whole. In the final section Gregory's views are reconsidered in relation to the conception of mechanics put forward by John Robison.

5. THE FORCE OF JUDGEMENT AND THE JUDGEMENT OF FORCES: GREGORY, ROBISON AND THE REFORMATION OF MECHANICAL PHILOSOPHY

The significance of Gregory's Essay does not lie solely in his attempt to apply scientific and mathematical reasoning to a moral subject. Instead, his attitudes to evidence and belief, judgement and demonstration express many of the distinctive concerns of later 18th century Scottish scientific metaphysics. These features emerge most clearly in Gregory's discussion of the nature, form and status of Newton's first corollary to the laws of motion. Gregory considered this to be:

> the basis of a vast fabric of the most important physical knowledge which all who inderstand it admit to be as firmly established as the abstract truths of pure geometry.[131]

Aspects of Gregory's moral use of the parallelogram of forces, and the various objections to this by necessitarians, have been considered in previous sections. Here the focus is upon the role Gregory perceived Newton's corollary to play in natural philosophy. Once again, it will be evident that there was no such dividing line between moral and scientific uses. Just as Gregory used Newton's corollary to secure the consent of judgements about liberty and necessity, so, as part of the apparatus of Newton's laws of motion, it could be used by him and John Robison to secure consent in natural philosophy. What was perceived as the basis of this consent and precisely how it was to be demonstrated in men's minds is the subject of this final section.

The precise wording of "Corollary 1" in the Principia was "A body acted on by two forces simultaneously, will describe the diagonal of a parallelogram in the same time as it would describe the sides by those forces separately."[132] As part of his introductory discussion, Gregory discussed the meanings that the key terms "body" and "force" had in physics.[133] Unlike Robison, Gregory did not discuss the nature and significance of Boscovich's point atomism in any detail.[134] Nor did he capitalise on the potential religious uses which can be found in Stewart's work.[135] Yet his brief discussion of ideas about body was clearly informed by such considerations.

He noted that, for all men knew, body might actually be reducible to "a mere atom or an indivisible moveable point", without figure, extension, solidity or divisibility.[136] However, as long as body was subject to inertia and lacked self-activity, then all Newton's deductions about the behaviour of bodies were still valid. If on the other hand, body was "capable of moving itself", then Newton's corollary became inapplicable, just as it was to predice the behaviour of the porter.[137]

This was one of the rare instances in the Project that Gregory actually discussed the nature of substance, and when he did so, he was prepared to concede that many of the accepted common sense properties of body might actually be illusory. In fact, Gregory considered it a particular merit of his scientific metaphysics that it made no such appeals to men's introspective experience of the nature of body. Instead, he concentrated upon the epistemological conditions which underlay men's conception of change in nature. Thus the notion of inertia and the passivity of matter were transposed into an account of the status of cause and effect relations in men's minds, and their "correct" expression in language. Because Gregory was insistent upon the necessary force of men's judgements about cause and effect in physics, he was relatively unconcerned with the nature of substance, provided body did not actually become an agent in its own right.

After clarifying his attitude to the notion of body, Gregory moved on to consider "force", the other key term of Newton's physics. He noted some ambiguity in its usage. Force sometimes meant the supposed causes of motion as well as the stricter and more correct sense of denoting merely "certain tendencies to move". However, this ambiguity was unimportant, so long as causes were always constantly conjoined to their effects:

> The nature of these causes Newton did not specify, and in the Principia he frequently warns us that he did not know it: nor indeed was it of any consequence to him, in his mode of reasoning, of what nature the causes of motion were, provided only they were constantly conjoined with their effects.[138]

Gregory generally preferred not to use the language of force. Like the term "law", which he largely restricted to laws of the operation of the mind, it had connotations of the kind of voluntarism Gregory sought to avoid. Gregory preferred to express the principles of mechanics in terms of the vocabulary of causality. For Gregory, Newton's corollary actually rested upon the perceived constant conjunction of causes and effects. But also, constant conjunction was itself intimately connected to the notion of the inertia of body. The family resemblance which Gregory perceived to exist between these concepts is evident. Gregory wrote that the inability of body to move itself was

> virtually implied in the first law of motion; and both the constant conjunction of cause and effect, and the inability of a body to move itself, are implied in the common notions of cause and body.[139]

Gregory argued that the inertness of body based upon constantly conjoined causes and effects constituted the demonstrative basis for Newton's corollary. This was not immediately apparent in the Principia because Newton had simply assumed and not stated such "self-evident necessary truths", "axioms" and "ultimate physical facts" in his exposition. In his own discussion, Gregory considered he had supplied these missing assumptions. These, in conjunction with others, such as a body must exist in some place, and not in two places at once, completed Newton's inadequate proof:

> I hope I shall not be accused of arrogance when I say that I conceive this little commentary to be a demonstration of [Newton's] first corollary.[140]

Arrogance it certainly was; but it was also something more. Gregory's reformulation of Newton's own demonstration reflects many of the distinctive concerns of later 18th-century Scottish scientific metaphysics. In the search for epistemological interiorisation, Gregory's metaphysics utilised the rhetoric of empiricism and instrumentalism. He repeatedly appealed to "patient impartial observation" and "cautious induction", etc. He claimed to emulate the "plain mirror" of Bacon's philosophy,[141] and so deliver metaphysics from the hands of necessitarians whose analogies of mind and physical nature distorted both the site of power in nature and the active nature of men's minds. The function of the "plain mirror" of Gregorian metaphysics was epistemological. It served to "distinctly reflect to man the features of his mind".[142] Thus despite Gregory's profession of empiricism, the reference of his discussion of Newton's corollary shifted away from external nature and became "interiorised" within men's minds. He sought to uncover and demonstrate the necessary ground for men's belief in nature. Or as Gregory put it:

> the question is not whether body can act, either where it is, or where it is not; but simply whether it be consistent with the laws of human thought to believe, that such relations may subsist among bodies.[143]

Gregory's Essay dealt with physical causation in the external world. But he made it quite clear that his demonstration was not based upon the order of nature. Instead it depended upon the necessary order of men's minds, according to which they must hold certain beliefs. Therefore his demonstration relied less upon laws of physical nature and more upon laws of human thought, expressed as first principles to which all reasonable men must consent. Gregory's search for the compelling grounds of human belief about causality expressed in terms of deductions from self-evident axiomatic truths dominated the concerns of the Project, notwithstanding the apparent counter-claims of Gregory's rhetoric which emphasised observation, fact and induction. Despite his defence of the freedom of men's will, Gregory remained committed to the necessary status of men's beliefs about nature. Like the necessitarians Gregory opposed, he considered that the force of human judgement was inevitable and compelling. In physics, this rested ultimately upon men's perception of the constant conjunction between physical events.

How are we to assess the importance of Gregory's interpretation of Newton's corollary and his resolution of the judgmental basis of mechanics in later 18th century Scottish scientific metaphysics? Part of the difficulty here lies in the incomplete nature of Gregory's Project. He claimed to discuss cause and effect in physics; but it has been shown earlier that Gregory's views on mechanics have to be "extracted" from his essays. This is because he did not actually consider physical causation in its own right. Rather, the characteristic features of his concept of causality in physics have to be recovered by a careful interpretation of statements found throughout the Project. This has been done here in terms of Gregory's search for the epistemological interiorisation of nature. Gregory's discussion on Newton's corollary is the final part of his Project to be viewed in this way. However, once again, despite the fact that all Gregory's essays dealt with cause and effect in physics, his statements about natural philosophy were usually oblique and ostensive, rather than concrete and factual. Nevertheless, the significant point is that Gregory modelled his approach on a form of reasoning he considered to be appropriate to natural philosophy. For Gregory, demonstrative proof was "the highest kind of evidence that human reason has yet discovered or can conceive".[144] As part of his justification of the approach followed in the Essay he wrote that "nearest of all to his situation was that of the geometer and the mechanical philosopher."[145] In view of 17th century uses of the term "mechanical philosopher", Gregory's comparison is very puzzling. Precisely why Gregory should view natural philosophy as demonstrative and certain rather than empirical and probable can be appreciated by considering the views of John Robison, Professor of Natural Philosophy at Edinburgh from 1774 to 1805.

Before Robison took up his appointment at Edinburgh, he had a varied scientific career which variously combined academic posts and widespread travel on the Continent as an adviser. He served as general secretary to the Royal Society of Edinburgh from its foundation in 1783 until his death in 1805. During this time, Robison was highly respected by other members of the Scottish scientific community.[146] As well as editing Black's Lectures on the elements of chemistry,[147] he produced several influential textbooks and wrote a number of scientific articles for the third edition of the Encyclopaedia Britannica. It has been argued that his views on the nature of force were crucial to the emergence of physics on 19th century Britain,[148] and that his influence is particularly noticeable in the writings of John Playfair, William Thomson and William Rankine.[149] Despite Robison's status as arguably the most important 18th century Scottish scientist, he has received relatively little consideration from modern scholarship.[150] However, his more polemical Proofs of a conspiracy has received attention.[151]

At various points in the Project, Gregory referred to Robison in a manner which suggests considerable familiarity with the latter's views. Gregory consulted Robison on the structure of Slavonic transitive verbs.[152] However, in Activity 2, Gregory actually quoted Robison who confirmed that there were rules of Slavonic and Russian syntax for denoting activity and physical causation separately by the use of an associated preposition in the former but not the latter case. This extended the generality of Gregory's own argument about the syntax of active and passive verbs in Latin. Gregory acknowledged his debt to Robison and commented that Robison did him

> the favour to revise several of these disquisitions, and who I find had anticipated me in many of my reflections and reasonings on this subject.[153]

Robison's concern with the structure of language as part of a metaphysical technology to maintain the passivity of matter is certainly evident in his published works. Three examples given below are chosen for their obvious resemblance to statements made by Gregory in the Project.

> The relation of physical cause to effect is expressed metaphorically in the words which belong properly to the relation of agent and action ... But the language and even the actions of all men show that they have a notion of the relation of an agent to the action, easily distinguished because all distinguish it from the relation between the physical cause and its effects.[154]

> Language is the expression of thought and every word expresses some notion or conception of the mind; therefore it must be allowed that we have such notions as are expressed by cause, power, energy.[155]

> The term action is frequently used in natural philosophy with great ambiguity. The only meaning which we can affix to it, without the risk of being led into mistakes, is the effect which is produced.[156]

The use of very similar terminology here suggests a continuity between the concerns of the Project and Robison's work. This is particularly apparent in Robison's development of a theory of force, according to which he articulated the principles of dynamics as part of a reformed system of "mechanical philosophy".[157]

Robison defined mechanical philosophy as

> the study of the mechanical appearances of the universe in order to discover their causes, to explain subordinate appearances and to improve art.[158]

Throughout his writings, Robison placed great emphasis on the general doctrines of dynamics as the core of mechanical philosophy. Although he discussed the notion of matter, his emphasis was consistently on motion and "moving forces". Thus, "mechanical appearances" were those changes of motion of which men were sensible; "mechanical forces" were the causes men ascribed to them. The latter constituted events which could be considered attributes of matter:

> A particle of matter under the influence of a moving force is the object of purely mechanical contemplation, and the consideration of the changes of motion which result from its condition as thus described may be called the mechanism of the phenomenon.[159]

In fact, Robison's basic model of moving forces was thoroughly relational. Given a sensible change of motion associated with one body which was constantly conjoined to the situation and distance of another body, then these "mechanical relations" were considered to be "mechanical affections" of the two bodies in question.[160] Here Robison was particularly sensitive to ambiguities of language and remained circumspect and cautious in his descriptions. He continually made use of locutions such as "is said to", "is called", "is conceived", etc. However, what were actually only the "mechanical relations" of "mechanical appearances", men spoke of as the real affections of matter and bodies composed of matter:

> These affections of matter are frequently terms powers, forces, an account of a resemblance of the phenomena which we consider as their effects, to the phenomena which are consequent on animal exertions.[161]

In a manner very similar to Gregory's <u>Project</u>, Robison criticised this language and confirmed that action was a term correctly predicated of active beings only.[162] Both men used the same examples of "magnetism" and "gravity" to state that these terms expressed relations not inherent properties.[163] The difference between them was that Gregory only used the term "force" in his technical discussions such as the status of Newton's corollary. There he was critical of misuses of this term as a further instance of the metaphorical usage of active verbs in philosophy. Therefore Gregory sought to adapt the vocabulary of causes, preferring the rather cumbersome phrase "the relation of cause and effect in physics". Robison discussed technical issues in mechanics throughout his works. He retained the language of force for the pragmatic reason that it was current usage in dynamics. But he also reformulated its meaning and recast it as the central concept of mechanical philosophy. Hence: "the term 'force' in all [Robison's] comparisons mean[t] nothing but some or any qualities that are proportional to observed phenomena".[164] It is evident then, that although the linguistic site of application was somewhat different in Robison and Gregory, the kind of conceptual work each did was very similar. This is further apparent in Robison's own discussions of the nature of causality and the conditions of human judgements about forces in nature.

It has been shown that Robison's conception of mechanical philosophy emphasised the role of "sensible motions", and "mechanical appearances". However, a fundamental question remains. How did Robison make the step from men's perception of sensible motions to the accreditation of the underlying causes to which they referred? This was an issue which was relevant to all the topics Robison treated as parts of mechanical philosophy. But it can be illustrated here with reference to his own views on Newton's corollary. Like Gregory, Robison attached great importance to it. He spoke of it as "a fundamental elementary proposition of continual and indispensible use in all mechanical enquiries".[165] Yet despite its importance, Robison also noted that following later 18th century dissatisfaction with the proof offered by Newton, there had been several other equally unsatisfactory attempts.[166] The precise details of his own proposed solution are of less importance than his diagnosis of the underlying metaphysical problem and how this was to be solved.[167]

In Robison's view, all these difficulties had arisen because of a general failure to distinguish between the composition of motions and the composition of forces, and the appropriate kind of evidence and proof for each.[168] The former of these received countless empirical confirmations in everyday life. A suitable example was the resultant motion when a man walked on an ice floe which was moving in another direction. However these were not actually illustrations of combining forces, or what Robison called "determinations to motion". These examples "serve[d] very well to exhibit to the mind the mathematical composition of two motions" which was certain and demonstrable.[169] But this was quite different from the "physical question" of whether:

> two natural powers, which are known to be productive separately, of two determinations of a body to two distinct motions, will, by their joint action, produce a determination to that motion which is compounded of those which they would produce separately.[170]

In this case, Robison stated that men did not see clearly that two forces which separately produced motions with directions and velocities expressed by the sides of a parallelogram, would jointly produce motion in the diagonal.[171] However, men could be confident that there was a perfect agreement between the composition of motions and forces. We are, he wrote

> led by an instinctive principle of our mind to confer every change which we observe to happen in the state of things as an effect, indicating the existence, characterising the kind, and determining the degree of its cause.[172]

As in Gregory, the issue turned upon the necessary force of men's judgement. In Robison, this was not restricted to Newton's corollary. It constituted the general basis upon which men made judgements about all forces in nature. Discussing the laws of motion, Robison wrote:

> Such being our notions of motion, and of the causes of its production and changes, there are certain results, which, by the constitution of our minds, necessarily arise from the relations of these ideas. These are laws of human judgement, independent of all experience of external nature, just as it results from the laws of judgement that the three angles of a right lined triangle are equal to two right angles, although there should not be a triangle in the universe.[173]

This viewpoint was also enshrined in Robison's conception of dynamics which formed the core of mechanical philosophy. It was

> that department of physico-mathematical science which contains the abstract doctrines of moving forces; that is, the necessary results of the relations of our thoughts concerning motion and the causes of its production and change.[174]

For Robison, the abstract doctrines of mechanical philosophy were "in reality, descriptions, not of external nature, but of the proceedings of the human mind in contemplating or studying it".[175] All Robison's remarks considered here indicate that his conception of dynamics was itself interiorised and ultimately referable to the conditions under which men made causal judgements. Therefore, it was also demonstrable on the basis of the necessary relations between men's ideas. So construed, the tautologous laws of dynamics were the necessary connections of ideas about motion which men displayed in demonstration and to which they must consent. In Robison, as much as in Gregory, the twin themes of the force of judgement and the judgement of forces were inextricably intertwined.

The exposition of Robison's views has so far been largely drawn from his textbooks. On this basis, it has been argued that Robison and Gregory held similar views on the use of language, on relational concepts of causality and force, and most importantly on the demonstrative role of mechanical philosophy or physics. In Robison's <u>Encyclopaedia Britannica</u> articles, the connections with issues raised in Gregory's <u>Project</u> are yet more apparent. These concern Robison's attitudes to efficient causality and the relationship to the paired concepts of constant conjunction and necessary connection.

Like Hume, Reid and Gregory, Robison consistently emphasised men's nescience about necessary connection, power or efficient causality in the material world:

> the principle which connects the pairs of concomitant events, rendering the one the inseparable companion of the other, is totally unknown to us, because it is not the immediate object of our perception.[176]

Yet by "the constitution of the human mind", men had a feeling of expectation that the course of nature would remain constant. However, Robison argued that such feelings were "accompanied by an instinctive reference of them to something distinct from the feelings themselves". He added:

> In precisely the same manner, the irresistible connection of ideas is interpreted as the sensation or sign of a <u>necessary connection</u> of external things or events. These we supposed

> to include something in their nature which renders them inseparable companions. To this bond of connection between external things we give the name causation. All our knowledge of this relation of cause and effect is the knowledge of what passes in our own minds during the contemplation of the phenomena of nature.[177]

In his article, Robison followed this remark with a criticism of Hume. He stated that Hume's account of necessary connection in terms of the customary transition of the imagination was false, and attacked it along with former accounts which stressed pre-established harmony or the constant supervision of the deity.[178] However, Hume was cited in support of the position that the perception of necessary connection in nature is an instinctive first principle.[179] In his Lecture notes, Robison seems to have considered Hume and Reid as joint exponents of this viewpoint.[180] However, just as he was critical of Hume for actually assimilating necessary connection to custom, Robison appears to have also resisted attempts to associate it with the constant supervision of the deity, and for which Gregory criticised Reid. He wrote that any further attempts to investigate the necessary connections of phenomena were "precisely the same absurdity or inconguity as to propose to examine light with a microscope".[181] Robison's relationship to both Reid and Hume requires careful discussion beyond the scope of the Robison-Gregory comparison undertaken here. However, Robison's various remarks on the origins of force throughout his writings indicate that, like Gregory, Robison was reluctant to relate force to the experience of human willing, or to the operation of mind generally.

The basis for Robison's search for the epistemological interiorisation of nature lay ultimately in men's feelings. These included the sense of an external world to which men's sensations referred; a feeling of expectation that the course of nature would remain constant and, crucially, a feeling that sensible motions themselves referred to underlying causes and powers which produced them. Such feelings were the result of "first principles" or instincts implanted in men's minds by God. Further analysis was impossible because it presupposed these very principles in operation. However, in the few instances where Robison mentioned men's feeling of exertion or resistance as a perception of force, he remained suspicious about it.

Whereas Reid could assert that without the feeling of exertion, men would only perceive constant conjunctions, Robison underplayed the importance of men's volitional access to power. This is particuarly evident in his accounts of resistance,[182] and men's feeling of the heaviness of bodies:

> The feeling of pressure which a heavy body excites might be considered as its characteristic phenomenon; for it is this feeling that makes us think it a force - we must oppose our force to it; but we cannot distinguish it from the feeling of any other equal pressure. It is most distinguishable as the cause of motion, as a moving or accellerating force. In short, we know nothing of gravity but the phenomenon, which we consider, not as gravity, but as its indication. It is like every other force - an unknown quality.[183]

Robison generally resisted analogies with human effort and volition in mechanical philosophy. They led to artificial and misleading divisions of force into attractive, repulsive, pressure and impulse "on account of the resemblance between the phenomena and those which we observe when we pull a thing towards us, push it from us, kick it away, or forcibly compress it".[184] At best, these were only "abbreviated descriptions or hints of the phenomena".[185] Robison did not explicitly equate this position with Reid, as Gregory had done. But Robison's perception of the opponents of mechanical philosophy certainly included one sect of philosophers who equated force with motion produced by mind alone. Their position was to be opposed, just as the position of materialists and necessitarians was also to be challenged:

> What these authors have been pleased to call mind, the whole world besides have called by another name FORCE, which, though borrowed from our exertions, is yet sufficiently distinctive, and never leads us to confound things that are different, except in the language of some modern philosophers, who apply it to the laws of the agency of mind; and when speaking of the force of motives, &c. commit the same mistakes which the followers of Aristotle commit in the use of the term 'mind'. Force in the language of these philosophers, means what connects the operations of mind; as mind in the language of Lord Monboddo, is that which connects the operations of body.[186]

Robison contended for a middle-ground occupied by mechanical philosophy, poised between two ontological sitings of force. Those who equated force with mind, and those who equated it with an inherent power of matter were both to be criticised. This corresponded very closely to Gregory's objections to necessitarian and voluntarist accounts of natural philosophy and physiology. Despite differences in terminology concerning "force" and "the relation of cause and effect in physics", Gregory and Robison shared similar views on causality in physics. Both employed a linguistic technology to maintain the passivity of matter. Both emphasised relations and events. Both employed notions of judgements about the physical world based upon instinctive first principles and necessary deductions from them. Each man developed views using a conceptual vocabulary derived from the epistemological writings of Hume and Reid. Finally, both perceived a similar role for a reformed "physics" or "mechanical philosophy", poised between what they saw as an extreme voluntarism of mind, and a form of necessitarianism which equated the behaviour of men with the behaviour of matter. Yet it is also evident that Gregory and Robison considered that men's judgements about nature were the necessary outcomes of their constitution based upon instinctive first principles. Men's conclusions about forces, or causes and effects in physics, were the necessary results of the force of men's judgement. Men could not judge otherwise than their common sense dictated. Therefore, despite the fact that the correspondence between human judgement and the external world could not be known independently of men's constitutional predispositions, men's judgements were nevertheless necessary and demonstrable. Having eliminated necessary connection from external nature, Robison and Gregory relocated it in men's minds. With this shift, the epistemological interiorisation of mechanics was secured and the limits of human understanding were transformed into certainty and demonstration.

6. CONCLUSION

In this chapter, Gregory's Essay has been discussed from several points of view. Fristly, it was situated with reference to necessitarian accounts of the relationship between motives and action. It was shown how Gregory perceived his work to be a demonstrative refutation of the kind of necessitarianism put forward by Hume and Priestley, based upon the analogy between constantly conjoined motives and actions and causes and effects in physics. Secondly, three replies to Gregory were considered in order to show that the central issue between Gregory and his critics concerned the nature and process of human judgements about cases and effects. All participants agreed that a truly scientific account of the problem of liberty and necessity was to be referred to the order of men's minds. Also, it is apparent that the same criteria were to be appealed to in understanding the natural world generally. Finally, the theme of epistemological interiorisation, or the search for the conditions of human judgements about causes and effects in physics, was discussed in relation to John Robison. It was shown that Robison and Gregory had similar conceptions of physics, in which the truths of mechanics were to be situated in relation to the nature of human understanding. They argued that men's nescience precluded knowledge of necessary connections in external nature. But men recovered necessary connections in their minds based upon the instinctive principles of their constitution and expressed as self-evident necessary truths felt by all men. Because human judgement and belief were the inevitable consequence of the evidence of men's senses, both Gregory and Robison regarded the truths of natural philosophy to be demonstratively true, in spite of their problematic reference to the external world. The underlying theme of Gregory's Project was his conception of the involuntary relationship between evidence and belief.

In keeping with his emphasis upon relations of event, Gregory considered evidence and belief as a particular relation among several others which had to be carefully distinguished and classified:

> With respect to this relation, we certainly have no choice, liberty or self-governing power: the force or influence of evidence is absolute and irresistible, and our belief is completely determined by it.[187]

However, men's beliefs were determined according to certain kinds of evidence, not all of which were constantly conjoined. But unlike the separable relationship between belief and the evidence of consciousness, the evidence appropriate to natural philosophy was unimpeachable. Thus

> the intuitive evidence of an axiom, and the distinct conclusive evidence of demonstration, produce firm and perfect belief, not to be shaken, nor confirmed, nor in any way modified, by the evidence of experiment, or of induction, or sensation, or of testimony. As little can demonstration be offered as evidence, in opposition to experiment, or sensation, or consciousness with respect to any matter of fact.[188]

For Gregory, the problem of experiment and induction was that men experienced degrees of certitude because of inevitable inconsistencies in evidence about matters of fact. Especially in cases where testimony was central, men

> experience irresistibly the various degrees and states of probability, conviction or doubt, according to the nature, the amount, the concurrence, the combination or the opposition, of evidence before us.[189]

Gregory's conception of physics or mechanical philosophy was framed in terms of instinctive axiomatic beliefs from which necessary inferences could be made in the manner of mathematical demonstration. Men failed to agree in natural philosophy, not because their underlying common notions were heterogeneous, but because of sectarianism and extraneous misunderstandings about analogies and language, and erroneous appeals to men's consciousness. Gregorian scientific metaphysics was in effect a nosology of these infirmities of human understanding focused upon the problem of causality, where their effects were most apparent and damaging.

The persistent problems of locating the site of power in nature and justifying how the order of nature could be known in men's minds preoccupied Scottish scientific metaphysicians generally in this period. Gregory's concern with the nature of causality is indicative of the first of these issues. However, his joint involvement with metaphysics and physiology also expressed a prominent aspect of the search for the order of nature. If men could display the nature and processes of human judgement, and thereby uncover the basis for reasoning, both metaphysics and natural philosophy would be reformed. Then truths about men, nature and God would receive universal assent. Men would be united in the future pursuit of knowledge. Despite differences between Scottish scientific metaphysicians over what was to count as human nature, and whether judgement itself depended upon instinctive first principles or the experienced association of ideas, or even transcendental ideas, they all subscribed to Reid's imminent vision of the "third organon" of human reasoning.[190]

If Gregory's writings as a whole are viewed from this perspective, the central themes of linguistic evidence, the nature of demonstration and the role of human judgement are all indications of the pervasive interaction between natural knowledge and metaphysics during the period as a whole. But the simplest and best illustration of his concern with epistemological interiorisation can be found in Gregory's persistent emphasis upon the analysis of relations. Perhaps this is where the fundamental characteristic of the "Scotch intellect" is to be found. George Davie has pointed to the abstractionist legacy of 18th century Scottish thought, in which an intellectual-classical approach was reflected in the emphasis upon mental acts of comparison which gave men sound knowledge. In the important instance of mathematical knowledge, McLaurin defended geometry from the sceptical attacks of Berkeley and Hume.[191] He emphasised that men might demonstrate relations between things, even though things themselves were doubtful and unknown. Hence a rapprochement between the competing claims of nescience and knowledge, constant conjunction and necessary connection might be achieved by relocating certainty in the nature of men's minds. This thesis deals with one man's attempt to demonstrate the certainty of a particular relation which men could know by an act of mind: the relation of cause and effect in physics. Gregory's search for the epistemological interiorisation of nature culminated in the identification of a fundamental act of human judgement regarding the physical world.

However, Gregory's emphasis on the necessary conditions of men's perception of causes and effects as the means of securing consent in natural philosophy had problematic consequences. So formulated, mechanical philosophy virtually became a certain, a priori science, independent of observation and experiment and interiorised in relation to men's minds. Faced with alternative resolutions of the status of natural philosophy by those he perceived as sceptics, materialists and spiritualists, Gregory sought a form of 'constitutional' certainty for the relation of cause and effect in men's minds. But once interiorised, the problem of "exteriorisation", or the correspondence between the contents of men's minds and the order of nature, re-emerged more dramatically. Once the relation of physical causation had been delineated, the second stage of the Project was to assess whether it was "just and rational" by comparing it with relations of event in nature itself. Yet this was the blind spot of the whole enterprise. At best, the problem of correspondence could only be resolved on traditional common sense grounds, where God underwrote the connection between external nature and men's minds as the common author of both. Thus in spite of Gregory's defence of human liberty, he endorsed the viewpoint that men's judgements were necessarily determined by constitutional first principles which were indefeasible. But this remained the case whether or not there was a real world to which men's judgements actually referred. Therefore, like so many of his fellow 18th century Scottish scientific metaphysicians, Gregory located the order of nature and the site of the power in the same place: both ultimately lay within men's minds.

REFERENCES TO CHAPTER 6

1. Samuel Clarke, A demonstration of the being and attributes of God ... (London 1705); A discourse concerning the unchangeable obligations of natural religion ... (London, 1706); and, of course, the classic statements about liberty in the Clarke-Leibniz exchanges. Reid's position is best illustrated in the "Active powers", Works, 511-670. No attempt is made here to enter into the Calvinist, Socinian and Arminian aspects of the liberty and necessity debate. These lie beyond the scope of this account. However, for a contemporary introduction to the complex theological issues at stake, see George Hill, Lectures in divinity, 6th ed. (Edinburgh and London, 1854), especially Book 4 "Opinions concerning the nature, the extent and the application of the remedy brought by the gospel", chapters 7-11.

2. Newton, Principia, 14. " A body, acted on by two forces simultaneously, will describe the diagonal of a parallelogram in the same time as it would describe the sides by those forces separately."

3. It is tempting to characterise the necessitarian position as one which asserted the passivity of mind. However, while this is often used by opponents of necessitarianism as an imputation of their position, it was rejected by some necessitarians such as Alexander Crombie (see ref. 74). Rather it was a different conception of men's activity asserted by necessitarians in contrast to the kind of activity they perceived advocates of liberty to be proposing.

4. For brief details on William Dudgeon (1706(?)-43) see James McCosh, The Scottish philosophy (London, 1875), 111-13. Also The philosophical works of Mr. William Dudgeon (Edinburgh, 1765). Dudgeon wrote a pamphlet called The state of the moral world ... in 1732. This was replied to by Andrew Baxter in Some reflections on the state of the moral world ... There were also subsequent exchanges between them. When it is considered that Dudgeon lived close to Hume in Berwickshire and that Kames also corresponded with Baxter (See Abercairny collection, Scottish Register Office, Register House GD 24/1, Bundle 547), it is clear there is an interesting pre-1750 context of debate in Scotland which merits closer attention.

5. Nicholas Phillipson, "Towards a definition of the Scottish Enlightenment", in Paul Fritz and David Williams, eds., City and Society in the eighteenth century (Toronto, 1973), 125-48.

6. A useful contemporary summary of Kames's position may be found in the article "Metaphysics", Encyclopaedia Britannica, 3rd ed., 18 vols. (Edinburgh, 1797), vol. 11, 480-609, on 594-95.

7. Certainly, all three were frequently perceived to be articulating the same form of necessitarianism. For example see ibid., 594-96.

8. See also Hume, Treatise, 399-407 for his earlier treatment of liberty and necessity.

9. For details of the overlap between Reid's books and the Project, see appendix III.

10. Joseph Priestley, An examination of Reid, Beattie and Oswald (London, 1774), 5. For other accounts of Priestley's criticisms see J.G. McEvoy and J.E. McGuire, "God and nature: Priestley's way of rational dissent", Historical studies in the physical sciences, 6 (1975), 325-404, on 357-61, 374-78; J.G. McEvoy, "Joseph Priestley, aerial philosopher": metaphysics and methodology in Priestley's chemical thought, from 1772 to 1781", Part 1, Ambix, 25 (1978), 1-55; Part 2, 93-116; Part 3, 153-75; Part 4 (1979), 16-38; George Davie, "The social significance of the Scottish philosophy of common sense", The Dow lecture (Edinburgh, 1973).

11. Ibid., 45-46.

12. Ibid., 6.

13. Ibid., 47.

14. Ibid., 19.

15. Ibid., 23-24 and 9-18, where Priestley gave a list of the various instinctive principles Reid put forward in the "Inquiry".

16. Ibid., liii.

17. Ibid., 62.

18. Ibid., 5-6. This raises the complex question of Priestley's relationship to Hume and, indeed, the precise nature of the ontological necessary connections Priestley referred to. McEvoy and McGuire (ref. 10) have discussed Priestley's theory of matter in detail. The point here is that both the Examination and Philosophical necessity stand independently of the views Priestley later developed in his Disquisitions relating to matter and spirit, 2 vols. (London, 1777). At the same time, Priestley's use of the rules of causal reasoning were at the forefront of his account of reasoning (See ibid., vol. 1, sections 1 and 2, passim.). Priestley's relationship to Hume is also very difficult to assess in view of Priestley's 'conversion' to materialism. Despite Priestley's various attacks on Hume over both natural religion and the association of ideas, Priestley's uses of the constant conjunction theory of causality in his writings prior to the Disquisitions, and perhaps even there, were broadly consonant with Hume's naturalistic emphasis. See also R.H. Popkin, "Joseph Priestley's criticisms of David Hume's philosophy", Journal of the history of philosophy, 15 (1977), 437-47.

19. Ibid., 87.

20. See Joseph Priestley, ed., Hartley's theory of the human mind, 2nd ed. (London, 1790); (first published 1776).

21. Priestley, An examination, (ref. 10), 101 and "Appendix".

22. Ibid., xv.

23. Ibid., 45-46.

24. See Joseph Priestley, Institutes of natural and revealed religion, 2nd ed., 2 vols. (Birmingham, 1782). Also his Letters to a philosophical unbeliever, 2nd ed. (Birmingham, 1787).

25. Priestley, Philosophical unbeliever (ref. 24), letters 2, 4 and 5, passim.

26. Priestley, An examination (ref. 10), "Introductory observations on the nature of judgement and reasoning", xliv-lxi.

27. See also Philosophical unbeliever (ref. 24), letter 1 "Of the nature of evidence", passim. See also the discussion of Priestley's news in John G. McEvoy, "Electricity, knowledge, and the nature of progress in Priestley's thought", The British journal for the history of science, 12 (1979), 1-30.

28. Joseph Priestley, The doctrines of philosophical necessity illustrated. Being an appendix to the Disquisitions relating to matter and spirit (London, 1777), 11.

29. Ibid.

30. Ibid., 31.

31. See ibid., section 5, "Of the supposed consciousness of liberty, and the use of the term agent".

32. For details see A. Holt, A life of Joseph Priestley (London, 1938), 1-48; F.W. Gibbs, Joseph Priestley: adventurer in science and champion of truth (London, 1965), 1-25.

33. Priestley certainly showed considerable familiarity with Scottish writers such as Baxter, Hutcheson, Kames, Hume and Smith. For example see his remarks on Hume in A course of lectures on oratory and criticism (London, 1777), 60-61. Unfortunately with the destruction of almost all of his commonplace books in which he kept a record of his reading, the Scottish influence on Priestley must remain a conjecture. To my knowledge, there is no record of his familiarity with the Kames-Stewart debate. However, if one were to combine Kames's justifications of active matter and his reformulations of the evidences of natural religion with Hume's account of causality, then the result would be something approaching Priestley's own position.

34. In Answer, 1-2, Gregory recounted a story of Reid's reaction when he was invited to reply directly to Priestley. He is reported to have replied to his bookseller: "What, Mr. Creech, would you have me wrestle with a chimney-sweeper?" However Reid was also more direct in his private papers. See, for example, Drafts of a paper entitled "Observations on the modern system of materialism", Aberdeen University Library, MS 3061/1/1-4, and other papers referring to Priestley in MS 3061. See also

J.H. Faurot, "Reid's answer to Joseph Priestley", Journal of the history of ideas, 39 (1978), 285-92.

35. Reid, "Active powers", Works, 609.

36. Ibid., 608-09.

37. See Gregory's "Dedicatory letter to Reid", Introduction, iv.

38. See Reid, "Active powers", Works, 608-09, where Reid drew out the theological consequences of Hume's necessitarianism founded on constant conjunction. Gregory, on the other hand, actively avoided religious issues surrounding liberty and necessity. This is evident, for example, in his discussion of the anonymous "Objections" to his views. He wrote: "I am no theologian, and am neither inclined nor qualified to reason about prescience and predestination" (Appendix, 691). Similarly, in the Essay, he wrote of the necessitarian: "His religious sentiments I pass over in silence; for the religion of a necessitarian is to me utterly incomprehensible" (258).

39. Reid, "Active powers", Works, 608-09.

40. Several of Gregory's discussions in the early sections of the Essay referred to linguistic evidence about usages of 'motive' and 'cause' and it is clear that he had by no means discarded his former metaphysical technology. See, for example, Essay, 115, where Gregory wanted to show that physical causes and motives were different. He argued that while cause was a flexible term which had several applications including causal language applied to motives, this was not the case with the usage of motive itself. Thus, although it was possible to say either "what caused a person to run away?", or "what was his motive for running away?", the language of motive could never characterise any physical event, even in the realms of passions affecting action. Thus, according to Gregory, we never ask: "what was his motive for trembling?".

41. Introduction, ccxxxiii.

42. Ibid., cxi.

43. Ibid., cv.

44. Gregory's diagram was included as a fly sheet at the end of his book. It has been simplified here to present his main case. See the material presented in Section 4.3 for an account of Gregory's notation which is largely a convenient shorthand for his arguments about the differences between causes and effects and motives and actions.

45. Essay, 60-114.

46. Ibid., 38.

47. Introduction, xxxviii.

48. _Ibid._, cxv.

49. _Ibid._, cxxvii.

50. _Ibid._, ccxxxii.

51. _Ibid._

52. _Ibid._, cxiii-iv.

53. _Ibid._, cclxxxii.

54. See Henry G. Van Leeuwen, _The problem of certainty in English thought 1630-1690_ (The Hague, 1963); Ian Hacking, _The emergence of probability: a philosophical study of early ideas about probability, induction and statistical inference_ (Cambridge, 1975); Barbara J. Shapiro, _Probability and certainty in seventeenth century England: a study of the relationships between natural science, religion, history, law and literature_ (Princeton, 1983). See also Lorraine Jenifer Daston, _The reasonable calculus: classical probability theory, 1650-1840_ (Ph.D. thesis, Harvard University, 1979).

55. See Shapiro, _Probability and certainty_, _ibid._, 16-17, 31-33 and passim for a discussion of this concept in the 17th century.

56. See _ibid._, 15-73 for an account of the role that natural philosophy played in this development.

57. John Locke, _An essay concerning human understanding_, abridged and edited by A.S. Pringle-Pattison (Hassocks, Sussex and Atlantic Highlands, New Jersey, 1978), Book 4, "Of knowledge and opinion", 255-371; see also Margaret Osler, "John Locke and the changing ideal of scientific knowledge", _Journal of the history of ideas_, 31 (1970), 3-16; also her "Certainty, scepticism and scientific optimism: the roots of eighteenth century attitudes towards scientific knowledge" in Paula Backscheider, ed., _Probability, time and space in eighteenth century literature_ (New York, 1979), 3-28; Reid, "Intellectual powers", essay 6, "Of judgement", and essay 7, "Of reasoning", _Works_, 413-89. In his _Lectures_ (ref. 1), Hill advised his 18th century divinity students on how to prepare themselves for the study of logic:

> I would recommend to you particularly to read and study upon this subject Reid's _Essay on the intellectual powers_ and the 4th book of Locke's _Essay_ ... They contain a most rational, and I think when properly understood, a just view of reason in judging of the truths of religion; and every student ought to be well acquainted with them. (165)

58. _Ibid._, 261-62.

59. Reid, "Intellectual powers", _Works_, 475-81.

60. Reid, Letter VII, _Works_, 66. For Reid's detailed comments, see _ibid._, Letter XIX, 83-87.

61. Reid, Letter XVIII, 83.

62. Overall, Reid's various comments suggest he saw the potential use of Gregory's argument, and strove where possible to tighten the analogy between the case of the porter and the behaviour of inanimate matter. See especially _ibid._, XIX, 84-85, where he made suggestions about Gregory's use of the epithet "inertia of mind".

63. See Reid "On quantity", _Works_, 715-19. This was first published in 1748 and criticised Hutcheson's _An inquiry concerning moral good and evil_. This was originally published in 1725 and had included on the title page "with an attempt to introduce a mathematical calculation on subjects of morality". Reid subtitled his own piece: "occasioned by reading a treatise in which simple and compound ratios are applied to virtue and merit".

64. See Reid's classification of the first principles of contingent and necessary truths in "Intellectual powers", _Works_, 441-61.

65. _Essay_, 98-101. In developing and illustrating his argument Gregory showed his familiarity with the distinction between fixed and variable interval scales, making an analogy with the calibration of heat as temperature (104-06).

66. Reid "On quantity" (ref. 63), 716.

67. _Ibid._, 717.

68. Alexander Crombie, _An essay on philosophical necessity_ (London, 1793).

69. James Hutton, _An investigation of the principles of knowledge and the progress of reason from sense to science and philosophy_, 3 vols. (Edinburgh, 1794).

70. John Allen, _Illustrations of Mr Hume's essay concerning liberty and necessity in answer to Dr. Gregory in Edinburgh, by a necessitarian_ (London, 1795). For details of John Allen (1771-1843) see _Dictionary of national biography_; also Henry Cockburn, _Memorials of his time_ (Edinburgh, 1856), 85, who noted that, together with Cullen's biographer, John Thomson, Allen was one of the only "true" medical Whigs in Edinburgh during the 1790s. Allen received his M.D. from Edinburgh in 1791 and lectured extra-murally on "animal economy" or physiology before living permanently in England.

71. See Joseph Priestley, _Memoirs of Dr. Joseph Priestley_, 2 vols. (London, 1806), vol. 1, 355 and cited by Crombie in _Letters_ 355. Cooper was a Unitarian industrialist and member of the Manchester Literary and Philosophical Society, who also had connections with members of the Lunar Society. He wrote _Tracts, ethical, theological and political_ (Warrington, 1787), which contained an essay on materialism. In this, Cooper seems to have professed a complete materialism, asserting a necessary

connection between the properties of perception and the state of the brain, based upon this constant conjunction:

> Certainty and universality of concomitance between two or more phenomena, is the only direct reason we have for asserting a necessary connection between them. (186-87)

At one point, Cooper actually criticised Priestley's views for what he perceived as Priestley's over-emphasis upon the deity as an agent active in nature. (185). This is not the same Thomas Cooper who added observations on Priestley's Memoirs, although, rather confusingly, the latter Thomas Cooper quoted the former in the passage referred to above. However, both seem to have held very similar views. See, for example, Memoirs, vol. 1, appendix 2, passim.

72. The monthly review, 11 (1792), 361-73; 15 (1794), 128-36. Enfield is identified as the author in Benjamin C. Nangle, The monthly review, second series, 1790-1815 (Oxford, 1955), 20.

73. On Priestley's dissenting circle see the biographical sources cited under ref. 32. Also useful is Roland N. Stromberg, Religious liberalism in 18th century England (London, 1954); Robert E. Schofield, The Lunar Society of Birmingham: a social history of provincial science and industry in eighteenth century England (Oxford, 1963).

74. McCosh, Scottish philosophy (ref. 4) 265-66, who notes that Crombie argued against materialism and for the immateriality of the soul in his Natural Theology 2 vols. (London, 1829). Although Crombie was a necessitarian, he did not thereby subscribe to either Priestley's or forms of materialism found, for example in both Coopers. Rather, the common factor seems to have been arguments for philosophical necessity based upon inferred constant conjunctions.

75. Answer, 7; Letters, 8, 79-80.

76. Crombie, On necessity (ref. 68), 63.

77. Ibid., 287-89.

78. Ibid., 356. See Essay, 227-28, where Gregory stated his argument did not rest on the time taken for the porter to arrive at point D, but only that he must go in the direction of the diagonal AD if necessitarianism were true.

79. Crombie, On necessity (ref. 68), 365.

80. Ibid., 398.

81. Ibid., 389.

82. Ibid., 355.

83. Reid, "Intellectual powers", Works, 237.

84. Answer, 121.

85. Ibid., 111-15, 121-22. Here and in the Essay, 299-301, Gregory discussed the notion of a "tottering balance" suggested to him by Daniel Rutherford, Professor of Botany at Edinburgh. By adjusting the centre of gravity of this balance, and making it coincide with its centre of motion, then the smallest additional weight would make the whole balance tip from the horizontal to the vertical. This would be an even more striking illustration for the necessitarian case. But, Gregory argued, whereas this was more appealing to the "eye", it was of no help to the "understanding" in deciding between the respective claims of necessity and liberty.

86. Ibid., 252.

87. Ibid., 443. As well as referring to his opponents collectively as "Crombie, Priestley and Co.", Gregory satirised them as "brother" or "brethren" necessitarians, the "flocks and herds" of the dissenting community. See ibid., 5, 451.

88. Crombie, On necessity (ref. 68), 424-25 (emphasis in original).

89. Letters, 74.

90. Ibid., 179.

91. Ibid., 256.

92. "Objections", Appendix, 473.

93. Ibid., 475.

94. Ibid., 476.

95. Ibid.

96. Ibid., 473.

97. Hutton, Investigation (ref. 69), vol. 1, 3. On Hutton see P. Gerstner, "James Hutton's theory of the earth and his theory of matter", Isis, 59 (1968), 26-31; D.R. Dean, "James Hutton on religion and geology", Annals of science 32 (1975), 187-93; R. Grant, "Hutton's theory of the earth", in L.J. Jordanova and Roy S. Porter, eds., Images of the earth: essays in the history of the environmental sciences (Chalfont St. Giles, 1979), 23-38; Roy Porter, The making of geology: earth science in Britain 1660-1815 (Cambridge, 1977), 184-96. See also J. Playfair, "Biographical account of the late Dr. James Hutton", Transactions of the Royal Society of Edinburgh, 5 (1805), 39-99.

98. Hutton, Investigation (ref. 69), 5-9.

99. Ibid., 39.

100. Ibid., 35.

101. Further circumstantial evidence for Hutton's involvement in the reception of the Essay can be found in Crombie's Natural theology (ref. 74), vol. 1, 13, 24, 308; vol. 2, 364, 533.

102. Hutton, Investigation (ref. 69), vol. 3, 212-45.

103. Ibid., 216.

104. "Objections", Appendix, 481-82.

105. Hutton, Investigation (ref. 69), vol. 3, 218.

106. Ibid., 219.

107. See James Burnett, Lord Monboddo, Ancient metaphysics or the science of universals, 6 vols. (Edinburgh, 1779-99), vol. 1, book 2, chapter 21, "On free will and necessity". 297-99.

108. Hutton, Investigation (ref. 69) vol. 3, 233.

109. Ibid., 233-37.

110. Although Hutton's "Theory of the earth" was actually read to the Royal Society of Edinburgh around the time of Gregory's various performances of the Project, it received no mention in the Essay. However, Hutton's "Theory of rain" did receive a brief notice by Gregory. See Essay, 198-99, where Gregory seems to have viewed Hutton's theory about the action of heat to follow from inactivity of matter and the constant conjunction of causes and effects in physics. See James Hutton, "Theory of the earth; or an investigation of the laws observable in the composition, dissolution and restoration of land upon the globe", Transactions of the Royal Society of Edinburgh 1 (1788), 209-304; "Theory of rain", ibid., 41-86. Hutton also summarised his theory of rain in Dissertations on different subjects in natural philosophy (Edinburgh, 1792), part 1, dissertations 1-3. See also A. Donovan, "James Hutton, Joseph Black and the chemical theory of heat", Ambix, 25 (1978), 178-90.

111. "Objections", Appendix, 468.

112. Appendix, 489-90.

113. See for example H. Home, Lord Kames, The principles of morality and natural religion (Edinburgh, 1751), 174-75. While Kames modified his position in successive editions, he maintained the general attack upon Arminian conceptions of an uncaused will.

114. See Reid, "Active powers" Works, passim, especially essays 1 and 4.

115. Appendix, 691.

116. Ibid., 553.

117. Ibid., 567-68.

118. _Ibid._, 538.

119. _Ibid._, 552.

120. See _Introduction_ cxliv, ccxxxvi-ccxli; _Essay_, 197. Apart from these remarks and Gregory's brief comments about heat (See refs. 65 and 110), it is surprising how little he mentioned chemistry. The standard text for the development of chemistry during this period is A.L. Donovan, _Philosophical chemistry in the Scottish Enlightenment_ (Edinburgh, 1975).

121. This is a paraphrase of Gregory's argument using his own symbolism discussed in _Essay_, 164-243. In the rest of his _Essay_, Gregory also strove to prove the falsity of 4(a) and 4(b) when applied to motives and actions.

122. Allen, _Illustrations_ (ref. 70), 39.

123. _Ibid._, 41.

124. _Ibid._, 30-31.

125. _Ibid._, 10.

126. _Ibid._, 15.

127. _Ibid._, 1.

128. _Ibid._, 5.

129. Hume, _Enquiry 8_, 87, and cited in Allen, _Illustrations_ (ref. 70), 17-18.

130. Allen, _Illustrations_ (ref. 70), 17-18.

131. _Essay_, 166.

132. Newton, _Principia_ 14.

133. _Ibid._, 315-26, In keeping with the interests of _Activity 2_, Gregory discussed the meaning of Newton's concepts in their original Latin as well as their English equivalents.

134. See John Robison's article "Boscovich" in George Gleig, ed., _Supplement to the third edition of the Encyclopaedia Britannica_, 2 vols. (Edinburgh, 1801) vol. 1, 96-110; also his "Boscovich's theory"in _System_ (see ref. 154), vol. 1, 267-339. Robison referred to Boscovich throughout his writings. A particularly important statement of his views can be found in the manuscript interleaved copy of his _Outlines of mechanical philosophy_, Edinburgh University Library MS Gen. 2012, opposite page 22. This is the draft of a letter in Robison's hand, answering an anonymous query about Boscovich. It raises the complex question of precisely how Robison read and used Boscovich. See Richard Olson,"The reception of Boscovich's ideas in Scotland", _Isis_, 60 (1969), 91-103.

135. For Stewart on Boscovich see chapter five, ref. 137.

136. Ibid., 316.

137. Here, Gregory differed from Priestley's views found in the appendix of his Disquisitions relating to matter and spirit. (ref. 18). Priestley specifically considered the objection that Newton's philosophy was "overturned" if there was no vis inertiae of matter. He rejected it, arguing that the laws of motion were founded upon facts "which result[ed] just as easily from [his] hypothesis concerning matter, as from the common one". (334). Once again, Boscovich is implicated in the development of Priestley's matter theory. See L.L. Whyte, ed., Roger Joseph Boscovich S.J., F.R.S., 1711-1787: studies of his life and work on the 250th anniversary of his birth (London, 1961) 168-72; John G. McEvoy, "Some comments on Professor Schofield's views", Ambix, 15 (1968), 115-23. This dispute whether Priestley or, for that matter, Reid and Stewart were influenced by Boscovich, and whether they understood and applied his theories correctly parallels those about Newton referred to earlier in chapter four. A more helpful perspective would focus upon the perceived uses of Boscovich's ideas by different historical actors. In this way, inconclusive debates about influences and their nature can be avoided.

138. Essay, 318-19.

139. Ibid., 328.

140. Ibid., 329.

141. Introduction, lxxvii.

142. Ibid.

143. Ibid., ccxii-iii.

144. Ibid., cccii.

145. Essay, 78.

146. For details on John Robison, see John Playfair, "Biographical account of the late John Robison LL.D., F.R.S.E., and Professor of Natural Philosophy in the University of Edinburgh", Transactions of the Royal Society of Edinburgh, 7 (1815), 495-540; Thomas Young, "Life of Robison", Miscellaneous works of Thomas Young, ed., G. Peackock, 3 vols. (London, 1855), vol. 2, 505-17.

147. See J.R.R. Christie, "Joseph Black and John Robison" in Joseph Black, 1728-1799: a commemorative symposium (Edinburgh, 1982), 47-52.

148. See Crosbie Smith, "Mechanical philosophy and the emergence of physics in Britain, 1800-1850", Annals of science, 33 (1976), 3-29.

149. See Crosbie Smith, "A new chart for British natural philosophy: the development of energy physics in the nineteenth century", History of science, 16 (1978), 231-79. See also his "From design to dissolution: Thomas Chalmer's debt to John Robison", British journal for the history of science, 12 (1979), 59-70.

150. For example see Richard Olson, Scottish philosophy and British physics, 1750-1880 (Princeton and London, 1975), 158-61. Olson devotes three pages to Robison, who is probably the best case for the interaction between Scottish philosophy and physics. On page 159, he notes his ignorance of any references to Reid by Robison. As I show later, Robison's lecture notes contain several important references to Reid. Also in the published Supplement (ref. 134) Robison refers to "On quantity" by Reid (see ref. 168) and discussed a number of optical experiments carried out with him. See ibid.,"Impulsion",vol. 1, 782-810, on 802.

151. See J.B. Morrell, "Professors Robison and Playfair and the 'theophobia gallica': natural philosophy, religion and politics in Edinburgh 1789-1815", Notes and records of the Royal Society of London, 26 (1971), 43-63.

152. Activity 1, 27.

153. Activity 2, 25.

154. John Robison, A system of mechanical philosophy, 4 vols. (Edinburgh, 1822), vol. 1, 4-5. This was edited by David Brewster and consists of a compilation of Robison's various Encyclopaedia Britannica articles, plus material re-worked from Robison's original manuscript drafts.

155. "Philosophy", Encyclopaedia Britannica (ref. 6), vol. 14, 573-600,on 586. This was co-authored with George Gleig, the general editor. I have used this article sparingly because it is not entirely clear precisely which parts were written by whom. A natural division would be on page 582. Before this, there is a general account of the history of philosophy which may have been written by Gleig. Afterwards, the subject is,the method of natural philosophy, which was certainly written in part by Robison, as there are many passages which relate directly to his other writings. However, there are also other sections which may be the work of Gleig. Compare, for example, statements throughout this article on Reid and the nature of instinctive feelings, with those found in Gleig's article "Instinct", ibid., vol. 9, 259-69.

156. John Robison, Outlines of mechanical philosophy (Edinburgh, 1781), 18.

157. John Robison, Elements of mechanical philosophy (Edinburgh, 1804), "Advertisement".

158. Robison, Outlines (ref. 156), 2. Some variations of this early definition can be found in later works, where Robison introduced the restriction that mechanical philosophy dealt only with

sensible motions into the definition itself. See Outlines of a course of mechanical philosophy (Edinburgh, 1797), "Introduction"; "Physics", Encyclopaedia Britannica (ref. 6), vol. 14, 647.

159. Robison, Elements (ref. 157), 84-85. See also System (ref. 154), 34, where in his discussion of the laws of motion, Robison wrote that these propositions were not about body as such but "the operations of our minds when contemplating body".

160. Robison, Outlines (ref. 156), 17. See also "Physics" (ref. 158), 637, for a discussion of relations.

161. Robison, Outlines (ref. 156), 18.

162. Robison, Elements (ref. 157), 345.

163. See ibid., 691 for Robison's views on gravity in this context.

164. Robison, Outlines (ref. 156), 20.

165. Robison, System (ref. 154), vol. 1, 51.

166. See Elements (ref. 157), 115, where Robison mentioned former attempts by Daniel Bernoulli, Riccati,D'Alembert and Frisi. For the background to Newton's corollary and its subsequent reception see Harvey F. Girvin,A historical appraisal of mechanics (Scranton, Pennsylvania, 1948) 68-71; C. Truesdell, Essays in the history of mechanics (New York, 1968), 138-43 Max Jammer, Concepts of force; a study in the foundations of dynamics (Cambridge, Mass., 1957), 128-33.

167. Robison gave his own proofs for both the composition of motions and the composition of forces. See ibid., 51-53; System (ref. 154), vol. 1, 57-64. Some indication of Robison's development of these proofs can be found in the annotated interleaved manuscript copy of Robison's Outlines (ref. 156), Edinburgh University Library MS. Gen. 2012, 7, and opposite 23-25.

168. For an account of some of the technical difficulties surrounding the parallelogram of forces in relation to Newton's conception of force, see Richard S. Westfall, Force in Newton's physics: the science of dynamics in the seventeenth century (London and New York, 1971), 435-40, 471-91, especially 477. Also useful for a general account of Newton's laws is Mary B. Hesse, Forces and Fields: the concept of action at a distance in the history of physics (London, 1961), 134-44. The major issue underlying the parallelogram involves its appropriateness as a mathematical measure of impressed force producing uniform accelleration as well as uniform velocity. Robison himself acknowledged that a "demonstration of the composition of pressures [was] still wanted in order to render mechanics a demonstrative science". (System, 57). Robison's views on the measure of forces cannot be considered here. However, he persistently emphasised that change of sensible motion was the

only "correct" measure of force. He supported his views in favour of the "Newtonian" measure of force against the "Leibnizian" using Reid's "On quantity". See *System*, vol. 1, 19; *Elements* 98, 105-06. From Robison's whole account, it is clear that he perceived there was considerable doubt and dissent about the foundations of mechanics and the appropriate measure of force. For an account of opposing Newtonian and Leibnizian measures of force in the 18th century see Carolyn Iltis, "The Leibnizian-Newtonian debates: natural philosophy and social psychology", *The British journal for the history of science*,6 (1973), 343-77; and her "Leibniz and the *vis viva* controversy", *Isis*, 62 (1971), 21-35; Thomas Hankin's "Eighteenth century attempts to resolve the *vis viva* controversy", *Isis*,56 (1965), 281-97; L.L. Laudan, "The *vis viva* controversy, a post-mortem", *Isis*, 59 (1968), 131-43.

169. Robison, *Elements* (ref. 157), 55.

170. *Ibid.*, 55-56.

171. *Ibid.*, 115.

172. Robison, *Outlines*, (ref. 156), 1. In the annotated manuscript copy (ref. 167), this note included the reference "Hume Ess. II, 106" added by Robison.

173. Robison, *Elements* (ref. 157), 99.

174. *Ibid.*, 88.

175. *Ibid.*, 157.

176. Robison, "Physics" (ref. 158), 645.

177. Robison, "Philosophy" (ref. 155), 583.

178. *Ibid.*, 586.

179. *Ibid.*, 587. The passage cited by Robison can be found in Hume, *Enquiry 5*, 55. Changes of expression indicate that Robison used an edition prior to the final 1777 one, upon which Selby-Bigg-Niddich is based.

180. *Lectures of John Robison, Professor of Natural Philosophy in the University of Edinburgh, on mechanics, hydrodynamics, astronomy, optics, electricity and magnetism etc.*, 40 vols., Edinburgh University Library, MS Dc 7. 1-40. These are a heterogeneous compilation of lecture notes, drafts of articles, letters etc. There is no consistent pagination, nor do the volumes follow any consistent chronological order. The material on Hume and Reid may be found in two separate sets of introductory lectures, Dc 7.2 and Dc 7.29. Where there are page references, these are cited; otherwise the numbers refer to the sheets themselves which make up each volume. There are numerous references to both men in the sections Dc 7.2 24, 34-41; 44-64, (marked "Lecture 4, Causation"), and Dc 29 73, 106-19. See also the annotated

edition of the Outlines (ref. 167) for further material on Hume, especially the third page of notes added by Robison before the printed text begins.

181. Robison, "Philosophy" (ref. 155), 587. See also a similar expression in Lecture notes (ref. 180), Dc 7.2, 21.

182. Robison, Elements (ref. 157), 95-98.

183. Ibid., 320.

184. Ibid., 91.

185. See also ibid., 654 for similar strictures on "nisus", "conatus" etc.

186. Robison, "Physics" (ref. 158), 640 (emphasis in original).

187. Introduction, ccxlvi.

188. Essay, 211.

189. Ibid., 216.

190. Reid, "Account of Aristotle's logic", Works. 713.

191. George Elder Davie, The democratic intellect: Scotland and her universities in the 19th century, 2nd ed. (Edinburgh, 1964), 144.

APPENDIX 1: MAJOR BIOGRAPHICAL SOURCES AND SIMPLIFIED FAMILY-TREE

Sources

The best modern source for Gregory is:

Paul David Lawrence, The Gregory family: a biographical and bibliographical study. To which is annexed a bibliography of the scientific and medical books in the Gregory Library (Ph.D. thesis, University of Aberdeen, 1972), 172-91.

This also contains a bibliography of Gregory's works, including his medical polemics which fall outside the scope of this thesis.

Other material on him may be found in the following:

William Anderson, The Scottish nation, 3 vols. (Edinburgh and London), vol. 2, 379-81.

G.T. Bettany, Eminent doctors: their lives and their work, 2 vols., 2nd ed. (London, 1885), vol. 1, 102-08, 110.

Alexander Bower, The history of the University of Edinburgh, 3 vols. (Edinburgh, 1817-30), vol. 3, 190-203.

Robert Chambers, ed., A biographical dictionary of eminent Scotsmen, 2 vols. (London and Glasgow and Edinburgh, 1875), vol. 2, 177-78.

Sir Robert Christison, Bart., The life of Sir Robert Christison, Bart., 2 vols. (Edinburgh and London, 1885), vol. 1, 73-84, 86.

Henry Cockburn, Memorials of his time, edited with an introduction by Karl F.C. Miller (Chicago and London, 1974), 96-97.

John D. Comrie, History of Scottish medicine, 2 vols., 2nd ed. (London, 1932), vol. 2, 474-78.

John D. Comrie, "John and James Gregory, professors of medicine at Edinburgh", University of Edinburgh journal, 8 (1936-37), 126-30.

Bransby Blake Cooper, The life of Sir Astley Cooper, Bart., 2 vols. (London, 1843), vol. 1, 160-64.

W.V. Craig, History of the Royal College of Physicians of Edinburgh (Oxford, 1976), 17, 101, 131, 240, 377, 419, 420, 424, 426-36, 447, 491, 539, 645, 683, 859, 944, 951, 958, 960.

Sir Alexander Grant, The story of the University of Edinburgh during its first 300 years, 2 vols. (London, 1884), vol. 2, 404-06.

D.B. Horn, A short history of the University of Edinburgh (Edinburgh, 1967), 57, 82, 108.

Dictionary of national biography, vol. 8, 542-44.

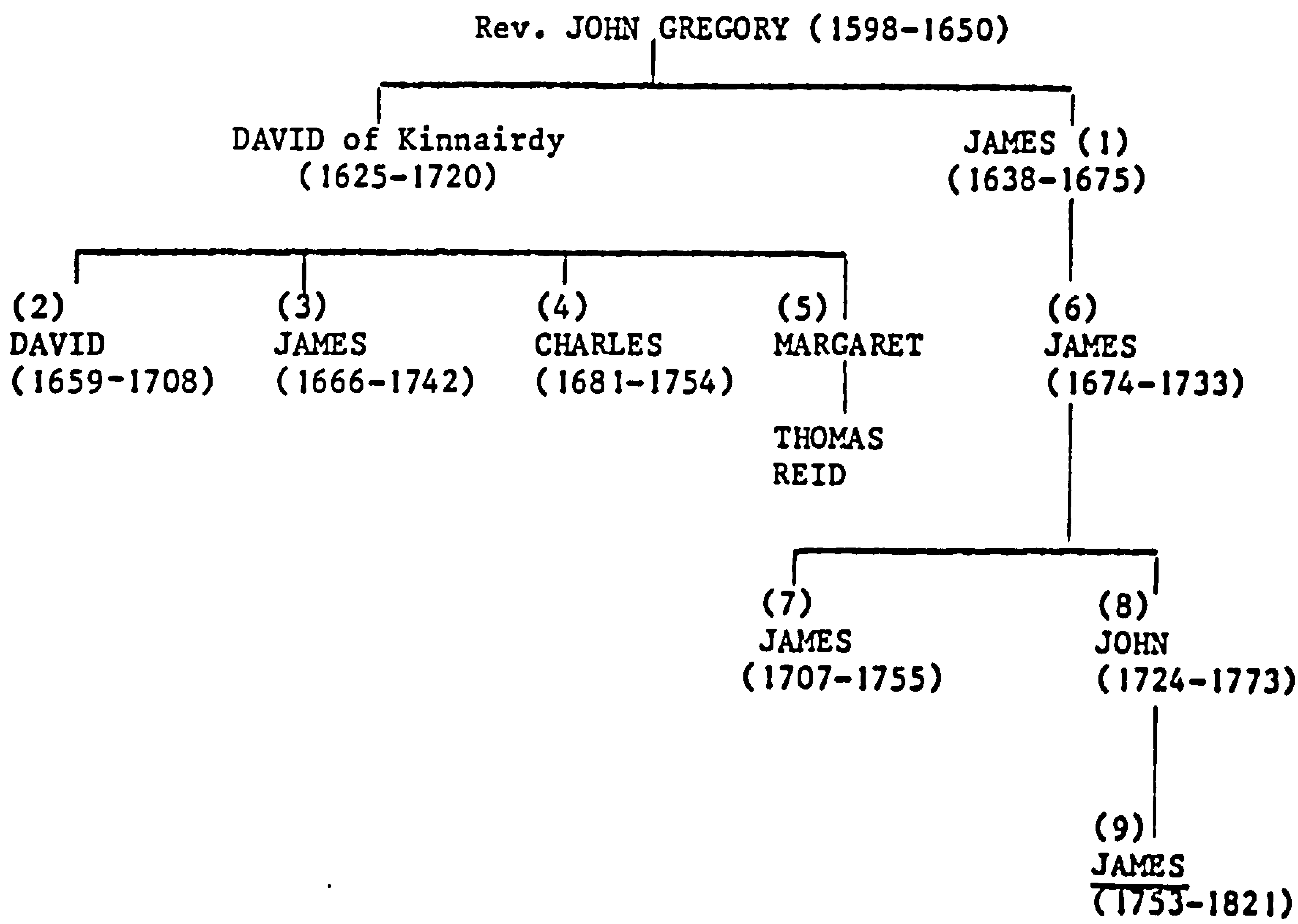
Agnes Grainger Stewart, The Academic Gregories (Edinburgh, 1901), 125-40.

Robert Thin, College portraits, being biographical sketches on portraits in the hall of the Royal College of Physicians in Edinburgh (Edinburgh and London, 1927), 71-73.

The most interesting contemporary account of Gregory's medical activities and publications can be found in John Bell, Letters on professional character and manners, on the education of a surgeon, and the duties and qualifications of a physician, addressed to James Gregory (Edinburgh, 1810). This also contains a list of Gregory's polemical medical writings.

Finally, there are several letters by Gregory held in Edinburgh University Library and the National Library of Scotland, together with many sets of lecture notes taken down by students. Copies of the latter may also be found in other Scottish, English and American libraries.

SIMPLIFIED FAMILY TREE



1. Professor of Maths at Edinburgh
2. " " "

3. Professor of Maths at St. Andrews, later at Edinburgh
4. Professor of Maths at St. Andrews
5. Mother of Thomas Reid
6. Professor of Medicine at Aberdeen
7. " " "
8. Professor of Philosophy and later of Medicine at Aberdeen, finally Professor of Medicine at Edinburgh
9. PROFESSOR OF MEDICINE AT EDINBURGH

APPENDIX II: DIAGRAM ILLUSTRATING THE CHRONOLOGICAL SEQUENCE OF GREGORY'S METAPHYSICAL WRITINGS

"An essay towards an investigation of the exact import and extent of the common notion of cause and effect in physics, and of the real nature of that relation."

		Read to Royal Society of Edinburgh
PART I	Introductory essay ("motive and action")	Nov. 1784; Mar. 1785
PART II	Power	Nov. 1785; Jan. 1786
PART III	Activity, sections 1, 2 and 3.	Transformed into "Theory of the Moods of Verbs", read June 1787, July 1787 published *T.R.S.E.*, 2 (1790).
PART IV	"Essay on the difference between the relation of motive and action and that of cause and effect in physics; on physical and mathematical principles"	Probably not read; subsequently printed and circulated; finally published in *Philosophical and literary essays* (1792)
	An Answer to Messrs Cronbie Priestley and Co.	Written 1793-early 1800's, privately printed but not published, circulated by Gregory. Copies in Edinburgh, Aberdeen and Glasgow University Libraries.
	Letters from Dr. James Gregory with replies by the Rev. Alexander Crombie	Written *circa* 1803-1815 published by Crombie 1819.

APPENDIX III: REID'S LETTERS TO GREGORY

Among the correspondence of Reid, Hamilton included 21 letters to Gregory, placed at his disposal by members of Gregory's family.[1] Given below is a table of Hamilton's arrangement and his description of their contents. In his editorial comments, Hamilton noted that he had not included a letter of condolence on the death of Gregory's first wife because this had already been quoted by Stewart in his Account of the life and writings of Dr. Reid.[2] Also, from what Hamilton said about the disappearance of letter XXI, it seems that even when he was compiling Reid's Works, at least one, if not more of Reid's letters had been lost. Now, apart from Letter VI, it seems that Hamilton's copies are the only available source.

The importance of the letters is evident, even from a brief assessment of their contents. They contain information upon the presentation and publication of "Intellectual powers" and "Active powers" (Letters I-VI and IX); anecdotes about Newton's Scottish connections and the history of the Gregory family (Letters III and X); incidental details about Hunter's bequest to Glasgow University (Letter I); information about an essay on cause and effect read to the Royal Society of Edinburgh by Dugald Stewart (Letter IV); information on Dr. Price (Letter VIII); comments by Reid on Bentham's Letters on usery (Letter XIII) and Crombie's Essay on philosophical necessity (Letter XX). However, the bulk of the letters are taken up with Reid's views on causation, motive, action, language, activity, laws of nature, geometry, power, necessary connection, instrument and volition. Reid's philosophical discussions of these topics give the letters their enduring value and interest.

The format within which Hamilton arranged the correspondence contains two different sorts of sub-headings which refer to the contents of individual letters. Hamilton's own capitalised lists at the beginning of some letters were intended to provide some indication of what philosophical issues were raised in which letters. However along with Hamilton's lists, several letters contain other sub-headings which were Reid's own. These have been italicised by Hamilton. It is the second kind of sub-headings which provide clues to the dating of Letters XV-XIX, which form the bulk of the correspondence. Reid's sub-headings and the letters to which they refer are given below.

"Remarks on the introduction"	LETTER XV
"Volume first"	LETTER XVI
"Volume second"	"
"Volume third"	"
"Motive-sect. 1"	LETTER XVII
"Of the notion of Instrument"	"
"Power"	"
"Activity-sect. 1"	"
"Activity-Sect. 2"	"
"Remarks"	LETTER XVIII
"Remarks on the Essay"	LETTER XIX

Reid's comments under each heading contained numerous page references. Hamilton was aware that the headings and references referred to Gregory's work. At various points in his letters Reid either acknowledged receiving material from Gregory or returning it to him (Letters I, XI, XIV, XVI, XI). Hamilton correctly noted that some material concerned Gregory's Theory of the moods of verbs (Letter XI). However, he considered that all Reid's other comments dealt with Gregory's Essay. Realising there were obvious discrepancies between titles given by Reid and in many of the page references, Hamilton stated:

> The Essay was probably considerably modifed before publication; and I have been unable to attempt the task of discovering how far, and to what pages of the published book, the following remarks apply.[3]

When he arranged Reid's letters, the information Hamilton lacked was the relationship the Essay had to other parts of Gregory's Project. By considering this, it is possible to locate precise references for Reid's comments and also to suggest a much more satisfactory ordering of the material included in the undated letters.

Reid's headings actually referred to titles used by Gregory to distinguish various parts and sections of the Project. Sometimes this was entirely direct as in "Power" and "Activity Sects. 1 and 2", for example. On other occasions it was indirect. Thus the "three volumes" Reid acknowledged receipt of, in Letter XVI in fact referred to Power, Activity and Gregory's Introductory essay. From these circumstances, it follows that Reid actually commented twice upon Power and Activity, once under their proper titles and once under the headings "Volume third". This circumstance is not at all unusual or in need of further explanation. Reid followed a similar pattern in his comments upon Gregory's Essay. It seems that Reid presented Gregory with his comments in two stages. In the first, he gave his comments, often as part of a letter which strove to reformulate Reid's perception of the differences between them, or one which began with details of former matters of dispute between them. See, for example, Letters VI, VIII, XI, and XIV. At this stage, Reid appears to have given Gregory initial reactions, rather than considered responses. The second stage of criticism was quite different. Reid provided Gregory with a series of detailed criticisms and comments with specific page references. Reid gave these sort of remarks the titles which Hamilton distinguished by italics in his presentation of the letters.

Once this is realised, it becomes clear that Hamilton actually treated many of Reid's titled remarks as if they were separate letters. As a result, Hamilton's organisation gives the impression of more letters sent from Reid to Gregory than there probably were, even when Hamilton first viewed them. Hamilton also appears to have strung together sequences of Reid's headed remarks which he then treated as a letter, and distinguished it from others, which he constructed along the same lines. Also, in the case of Letter XVI, he joined together a fragment of a genuine but undated letter with a sequence of headed remarks. The only indication of this procedure in Hamilton's edition of the letters is that he used evenly spaced dots to indicate breaks in Reid's narrative. In the above example, Hamilton did this because the undated fragment referred to Reid's reception of Gregory's "three volumes" and the sequence Hamilton appended had the titles "Volume first", "Volume second", and "Volume third". However in all other cases, Hamilton's arrangement is arbitrary and misleading. By relating dated letters, and undated remarks, to the known contents and order of the essays in Gregory's Project, it is possible to re-arrange the contents of the letters in a more consistent and logical way. Whether this corresponds to their actual chronology can only be confirmed if the letters are subsequently found. Nevertheless, the following re-distribution probably approaches the original sequence of the letters and remarks.

Hamilton's fragment of Letter XVI is probably the earliest part of the surviving correspondence between Reid and Gregory. It referred to Reid's receipt of Gregory's "three volumes". These were the Introductory essay, Power and Activity 1 and 2. Also, the letter mentioned Gregory's correspondence with Dr. Rose on Reid's behalf. Rose was party to negotiations over the publication of Active powers, as Letters III and IV indicate; and it is possible that Gregory may have put Reid into contact with him. Further evidence for this early dating occurs in Letter I. Referring presumably to the same "three volumes", Reid stated he had "put off examining those you have sent" until his own manuscript of essays from Intellectual powers was returned to him. This letter was dated April 7, 1783.

If we take Reid at his word, the subsequent comments by him ("Volume first", "Volume second" and "Volume third") were probably written around May 1783. Reid made his later comments on "Volume second" and "Volume third" under their assigned titles, Power and Activity. However, these were included by Hamilton as part of the remarks compiled to form Letter XVII.[4] It is not possible to state their date with precision. However, their continuity with Reid's general remarks is clear; and together, both should be seen as part of the early exchanges between Reid and Gregory. Interestingly, Reid made no reference to Activity 3. The unfinished character of this manuscript has already been noted. It consisted of a summary and reformulation of material in Activity 1 and 2. It also considered a number of possible "Objections" to his views. Gregory stated that they were proposed to him by "different persons for whose judgement and knowledge [he] entertain[ed] very great respect".[5] One of these was certainly Reid. It is one of several instances where Gregory either reformulated or excised passages in response to Reid's criticisms.[6] Internal evidence also suggests that the comments under the sub-title "Of the notion of instrument", which Hamilton included in Letter XVII, was also a part of these early exchanges.[7] All the points so far mentioned conspire to suggest a more satisfactory ordering of the first four "letters" of the correspondence as follows:

Letter A:	Introductory fragment of Hamilton's Letter XVI.
Letter B:	Hamilton's Letter I.
Letter C: (May 1783?)	Compilation of the following comments by Reid.

(i)	"Volume first"	Hamilton's Letter XVI
(ii)	"Volume second"	Hamilton's Letter XVI
(iii)	"Volume third"	Hamilton's Letter XVI
(iv)	"Power"	Hamilton's Letter XVII
(v)	"Of the notion of instrument"	Hamilton's Letter XVII
(vi)	"Activity sect. 1"	Hamilton's Letter XVII
(vii)	"Activity Sect. 2" (excluding the second paragraph)	Hamilton's Letter XVII

Letter D:	Hamilton's Letter II (June 8th, 1783).

Gregory almost certainly received all the above comments from Reid before Letter V, December 31, 1784. In this Reid referred to the disagreement between them over the sense Gregory gave to the term "notion". An internal reference for this can be found in Reid's comments on "Volume first", which confirms its date as earlier than Letter V itself. However, the best evidence for regarding this block of remarks comes from the dates of Gregory's performance of the Introductory essay to members of the Literary Class of the Royal Society of Edinburgh. He began reading his first essay in November 1784.[8] Obviously, Reid's comments would have been most beneficial before Gregory actually began to read parts of his Project in Edinburgh.

The block of four letters following on from new letters A-D are straightforward. They correspond to precisely dated material, correctly arranged by Hamilton. Thus:

Letter E:	Hamilton's Letter		III
Letter F:	"	"	IV
Letter G:	"	"	V
Letter H:	"	"	VI

In Hamilton's Letter VII, June 14, 1785, Reid noted Gregory's "speculation to demonstrate, mathematically, the difference between the relation of motive and action, and the relation of cause and effect".[9] The letter went on to offer some general comments which were typical of Reid's "first stage" remarks about other essays. Reid returned to the subject in Letter IX March 1786, where he stated that "the style of this essay [was] more simple than that of the last".[10] In another letter, (XIV July 30, 1789) Reid mentioned receiving a copy of Gregory's "book". Finally in Letters XV, XVII, XVIII and XIX, Reid also made a series of undated remarks upon the Essay. All Reid's various references to Gregory's "speculation", to his "essay" being more simple than "the last", and finally, to his "book" refer to the various stages the Essay went through before publication in the Philosophical and literary essays.

As with earlier parts of the Project, the problem is to relate the sequence of undated comments made by Reid to successive stages of the Essay and hence, arrange them in a more logical and chronologically probable sequence.

Hamilton's response to the relationship between the letters and the published Essay was to note that "some pages correspond[ed] to the published work, others [did] not". He concluded that at this stage, the Essay was probably printed but in proof.[11] He also noted that some of Reid's comments referred to the Introduction of Gregory's Philosophical and literary essays published in 1792, which contained the essay on motives and action causes and effects. However, from information provided by Gregory himself in the Introduction to the Philosophical and literary essays, it is possible to piece together the transformation of the Essay from a "speculation", into the final published version and to suggest which of Reid's remarks applied at which stage.

The first mention of Gregory's "speculation" on motives and actions, causes and effects occurred in Letter VII, JUne 14, 1785. Gregory actually referred to this in the Introduction to the Philosophical and literary essays stating:

> After considering by myself the argument and illustrations ... for more than a twelvemonth, I ventured to communicate the principle and general tenor of them to a friend of whose talents and knowledge I had ... the highest opinion.[12]

Gregory's next step was to put it in writing and, over several years, he circulated it to "thirty or more mathematicians, physicists and metaphysicians". Inevitably, one of these was Reid himself. In Letter IX, March 1786, Reid referred this time, to the return of Gregory's "essay". Thus between June 14, 1785 and March, 1786, Reid read a draft of it. This earliest draft form has not survived.

It is very probable, however, that Reid made comments upon it. Of the various "Remarks" which Hamilton included, several either bear no relation to the printed text, or Reid's page references do not correspond to the published text of the Essay. It seems likely therefore that these refer to this first draft. For example, Letter XVII contained a section entitled "Motive - sect.1", giving the page reference, 27. The matter referred to by Reid eventually appeared on page 21, as Hamilton noted.[13] Also in the published Essay the title was changed from "Motive - Section 1" to "Hume's views examined". Therefore, it seems probable that the former title referred to a heading in the first draft of the essay which is now no longer extant. I have applied this principle to other problematic passages, in order to distinguish them from those which refer more directly to the Essay.

In Letter XIV, July 30, 1789, Reid mentioned that he had received Gregory's "book". He also noted Gregory's intention to dedicate it to Reid "if published". From what Gregory stated in his Introduction, we know that he had the Essay printed some two years or so before it was eventually published, supplemented by a lengthy

Introduction and Appendix. This, Gregory noted, was in Midsummer 1789.[14] This then is the appropriate place for Reid's detailed and referenced comments given in part of Letter XVIII and in Letter XIX. The reason why the comments ascribed to the missing first draft of Gregory's Essays could not equally refer to the separately printed version is as follows. From a copy of this separate printing, it is clear that the pagination was unchanged when the Philosophical and literary essays were compiled for publication.[15] In the light of this, Hamilton's remark that Reid's page references did not correspond because the Essay was in proof when he read it, is almost certainly wrong.

As well as remarks referring to a lost early draft and to the separate printing of the Essay, Reid also gave a third category of comments. These were grouped under the heading "Remarks on the Introduction". It is evident that these referred to Gregory's Introduction which was not completed until January 20th, 1792.[16] Reid's page references correspond to the printed form of the Introduction and it is therefore likely that they represent Reid's latest and final comments on Gregory's writings.[17]

On the basis of this three-tier structure of Reid's comments referring to the various stages of Gregory's Essay, the following reordering of Reid's remaining letters can be proposed:

Letter I:	Hamilton's Letter VII	June 14, 1785
Letter J:	" " VIII	
Letter K:	" " IX	
	Compilation of (i) XVII, "Motive sect. 1" (ii) "Activity sect. 2", paragraph 2; XVIII, "Remarks" p. 27 & 76	
Letter L:	Hamilton's Letter X	
Letter M:	Hamilton's Letter XI	
Letter N:	" " XII	
Letter O:	" " XIII	
Letter P:	" " XIV July 30, 1789	
	Compilation of (i) XVIII, "Remarks" p.2, p.72 (ii) XIX, "Remarks"	
Letter Q:	Hamilton's Letter XV	
Letter R:	" " XX	
Letter S:	" " XXI	

TABLE SHOWING HAMILTON'S ARRANGEMENT OF REID'S LETTERS TO GREGORY GIVING NUMBERING, DATE, PLACE, AND HIS SYNOPSIS OF THEIR CONTENTS.

Number, Date and Place			Hamilton's synopsis of letter contents
I	April 7, 1783,	Glasgow College	-
II	June 8, 1783,	" "	-
III	Mar. 14, 1784,	-	-
IV	1784,	Glasgow College	-
V	Dec. 31, 1784,	" "	ON THE MEANING OF NOTION
VI	May 2, 1785,	" "	
VII	June 14, 1785	-	MEANINGS OF CAUSE - MOTIVE - LAW OF NATURE
VIII	Sept. 1785,	Glasgow	MEANING OF CAUSE
IX	(March 1786)	-	ON CAUSE AND EFFECT - MOTIVE AND ACTION
X	Aug. 24, 1787	-	-
XI	Aug. 26, 1787	-	ON THE ORIGIN, PROGRESS AND THEORY OF LANGUAGE
XII	(1788)	-	-
XIII	Sept. 5, 1788,	Glasgow	ON USURY
XIV	July 30, 1789	-	CAUSE - PHYSICAL CAUSE - LAWS OF NATURE - AGENT - POWER AND ACTIVITY
XV	N.D.		ARISTOTELIC SPECIES OR CAUSES - ORIGIN OF NOTIONS OF CAUSE AND POWER - WHAT ESSENTIAL TO THE NATURE OF CAUSE - DISTINCTION OF PHYSICAL AND METAPHYSICAL CAUSES.
XVI	N.D.		ON CAUSE - OBJECTS OF GEOMETRY - POWER - AGENCY, & E.
XVII	N.D.		AN AMBIGUITY OF HUME - MEANINGS OF WILL AND VOLITION - POWER
XVIII	N.D.		ON THE TERMS, PHILOSOPHICAL NECESSITY AND NECESSITARIAN ON DETERMINATION BY STRONGEST MOTIVE - REPROACH OF MALAFIDES - CONSCIOUSNESS OF LIBERTY - ARGUMENTUM PILGRUM, &c - IN A PAPER ENTITLED -

XIX	N.D.	ON VULGAR NOTION OF NECESSARY CONNECTION INADVERTENCY OF HUME - REID'S REFUTATION OF IDEAS - REID'S USE OF THE WORD CAUSE INERTIA, PASSIVITY, STATE OF MIND - AND SUNDRY OBSERVATIONS ON THE NECESSITARIAN CONTRO-VERY - IN A PAPER ENTITLED
XX	1793	ON A NOVAL USE OF THE WORD MOTIVE - CAUSALITY OF MOTIVES &c.
XXI	N.D.	(The following letter to Dr. Gregory is quoted by Mr. Stewart in his "Dissertation of the Progress of Metaphysical and Moral Science". The date is not given; and the original is not now extant among the letters of Reid in the hands of Dr. Gregory's family)

REFERENCES TO APPENDIX III

1. Reid, Works, 39.

2. Ibid., 34. Hamilton noted that this letter should properly find its place with Letter IV, 1784.

3. Ibid., 76, Hamilton's footnote to Letter XVI.

4. Ibid., 80-82.

5. Activity 3, 30.

6. An example of the former occurred in the continuation of "Note A", Power, opposite pages 77-79. Gregory used the same locution, stating "I have found that some persons whose judgement [and] knowledge I have the greatest respect, are not satisfied with this reasoning". This was a direct response to Reid's comments on the same note (see Letter XVIII, section on "Power", Works, 80.)

7. It is likely that Reid's criticisms under the heading "Of the notion of instrument" (Works, 79) referred to a passage in Power, 66-67, which Gregory subsequently omitted. If the pagination of Power is examined, the text elides from page 65 to 68. Reid used the heading "instrument" because the discussion in Power referred to the question of the action of mind upon body, considered as its "instrument".

8. See appendix 1 for precise dating.

9. Reid, Works, 65.

10. Ibid., 67.

11. Ibid., 82.

12. Introduction, cclvii - cclviii.

13. Reid, Works, 79.

14. Introduction, cclxiii - iv. This date coincides with Reid's receipt of the book.

15. See James Gregory, New College Library, TQM4 Gre.3.

16. Introduction, cccxxxi.

17. Although they appear not to have survived in the Birkwood Collection of Reid's papers, or in the recent rediscovery of more of Reid's papers, Hamilton noted several others written by Reid in connection with Gregory's Essay (Works, 88). These were:

    (i) "Remarks on three sets of objections by a distinguished natural philosopher to Dr. Gregory's Essay in the years 1786, 1789 and 1790."

(ii) "Remarks on the objections to Dr. Gregory's Essay which were printed in the appendix to that essay"

(iii) "Remarks on a pamphlet entitled Illustrations of liberty and necessity in answer to Dr. Gregory, published in 1795."

(ii) and (iii) refer to the "Objections" and Allen's criticisms; (i) is unidentified. Could it have been John Robison?

APPENDIX IV : THE CIRCULATION AND RECEPTION OF GREGORY'S ESSAY

Gregory's Essay has received very little attention from contemporary scholars.[1] However, this was not the case among Gregory's contemporaries. It was widely circulated and actually precipitated considerable controversy in the period from the late 1780s until the early 1900s. Even by the time Hamilton edited Reid's Works, he could still speak of Gregory's "distinguished talent", and express regret that his Answer was never published. From comments made in Gregory's works and various other sources, the circumstances surrounding the reception of the Essay can be stated in some detail.

The various stages of production of Gregory's Essay have been noted in Appendix III. After communicating the plan of it in June 1785, Reid commented on a lost draft in March 1786; finally he received the published Essay without the Introduction and Appendix in July 1789. Between this time and its eventual publication as the Philosophical and Literary Essays in 1792, Gregory circulated it to some thirty people familiar with scientific research, mathematics or metaphysics.[2] He invited them to give him their comments and undertook to publish any objections they might have. Gregory stated they included both libertarians and necessitarians, and that several gave him replies viva voce and in writing. However, only one allowed his written objections to be published, and these Gregory included in the Appendix of his work.[3] This person chose to remain anonymous, although Gregory described him as a "metaphysician".[4] Gregory, it appears, considered the reply unworthy of publication. In order not to be seen to go back on his offer of publication, he asked two referees to give their opinion of it. Gregory described these men as friends and wholly familiar with his arguments. One had given Gregory two lists of chiefly mathematical objections; the other an "imagined falsification". The former Gregory described as "a metaphysician as well as a mathematician"; the latter as a "simple mathematician". However, Gregory noted that both men sent him testimonials approving of the published objections, and stating further objections to Gregory's Essay.[5] Gregory described the former as "a great admirer of Mr. Hume". He also used the term "metaphysico-mathematico-philosopher"; this expression occurs in the Introductory essay to characterise those:

> who disbelieved the existence not only of geometrical figures but of everything else, and had even great doubts about their own existence, had yet no doubt of the validity of mathematical demonstration, and were very certain that they themselves, whether they existed or not, firmly believed it.[6]

Gregory unfortunately never named these men, nor have their testimonials or remarks survived.

Of the others who saw Gregory's Essay, Daniel Rutherford, Professor of Botany, was explicitly mentioned.[7] Gregory also referred to Professor Thomas Gordon, Principal of King's College Aberdeen,[8] and Dr. Campbell, Principal of Marischal.[9] With the exception of the latter, Gregory mentioned no other Scottish necessitarians by name. The only other evidence for other Scottish readers of the Essay was a statement by Gregory that he sent the Essay to the only Edinburgh woman whom he thought would either be interested in it or understand it. She subsequently sent it to a Church of Scotland minister, who also sent Gregory objections, and then acquiesced upon Gregory's subsequent reply. Later, this gentleman took part in the debate with Crombie.[10]

Despite the aura of total or partial anonymity surrounding those to whom the Essay was sent, three sorts of circumstantial evidence help to clarify who they were. Firstly, the fact that it was sent to thirty metaphysicians, philosophers and scientists. If this number is correct, it must mean that Gregory circulated it to most of the scientific literati in Edinburgh. Secondly, Gregory's Project was well known to the fellows and officers of the Royal Society of Edinburgh. As well as being the most regular performer in the Literary Class from its foundation until 1790, Gregory was also one of the secretaries of the Physical Class. Given the association between the Project and the Royal Society of Edinburgh, it is likely Gregory circulated his Essay to many of its fellows. Thirdly, Gregory was educated and subsequently became a professor at Edinburgh University. He was taught by Cullen, Black, Hope, and Alexander Monro secundus. He was a friend and colleague of Stewart, Rutherford, and Playfair. It is probable that most, if not all, of the above were presented with copies of Gregory's work. Also, given Gregory's literary contacts such as Henry MacKenzie, it is very possible that men such as Robertson, Dalzel and Blair also saw it.

During the mid 1780s until the mid 90s, the common institutional focus of virtually all of these various scientific friends, contacts and colleagues was the newly-formed Royal Society of Edinburgh.[11] Robison was the secretary during this period. Gregory's medical teachers, Cullen, Monro, Hope and Black dominated the early presidency of the Physical Class. Other professors made up the majority of the elected counsellors, or were secretaries such as Playfair and Walker, who succeeded Gregory when the latter became a counsellor. In the Literary Class, Robertson and Blair were constantly re-elected as presidents, while Alexander Fraser Tytler and Dalzel, Professor of Greek at Edinburgh, were its secretaries. When office-holding professors such as Hope and Cullen died during this period, they were replaced by a re-arrangement of existing incumbents. Non-professorial office holders with scientific interests included Hutton and Benjamin Bell. As the probable author of the "Objections", Hutton played an important role in the reception of Gregory's <u>Essay</u>. Bell was a surgeon and Gregory's colleague at the Infirmary. Also, Adam Smith, who also died during this period, was made a president of the Literary Class for a brief period during this time.[12]

Drawing these factors together, the following list are likely recipients of Gregory's <u>Essay</u>. The thirty metaphysicians, mathematicians and scientists almost certainly included Robison, Playfair, Stewart, Hutton, Rutherford, Walker, Black and Home. As the <u>Essay</u> was circulated in 1789, Cullen and Smith, as surviving members of Hume's circle, probably received copies before they died. Also, it is possible that A.F. Tytler, Dalzel, Robertson, Blair, Smellie, Meadowbank, Bell, MacKenzie, Fergusson and perhaps John Bruce, Professor of Logic and F.R.S.E., were included.

The rest of the number mentioned by Gregory can be made up as follows. Gregory mentioned Gordon, and Campbell from Aberdeen. Given his family connections it is likely that men such as Beattie, Gerrard, Dunbar, Skene, Copland and Scott were either presented with or received "passed-on" copies. Also, Reid's contacts with Glasgow probably embraced men such as John Anderson, James Williamson. Again, many of these men were F.R.S.E.

The only university not mentioned so far is St. Andrew's, where Gregory had no obvious contacts, except perhaps John Hunter, Professor of Humanity, and once Monboddo's amanuensis. The overall picture is one of an inter-connecting professorial elite in Scotland, centred upon the Royal Society of Edinburgh, which Gregory, through birth, education, profession and personal contacts had an almost unique and widespread access to.

The only information on Gregory's non-Scottish correspondents and discussants concerns Priestley, Cooper and Price. In the Introduction Gregory noted that he sent copies to Price and Priestley with accompanying letters in Midsummer 1789, shortly after it was printed. Price, according to Gregory, acquiesced in the demonstration. However, Priestley stated in a letter that he had delegated the invitation to reply to Cooper. However, Gregory received no further communication from the latter. As a result, Gregory wrote again to Priestley shortly before the Essay was published, and in the Introduction he included a full account of these circumstances, reprinting his letter and Priestley's subsequent reply.[13] Gregory accused Priestley and Cooper of mala fides because of their conduct towards him.

These then are the circumstances surrounding the circulation of Gregory's Essay. To summarise, Gregory sent it to Edinburgh's scientific and literary elite. Via Reid he sent it to other members of the Scottish professoriate at Aberdeen, and probably Glasgow and St. Andrews. He also distributed it to Priestley and hence, to other members of the English dissenting community. We also know that it reached at least one expatriot member of the Church of Scotland in England. In many ways, these details epitomise the social transmission of metaphysical ideas during this period. Through societies, through discussions, through letters and through publications, metaphysical ideas were canvassed, transmitted and popularised. Taken as a whole, these processes make up the social intelligence system underlying metaphysical discourse.

A number of written responses to Gregory's Essay have survived. It is impossible to state what proportion they represent of the total replies Gregory received. They include the following:

(i) Comments found in Reid's "Letters to Gregory".

(ii) Comments in Bishop Gleig's article, "Metaphysics", in the Encyclopaedia Britannica, 3rd ed., 18 vols. (Edinburgh, 1797).
Vol. 11, part 3, Ch.5, "Of liberty and necessity", 594-98.

(iii) Comments by Alexander Crombie. These were contained in his Essay on philosophical necessity (London, 1793), Ch.3, "Dr. Gregory's essay in defence of philosophical liberty answered".

(iv) Comments by John Allen in his Illustrations of Mr. Hume's Essay concerning liberty and necessity in answer to Dr. Gregory of Edinburgh (London, 1795). This appeared anonymously by "a Necessitarian".

(v) Comments by the anonymous author of the "Objections" to the Essay included in the Appendix and probably by James Hutton. (See Appendix V).

(vi) Comments by James Hutton in his An Investigation of the principles of knowledge and the progress of reason from sense to science and philosophy, 3 vols. (Edinburgh, 1794), vol. 1, Preface, passim; vol.3, 215-20.

Of Gregory's replies, we have:

(i) Comments found in An Answer to Messrs Crombie, Priestley and Co. (unpublished).

(ii) Comments exchanged between Gregory and Crombie in Letters from Dr. James Gregory with replies by Alexander Crombie LL.D. (London, 1819). Despite the publication date, the letters were actually written much earlier.

(iii) Comments in the Appendix referring to the "Observations".

REFERENCES TO APPENDIX IV

1. One exception to this is Richard Olson, Scottish philosophy and British physics (Princeton, 1975) 83-84. However there are several inaccuracies in his brief treatment. For example, Olson views Reid as a complete opponent of Gregory's Essay and gives a supporting quotation from one of Reid's letters, discussing the status of mathematical objects (Works, 72). However, this remark actually referred to a passage in Gregory's early Introductory Essay 86-89, and not the Essay itself. Similarly, Olson equates Gregory with Hutcheson because both tried to put moral philosophy upon a firm scientific foundation. Rather, as I show in chapter six, Gregory was concerned to show that necessitarian arguments could not be put upon such a foundation. His own proof was indirect.

2. Introduction, cclx.

3. Appendix, 468-82, and consisting of 16 numbered objections.

4. Introduction, clxi.

5. Ibid., clxviii.

6. Introductory essay, 89.

7. Answer, 122.

8. Ibid., 336.

9. Letters, 405; Answer,336-40.

10. See Answer, 458-72, where Gregory reprinted the clergyman's letter to the lady, attacking Crombie.

11. On the founding of the Royal Society of Edinburgh see Steven Shapin "Property patronage and the politics of science: the founding of the Royal Society of Edinburgh", The British journal for the history of science, 7 (1974), 1-41. Also his The Royal Society of Edinburgh: a study of the social context of Hannovarian science (Ph.D. thesis, University of Pennsylvania, 1971), chapters 5-8, 170-330.

12. On the office holders of the society see Transactions of the Royal Society of Edinburgh 1 (1788), 98-100; ibid., 2 (1790), 34-36; ibid., 3 (1794), 27-28; ibid., 4 (1798), 31-32. Shapin has noted that several of the nobility and legal lords had amateur scientific interests like Kames. Also, some of these men were elected to offices in the society. However, it is not clear what role such men played. Allan Maconochie, Lord Meadowbank, one of the founders of the Speculative Society would be a case in point. However, because of a lack of information about such men, I have excluded them fron considera-tion in reconstructing the catchment for Gregory's Essay. See the standard Scottish and national biographical sources for other names mentioned in this appendix.

13. Introduction, cclxvi-cclxxxv.

APPENDIX V: THE TEXT OF THE PUBLISHED "OBJECTIONS" AGAINST GREGORY'S ESSAY

1. I believe the doctrine of the Necessitarians is, That human actions, or the acts of the will which prompt them, depend as much as any other events on causes; and that these causes are to be found in the nature of mind, and in those perceptions, sentiments and opinions, which arise in it.

2. The physical constitution of the mind, on which its existence and the performance of its operations, depend, must naturally be supposed to contain the proper physical cause or causes of the acts of the will as well as of every other mental operation: For I think we cannot conceive a change to take place in any substance, without supposing that there is a physical cause for it in the nature of the substance. But this constitution we have no faculties for examining. The perceptible operations of the mind, however, or the processes of thought which attend on volition, may be considered as exciting causes of the acts of the will. If there is any thing contingent in these processes of thought, or if the acts of the will are not constantly conjoined with them, it is evident that however constantly conjoined the acts of the will be with their proper physical cause, if that physical cause is only attended with its effect when stimulated by something contingent, the doctrine of the Necessitarians must be erroneous. If, on the other hand, processes or trains of thought are constantly conjoined with the acts of the will, and there is nothing contingent in those trains of thought, it appears to me, that the doctrine of the Necessitarians must be well founded; as, in that case, the relation of constant conjunction must take place between the acts of the will and trains of thought which invariably precede them.

3. It has been hitherto thought by the Necessitarians, that every volition is very obviously the result of a train of thought; and that the relation of constant conjunction is very perceptible in such trains of thought, at least as far as it is necessary to

trace back the steps of them. I understand the object of the Essay is, to show, in the following manner, that absurdities result from this hypothesis. The doctrine of the Necessitarians is supposed to be, That of every apprehension and desire of attainable good, or in the language of the Essay every motive, is attended with an influence on the will, commensurate to the intensity of such desire; and then, by having recourse to the known laws of physics, it is proved that instead of the human actions which do happen, other the most absurd and extravagant would necessarily result from the opposite and combined effects of certain and such motives.

4. But if it can be shown, that, according to the doctrine of the Necessitarians, the will is not, and need not be, exposed to such combinations or oppositions of influences, it seems to me to follow, that the argument in the Essay fails in its foundation.

5. The Necessitarians maintain, That the will is invariably determined by the judgement of the understanding, or the last step in the train of thought previous to volition; and that this judgement is involuntary; and that no apprehension and desire of attainable good has any influence on the will, till the understanding decides on its preference, or on the expediency of attempting the pursuit of it. It is therefore a mistake to have supposed, that, according to the Necessitarians, every apprehension and desire of attainable good had a determinate influence on the will. I believe there is no Necessitarian that would require any demonstration or argument to be convinced, that such sentiments occur every day without producing any effect whatever on the will; and that accordingly there is no constant conjunction between them and human actions.

6. Again, I believe it will not admit of dispute, that the decisions of the understanding are involuntary. It seems to be admitted in the Essay, that belief, which is a judgement of the truth or falsehood of a proposition, or of an event is

involuntary; and I can see no reason for doubting, that an opinion of what is preferable, or otherwise, is equally involuntary. The former kind of judgements is indeed more uniform and steady than the latter, which varies according to the state of a person's health, or other circumstances; but there is no reason for esteeming them to be less involuntary than the former.

7. Neither will it admit of dispute, that a judgement will never be pronounced by a person in health, in favour of two pursuits at one and the same time, that are incompatible, or admit only of combinations which are inconsistent with each severally.

8. Unless, therefore, the Necessitarians are under the necessity of admitting, that the involuntary judgement of the understanding is contingent, or proceeds upon a train of thought, some step of which is contingent, the Essay seems to fail in its object; since, according to the Necessitarians, the act of the will depends on an operation of the understanding which is itself involuntary, and excludes all those absurd combinations of influence alluded to in No. 3.

9. The question, therefore, turns on the nature of the operations of the understanding. If the Necessitarians must yield, that every apprehension and desire of attainable good must have an influence on the understanding, in a manner perfectly similar to that of forces in physics, in order to be intitled to maintain, that its operations proceed by immutable laws; and that the relation of constant conjunction takes place among them, the substance of the argument in the Essay would, I think, still remain solid, not withstanding what has been remarked. It appears, however, to me very clear, that the laws of the operations of the understanding are immutable; that the relation of constant conjunction is universally acknowledged by mankind to take place among these operations; and that the influence of our desires for attainable good on the decisions of the understanding, respecting the pursuit of them, though as certain and, strictly speaking, uniform as that of forces in physics, is subject to extremely different laws.

10. I imagine all men will acknowledge that a person will form exactly the same judgement today, for instance, that he did a twelvemonth ago, if he is circumstances in precisely the same situation, viz. having perceptions, appetites, expectations, and discernment, perfectly similar to those which he then possessed; and it does not appear to me possible that this persuasion can be otherwise accounted for than from a belief, founded in consciousness, of the immutability of the laws of the operations of the understanding, and of one of those laws being constant conjunction in the steps of the trains of thought which precede the judgements of the understanding: so that we are sure that similar effects will always result from similar causes in the mind, as well as elsewhere; or, if a different mode of expression is preferred, that familiar effects will ensue in the mind from similar preceding circumstances. We cannot, as I believe an able writer has observed, trace back the rout of the die in the dice box, or the train of causes and effects by which a particular face of it comes at last to cast up; but we have no doubt of the constant conjunction of the whole from the first impulse it receives, till it settles on the table; and I think we have as little doubt of the same relation pervading the trains of thought that issue in judgements of the understanding; though these trains are too fleeting and various, and the memory too imperfect a faculty, to admit often of our tracing them back with accuracy.

11. The total want of analogy between the influence of our appetites upon the judgement and of forces in physics, appears also to me to be so striking, that it is scarcely requisite to make any remarks upon it. The desire of earning a guinea by going a mile westward, can no more combine with a desire to gain half a guinea by travelling a mile southward, in forming a judgement, than it would be eligible to travel a mile in the diagonal south-westward, than physical forces applied to make a ball move with different directions south and north, could combine of themselves to make it move to one of these points. The intelligence of the mind renders the combination

impossible. At the same time, no man can say but that he is as certain that the porter, if there is no other appetite in the case, will decide upon the preference of travelling the mile westward for the guinea, as that a ball impelled by equal forces southward and westward will move south-westward. If it is asked, What becomes of the effects of the appetite for the half guinea? I answer, That it has had all the effects that by the immutable laws of the understanding it was filled to have. It was felt, observed, its inferiority to a desire, the gratification of which was incompatible with it perceived, that gratification judged preferable to it accordingly; and it then probably ceased to exist and was forgotten. It is not every train of thought that is constantly conjoined with volition, though volition be constantly conjoined with a previous train of thought; nor is it requisite that every train of thought that might terminate in volition must be prevented from doing so by a spontaneous exertion of a supposed self-governing power: for, independently of these judgements which I have said involuntarily put a period to them, or at least to our attention to them, we know that any one of a thousand external circumstances may occur, and either contrary or agreeable to our inclination, monopolise our attention so completely as at once to put an end to any of those trains of thought that formerly engaged us, and might have terminated in action. After turning the subject every way in my mind, I cannot discover the smallest use for a supposition, that self-governing power was necessary to enable the understanding, possessed as it is of intelligence for perceiving the incompatibility of two pursuits, to judge the one eligible, without absurdly combining it with the other. The sufficiency of the understanding for this operation, seems to be the natural result of its intelligence, which differences that faculty so infinitely from every thing that is exposed to the influence of physical force; and surely it is not meant in the Essay to prove, that intelligence cannot be subject to the relation of constant conjunction.

12. It is said in the Essay "That the action is not always being proportioned to the motive, or corresponding to it in point of quantity, is equally inconsistent with the principle of constant conjunction, and with the supposition of mere chance, or the want of power in the being who acts to allow or to prevent the full effect of the motive". This appears to me to be a mistake. Even in physics, an effect may be constantly conjoined with a circumstance, which is in one sense its cause without being the measure of it. The explosion of a mine of gunpowder cannot measure the quantity of fire that kindled it. The malignity of the small pox is no measure of the quantity or quality of the contagious matter employed to give the disease. The contraction of a muscle is no measure of the stimulus applied to produce it. Human actions do not admit of degrees that bear proportions to the degrees of our appetites. I need not make any remarks on the latter part of the passage. I think the involuntary opinion of the understanding always has it full effect on the will.

13. I could have wished that the Essay had contained something more detailed with respect to that self-governing power the existence of which it is the object of it to establish. The terms <u>option</u> and <u>discretion</u>, which are attributed to this power when acting, as is supposed it often does, without motives, or in opposition to motives, or in opposition to some, and in favour of others, and the character ascribed to it, of being vanquished by appetites or feelings of a certain intensity, leave the reader very much at a loss what to understand by it, and how to discriminate its functions from those of the understanding. One should be apt to think, from some of these terms, that it was a faculty which decided according to reason and argument; and from the last circumstance, its yielding to feelings of certain intensity, that combinations of these feelings would, according to the doctrine of the Essay, frequently, or at least sometimes, lay men under the necessity of performing actions as absurd as those which are supposed to be the result of the doctrine of the necessitarians.

14. I have no occasion in these remarks to concern myself with the fact, which possibly may prove to be important, and which I think the Essay establishes, that the relation between cause and effect is different from that between motive and action. It is sufficient for my argument if a relation subsists between what is involuntary in the train of thought in the mind and the acts of the will, as constant and as certain as that of cause and effect".

15. I also acknowledge, that ever since I first studied pneumatology, I have been persuaded, that we truly possess a notion of power derived from the consciousness of our mental efforts; at the same time I must think that these efforts, or the faculty that makes them, are in general under the direction of the understanding, which again is under the necessity of examining what is suggested for its consideration, and of forming an opinion as to what pursuits appear at the moment most conducive to our happiness.

16. I shall only further observe, that though I may have been unsuccessful in pointing out any defect in the argument in the Essay, my remaining unconvinced by it is some ground for suspicion against it since I can discover nothing in my situation or sentiments that should lead me to suspect I had imbibed any invincible prejudice against it; and if it solid, I should think, - that, notwithstanding any degree of prejudice, it ought to produce infallibly the same degree and facility of conviction that results from a theorem in geometry. I confess also, it seems to me very clear, that if the acts of the will are not determined by the judgements of the understanding, but by a self-governing power, which may act, and if I recollect right, is supposed to often act without motives, and in opposition to all motives, the human race, instead of being moral agents, would sometimes at least be more disorderly than any madmen; their manners could be regulated with any degree of certainty by no laws; the prescience of God Almighty could not trace their actions; and even his omnipotence, unless he altered their nature, could do nothing more for them than

make a vast bedlam to contain them. I do not assert, that these consequences, even though proved to be just, can impeach the validity of a demonstration; but, on the other hand, I must think, that the apprehension of such consequences is sufficient to justify a suspicion, that there lurks some inaccuracy in it.

(See Appendix 467-82)