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A REEXAMINATION OF THE INCEPTION, DEVELOPMENT, AND "NEWTONIANISM" OF DAVID HARTLEY'S "OBSERVATIONS ON MAN"

The University of Oklahoma PH.D. 1981

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THE UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

A REEXAMINATION OF THE INCEPTION, DEVELOPMENT, AND "NEWTONIANISM" OF DAVID HARTLEY'S <u>OBSERVATIONS ON MAN</u>

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

DOCTOR OF PHILOSOPHY

BY

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Norman, Oklahoma

1981

A REEXAMINATION OF THE INCEPTION, DEVELOPMENT, AND

"NEWTONIANISM" OF DAVID HARTLEY'S

<u>OBSERVATIONS ON MAN</u>

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DISSERTATION COMMITTEE

To my Dad,
in loving memory,
and to
Mom, Alan, and Deana,
who are just as dear.

_Qu_. 23. Is not Vision perform'd chiefly by the Vibrations of this [aetherial] Medium, excited in the bottom of the eye by the Rays of Light, and propagated through the solid, pellucid and uniform Capillamenta of the optick Nerves into the place of Sensation? And is not Hearing perform'd by the Vibrations either of this or some other Medium, excited in the auditory Nerves by the Tremors of the Air, and propagated through the solid, pellucid and uniform Capillamenta of those Nerves into the place of Sensation? And so of the other Senses.

_Qu_. 24. Is not Animal Motion perform'd by the Vibrations of this Medium, excited in the Brain by the power of the Will, and propagated from thence through the solid, pellucid and uniform Capillamenta of the Nerves into the Muscles, for contracting and dilating them?

--Query 23 and Query 24,
Sir Isaac Newton,
Opticks (1704)

Every hypothesis or speculation of Newton's constituted a challenge to the men of the eighteenth century. . . . The scientists in the "age of Newton" could seek progress in realms in which Newton was not sure of himself or in which new experimental data were needed, and in those areas which Newton himself had not studied at all or which he had not been able to investigate fully.

--I. Bernard Cohen,
Franklin and Newton,
127.

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PREFACE

When I chose the subject of this dissertation several years ago, little recent work had been done on David Hartley. After I began my study, I became aware of the complexity of his thought, and at the same time new treatments of different aspects of his theory began appearing. During the course of my research, my view of Hartley began to resemble a jig-saw puzzle: Hartley the Christian apologetic, Hartley the physician, Hartley the natural philosopher, and Hartley the psychologist badly needed fitting together. This I have attempted in Chapter I; Chapters II and IV treat in more detail the relationships between several of these aspects of Hartley's life and work. Chapter III contains an analysis and description of Hartley's physiological psychology that forms a necessary preliminary to Chapter IV. Consequently, the reader who is thoroughly familiar with Hartley's theory itself may wish to move directly from Chapter II to Chapter IV of my study.

Much of the source material upon which this study is based previously existed only in unpublished form and appears here in print for the first time. The Halifax Public Library, the Berkshire County Record Office, and the British Museum have generously supplied primary source materials, excerpts from which are included below. In presenting the text of these documents, and all other sources as well, I have chosen to retain the original abbreviations, spelling, capitalization, punctuation, and so forth, rather than to modernize them. However, I have not followed these old forms with the cumbersome and ever-present _sic_, except where the sense of the excerpt is confusing in its original state. In including the text of correspondence which appears to be early drafts of letters, I have presented the final revision of the text, without indicating strike-outs. Furthermore, since some of the correspondence exists today only in shorthand notation, I have presented excerpts from my transcriptions in the text and have indicated in the corresponding footnote that the original is in shorthand.

During my research and writing, particularly of Chapter IV, the word _Newtonian_ became problematic because of its ambiguity. In order to eliminate probable misunderstanding, I have therefore employed the following typographical devices to clarify its specific meaning in each instance of use: _"Newtonian"_ indicates the source lies in either Newton's own work and/or that of his followers, while _Newtonian_ indicates the source is only in the work of Newton's followers. _Newton's_, rather than some variant of _Newtonian_, is employed to refer to Newton's own work and thought.

I have benefitted from the help of many people while in graduate school at the University of Oklahoma and while completing this dissertation there and elsewhere. I would like to thank my parents and family for their endless personal and financial support and also the Department of the History of Science at the University of Oklahoma, who provided financial assistance by awarding me an NDEA Title IV Fellowship and, later, a Graduate Assistantship. Robert A. Nye (Associate Professor of History, University of Oklahoma), Thomas M. Smith (Professor of the

History of Science, University of Oklahoma), William M. Sudduth (Director of the North Carolina Museum of Life and Science), Allen M. Ward (Professor of History, University of Connecticut), and Steven C. Hardy have provided extensive comments on the text from which I have profited. Robert M. Schofield (Professor of History of Technology and Science, Iowa State University) allowed me access to manuscript portions of his recently published biography of Stephen Hales. I owe a great debt to Marilyn Bailey Ogilvie (Assistant Professor of Natural Science, Oklahoma Baptist University) and the graduate students in History of Science at the University of Oklahoma for their personal support and encouragement. Finally, I could not have produced this dissertation if Duane H. D. Roller (McCasland Professor of the History of Science and Curator of the History of Science Collections, University of Oklahoma) and Marcia M. Goodman (Librarian of the History of Science and Rare Book Collections and Assistant Professor of Bibliography, University of Oklahoma) had not created in the History of Science Collections at the University of Oklahoma an environment conducive to scholarly research, if my major professor Kenneth L. Taylor (Associate Professor of the History of Science and Chairman of the Department of the History of Science, University of Oklahoma) had not always given me prompt and constructive criticism and direction, or if Ingrid Poole Shafer (Assistant Professor of Philosophy and Religion, University of Science and Arts of Oklahoma) had not directed me into the study of the history of science in the first place.

A REEXAMINATION OF THE INCEPTION, DEVELOPMENT, AND "NEWTONIANISM" OF DAVID HARTLEY'S OBSERVATIONS ON MAN

INTRODUCTION

When a man makes a descriptive or explanatory statement, he has two fundamental options concerning the content of that statement: He can describe or explain something external to himself, or he can describe or explain something internal. Historically, man's formal attempts to describe or explain the external world predate by centuries his formal attempts to describe or explain the internal, psychic world. That is, natural philosophy, or science, historically predates psychology. In one sense, however, natural philosophy and psychology originated simultaneously because man always informally reveals aspects of his view of himself in his statements about his relationship to the physical world.

Statements men have made in the past describing their views of man's relationship to the physical world may be divided into three qualitatively different groups. Into the first group fall those statements reflecting a view of the physical world as an extension of the human psychic world. Men, such as Empedocles (fl. ca. 450 B.C.), who held this point of view explained natural phenomena as the result of universal forces, such as "Love" and "Strife," analogous to their own human passions. Or, like the ancient Babylonians, they explained natural phenomena as produced and directly controlled by a deity or deities who possessed mental attributes, passions, and whims similar to their own. Men holding this point of view described the external world in terms of the internal psychic world with which they had a native familiarity.

The second group of statements exhibit a point of view according to which there is no similarity between natural and psychic phenomena. As described by Plato (427-347 B.C.) and René du Perron Descartes (1596-1650), there is a complete duality between the human mind and the external world; therefore, neither can ultimately be described in terms of the other. Consistent with this point of view, men have not described natural phenomena as the result of causes analogous to human or theistic passion, nor have they described events of the mind in terms of physical forces. Since events of mind are viewed as qualitatively different from natural phenomena, their explanation is to be sought in non-physical, non-mechanical causes.

Historically, as this second point of view flourished and came into dominance in the seventeenth century, occult powers were banished from the study of nature and the human body. But since the human mind was regarded as outside the domain of natural philosophy, it remained acceptable to account for the phenomena of mind by reference to unexplainable 'mental powers.'[1]

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[1]Theodore Mischel, "'Emotion' and 'Motivation' in the Development of English Psychology: D. Hartley, James Mill, A. Bain," Journal

The third group of statements describing man's relationship to the physical world contains statements which are essentially reversals of those in the first group. Instead of viewing the physical world as accountable in terms of their own or analogous psychic qualities, men who made statements falling into this third group explained themselves in the same terms currently used to explain natural phenomena. This point of view was espoused by the early Greek atomist Democritus of Abdera (fl. ca. 430 B.C.) and was revived in the early seventeenth century. As this point of view gained ascendancy in modern times, philosophers banished the 'occult forces' of the first and second points of view from their study of mind in the same way they had earlier banished them from the study of nature. As many historians have noted, this methodological shift occurred when philosophers, such as the heretical materialist Thomas Hobbes (1588-1679), extended the concepts and methods used in contemporary natural philosophy to their description of the operation of the human mind.[2]

This point of view became more acceptable in the eighteenth century, particularly due to the influence of the disciple of Sir Isaac

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of the History of the Behavioral Sciences, II (1966), 123; hereinafter referred to as Mischel, "Emotion and Motivation."

[2]For a discussion of Hobbes and Descartes' application of the concept of mechanism to psychology in the seventeenth century, see Richard Lowry, "Galilean and Newtonian Influences on Psychological Thought," The American Journal of Psychology, LXXXII (1969), 393 (hereinafter referred to as Lowry, "Galilean and Newtonian Influences"); also see Joan Woodworth Walls ("The Application of the Root Metaphor of Mechanism in the Psychology of David Hartley" (unpublished Ph.D. dissertation, University of North Carolina, Chapel Hill, 1975); hereinafter referred to as Walls, "Mechanism") for an account of the impact of the new mechanical world view produced during the Scientific Revolution upon the psychology of Hobbes, John Locke, and David Hartley.

Newton (1642-1727), John Locke (1632-1704), who challenged the point of view described in group two above. Locke postulated the unity of, rather than a duality between, man and nature. He viewed man as subject to natural law and believed that, just as we can have a science of nature, we can have analogous sciences of man and mind. These new sciences would incorporate the same or analogous concepts, proceed according to the same or similar methods, and possess the same goals as the obviously successful contemporary science of nature. More specifically, Locke transferred the concepts of corpuscular natural philosophy, the method of analysis, and the goal of the discovery of regular laws of nature to his study of the mind. The result was a view of mind as a miniature cosmos in which elemental particulate ideas interact and fuse together due to the regular and lawful action of external forces.[3]

The Psychology of David Hartley

One of the earliest philosophers to accept Locke's unification of man and nature, as well as his approach to and view of the mind was the English physician and theologian David Hartley (1705-1757). Hartley intended to become a member of the Anglican clergy; consequently, he principally studied divinity at Cambridge. He did, however, attend some lectures on mathematics and natural philosophy during which he was introduced to the works of Sir Isaac Newton. Hartley's circle of acquaintances there included several eminent theologians and Newtonian

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[3]Lowry, "Galilean and Newtonian Influences," 392; R. B. MacLeod, "Newtonian and Darwinian Conceptions of Man; and Some Alternatives," Journal of the History of the Behavioral Sciences, VI (1970), 207-210 (hereinafter referred to as MacLeod, "Conceptions of Man"); J. R. Kantor "Newton's Influence on the Development of Psychology," The Psychological Record, XX (1970), 89 (hereinafter referred to as Kantor, "Newton's Influence"); G. S. Rousseau, "Nerves, Spirits and Fibres: Towards

natural philosophers as well. Hartley abandoned his plans to enter the clergy, however, and left Cambridge to assume a teaching position. Soon afterwards he began to practice medicine. His practice took him to London, where he was accepted into a circle of notable theologians, physicians, and natural philosophers.[4] Throughout his life, Hartley remained intensely religious; in fact, his psychological work was begun primarily as a personal attempt to assess the reliability of human knowledge in order to resolve a conflict in Hartley's mind between reason and revelation, although his psychological theory later became grounded in physiology and natural philosophy.[5] Hartley published two separate treatises of importance in the history of psychology. The first, entitled Conjecturae quaedam de Sensu, Motu, & Idearum Generatione, was published in 1746 and is essentially a summary of the more exhaustive two-volume work, Observations on Man, His Frame, His Duty, and His Expectations, which appeared in 1749.[6] On the basis of the theory presented in these two works, its relationship to previous theories of the human mind, and its effect upon subsequent psychological thought, Hartley has been described as "perhaps the most inventive and certainly

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Defining the Origins of Sensibility," Studies in the Eighteenth Century: Papers Presented at the David Nichol Smith Memorial Seminar, III (1976), 138-142 and 150.

[4]See Chapter I below for more detailed biographical information.

[5]See Chapter II below for an account of the theological motivation behind Hartley's work and the development of his theory.

[6]David Hartley, De Lithontriptico a Joanna Stephens nuper invento Dissertatio Epistolaris . . . editio secunda. Cui Adjicitur Methodus exhibendi Lithontripticum sub formâ commodiore. Accedunt etiam Conjecturae quaedam de Sensu, Motu, & Idearum Generatione (Bathoniae: Typis T. Boddely . . ., 1746) (hereinafter referred to as Hartley, Conjecturae); David Hartley, Observations on Man, His Frame, His Duty, and His Expectations. In Two Parts (2 vols.; London: Printed by S. Richardson . . ., 1749) (hereinafter referred to as Hartley, Observations on Man).

. . . the most influential psychologist of the eighteenth century. . . ."[7] This evaluation is borne out by other secondary literature which has generally credited Hartley with three historically significant accomplishments: (1) the extension and systematization of the theory of association, (2) the establishment of a subtradition of physiological psychology within the general field of psychology, and/or (3) the early application of the concepts and methods of natural philosophy to the study of the human mind.

Hartley and Association

Although many psychologists and historians of pyschology have regarded David Hartley as the "father of association psychology,"[8] the concept of the association of ideas was not originated by Hartley.

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[7]Peter Gay, The Enlightenment: An Interpretation, Vol. II: The Science of Freedom (New York: Alfred A Knopf, 1969), 181; hereinafter referred to as Gay, Enlightenment.

[8]See the following treatments of Hartley's work: Edwin G. Boring, A History of Experimental Psychology (2nd ed.; New York: Appleton-Century-Crofts, Inc., 1950), 193-194 (hereinafter referred to as Boring, History of Psychology); George Spencer Bower, Hartley and James Mill, English Philosophers (London: Sampson Low, Marston, Searle & Rivington, 1881), 24 (hereinafter referred to as Bower, Hartley and Mill); R. S. Peters, ed., Brett's History of Psychology, The Muirhead Library of Philosophy (abr. and rev.; London: George Allen & Unwin Ltd, 1962), 450 (hereinafter referred to as Brett, History of Psychology); Barbara Bowen Oberg, "The Progress Toward the Perfection of Man: David Hartley and the Association of Ideas" (unpublished Ph.D. dissertation, University of California, Santa Barbara, 1973), 9-10 (hereinafter referred to as Oberg, "Progress Toward Perfection"); Bruno Schoenlank, Hartley and Priestley: Die Begründer des Associationismus in England (Halle A/S: Druck von Otto Hendel, 1882), 2; Walls, "Mechanism," 3 and 163; Howard C. Warren, A History of the Association Psychology (New York: Charles Scribner's Sons, 1921), 15 (hereinafter referred to as Warren, History of Association); Robert I. Watson, The Great Psychologists From Aristotle to Freud, The Lippincott College Psychology Series, ed. by Carl P. Duncan and Julius Wishner (2nd ed.; Philadelphia: J. B. Lippincott Company, 1968), 203 (hereinafter referred to as Watson, Great Psychologists).

Indeed it can be traced back as far as the writings of Aristotle.[9] Association reappeared in the early modern historical period as an epistemological tool,[10] soon to become "the central explanatory conception" in the study of mind, as a result of a general reaction to the Cartesian theory of innate ideas.[11] Numerous theories of association arose in the late seventeenth and early eighteenth centuries.[12] In Hobbes' Leviathan and Elements of Philosophy, association was a regular and natural process by which ideas are generated,[13] but it was not the central feature of Hobbes' epistemology.[14] Nor was it but incidental to the epistemology expounded by John Locke in the fourth edition of his An Essay concerning Humane Understanding. Locke identified reflection and association as the two processes involved in the generation of complex ideas, but of the two he considered association unnatural and responsible for distorted perceptions and madness.[15] In the eighteenth century, association was a "pervasive and popular" concept, and, although Hobbes' treatment of it was more extensive, Locke's theory was

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[9] Oberg, "Progress Toward Perfection," 9-10; Warren, History of Association, 23-49.

[10] Barbara Bowen Oberg, "David Hartley and the Association of Ideas," Journal of the History of Ideas, XXXVII (1976), 453; hereinafter referred to as Oberg, "Hartley and Association."

[11] Robert M. Young, "Association of Ideas," Dictionary of the History of Ideas, I (1973), 111-112; hereinafter referred to as Young, "Association."

[12] Oberg, "Progress Toward Perfection," 52.

[13] Ibid., 53.

[14] Oberg, "Hartley and Association," 453.

[15] Ibid.; Oberg, "Progress Toward Perfection," 9-10, 53, 97 note 2.

historically more influential,[16] primarily as a result of Hobbes' reputation as a materialist and atheist. Of the numerous eighteenth-century philosophers who accepted the concept of association prior to Hartley,[17] only Berkeley[18] and a "Rev. Mr. Gay"[19] appear to have directly influenced Hartley's theory.[20] In fact, it was Gay's work that initially

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[16] Oberg, "Progress Toward Perfection," 52-54; Walls, "Mechanism," 4.

[17] According to Oberg ("Progress Toward Perfection," 52), Joseph Addison (1672-1719), Francis Hutcheson (1694-1746), George Berkeley (1685-1753) and David Hume (1711-1776), for example, incorporated association into their philosophies.

[18] Whether Berkeley significantly influenced Hartley is debatable. Oberg ("Hartley and Association," 441 note 2) is of the opinion he did, but Walls ("Mechanism," 4) claimed, "There is no evidence that Hartley was greatly influenced by Berkeley. . . ." In the Observations on Man, Hartley cited Berkeley twice (I, 137 and 361), but the degree of Berkeley's influence upon Hartley merits further investigation.

[19] David Hartley, "The Preface," Observations on Man, I, v (hereinafter referred to as Hartley, "Preface," Observations on Man, I). The Rev. Gay to whom Hartley referred here is probably the John Gay (b. ca. 1699-1745) who was a fellow of Sidney Sussex College, Cambridge, from 1724 through 1732 and later vicar of Wilshampstead and Hawnes (see John Venn and J. A. Venn, comp., "Gay, John," Alumni Cantabrigienses, A Biographical List of all known Students, Graduates and Holders of Office at the University of Cambridge, from the Earliest Times to 1900, Part I: From the Earliest Times to 1751 (4 vols.; Cambridge: At the University Press, 1922-1927), II, 202).

[20] Although several historians have maintained that Hartley was aware of and influenced by the work of his contemporary David Hume (see, for instance, Louis Ferri, La psychologie de l'association depuis Hobbes jusqu'a nos jours (histoire et critique) (Paris: Librairie Germer Ballière et Cie, 1883), 36; J. R. Kantor, The Scientific Evolution of Psychology (Chicago, Illinois: The Principia Press, Inc., 1969), II, 222 (hereinafter referred to as Kantor, Evolution of Psychology); and Oberg, "Hartley and Association," 441 note 2), there is general agreement that Hartley was not directly influenced by Hume. Hartley does not refer to Hume by name at any place in the Observations on Man, even though he may have owned a copy of Hume's Philosophical Essays Concerning Human Understanding (London: Printed for A. Millar, 1748). "Hume's Essays (1748)" is listed in a catalogue of books purported to be of

motivated Hartley to study the process of association.[21] In his short "Preliminary Dissertation. [sic] Concerning the Fundamental Principle of Virtue or Morality,"[22] Gay extended the concept of association, previously confined to the explanation of the generation of ideas, to account for the differentiation of pleasure and pain, the generation of desire and aversion, the generation of moral codes, and the pursuit of action.[23]

Although Gay offered the first description of the generation of ideas, moral codes, and human action as a result of association and, thus, has been credited by some historians with having first coherently expressed the psychology of association,[24] David Hartley elaborated, extended and systematized the concept of association. Hartley was the first to explain all human experience, ideation, activity, and spirituality on the basis of association[25] and to present a law-like description

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Hartley's personal library, which is deposited at the Berkshire County Record Office, Royal County of Berkshire, Reading, Berkshire, England, Hartley-Russell Collection MSS, D/EHy F-55; this archive hereinafter referred to as the Hartley-Russell Collection MSS.

[21] Hartley, "Preface," Observations on Man, I, v. See Chapter II below for a discussion of Gay as a source of motivation and major influence upon Hartley.

[22] Gay's dissertation first appeared anonymously appended to Dr. William King, An Essay on the Origin of Evil . . ., [trans. by Edmund Law] (London: Printed for W. Thurlbourn . . ., 1731); hereinafter referred to as Gay, "Dissertation."

[23] See Chapter II below for a more detailed discussion of the content of Gay's "Dissertation."

[24] Young, "Association," 112; Oberg, "Progress Toward Perfection," 9-10.

[25] Brett, History of Psychology, 440; Oberg, "Progress Toward Perfection," 51 and 56; R. C. Oldfield and Lady Kathleen Oldfield, "Hartley's

of the mechanical operation of association.[26]

Some historians of psychology have attributed Hartley's influence on the subsequent development of psychology primarily to his elaboration, extension, and systematization of the concept of association.[27] They have maintained this aspect of his thought was particularly influential in the late eighteenth and nineteenth centuries and led to the creation of the modern school of association psychology.[28]

Hartley's Physiological Psychology

Discussions of the physiological aspects of Hartley's psychological theory given in the secondary literature also support the description of Hartley as perhaps the most inventive and influential psychologist of the eighteenth century. In the first volume of the Observations on Man, Hartley gave a detailed description of the physiological basis of sensation, ideation, and motion, all of which he considered products of mental association. Although he believed in a strict qualitative dualism of body and mind, he nonetheless presented a

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'Observations on Man'," Annals of Science, VII (1951), 375-376 (hereinafter referred to as Oldfield and Oldfield, "Hartley"); Warren, History of Association, 56; Watson, Great Psychologists, 200; Basil Willey, The Eighteenth Century Background: Studies on the Idea of Nature in the Thought of the Period (New York: Columbia University Press, 1950), 111-112 (hereinafter referred to as Willey, Eighteenth Century); Robert M. Young, "Scholarship and the History of the Behavioural Sciences," History of Science, V (1966), 21 (hereinafter referred to as Young, "Scholarship").

[26]Oberg, "Progress Toward Perfection," 14 and 51; Oberg, "Hartley and Association," 453.

[27]Oberg, "Hartley and Association," 441.

[28]Oberg, "Progress Toward Perfection," 9-10, 52, 55-56; MacLeod, "Conceptions of Man," 210; Walls, "Mechanism," 3.

theory in which events in one realm correspond to, if not depend upon events in the other. Hartley's theory has thus correctly been labelled a "physiological psychology."

Evaluations of the novelty of Hartley's physiological psychology vary, however. It is quite common to find Hartley referred to in the secondary literature as the first physiological psychologist.[29] Taking into account the earlier theories of Hobbes and Descartes, for example, this description of Hartley becomes questionable, and as a result at least one historian of psychology has disagreed with the common view of Hartley as having introduced physiological psychology.[30] Hartley's Conjecturae does, however, stand "as one of the earliest distinctive publications in . . . physiological psychology."[31] In the Conjecturae and the later and more detailed Observations on Man, Hartley undoubtedly presented the earliest description of a physiological mechanism underlying the mental process of association.[32]

Like Hartley's theory of association, his physiological psychology exerted considerable influence upon the subsequent development of psychology. Much of the work done in association psychology and in physiological psychology during the nineteenth century was based upon

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[29]Brett, History of Psychology, 437; George Henry Lewes, The Biographical History of Philosophy from its Origin in Greece Down to the Present Day . . ., Library Edition (enl. and rev.; New York: D. Appleton and Company, 1893), II, 603 (hereinafter referred to as Lewes, History of Philosophy).

[30]Bower, Hartley and Mill, 243.

[31]Benjamin Rand, "The Early Development of Hartley's Doctrine of Association," Psychological Review, XXX (1923), 313; hereinafter referred to as Rand, "Development."

[32]Lewes, History of Philosophy, II, 608.

Hartley's physiology of sensation and association.[33] Indeed, Hartley has been commonly credited with having established a subtradition of physiological psychology within the larger field of psychology,[34] since physiological psychologists of today continue to operate upon the same basic physiological assumptions that appear in the Observations on Man.[35]

Hartley's Psychology and Contemporary Natural Philosophy

In the course of providing a physiological foundation for his theory of association, Hartley necessarily incorporated various concepts and methods from contemporary anatomical and physiological thought into his psychology. But Hartley did not rest his analysis of association in physiological causes. He considered ". . . Psychology, or the theory of the human Mind, with that of the intellectual Principles of Brute Animals," to be a branch of natural philosophy,[36] and as a result he searched for the causes of association among the general physical causes of natural phenomena.[37] Ultimately, then, Hartley applied the

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[33]Oberg, "Progress Toward Perfection," 6 and 8-9; Young, "Scholarship," 23-24.

[34]Rand, "Development," 313; Kantor, Evolution of Psychology, 218 and 220-221; Theodore L. Huguelet, "Introduction," in David Hartley, Observations on Man, His Frame, His Duty, and His Expectations. (1749) . . . (facsimile of the 1st ed.; 2 vols. in 1; Gainesville, Florida; Scholars' Facsimiles & Reprints, 1966), ix (hereinafter referred to as Huguelet, "Introduction").

[35]Young, "Scholarship," 23-24.

[36]Hartley, Observations on Man, I, 354. According to Oldfield and Oldfield ("Hartley," 371) and Robert M. Young ("Hartley, David," Dictionary of Scientific Biography, VI (1972), 139; hereinafter referred to as Young, "Hartley"), the word psychology is used for the first time in English in its modern sense in Hartley's Observations on Man.

[37]Hartley, Observations on Man, I, 72.

concepts and methods of the particular type of contemporary natural philosophy he accepted to his study of the human mind.

Psychologists and historians of psychology have generally agreed that, although Hartley was not the first philosopher to transfer concepts and methods from natural philosophy to the study of man and mind in the early modern period,[38] he was certainly among the earliest to do so.[39] The Observations on Man has been described as "the first distinctly psychological treatise which incorporates the main assumptions" of the Scientific Revolution[40] and as "the central document in the history of attempts to apply the categories of science . . . to the study of man and society."[41] The difference between Hartley and "other scientists of the period" has been determined to lie only in his subject matter: Hartley "attempted to explain mental phenomena in terms of the concepts they were using to explain physical phenomena."[42] Specifically, Hartley has been described as having incorporated the general concept of mechanism, as well as concepts from contemporary corpuscular physics into his system.[43] Many concepts apparent in Hartley's theory have been identified as drawn directly from the works of Newton. Hartley

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[38] Walls, "Mechanism," 1-4 and 88-144; MacLeod, "Conceptions of Man," 207-215.

[39] See Walls, "Mechanism," [ii], 3, 8; Corinna Delkeskamp, "Medicine, Science, and Moral Philosophy: David Hartley's Attempt at Reconciliation," The Journal of Medicine and Philosophy, II (1977), 162-171; Mischel, "Emotion and Motivation," 123-144.

[40] Walls, "Mechanism," 3.

[41] Young, "Hartley," 139.

[42] Mischel, "Emotion and Motivation," 127 (emphasis mine).

[43] Walls, "Mechanism," 147; Young, "Hartley," 140.

is said to have accepted both Newton's general scientific assumptions and specific theories he developed.[44] According to the secondary literature, Newton's concept of matter,[45] concept of the aether,[46] concept of motion,[47] physiological speculations,[48] and his perceptual model[49] formed the basis of Hartley's work. Psychologists and historians of psychology have also described Hartley's theory as based upon the "Newtonian conception of man"[50] and the "Newtonian world-view,"[51] in addition to the above concepts drawn directly from Newton's work.

Although Hartley's method has been described by various psychologists and historians of psychology as Baconian,[52] Cartesian,[53]

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[44] Oberg, "Hartley and Association," 442; Oberg, "Progress Toward Perfection," 20-26; Kantor, Evolution of Psychology, II, 219.

[45] Kantor, Evolution of Psychology, II, 220.

[46] Oberg, "Hartley and Association," 442; Rand, "Development," 317; Huguelet, "Introduction," viii and ix; Robert E. Schofield, Mechanism and Materialism: British Natural Philosophy in An Age of Reason (Princeton, New Jersey: Princeton University Press, 1970), 199 (hereinafter referred to as Schofield, Mechanism and Materialism).

[47] Oberg, "Hartley and Association," 442-444; Huguelet, "Introduction," ix; Watson, Great Psychologists, 201.

[48] Young, "Hartley," 139; Kantor, Evolution of Psychology, II, 220 and 223; Huguelet, "Introduction," ix; Rand, "Development," 313 and 317; Schofield, Mechanism and Materialism, 199-200; Watson, Great Psychologists, 201; Oberg, "Hartley and Association," 442; Kantor, "Newton's Influence," 89-90.

[49] Kantor, "Newton's Influence," 83-88.

[50] MacLeod, "Conceptions of Man," 207-215.

[51] Oberg, "Progress Toward Perfection," 17-18.

[52] Ibid., 20, 29-30, 31; Brett, History of Psychology, 352-353.

[53] Oberg, "Progress Toward Perfection," 26, 41, 45; Walls, "Mechanism," 150.

and/or Lockean,[54] the majority have depicted Hartley as having primarily proceeded according to "Newtonian" scientific method in his study of the human mind.[55] More specifically, the methodology Hartley observed in his Observations on Man has been characterized as "classic empirical,"[56] "scientific, empirical,"[57] and "scientific or analytical."[58] His method has been described as "reductionist,"[59] "physical,"[60] "observational,"[61] "experimental,"[62] and "inductive."[63] On the other hand, it has also been labelled "abstract,"[64] "classically rationalist,"[65] "deductive,"[66] "mathematical,"[67] and "geometrical."[68] Hartley's method

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[54] Oberg, "Progress Toward Perfection," 43-44; Brett, History of Psychology, 352-353.

[55] Oberg, "Progress Toward Perfection," 5, 12, 17, 19, 26-32, 41, 45; Walls, "Mechanism," 149-150; Brett, History of Psychology, 439.

[56] Oberg, "Progress Toward Perfection," 31-32, 20, 29-30, 44-45; Walls, "Mechanism," 152 and 175.

[57] Oberg, "Progress Toward Perfection," 40.

[58] Ibid., 32; Walls, "Mechanism," 165, 172, 175.

[59] Walls, "Mechanism," 152.

[60] Ibid., 175.

[61] Ibid., 174; Oberg, "Progress Toward Perfection," 31.

[62] Oberg, "Progress Toward Perfection," 19, 23, 28.

[63] Ibid., 30-31 and 37.

[64] Ibid., 41.

[65] Ibid., 32, 41, 45.

[66] Ibid., 42 and 45.

[67] Ibid., 19, 32, 41, 45.

[68] Ibid., 41.

has also been described as "quantitative"[69] and "mechanical."[70]

Hartley's Significance to the Development of Psychology

Psychologists and historians of psychology have evaluated Hartley's significance to the development of psychology on the basis of (1) his extension and systematization of the theory of association, (2) the establishment of a subtradition of physiological psychology within the general field of psychology, and (3) his early application of the concepts and methods of natural philosophy, particularly of "Newtonian" natural philosophy, to his study of mind. All in all, ". . . Hartley's assumptions . . . set psychology on a course which it is still running."[71] Thus it is in his assumptions, such as that man is part of the natural world and therefore that the study of man can be furthered by the application of the concepts and methods of natural philosophy, that Hartley's ultimate significance in the history of psychology lies.[72]

Program of Study

It is only within the last decade that Hartley's application of natural philosophy to the study of mind has received more than general treatment by historians of psychology,[73] and, despite the recent

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[69]Walls, "Mechanism," 175.

[70]*Ibid.*, 147 and 153; Oberg, "Progress Toward Perfection," 25 and 41.

[71]Walls, "Mechanism," 4. See also *ibid.*, 4-7 and 10-11; Watson, *Great Psychologists*, 203; Oldfield and Oldfield, "Hartley," 376-380.

[72]Young, "Hartley," 139.

[73]Both Oberg ("Progress Toward Perfection") and Walls ("Mechanism") have presented pioneer studies which have contributed to a better understanding of Hartley's use of the concepts and methods of

interest in and study of the relationship between contemporary natural philosophy and Hartley's physiological psychology, there is need for further study. At the present time it is not clear precisely which concepts and methods of contemporary natural philosophy Hartley transferred to his study of mind, nor what their origins were. What aspects of corpuscular physics, for example, did Hartley incorporate into his psychology, and from what sources did he draw his ideas on the corpuscular nature of matter? Is his method of investigation and presentation empirical, inductive, rationalistic, or deductive? Is his method Baconian, Cartesian, Lockean, or "Newtonian?" Previous studies of Hartley's work have presented apparently conflicting views of Hartley's method and vague descriptions of the concepts Hartley utilized, partially as a result of inherent terminological ambiguities. In order to clarify some of this ambiguity and to move towards a better understanding of the relationship between Hartley's psychological theory and the concepts and methods of contemporary natural philosophy, this study will focus upon the "Newtonian" aspects of Hartley's Observations on Man.

In Chapter I, a biographical study of David Hartley, inaccuracies in existing biographical descriptions will be corrected, and an account will be given of Hartley's original intent to enter the ministry, his education and introduction to natural philosophy at Cambridge, and his decision to pursue a career as a physician. His medical practice, research, and publications, his various pursuits in London, and the composition of the Observations on Man will be shown to stem

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contemporary natural philosophy and their origins.

from the overriding concern for the physical, intellectual, and spiritual welfare of his fellow man so typical of those who shared the ideals of the Enlightenment. Other aspects of Hartley's life that motivated him to compose the Observations on Man and influenced its content and methods will be noted, particularly Hartley's association with Newtonian natural philosophers such as Nicholas Saunderson (1682-1739), John Mickleburgh (ca. 1682-1756) and Rev. Stephen Hales (1677-1761).

The second chapter will describe the composition of the Observations on Man. Hartley's ever-present religious motivation will be more fully discussed, the date of his initial composition of the preliminary treatises will be established, and the expansion and reorganization of these treatises will be described. Previous datings of Hartley's decision to provide a physiological foundation for his epistemological theory of association will be improved upon. The first circulation of Hartley's manuscript, his reluctant acceptance of the doctrine of necessity, and criticisms levied against his theory by his friend Rev. John Lister (1703-1759) will be described. On the basis of new information provided by the transcription of the shorthand correspondence between Hartley and Lister,[74] a report of Hartley's

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[74]Hartley and Lister corresponded frequently in the years 1735-1756, and in 1740 they began to write many of their letters in the now-obsolete shorthand style devised by John Byrom (1692-1763), which Hartley enthusiastically promoted (see Chapter I). Although the longhand letters have been available to historians both in edited and original form for many years (see W. B. Trigg, ed., "The Correspondence of Dr. David Hartley and Rev. John Lister," Transactions of the Halifax Antiquarian Society (1937); the original letters are preserved in the Central Library, Metropolitan Borough of Calderdale, Halifax, Yorkshire, England, Shibden Hall Collection MSS, SH:7/HL; this archive hereinafter referred to as the Shibden Hall Collection MSS; copies have kindly been

lingering hesitancy to publish because of the theological implications of his theory and a revised account of the composition and publication of Hartley's Conjecturae will be presented. Information from the transcriptions will also be used to reevaluate the relationship between the Conjecturae and the Observations on Man, as well as to recount the revision, completion, printing, and appearance of the first edition of the Observations on Man.

Chapter III contains a detailed analysis of the physiological psychology of association presented in Volume I of the Observations on Man, with an emphasis upon Hartley's view of the relationship between his study and natural philosophy. Hartley's approach and method, as well as the content of the theory, will be described.

In the last chapter, the "Newtonian" characteristics of Hartley's theory will be identified and their origins investigated. Since many difficulties have arisen in previous discussions of Hartley's "Newtonianism" due to terminological ambiguities, a clarification of the term Newtonian will first be undertaken. The methods and concepts of Hartley's physiological psychology will then be examined in relationship to Newton's own work and to the work of Newton's followers in the eighteenth century. Hartley's methodology will be compared to an ideal method of investigation, proof, and presentation suggested in Newton's Principia and Opticks, to the methods Newton actually employed in his

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supplied for use in this dissertation by archivist Alan Betteridge), the content of the shorthand letters was unknown to contemporary historians. Only incomplete, anonymous transcriptions of several of the shorthand letters existed. With the hope of unearthing new information on the development of the Observations on Man, I have transcribed these shorthand letters; excerpts from them are presented in Chapter II below.

work, and to both the mathematico-deductive and the speculative-experimental methodological traditions of Newton's followers. The concepts in the Observations on Man derived from contemporary natural philosophy will be compared with the concepts found in Newton's Principia and Opticks, as well as with those of the mechanistic and materialistic Newtonian traditions.

Having thus determined which of Newton's methods and concepts and which methods and concepts from the various Newtonian traditions appear in the Observations on Man, Chapter IV will conclude with a brief investigation into the origins and sources of these methods and concepts, other than the works of Newton. To date, psychologists and historians of psychology have treated the origin of Hartley's "Newtonianism" as if it were traceable only to Newton's own works. But, in a century in which many men accepted, praised, and elaborated "Newtonian" natural philosophy, might not Hartley have learned of Newton's ideas from sources other than Newton? This is not only probable, but it is certain that he did so. Hartley acquired his knowledge of "Newtonian" natural philosophy directly from Newton, directly from Newtonians with whom he came into contact, and directly from Newtonian literature to which he was exposed. As a result of the examination of Hartley's education, his studies, and his social, intellectual, and professional contacts undertaken in Chapter I, it will become apparent that from an early age he was exposed to the concepts and methodology of several Newtonian scientific traditions. While at Cambridge, Hartley studied mathematics and natural philosophy with Nicholas Saunderson and chemistry with John Mickleburgh. After moving to London, Hartley undertook a series of chemical experiments in conjunction with Stephen Hales. Focusing upon these three men as indirect sources of Newton's natural philosophy but direct sources of Newtonian natural philosophy, Chapter IV will conclude with an examination of the kind of Newtonianism each espoused and the effect each of them may have had upon the "Newtonian" methods and concepts of the Observations on Man.

CHAPTER I

DAVID HARTLEY'S LIFE AND WORK

The English physician and philosopher Dr. David Hartley (1705-1757) was the second child of Rev. David Hartley (d. 1720) and his wife Evereld Wadsworth Hartley (d. September, 1705), who died shortly after her son's birth. Rev. Hartley had received his B.A. from Lincoln College, Oxford, in 1695,[1] and prior to David's birth he had served as curate at Luddenden Chapel in the township of Midgely, Halifax.[2] In

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[1]Leslie Stephen, "Hartley, David," The Dictionary of National Biography, IX (1937-38 reprint), 66-67; hereinafter referred to as Stephen, "Hartley." Stephen's is the most accurate and detailed of the several readily available biographical articles concerning David Hartley. For a fuller account of Hartley's younger years, consult and compare the following: John Watson, The History and Antiquities of The Parish of Halifax, in Yorkshire. Illustrated with Copper-Plates (London: Printed for T. Lowndes . . . , 1775), 473-475 (hereinafter referred to as Watson, Halifax); W. B. Trigg, ed., "The Correspondence of Dr. David Hartley and Rev. John Lister," Transactions of the Halifax Antiquarian Society (1937), 231-233 (hereinafter referred to as Trigg, "Correspondence"); and letters written by Hartley and his daughter Mary, in Rebecca Warner, ed., Original Letters from Richard Baxter, . . . &c., &c. (Bath: Printed by R. Crutwell, 1817), 89-110 (anthology hereinafter referred to as Warner, Letters).

[2]According to Watson (Halifax, 437), Rev. Hartley was curate at Luddenden in 1698 and 1702.

October of 1705 and 1706, Rev. Hartley became curate at Illingworth Chapel in the township of Ovenden.[3]

The exact place and date of the philosopher David Hartley's birth is difficult to pinpoint. It appears he was born either at Illingworth or Luddenden, some time during the summer of 1705.[4] Hartley's birthdate was later determined by his children to have been August 30, 1705,[5] and it has commonly been given as such in subsequent secondary literature.

On May 25, 1707, Rev. Hartley married Sarah Wilkinson, the daughter of the late Rev. Edward Wilkinson (d. 1704), who had been Hartley's predecessor as curate at Illingworth.[6] Some time before October of 1717, Rev. Hartley resigned his curacy at Illingworth to take the curacy at Armley, Leeds,[7] and he remained at Armley until his death three years later.[8] After his father's death, young David Hartley was left in the care of Mrs. Anne Brooksbank, his mother's sister.[9]

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[3] _Ibid._, 442; Trigg, "Correspondence," 231.

[4] Watson (_Halifax_, 473) and Warner (_Letters_, 89) identified Illingworth as Hartley's birthplace, while Stephen ("Hartley," 67) claimed Hartley was baptised at Luddenden on June 21, 1705. Trigg ("Correspondence," 231), however, maintained that Hartley's baptism was recorded neither at Illingworth nor at Luddenden.

[5] David Hartley, Esq., "A Sketch of the Life and Character of Dr. Hartley," in David Hartley, _Observations on Man, His Frame, His Duty, and His Expectations. In Two Parts . . . Reprinted from the Author's Edition in 1749_ . . . ([2nd ed.]; London: Printed for J. Johnson . . . , 1791), i; hereinafter referred to as Hartley, Esq., "Sketch."

[6] Watson, _Halifax_, 442 and 473.

[7] _Ibid._; Trigg, "Correspondence," 232.

[8] Trigg, "Correspondence," 232.

[9] _Ibid._

The beginnings of David Hartley's formal education can be traced to his studies at Bradford Grammar School in Halifax,[10] which was then under the direction of Rev. Thomas Hill, M.A. (d. 1728), Headmaster, and Thomas Preston (n.d.), Usher.[11] It was at Bradford that Hartley formed a lifelong friendship with a classmate two years his senior, John Lister of Shibden Hall, later First Headmaster of Bury School, Lancashire. Years later, Hartley maintained a frequent and historically-illuminating correspondence with Lister.[12]

Hartley remained at Bradford through the fall of 1721. On October 8 of that year, he wrote his sister from Bradford and shared with her his plans to continue his education at Cambridge. By way of postscript, he added, "I am in good hopes to get £15 or £16 a year in the University, and am fitting myself for that honourable society."[13]

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[10]Stephen, "Hartley," 67; John Venn and J. A. Venn, comp., "Hartley, David," Alumni Cantabrigienses, A Biographical List of all known Students, Graduates and Holders of Office at the University of Cambridge, from the Earliest Times to 1900, Part I: From the Earliest Times to 1751 (4 vols.; Cambridge: At the University Press, 1922-1927), II, 320; hereinafter referred to as Venn and Venn, "Hartley."

[11]W. Claridge, Origin and History of the Bradford Grammar School, from its Formation to Christmas, 1882 . . . (Bradford [England]: J. Green . . . , 1882), 37-38 and 41.

[12]Stephen, "Hartley," 67; Trigg, "Correspondence," 232. The letters which passed between Hartley and Lister during the years 1735-1756 are invaluable to the historian for they are the only extant source from which he can gain knowledge of the motivation behind, pinpoint the beginning, and trace the development of the thoughts which took final form in Hartley's Observations on Man. Even though excerpts from the correspondence can be found in many secondary sources, all are ultimately derived from Trigg's incomplete edition of the letters ("Correspondence"). Fortunately, the original letters are preserved today in the Shibden Hall Collection MSS.

[13]David Hartley to his sister, October 8, 1721, Letter XXVIII, in Warner, Letters, 99. The reader is reminded that all excerpts from original historical documents are presented herein without any modernization of spelling, punctuation, and so forth.

Hartley matriculated at Jesus College, Cambridge, as an ordinary sizar on April 21, 1722,[14] and he had every intention of following his father into the Anglican ministry.[15] Although no specific information is available concerning the content of Hartley's studies at Bradford Grammar School, a picture of his studies at Cambridge can be pieced together in some detail from various sources. Hartley's daughter Mary later confirmed that at Cambridge her father "directed his studies for a long time to divinity, and intended to have taken orders . . . ."[16] His interests at Cambridge ranged beyond theological studies alone, however, for he also "studied mathematics, together with natural and experimental philosophy, under the celebrated professor [Nicholas] Saunderson,"[17] Lucasian Professor of Mathematics. Furthermore, Hartley enrolled in the "Second Course of Chymistry" offered in 1728 by John Mickleburgh,[18] who held the Third Chair of Chemistry there and was also

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[14]Venn and Venn, "Hartley," 320. There exists some confusion in secondary sources concerning the date of Hartley's entrance at Jesus College. Bower (Hartley and Mill, 1) dated Hartley's matriculation as having taken place in 1720. Maria Heider (Studien über David Hartley . . . (Bergisch Gladbach: n.p., 1913), 4; hereinafter referred to as Heider, Studien) did the same. Stephen ("Hartley," 67) and Robert M. Young ("Hartley, David," Dictionary of Scientific Biography, VI (1972), 139; hereinafter referred to as Young, "Hartley") both dated Hartley's entrance as having taken place in 1722. Evidence that Hartley did not enter Jesus College until 1722 is afforded by the letter that Hartley wrote his sister from Bradford late in 1721 (see footnote 13 above).

[15]Mary Hartley to Rev. William Gilpin, 1796, Letter XXX, in Warner, Letters, 109-110; Stephen, "Hartley," 67.

[16]M. Hartley to Gilpin, Letter XXX, 109-110.

[17]Hartley, Esq., "Sketch," iv. See Chapter IV for a discussion of Saunderson's influence upon the method and content of the Observations on Man.

[18]R. T. Gunther, "Appendix C: List of Persons Who Attended

a dispensing chemist.[19] During his years at Cambridge, Hartley also associated with Robert Smith (1689-1768),[20] then Plumian Professor of Astronomy,[21] and Richard Davies (d. 1762).[22]

After having received his B.A. in January 1725-26,[23] Hartley

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Lectures on Chemistry in 1726-33," Early Science in Cambridge (Oxford: Printed for the Author at the University Press, 1937), 469; hereinafter referred to as Gunther, "Appendix C." Despite R. C. Oldfield and Lady Kathleen Oldfield's claim that no chemistry classes were taught at Cambridge while Hartley was a student there ("Hartley's 'Observations on Man'," Annals of Science, VII (1951), 374; hereinafter referred to as Oldfield and Oldfield, "Hartley") and L. J. M. Coleby's comment that "there are no notable names on any of the [chemistry] rolls" ("John Mickleburgh, Professor of Chemistry in the University of Cambridge, 1718-56," Annals of Science, VIII (1952), 167; hereinafter referred to as Coleby, ("Mickleburgh"), Hartley's name does appear on the 1728 class list. See Chapter IV below for a discussion of the effects of this previously unnoted connection between Hartley and Mickleburgh on the theory Hartley presented in the Observations on Man.

[19]Coleby, "Mickleburgh," 165.

[20]Oldfield and Oldfield, "Hartley," 374.

[21]Edgar W. Morse, "Smith, Robert," Dictionary of Scientific Biography, XII (1975), 477.

[22]Oldfield and Oldfield, "Hartley," 374. Davies was a fellow student of Hartley's and would later become a physician and Fellow of the Royal Society (see Gordon Goodwin, "Davies, Richard, M.D.," The Dictionary of National Biography, V (1937-38 reprint), 604).

[23]According to Stephen ("Hartley," 67), Hartley received his B.A. January 14, 1726. Young ("Hartley," 139) and Trigg ("Correspondence," 232) both stated he received it in 1726. Venn and Venn ("Hartley," 320) recorded the date as 1725-26. At this point it has become problematic to date even minor events in Hartley's life. This is due to differences between the contemporary calendar and our modern one, as well as to the various techniques historians have used to treat these dates in the past. Although many countries on the Continent, particularly the Catholic ones, had accepted the "New Style" of dating (which we use today) following the decree of Pope Gregory XIII in 1582, the Gregorian Calendar was not adopted for use in England until 1750. The simultaneous use of these two calendars, the "New Style" Gregorian and the "Old Style" Julian, on the Continent and in England, respectively, has made it difficult for modern historians to order historical events in the two areas, especially during the period of time from

became a fellow of Jesus College in November 1727 and was awarded his M.A. in January, 1728-29.[24] In October 1729,[25] Hartley received college testimonials,[26] similar to letters of reference, either to prepare for taking holy orders, in order to embark on a new course of study, or to apply for employment.[27] He left Cambridge sometime in 1729, probably following his receipt of testimonials in October, to accept a position as Master of Newark Grammar School.[28] Hartley continued to teach, as well as to hold his college fellowship, until February 1729-30 when he took a leave of absence from Jesus College.[29]

January 1 to March 25 of each year. This is because January 1 is the first day of the new year according to the Gregorian Calendar, while March 25 was the first day of the new year according to the old Julian Calendar. Furthermore, by the eighteenth century the Julian Calendar lagged behind the Gregorian by eleven calendar days (see "Calendar," Encyclopaedia Britannica, IV (11th ed.), 994-1000). It appears that Stephen has modernized 1725 (OS) to read 1726, and Young and Trigg have followed suit. It is not clear whether Stephen has modernized the date of the day or not.

[24] Stephen ("Hartley," 67) supplied the date of November 13, 1727 for Hartley's fellowship and January 17, 1729 for his M.A.

[25] Stephen (ibid.) supplied the date of October 8, 1729 for Hartley's testimonials.

[26] Ibid.; Venn and Venn, "Hartley," 320.

[27] See "Testimonial," Cyclopaedia: or, an Universal Dictionary of Arts and Sciences . . . , ed. by E. Chambers (2 vols.; London: Printed for James and John Knapton . . . , 1728), II, 198; and J. Harvey Bloom and R. Rutson James, Medical Practicioners in the Diocese of London, Licensed under the Act of 3 Henry VIII, c. II: An Annotated List 1529-1725 (Cambridge: At the University Press, 1935), 1-11 (hereinafter referred to as Bloom and James, Medical Practicioners). Both works list several reasons for which a man may have requested college testimonials. See also footnote 34 below.

[28] Venn and Venn, "Hartley," 320.

[29] Stephen ("Hartley," 67) recorded that Hartley took his leave of absence beginning February 21, 1730.

Sometime after he received his Master's in January of 1728-29 but before February of 1729-30, Hartley developed serious second thoughts about pursuing his original plan to enter the Anglican ministry.[30] Extant historical documents do not clearly reveal the motivation which prompted Hartley to abandon his intended clerical career, but his daughter Mary's reminiscences are again enlightening. She related that "upon closer consideration of the conditions attached to the clerical profession, he felt scruples, which made him reluctant to subscribe to the Thirty-nine Articles."[31]

Hartley was not alone in questioning the Thirty-Nine Articles. As the empirical epistemology propounded by John Locke gained adherents, challenges to revealed theological doctrine increased. Men began to consider reason an equally reliable, if not preferable foundation for religious thought. By 1713, Anthony Collins (1676-1729) noted in his Discourse on Freethinking that it was very rare to find a clergyman who accepted all the Thirty-Nine Articles literally.[32] Hartley was,

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[30] According to Gilbert Ainslie (An Historical Account of the Oaths and Subscriptions Required in the University of Cambridge on Matriculation, and of all Persons who Proceed to the Degree of Master of Arts (Cambridge: Printed at the Pitt Press, by John Smith . . . , 1833), 35, 38-39, 41-42, 55), after December of 1616 anyone receiving a degree from an English college was required to acknowledge the supremacy of the King as head of the Anglican Church, to agree that the liturgy and episcopacy of the Church was not contrary to the word of God, and to affirm the Thirty-Nine Articles of the Anglican Church. Since the oaths were not revised until 1739 (ibid., 60), Hartley would have subscribed to these three statements, including the Thirty-Nine Articles, when he received his Bachelor's degree in 1726 and also when he received his Master's in 1728-29. His doubts must have become crucial sometime between January 1728-29 and February 1729-30.

[31] M. Hartley to Gilpin, Letter XXX, 110.

[32] Willey, Eighteenth Century, 6, 59, 76; Frederick Albert Lange, The History of Materialism and Criticism of its Present Importance, trans. by Ernest Chester Thomas, International Library of Psychology

then, one of many whose reason led him to conclusions he first saw as inconsistent with the Thirty-Nine Articles.[33] Hartley's later attempts to resolve these inconsistencies ultimately resulted in the composition of the Observations on Man.[34]

Hartley's doubts concerning the truth and consistency of natural and revealed religion were at least partially responsible for his abandonment of his clerical ambitions in 1730 and his embarkation upon what was to become a lifelong medical career. Hartley is supposed

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and Scientific Method, First Book: History of Materialism until Kant (3rd ed.; 3 vols. in 1; New York: The Humanities Press, 1950), 322-323 (hereinafter referred to as Lange, History of Materialism); Leslie Stephen, "Collins, Anthony," The Dictionary of National Biography, IV (1937-38 reprint), 819-820.

[33]Hartley's later correspondence with Lister substantiates that Hartley indeed had serious theological doubts which either caused or contributed to Hartley's decision to change from a clerical to a medical career. Corinna Delkeskamp ("Medicine, Science, and Moral Philosophy: David Hartley's Attempt at Reconciliation," The Journal of Medicine and Philosophy, II (1977), 164 note 3; hereinafter referred to as Delkeskamp, "Reconciliation") noted that Hartley's

> letters testify to the fact that he could not accept the doctrine of eternal damnation. On surveying The 39 Articles (1724) [sic], it seems plausible that Hartley particularly objected to Article IX ("The flesh lusteth always contrary to the spirit" and thus deserves God's wrath and damnation), which contradicted his teleological theory of man, and to Article XVII (on predestination and election and on the punishment of souls in hell).

Although the earliest extant letter from Hartley to Lister is dated 1735, Hartley implied therein that his doubts were fairly long-standing ones. This letter particularly documents the interpretation that Hartley was not comfortable with the Articles pertaining to eternal damnation and punishment, for in it he maintained that ". . . Universal Happiness in the most absolute Sense ultimately" is every man's end (David Hartley to John Lister, November 15, 1735, Shibden Hall Collection MSS, SH 7/HL: 1).

[34]See Chapter II below for a discussion of the cause and effect relationship between Hartley's religious doubts and his composition of the Observations on Man.

to have first studied "physic," or medicine, at Newark,[35] although it should be recollected he had already attended a series of lectures given by the apothecary John Mickleburgh at Cambridge. Due to the influence of Thomas Sydenham (1624-1689), who had advocated that young physicians be trained by apprenticeship rather than by university lectures,[36] a great many physicians in the early eighteenth century practiced medicine without a medical degree.[37] David Hartley was such a physician, for although he was never awarded a medical degree he began to practice medicine "first at Newark, when he was a very young man; and before he was married to his first wife. . . ."[38]

Sometime between February 1729-30 and June 1730, Hartley married "the daughter of a Mr. Rowley, a lawyer, in Essex, of a respectable family,"[39] and as a result he terminated his fellowship at Jesus

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[35] Young, "Hartley," 139.

[36] See Kenneth Dewhurst, Dr. Thomas Sydenham (1624-1689): His Life and Original Writings (Berkeley: University of California Press, 1966), 47.

[37] Michael Kraus, "American and European Medicine in the Eighteenth Century," Bulletin of the History of Medicine, VIII (1940), 679.

[38] M. Hartley to Gilpin, Letter XXX, 105. One way a man could practice without a medical degree was to be licensed as a "doctor of physic" or a "physician" by the Bishop of his diocese or his Chancellor after having been certified by an appointed examination committee and/or having presented testimonial letters recommending his skill at physic and attesting to his religious piety (see Bloom and James, Medical Practicioners, 1-11). In view of this, one may speculate that Hartley received his college testimonials in October of 1729 in order to qualify for a license to practice physic in Newark. Delkeskamp ("Reconciliation," 164 note 2) incorrectly stated Hartley began to practice physic "about 1727. . . ."

[39] M. Hartley to Gilpin, Letter XXX, 105. Stephen ("Hartley," 67) stated that Hartley's marriage occurred between February 21, 1730 and the following June 8th. Trigg ("Correspondence," 232) also assigned the marriage the date of 1730, but Young ("Hartley," 139) believed the marriage took place a year after Hartley took leave from his fellowship in 1730.

College in June of 1730.[40] Hartley then settled his bride and his medical practice at Bury St. Edmunds, in Suffolk, a popular eighteenth-century resort, "where he was much known and esteemed by all the principal families in that neighbourhood; particularly those of Lord Cornwallis, and Lord Townshend."[41] Shortly afterwards, Dr. Hartley lost his wife at the birth of their son, whom he also named David Hartley (1732-1818).[42]

By January 1732-33, Hartley's medical practice was flourishing in Bury St. Edmunds. He was working in association with Dr. Francis Sandys (n.d.), and the two of them later submitted an account of an unusual medical case they attended at this time to the Royal Society of London for publication in the Philosophical Transactions.[43]

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[40] Stephen ("Hartley," 67) recorded the termination of the fellowship to have occurred on the 8th of June following the 21st of February, 1730. Venn and Venn ("Hartley," 320) confirmed the date of 1730.

[41] M. Hartley to Gilpin, Letter XXX, 106.

[42] Ibid., 105; Young, "Hartley," 139; George Herbert Guttridge, David Hartley, M.P.: An Advocate of Conciliation, 1774-1783, University of California Publications in History, ed. by Herbert Eugene Bolton, et al., XIV (Berkeley, California: University of California Press, 1926), 234-235 (hereinafter referred to as Guttridge, "Hartley, M.P."). Great care should be taken not to confuse Dr. David Hartley with his son David Hartley, Esquire, as has occasionally been done.

[43] David Hartley and Francis Sandys, "Another Case of a Person bit by a Mad-Dog, drawn up by David Hartley, M.A. and Mr. Fr. Sandys, communicated to the Royal Society by Francis Wollaston, Esq; F.R.S.," Philosophical Transactions, XL, No. 448 (for June-July, 1738; published 1741), 274-276. Note that the accident here described occurred in 1732, although it was not submitted to the Royal Society until 1738, nor was it published until 1741. According to Gunther ("Appendix C," 468), Francis Sandys also attended John Mickleburgh's lectures on chemistry at Cambridge, although two years earlier than Hartley did; after Sandys received his M.D. in 1739, he became a surgeon and lecturer in anatomy at Cambridge (ibid.). Since Hartley was closely associated with Sandys during the early years of Hartley's medical career and during

Although Dr. Hartley is primarily known today for his contribution to psychology, he won the regard of his contemporaries and first came to the attention of the public as a result of his medical work. During his lifetime, the great majority of his essays were on subjects of medical interest, and in fact his first published work was a pamphlet concerning the practice of inoculation, Some Reasons Why the Practice of Inoculation Ought to be introduced into the Town of Bury at Present.[44]

By 1732, Hartley had begun to take sides in current medical disputes, particularly the one concerning the newly-introduced practice of "buying the smallpox" or variolus inoculation. Although descriptions of the methods and results of inoculation were published in England as early as 1715, inoculation was not advocated as a deterrent against individual infection in England until after 1717, and it was not openly practiced there until 1721. In Hartley's day, inoculation was still

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the early stages of his composition of the Observations on Man, it would be interesting to investigate both Sandys himself and Hartley and Sandys' joint practice in order to determine what influence, if any, Sandys exerted on the development of Hartley's thought.

[44]David Hartley, Some Reasons Why the Practice of Inoculation Ought to be introduced into the Town of Bury at Present, pamphlet dated January 12, 1732-33 (Bury St. Edmunds: n.p., Printed in the Year, 1733); hereinafter referred to as Hartley, Inoculation. To the reader scanning secondary accounts, the pamphlet on inoculation may not appear to have been Hartley's first publication. Young ("Hartley," 139), for example, has erroneously presented Hartley's Conjecturae as having been published in 1730 rather than in 1746, thus implying that the Conjecturae was Hartley's earliest publication. On the whole, there is a great deal of confusion in the secondary literature concerning the development of Hartley's thought and the order of publication of his various works. Appendix A, a chronological list of Hartley's works, has been provided below in order to eliminate this confusion.

considered a suspect, if not positively dangerous practice.[45]

Prior to 1732, Hartley had made the acquaintance of Sir Hans Sloane (1660-1753), then President of the Royal Society of London and President of the Royal College of Physicians.[46] Sloane had been promoting inoculation for the prevention of smallpox,[47] and in January of 1732-33 Hartley wrote Sloane:

> I presume to send you a little hasty incorrect Paper in favour of Inoculation. Besides the Rank you bear in the Profession of Physic, your Eminence as a Patron of that Practice makes all those who approve of it desirous of recommending themselves to you, & I doubt not but that Goodness wch you shew to all, & have done to me particularly in the small Acquaintance I have had the Honr to have with you will pardon the Freedom I have taken.[48]

The "hasty incorrect Paper" Hartley referred to in his letter to Sloane was the pamphlet he had recently published to persuade his fellow residents of Bury St. Edmunds to submit themselves to inoculation in order to end the current smallpox epidemic there.[49] In the

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[45]"Smallpox," Encyclopaedia Britannica, XXV (11th ed.), 249; Edgar M. Crookshank, History and Pathology of Vaccination, Vol. I: A Critical Enquiry (London: H. K. Lewis, 1889), 3 and 33-43.

[46]Gavin de Beer, "Sloane, Sir Hans," Dictionary of Scientific Biography, XII (1975), 458 (hereinafter referred to as de Beer, "Sloane"); E. St. John Brooks, Sir Hans Sloane: The Great Collector and his Circle (London: The Batchworth Press, 1954), 79 (hereinafter referred to as Brooks, Sloane).

[47]Brooks, Sloane, 88-94; de Beer, "Sloane," 458.

[48]David Hartley to Hans Sloane, January 27, 1732-33, British Museum, Sloane Collection MSS, Sloane 4052, folio 264. (Inclusion of the text of this letter is with the kind permission of the British Museum.) Sloane replied to Hartley's letter, and in the following year Hartley wrote Sloane again to inform him of his success at inoculation (David Hartley to Hans Sloane, February 9, 1733-34, British Museum, Sloane Collection MSS, Sloane 4053, folio 163). Little is known today of the circumstances or extent of Hartley's connection with Sloane. This is another area of Hartley's life that needs further investigation.

[49]Hartley, Inoculation, 6-7 and 20. Hartley was so much in

course of his argument, Hartley appealed to experimental and statistical evidence gathered by two well-known contemporary medical authorities, Dr. Thomas Nettleton (d. 1741-42) and Dr. James Jurin (1648-1750).[50] The publication of this pamphlet in 1733 marked Hartley's first appearance in print.

After his initial immersion in the study and practice of physic and the publication of his treatise on inoculation, the focus of Hartley's studies shifted away from medical topics and towards metaphysical ones. In a letter to his sister, Mrs. Booth, in March of 1734-35, Hartley reviewed his recent activities at Bury St. Edmunds.

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favor of inoculation that he later inoculated his own son (see John Byrom, The Private Journal and Literary Remains of John Byrom, ed. by Richard Parkinson, in Remains Historical & Literary connected with the Palatine Counties of Lancaster and Chester, published by the Chetham Society (4 vols.; [Manchester, England:] Printed for the Chetham Society, 1854-1857), XL, 29-30; hereinafter referred to as Byrom, Journal, in Chetham).

[50]Hartley, Inoculation, 5-6 and 12-13. Dr. Nettleton had begun inoculating patients in and around Halifax, Yorkshire, in December of 1721 (while Hartley was enrolled at nearby Bradford Grammar School), and Nettleton's letters on the success of his inoculations were included by Dr. Jurin in the Philosophical Transactions (see: Thomas Nettleton, "A Letter from Dr. Nettleton, Physician at Halifax in Yorkshire, to Dr. Whitaker, concerning the Inoculation of the Small Pox," Philosophical Transactions, XXXII, No. 370 (for January, February, and March, 1722; published 1724), 35-48; __________, "A Letter from the same Learned and Ingenious Gentleman, concerning his farther Progress in inoculating the Small Pox: To Dr. Jurin R. S. Secr.," Philosophical Transactions, XXXII, No. 370 (for January, February, and March, 1722; published 1724), 49-52; __________, "Part of a Letter from Dr. Nettleton, Physician at Halifax, to Dr. Jurin, R. S. Secr. concerning the Inoculation of the Small Pox, and the Mortality of that Distemper in the natural Way," Philosophical Transactions, XXXII, No. 374 (for November and December, 1722; published 1724), 209-212). According to George Thomas Bettany ("Jurin, James," The Dictionary of National Biography, X (1967-68 reprint), 1117-1118), while the Newtonian Dr. Jurin served as Secretary of the Royal Society from 1721-27, he gained much notoriety for five yearly publications supporting inoculation, the first of which appeared in 1723.

He wrote,

> I have lately gained the knowledge of some things in physic, which have been of great use to me; but the chief of my studies are upon religious subjects, and especially upon the true meaning of the Bible.[51]

The final product of these initial studies would be the publication of the Observations on Man some fourteen years later.[52]

In addition to his medical and religious studies, Hartley was also courting Elizabeth Packer (n.d.), the daughter of the late Robert Packer, Esquire (d. 1730), of the old Winchcombe family and member of Parliament from Bucklebury, Berkshire.[53] Hartley's daughter later recollected, "Her family were against the match, and did for some time retard it;"[54] nonetheless, Hartley and Elizabeth Packer solemnized their marriage sometime between August and November of 1735.

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[51] David Hartley to his sister, Mrs. Booth, March 2, 1734-35, Letter XXIX, in Warner, Letters, 100.

[52] The Observations on Man evolved from Hartley's early attempts to resolve conflicts he perceived between established church doctrine and conclusions reached through the use of human reason. His study of "the true meaning of the Bible" in March of 1734-35 thus marks the beginning of his work on the Observations on Man. See Chapter II for a detailed discussion of its development and composition.

[53] M. Hartley to Gilpin, Letter XXX, 107; Sir Lewis Namier and John Brooke, The History of Parliament: The House of Commons, 1754-1790, Vol. II: Members A-J (London: Published for the History of Parliament Trust by Her Majesty's Stationery Office, 1964), 594; "Marriage Articles Between Dr. Hartley and Miss Elizabeth Packer," August 1, 1735, Hartley-Russell Collection MSS, D/EHy F82. There has been some confusion in both primary and secondary literature concerning Hartley's second wife's name. In a letter describing her father's life, Hartley's daughter's script appears to have been misread by the editor, causing the Packer surname to appear in print as Parker (M. Hartley to Gilpin, Letter XXX, 107). Guttridge ("Hartley, M.P.," 235) also referred to Hartley's second wife as the daughter of Robert Parker. Papers contained in the Hartley-Russell Collection MSS confirm that Packer, not Parker, is the proper surname.

[54] M. Hartley to Gilpin, Letter XXX, 107.

At that time, Hartley left Bury St. Edmunds; he moved his new wife, his medical practice, and his wife's fortune to Prince's Street, near Leicester Fields, in London. On November 15, 1735 Hartley renewed his correspondence with his friend John Lister by informing him of his recent marriage and change of residence. Hartley described his wife to Lister as "a Woman of all others I ever yet have known the most amiable & valuable, & with a Fortune of £6500."[55]

Hartley and his wife were to reside in London for the following six years, and the activities he undertook there were quite varied in scope. These activities, along with his earlier campaign for the practice of inoculation and the pursuits of his later years, are all unified, however, by their relation to the common philosophical goals of the Enlightenment and to Hartley's personal religious convictions. Hartley has been characterized as "representative of that age in his intellectual aims. He displayed a typical eighteenth century concern with man; and furthermore, that concern manifested itself in a desire and commitment to study" the medical, physiological, mental, and spiritual natures of man.[56]

Hartley was motivated to do more than study man by his participation in the philosophy of the Enlightenment, however. The ultimate raison d'être behind Hartley's study of man was to insure the spiritual progress of all mankind. Although the thrust of his work does not reflect the general shift of "the center of interest from preoccupation with the fate of the soul in another world toward improvement of

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[55]Hartley to Lister, November 15, 1735.

[56]Oberg, "Progress Toward Perfection," 11.

conditions in this world" that occurred during the Enlightenment,[57] Hartley believed the first step toward the perfection of man's spirit lay in the improvement of his physical state. The second step was the improvement of his intellectual and moral state. All in all, Hartley shared the Enlightenment belief that physical and intellectual improvements could be effected by the use of reason, the general dissemination of knowledge, and especially by the application of scientific knowledge;[58] moreover, his lifetime's activities evince and are unified by this conception.

Shortly after moving to London, Hartley was elected a Fellow of the Royal Society and was admitted to membership on April 1, 1736.[59] Medical subjects were still his daily concern; consequently, his contributions to the Royal Society were generally of a medical nature. During his residency in London, Hartley produced no less than eleven medical publications, three of which appeared in the Royal Society's Philosophical Transactions.[60]

While living in London, Hartley was also involved in promoting a new and technically-innovative system of shorthand notation developed

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[57]Erwin Ackerknecht, A Short History of Medicine (rev. ed.; New York: The Ronald Press Company, 1968), 139; hereinafter referred to as Ackerknecht, History of Medicine.

[58]Ibid., 139-140.

[59]Thomas Thomson, "Appendix. [sic] No. IV," History of the Royal Society, from its Institution to the End of the Eighteenth Century (London: Printed for Robert Baldwin, 1812), xl.

[60]See Appendix A below for a list of Hartley's medical works, included in a chronological bibliography of his publications and their various editions.

by Dr. John Byrom.[61] Dr. Byrom, who kept a detailed and picturesque diary during stays away from his home in Yorkshire, noted in his entry for Tuesday, March 9, 1736, that while he was out for the evening in a London coffeehouse, "there came Dr. Hartley to me and took me to a table and said he wanted to learn shorthand, and appointed Friday morning to call upon him. . . ."[62] Hartley genuinely admired Byrom's method of shorthand[63] and used it frequently in his personal correspondence and record-keeping.[64] In a letter to Lister, Hartley described the method as "the most perfect Invention that I have ever known from a single Person, & . . . a most noble Instance [of] what a strict

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[61]Dr. Byrom developed this system while a student at Trinity College, Cambridge (1708-1715), and, although he studied medicine at Montpellier, he gained his livelihood by teaching shorthand lessons in Cambridge and London at five guineas per pupil. Byrom became a member of the Royal Society of London in 1724 and submitted papers on the shorthand to the Philosophical Transactions (Leslie Stephen, "Byrom, John," The Dictionary of National Biography, III (1937-38 reprint,) 581-584).

[62]Byrom, Journal, in Chetham, XL, 6. According to Byrom, Hartley had been introduced to his system of shorthand at Cambridge, but it was not until approaching Byrom in London that Hartley began to study it (John Byrom to Mrs. Byrom, March 11, 1736, in ibid., 10).

[63]Byrom commented that he was continually trying to moderate Hartley's zealous claims for the excellence of his system (Byrom, Journal, in Chetham, XL, 153).

[64]In 1741 Hartley began using the shorthand in his correspondence with John Lister, and after 1742 the shorthand correspondence flourished almost to the exclusion of longhand letters between them. See Chapter II below for a discussion of this correspondence and excerpts from my transcriptions of the shorthand letters. Hartley also kept many of his medical records in shorthand. Archives in the Berkshire County Record Office contain several "doctor's day-books" in which Hartley kept shorthand notes on his medical calls and the condition of his patients during the years 1749-1755 (Hartley-Russell Collection MSS, D/EHy 56: 1-4 and 56: 80; hereinafter referred to as Hartley, "Doctor's Day-books").

adherence to Rule & Method is able to perform."[65] He later commented in the Observations on Man that the development of a universal philosophical language, which he saw ". . . Mr. Byrom's Method of Short-hand" as proceeding towards

> would . . . take away all Occasion of Mistake from the Bulk of Mankind, and . . . give them an Opportunity of learning important Truths with more Ease and Certainty, and in a shorter time, than they can at present.[66]

Hartley fruitlessly pressed Byrom for some fifteen years to make his system available to the general public.[67] In spite of all Hartley's perseverance Byrom commented "that the man was not yet arisen that was to make shorthand flourish by way of patronage. . . ."[68] He did concede, however, that Dr. Hartley "might have been the man if Mrs. Stephens had not come in the way. . . ."[69]

Around 1720, Mrs. Joanna Stephens (n.d.), "the Daughter of a Gentleman of a good Estate and Family in Berkshire,"[70] had concocted a

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[65]David Hartley to John Lister, September 26, 1741, Shibden Hall Collection MSS, SH 7/HL: 25.

[66]Hartley, Observations on Man, I, 318.

[67]By March of 1737 Hartley had begun urging Byrom to publish the shorthand, possibly by means of subscription, a method commonly in use at that time (Byrom, Journal, in Chetham, XL, 95-96), but to no avail. Byrom did secure a patent on his system on May 25, 1742 (ibid., 315 and 324; London Gazette, June 16, 1742), but the shorthand did not appear in print until ten years after Hartley's death: See John Byrom, The Universal English Short-hand; or, The Way of Writing English, in the most Easy, concise, regular, and beautiful Manner . . . (Manchester: Printed by Joseph Harrop . . . , 1767).

[68]Byrom, Journal, in Chetham, XL, 222.

[69]Ibid., 222-223.

[70]David Hartley, "A Supplement to a Pamphlet intitled, A View of the present Evidence for and against Mrs. Stephens's Medicines, &c.

mixture which appeared to dissolve bladder stones in situ.[71] In the eighteenth century, "with the exception of gout, . . . the most prevalent disorder was stone in the bladder,"[72] and, since

> the standard surgical remedy nearly exceeded, in pain and danger, the ailment itself, the possibility of finding an alternative cure was a practical concern of major interest to eighteenth century physicians.[73]

Many physicians accepted Mrs. Stephens' secret recipe as a genuine cure for the stone, and David Hartley was among them. In fact, all the while Hartley was attempting to secure the publication of Byrom's shorthand system, he was also involved in a similar, but more successful attempt to obtain the disclosure of the recipe for her medicament.[74]

Being a Collection of some Particulars relating to the Discovery of these Medicines, their Publication, Use and Efficacy," appended to Stephen Hales, An Account of some Experiments and Observations on Mrs. Stephens's Medicines for dissolving the Stone: Wherein Their Dissolving Power is inquir'd into, and shown . . . (London: Printed for T. Woodward . . . , [1740]), 37; Hartley's work hereinafter referred to as Hartley, "Supplement," and Hales' work hereinafter referred to as Hales, Mrs. Stephens's Medicines.

[71] Hartley, "Supplement," 37.

[72] Victor Robinson, The Story of Medicine (New York: The New Home Library, 1944), 343; A. E. Clark-Kennedy, Stephen Hales, D.D., F.R.S.: An Eighteenth Century Biography (Cambridge: At the University Press, 1929), 112 (hereinafter referred to as Clark-Kennedy, Hales).

[73] D. G. C. Allan and Robert E. Schofield, The Rev. Dr. Stephen Hales (1677-1761): Scientist-Philanthropist (London: Scolar Press, in press), 158 (hereinafter referred to as Allan and Schofield, Hales); also see R. K. French, Robert Whytt, the Soul, and Medicine (London: The Wellcome Institute of the History of Medicine, 1969), 5 and 17; Henry Guerlac, "Joseph Black and Fixed Air: A Bicentenary Retrospective, with Some New or Little Known Material," Isis, XLVIII (1957), 137-139 (hereinafter referred to as Guerlac, "Black"). I would like to express my appreciation to Dr. Schofield for granting me access to and permission to cite from a manuscript copy of "Chapter Seven: Practical Invention and the Applications of Science" (Allan and Schofield, Hales).

[74] See Guerlac ("Black," 138-139) for a brief, readily-available account of Mrs. Stephens' medicines and their publication.

Although he was aware most of his colleagues maintained "that Stones of the urinary Passages cannot be dissolved by any Liquid, except such as is too acrimonious for the Passages themselves,"[75] Hartley was convinced "that those who take Mrs. Stephens's Medicines have evidently a Liquid running thro' the urinary Passages, which is a Solvent for Stones in a Heat no greater than that of those Passages."[76]

Hartley was himself afflicted with kidney and bladder stones,[77] and he had begun taking Mrs. Stephens' medicines in 1737,[78] after "having first informed myself of some Facts which made me think them both effectual and safe."[79] He was concerned to know the composition of the lithontriptic he took daily,[80] and he therefore wrote and

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[75]David Hartley, An Account of the Contribution for making Mrs. Stephens's Medicines public; with some Reasons for it, and Answers to the most Remarkable Objections made against it, pamphlet dated June 5, 1738, 1; hereinafter referred to as Hartley, Account of the Contribution.

[76]Ibid.

[77]David Hartley, Ten Cases Of Persons who have taken Mrs. Stephens's Medicines for the Stone. With an Abstract of some Experiments, tending to Illustrate these Cases, pamphlet dated March 6, 1737-38 (London: Printed for S. Harding . . . , 1738), [i] (hereinafter referred to as Hartley, Ten Cases); Hartley, Account of the Contribution, 4; David Hartley, A View of the Present Evidence For and Against Mrs. Stephens's Medicines, as a Solvent for the Stone. Containing A Hundred and Fifty-five Cases. With some Experiments and Observations, pamphlet dated March 3, 1738-39 (London: Printed for S. Harding . . . , 1739), 134-137 (hereinafter referred to as Hartley, View of the Present Evidence).

[78]Hartley, Account of the Contribution, 3; Hartley, View of the Present Evidence, 135.

[79]Hartley, View of the Present Evidence, 135.

[80]Hartley, Ten Cases, [ii].

published a series of pamphlets[81] designed "to engage the Public to purchase the Discovery of the Medicines [by subscription] from Mrs. Stephens"[82] for the sum of £5000.[83]

Hartley was familiar with the many objections which had been raised against the medicines he championed, and in his pamphlets he used several methods of proof to dispel them. First, he compiled and published case histories of persons having taken the medicines with either favorable or unfavorable results.[84] Secondly, Hartley undertook a series of chemical experiments designed to identify the ingredients in Mrs. Stephens' concoction, as well as to compare the stone-dissolving power of the medicated urine to the dissolving powers of other liquids at various levels of heat.[85] Finally, Hartley referred his readers to the work of other authorities to bolster his conclusion that the medicines were indeed effective as a cure for the stone. These methods of proof by observation and experiment and by reference to the authority of specific natural philosophers and physicians and to common opinion would later play a role in substantiating the psychological

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[81]See Appendix A below for a list of the pamphlets, included in a chronological bibliography of Hartley's publications.

[82]Hartley, Ten Cases, [ii].

[83]Ibid.

[84]Ibid.; Hartley, View of the Present Evidence; David Hartley, De Lithontriptico a Joanna Stephens nuper invento dissertatio epistolaris auctore Davide Hartley, A.M. & R.S.S. (Basileae: Apud Johannem Christ, 1741) (hereinafter referred to as Hartley, De Lithontriptico (1741)).

[85]David Hartley, "An Abstract of some Experiments, Tending to Illustrate the Foregoing Cases," in Hartley, Ten Cases, 28-38 (hereinafter referred to as Hartley, "Abstract of some Experiments"); Hartley, De Lithontriptico (1741); Hales, Mrs. Stephens's Medicines.

system Hartley presented in the Observations on Man.[86]

Much information concerning Hartley's intellectual development during his residency in London can be gleaned from his pamphlets attempting to secure contributions for the purchase of the recipe for Mrs. Stephens' secret remedy. Perusal of the case histories, for instance, indicates that Hartley's deepening involvement in his medical practice expanded his intellectual contacts during this period. The case histories show that Hartley continued his earlier association with Francis Sandys as late as 1737[87] and that by 1739 he had formed contacts with many other physicians and surgeons as well.[88]

These pamphlets also reveal that Hartley possessed an active interest in experimental chemistry. By March of 1737-38 Hartley had become associated with Stephen Hales. Hales supplied Hartley with materials for his experiments on the stone[89] and directed, worked alongside, and continued some of the experimental tests Hartley ran on Mrs.

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[86] See Chapter IV below for a discussion of the methods of proof Hartley relied on in the Observations on Man and their origin in contemporary "Newtonian" natural philosophy.

[87] Hartley, Account of the Contribution, 2. In 1738 Hartley was practicing medicine in conjunction with Dr. Sandys as well as with a Dr. Hulse (n.d.) (David Hartley, Letter of July 24, 1738, British Museum, Add. MSS 33083, folio 276; David Hartley, Letter of July 25, 1738, British Museum, Add. MSS 33083, folio 278; David Hartley, Letter [n.d.], British Museum, Add. MSS 33083, folio 279).

[88] These case histories are replete with references to various physicians and surgeons, some as notable as William Cheselden (1688-1752) (Hartley, "Supplement," 41). Hartley's pamphlets, Ten Cases and View of the Present Evidence, are also spattered with the names of the physicians and surgeons with whom Hartley came into contact during his work on Mrs. Stephens' medicines. An examination of the connection between Hartley and these physicians and surgeons would be helpful in illuminating the origins of the physiological concepts upon which his psychology is based.

[89] Hartley, "Abstract of some Experiments," 34. Some of the

Stephens' medicines.[90] Hales and Hartley served together on a board of examiners appointed to test the efficacy of the medicines after their disclosure in 1739,[91] and Hartley appended a supplement outlining the history of the medicines to an account which Hales published in 1740 describing the experiments he and Hartley had undertaken to determine their efficacy.[92]

The pamphlets also indicate that by 1738 Hartley was familiar with Hales' chemical publications as well, for Hartley frequently cited Hales therein to lend weight of authority to his conclusions.[93] Furthermore, in 1741 Hartley's familiarity with prominent works in natural philosophy as a whole had increased so that he was able to include citations from Sir Isaac Newton, as well as from Hales, in his final substantive publication on Mrs. Stephens' medicines.[94]

In addition to promoting John Byrom's shorthand and Mrs. Stephens' medicines during his years in London, Hartley also worked to

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stones Hales gave to Hartley had been given to Hales by Hans Sloane (Clark-Kennedy, Hales, 112).

[90]Hales, Mrs. Stephens's Medicines, 7-8; Allan and Schofield, Hales, 166. According to Allan and Schofield (Hales, 158), Hales was involved in a search for a lithontriptic from 1727 to 1756. Guerlac ("Black," 139-140) reviewed Hales' experiments on the stone; for a detailed account of Hartley's experiments see Chapter IV below.

[91]Hartley, "Supplement," 39-41. Hartley's pamphlets did not succeed in raising funds to purchase the recipe from Mrs. Stephens, but on March 17, 1739-40 Parliament awarded her £5000 and made the recipe public (ibid., 39 and 48).

[92]Ibid.

[93]Hartley, Account of the Contribution, 2 and 216.

[94]Hartley, De Lithontriptico (1741). See Chapter IV below for a discussion of Hartley's association with Hales and the impact Hales may have had on the method and content of the Observations on Man.

obtain the publication of his Cambridge professor Nicholas Saunderson's introductory algebra text. On June 5, 1738, Hartley enlisted his friend John Lister's aid in the following letter:

> I now send you Proposals for Saundersons Algebra & beg of you to do him all the Service you can. It has been with much Difficulty that he has been prevailed with to finish this Work, & if he does not meet with proper Encouragemt, the World will be a great Loser because he has so many beautiful useful Treatises wch only want the last Stroke.[95]

Throughout the fall of 1738 and the spring of 1738-39, Hartley and Lister collected subscriptions for the purchase of Saunderson's book upon its publication.[96] They continued to raise funds for the publication of the Algebra even after Saunderson's death, "for the sake of Mrs. Saunderson, & the Excellence of the Work it self both."[97] Their efforts were successful, and several hundred subscribers were able to underwrite the publication of the textbook, which appeared in 1741.[98]

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[95] David Hartley to John Lister, June 5, 1738, Shibden Hall Collection MSS, SH 7/HL: 5.

[96] John Lister to David Hartley, September 8, 1738, Shibden Hall Collection MSS, SH 7/HL: 7; John Lister to David Hartley, November 6, 1738, Shibden Hall Collection MSS, SH 7/HL: 9; John Lister to David Hartley, December 18, 1738, Shibden Hall Collection MSS, SH 7/HL: 11; David Hartley to John Lister, April 1, 1739, Shibden Hall Collection MSS, SH 7/HL: 13.

[97] David Hartley to John Lister, August 7, 1739, Shibden Hall Collection MSS, SH 7/HL: 18. According to the correspondence between Lister and Hartley, Nicholas Saunderson died in April or early May, 1739 (Hartley to Lister, April 1, 1739; John Lister to David Hartley, May 7[?], 1739 Shibden Hall Collection MSS, SH 7/HL: 16).

[98] "A List of such of the Subscribers [sic] Names As are come to Hand," in Nicholas Saunderson, The Elements of Algebra, in Ten Books . . . (Cambridge: Printed at the University-Press, 1740), [xi-xvii] and xxx; Saunderson's work hereinafter referred to as Saunderson, Algebra. Although the publication date on the title page of Saunderson's Algebra reads 1740, a letter from Hartley to Lister indicates the book was not actually released from the printer until April or May, 1741 (David Hartley to John Lister, April 20, 1741, Shibden Hall Collection MSS, SH 7/HL: 22).

During Hartley's residence in London, his health grew steadily worse, to the point that it began to restrict his daily activities. In August of 1738, he described his situation to Lister as follows:

> As to my self I am happy in all externals, except my Wife's Health & my own, & I have good Hopes for both. Our Fortunes are rather too narrow for the way I am obliged to live in, but if it please God to give me Health I believe that will soon be easy. I cannot bear to read so much as I have done sometimes, & what I do apply to is chiefly Physic & Divinity. Indeed I have resolved to refrain from every thing else as much as may be. I am sensible how good it has been for me to be afflicted & do endeavour to comply from my Heart with the great Prayer & Precept, Thy will be done.[99]

In the spring of 1742, Hartley and his family left the bustle of London because both his and his wife's health no longer permitted them to live in the city. According to his daughter, Hartley

> left town, partly on my mother's account, who was thought to be consumptive, and partly because he had a painful complaint himself [the stone], which made him unable to bear the motion of a carriage. In 1742 he settled at Bath, where he remained till he died, except when he went for the summer to one of my mother's country houses.[100]

On May 26, 1742 Hartley informed Lister,

> I rec'd your Letter in London just as I was setting out for Bath, whither I am come with my Family to settle, on Acct of the many Illnesses, & particularly some affecting the Lungs, wch my Wife has had in Town. We have got a very pleasant House in the new Square, where we breath good Country Air, & I hope it will please God to grant my Wife a confirmed State of Health.[101]

By December, Hartley had decided,

> I like this Place upon the whole better than London, I have much more Leisure for Books, & at the same time have a tolerable Share of Business. But what is above all my Wife is well, & I hope

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[99]David Hartley to John Lister, August 29, 1738, Shibden Hall Collection MSS, SH 7/HL: 6.

[100]M. Hartley to Gilpin, Letter XXX, 108-109.

[101]David Hartley to John Lister, May 26, 1742, Shibden Hall Collection MSS, SH 7/HL: 26.

likely to continue so.[102]

Furthermore, he wrote,

> This is a Place where there is good Intelligence & very fresh. But I am not much in the Way of it, & indeed my own Business, studies & the Care of my Son engage me too much to suffer me to be taken up by what is foreign to me.[103]

After moving to Bath, Hartley's publications took a more philosophical turn, although he continued to practice medicine as his profession.[104] In February of 1745-46 Hartley issued a second edition of his major work on Mrs. Stephens' medicines, De Lithontriptico, first published in 1741. To this he appended the Conjecturae, a short abstract of his recently completed, larger psychological work.[105] In March 1745-46, the Prince of Wales appointed Hartley co-vice-president of the general hospital at Bath.[106] In July 1746 Hartley and Hales published a proposal to raise money for a printing of 15,000 Bibles in the Welsh language in Gentleman's Magazine,[107] and, following the death of Colin Maclaurin (1698-1746), Hartley contributed to the subscription for the publication of his An Account of Sir Isaac Newton's Philosophical

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[102] David Hartley to John Lister, December 2, 1742, Shibden Hall Collection MSS, SH 7/HL: 29.

[103] Ibid.

[104] Hartley, "Doctor's Day-books."

[105] See Chapter II for a detailed account of the development of Hartley's psychological system and the publication and contents of the Conjecturae.

[106] "Promotions, &c.," The Gentleman's Magazine, and Historical Chronicle, XVI (for March, 1746), 165.

[107] "A Proposal for an Impression of Bibles in the Welsh Language," The Gentleman's Magazine, and Historical Chronicle, XVI (for July, 1746), 387.

Discoveries, which appeared in 1748.[108]

On December 22, 1748,[109] Hartley moved his family to his wife's estate in Berkshire, ". . . Donnington Castle, where . . . [he] had some thoughts of residing. . . ."[110] In late winter 1748-49 or spring 1749, while Hartley and his family were at Donington Castle, his most historically-significant intellectual contribution, the Observations on Man, appeared in print.[111] It is in the Observations on Man that Hartley elaborated his theory that all man's thoughts, actions, and his spiritual condition and progress are based upon the association of simple ideas which are themselves the products of the physical interaction of the small particles of the human body, according to the laws of contemporary "Newtonian" physical science.[112]

There is not much information available concerning the remaining years of Hartley's life. Hartley and his family returned to Bath on September 9, 1749,[113] and Hartley's health grew increasingly worse

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[108]"A List Of such of the Subscribers [sic] Names As are come to the Hands of the Publisher," in Colin Maclaurin, An Account of Sir Isaac Newton's Philosophical Discoveries, in Four Books . . . (London: Printed for the Author's Children . . . , 1748), [xxiii].

[109]David Hartley, "Account Books," Hartley-Russell Collection MSS, D/EHy A6; hereinafter referred to as Hartley, "Account Books."

[110]M. Hartley to Gilpin, Letter XXX, 108-109.

[111]See Chapter II for the composition and publication of the Observations on Man.

[112]See Chapter III for an analysis of Hartley's theory of the association of ideas and its physiological basis. See Chapter IV for a discussion of Hartley's application of "Newtonian" scientific theory to his study of mind.

[113]Hartley, "Account Books."

with time. Letters which passed between Hartley and Lister contain frequent references to Hartley's ill health as a result of recurring bladder stones.[114] Despite this, Hartley continued to practice medicine,[115] and he continued to pressure John Byrom to publish his shorthand notation.[116] For the most part, it appears that Hartley's attention was focused upon his medical practice and his religious studies in his later years. In a letter dated October 29, 1754, Hartley apprised Lister, "I have quite left off all philosophical & mathematical Inquiries for some years, finding that they fill my Imagination with Ideas that are foreign to my proper Business."[117] Hartley did, however, retain intellectual contacts he had made while in London; for instance, he kept up correspondence with his colleague Stephen Hales.[118] Shortly before his death, Hartley also engaged in a brief correspondence with an admirer of his, the young chemist and philosopher Joseph Priestley (1733-1804).[119]

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[114]See, for instance, John Lister to David Hartley, August 1750, Shibden Hall Collection MSS, SH 7/HL: 44; David Hartley to John Lister, January 18, 1753, Shibden Hall Collection MSS, SH 7/HL: 46, among others.

[115]Hartley, "Doctor's Day-books." Also included in these archives are personal letters requesting medical advice of Hartley as late as 1757.

[116]J. Houghton to John Byrom, April 8, 1752, in Byrom, Journal, in Chetham, XLIV, 536.

[117]David Hartley to John Lister, October 29, 1754, Shibden Hall Collection MSS, SH 7/HL: 47.

[118]Contained in the Hartley-Russell Collection MSS are six letters written from Stephen Hales to Hartley, spanning the years 1755 to 1757 (D/EHy F79: 7-12 and 79: 29).

[119]Stephen, "Hartley," 68. Priestley had read Hartley's Observations on Man while he was a student at Daventry Academy (1752-

Hartley's health became increasingly poor in 1757, and on April 18 Hales lamented, "I am sorry to find that your calculos complaints continnue."[120] On August 28 of that year, Hartley died following a final bout with his recurrent bladder stones.[121]

During the fifty-two years of his life, Hartley engaged in a gamut of activities. Originally he intended to follow his father as an Anglican minister, and he pursued his university education at Cambridge accordingly. Finding that he could not entirely agree with several of the Thirty-Nine Articles of the English church, however, he shifted his plans and became a practicing physician instead. Throughout his life Hartley was a devout Christian; his uncertainties about the fundamental tenets of the Anglican faith played a formative role in his subsequent intellectual development,[122] and his personal religious convictions directed his various life-long pursuits.

Although Hartley's activities and publications may at first glance appear highly disparate, there is indeed a connection between them all. Each is a manifestation of Hartley's personal blend of the general philosophy of the Enlightenment with a desire to insure the spiritual progress of all mankind. Hartley's advocacy of inoculation,

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1755) and was very impressed by it (Joseph Priestley, Memoirs of Dr. Joseph Priestley, to the Year 1795, written by himself: With a Continuation, to the Time of his Decease, by his Son, Joseph Priestley: and Observations on his Writings . . . (Northumberland: Printed by John Binns, 1806), I, 17-19).

[120] Stephen Hales to David Hartley, April 18, 1757, Hartley-Russell Collection MSS, D/EHy F79: 12.

[121] Venn and Venn, "Hartley," 320; Young, "Hartley," 138; Bower, Hartley and Mill, 2.

[122] See Chapter II below for a discussion of the religious motivation underlying the composition of the Observations on Man.

his promotion of Mrs. Stephens' medicines, and his affiliation with the general hospital at Bath are evidences of his concern with the improvement of man's physical condition, a concern which was itself a product of the impact of the philosophy of the Enlightenment upon medical thought in the eighteenth century. Hartley's promotion of Byrom's shorthand, Saunderson's algebra text, the printing of Welsh Bibles, and Maclaurin's popularization of Newton all stem from his characteristically Enlightenment belief that human intellectual improvement will result from the dissemination of knowledge.[123]

Even Hartley's penultimate work, the Observations on Man, reflects the impact of Enlightenment philosophy, which removed the study of mind from the clergy and awarded it to the physician.[124] Yet, with its emphasis upon the connection between physical, mental, and spiritual perfection, the Observations on Man also stemmed from Hartley's overriding theological convictions.

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[123]Ackerknecht, History of Medicine, 139-144.

[124]As was discussed in the Introduction above, this was also a result of the "Newtonian conception of man" as part of the natural world. See Chapters III and IV below for the role this concept plays in Hartley's theory and its origins in "Newtonian" philosophy.

CHAPTER II

THE DEVELOPMENT AND COMPOSITION OF THE OBSERVATIONS ON MAN

In 1795, David Hartley's daughter Mary recalled, though hardly in an objective manner, hearing her father declare

> that the intention of writing a book upon the nature of man was conceived in his mind, when he was a very little boy. He was not a boasting man, nor ever spoke an untruth; but in many conversations that I have had with him about his book, he has told me, that when he was so little as to be swinging backwards and forwards upon a gate, (and, I should suppose, not above nine or ten years old,) he was meditating upon the nature of his own mind; wishing to find out how man was made; to what purpose, and for what future end; in short, (as he afterwards entitled his book,) 'the 'Frame, the Duty, and the Expectation of Man.'[1]

Information provided by Hartley's own correspondence, however, points to circumstances occurring during his studies at Jesus College, Cambridge, as the immediate motivation behind the composition of the Observations on Man.

Hartley's Ethical and Theological Motivation

As was described in Chapter I, Hartley entered Jesus College in April of 1722, intending to become an Anglican priest. Sometime between

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[1]Mary Hartley to Rev. William Gilpin, July 18, 1795, Letter XXVII, in Warner, Letters, 92-93. The reader is reminded that all documents are reproduced herein without correction or modernization of spelling, punctuation, and so forth.

January 1728-29 and February 1729-30, Hartley began to have serious doubts about the veracity of several of the Thirty-Nine Articles, the fundamental tenets of the Anglican church. Following the tradition of empiricism and natural religion according to which reason was held to be equally reliable, if not preferable to revelation as a source of religious thought,[2] Hartley was led by reason to conclusions he believed were contrary to the Thirty-Nine Articles. Hartley's later letters to Lister[3] substantiate the assertion that Hartley was particularly uncomfortable with Articles IX and XVII, both of which reflect the Anglican church's belief in election, predestination, and the eternal damnation and punishment of the wicked.[4]

Hartley's doubts about eternal damnation and punishment appear to have initially been based upon his belief that human benevolence was a product both of Providence and the beneficence of God. During the eighteenth century, philosophers and theologians were divided on the issue of "the moral order of the universe. . . ."[5] One school of thought maintained

> that the world is a system which automatically works together for good, and the other, that in order to secure good results we must make good efforts. Associated with the first of these . . . is the view that there is a 'natural' identity of interest between the individual and society (self-love and social are the same),

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[2]See Chapter I above.

[3]See Hartley to Lister, November 15, 1735, for example.

[4]Ibid.; Corinna Delkeskamp, "Medicine, Science, and Moral Philosophy: David Hartley's Attempt at Reconciliation," The Journal of Medicine and Philosophy, II (1977), 164 note 3.

[5]Willey, Eighteenth Century, 95.

> so that each man in following his own interest is in fact thereby promoting that of the whole. This view, as we see particularly in [Jeremy] Bentham [1748-1832], is compatible with the theory that egoism is the mainspring of human action. But on the whole the eighteenth century thought well of human nature, and it was generally believed that men were 'by nature' sociable, sympathetic, and benevolent. Good results, therefore, were to be expected from the nature of man, and as for vice (which undeniably existed), the wise ordinances of Providence could be relied upon to turn it to good ends (or at least to set matters right in the hereafter). So that even if we made no good efforts, 'good' would ultimately triumph just the same. On the whole, man's 'good nature' was supposed to be a part of the beneficent automatism of things.[6]

Hartley's discomfort with the concept of eternal damnation and punishment of the wicked is compatible with and may have historically sprung from his initial acceptance of the latter school of thought, which maintained men's actions automatically tend towards the good.

As was noted in Chapter I, Hartley abandoned his clerical ambitions in 1730 and embarked upon a medical career, at least partially due to his inability to resolve this apparent inconsistency between reason and orthodox Anglican theological doctrine. During the early years of his medical career he was not, however, able to put this inconsistency and the doubt it consequently cast upon the veracity of both reason and Scripture out of his mind. Hartley continued to study "religious subjects" alongside his study of physic, and in fact in his opinion the religious studies took precedence over the medical ones.[7]

Hartley's initial study of association must therefore be seen within the context of his attempts to resolve the religious doubts which had earlier caused him to flee his intended clerical career. From the

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[6] Ibid.

[7] Hartley to Booth, Letter XXIX, 100.

time of its inception, "the major intent of his psychological analysis was to contribute to a rational and scientific solution to the problems of faith and morality,"[8] not, as has otherwise been suggested, to resolve a conflict he perceived to exist between determinism and materialism and Christian idealism.[9]

If Hartley's recollections are accurate, he began his initial speculations on association in 1730 or 1731.[10] In the preface to the Observations on Man, written in December of 1748, Hartley recalled how hearing "that the Rev. Mr. Gay . . . asserted the Possibility of deducing all our intellectual Pleasures and Pains from Association . . . put me upon considering the Power of Association."[11] Hartley read Gay's "Preliminary Dissertation. [sic] Concerning the Fundamental Principle of Virtue or Morality" around the time of its publication in 1731[12] and was greatly influenced by its contents.

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[8]Walls, "Mechanism," 147; see also Hartley, "Preface," Observations on Man, I, v; and Margaret Leslie, "Mysticism Misunderstood: David Hartley and the Idea of Progress," Journal of the History of Ideas, XXXIII (1972), 628.

[9]Barbara Bowen Oberg, "David Hartley and the Association of Ideas," Journal of the History of Ideas, XXXVII (1976), 442; hereinafter referred to as Oberg, "Hartley and Association." This could not have been the case, since Hartley himself declared he only reluctantly accepted the concept of necessity much later in his studies (Hartley, "Preface," Observations on Man, I, vi) and he never accepted materialism in the sense of the concept of endowing matter with the ability to engage in thought (Hartley, Observations on Man, I, 33-34, 111, 511).

[10]Hartley, "Preface," Observations on Man, I, v.

[11]Ibid.

[12]Ibid. According to a catalogue purported to be of Hartley's library (Hartley-Russell Collection MSS, D/EHy F-55), Hartley owned a copy of the 1739 edition of "King's Origin of Evil," to which Gay's

The Content of Gay's "Dissertation"

In his brief but influential "Dissertation," Rev. John Gay explored the following topics: (1) the dual motives behind human action, (2) the end of human action, (3) the criteria by which we measure virtuous action, and (4) the origin of these criteria.

Gay identified egoism, altruism, and the association of ideas as motivating forces behind human behavior. Along with Francis Hutcheson and Anthony Ashley Cooper, the third Earl of Shaftesbury (1671-1713), Gay pointed to the pursuit of pleasure and the avoidance of pain, that is, self-love or egoism, as the motivation behind human action in cases in which man perceives the end of his action to be his own happiness.[13] He agreed with Hutcheson that man occasionally pursues virtuous action when he does not perceive the end of his action to be happiness[14] or even when it appears to be inconsistent with his own happiness.[15] In these cases, Gay maintained his actions "are to be accounted for from the Association of Ideas"[16] and/or "a public or benevolent Affection,"[17] or altruism.

The end of all action, whether motivated by egoism, the association of ideas, or altruism was judged by Gay to be happiness.

"Dissertation" was appended. For a discussion of the relationship between the ethical theories proposed by Gay and Hartley and those of other writers in the eighteenth and nineteenth centuries, see Oberg, "Progress Toward Perfection," 103-151.

[13]See Thomas Fowler and "X," "Hutcheson, Francis," Encyclopaedia Britannica, XIV (11th ed.), 9-12 (hereinafter referred to as Fowler, "Hutcheson"); Gay, "Dissertation," xiv and xxii.

[14]Gay, "Dissertation," xiv. [15]Ibid., xiii-xiv.

[16]Ibid., xiv. [17]Ibid., xiii-xiv.

Asserting that God had established happiness as the end, as well as the principle behind human action,[18] Gay described happiness, rather than eternal punishment as the future state towards which each man's actions ultimately propel him.[19] Gay thus falls within the eighteenth-century moral tradition described above according to which egoism is the primary motivation behind human action, self-love and social benevolence are identical, and, therefore, the world as a system is automatically working towards good.[20]

Although Gay identified the "immediate Criterion [by which man judges human behavior as] . . . the Will of God,"[21] he considered the mediate criteria of virtue to be "the Happiness of Mankind," the ". . . Fitness and Unfitness of things," and/or ". . . Reason and Truth. . . ."[22] These criteria form the foundation of man's moral sense and his benevolence.

In his "Dissertation," Gay joined contemporary philosophers who were arguing in reaction to Hutcheson's explanation of man's moral sense and benevolence as innate or instinctual.[23] Gay agreed that Hutcheson "rightly infers the Necessity of supposing a Moral Sense . . . and public Affections, to account for the principal Actions of human Life."[24] According to Gay,

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[18]<u>Ibid</u>., xiv and xix. [19]<u>Ibid</u>., xiv.

[20]Willey, <u>Eighteenth Century</u>, 95.

[21]Gay, "Dissertation," xix-xx. [22]<u>Ibid</u>., xix.

[23]Fowler, "Hutcheson," 9-12.

[24]Gay, "Dissertation," xiv.

> the ingenious Author of the Enquiry into the Original of our Idea of Virtue [Hutcheson] . . . has supposed . . . a Moral Sense to account for the [fact that men approve of virtuous action without being able to cite a reason for their approval] . . . , and a public or benevolent Affection for the [fact that men occasionally pursue virtuous action even when it is apparently inconsistent with their own private happiness] . . . : And these, viz. the Moral Sense and Public Affection, he supposes to be implanted in us like Instincts, independent of Reason, and previous to any Instruction; and therefore his Opinion is, that no account can be given, or ought to be expected of them. . . .[25]

Gay, on the other hand, believed that attributing the moral sense to instinct smacks of the ". . . Doctrine of Innate Ideas [and] . . . relishes too much of that of Ocult Qualities."[26] Gay explained that Hutcheson, "by calling these Instincts, . . . stops too soon, imagining himself at the Fountain-head, when he might have traced them much higher, even to the true Principle of all our Actions, our own Happiness."[27]

Gay denied "that this Moral Sense, or these public Affections are innate, or implanted in us"[28] "by way of Instinct, but are all acquired, being fairly deducible from supposing only sensible and rational Creatures dependent upon each other for their Happiness. . . ."[29] More specifically, Gay maintained "they are acquired either from our own Observation or the Imitation of others"[30] or by the internal process of association. Gay suggested human action could be better understood by viewing moral ideas as "mixed Modes, or compound Ideas,"[31] made up of simple ideas gained from sensation and observation, which are arbitrarily "ty'd together and associated in our Minds."[32] He explained that when a man

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[25] Ibid., xiii-xiv. [26] Ibid., xiv.

[27] Ibid. [28] Ibid., xxxiii. [29] Ibid., xxviii.

[30] Ibid., xxxiii. [31] Ibid., xii.

[32] Ibid., xii, xiv, xxx, xxxiii.

perceives that an action will further his pursuit of happiness, the idea of pleasure becomes associated with that action in his mind, and the action will henceforth be pursued because it is a pleasurable action.[33] In Gay's opinion, then, it is ultimately the process of association, not the implantation of innate ideas or human instinct, which determines and directs human action.[34]

The Impact of Gay upon Hartley

Gay's "Dissertation" appealed strongly to Hartley for several reasons. Gay's assertion that egoism and altruism both propel man towards his ultimate end of happiness, rather than eternal punishment, that God had established for him was in accord with Hartley's troublesome doubts about eternal punishment and damnation and also agreed well with Hartley's concept of God as a benevolent creator.

Furthermore, Gay's theory indicated a divine sanction of human reason, as well as the validity of revelation. If moral codes and benevolence result from association and both propel man towards God's desired ends, then association and human reason are vehicles of the will of God. Reason and revelation only appear to be in conflict, if this is the case, and both must ultimately be reconcilable.

Finally Gay's treatise provided Hartley with a potentially fruitful tool in his study of the validity of reason--the process of association. If, as Gay had suggested, association accounts for the formation of the moral sense and human benevolence, the founts of virtuous

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[33] *Ibid.*, xxx-xxxi. [34] *Ibid.*

human behavior which were considered by some to be innate or instinctual, then perhaps association accounts for other human concepts and actions also popularly considered to be innate or instinctual. Hartley may have extrapolated from Gay's utilization of association in his "Dissertation" along these or similar lines of thought. Whatever his line of reasoning, however, Hartley later recalled that Gay's assertions first "put . . . [him] upon considering the Power of Association." From there, he "was led to examine both its Consequences, in respect of Morality and Religion, and its physical Cause."[35]

Hartley's Initial "Progress to Happiness" Treatises

As was noted in Chapter I, Hartley continued to be preoccupied with resolving the conflict he perceived between reason and Scripture and the doubt this conflict cast upon the veracity of each even after he had abandoned his plans to enter the ministry, had established his medical practice, and had published his small treatise promoting inoculation for the prevention of smallpox in 1733. In March of 1734-35, he informed his sister that his religious studies had lately even taken precedence over his study of medicine.[36]

Although Hartley's daughter was unsure "whether . . . [her father] had . . . begun to arrange . . . [his thoughts] in the form of a book" by 1734-35,[37] by June of 1735 Hartley's thoughts had indeed taken written form. In fact, "Dr. Hartley's book" had already become

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[35] Hartley, "Preface," Observations on Man, I, v.

[36] Hartley to Booth, Letter XXIX, 100.

[37] M. Hartley to Gilpin, Letter XXVII, 93.

a topic of discussion among John Byrom and his friends at Cambridge.[38]

In November of 1735, Hartley renewed his correspondence with his schoolmate John Lister by acquainting Lister with his recent marriage and move to London. From the context of the letter, Lister had been aware of the intellectual turmoil which had precipitated Hartley's departure from Cambridge in 1730, and Hartley was anxious to inform Lister that he had finally resolved his difficulties. Hartley wrote, "I have for some time applied my self chiefly to moral & religious Enquiries, & have got the better of every material Doubt I ever yet had concerning either natural or revealed Religion." Hartley related to Lister that he had recently read "a Book called The State of Souls seperated from their Bodies, . . . a Translation from the French of one Murrault," which had especially reconfirmed his denial of eternal damnation and punishment. He now concluded, "The chief Result of both Reason & Scripture as appears to me is Universal Happiness in the most absolute Sense ultimately." Furthermore, he confided to Lister,

> I cd not avoid giving my Thoughts in writing upon so important a Subject, & indeed have rec'd even from thence a greater Degree of Conviction in relation both to Reason & Scripture. I have no Design of appearing in public upon these Subjects till I have fully satisfied my self & my Friends, but if that ever happens it is not improbable but I may.[39]

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[38]Byrom, Journal, in Chetham, XXXIV, 622.

[39]Hartley to Lister, November 15, 1735. The "Murrault" Hartley referred to here is probably Béat Louis de Muralt (1665-1749), a Swiss traveller and religious philosopher, whose Lettres sur les Anglais et les Français was first published in 1712. Later editions, however, often included additional essays on subjects such as "L'instinct divin. [sic] Recommandé aux hommes." According to the alleged catalogue of

"Dr. Hartley's book," referred to by Byrom in the summer of 1735 and by Hartley himself in this letter to Lister, was apparently being circulated in manuscript form among Hartley's friends.

On March 12, 1735-36, Byrom recorded in his diary that ". . . Doctor [Hartley] and I had had talk about the Christian religion, which he said he was persuaded of by reasoning. . . ."[40] In a letter to Lister written the following day, Hartley explained the reasoning behind his deduction "that the supposed Coincidence of Moral Good with private Happiness will draw after it a consequential one both with public Happiness & with the Will of God" and also reiterated his ". . . Proposition . . . That Universal Happiness is the fundamental Doctrine both of Reason & Scripture. . . ." Hartley had concluded that "undoubtedly nothing is so irreconcileable [to] Reason as eternal Punishment, nothing so contrary to all the Intimations God has given us of himself in his Works."[41]

Although Hartley's manuscript had been in circulation since the summer of 1735 and in spite of Hartley's allusion to his manuscript in an earlier letter to Lister, it was only in the fall of 1736 that

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Hartley's library, Hartley owned a copy of "Lettres sur Les Anglais &c" printed in "Cologne, 1725" (Hartley-Russell Collection MSS, D/EHy F-55). This is probably an edition of Muralt's work which included his theological discourses.

[40]Byrom, Journal, in Chetham, XL, 12.

[41]David Hartley to John Lister, March 13, 1735-36, Shibden Hall Collection MSS, SH 7/HL: 1A. Hartley's discussion of "Moral Good" and "Moral Evil" in this letter, as well as his discussion of virtue and benevolence in the subsequent letter (David Hartley to John Lister, May 15, 1736, Shibden Hall Collection MSS, SH 7/HL: 2A) closely parallels Gay's "Dissertation."

Lister became aware of the extent and purpose of Hartley's efforts. In November 1736, Lister wrote Hartley, "I was told not long since by a Fellow of St John's, yt You were preparing a Treatise agst the Natural affections, proving ym to be only Prejudice & Custom. Methinks," Lister cautioned Hartley, "yt Prejudice is so very strong, yt [it] wil be difficult, extremely difficult to perswade the World out of it."[42]

In December 1736, Hartley described the structure and content of his manuscript "Treatise" to Lister:

> I have wrote two small Treatises abt a year & half ago, but without any Design of publishing them in their present Form. I call them, The Progress to Happiness deduced from Reason--& from Scripture. The first begins with shewing that all our Intellectual Pleasures & Pains are formed either imediately or mediately from sensible ones by Association, i. e that they are meerly Compositions of a variety of Sensations & all Reflection ultimately resolvible into Sensation. It then proceeds to show that Benevolence is the best Means of obtaining private Happiness, that this naturally leads us to the Love of God, that our Natures are so formed & so adjusted to the System of things that we must from the Law of Association at last become benevolent, & [conse]quently that all must some time or other be happy. The 2d endeavours to show that if we interpret Scripture in the large & unconfined Sense according to wch our Saviour & his Apostles interpret the old Test., or even in any other way almost, its great Doctrine will be universal Salvation. I add at the same time some Hints to show that the Christian Revelation has the most incontestible Marks of Truth & Certainty.[43]

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[42]John Lister to David Hartley, November 15, 1736, Shibden Hall Collection MSS, SH 7/HL: 2B.

[43]David Hartley to John Lister, December 2, 1736, Shibden Hall Collection MSS, SH 7/HL: 3A. Leslie Stephen ("Hartley, David," The Dictionary of National Biography, IX (1937-38 reprint), 67; hereinafter referred to as Stephen, "Hartley") incorrectly supplied December 12, 1736 as the date of this letter. Benjamin Rand ("The Early Development of Hartley's Doctrine of Association," Psychological Review, XXX (1923), 312; hereinafter referred to as Rand, "Development") followed Stephen in this regard. According to Hartley's recollections in this letter, the two treatises were composed in the summer of 1735,

Hartley's description of these two treatises shows them to be the "Thoughts" that he had put into written form before June of 1735, after he had resolved his doubts about the veracity of natural and revealed religion. Reason and Scripture are no longer seen to be at odds with one another; indeed reason and revelation can be seen as two paths leading to the same single conclusion: that happiness and salvation is the ultimate end of every man.

Hartley's letter to Lister also reveals the relatively advanced state of development of the psychology of association as of 1735. Hartley has extended Gay's use of the process of association to account for the formation of moral codes and human benevolence[44] to account for the formation of "all our Intellectual Pleasures & Pains" as well. Hartley also followed a recent trend to reject John Locke's faculty of reflection as a separate source of ideas[45] by reducing reflection to its basis in sensation. Finally, not only has Hartley conceived

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although different dates of composition as well as various titles have been attributed to them by historians in the past. Stephen ("Hartley," 67) and Rand ("Development," 312) referred to the treatises as entitled "'The Progress to Happiness deduced from reason,' and starting from the principle of association." Robert M. Young ("Hartley, David," Dictionary of Scientific Biography, VI (1972), 139; hereinafter referred to as Young, "Hartley") simply titled them The Progress of Happiness Deduced from Reason; Young also considered them to have been developed in 1734 from Hartley's Conjecturae, which he believed had been composed in 1730 (ibid.). Unfortunately, the two treatises were never published by Hartley, and they do not seem to have been preserved in manuscript.

[44] Gay, "Dissertation," xii, xiv, xxviii, xxx, xxxiii.

[45] According to Warren (History of Association, 47) at least one earlier writer, Peter Browne (ca. 1665-1735), had rejected Locke's faculty of reflection.

of association as a general, natural, and regularly-occurring mental process that can be expressed in terms analogous to a natural law, but he has also expressed it as such and labelled it "the Law of Association." He furthermore appears to have organized the first of the two "Progress" treatises in a logically synthetic manner, by means of which he has proven "the Law of Association" by deduction. On the basis of Hartley's description of his two treatises, "The Progress to Happiness deduced from Reason--& from Scripture," the emergence of a systematized association psychology can be pinpointed to have occurred in 1735, rather than to the dates of publication of Hartley's later, more exhaustive treatments of association.

Hartley's letter to Lister of December 1736 also confirms the fact that Hartley developed the psychology of association as a means to explain the unconscious but inevitable progress of men to the state of happiness guaranteed them by Scripture. The law of association thus functions as the automatic means of reconciling man's apparent independence, as well as his occasional evil thoughts and actions, with the revealed ultimate state of happiness for all mankind.

Lister, however, was of the second school of eighteenth-century moral philosophy noted earlier, that believed "in order to secure good results we must make good efforts,"[46] and he was by no means convinced by Hartley's sketch that man progresses automatically towards

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[46] Willey, Eighteenth Century, 95.

happiness. In a letter to Hartley composed December 14-16, 1736, Lister argued,

> But how can Reason give us any Assurance, yt they who have refus'd to accept of Happiness, shal have the Gift in a Manner forc'd upon ym, Our Title to Happs according to Reason is founded not on an extorted but free Choice & Preference of Virtue before Vice. -- I observe farther, We are not imutably Good & yrefore not necessarily happy. A Necessity of Happs must presuppose a Necessity of Goodness, wch methinks is inconsistent with our Free-Agency.

Thus, he reasoned, ". . . We can with no Certainty conclude from either Reason or Scripture, yt the last End of [sinners as well as virtuous men] . . . shal be Happiness." Even though he and Hartley did not agree, Lister told Hartley he was anxiously waiting to read the two treatises, copies of which Hartley apparently had said he was sending him.[47]

Hartley's enthusiasm was not dampened by Lister's refusal to accept his theory, and in January 1736-37 Hartley continued to argue that reason and Scripture alike demonstrate man's progress to happiness. Hartley described to Lister how the process of association continually propels man towards happiness, regardless of his actions, in the following manner:

> . . . Our Minds are here formed & regulated by Association, & all the Events of our Lives are in general adjusted so as to correct & exalt us. If therefore we begin in the next world as we left off here, & the Progress of the next world be analogous to this, we must at last become pure & perfect i. e. happy.[48]

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[47] John Lister to David Hartley, December 14-16, 1736, Shibden Hall Collection MSS, SH 7/HL: 3B.

[48] David Hartley to John Lister, January 26, 1736-37, Shibden Hall Collection MSS, SH 7/HL: 4. W. B. Trigg (ed., "The Correspondence of Dr. David Hartley and Rev. John Lister," Transactions of the Halifax Antiquarian Society (1937), 237; hereinafter referred to as Trigg, "Correspondence") incorrectly supplied the date of January 16, 1736-37 for this letter.

The Expansion of the "Progress" Treatises

In the following years Hartley continued his theological studies alongside his chemical experimentation on bladder stones, the publication of a series of pamphlets designed to persuade the public to purchase Mrs. Stephens' recipe, and the collection of subscriptions to underwrite the publication of Saunderson's Algebra. In August of 1738, he complained to Lister that his ill-health had forced him to restrict his studies "chiefly [to] Physic & Divinity. Indeed I have resolved to refrain from every thing else as much as may be."[49] In September 1738, Hartley explained,

> My Studies in Divinity have been chiefly with relation to the History, Chronology, Authors, & general Purport of the Writings of the old & new Testamt, so as to satisfy my self as to the Truth of Religion, & I thank God I am very comfortably satisfied, or indeed rather wonder how any Body can doubt. As to particular Disputes I can read both sides often without finding much amiss in either excepting their want of Candour to each other.[50]

Hartley continued to examine the concept of association as a part of his studies in divinity, and by the fall of 1738 he had greatly expanded and reorganized his two "Progress" treatises into a book-length manuscript. In November 1738, Lister commented on Hartley's "ful Employ" with Mrs. Stephens' medicine, Saunderson's algebra text, and his medical practice. In spite of these activities, Hartley had found time to write, for in the same letter Lister assured

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[49] Hartley to Lister, August 29, 1738.

[50] David Hartley to John Lister, September 27, 1738, Shibden Hall Collection MSS, SH 7/HL: 8.

him that "if you dare venture yr M. S. Book the Child of yr Brain so far as Bury, I shal be very glad to see it, & wil give you my sincere Opinion of it."[51]

Three weeks later, Hartley informed Lister,

> There is a Mr Chaddock a Manchester Man who will be in Manchester shortly, in a Week or 10 Days. I have given him my Papers wch he will take care to send over to you as soon as he gets into the Country, & will at the same time let you know how long he will stay. Be so good as to return them by him. . . . There is a blank Page, be so good as to favour me with any Remarks that occur in reading.[52]

In the same letter, Hartley described the expansion and reorganization which his work had recently undergone:

> My first Design was to have confined my self to the Plan of the 2 Pieces I send you. Since I have enlarged my Design & propose to call it, <u>An Introduction to the History of Man in four Parts</u>, considering him in his corporeal, mental, moral & religious Capacities. The 2 Pieces I send you are rough Draughts of the 3d & 4th Parts, & I have just made a foul over as it were, of the 1st & 2d. The 1st will contain an Enumeration of the Phaenomena of the Body & its several Parts, as they are affected by the external Objects of Touch, Taste, Smell, Hot, Cold, Diet, Medicine &c, as they affect & are affected by one another [,] suppose for Instance that a Stone in the Kidneys causes Vomiting, & lastly as they affect & are affected by the Mind. The 2d will contain the Original of the Several Senses of Beauty, Honour, Benevolence, &c with their several Parts, & the manner in wch they rise, with the time of their rise in Infancy &c as particularly as I can. There are some Sketches of this in the largest of the Pieces wch you will receive. For I there assert & explain a little how all our mental Pleasures & Pains are derived from sensible ones either immediately or mediately by Association.[53]

Hartley's description of the plan and content of his recently reorganized "Progress" treatises reveals that significant changes

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[51]Lister to Hartley, November 6, 1738.

[52]David Hartley to John Lister, November 23, 1738, Shibden Hall Collection MSS, SH 7/HL: 10.

[53]<u>Ibid</u>.

had occurred since Hartley first put his thoughts in writing in the summer of 1735, hoping to resolve his doubts about the agreement of natural and revealed religion and the truth of reason and the Scriptures. His description above also shows that he had made significant changes in the treatises since he had described their contents to Lister in December of 1736.

The theological intent remained, however, essentially the same: From the start, Hartley designed, first, to show by reason that man's future state would be one of happiness rather than eternal punishment and, secondly, to derive the same conclusion from "revelation," that is, from the Scriptures.

By November of 1738, however, Hartley had significantly enlarged his argument by reason to include an examination of man's corporeal and mental natures; until this time he had confined his study to man's moral and religious character. More importantly, he had for the first time begun to examine in detail the connection between events occurring in the human body and those that occur in the mind. His letter to Lister reveals that, in November of 1738, Hartley viewed the relationship between the human body and mind as if it were one of cause and effect. He had determined not only to examine "the Phaenomena of the Body & its several Parts, as they are affected by . . . external Objects," but also to examine physiological phenomena "as they affect & are affected by the Mind." In other words, Hartley now proposed to analyze the physiological basis of association, as well as the effect of mental phenomena upon the body.[54]

At this time, however, Hartley had only briefly sketched Part 1 and Part 2 of his new Introduction to the History of Man, the two parts which were to contain his thoughts on man's corporeal and mental capacities. Parts 3 and 4, on man's moral and religious capacities, were, however, a rewrite of his earlier two treatises on "The Progress to Happiness deduced from Reason--& from Scripture." Thus, Hartley was able to send these two sections in rough draft to Lister for his criticism.

In his next letter to Lister, Hartley repeated his request for Lister's comments, referred to the unfinished state of the work, and implied he eventually intended to publish the finished manuscript. "I shall," he commented,

> be extremely glad to have your freest Thoughts upon my Papers. I shall not publish them without many Corrections, Additions & Blottings out. And when I have made them more to my Mind than they are at present, I shall intend to take the Advice of my Friends.[55]

Although Hartley delayed sending the manuscript, by the end of January 1738-39 Lister had received and read Hartley's work. He

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[54]As noted in Chapter I above, Hartley had become associated with the Newtonian experimental physiologist Stephen Hales by March 1737-38. See Chapter IV below for a discussion of the effect Hales may have had on Hartley's decision to include an analysis of the interaction of physiological and mental phenomena in his Introduction to the History of Man.

[55]David Hartley to John Lister, January 9, 1738-39, Shibden Hall Collection MSS, SH 7/HL: 12A.

began his comments with the following praises:

> I thank you for the Favour of yr Books, wch I read over with as much Care as the Time wd permit not wthout great Pleasure & Satisfaction. There's a Chain of Reasoning goes thro' yr Observations, wch I own have not been usd yet but, I think, it is very wel connected, & your Opinion of an ever increasing Happiness made as probable as it is desireable.[56]

Although Lister appears finally to have accepted Hartley's argument against eternal damnation and punishment in favor of man's automatic progress towards happiness by means of the mechanism of association, Lister nonetheless deemed it dangerous to spread such ideas among the masses. Hartley's doctrine of the certainty of future happiness would, he felt, incite the public to sin and licentiousness. "On this Acct," he advised Hartley,

> I cannot say how proper it wd be to trust the Public with yr Observations; I doubt not they wd be very entertaining & satisfactory to many thinking Persons . . . Yet the Public, methinks, shd rather be taught to have all their Hopes & Fears engag'd in their present Conduct, as if an Eternity of Happiness or Misery depended upon it. This perhaps is the best Doctrine for the People, is perhaps the safest & wisest Principle for all to act upon. . . .[57]

Hartley's Acceptance of the "Doctrine of Necessity"

When Hartley replied two months later he apologized for his tardiness, "but," he explained, I "have been so much hurried of late

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[56]John Lister to David Hartley, January 29, 1738-39, Shibden Hall Collection MSS, SH 7/HL: 12B.

[57]*Ibid.* In the same letter, Lister also particularly objected to four points Hartley presented in his manuscript. Lister commented,

> [Yr] Suppositions of an Atom containing millions of Worlds [,] the System of the Sun & fix'd Stars being but a single Particle . . . [cir]culating in the Capillary Vessel of an Immense Animal-- . . . [and] also of the Smallest Moment including Millions of Ages . . . [and] Millions of Ages being contracted into a Moment [ap]pear to me a little whimsical.

by my Attendance to Mrs Stephens's Affair, that I have not been able to write to you." He thanked Lister for his "candid & judicious Remarks upon my Treatises. . . ." Hartley noted, however,

> You have not observed to me that I am quite in the Necessitarian Scheme. This has also been thought to be injurious to the Cause of Virtue, but appears to me in a different Light when rightly understood, & I was much pleased to find a Chapter in Dr Butler's Analogy, intended to prove this Point.[58]

All in all, Hartley assured Lister he intended to "make a new Edition of . . . [his treatises] as it were," and he concluded by emphasizing,

> . . . I am in [no] Haste to publish. I shall write all over [aga]in, when I have finished my 2 first Parts concerning Man in his Corporeal & Mental Capacity; & shall shew the whole to my Friends, & endeavour to be teachable & impartial in all things. I will then beg the Favour of you to look over my Papers once more, & give me your Thoughts; & shall be obliged to you in the Mean time for whatever occurs to you concerning Man in his Corporeal, Mental, Moral, & Religious Capacities.[59]

(Ellipses and brackets in the above excerpt indicate illegible portions of the manuscript.)

[58] Hartley to Lister, April 1, 1739. The Butler here referred to was Joseph Butler (1692-1752), English bishop, theologian, and moral philosopher. Butler, who was a close friend of Hartley, published his The Analogy of Religion, Natural and Revealed, to the Constitution and Course of Nature in 1736. For a discussion of Hartley and Butler, see Oberg, "Progress Toward Perfection," 103-151. It should be noted that Hartley did not begin his ethical study and his study of association as a necessitarian; on the contrary, in the preface to his Observations on Man (Hartley, "Preface," Observations on Man, I, vi), Hartley declared he later found the idea of necessity followed from that of association. The text of the above letter to Lister reveals that he had accepted the idea of necessity prior to his revision of the "Progress" treatises in the fall of 1738 (Hartley to Lister, April 1, 1739). Benjiman Rand ("Development," 319) has thus correctly dated Hartley's acceptance of the doctrine of necessity as having occurred between 1731 and 1738.

[59] Hartley to Lister, April 1, 1739.

Hartley's identification with the "Necessitarian Scheme" provoked Lister to exclaim in his next letter,

> You do not seem to me to be a Necessitarian in any other Sense than yt Mankind wil certainly in the End be virtuous & happy. yt is, yt Vice will be attended with such Discouragemts, yt Men in Process of Time wil be glad to exchange it for Virtue & Happiness. Such a Necessity does not appear to me destructive of Liberty & Virtue, but rather a very proper Guard for Virtue, & a fit Attendant upon the Liberty of an imperfect Creature: for otherwise his Liberty might be a dangerous Gift & mislead in a terrible Manner, but restrain'd & checkd may serve greatly to enhance his Happiness. Liberty is restrain'd under all wise human Governmts, & surely under the wisest Governmt of all viz yt of God. But take Liberty quite away, & dont You substitute a Form of Governmt less glorious less worthy of the Supreme Being?
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> I yrefore cannot approve of their Scheme who hold yt Wtever is, is of Necessity, is an unavoidable Effect of the first Formatn of Things, & of the first Impulse, yt was given to the Machine of the World by the Creatr[.] Such an Opinion leads to strange Consequences; it charges God with the Follies & Impieties of Man. It damps our Endeavours after a good Life, & encourages Licentiousness & Living at Random. . . . Dr Butler indeed says yt ye Opinion of Necessity is not to be applyd to Practice, in Conduct & Behavr we must suppose ourselves to be Free Agts. As this Opinion of Necessity is to be rejected, as false, in Practice, I greatly suspect the Truth of it in Speculatn. Surely the Notion of Virtue & Vice as deserving Rewd & Punishmt & the whole Story of Man's being an Accountable Creature is founded on Freedom. I shd be obligd to you for a little Explanatn of this Doctrine of Necessity & also for Yr Opinion of Mr Pope's Assertn of Wtever is, is right.[60]

A month later Hartley replied,

> You ask my opinion abt Necessity. I ought previously to know your Opinion concerning Free-will. For I find several Persons who allow all that I require & yet still maintain that we have Free-will. And without doubt I do not deny Free-will in any such Sense, as that Men cannot feel Pleasure & Pain, desire & fear, resolve & perform in Consequence of those Resolutions. All I mean to say is, that all our most internal & intellectual Perceptions result as much from the Structure of our Bodies &

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[60] John Lister to David Hartley, April 16, 1739, Shibden Hall Collection MSS, SH 7/HL: 14. The Pope mentioned herein is the poet and moralist Alexander Pope (1688-1744).

> Impressions of external Objects or the remains of such Impressions, as the Perceptions of Colours do upon the Structure of the Eye & the Operation of Light &c., & that in the way of Association hinted at in the Papers you read. In like manner every Resolution to act, & every consequent Action are as much the Result of internal or external Sensations, as Deglutition in a new-born Child is of the Sweetness of the Milk wch falls upon the Tongue, or the Action of Vomiting is of the Sickness in the Stomach occasioned by the Emetic. And when every Action is the Result either immediately or mediately of Causes thus existing by the Will of God & in wch we have no Share, I cannot help referring all to him. Neither does this seem to me to reflect any dishonour upon him, if all be Wisdom, Virtue & Happiness at last.[61]

By way of illustration, he continued,

> I am mechanical, & for this very Reason it is that the Flame wch I see approaching, raises in me Apprehensions & a Train of internal Sensations, the consequence of wch is (according to preceding Associations) that my muscles contract & carry me away, or if you please to vary the Phrase, I contract my Muscles & run off.[62]

Hartley maintained moral judgments are just as much a product of association as is the reaction to fire he described above. He explained to Lister,

> All that we call noble, beautiful, virtuous &c receives its lustre entirely from the Perception of some kind or other of Happiness, where these words have been used; as will easily appear if you allow the Doctrine of Association in the Extent that I suppose.[63]

However, he noted,

> it is difficult to analyse so complicated a Subject as Human Nature. I endeavour to be as clear as I can, but I seem to my self to feel abundantly more Conviction than I can express.[64]

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[61]David Hartley to John Lister, May 13, 1739, Shibden Hall Collection MSS, SH 7/HL: 17.

[62]*Ibid.*

[63]*Ibid.*

[64]*Ibid.*

Lister took issue with the mechanistic picture of man Hartley had presented in this letter. He objected,

> You say yt every Resolutn to act, & every Actn conseqt yreupon, is as much the Result &c as the Actn of Vomiting &c wch Assertn I think very exceptionable as if Man was passive in every Thing & had not the least Power within himself to think or stir.[65]

According to Lister,

> We are more than Intelligt & sensible Machines. We have a Liberty of Will, by which I mean a Freedom of Choice & a Powr of determining ourselves to some Actns in Preference to others. Such a Powr, I think, essential to a Creature's being a moral Agent & capable of rendring Himself an Object of the good Pleasure or Displeasure of his Creator & Governour.[66]

Although Lister acknowledged that man's ". . . Liberty is the Origin of Evil," he nonetheless asserted "it is the Origin of Good too, it is the Origin of his Virtue, wch is essential to his best Happiness. . . ."[67]

By August of 1739, Hartley admitted to Lister,

> Our Differences abt Free-Will are not likely to be adjusted I imagine. Yet our Friend Law with one or two more have yielded to the Method of Reasoning wch I have suggested. By free Will I mean a Power in <u>A</u> to do an Action at the same time that <u>B</u> in precisely the same Circumstances as to Original Constitution, Education, present Appearances & in everything else whatsoever, has a power to do the contrary. Now here either the Action of A or of B wd be an Effect without a Cause. 2dly we never observe any thing that is contrary to original Temper, Education &c in ourselves or others. I mean as far as we have a proper Knowledge of these things.[68]

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[65]Lister to Hartley, May 7 [?], 1739. Although the date on this letter is earlier than that of the above letter from Hartley to Lister, the content reveals it is a reply to Hartley's letter dated May 13, 1739.

[66]Lister to Hartley, May 7 [?], 1739.

[67]<u>Ibid</u>.

[68]Hartley to Lister, August 7, 1739. Here Hartley probably referred to Edmund Law (1703-1787), educated at Cambridge along with Hartley and Lister and noted above as the translator of King's <u>De Origine Mali</u> (1731).

Just as Hartley could not agree with Lister on the definition of free will, neither could he accept Lister's belief that

> . . . Man cannot enjoy Happiness without Freedom. Yet he can see, hear, feel &c; he can love Beauty, Honour, Riches &c; & . . . he may adore, & delight in his Creator . . . without Freedom. For all these things may be proved to rise in him by Degrees from Association, from the Mechanism of his Nature.[69]

These early letters between Hartley and Lister reveal that at this stage of development Hartley spoke of both the human body and the human mind as if they were mechanisms: The mind, he believed, receives sensations from external phenomena via the physiological mechanism of the body; these sensations form "internal perceptions" according to the mental mechanism of association. Intellectual ideas, emotions, and spiritual thought are all products of association. Action is also a product of association. When man experiences an internal perception, such as the emotion of apprehension, association determines his judgment as to action, his will to act, and the resulting activity he performs. The mechanism of the body produces sensation; association, or "the Mechanism of . . . [man's] Nature,"[70] produces thought, judgment and action. Hartley has indeed accepted the doctrine of necessity, and in these early letters he approached man as if there were a cause and effect relationship between the human body and mind.

A comment Hartley made the following year to Lister, however, reveals Hartley ultimately drew a distinction between his view of the

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[69] Ibid.

[70] Ibid.

relationship between the body and mind and one of cause and effect. Hartley declared he did not maintain "that the Mind depends entirely on the Body, both upon mechanical Causes &c" as, he said, ". . . Atheists & Unbelievers" do. But he did believe it was occasionally useful to view them as related in this manner in order "to attack all Vice & Infidelity."[71]

The Beginning of the Shorthand Correspondence

In January of 1740-41, Lister informed Hartley that he intended to travel to London and Scarborough soon and expressed his hope to see Hartley during his trip.[72] Hartley was excited at the prospect of seeing his old friend,[73] and when Lister arrived Hartley took advantage of the opportunity to show Lister his book,[74] as well as to recruit another student and proponent for John Byrom's shorthand system.[75] Lister was receptive to the system; hence several of Hartley's subsequent letters to him are written in Byrom's shorthand style, contain sample enclosures of shorthand inscriptions, and include Hartley's

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[71]David Hartley to John Lister, May 17, 1740, Shibden Hall Collection MSS, SH 7/HL: 19.

[72]John Lister to David Hartley, January 10, 1740-41, Shibden Hall Collection MSS, SH 7/HL: 21. Although Trigg ("Correspondence," 260) stated, "Whether this anticipated meeting took place or not we cannot discover," subsequent correspondence, as well as an entry in Byrom's Journal (in Chetham, XL, 212), confirm that Lister did visit Hartley in London.

[73]Hartley to Lister, April 20, 1741.

[74]David Hartley to John Lister, December 13, 1743, Shibden Hall Collection MSS, SH 7/HL: 31 (shorthand).

[75]See Byrom, Journal, in Chetham, XL, 212.

pointers on writing it.[76] The shorthand correspondence between Lister and Hartley also began at this time, for Lister was able to write the shorthand with ease shortly after his brief exposure to it in London.[77]

Extant letters which passed between Hartley and Lister from the summer of 1740 until the winter of 1743 do not touch upon the subject of Hartley's book. In December of 1742, Hartley wrote Lister from his new residence in Bath and commented that he had "much more Leisure for Books" there than in London. In the same letter Hartley also asked Lister to write him in shorthand.[78] After this time, the shorthand correspondence between the two flourished almost to the exclusion of longhand letters for many years.

In December of 1743, in one of the earliest extant shorthand letters, Hartley described his attitude toward the content and publication of his book as follows:

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[76] David Hartley to John Lister, April 22, 1741, Shibden Hall Collection MSS, SH 7/HL: 23; David Hartley to John Lister, December 29, 1741, Shibden Hall Collection MSS, SH 7/HL: 24; Hartley to Lister, September 26, 1741.

[77] Hartley to Lister, September 26, 1741. Trigg ("Correspondence," 260-261) supposed Hartley had only recently become enthused about Byrom's shorthand system and that both Hartley and Lister learned the shorthand after Lister's visit to London. Trigg (<u>ibid</u>.) admitted that he was "unable to meet with anyone who could decode Hartley's letters, . . . and [he regretted that] apart from using . . . [some undated anonymous notes made on the content of them] the shorthand letters must perforce be omitted" from his edition of the Hartley-Lister correspondence. He also speculated, "Probably little will be lost as the trend of Hartley's thought is sufficiently indicated in his previous letters. . . ." (<u>ibid</u>.) On the contrary, however, the shorthand letters will be shown herein to provide otherwise unavailable information on the composition and publication of the <u>Observations on Man</u>.

[78] Hartley to Lister, December 2, 1742. From the content of

> I have been and am very busy in drawing up the papers which you have seen [in London] . . . for the press, though I may not . . . print them yet for some years. The thoughts that present themselves to me in this inquiry . . . [word illegible] me much to be serious, and I see infinitely more reason to be so than I am able to conceive or express.[79]

As is evident from the earlier letters, one of Hartley's main concerns was the theological propriety of his theory. This was greatly aggravated by Lister's continual objections to the mechanistic and necessitarian content of Hartley's work. In April of 1744, Hartley commented,

> In the last part of your letter you spoke of the doctrine of n-ism, I suppose you mean the doctrine of mechanism, and have wrote <u>n-ism</u> for <u>m-ism</u> [in shorthand]. What you say is very good, candid and . . . [word missing]. You in some measure answer your own objections. I believe the doctrine [of mechanism] is entirely agreeable both to reason and religion, and that when it is rightly understood it will not have any bad tendencies, but far otherwise. However I shall publish nothing upon this subject yet, perhaps never. I am full of doubts and difficulties, though I think I do see a way to solve many very important difficulties in a clearer manner than is generally done.[80]

The Completion of "a Tolerable Draft"

In the course of the following year, Hartley completed a reading copy of his book during a lull in his medical practice. He wrote to Lister in December 1745,

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this letter it may reasonably be concluded that if Hartley had not moved from the bustle of London to the quietude of Bath the <u>Observations on Man</u> might never have been completed or appeared in print.

[79]Hartley to Lister, December 13, 1743 (shorthand). Although it is not certain the papers Hartley referred to herein are the early drafts of the <u>Observations on Man</u>, from the context of the letter it is probable that they are. The reader is reminded that all excerpts from the shorthand correspondence are presented in the text in their transcribed form, rather than in the original shorthand notation, and that all transcriptions presented are mine.

[80]David Hartley to John Lister, April 17, 1744, Shibden Hall Collection MSS, SH 7/HL: 32 (shorthand).

> I have been a very long time indeed in your debt, and in that part of the year too when I am least engaged by the business of my profession. But I have been so much the more . . . [word illegible] employed in my studies on that account, and partly in the affairs of my book. A little while ago I almost determined to begin to print, but now again my heart fails me, and I think my thoughts are too crude to further them abroad. I finished a tolerable draft of all I have to say in the beginning of June last, so that if I should die, my design will be sufficiently intelligible to thinking persons, but I am not at all satisfied about many assorted parts.[81]

Lister congratulated Hartley on having finished his work and concurred with his decision not to publish. He wrote,

> I am glad you have finished yr Book, for yr own Ease & Satisfactn. Intense Thought is prejudicial to Health. Perhaps it is better not to publish [since] you wd thereby draw a Shower of paper Arrows upon you, & tho' you might be steeld agst such soft Mettle yet it is troublesome to be always upon the Self Defense & to be engagd in War of any Kind.[82]

The Publication of the CONJECTURAE

One month later, however, Hartley had decided to expose his theory to public view, and he had sent an abstract of the Observations on Man to press. He informed Lister,

> I am now republishing my pamphlet upon the stone and shall add to the end a . . . [word missing] by way of appendix . . . , a short account of the nature of sense, motion and the generation

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[81]David Hartley to John Lister, December 15, 1745, Shibden Hall Collection MSS, SH 7/HL: 35A (shorthand). The text of this previously untranscribed shorthand letter provides information leading to the amending of earlier historians' views of the completion of Hartley's Observations on Man. Boring, for instance (History of Psychology, 195), believed the Observations on Man was completed about 1747, and Bower (Hartley and Mill, 2) gave the date of 1746.

[82]John Lister to David Hartley, n.d., Shibden Hall Collection MSS, SH 7/HL: 35B.

of ideas. It ought have been out by this time, but my illness has hindered me, however I hope it may be published in less than a month.[83]

The second edition of Hartley's De Lithontriptico appeared in February 1745-46,[84] and appended to it was a short treatise containing, as Hartley described it, "some remarks on sensation, motion, and ideas."[85] The treatise is essentially a brief abstract of the theory later presented in the first volume of the Observations on Man,[86] focusing upon the physiological mechanism and including a call for criticism and correction.

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[83]David Hartley to John Lister, January 23, 1745-46, Shibden Hall Collection MSS, SH 7/HL: 36 (shorthand).

[84]David Hartley to John Lister, May 22, 1746, Shibden Hall Collection MSS, SH 7/HL: 37 (shorthand).

[85]David Hartley, Various Conjectures on the Perception, Motion, and Generation of Ideas (1746), trans. by Robert E. A. Palmer, The Augustan Reprint Society, No. 77-78 (Los Angeles: University of California, 1959), 1; hereinafter referred to as Hartley, Conjectures. Palmer's translation is based upon the edition of the abstract which appeared in Rev. Samuel Parr's anthology (Metaphysical Tracts by English Philosophers of the Eighteenth Century . . . (London: Edward Lumley . . . , 1837); hereinafter referred to as Parr, Metaphysical Tracts), although the translation has also been compared with the first edition (Hartley, Conjecturae). There have been several different opinions as to the date of publication of the first edition of the Conjecturae. Young ("Hartley," 139-140) claimed it was first printed in 1730 and that the 1746 printing was a second edition. I have found no evidence of a 1730 edition, and Hartley's correspondence with Lister indicates as well that 1746 is the earliest appearance of the Conjecturae in print. Other alternative datings found in secondary literature are as follows: Lewes (History of Philosophy, II, 604) dated the Conjecturae's first publication as in 1747, and Parr (Metaphysical Tracts, in Rand, "Development," 306-309) believed the Conjecturae was first printed in 1748. Warren (History of Association, 50 note 1) maintained that the Conjecturae first appeared anonymously in 1731. Martin Kallich ("Introduction," in Hartley, Conjecturae, iv and xi; hereinafter referred to as Kallich, "Introduction") offered conflicting dates of 1736 and 1745 for the Conjecturae.

[86]See Rand ("Development," 314-317) for a comparison of the

Hartley's choice of medium of publication, language, and style of the Conjecturae quaedam de Sensu, Motu, & Idearum Generatione, as the abstract was entitled, were all direct results of his lingering hesitancy to present his completed manuscript to public view. Because Hartley's major design was to confirm rather than to undermine the validity of the Christian revelation,[87] he was not willing to present to the general public a theory that appeared to some to have atheistical tendencies. It was therefore no accident that the Conjecturae was appended to a medical work, for Hartley intended first to subject his speculations "to the independent scrutiny of physicians and philosophers" so that he could "learn what must be corrected, struck out, or retained"[88] before exposing his theory to a wider audience. In order

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contents of the Conjecturae and the Observations on Man. There has been much dispute in the secondary literature about the temporal relationship between the two "Progress" treatises, the Conjecturae, and the finished Observations on Man. Lewes (History of Philosophy, II, 604) maintained the Conjecturae was an abstract of the Observations on Man and that it appeared before the larger work. Rand ("Development," 316 and 318-319) thought the Observations on Man was a later enlargment and translation of the Conjecturae. Kallich ("Introduction," iii-iv) believed the Conjecturae was a development of the first of the "Progress" treatises and that the Observations on Man was completed after the Conjecturae. Bower (Hartley and Mill, 5) considered the Conjecturae to have been "the first preliminary sketch of his system . . . ;" Young ("Hartley," 139) agreed, considering the "Progress" treatises to have been developments of the Conjecturae and the Observations on Man to have been a development of the two "Progress" treatises. Edward Tagart (Locke's Writings and Philosophy Historically Considered, and Vindicated from the Charge of Contributing to the Scepticism of Hume (London: Longman, Brown, Green, and Longmans, 1855), 151 note) regarded the Latin Conjecturae as an abstract of the Observations on Man but believed it appeared after the larger work. In the following pages, discussion will focus upon the development of the physiological psychology Hartley presented in the Conjecturae; for a detailed discussion of the theory itself, as presented in the Observations on Man, see Chapter III below.

[87] Hartley, Conjectures, 58.

[88] Ibid., 1.

further to insure that his ideas would not be accessible to the uneducated at this time, Hartley presented the Conjecturae in Latin, rather than in the English language.

That Hartley was hesitant to present his theory even to physicians and philosophers is evident from the hypothetical tone of the Conjecturae. Throughout the sketch, Hartley referred to the conjectural nature of the theory as a whole[89] and of several aspects of the physical doctrine upon which it rested in particular.[90] He informed his readers "that numerous reasons for doubt are still inherent in my work and many other solutions can be adduced to the contrary;"[91] he furthermore admitted that he might have misunderstood his sources on some points.[92]

Although Hartley presented his theory in rather conjectural terms, he himself was satisfied with the validity of his system. On the whole, Hartley believed he had "hit upon some form of the truth."[93] He felt that his theory agreed very well with both physiological phenomena and the phenomena of the mind and that this was a strong argument for the truth of it.[94] "Moreover," Hartley confidently

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[89] Ibid.

[90] Ibid., 4 and 53. Hartley referred specifically to the conjectural nature of Newton's aether and his "doctrine of vibrations." See below for his incorporation of these elements into the Conjecture, Chapter III for their role in the Observations on Man, and Chapter IV for the "Newtonian" sources of these concepts.

[91] Hartley, Conjectures, 1.

[92] Ibid., 4 and 11. Here Hartley referred to Newton's aetherial medium.

[93] Ibid., 1. [94] Ibid., 6 and 49-50.

speculated, "unless I am much mistaken, [explanations of sensation, ideation, and motion very similar to my own] . . . will afterwards be offered by students of these questions."[95]

The Conjecturae is the earliest complete description of Hartley's physiological psychology extant today. In spite of the fact that Hartley had begun formulating his psychological theory much earlier, his study of the physiological basis of association was a relatively new facet of Hartley's examination of the association of ideas as the mechanism underlying man's progress to happiness. The Hartley-Lister correspondence has revealed that it was not until November of 1738 that Hartley decided to include an account of the corporeal nature of man as a distinct part of his reorganized treatises.[96] Since that time, occasional references to the relationship between the physical body and the human mind had appeared in Hartley's letters to Lister,[97] but the Conjecturae stands as the earliest complete presentation of the results of his seven-year-long inquiry into the physical basis of the process of association.

It was as a result of his inquiry into the physical causes of association that the earliest references to medical and scientific authorities, particularly to Isaac Newton, appear in Hartley's psychological work. In the course of substantiating his theory in the Conjecturae, Hartley referred to sixteen authorities, most of whom were cited in connection with the physiological basis of the

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[95] Ibid., 29. [96] Hartley to Lister, November 23, 1738.

[97] Hartley to Lister, May 13, 1739; Hartley to Lister, May 17, 1740.

theory. He cited Sir Isaac Newton in ten instances;[98] Gottfried Wilhelm Leibniz in three;[99] René Descartes twice;[100] John Locke twice;[101] and Stephen Hales twice.[102] The remaining eleven medical and scientific authorities he referred to only once apiece.[103]

It is in the Conjecturae that the earliest extant display of Hartley's connection of Newton's scientific theories to the study of association can be found. As were most British natural philosophers in the mid-eighteenth century,[104] Hartley was especially puzzled and intrigued by Newton's subtle and elastic aetherial medium.[105] So ambiguous was Newton's aether that Hartley advised the readers of the Conjecturae:

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[98] Hartley, Conjectures, 1, 4, 5, 6, 7, 16, 17, 49, 57.

[99] Ibid., 48 and 56-57.

[100] Ibid., 48 and 55.

[101] Ibid., 1 and 57.

[102] Ibid., 34-35. For a discussion of Hales' effect upon Hartley's theory, see Chapter IV below.

[103] Other authorities referred to are: Jacob Winslow, Hermann Boerhaave, Richard Lower, Antoni van Leeuwenhoek, Henry Pemberton, Georg Ernst Stahl, Robert Hooke, Bernhard Albinus, James Jurin, and Richard Mead.

[104] According to Schofield (Mechanism and Materialism, 15-16, 19, 103-106), Newtonian natural philosophers gradually began to understand, accept, employ, and popularize Newton's aetherial medium in the mid-eighteenth century. Hartley's acceptance and use of the aether followed the publication of four discussions which Schofield (ibid., 106) has identified as having brought it to the forefront of scientific thought. For an examination of the "Newtonian" origin of Hartley's views of the aether and the effect of these publications on Hartley, see Chapter IV below.

[105] Hartley, Conjectures, 4 and 49.

> . . . Newton himself ought by all means to be consulted concerning the existence and properties of this ether, since I remain somewhat doubtful that I have sufficiently understood his views. It is desireable [in order to clarify our understanding of Newton's aether] that there be brought to light anything on this matter which appears elsewhere in his posthumous writings.[106]

Nonetheless, Hartley found Newton's aether as well as Newton's "doctrine of vibration" to be extremely useful devices. Hence, in the Conjecturae, Hartley proposed to present, establish, and illustrate the theory that the doctrine of the vibration of the aether and the doctrine of association together form the basis of sensation, ideation, and muscular motion.[107] Although association psychology can be said to have emerged in Hartley's two "Progress" treatises of 1735, the connection between vibrations and association, and, therefore, the genesis of Hartley's physiological psychology as a whole, can be pinpointed to have occurred some time between 1738 and 1745, since it is in the Conjecturae that the earliest extant historical evidence of Hartley's incorporation of Newtonian physical science into his study of mind appears.[108]

In the Conjecturae, Hartley specifically cited Newton's Principia as having "first led me into this hypothesis" that sensation and movement might occur as results of aetherial vibrations.[109] But Hartley

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[106] Ibid., 4. [107] Ibid., 22-23 and 28-29.

[108] Since the Conjecturae is an abstract of the Observations on Man, the latter of which was completed in 1745, the physiological psychology had been completed after 1738 but before 1746. Previous datings of the Conjecturae would, however, have led to the conclusion (had it been drawn) that the transfer of the concepts and methods of Newtonian natural science to the realm of psychology had occurred and therefore that Hartley's physiological psychology was completed as early as 1730 (Young, "Hartley," 139-140) or as late as 1748 (Parr, Metaphysical Tracts, in Rand, "Development," 306-309).

[109] Hartley, Conjectures, 49.

had not simply taken the speculation that the vibration of the aether might be the physical cause of sensation and voluntary muscular motion from Newton[110] and joined it to his theory of association, he had generalized the doctrine of vibration to serve as an explanation of the physical cause of the generation of ideas as well. In the *Conjecturae* Hartley identified vibration as an efficient cause of sensation, thought, and muscular motion.[111] He utilized the doctrine of vibration to explain the action of external objects on the nerves and brain.[112] He identified the brain as the seat of the immaterial soul,[113] and, although he denied the brain was endowed with the power of sensation,[114] he postulated that sensation in the mind[115] was caused by and dependent upon motion in the medullary substance of the brain.[116] This motion entered through the five external senses.[117] Hartley distinguished sensations in the mind from one another on the basis of differences in their corresponding vibrations,[118] and in general he theorized that the contents of the human mind vary in correspondence to any variation of the white medullary substance of which the brain is composed.[119]

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[110] *Ibid.*, 1 and 49.

[111] *Ibid.*, 52.

[112] *Ibid.*, 3.

[113] *Ibid.*, 56 and 48.

[114] *Ibid.*, 56.

[115] *Ibid.*, 2 and 15.

[116] *Ibid.*, 9, 12, 22, 34, 55-56.

[117] *Ibid.*, 15.

[118] *Ibid.*, 11 and 15-16.

[119] *Ibid.*, 2.

In the Conjecturae, Hartley contended "the doctrine of associations [of ideas] . . . proceeded from the doctrine of vibrations,"[120] and the doctrine of vibration "requires the power of association" as well.[121] He attributed the generation of simple ideas from sensation to the action of vibration and association.[122] The epistemological process of the formation of complex ideas by means of association is, he explained, due to the physical coalescence and blending of the vibrations in the brain which correspond to the simple ideas involved in the association.[123] Similarly, "decomplex" ideas are formed from complex ones by vibration and association.[124]

Hartley also explained muscular contraction and motion as results of vibration[125] and association. Involuntary motions are directly attributed to the action of vibration,[126] while voluntary and semivoluntary motions are attributed to association.[127] Hartley also considered the formation of complex and "decomplex" actions to occur by means of the association of simple actions.[128] Finally, he described the connection between specific sensations, ideas, and motions on the basis of the doctrine of association.[129]

Hartley continued to view his examination of the association of ideas, even with its newly-constructed physiological basis, as

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[120] Ibid., 54; see also ibid., 28-29.

[121] Ibid., 29.

[122] Ibid., 22, 28-29, 42.

[123] Ibid., 18, 22, 28-29, 53.

[124] Ibid., 30.

[125] Ibid., 16, 33-35, 47.

[126] Ibid., 47.

[127] Ibid., 42-43.

[128] Ibid., 42.

[129] Ibid., 42-43.

primarily a study in the foundations of ethics and morality and as an attempt to confirm the truth of revealed and natural religion.[130] According to Hartley,

> the principal use of the doctrine of association must be considered to be what it brings to the amendment of ethics and morals. For, having been led by this thread, we are able to investigate the primary origins of mental pleasures and pains, and thereby of desires and of aversions, and, lastly, of the voluntary and semivoluntary power over these; the same task begins to illuminate the ways by which the good motivations of the spirit may be fostered, the bad restrained, and how each one of us can both take <u>the beam out of one's own eye and the mote from the eye of one's neighbor</u> and, besides, what is particularly noteworthy, by what precepts and principles of life the tender minds of children can be best formed to virtue and piety.[131]

Besides contributing to the understanding and improvement of ethics and morals, Hartley argued that his theory of vibration and association also contributes to the confirmation of both natural and revealed religion. "For," he explained,

> since it discloses a few of the hidden treasures of divine wisdom and exhibits new instances, of every sort, of the coincidence of efficient and final causes; and, further, since it establishes the fundamentals of logic and ethics and extends their boundaries . . . , it can at the same time contribute to the confirmation of natural as well as revealed religion. . . . For all these matters are united in the closest affinity and by the strictest bonds. . . . It seems to me that no one . . . may elicit any new truth at all without at the same time casting light upon the Christian religion, which is the beginning and end of all truths, and hastening that most desired future age during which all things must finally be subject to Him who is the <u>Way</u> and the <u>Truth</u> and the <u>Life</u>.[132]

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[130] Kallich ("Introduction," v-vi), however, erroneously concluded that, because there are no "extensive religious speculations" in the <u>Conjecturae</u>, ". . . Hartley's purpose [therein] is to advance science, not religion. . . ."

[131] Hartley, <u>Conjectures</u>, 54-55.

[132] <u>Ibid.</u>, 57-58. See also Oberg, "Hartley and Association," 445.

Finally, Hartley maintained an understanding of the processes of association explains how all men will eventually become one with God.[133]

Hartley was well aware of the novelty and potential of the system of physiological psychology contained in the Conjecturae, and hence in the larger Observations on Man. In May of 1746, he wrote to Lister,

> I have directed the bookseller to send you one of my pamphlets. It has been out almost 3 months. I shall be glad to have your observations upon the last part [the Conjecturae], either the style or the material. I can hardly help thinking the last to be of great importance to be well considered, and if I do not much err there is a foundation laid for understanding human nature better than it has hereto been. . . . I have made it short that it may be read over soon. Read it 2 or 3 times pretty carefully, and then turn it over can you, and compare it with all you observe of yourself, or your scholars.[134]

The Final Draft of the OBSERVATIONS ON MAN

The general reception that Hartley's theory received as a result of the publication of the Conjecturae must not have been discouraging, for Hartley began to devote large amounts of time to preparing the complete work for publication. By winter of the following year, Hartley had completed a new draft of the manuscript, and it was ready for circulation among his friends. In December 1747, he informed Lister,

> [I] have been very busy with my papers, the contents of which I here send you. You may show them to any serious well disposed person, but keep them yourself. My work is by no means finished as I could wish, or as it ought to be, I shall endeavor to mend it from time to time, but do not at all know when I shall publish it.[135]

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[133]Ibid., 32 and 58.

[134]Hartley to Lister, May 22, 1746 (shorthand).

[135]David Hartley to John Lister, December 20, 1747, Shibden

Lister was impressed by the recent draft of Hartley's work, although he was more satisfied with the theological than with the physiological part of the theory. In a letter to Hartley, Lister both praised and criticized his efforts:

> I am much favourd with the Contents of yr Book wch I doubt not is a very considerable & excellent Performance. The first Part [the first volume, explaining the physiological psychology of association] shews great Sagacity & a penetrating Genius, but seems to be built so much upon Hypothesis, that I am apt to think it will give Entertainmt rather than Satisfactn, wil agreeably amuse rather than convince. The second Part [the second volume, containing a discussion of the theological implications of association] I like very well, being more ad Captum & more usefull.[136]

Nonetheless, Hartley's treatment of the immortality of the soul and of free will and necessity remained unsatisfactory in Lister's opinion. In his letter, Lister drew Hartley's attention to Proposition 90 of Volume II of his book, in which, Lister objected, Hartley treated

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Hall Collection MSS, SH 7/HL: 39B (shorthand). In his edition of the Hartley-Lister letters, Trigg, hampered by his inability to read the shorthand notation, incorrectly dated this letter as written on October 20, 1747. Although Trigg speculated on the basis of subsequent longhand letters, "Sometime about this period he [Hartley] had again sent to Lister the MS. of his book which had now reached almost its final form before going to press" ("Correspondence," 267), the transcription of this shorthand letter provides a more accurate dating of this near-final draft of the Observations on Man. It also serves to upset Rand's contention ("Development," 314 and 317) that Hartley spent the three years between the publication of the Conjecturae and the publication of the Observations on Man putting together a first draft of the Observations on Man from his separate papers and doing a historical study of association.

[136] John Lister to David Hartley, n.d., Shibden Hall Collection MSS, SH 7/HL: 54. Trigg ("Correspondence," 267-269) did not speculate about the date of this letter, but the contents reveal that Lister wrote it between December 20, 1747 and December 30, 1747.

the soul as if it died with the body. Furthermore, he implored Hartley, "Give me Leave to suspend my Opinion in Reference to yr 14, 15 & 16 Propositns" in the same volume, concerning "the Doctrines of Liberty & Necessity," practical and philosophical free will.[137] Lister lamented that

> the Doctrines of Liberty & Necessity are so full of Difficulty to me, that I am presently lost, wnever I offer to think abt them. I lately read Dr Butler upon Necessity, & believe he thinks clearly himself, but he does not explain the Thing clear enough to me, I was in the Dark at first & so continued to the End of the Chapter.[138]

Philosophically unable to consider Necessity and Christian theology even remotely compatible, Lister emphatically replied to Hartley's contention "we have Liberty in a practical Sense but not in a philosophical Sense--[that] We eithr have Liberty or not."[139] With the publication of Hartley's work becoming more and more probable, Lister also recommended Proverbs 2 as a motto for the title page. Finally, he cautioned Hartley, who was suffering from a recurrent bout with his kidney stones,

> No Doubt the Knowledge of Man is a noble Subject for the Mind to employ itself upon but let it not engage yr Thoughts to the Prejudice of yr Health. for wt Speculatns however curious & refind can compensate for the Loss of it, or deserve to be purchasd at so expensive a Price?[140]

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[137] Lister to Hartley, n.d., SH 7/HL: 54. That these propositions retain these numbers in the final edition of the <u>Observations on Man</u> is evidence that the work was at least in its final structural format at this time.

[138] <u>Ibid.</u>

[139] <u>Ibid.</u>

[140] <u>Ibid.</u>

Hartley quickly responded to Lister's comments on the progress and content of his work. He explained,

> I have been employed for many years now, more or less, upon the subject of these papers, but my business and other avocations have hindered me from applying very intensely at any particular time. On this account there are many things so incorrect that I do not propose publishing till I have consulted books and friends about them.[141]

Admitting the manuscript was not totally to his liking yet, Hartley agreed with Lister,

> The proposition in which the state of insensibility [of the soul] is mentioned is not rightly worded. In speaking about that subject I rather suppose that the soul is sensible though not active, as the most probable conclusion which we can draw from Scripture. However I sometimes suspect that the writers of the Old Testament thought the . . . [word missing, probably <u>soul</u>] entered upon a state of insensibility immediately after death. There are several passages in the Psalms and in Job particularly to this purpose.[142]

In response to Lister's remark concerning the hypothetical, although entertaining nature of Hartley's physiological psychology, Hartley observed,

> What relates to the doctrine of vibration in the first part is conjectural, but the 3rd and 4th chapters, which contain the doctrine of association, is evident and satisfactory I think. Many of my friends are of the same opinion.[143]

Towards the end of his letter, Hartley reminded Lister that he was not alone in finding the question of free will problematic:

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[141] David Hartley to John Lister, December 30, 1747, Shibden Hall Collection MSS, SH 7/HL: 40 (shorthand). My transcription of Hartley's letter amends Trigg's edition of Lister's own transcription, the latter of which is attached to the letter itself ("Correspondence," 269).

[142] Hartley to Lister, December 30, 1747 (shorthand).

[143] <u>Ibid</u>.

> There are few writers that attempt to prove anything but the practical free will, and most assert no other in express terms. However they every now and then suppose the philosophical. And it is very true that there are great difficulties in considering this subject.[144]

By way of postscript, Hartley asked for "any remarks, objections, etc." that occurred to Lister.[145]

A Preliminary Printing of Hartley's Book

In the course of the following year, Hartley and Lister were unable to resolve their fundamental differences of opinion concerning theological problems tangential to the physiological psychology of Hartley's book. Hartley finally realized he would never prove his theory beyond all possible doubt or eliminate every possible objection to it.

As a result, sometime between January 1747-48 and December 1748, Hartley sent his manuscript to the printers, received a preliminary printing, and directed it to Lister for criticism. In December 1748, Hartley thanked Lister for commenting upon the proofs. "I had your letter in due time," Hartley began,

> and I am much obliged to you for your comment in relation to Bp Bull [Butler?]. The 90th proposition [concerning the sensibility of the soul after death] is printed wrong, and my opinion is probably scarcely different from his. It is a matter on which there is no clear light, it seems to me, either from Scripture or reason.[146]

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[144] *Ibid.* [145] *Ibid.*

[146] David Hartley to John Lister, December 4, 1748, Shibden Hall Collection MSS, SH 7/HL: 41 (shorthand).

The "Preface" and Publication of the OBSERVATIONS ON MAN

The text of Hartley's December 1748 letter to Lister reveals that by that time Hartley had returned the corrected proofs to the printers and had attached a qualifying preface as well. Hartley informed Lister,

> I have begun to print my book and hope it will be finished about Christmas next. I shall then make it publici juris, and hope to be able to resign it to the judgement of wise and good men.[147]

In the preface, Hartley described having begun composition of the Observations on Man as an inquiry into the process of the association of ideas. "About Eighteen Years ago," he recalled,

> I was informed, that the Rev. Mr. Gay . . . asserted the Possibility of deducing all our intellectual Pleasures and Pains from Association. This put me upon considering the Power of Association.[148]

He recollected how, following his inquiry into the process of association, he "was led to examine both its Consequences, in respect of Morality and Religion, and its physical Cause."[149]

Hartley described the Observations on Man to his readers as somewhat of a collage, since "the separate Parts of this Work [had been written] at different Times, and in different Situations of Mind."[150] He related that, in the process of preparing the Observations on Man for publication, he had

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[147] Ibid.

[148] Hartley, "Preface," Observations on Man, I, v.

[149] Ibid.

[150] Ibid., vii.

> put together all . . . [his] separate Papers on these Subjects, digesting them in such Order as they seemed naturally to suggest; and adding such Things as were necessary to make the Whole appear more complete and systematical.[151]

Hartley revealed to his readers that even he had found the consequences of his system somewhat surprising. Particularly "in respect of the Doctrine of Necessity," he admitted, ". . . I was not at all aware, that it followed from that of Association, for several years after I had begun my Inquiries; nor did I admit it at last without the greatest Reluctance."[152] Having accepted the controversial concepts of "the Necessity of human Actions, and the ultimate Happiness of all Mankind,"[153] Hartley argued that "these Tenets appear to me not only innocent, but even highly conducive to the Promotion of Piety and Virtue amongst Mankind."[154] Nonetheless, he did not want to be misinterpreted as having denied either practical free will or the infinity and eternity of the punishment of the wicked in the Observations on Man.[155]

In the preface, Hartley claimed to have presented "all that I know material, in Support of my System" in the Observations on Man,[156] although in a less than conclusive manner.[157] He described the work as "nothing more than Hints and Conjectures in difficult and obscure Matters, and a short Detail of the principal Reasons and Evidences in

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[151] Ibid., v-vi.
[152] Ibid., vi.
[153] Ibid., vii.
[154] Ibid.
[155] Ibid., vii-viii.
[156] Ibid., vi.
[157] Ibid.

those that are clear. . . ."[158] But, be this as it may, he was "now desirous to recommend it to the Consideration of others."[159]

In January 1748-49, Hartley wrote Lister from Donington Castle, where he had gone for his own as well as his wife's health. He exclaimed,

> My book is all printed off, but I do not know how soon it will be out. I have now . . . [word illegible, probably done] with it, it is publici juris.[160]

Soon afterwards, in the late winter of 1748 or early spring of 1749, one of the most influential works in the history of psychology was released to the public.[161]

Hartley had begun the study of association which found its final expression in the two-volume Observations on Man in 1730 or 1731. At that time, he approached the study of the association of ideas as a study in ethical philosophy with the overriding goal of resolving both his own personal doubts about the truth of revealed religion and an apparent conflict between revealed and natural religion. To the end, Hartley's motivation remained primarily a theological one, although he speculated in 1746 that the theory he had created might have great potential as an explanation of human behavior in

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[158] *Ibid.* [159] *Ibid.*

[160] David Hartley to John Lister, January 23, 1749, Shibden Hall Collection MSS, SH 7/HL: 42 (shorthand).

[161] The transcription of the above shorthand letter serves to amend earlier dates of publication of the Observations on Man, such as that given by Trigg ("Correspondence," 232 and 270) who supplied both 1748 and sometime between April 1749 and August 1750 as its date of publication.

general. Up until 1738, Hartley's inquiry into association remained epistemological in nature. In the fall of that year, however, he decided to expand his study to include an examination of the physiological basis of association. At that time he began to develop one of the fundamental theories in the field of physiological psychology, based upon a synthesis of his epistemology of association, his working knowledge of the physiology of the human body, and concepts currently employed in the study of natural philosophy. By 1746, the time of the publication of his short <u>Conjecturae</u>, Hartley's theory had become well-grounded upon natural philosophy, based as it was upon Sir Isaac Newton's corpuscular physics. Admitting his theory of vibrations to be conjectural, holding the theory of association to be certain, and arguing his theory had positive rather than negative theological implications, Hartley released his two-volume <u>Observations on Man</u> to the public in 1748-49.

CHAPTER III

THE PHYSIOLOGICAL AND MENTAL MECHANISMS OF SENSATION, THOUGHT, AND HUMAN BEHAVIOR

In the late winter of 1748 or the early spring of 1749, David Hartley released his two-volume Observations on Man, His Frame, His Duty, and His Expectations, containing his ". . . Hints and Conjectures" on the psychology of association, to the public for its consideration.[1] In the first volume of the Observations on Man, subtitled "Containing Observations on the Frame of the Human Body and Mind, and on their mutual Connexions and Influences," Hartley presented a system of physiological psychology according to which all human sensation, thought, muscular motion, moral codes, spiritual condition, progress towards spiritual perfection and union with God is a result of corporeal vibration and mental association. The second volume of the Observations on Man, which he subtitled "Containing Observations on the Duty and Expectations of Mankind," develops the theological implications of

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[1]Hartley, "Preface," Observations on Man, I, vi; see Chapter II above for an account of the development and publication of the Observations on Man.

Hartley's view of human thought and action presented in the first volume.

The Organization and Intent of the First Volume

The first volume is divided into four chapters, the first three of which describe, analyze, and establish the principles underlying human sensation, motion, and ideas.[2] In the first chapter, Hartley identified "the general Laws, according to which the Sensations and Motions are performed, and our Ideas generated,"[3] i.e. the theories of vibration and association. Indeed, it was Hartley's express intent in Chapter I "briefly, to explain, establish, and apply the Doctrines of Vibrations and Association"[4] and to examine the "mutual Relation" existing between the two doctrines.[5] In the second chapter of the first volume, Hartley proposed to "consider each of the Sensations and Motions in particular, and inquire how far the Phaenomena of each illustrate, and are illustrated by, the foregoing general laws."[6] The third chapter consists of a discussion of vibration and association as the foundation of "the particular Phaenomena of Ideas, or of Understanding, Affection, Memory, and Imagination. . . ."[7] "Lastly," Hartley designed in Chapter IV, ". . . to give a particular History and Analysis

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[2]Hartley, Observations on Man, I, 416.

[3]David Hartley, "Introduction," Observations on Man, I, iv; hereinafter referred to as Hartley, "Introduction," Observations on Man, I. See also Hartley, Observations on Man, I, 416.

[4]Hartley, Observations on Man, I, 5.

[5]Ibid., 6.

[6]Hartley, "Introduction," Observations on Man, I, iv.

[7]Ibid.; see also Hartley, Observations on Man, I, 268.

of the Six Classes of intellectual Pleasures and Pains; viz. those of Imagination, Ambition, Self-Interest, Sympathy, Theopathy, and the Moral Sense,"[8] by tracing their generation from sensible pleasures and pains by means of the process of association.[9]

Hartley's "Method of Philosophizing"

Before beginning to unfold his physiological psychology in Volume I, Hartley observed,

> The proper Method of Philosophizing seems to be, to discover and establish the general Laws of Action, affecting the Subject under Consideration, from certain select, well-defined, and well-attested Phaenomena, and then to explain and predict the other Phaenomena by these Laws.[10]

But, he lamented,

> I shall not be able to execute, with any Accuracy, what the Reader might expect of this kind, in respect of the Doctrines of Vibrations and Association, and their general Laws, on account of the great Intricacy, Extensiveness, and Novelty of the Subject.[11]

Hartley realized,

> These Subjects are so much involved in each other, that it is difficult, or even impossible, to begin any-where upon clear Ground, or so as to proceed intirely from the Data to the Quaesita, from Things known to such as are unknown.[12]

Nonetheless, he assured his readers that he would "endeavour it as

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[8] Hartley, "Introduction," Observations on Man, I, iv.

[9] Hartley, Observations on Man, I, 416.

[10] Ibid., 6. See Chapter IV below for a discussion of Hartley's methods within the context of current "Newtonian" scientific method.

[11] Hartley, Observations on Man, I, 6.

[12] Hartley, "Introduction," Observations on Man, I, iv.

much as I can"[13] and would "attempt a Sketch in the best manner I can, for the Service of future Inquirers."[14]

Accordingly, in Volume I Hartley presented his views on the physiological psychology of vibration and association in a series of twenty-two propositions, fifty-one corollaries, and one scholium. The propositions are arranged in a deductive manner, and the manner of deductive proof is indicated. In almost every instance, however, Hartley presented and emphasized empirical proofs based upon evidence drawn from observation, analogy, and/or authorities in the natural sciences, medicine, and physiology.[15]

Argument by Induction and Analogy

In Hartley's opinion, there were two general ways of arriving at the truth in any non-mathematical inquiry. He believed there was a "great Probability"[16] that man could arrive at a true statement by "arguing from Experiments and Observations, [both] by Induction and Analogy."[17] In man's quest for knowledge, Hartley asserted that "the Use of Attempts to make general Conclusions by Induction and Analogy, from particular Effects or Phaenomena, is to enable us to predict other Phaenomena in different Circumstances, by applying the general Law [or] Conclusion to these Circumstances."[18] Hartley defined analogy as

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[13] _Ibid._ [14] Hartley, _Observations on Man_, I, 6.

[15] See for instance the empirical proof Hartley offered for Proposition 9 (_ibid._, 59-61).

[16] _Ibid._, 341 [17] _Ibid._, 339.

[18] _Ibid._, 340.

> that Resemblance, and in some Cases Sameness, of the Parts, Properties, Functions, Uses, &c. any or all, of A to B, whereby our Knowledge concerning A, and the Language expressing this Knowledge, may be applied in the Whole, or in Part, to B, without any sensible, or, at least, any important practical Error.[19]

Hartley pointed out to his readers that ". . . Evidence for . . . Propositions concerning natural Bodies . . . [is] taken from Induction and Analogy;"[20] however the certainty of the results proceeding from these two methods of reasoning is not, he concluded, the same. He maintained that the product of analogy often approaches that of induction in level of certitude,[21] but even when it does not Hartley believed the method of analogy remains useful as "a Guide in the Search after Truth, and an Evidence for it in some degree."[22] He argued,

> It is often in our Power to obtain an Analogy where we cannot have an Induction; in which Case Reasoning from Analogy ought to be admitted; however, with all that Uncertainty which properly belongs to it, considered as more or less distant from Induction, as built upon more or fewer dependent or independent Evidences, &c.[23]

On the whole, then, Hartley considered the method of induction preferable to that of analogy in resolving questions of natural philosophy because the method of induction affords the highest probability of arriving at a true conclusion in such matters.[24] Yet he insisted analogy plays a large role in man's search for truth in the natural sciences. He claimed that "we . . . invent chiefly by means of . . .

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[19] Ibid., 293. [20] Ibid., 332.

[21] Ibid., 342 and 344. [22] Ibid., 293.

[23] Ibid., 343. [24] Ibid., 342-343.

Analogies [between words],"[25] and thus he concluded, "Analogy may . . . , in all Cases, be made use of as a Guide to the Invention."[26] In fact, in the study of ". . . Science Analogy leads on perpetually to new Propositions; and, being itself some Presumption of Truth, is a Guide much preferable to mere Imagination."[27]

Analogy in the Natural World

Hartley felt that discovery by means of analogy was a method particularly applicable to the study of nature, since everywhere he looked he found nature to be replete with analogy.[28] He pictured the universe as "a Gradation of Analogies respecting the Earth, Moon, Planets, Comets, Sun, and fixed Stars, compared with one another."[29] On earth, he saw "a perpetual Thread of Analogy continued from the most perfect Animal to the most imperfect Mineral, even till we come to elementary Bodies themselves."[30] He described to his readers the way in which ". . . Analogies, . . . some more exact and extensive, some less so, present themselves to us every-where in natural and artificial Things;"[31] he observed,

> The Body Politic, the Body Natural, the World Natural, the Universe;--The human Mind, the Minds of Brutes on one hand, and of superior Beings on the other, and even the infinite Mind himself . . . , &c. &c. afford endless Instances of Analogies natural and artificial.[32]

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[25] Ibid., 305. [26] Ibid., 343.

[27] Ibid., 435.

[28] See Chapter IV below for a discussion of the "Newtonianism" of this view of nature.

[29] Hartley, Observations on Man, I, 295. [30] Ibid., 294.

[31] Ibid., 293. [32] Ibid., 296.

Indeed, Hartley noted that "the more any one looks into the external natural World, the more Analogies, general or particular, perfect or imperfect, will he find every-where."[33] Furthermore, he explained,

> The analogous Natures of all the Things about us, are a great Assistance in decyphering their Properties, Powers, Laws, &c. inasmuch as what is minute or obscure in one may be explained and illustrated by the analogous Particular in another, where it is large and clear.[34]

Thus, according to Hartley, the method of reasoning by analogy can be a particularly fruitful approach when considering questions of natural philosophy.

Hartley's View of "the World Natural"

Without a doubt Hartley accepted the contemporary view of the physical world as particulate in nature.[35] He furthermore supposed "the Number of [sizes or] Orders of Particles [in nature to be] infinite, or at least very great;"[36] in fact he conceded that

> how far the Number of Orders may go, is impossible to say. I see no Contradiction in supposing it infinite, and a great Difficulty in stopping at any particular Size.[37]

In Hartley's opinion, the various orders of particles produce different phenomena of nature. For instance, "the Particles of the first or largest Order . . . [excite] Sound . . . in the Air,"[38] and "the Operations in Chemistry, and the Colours of natural Bodies, depend"[39]

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[33] *Ibid.*, 295. [34] *Ibid.*, 343.

[35] See Chapter IV below for a discussion of the contemporary world view.

[36] Hartley, *Observations on Man*, I, 364.

[37] *Ibid.* [38] *Ibid.*, 87.

[39] *Ibid.*, 12.

upon "the biggest component Particles of Matter. . . ."[40] On the other hand, light is produced by ". . . Particles . . . infinitely smaller than the biggest component ones of natural Bodies. . . ."[41]

Hartley maintained that observation of natural phenomena "shews, that there are latent active Powers in the small Parts of Bodies,"[42] that is, in all the descending orders of particles. He furthermore drew a correlation between the smallness of the particle and its level of activity;[43] hence he was led to assert the especially active nature of the particles of light.[44]

Hartley spoke of all the orders of particles, all component particles, and all gross bodies composed of these particles as possessing powers of ". . . Attraction and Repulsion, [that is] a mere mathematical Tendency to approach and recede. . . ."[45] He also maintained that some particles in nature, particularly particles of air, possess an "electric virtue."[46]

In the natural world, Hartley declared "that the Properties of Bodies are . . . closely connected with each other" and that the "close Connexion of the Properties follows undoubtedly from the Powers and mutual Actions of the small Parts. . . ."[47] For instance, Hartley contended "that there is scarce any Body intirely devoid of [the property of] Elasticity,"[48] which he held to be a product of the

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[40] Ibid., 352; see also ibid., 12. [41] Ibid., 353.

[42] Ibid., 231; see also ibid., 353. [43] Ibid., 20.

[44] Ibid., 352-353. [45] Ibid., 20; see also ibid., 27-28.

[46] Ibid., 94-95. [47] Ibid., 365-366.

[48] Ibid., 27.

interparticulate powers of attraction and repulsion.[49] Hartley further asserted,

> If it be reasonable to suppose many Orders of Particles, it is also reasonable to suppose, that their Powers and Properties are somewhat analogous to one another; and that those of the larger Particles arise from, and are compounded of, those of the next less in Size, and so on. . . .[50]

Thus the elasticity of natural bodies, arising from the powers of attraction and repulsion, renders them in turn subject to vibration,[51] "or reciprocal Motions. . . ."[52] Hartley identified both grossly and subtly vibrating bodies in nature,[53] and he generalized "that many of . . . [the phenomena of nature] are carried on by Attractions and Repulsions; . . . and afford a Presumption, that other reciprocal Motions or Vibrations have a great Share in the Production of Natural Phaenomena."[54]

The Subtle Aether and its Properties

Hartley divided natural substances into "gross matter" and "fine matter."[55] One type of "fine matter" that Hartley supposed plays a singularly large role in the operation of the natural world, the functioning of the human body, and the production of human sensation, thought, and behavior is the "very subtle and elastic Fluid" known as aether.[56] Hartley was not entirely certain of its existence, but he believed that various natural ". . . Phaenomena may . . . be alleged

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[49] *Ibid.*

[50] *Ibid.*, 364-365.

[51] *Ibid.*, 27.

[52] *Ibid.*, 24; see also *ibid.*, 28.

[53] *Ibid.*, 21-22.

[54] *Ibid.*, 28.

[55] *Ibid.*, 13.

[56] *Ibid.* See Chapter IV for a discussion of contemporary opinion concerning the subtle aether and the "Newtonian" origins of Hartley's use of it.

as probable Evidences of the Existence of the Aether."[57] For instance, he reasoned,

> Since the gross Bodies that lie upon the Surface of the Earth emit Air-Particles, constituting a thin, elastic Fluid, of great Efficacy in performing the ordinary Operations of Nature, it seems not unnatural to expect, that the small Particles of Bodies should emit a proportionably attenuated Air, *i. e.* an Aether, which may likewise have a great Share in the subtle Actions of the small Particles of Bodies over each other. The Emission of odoriferous Particles, Light, magnetical and electrical Effluvia, may also be some Presumption in favour of the Existence of the Aether.[58]

According to Hartley, the "indefinitely small Corpuscles" of this aetherial material are thrown off "with indefinitely great Velocity from all the Bodies of the Universe"[59] and are "diffused through the Pores of gross Bodies, as well as through the open Spaces that are void of gross Matter."[60] He explained the aether "is rarer in the Pores of Bodies than in open Spaces, and even rarer in small Pores and dense Bodies, than in large Pores and rare Bodies; and also, that its Density increases in receding from gross Matter. . . ."[61] Hartley supposed "the Gravity of the Aether to be very small, and"[62] he also considered "it . . . reasonable to expect, that it should have a repulsive Force in respect of the Bodies which emit it; and for the same Reasons, its Particles may repel each other."[63] He described the aether as extremely elastic and compressible due to the self-repulsive nature of its particles.[64] Furthermore, "from its great Elasticity we may infer, that it is extremely susceptible of Vibrations

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[57] Hartley, Observations on Man, I, 14.

[58] *Ibid.*, 14-15. [59] *Ibid.*, 29. [60] *Ibid.*, 29.

[61] *Ibid.*; see also *ibid.*, 15. [62] *Ibid.*, 15.

[63] *Ibid.* [64] *Ibid.*, 14-15.

and Pulses, in the same manner as common Air."[65] He consequently speculated that the corpuscles of the aetherial material, "by stopping each other in the intermundane Spaces, or other mutually repulsive Corpuscles lodged there from Causes not yet discovered, may compose a subtle vibrating Medium."[66]

He admitted, however, that in studying

> . . . Philosophy we must give Names to unknown Quantities, Qualities, Causes, &c. not in order to rest in them, as the Aristotelians did, but to have a fixed Expression, under which to treasure up all that can be known of the unknown Cause, &c. in the Imagination and Memory, or in Writing for future Inquirers.[67]

On the one hand, Hartley considered the aether to be such a term,[68] but on the other hand, he hoped that "the Existence of so subtle and elastic a Fluid, as the Aether . . . can be established upon independent Principles. . . ."[69] In the meantime, he argued,

> . . . Let us suppose the Existence of the Aether, with these its Properties, to be destitute of all direct Evidence, still, if it serves to explain and account for a great Variety of Phaenomena, it will have an indirect Evidence in its favour by this means. Thus we admit the Key of a Cypher to be a true one, when it explains the Cypher completely; and the Decypherer judges himself to approach to the true Key, in proportion as he advances in the Explanation of the Cypher; and this without any direct Evidence at all. And as the false and imperfect Keys, which turn up to the Decypherer in his Researches, prepare the Way for the Discovery of the true and complete one, so any Hypothesis [such as the aether] that has so much Plausibility, as to explain a considerable Number of Facts, helps us to digest these Facts in proper Order, to bring new ones to Light, and to make *Experimenta Crucis* for the sake of future Inquirers.[70]

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[65] *Ibid.*, 14; see also *ibid.*, 15.

[66] *Ibid.*, 29.

[67] *Ibid.*, 348.

[68] *Ibid.*

[69] *Ibid.*, 25.

[70] *Ibid.*, 15-16.

Hartley listed

> the Attractions of Gravitation and Cohesion, the Attractions and Repulsion of electrical Bodies, the mutual Influences of Bodies and Light upon each other, the Effects and Communication of Heat, . . . the Performance of animal Sensation and Motion,[71]

and the communication of vibration to other particles in general as among the natural phenomena possibly attributable to the action of the aether.[72] Finally, he concluded "that the Aether must have a considerable Share in the Production of many other natural Phaenomena; and therefore [we] shall have a sufficient Foundation for trying how far it will carry us, agreeably to the Facts."[73]

The Particulate Mechanism of Nature

In general, Hartley described the world of nature as a mechanism,[74] a world of matter in lawful motion, and he consequently maintained that natural phenomena can be explained on the basis of the "determinate Shapes, Sizes, and mutual Actions of the constituent Particles of Matter. . . ."[75] He regretted, though, that since

> the small Parts of Matter, with their Actions, are too minute to be the Objects of Sight . . . we are as yet neither possessed of a Detail of the Phaenomena sufficiently copious and regular, whereon to ground an Investigation; nor of a Method of Investigation subtle enough to arrive at the Subtlety of Nature, even in the biggest component Particles, much less in the Particles of the smaller Orders. . . .[76]

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[71] *Ibid.*, 13. [72] *Ibid.*, 25.

[73] *Ibid.*, 32. [74] *Ibid.*, 463.

[75] *Ibid.*, 338. The concept of nature as a mechanism was common in Hartley's time; for a fuller discussion of the contemporary view of the "Newtonian" dynamic and corpuscular mechanism of nature, see Chapter IV below.

[76] Hartley, *Observations on Man*, I, 364.

We are thus beset with ". . . Uncertainties and Perplexities" in these matters;[77] and our knowledge remains inadequate.[78] Yet he speculated "that Optics and Chemistry will, at last, become a Master-Key for unlocking the Mysteries in the Constitution of natural Bodies;"[79] indeed, comparing changes in color with other chemical changes seems most "likely . . . to be a Key to the Philosophy of the small Parts of natural Bodies, and of their mutual Influences."[80] Hartley also viewed the hypotheses of the aether and of the forces of attraction and repulsion as potentially fruitful in man's search for the laws of nature.[81] On the whole, he was certain that as soon as "the subtle Influences of the small Parts of Matter upon each other . . . are sufficiently understood," the phenomena of nature and, of greater interest here, the phenomena of man would also be explained.[82]

The Particulate Structure of the Human Body

Hartley conceived of the human body as constructed of a series of particles, corpuscles, molecules, and ". . . Molecules of the Molcules"[83] "of the same Matter as the external World. . . ."[84] In his physiological psychology, seven basic anatomical constructions are involved in the process of sensation, thought, and muscular activity:

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[77] *Ibid.*, 364.

[78] *Ibid.*, 363-366.

[79] *Ibid.*, 352.

[80] *Ibid.*, 209.

[81] *Ibid.*, 348.

[82] *Ibid.*, 72.

[83] *Ibid.*, 62.

[84] *Ibid.*

(1) the nervous papillae, (2) the nerves, (3) the ganglion, (4) the plexuses, (5) the spinal marrow, (6) the cortical substance, and (7) the white medullary substance. These are all constructed from particles of matter in the following manner: The primary particles cohere to fashion small vessicles and vessels, slender capillaments, and small fibrils; these compose papillae, membranes, and muscular fibers, which in turn form the human cortical and medullary substances; the human cortical and medullary substances then compose the nerves, spinal marrow, ganglia, plexuses, and brain. Hartley furthermore maintained that, just as the powers and properties of natural bodies are produced by the powers and properties of their component particles, the powers and properties of these anatomical structures derive from the powers and properties of their constituents and their constituent particles.

Hartley's Approach to the Study of the Human Body

Since it is composed of the same particulate matter and exhibits "plain Traces of Mechanism"[85] similar to the mechanism of nature, Hartley confidently reduced the study of the human body to the study of the nature and interaction of its constituent particles. He considered "it . . . reasonable to expect, that its component Particles should be subjected to the same subtle Laws" as the external world,[86]

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[85] Ibid., 267.

[86] Ibid., 62. In subjecting the particles of the human body to the same laws as the natural world, Hartley is participating in the Oxford tradition of speculative, Newtonian dynamic corpuscular physiology best exemplified by James Keill (1673-1719), who had earlier reduced "physiology to the dominion of natural law" (see Schofield, Mechanism and Materialism, 51-57 for a discussion of this tradition). See Chapter IV below for a look at the possible sources of Hartley's exposure to this tradition.

and, therefore, he did not hesitate to classify medicine, for instance, as a division of

> . . . Natural Philosophy, or the Application of the Arts of Mathematics and Logic to the Phaenomena of Natural and Civil History, communicated to us by means of our previous Skill in Philology, in order to decypher the Laws by which the external World is governed, and thereby to predict or produce such Phaenomena, as we are interested in.[87]

He considered the human body to be "subjected to our Senses and Inquiries, in the same manner as the other Parts of the external material World;"[88] consequently, it is not surprising to find that Hartley employed the concepts, approach, and methods of proof used in contemporary natural philosophy in the study of the corporeal nature of man he undertook in Volume I of his Observations on Man.

Hartley's Approach to the Study of Mind

At the beginning of his work, Hartley declared, "Man consists of Two Parts, Body and Mind."[89] In spite of his avowed dualism, Hartley placed ". . . Psychology, or the Theory of the human Mind, with that of the intellectual Principles of Brute Animals" within the field of natural philosophy,[90] alongside the study of ". . . Mechanics, Hydrostatics, Pneumatics, Optics, Astronomy, Chemistry, the Theories of the several manual Arts and Trades, [and] Medicine. . . ."[91]

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[87] Hartley, Observations on Man, I, 354. Again Hartley follows Boerhaave, whose medical system was, for the most part, mechanistic in nature (Schofield, Mechanism and Materialism, 193-194).

[88] Hartley, "Introduction," Observations on Man, I, i.

[89] Ibid.

[90] Hartley, Observations on Man, I, 354.

[91] Ibid.

Moreover, in many passages in the Observations on Man, Hartley referred to the general ". . . Mechanism of our Natures,"[92] which he claimed was "inspired by God."[93] He also specifically alluded to "the Mechanism of the Mind," which he believed he had explained and established in the first volume of his work.[94]

By categorizing psychology within natural philosophy and by referring to the mind as a mechanism, Hartley implied mind is a part of, closely connected to, or analogous to the natural world; thus, mind is subject to the same laws of matter and motion as other natural phenomena, and it can be studied by means of the methods natural philosophers ordinarily use to study the external material world. Just as he was certain a sensory impression in the human brain "must have its Rise from some Powers in the small Parts of Matter over each other [and] . . . must therefore admit of an Explanation, either from the Doctrine of Vibrations, or from some other Law of Matter and Motion,"[95] he also insisted

> that the Powers of generating Ideas, and raising them by Association, must also arise from corporeal Causes, and consequently [must also] admit of an Explication from the subtle Influences of the small Parts of Matter upon each other, as soon as these are sufficiently understood. . . .[96]

All in all, then, Hartley argued that, since the phenomena of mind arise from corporeal causes, mental events must be capable of explanation according to the natural laws of matter and motion.

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[92]Ibid., 501; see also ibid., 463. [93]Ibid., 370.

[94]Ibid., 501 and 435. [95]Ibid., 39.

[96]Ibid., 72.

Hartley was aware that his unified approach to the study of the corporeal and mental aspects of man was a rather novel one,[97] but he maintained nonetheless that it was a potentially fruitful one. He encouraged others to adopt his approach to the study of man according to the methods used in natural philosophy by alluding to its pragmatic possibilities: In his opinion, "all the Evidences for the mechanical Nature of the Body or Mind are so many Encouragements to study them faithfully and diligently, since what is mechanical *may* both be understood and remedied."[98]

According to Hartley, human sensation, thought, and behavior can all be explained

(1) as a result of an interaction between the external physical world and the human body,

(2) by means of the structure of the human body,

(3) as a result of a connection between the human body and the human mind, and

(4) by means of the associational mechanism of the human mind.

Since Hartley viewed man as the sum of his impressions and his associations,[99] these four elements are both necessary and sufficient in his psychology. Hartley's system can therefore be described as at once sensationalist, physiological, mechanical, dualistic, empiricist, and associational.

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[97] *Ibid.*, 6.

[98] *Ibid.*, 267.

[99] *Ibid.*, 82.

The Physiology of the Brain

At the beginning of his explanation of sensation, thought, and human behavior, Hartley informed his readers, "Under the Word Brain, in these Observations, I comprehend all that lies within the Cavity of the Skull, i. e. the Cerebrum, or Brain properly so called, the Cerebellum, and the Medulla oblongata."[100]

Although Hartley acknowledged "many, or even most things in the Boerhaavian Doctrine concerning the Structure and Functions of the Brain, to be beautiful, just, and useful,"[101] he could not agree with Boerhaave's supposing "the Brain to be a Gland properly so called"[102] because in Hartley's opinion the brain did not possess "the Difformity

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[100]Hartley, Observations on Man, I, 7. To gain a perspective against which to view Hartley's discussion of the brain, see the history of concepts of the brain, its structure, and function presented by Edwin Clarke and C. D. O'Malley in The Human Brain and Spinal Cord: A Historical Study Illustrated by Writings from Antiquity to the Twentieth Century (Berkeley and Los Angeles: University of California Press, 1968); hereinafter referred to as Clarke and O'Malley, Human Brain.

[101]Ibid., 18. Here Hartley referred to the influential mechanistic chemist and physician Hermann Boerhaave (1668-1738), an enthusiastic Newtonian whose chemistry textbook, the Elementa Chemiae (1732), "was to achieve the greatest popularity of any single text until that of Lavoisier at the close of the century" (Schofield, Mechanism and Materialism, 147 and 136-137). Boerhaave, John Keill (1671-1721), John Friend (1675-1728), Hales, and Newton himself were the primary chemical authorities in the early 1740's (ibid., 191), at which time Hartley was developing the physiological foundation of his theory of association. References to Boerhaave are so numerous in Hartley's work that a thorough study of Boerhaave's influence is well warranted and cannot fail to illuminate the historical connection of psychology and Newtonian physical science. For Newton's and Hales' influence on Hartley, see Chapter IV below.

[102]Hartley, Observations on Man, I, 17.

of Texture required in a Gland. . . ."[103] Nor could Hartley accept the Boerhaavian theory that the brain functioned by means "of a glandular Secretion [of a subtle fluid], called nervous Fluid, animal Spirits, &c."[104]

In general, Hartley recognized a great ". . . Dependence of all the Parts [of the human body] on the Brain;"[105] consequently, he asserted that "the Brain has as great a Share in all the natural Functions of the Parts, and its Disorders, in all their Disorders, as the Heart, and its Disorders, can have; and much more than any other Part, besides the Heart."[106]

On the whole, Hartley described the brain as composed of cortical and medullary substances, penetrated by the pia mater, containing ventricles or cavities, and surrounded by venal sinuses. According to Hartley, the cortical substance is vascular in nature,[107] that is

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[103] Ibid.

[104] Ibid., 18; see also ibid., 20-21. During the seventeenth and eighteenth centuries, the brain was largely considered a gland which secreted a nervous fluid that then passed through hollow or porous nerves to the rest of the body. In addition to Boerhaave, Marcello Malphigi (1628-1694) and Thomas Willis (1621-1675) accepted this point of view (E. Bastholm, The History of Muscle Physiology From the Natural Philosophers to Albrecht von Haller, Acta historica scientiarum naturalism et medicinalium, II (Kobenhavn: Ejnar Munksgaard, 1950), 132-133; hereinafter referred to as Bastholm, Muscle Physiology).

[105] Hartley, Observations on Man, I, 265.

[106] Ibid.

[107] Ibid., 17.

composed of very small vessels. He explained to his readers that "the finer Orders of the Vessels of the cortical Substance are far too minute to admit of the most subtle Injections, the best Injectors having never penetrated farther than the grosser Orders of Vessels in the cortical Substance."[108] Hartley also considered the cortical substance to be soft and compressible in nature.[109] The cortical substance itself was of relatively little significance in his physiological psychology however.

The White Medullary Substance

Even though Hartley referred to the brain as the general organ of accretion, nutrition, sensation, and motion in the animal body,[110] he isolated the medullary, rather than the cortical substance as its active part.[111] He declared it was commonly acknowledged in his day

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[108] *Ibid.*   [109] *Ibid.*, 46.

[110] *Ibid.*, 17-18. Hartley's concept of the brain as the chief organ of the body, especially of sensation, and the seat of the soul can be contrasted with the Aristotelian concept of the heart as the chief organ and seat of the soul. The Aristotelian scheme continued to be advocated through the middle ages (Edwin Clarke and Kenneth Dewhurst, *An Illustrated History of Brain Function* (Berkeley and Los Angeles, Ca.: University of California Press, 1974), 17; hereinafter referred to as Clarke and Dewhurst, *Brain Function*) and was given expression in the late seventeenth century by Thomas Hobbes, who connected sensation with the heart rather than the brain (Lange, *History of Materialism*, 288-289). As early as the sixth century B.C., however, the brain was described as the seat of the soul and this doctrine, as well as the Aristotelian one, was adopted by medieval philosophers (Clarke and Dewhurst, *Brain Function*, 6 and 10).

[111] Although Galen (129/130-199/200) located intellectual functions in the solid substance of the brain, he associated the ventricles with the various functions as well. Nemesius (fl. ca. 390 A.D.) localized the processes of thought in the ventricles themselves; this model of the physiology of thought was elaborated, formed the psychological paradigm of the middle ages, and persisted well into the seventeenth

that "the medullary Substance of the Brain, spinal Marrow, and Nerves . . . is the chief Instrument of Nutrition and Growth."[112] Practically although not ultimately speaking,[113] Hartley insisted "all Physicians and Philosophers must allow" that the white "medullary Substance is . . . the common Instrument of Sensation, Thought, and Motion"[114] as well.

In the Observations on Man, he referred to the white medullary substance as "that Part [of the body] which is most nearly related to the sentient Principle"[115] and as "the immediate Instrument of Sensation and Motion."[116] He supposed the function of the medullary substance in the processes of sensation and motion

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century. In 1586, Archangelo Piccolomini (1526-1586) differentiated the grey cortical substance from the white medullary substance of the brain. Then in the mid-seventeenth century Thomas Willis shifted interest towards the study of the functional significance of the cortical and medullary substances by postulating that animal or psychic spirits are secreted by the cortical substance and by localizing the mental functions in the matter of the brain rather than in the ventricles. According to Willis, sensation occurs in the corpus striatum, the corpus callosum (or white medullary matter between the basal ganglia and the cortical substance) is the seat of the imagination, and the cortical substance is the seat of memory; voluntary motion is controlled by the cerebrum and the vital and involuntary actions by the cerebellum (see Clarke and Dewhurst, Brain Function, 10-14, 51, 65-79). It must be noted here that the grey substance of the brain plays no role in Hartley's physiological psychology; when Hartley referred to the medullary substance in the Observations on Man he was generally referring to the white medullary substance of the brain. In the course of this paper, the terms medullary substance and white medullary substance will be used interchangeably, since Hartley considered them virtually synonymous and used them interchangeably in his work.

[112] Hartley, Observations on Man, I, 52.

[113] Ibid., 34.

[114] Ibid., 87; see also ibid., 7, 26, 31, 85-86.

[115] Ibid., 33.

[116] Ibid., 7.

> to be sufficiently proved in the Writings of Physicians and Anatomists; from the Structure and Functions of the several Organs of the Human Body; from Experiments on living Animals; from the Symptoms of Diseases, and from Dissections of morbid Bodies.[117]

In Hartley's physiological psychology, the "<u>white medullary Substance of the Brain is also the immediate Instrument, by which Ideas are presented to the Mind</u>. . . ."[118] He argued that

> . . . Evidence for this Proposition is . . . to be taken from the Writings of Physicians and Anatomists; but especially from those Parts of these Writings, which treat of the Faculties of Memory, Attention, Imagination, &<u>c</u>. and of mental Disorders.[119]

Indeed, Hartley maintained "that the Perfection of our mental Faculties depends upon the Perfection of this Substance. . . ."[120]

In order to prove his conclusion that the white medullary, rather than the cortical substance is the substance of the brain that is active in sensation, thought, and motion, Hartley presented the following observation: "When any considerable Injury is done to the medullary Substance of the Brain," he wrote,

> Sensation, voluntary Motion, Memory, and Intellect, are either intirely lost, or much impaired; and if the Injury be very great, this extends immediately to the vital Motions also, <u>viz</u>. to those of the Heart, and Organs of Respiration, so as to occasion Death. But this does not hold equally in respect of the cortical Substance of the Brain; perhaps not at all, unless as far as Injuries done to it extend themselves to the medullary Substance.[121]

Hartley was uncertain whether the medullary substance itself should be described as glandular in function.[122] There was no doubt

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[117] <u>Ibid</u>.

[118] <u>Ibid</u>., 8.

[119] <u>Ibid</u>.

[120] <u>Ibid</u>., 8-9.

[121] <u>Ibid</u>., 8.

[122] <u>Ibid</u>., 54. Hartley characterized glands as being (1) difform in texture, (2) fitted for their specific functions during sleep,

at all in his mind, however, that it was the central physiological structure involved in the production of human sensation, thought, and motion, for, generally speaking, Hartley declared that all human sensation, thought, and motion is performed by means of vibrations in the white medullary substance of the nerves, spinal marrow, and brain.[123]

The role of the white medullary substance in Hartley's physiological psychology, then, lies "in receiving, retaining, and communicating Vibrations. . . ."[124] He portrayed the medullary substance as peculiarly well-fitted for these functions as a result of (1) its particulate nature, (2) the active powers possessed by its particles, (3) its ultimate structure, and (4) its overall vascularity, uniformity, continuity, softness, and texture.

The Particularity of the Medullary Substance

Hartley described the medullary substance as composed of several orders of particles; "small Particles . . . compose . . . [both] the ultimate Vessels of this Substance . . . [and] the Fluid which circulates in these ultimate Vessels."[125] Although there are several orders of particles from which the medullary substance is constructed, only "the Particles . . . of the inferior Orders, and not those biggest

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and as (3) secreting or excreting "their proper fluids from muscular compression, or Vibrations running up their excretory Ducts" (ibid., 17 and 54). The medullary substance would be included as a gland on all these counts, for, by Hartley's description, it differs in texture by region, is prepared for its function during sleep, and secretes a fluid as well (ibid., 60-61, 54, 19).

[123] Ibid., 232; see also ibid., 109.

[124] Ibid., 46.

[125] Ibid., 19.

Particles, on which the Operations in Chemistry, and the Colours of natural Bodies, depend, "are involved in human sensation, thought, and motion.[126] It is not "the Particles of the first or largest Order (by the Vibrations of which, in sonorous Bodies, it seems, that Sound is excited in the Air)," but "the Particles of the Second, Third, &c. Orders" that participate in the vibration of the medullary substance.[127] The particles of the fine circulating fluid are even smaller still than those of the medullary substance proper.[128] All in all, Hartley identified "the small, and, as one may say, infinitesimal, medullary Particles"[129] as those playing a role in his physiological psychology.

The Activity of the Medullary Particles

Because Hartley believed all the particles of natural bodies possess latent active powers, most importantly those of attraction and repulsion,[130] he also deemed it necessary "to consider what active Properties may belong to the small Particles of the medullary Substance, *i. e.* to the small Particles which compose either the ultimate Vessels of this Substance, or the Fluid which circulates" in them.[131] He acknowledged that the popularly-accepted

> . . . Doctrine concerning the Powers of the nervous System supposes the Fluid secreted by, and circulating through, the medullary Substance, to be of a very active Nature; and [he admitted] this may be, though the Taste of the medullary Substance in Brute Animals discovers no such Activity.[132]

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[126] *Ibid.*, 12.

[127] *Ibid.*, 87.

[128] *Ibid.*, 20 and 47.

[129] *Ibid.*, 11.

[130] *Ibid.*, 20, 27-28, 231, 353.

[131] *Ibid.*, 19.

[132] *Ibid.*

Nonetheless, Hartley concluded that the infinitesimal particles of both the medullary substance proper and its circulating fluid are active in nature; in fact, he exclaimed, "that some Powers of Attraction or Repulsion, or rather of both at different Distances, reside in the small Particles of the medullary Substance, can scarce be doubted. . . ."[133]

The force of attraction and repulsion is not constant in the particles, however. In the first place, Hartley noted that the ". . . Spheres of Attraction and Repulsion" of the medullary particles change "upon every Change in their Situations. . . ."[134] In the second place, Hartley speculated, "The Smallness . . . of the Particles of the medullary Substance may not improbably increase their Activity, in respect of their Bulk,"[135] since the activity of the particles of natural bodies is always indirectly related to their size. Moreover, since the particles of the fluid are smaller than the particles of the medullary substance proper, the particles of the fluid are also more active in nature than those of the solid medullary substance.[136]

The Qualities of Alteration and Retention

Equally as fundamental as the particulate and active nature of the medullary substance to Hartley's physiological psychology is his conception of the medullary substance's peculiar ability to change in reaction to frequent impressions and to retain a state often

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[133] *Ibid.*, 20.

[134] *Ibid.*, 38.

[135] *Ibid.*, 20.

[136] *Ibid.*

impressed upon it. Hartley ultimately attributed these abilities to the "proper subtle ultimate Structure"[137] of the medullary substance, i.e. to the arrangement of its particles and their exertion of the powers of attraction and repulsion on one another.

In general, Hartley observed that "animal Bodies" are disposed "to accomodate themselves to, and continue in, almost any State that is often impressed. . . ."[138] This disposition and the analogous qualities of the medullary substance arise from its ultimate structure since, Hartley claimed, "the Alterations which Habit, Custom, frequent Impression, &c. make in the small constituent Particles [of the medullary substance], can scarce be any thing besides Alterations of the

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[137] Ibid., 62. It is interesting to note here that Hartley attributed the intellectual inferiority of animals (when compared to man) to an ". . . Imperfection of the Matter of their Brains, whereby it is less fitted for retaining . . . and combining" a variety of sensory impressions than is the human medullary substance (ibid., 405). Since he then reduced the human ability to retain and combine a great variety of sensory impressions to the different arrangement and exertion of the active powers of the particles of the medullary substance in the human brain (see discussion below), he essentially reduced a qualitative difference between the intellectual capacities of men and animals to a difference in the matter, powers, and motions of the particles of their respective medullary substances.

[138] Ibid., 61. Robert M. Young ("Hartley, David," Dictionary of Scientific Biography, VI (1972), 139-140) has indicated that Hartley's physiological psychology "provided the grounds for the secularization of the concepts of adaptation and utility" in the nineteenth century, and, Young maintained, "This secularization was taken up in a wide range of disciplines as a basis for accounting for cumulative ordered change through experience." He noted in particular that "Erasmus Darwin used Hartley's mechanisms as the basis for his theory of evolution." Hartley's reduction of an animal body's ability to accommodate itself to and continue in any state that is often impressed to particulate arrangement and the exertion of particulate powers is one aspect of his physiological psychology that Darwin and others may have found especially appealing in their arguments for human and animal adaptation and utility.

Distances, and mutual Actions, of these Particles. . . ."[139] The medullary substance has a general tendency "always to lean towards the Situation last superinduced" because the distances and, hence, the spheres of attractions and repulsion have been altered by that situation.[140] Hartley illustrated this tendency of the medullary substance by analogy: He observed that the ability of a string on a musical instrument to maintain its tension and tune "must arise from the mutual Influences of the component Particles tending to their last superinduced State" of tension. Similarly, the medullary substance retains frequently impressed states due to the "tension" existing between its particles, which is precisely a result of the distances between them and their spheres of attraction and repulsion.[141]

The Properties of the Medullary Mass

Hartley asserted that the characteristic properties of the general mass of the white medullary substance further enable it to receive, retain, and communicate impressions. On the whole, the medullary substance was described by Hartley as vascular, uniform, continuous, soft, and textured.

The white medullary substance is, according to Hartley, composed of "fine Vessels. . . ."[142] Indeed, "the Vessels are [so] extremely fine"[143] and excessively minute that Hartley referred to them as infinitesimal in size.[144] "These Vessels," Hartley elaborated,

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[139] Hartley, Observations on Man, I, 61.

[140] Ibid., 38.

[141] Ibid., 62.

[142] Ibid., 134.

[143] Ibid., 133.

[144] Ibid., 16 and 18.

> are, by all Anatomists and Physiologists, supposed to arise from those of the cortical Substance, this being agreeable to the Analogy of the other Parts of the Body. And it follows from the same Analogy, that they must be smaller than those [cortical] Vessels from which they arise.[145]

In addition to their diminutive size, Hartley considered the vessels of the medullary substance to be pellucid, or transparent.[146] They are, however, "liable to Obstructions, especially in old Age,"[147] and when such obstructions occur, opacity and inability to receive or transmit impressions follow.[148] This may result in total loss of sensation or motion, as well as in gradual decay of the brain.[149] These normally pellucid vessels of the medullary substance compose in turn "the Fibrils of the medullary Substance," which Hartley portrayed as "pellucid, when singly taken" and equally as subject to opacity, obstruction, and decay as their component vessels.[150]

Hartley identified the vascularity of the white medullary substance as responsible for producing its other general characteristics of uniformity, continuity, softness, and regularity of texture. He claimed "that this Substance is uniform and continuous every-where,"[151] and, he argued, this is

> evident to the Eye, as far as that can be a Judge of them. The white medullary Substance appears to be every-where uniform and similar to itself throughout the whole Brain, spinal Marrow, and Nerves; and tho' the cortical Substance be mixed with the medullary in the Brain, and spinal Marrow, and perhaps in the Ganglions

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[145] _Ibid._, 16-17. [146] _Ibid._, 133. [147] _Ibid._

[148] _Ibid._, 124, 133, 393. [149] _Ibid._, 392.

[150] _Ibid._, 18. [151] _Ibid._, 86.

> and Plexuses, yet it does not appear, that the Communication of any one Part of the medullary Substance with every other, is cut off any-where by the Intervention of the cortical.[152]

In spite of his contention that the white medullary substance is continuous throughout the brain, Hartley did acknowledge the existence of several ventricles or cavities within the mass of the medullary substance.[153] Although Hartley did not describe the ventricles as full of any gross fluid,[154] he still claimed that the ventricles do not create discontinuities in the medullary substance which disrupt the reception or communication of vibration. This is because he envisioned a "denser Aether lodged in those Cavities. . . ."[155] Hartley both supposed and reasoned from "experiments" that this aether is a particulate and

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[152] Ibid., 16.

[153] Throughout history the ventricles have played various roles in the explanation of human behavior and intellectual processes. Galen, for example, believed the vital spirit is transformed into animal spirit in the ventricles. He further connected human thought processes with the third ventricle, imagination with the anterior ventricle, and memory with the fourth ventricle. This association of mental processes with specific ventricles in the brain was dominant until Andreas Vesalius (1514-1564) denied the ventricles are the seat of human intellectual processes (see Alfred Meyer, Historical Aspects of Cerebral Anatomy, Oxford Medical Publications (London: Oxford University Press, 1971), 7-9 (hereinafter referred to as Meyer, Cerebral Anatomy); and C. D. O'Malley, "Vesalius, Andreas," Dictionary of Scientific Biography, XIV (1976), 10).

[154] The contents of the ventricles have been variously described through the centuries. Galen may have noted the presence of fluid in the cavities, and in 1536 Niccolo Massa (1485-1569) declared the ventricles are full of fluid at all times (Meyer, Cerebral Anatomy, 9).

[155] Hartley, Observations on Man, I, 44.

> subtle Vapour, which is exhaled from the Vessels of the investing Membrane, and whose Particles, like the Vapour of Water, have a repulsive Power, in respect of each other, [which] prevents the absolute mutual Contact of the opposite Sides [of the ventricles], in common Cases.[156]

He was aware he differed on this count with Boerhaave, who "is, indeed, of Opinion, that the opposite Sides of the Ventricle always touch each other, so as to leave no Cavity," but, by filling the otherwise empty cavities of the ventricles with particles of the aether, Hartley was able to employ them "to increase and keep up all the Vibrations propagated from the external Nerves into the medullary Substance of the Brain. . . ."[157] Furthermore, by identifying certain abnormal instances in which the aether is forced from the ventricles, Hartley was able to assign the ventricles a role in the suffocation of sensation as well.[158] In spite of the existence of these cavities in the medullary substance of the brain, Hartley was nonetheless able to declare, "There is no Part of the medullary Substance separated from the rest, but all make one continuous white Body. . . ."[159]

"We may . . . well suppose," he continued, "that the medullary Substance consists of a Texture of Vessels so small and regular, as that it may have no Vacuity or Interval in it, sufficient to interrupt or disturb" the vibratory process by which it receives and communicates impressions.[160] Hartley explained this characteristic uniformity and continuity as arising from the regular, vascular

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[156] *Ibid.*

[157] *Ibid.*

[158] *Ibid.*, 44 and 48.

[159] *Ibid.*, 16.

[160] *Ibid.*, 17.

structure of the medullary substance. He suggested, "The excessive Minuteness of the Vessels of which the medullary Substance consists, may also be conceived as producing its Uniformity and Continuity."[161]

Hartley noted, however, that both minute, invisible as well as "evident Solutions of Continuity"[162] can occur between the small particles of the medullary substance as a result of violent impressions.[163] These breaks in continuity are "healed again, and the Parts restored, in great measure, to their primitive Integrity and Perfection, by the Power of Nature. . . ."[164]

Hartley also characterized the medullary substance as an exceedingly soft mass--by "far the softest of all the Parts of the Body"[165]--although he believed it tends to grow more callous and rigid with age.[166] On the whole, he referred to the medullary substance as a "soft . . . Pulp,"[167] and, like the uniformity and continuity of the medullary substance, this ". . . Softness . . . is . . . evident to the Senses, and the natural Consequence of the extreme Smallness of the compounding Vessels, and Fluids circulating through them."[168] According to Hartley,

> the same Excess of Softness, which renders the medullary Substance totally inelastic as to Sense, and consequently unfit for the grosser Vibrations of the Particles of the first or largest Order . . . , may render it more susceptible of Vibrations, in the Particles of the Second, Third, &c. Orders. . . .[169]

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[161] Ibid., 16. [162] Ibid., 35.

[163] Ibid., 35-38, 153, 226. See also the discussion of the physiology of pleasure and pain below.

[164] Ibid., 37. [165] Ibid., 47.

[166] Ibid., 162 and 380. [167] Ibid., 87. [168] Ibid., 17.

[169] Ibid., 87.

It follows, however, from this excessive natural softness of the medullary substance, that it is more subject to compression than any other part of the human body. Furthermore, Hartley maintained that it could become "soft and compressible in a preternatural Degree" as a result of "a Defect of Nutrition in this Substance. . . ."[170] Hartley enumerated several physiological causes of compression: For instance, he believed when the heat of the body rarifies "the Blood and Juices,"[171] the veins and "the venal Sinuses which surround the Brain and spinal Marrow"[172] distend "so as to . . . compress the medullary Substance. . . ."[173] Similarly, "the Rarefaction of the Humours" can cause its compression.[174] The result of this initial compression of the medullary substance, whatever its precise cause, is to "exhaust this Substance of its fluid and active Particles, so as to render it more easily compressible, and less susceptible and retentive of Vibrations."[175] Thus, "if we suppose its Functions to consist in receiving, retaining, and communicating Vibrations, it will be rendered peculiarly unfit for these Functions, from the Compression here mentioned. . . ."[176]

The Regions of the Medullary Substance

Hartley maintained the entire mass of the brain is penetrated by the membranous pia mater. "Since the Pia Mater, with its

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[170] *Ibid.*, 47. [171] *Ibid.*, 48. [172] *Ibid.*, 45.

[173] *Ibid.*, 394. [174] *Ibid.*, 48. [175] *Ibid.*

[176] *Ibid.*, 46; see also *ibid.*, 48, 130-131, 402.

Blood-vessels, enters the Interstices of the several Folds of the Brain," Hartley suspected "that it penetrates not only the cortical Substance, but also the medullary, along with the several descending Orders of Vessels, and consequently that it divides and subdivides the medullary Substance into various greater and lesser Regions."[177] This separation of the medullary substance into regions by the pia mater affects neither its continuity, its uniformity, nor its consequent ability to communicate sensory impressions because

> we may reasonably suppose the Pia Mater to be so attenuated in these its Processes, as that the medullary Substance may still remain sufficiently uniform for the free Propagation of Vibrations. Or, if there be some little Impediment and Confinement in certain Regions, on account of some exceedingly small Discontinuity, arising from this Intervention of the Pia Mater between certain Regions, it may, as it seems to me, suit this Theory rather better than an absolute and perfect Continuity, as before supposed.[178]

This division of the medullary substance of the brain into regions by the penetration of the pia mater plays an integral role in Hartley's physiological psychology on several counts. With respect to the general properties of the medullary substance, however, Hartley's view that the internal structure and the texture of the medullary substance varies from region to region is particularly significant. In spite of the overall vascularity, uniformity, continuity, and softness of the medullary substance, each region has a slightly "different internal Structure" and texture, which predisposes it to receive certain specific types of sensory impressions and facilitates change from one

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[177] Ibid., 18.

[178] Ibid., 19.

disposition to another.[179] That is, by means of its internal structure, each ". . . Region is originally fitted to receive, and, as one may say, sympathize with, such Vibrations as are likely to be impressed upon . . . [it] in the various Incidents of Life. . . ."[180] Likewise, Hartley conceived "that each Region of the medullary Substance has such a Texture as to receive, with the greatest Facility, the several specific Vibrations, which the Objects corresponding respectively to these Regions, i. e. to their Nerves, are most disposed to excite."[181]

Hartley did not clarify the connection between regional internal structure and texture beyond identifying texture with regional disposition, which changes through time,[182] and attributing changes in disposition to "a Change of the Spheres of Attraction and Repulsion in these Particles" of the medullary substance.[183] Regional texture is then itself a result of the arrangement of the ultimate medullary particles and their active powers, as are all the general properties of the mass of the white medullary substance.[184] All in all,

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[179] Ibid., 17, 42, 407.

[180] Ibid.

[181] Ibid., 60; see also ibid., 61.

[182] Ibid., 162-163; see also ibid., 38.

[183] Ibid., 38.

[184] In the corpuscularean philosophy propounded by Robert Boyle (1627-1691), texture is identified with the disposition, relationship, or internal configuration of corpuscles in the body they compose, and this texture gives rise to the properties displayed by the whole (Lester S. King, "Stahl and Hoffmann: A Study in Eighteenth Century Animism," Journal of the History of Medicine and Allied Sciences, XIX (1964), 127; hereinafter referred to as King, "Stahl and Hoffmann").

then, Hartley reduced the medullary substance's unique ability to mediate between the human body and mind to the motions of its small active particles and their interaction with the aether.

The Medullary Substance and the Aether

Hartley believed the same subtle, elastic, and self-repulsive aether that is diffused through the pores of natural bodies and fills the cavities of the ventricles of the medullary substance pervades the pores of the entire human body as well.[185] According to Hartley,

> if the Existence of so subtle and elastic a Fluid, as the Aether . . . can be established upon independent Principles, it may reasonably be supposed to penetrate the Pores of the medullary Substance, how small soever they be, in the same manner as Air penetrates grosser Cavities and Pores. . . .[186]

Just as the aether in nature "is rarer in the Pores of Bodies than in open Spaces,"[187] the aether in the pores of the human body is rarer on the whole than the aether in the surrounding air.[188] In addition, it varies in density within the body, and this variation helps produce discontinuities between one physiological structure and another.[189]

He considered the aether pervading the pores of the medullary substance to be "of an uniform Density on account of the Smallness of . . . [its] Pores . . . and Uniformity of its Texture. . . ."[190] Since Hartley pictured the aether itself as extremely susceptible of vibrations and pulses and hypothesized that it serves to communicate vibrations to other particles in nature,[191] he found no difficulty

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[185] *Ibid.*, 13 and 23.

[186] *Ibid.*, 25.

[187] *Ibid.*, 13.

[188] *Ibid.*, 43.

[189] *Ibid.*, 22-23.

[190] *Ibid.*

[191] *Ibid.*, 14-15 and 25.

in proposing that the aether communicates "these [vibrations] to the medullary Particles"[192] and interacts with them to excite, propagate, and sustain vibrations in the medullary substance as a whole.[193]

Hartley's "Foetus in Utero"

That natural philosophers and physicians in the seventeenth and eighteenth centuries were particularly interested in the physiology of sensation[194] was a result of their growing empiricism and rejection of Cartesian innate ideas. In order to describe the physiological mechanism which Hartley contended furnished the human mind with material for thought and action, it will be useful to employ a hypothetical device Hartley constructed in the Observations on Man. This device, the figure of the *foetus in utero*, is not unlike John Locke's "white Paper" or the "statue man" constructed by Locke's follower Étienne Bonnot de Condillac (1714-1780).[196] In a manner similar to Aristotle's

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[192] *Ibid.*, 25.

[193] *Ibid.*, 13. The use of the aether in sensation, thought, and muscular motion is a very "Newtonian," although not original aspect of Hartley's system. See Chapter IV below for a brief discussion of its origin in Newton's work and its use by previous Newtonians.

[194] Mary A. Brazier, "The Growth of Concepts Relating to Brain Mechanisms," *Journal of the History of Behavioral Sciences*, I (1965), 227. Indeed, this preoccupation with sensation was "at the very heart of" "the eighteenth-century revolution in intellectual thinking regarding the 'science of man'. . . ." (G. S. Rousseau, "Nerves, Spirits and Fibres: Towards Defining the Origins of Sensibility," *Studies in the Eighteenth Century: Papers Presented at the David Nichol Smith Memorial Seminar*, III (1976), 141; hereinafter referred to as Rousseau, "Nerves, Spirits and Fibres.")

[195] Hartley, *Observations on Man*, I, 45, 51-52, 59-60.

[196] John Locke, *An Essay concerning Humane Understanding* . . . (London: Printed for Tho. Basset . . . , 1690), 104; the "statue man"

earlier postulation of a tabula rasa[197] in opposition to Plato and Socrates' "theory of recollection," Locke, Hartley, and Condillac postulated their three devices in response to the Cartesian epistemological theory of innate ideas. These devices were intended to depict man's total lack of innate ideas at birth and were employed by their creators to illustrate the processes involved in the production of knowledge solely from experience.

Although Hartley used the hypothetical figure of the foetus in utero sparingly in his own work, its applicability to his entire description of human sensation, mental processes, and action is unlimited. Indeed, if its use is extended, if the foetus in utero is set up as a focal point around which Hartley's psychological theory is centered, a clear and concise presentation of his thought can be obtained.

The Process of Sensation

According to Hartley, the process of sensation which leads, first, to perception and, eventually, to the generation of ideas begins when the human body comes into contact with objects in the external world. While the fetus remains in the uterus, however, Hartley

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first appeared in Condillac's Essai sur l'origine des connoissances humaines . . . (Amsterdam: Chez Pierre Mortier, 1746) and was fully utilized in his Traité des sensations . . . (Londres, Paris: De Buré l'aîné, 1754).

[197]According to Lange (History of Materialism, 322 note 76), the concept of the mind as a tabula rasa appears in Aristotle's De anima, iii, c. 4.

maintained it has little or no contact with the external world. He described every region of the white medullary substance of the brain of the _foetus in utero_ as being in a state of uniform natural vibration or as in a state of vibration which uniformly increases "in Degree . . . as the _Foetus in Utero_ increases in Bulk and Strength."[198] This state of vibration of the medullary substance of the _foetus in utero_, he labelled _N_ and referred to as "the _Natural Vibrations_."[199] Since this natural state of vibration of the medullary substance of the _foetus in utero_ is a response to the general warmth and pulsation of its environment, Hartley commented that the vibrations "are also probably the same in all the different Regions of the medullary Substance."[200] The _foetus in utero_ is thus essentially devoid of ideas and in a constant state of sleep.[201]

In Hartley's opinion, ". . . All the mere Sensations . . . enter the Mind by the Five external Senses;"[202] consequently, the _foetus in utero_, "having no Sensation from without impressed upon it, . . . only becomes awake upon its Entrance into a new World," when it receives its first impressions from external objects.[203]

The "Doctrine of Vibrations"

"External Objects," Hartley explained, "being corporeal, can act upon the Nerves and Brain, which are also corporeal, by nothing

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[198] Hartley, _Observations on Man_, I, 60. [199] _Ibid._

[200] _Ibid._, 60; see also _ibid._, 63. [201] _Ibid._, 45.

[202] _Ibid._, 41. [203] _Ibid._, 45.

but impressing Motion on them."[204] From this, he concluded that sensation must be performed by means of motions in the nervous system. Although he accepted the idea "that . . . subtle Motions [are] excited in the sensory Nerves, and medullary Substance of the Brain, during Sensation and intellectual Perception,"[205] Hartley was not absolutely certain what kind of subtle motions were involved. Ultimately, however, he asserted that "a vibratory Motion is more suitable to the Nature of Sensation than any other Species of Motion,"[206] and he supposed on the whole "that all Sensation, Thought, and Motion, is performed by Vibrations in the medullary Substance."[207] The motion involved then "must be a vibratory one, and that of the most subtle Kind."[208]

Hartley noted that ". . . Arguments . . . prove the Performance of Sensation and intellectual Perception, by means of Vibrations of the small medullary Particles. . . ."[209] He himself argued that "unless we do suppose some such subtle Vibrations as these, it will be extremely difficult to conceive, how so soft a Pulp as the medullary Substance is, should be the common Instrument of Sensation, Thought, and Motion. . . ."[210] For, he reasoned, barring

> subtle vibratory Motions, the Impulse of the Objects of Sense can communicate nothing, as it seems, to so soft a Substance, but an uniform Pressure, susceptible of few or no Modifications, and consequently highly unsuitable to the great Variety

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[204] *Ibid.*, 12.

[205] *Ibid.*, 86.

[206] *Ibid.*, 72.

[207] *Ibid.*, 232.

[208] *Ibid.*, 87.

[209] *Ibid.*, 86.

[210] *Ibid.*, 87.

> of the Phaenomena that are to be solved by it. This Argument therefore tends to shew, that Sensation, Thought, and Motion, must all be performed by Vibrations.[211]

Furthermore, "the Doctrine of Vibrations," as he labelled this concept, ". . . appears to be the only one that admits of permanent States of Motion, and Disposition to Motion, in the Brain. . . ."[212]

While he thus conceded the possibility that some other form of motion might be responsible, Hartley presented the doctrine of vibration as the universal law of action in both human and animal nervous systems and employed vibration as the efficient cause of sensation, ideation, and motion throughout the Observations on Man.[213] Embarking on his explanation of the sensory process, Hartley declared

> that, admitting the Existence and Subtlety of the Aether, and the Qualities of the medullary Substance here alleged, a probable Account may be given, how the Vibrations . . . may be excited in the sensory Nerves, and propagated thence over the whole medullary Substance, and over that alone.[214]

As was mentioned earlier, Hartley did not believe the foetus in utero experiences sensation, since it has no contact with the external world. He noted, however, that ". . . As soon as the Child is born, external Objects act upon it violently"[215] and impress vigorous vibrations on its senses.[216] Thus the process of sensation begins.

The Five Senses

Suppose the new-born infant's sense of sight is the first affected by means of the impression of an external object upon the

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[211] Ibid., 87-88. [212] Ibid., 424.

[213] Ibid., 265 and 404. [214] Ibid., 24-25.

[215] Ibid., 60. [216] Ibid., 45.

eye. The object would be a ray of light, which Hartley conceived of as vibratory in nature.[217] Hartley considered the retina in particular to be "the immediate Organ of Sight,"[218] and he commented that "when we view any Object with Attention, we make the central Point of it fall upon the central Part of the Retina."[219] Morphologically, Hartley described the retina as "an Expansion of the Optic Nerve," and even though he admitted "the minute Structure and Disposition of the Parts of this Button are not known," he considered it "peculiarly fitted for the immediate Organ of Sight" due to its white color.[220] Hartley viewed the color of the retina as particularly beneficial since its whiteness causes it to reflect all entering rays of light.[221] This reflective ability enables the retina to undergo only "moderate Agitations" instead of "the greater Agitations" that would occur if it absorbed the rays of light.[222] Furthermore, the retina retains "the impressed Vibrations distinctly,"[223] the sense of sight on the whole being particularly acute and precise in Hartley's opinion.[224]

On the other hand, the infant's sense of hearing may first be excited by the vibrations of the particles of air called sound. "The Auricle and Meatus Auditorius," Hartley explained, "are Cartilaginous, and seem by this means to be peculiarly fitted for receiving and retaining the Vibrations of the Air, and for communicating them

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[217] Ibid., 22.

[218] Ibid., 191.

[219] Ibid., 210.

[220] Ibid., 191.

[221] Ibid.

[222] Ibid., 332.

[223] Ibid., 191.

[224] Ibid., 200.

to the Membrana Typani."[225] This is in a constant, although variable state of tension and is therefore "fitted for vibrating synchronously to the several Sounds, which affect it."[226] These vibrations are then precisely conveyed to the immediate organ of hearing, that is to "the soft Portion of the Seventh Pair of Nerves, distributed in the Cochlea, and semicircular Canals," and from there to the expanded auditory nerve.[227] In addition, Hartley considered all these structures of the ear so formed that they communicate differences in vibration of sounds to the nerves, as well as preserve the order of vibrations.[228]

Perhaps it is the new-born infant's sense of feeling that is first affected by contact with an external object. Hartley referred to the senses of touch, taste, and smell under one heading: "The Sense of Feeling," he explained, "may also be distinguished into that of the external Surface of the Body, and that of the Cavities of the Nose, Mouth, . . . &c."[229] With respect to the sense of feeling centered in the mouth and nose, he noted that "this Sensibility is so great, and attended with such distinguishing Circumstances, as to have the Names of Taste and Smell assigned respectively to the Sensations impressed upon the Papillae of these two Organs."[230]

In Hartley's opinion, however, "these three Senses have a much greater Resemblance to one another, than any of them has to the Sight, or to the Hearing; or than the Sight and Hearing have to each other."[231]

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[225] Ibid., 223. [226] Ibid.; see also ibid., 26-27.
[227] Ibid., 223-224; see also ibid., 27. [228] Ibid., 228-229.
[229] Ibid., 117. [230] Ibid. [231] Ibid., 181.

Hartley differentiated the senses of taste, smell, and feeling proper from one another on the basis of their relative importance to man, their primary sensory organs and the structure of those organs, and the external vehicle of sensation. Although he did not comment on the relative importance of hearing, Hartley allowed that ". . . Smell . . . is of far less Consequence than any other of the Senses, and Taste of the greatest. . . ."[232] All in all, however, Hartley valued touch above the other four senses, including that of sight: In his opinion, "if the Informations from Touch and Sight disagree at any time, we are always to depend upon Touch," "as our first and principal Key to the Knowlege of the external World."[233]

As to the primary sensory organs of the three senses of feeling, Hartley located "the particular exquisite" sense of taste "in the Tongue, and especially in the Tip of it. . . ."[234] He deduced the great sensibility of the tongue "from the Number and Largeness of its Papillae, and from their rising above the Surface in living Persons more remarkably than any other sentient Papillae in the whole Body, so as to be extreme Parts in an eminent Degree."[235] "But," he added, "there may be likewise a different peculiar Distribution, and other Causes of an exquisite Sensibility, in the Nerves of the Tongue."[236] Smell, or that "exquisite Sensation, which odoriferous Bodies impress on the Nose," he placed "chiefly, or perhaps intirely, in that Part of the pituitary Membrane, which invests the Cells of

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[232]Ibid., 186. [233]Ibid., 138; see also ibid., 204.

[234]Ibid., 151. [235]Ibid. [236]Ibid., 152.

the Ossa spongiosa;"[237] he also described the organ of smell as "much more sensible and irritable" than that of taste because it is "extended upon Bones. . . ."[238] Lastly, he identified the sense of feeling proper as

> that more exquisite Degree [of feeling] which resides in the Insides of the Hands, and especially in the Ends of the Fingers; and by which we distinguish the tangible Qualities of Bodies, . . . with more Accuracy than by any other Part.[239]

The external vehicles of the senses of taste, smell, and touch also differentiate them from one another in Hartley's physiological psychology. He observed that whereas "a watry Fluid is the proper Menstruum for the Dissolution of sapid Particles, and Conveyance of their Tastes, . . . Smells seem to make their Impressions by means of Air-Particles."[240] Hartley identified the particles of air as ". . . Electrics per se," and he speculated that "they may have, on this Account, a peculiar Fitness for conveying and impressing Smells."[241] He supposed "that odoriferous Particles are thrown off by vibratory Motions in the Body that emits them;" these particles he characterized as more subtle than sapid particles, as self-repulsive, and also as repulsive to the particles of air.[242] He explained that "the odoriferous Particles . . . [are] attracted by the Body which emits them, after they have receded from it to a certain Distance, and so follow it, in some measure, like an Atmosphere," and are then conveyed to the nose through the air.[243] Our sense of feeling, on the other

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[237]Ibid., 180. [238]Ibid., 181. [239]Ibid., 115-116.

[240]Ibid., 181. [241]Ibid., 182.

[242]Ibid., 181; see also ibid., 181-183. [243]Ibid., 181.

hand, requires no external medium of communication, as sensation results from the direct contact of the particles of an external object with the sentient papillae.

All in all, Hartley declared that "the several Organs of Sensation are evidently analogous to each other," since they all communicate vibrations from the external objects to the particular sensory nerve corresponding to each sensory organ, usually via the sentient papillae.[244]

The Nerves

In the elaboration of his physiological psychology, Hartley called attention to three varieties of nerves. One of these, the sentient papillae, he identified as "the immediate Organ in the Senses of Feeling, Taste, and Smell;" consequently, he declared, "the Sensibility of each Part does depend, in great measure, on the Number, Structure, and Disposition, of the nervous Papillae" it contains.[245] He described the papillae as pointed and rising "high from the Skin (becoming extreme Parts thereby),"[246] and he contended that when they are rubbed against an external object in the process of feeling, "this Friction may, by exciting Vibrations, and a consequent Contraction in certain muscular Fibrils belonging to the _Papillae_, distend and erect these, and thereby increase their Sensibility."[247] Hartley speculated that this "exquisite Sensibility" is produced when

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[244] _Ibid._, 295. [245] _Ibid._, 43.

[246] _Ibid._, 116; see also _ibid._, 43.

[247] _Ibid._, 116.

> the nervous Papillae are erected . . . so as to recede from each other, and consequently, to admit the denser Aether between them. They may also, upon the same Occasions, be made turgid, by the Constriction of their Bases, and thus have their Sensibility, or Power of receiving Vibrations, increased by Distention.[248]

Moreover, he maintained "we may get a voluntary Power of erecting the Papillae without Friction, or of increasing and fixing the Distention during Friction, in order to feel with greater Exquisiteness and Precision."[249]

Hartley described the nerves in the human body as arising "from the medullary, not the cortical Part" of the brain and spinal marrow, and he claimed they "are themselves of a white medullary Substance."[250] He described the medullary substance in the nerves to be in the form of solid, pellucid capillaments, which are in turn composed of small vessels.[251] Like a growing number of contemporary physiologists, Hartley could not accept the popular contemporary view of nerves as "small Tubuli," which he correctly attributed to Boerhaave.[252] It appeared to Hartley that this

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[248] Ibid., 43-44. [249] Ibid., 116-117.

[250] Ibid., 7; see also ibid., 31.

[251] Ibid., 17, 18, 124, 134, 199.

[252] Ibid., 17-18. During the seventeenth and eighteenth centuries, the fifteen-hundred-year-old Galenic concept of nervous action via the passage of an animal spirit or nervous juice through a hollow nerve was gradually abandoned. Although a few physiologists, such as Georgius Baglivi (1668-1707) and Alphonse Borelli (1608-1679), earlier utilized a non-hollow nerve, Newton's speculations gave a great boost to the adoption of a solid nerve and the abandonment of the Galenic concept of nervous action. For the most part, however, the majority of physiologists, including Boerhaave, still utilized the hollow-nerve theory in the seventeenth and eighteenth centuries, their numbers declining after Newton's aether and its vibrations began to play a larger and larger role in the explanation of natural and physiological phenomena.

> . . . Conclusion arises from admitting the Doctrine of Vibrations. The Vibrations hereafter to be described may more easily be conceived to be propagated along solid Capillaments, so uniform in their Texture as to be pellucid when singly taken, than along hollow Tubuli.[253]

Furthermore, the particles of the medullary substance composing the nerves are arranged in a porous manner. The pores are very small and regular, and, more importantly, they are filled with particles of the aetherial fluid.[254]

On the whole, Hartley distinguished the nerves in the human body into sentient papillae, sensory nerves, and motory nerves. He described the sensory nerves as varying in size and in internal structure according to which of the five senses and corresponding regions of the brain they serve. Just as is the case with the medullary substance of the brain,

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For a discussion of these concepts of nervous activity, see the following: Mary A. B. Brazier, "The Evolution of Concepts Relating to the Electrical Activity of the Nervous System: 1600-1800," in The History and Philosophy of Knowledge of the Brain and its Functions . . . (Amsterdam: B. M. Israël, 1973), 198-208 and 225 (hereinafter referred to as Brazier, "Concepts of Electrical Activity"); Clarke and O'Malley, Human Brain, 160-161; Bastholm, Muscle Physiology, 190-200; Edwin Clarke, "The Doctrine of the Hollow Nerve in the Seventeenth and Eighteenth Centuries," in Medicine Science and Culture: Historical Essays in Honor of Owsei Temkin, ed. by Lloyd G. Stevenson and Robert P. Multhauf (Baltimore, Md: The Johns Hopkins Press, 1968), 125 (hereinafter referred to as Clarke, "Hollow Nerve").

[253] Hartley, Observations on Man, I, 17.

[254] Ibid., 18 and 21. Although the origins of Hartley's nerve physiology are "Newtonian" (see Chapter IV below), a similar structure had earlier been presented by Borelli (see Clarke and O'Malley, Human Brain, 163-165, for a discussion of Borelli's theory of nervous action).

> each Nerve . . . is originally fitted to receive, and, as one may say, sympathize with, such Vibrations as are likely to be impressed upon them in the various Incidents of Life; and not that the auditory Nerve could perform the Office of the Optic, if put into its Place, or vice versa. . . .[255]

Hartley maintained that the nerves enter every part of the body as well as the blood vessels, and he acknowledged their primary function to be the transmission of ". . . Vibrations freely to and from the Brain. . . ."[256] Since vibration is the efficient cause of sensation, thought, and motion in Hartley's theory, he reasoned, "Sensibility, and the Power of Motion, seem to be conveyed to all the Parts, in their natural State, from the Brain and spinal Marrow, along the Nerves."[257] "Agreeably to this," he noted,

> a Compression made upon the Nerve, which leads to any Part, will occasion a Numbness in that Part, the Nerve below the Compression being unfitted thereby to receive Vibrations freely, and the Nerve above incapable of transmitting freely such as are excited.[258]

He furthermore observed that if "the Nerves of any Part are cut, tied, or compressed in any considerable Degree, the Functions of that Part are either intirely destroyed, or much impaired."[259]

Hartley maintained "that the intercostal Nerve" divides all the nerves of the human body and "makes those of each Side a separate System," yet he allowed that "the Nerves of the same Names throughout

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[255]Hartley, Observations on Man, I, 42; see also ibid., 86-87, 91-92, 185-186, 210, 239.

[256]Ibid., 18; see also ibid., 265.

[257]Ibid., 7.

[258]Ibid., 131; see also ibid., 31-32.

[259]Ibid., 7.

the Body have . . . some sympathetic Influences over each other. . . ."[260] "If those of the right Side arise from the left Part of the Brain, and *vice versa*," he reasoned, "then one would imagine, that the homonymous Nerves of the right and left Sides must, in crossing over, lie somewhere contiguous to each other, and so impart Vibrations to each other."[261] Similarly, the nerves of the same limb sympathize with one another.[262] He furthermore considered it

> reasonable . . . to think, that the Nerves of different Parts have innumerable Communications with each other in the Brain, in the Ganglions (which are, as it were, little Brains, according to the Opinion of *Winslow*), and even in the Plexuses; and that many Phaenomena, particularly those of the sympathetic Kind, are deducible from these Communications.[263]

The Impression of an Object on a Nerve

Suppose then the external object A to be impressed upon any one of the new-born infant's five sensory organs. Although there will be a slight difference in the original interaction between object A, the infant's organ of sensation, and the papillae or sensory nerve, according to the particular sense that is affected, the general physiological process of the impression of a sensation is the same. "First then," Hartley explained,

> . . . We are to conceive, that when external Objects are impressed on the [papillae or] sensory Nerves, they excite Vibrations in the Aether residing in the Pores of these Nerves, by means of the mutual Actions interceding between the Objects, Nerves, and Aether. For there seem to be mutual Actions of all the Varieties between these Three, in all the Senses, though of a different Nature in different Senses.[264]

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[260] *Ibid.*, 98. [261] *Ibid.*, 98-99; see also *ibid.*, 217.

[262] *Ibid.*, 98. [263] *Ibid.*, 19. [264] *Ibid.*, 21.

Hartley suggested two possible forms of initial interaction between the object A, the nerve, and the aether. In the first case, Hartley conjectured,

> the Rays of Light excite Vibrations in the small Particles of the Optic Nerve, by a direct and immediate Action. For it seems probable, from the alternate Fits of easy Transmission and Reflexion, that the Rays of Light are themselves agitated by very subtle Vibrations, and consequently that they must communicate these directly and immediately to the Particles of the Optic Nerves. And it may be also, that sapid and odoriferous Particles are agitated with specific Vibrations, and that they communicate these directly and immediately to the small Particles of the gustatory and olfactory Nerves respectively, as well as to the interjacent Aether. Upon this Supposition, the Vibrations of the Aether must be conceived as regulating and supporting the Vibrations of the [medullary] Particles, not as exciting them originally.[265]

On the other hand,

> it seems, that Light affects both the Optic Nerve and the Aether; and also, that the Affections of the Aether are communicated to the Optic Nerve, & vice versâ. And the same may be observed of Frictions of the Skin, Tastes, Smells, and Sounds. The Impulse, Attraction, or whatever else be the Action of the Object, affects both the Nerves and the Aether; these affect each other, and even the Object or Impression itself, in most or all Cases, so as to alter or modify it. And the Result of these Actions, upon the Whole, may be supposed such a Compression or Increase of Density in the Aether, as must agitate its Particles with Vibrations analogous to those which are excited in the Air by the Discharge of Guns, by Thunder-claps, or by any other Method of causing a sudden and violent Compression in it.[266]

The vibrations of the aether will then

> agitate the small Particles of the medullary Substance of the sensory Nerves with synchronous Vibrations, in the same manner as the Vibrations of the Air in Sounds agitate many regular Bodies with corresponding Vibrations or Tremblings. And here the Uniformity, Softness, and active Powers of the medullary Substance, must be considered as previous Requisites and Assistances.[267]

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[265] Ibid., 22.

[266] Ibid., 21.

[267] Ibid., 21-22.

Whether the object affects the medullary particles of the nerve directly or whether it affects them indirectly by means of the mediating aether, the end result of the impression of object A upon any of the new-born infant's sensory organs is to occasion a vibration in the small medullary Particles of the nerve. Hartley was particularly careful here to point out,

> These Vibrations are Motions backwards and forwards of the small Particles; of the same Kind with the Oscillations of Pendulums, and the Tremblings of the Particles of sounding Bodies. They must be conceived to be exceedingly short and small, so as not to have the least Efficacy to disturb or move the whole Bodies of the Nerves or Brain. For that the Nerves themselves should vibrate like musical Strings, is highly absurd. . . .[268]

The vibrations provoked by the external object A in the particles of the medullary substance of the nerves will, in Hartley's opinion, vary in degree and kind according to the density of the aether in the pores of the affected nerve and with the various qualities of the external body itself. Hartley noted that sensory vibrations are stronger in the nerves of extreme parts of the body, such as the fingers, because of the greater density of the aether in those nerves. While the density of the aether in the nerve thus affects only the degree of vibration, the qualities of the external object produce variations in both the degree and the kind, or frequency, of the vibration. For instance, in the sense of touch the various tangible qualities of the

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[268] Ibid., 11-12. Here Hartley condemned a popular theory of nerve action according to which the nerve as a whole vibrates (see Brazier, "Concepts of Electrical Activity," 200, for a discussion of this theory). Also note the similarity here between Hartley's theory and that of Borelli, who based the communication of vibration along the nerve upon reciprocal backwards and forwards motions of the small contiguous and continuous parts of the nerve (see Clarke and O'Malley, Human Brain, 163-165, for Borelli's theory).

object A will produce corresponding vibrations of varying degree and frequency upon the nerves of touch. In the senses of taste and smell, the particles of the sapid and fragrant bodies vibrate with varying degrees and frequencies, yet Hartley maintained they excite vibrations of the same frequency as their own vibrations in the sensory nerves. These differences in degree and frequency of vibration in the nerves may, he speculated, be responsible for the different tastes and smells perceived. The particles of sounding bodies vibrate with different degrees and frequencies, produce corresponding vibrations in the air, and these particles communicate a synchronous vibration to the _membrana tympani_ of the ear. The vibration which is communicated from the ear-drum to the auditory nerve, however, is much more subtle in degree than the vibration of the air particles. It may also be more frequent; it may on the other hand be synchronous; or it may consist of a series of innumerable and infinitesimal vibrations occurring at different intervals of time. Hartley maintained that the optic nerve is also affected with vibrations that vary in degree and frequency. It has previously been noted that he described the vibrations of the retina and optic nerve to be smaller in degree than those of the rays of light which strike it; he furthermore believed that the vibrations of the optic nerve vary in frequency. Hartley considered the differences in colors, for example, to reside in the differences in the frequency of vibration of their rays, and, he declared, "it is probable, that the Vibrations of the Rays themselves, and consequently those which they excite in the Retina, are reciprocally as the Intervals of their Fits."[269]

Whatever their external origin, degree, or frequency, Hartley asserted that the vibrations excited by the object A in the small medullary particles of the sensory nerve and the adjacent aether will, after their initiation, either cease, be diffused into the neighboring parts of the body, or "be propagated along the Course of these Nerves up to the Brain" via the white medullary substance of the spinal marrow.[270] If the nerve or spinal marrow is in an abnormal state of compression, the vibration in the medullary substance and aether will not be communicated to the brain and loss of "the Sense of Feeling in the Part to which it leads" will occur.[271] On the other hand, the vibration may be diffused into areas of the body adjacent to the excited nerve or spinal marrow. In general, Hartley declared, a vibration will

> only [be] propagated feebly and imperfectly into the neighbouring Parts, on account of the Heterogeneity and greater Hardness of the neighbouring Parts. The First will make the Aether of

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[269]Hartley, Observations on Man, I, 193; see also ibid., 27, 31, 42-43, 118, 136-137, 145-146, 153-154, 184, 192-194, 197, 223-225, 322.

[270]Ibid., 22; see also ibid., 7-8, 13, 16, 31. Although Rousseau maintained that one argument in favor of continuing to view nerves as hollow was that "if the nerves were solid fibres rather than porous hollow tubes, no avenue existed by which to explain the brain's control over the rest of the body--not, at least, before the discovery of electricity in the mid eighteenth century" ("Nerves, Spirits and Fibres," 147), the "Newtonian" doctrine of vibration obviously provided a mechanism to support the concept of the solid nerve.

[271]Ibid., 7 and 31-32

> different Densities, and, in some Cases, there may be almost an Interruption or Discontinuity of it; and the Last will indispose the Particles to receive and communicate Vibrations; and we may suppose from both together . . . that only small Vibrations, and such irregular ones as oppose each other, will just begin to take place in the immediately contiguous Parts, and there cease without proceeding farther.[272]

If the vibration is "of a middle Strength," however, it may, "by descending into the red Fibres of the Muscles . . . contract them in the ordinary Functions and Actions of Life;" furthermore, "the stronger Vibrations, which attend Pain" will diffuse from the nerves into the adjacent parts and "should be sufficient to contract the pale Fibres of Membranes" to cease the vibration.[273]

Ordinarily, however, the vibrations excited by object A

> in the Aether, and Particles of the sensory Nerves, will be propagated along the Course of these Nerves up to the Brain. For the Aether residing in the medullary Substance, being of an uniform Density on account of the Smallness of the Pores of the medullary Substance, and Uniformity of its Texture, before taken notice of, will suffer the excited Vibrations to run freely through it. And the same Uniformity, together with the Continuity, Softness, and active Powers of the medullary Substance, will farther contribute to the free Propagation of the Vibrations; since, on these accounts, it follows, that the Particles, which were last agitated, may easily communicate their Agitations or Vibrations to the similarly posited and equal contiguous ones, without Interruption, and almost without any Diminution of Force.[274]

Hartley illustrated the propagation of this internal vibration along the nerves by means of an analogy with the external world: He noted that the ". . . Motions [of electrical effluvia] along hempen Strings resemble the Motions along the Nerves in Sensation and muscular Contraction. . . ."[275]

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[272] _Ibid._, 23.

[273] _Ibid._, 42; see also _ibid._, 23-24, 141, 172.

[274] _Ibid._, 22-23; see also _ibid._, 13 and 133.

[275] _Ibid._, 28.

Hartley did acknowledge certain instances in which the vibration "cannot penetrate to, and prevail in, the Brain," even after it has been propagated thence along the nerves and spinal marrow in the manner described above.[276] The vibration may not penetrate the medullary substance of the brain if it is already greatly agitated with other vibrations, as Hartley speculated is the case when a person is mentally preoccupied or deranged. Even if it penetrates, the vibration may not prevail in the brain if there is a physiological abnormality; for instance, if blood and serum have excluded the aether from the cavities of the ventricles, then the vibrations will be suffocated upon their entrance.[277]

<u>Vibrations in the Medullary Substance of the Brain</u>

For the most part, vibrations reaching the brain will enter it and prevail in the medullary substance there. This is certainly true in the case of the physiologically-normal new-born infant, whose medullary substance is vibrating in a state of gentle uniform "natural vibration" N in all the regions of the brain, and who has as yet no thoughts with which to be preoccupied. Thus, the vibrations excited by the external object A will enter the infant's brain and will immediately "begin to be propagated freely every way over the whole medullary Substance. . . ."[278]

Hartley differentiated among vibrations entering the brain according to their respective points of entry and lines of direction

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[276] <u>Ibid.</u>, 32.

[277] <u>Ibid.</u>, 32, 44, 402.

[278] <u>Ibid.</u>, 24.

of propagation. The point of entry into the brain is determined by the sensory organ initially affected, since, as was earlier noted, the nerve of sensation connected to a particular sensory organ corresponds to one or two specific regions of the medullary substance of the brain.[279] In Hartley's terminology, a vibration occurring in the region of its entry into the medullary substance, "or chief Seat," is called a "primary vibration," while a vibration "propagated from the Region of the medullary Substance primarily affected into the rest" is referred to as a "secondary vibration" in those regions.[280] Thus, Hartley asserted, vibrations "differ in Place, according as they affect this or that Region of the medullary Substance of the Brain primarily. And," he continued, "they differ in the Line of Direction, according as they enter by different external Nerves."[281] With respect to the direction of vibration, Hartley asserted that

> . . . Since the Vibrations, or reciprocal Motions, of the small Particles of each Nerve are made in the same Line of Direction with the Nerve, they must enter the Brain in that Direction, and may preserve some small Regard to this Direction at considerable Distances within the Brain; especially if this be favoured by the Structure of the nervous Fibrils in the Brain. Hence the same internal Parts of the Brain may be made to vibrate in different Directions, according to the different Directions of the Nerves by which the Vibrations enter.[282]

The vibrations of the medullary substance of the brain also differ according to their degree and frequency. Hartley explained,

> Vibrations differ in Degree, according as they are more or less vigorous; i. e. as the Particles oscillate to and fro, through a longer or shorter very short Space; i. e. as the Impression

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[279] Ibid., 24, 30-31, 42, 60, 137, 407. [280] Ibid., 61-63.

[281] Ibid., 31. [282] Ibid., 24.

> of the Object is stronger or weaker, and thus affects the medullary Particles more or less vigorously, either directly and immediately, or mediately, by generating a greater or less Degree of Condensation in the Pulses of the Aether.[283]

In general, he regarded the strength of the vibrations in the brain to be a function of the type of external object that stimulated it. In his opinion, "we may range the Vibrations of the medullary Substance in the following Order, in respect of Subtlety; Heat, Light, Smell, Tastes, tangible Impressions, and the Vibrations of the Air, from which Sound arises."[284] Regardless of their sensory origins, however, Hartley described the vibrations of the medullary substance of the brain as much stronger in degree than during their propagation along the nerves and spinal marrow, and he attributed their increase upon entering the brain to the action of the cerebral ventricles.[285]

In Hartley's physiological psychology, vibrations also vary in degree from region to region of the medullary substance of the brain; the strength of the vibration in a particular region is inversely proportional to the distance of that region from the primary region of the vibration. Hartley reasoned "that if we suppose Vibrations apt to run freely along this Body from its Uniformity, they must pervade the Whole, in whatever Part they are first excited, from its Continuity" and from the supporting action of the denser aether lodged in the cavities of the ventricles.[286] But in the process of the diffusion of the vibrations across the substance of the brain, Hartley speculated they are

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[283] _Ibid._, 30-31.

[284] _Ibid._, 183.

[285] _Ibid._, 31 and 44.

[286] _Ibid._, 16; see also _ibid._, 44.

> diminished in Strength, in proportion to the Quantity of Matter agitated, just as in Sounds, i. e. as it were in a reciprocal duplicate Ratio of the Distance from the Place where the sensory Nerve affected by the Vibrations enters the Brain. Or, if we suppose the Pia Mater to make some small Discontinuity in the medullary Substance by its Processes, as has been hinted above, then we must also suppose, that the Vibrations, which ascend along any sensory Nerve, affect the Region of the Brain which corresponds to this sensory Nerve more, and the other Regions, less than according to this Proportion.[287]

Once the vibration excited by the external object A has pervaded all the regions of the medullary substance of the brain, Hartley referred to the brain as in a "preternatural" state of vibration, as opposed to its earlier state of "natural" vibration, N. This preternatural state of vibration, which he labelled ". . . Vibration A,"[288] will be kept up in the brain "partly by the Aether . . . and partly by the Uniformity, Continuity, Softness, and active Powers of the medullary Substance. . . ."[289]

The Connection Between Vibration and Sensation

The occurrence of vibration A in the medullary substance of the infant's brain is, furthermore, simultaneous with the perception of a sensation in the infant's mind. On the whole, Hartley spoke of physiological states as "attending" or "causing" sensation, and he considered sensation to "arise from" a physiological event.[290] He did not, in the manner of Thomas Hobbes, reduce human sensation completely to the motions of corporeal particles;[291] instead, in the "Introduction"

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[287] Ibid., 24. [288] Ibid., 60.

[289] Ibid., 13; see also ibid., 6-61. [290] Ibid., 10 and 36.

[291] See Lange, History of Materialism, 289, for a discussion of Hobbes' theory. On this account, Basil Willey's statement (Eighteenth

to the Observations on Man, Hartley specifically defined sensations as "those internal Feelings of the Mind, which arise from the Impressions made by external Objects upon the several Parts of our Bodies."[292] In other sections of his work, he spoke of "the Impression of the sensible Object" as "exciting," "begetting," or simply "leaving" a sensation "in the Sensorium, Fancy or Mind," by means of its effect upon the medullary substance of the brain.[293]

As was earlier noted, Hartley identified the white medullary substance as the instrument of sensation, and he remarked that the concept that ". . . Sensations are conveyed to the Mind, by the Efficiency of corporeal Causes upon the medullary Substance, . . . is acknowledged by all Physiologists and Physicians. . . ."[294] In Hartley's physiological psychology, then, the medullary substance functions as the connecting link between body and soul in sensation: In general, he supposed "that there is a Change made in the medullary Substance, proportional and correspondent to every Change in the Sensations;"[295] moreover, he identified this change in the medullary substance as a change in motion.

Century, 141) that, in Volume I of the Observations on Man, Hartley developed the views of Hobbes should be accepted with some reservation. Hartley made no reference to Hobbes in the Observations on Man, and it is more likely he was reacting to rather than developing Hobbes' theory.

292 Hartley, "Introduction," Observations on Man, I, ii.

293 Hartley, Observations on Man, I, 102; see also ibid., 9-10.

294 Ibid., 72.

295 Ibid., 111; see also ibid., 7, 33, 130.

As has been discussed above, Hartley maintained corporeal causes produce motions in the medullary substance of the nerves and brain; furthermore, this ". . . Motion . . . occasions Sensation. . . ."[296] "It is common to all Systems," he remarked, "to suppose some Motions attendant upon Sensation, since corporeal Objects must, by their Actions, impress some Motion upon our Bodies, and particularly upon that Part which is most nearly related to the sentient Principle. . . ."[297] He himself postulated "that Sensations arise in the Soul from Motions excited in the medullary Substance of the Brain."[298] And, he continued,

> I do indeed bring some Arguments from Physiology and Pathology, to shew this to be a reasonable Postulatum, when understood in a general Sense; for it is all one to the Purpose of [my] . . . Theory, whether the Motions in the medullary Substance be the physical Cause of the Sensations, according to the System of the Schools; or the occasional Cause, according to Malbranche; or only an Adjunct, according to Leibnitz.[299]

It not only appears ". . . By the First Proposition . . . that some Motion must be excited in the medullary Substance, during each Sensation;" but "by the Fourth [proposition], this Motion is determined to be a vibratory one. . . ."[300] Thus, in addition to Hartley's arguments that the transmission of sensory impression takes place by means of vibrations, which have been presented above, Hartley asserted that "all the Sensations . . . of all Animals, will be conducted according to

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[296] Ibid., 87.

[297] Ibid., 33.

[298] Ibid., 511

[299] Ibid.

[300] Ibid., 59.

the Vibrations of the small medullary Particles" of the brain.[301] He further proposed that these ". . . Sensations are . . . conveyed to the Mind by means of vibratory Motions."[302]

The Mind-Body Problem

Hartley was aware of several "principal and . . . obvious Difficulties attending the Supposition, that all Sensation, Thought, and Motion, is performed by Vibrations in the medullary Substance."[303] Because the issue of the relationship between the body and mind in the process of sensation is essentially one aspect of the classic philosophical question known as the "mind-body problem," "a problem . . . which has been to the forefront in the investigations and speculations of philosophers for over 300 years,"[304] a large part of the difficulties Hartley encountered in explaining the relationship between vibration and sensation are those that any philosopher confronting the mind-body problem necessarily faces: If the body is corporeal and the mind is incorporeal, how does the body relate to the mind? Is there an interaction between the two? If there is, how does it occur?

As has been noted, Hartley approached the mind-body problem from a "dualistic" point of view; that is, he believed, "Man consists of Two Parts, Body and Mind."[305] Mind he defined as "that Substance,

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[301] Ibid., 109; see also ibid., 33, 59, 86, 232, 374, 511.

[302] Ibid., 64; see also ibid., 86 and 111. [303] Ibid., 232.

[304] G. N. A. Vesey, ed., "Preface," Body and Mind: Readings in Philosophy (London: George Allen and Unwin Ltd., 1964), 11; anthology hereinafter referred to as Vesey, Body and Mind.

[305] Hartley, "Introduction," Observations on Man, I, i.

Agent, Principle, &c. to which we refer the Sensations, Ideas, Pleasures, Pains, and voluntary Motions,"[306] and to it he attributed "the Faculties of Memory, Imagination or Fancy, Understanding, Affection, and Will."[307]

Following the modern tradition established by Descartes,[308] Hartley considered man to be a union of two totally distinct substances, body and soul. Just as Descartes had described immaterial mind and its attributes as distinct from extension and its attributes,[309] Hartley considered mind to be immaterial and sensation and thought to be a modification of mind, while at the same time he maintained the human body is corporeal and vibrations are a modification of corporeal substance.[310] Hartley also followed Descartes in stating he did not "in the least presume to assert, or intimate, that Matter can be endued with the Power of Sensation."[311]

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[306] Ibid.

[307] Ibid., iii.

[308] René Descartes, "Meditations on First Philosophy (1641)," in Vesey, Body and Mind, 28-29, 34, 30, 31, 33 (hereinafter referred to as Descartes, "Meditations"); René Descartes, "Objections and Replies (1642)," in Vesey, Body and Mind, 36-37 and 40-42 (hereinafter referred to as Descartes, "Objections and Replies"); René Descartes, "The Principles of Philosophy (1644)," in Vesey, Body and Mind, 43 and 45 (hereinafter referred to as Descartes, "Principles"); René Descartes to Princess Elizabeth, June 28, 1643, "Correspondence with Princess Elizabeth (1643)," in Vesey, Body and Mind, 51-53.

[309] Descartes, "Objections and Replies," 36-37.

[310] Hartley, Observations on Man, I, 34 and 111.

[311] Ibid., 33; see also ibid., 511; Descartes, "Objections and Replies," 40.

Hartley was therefore faced with the problem of explaining the relationship between vibration, sensation, and thought in his theory, just as earlier dualists had had to explain the relationship between events occurring in the clearly distinct and separate substances of body and mind.

Earlier Solutions of the Problem

In the seventeenth and eighteenth centuries, two general dualistic forms of explanation had arisen: Events in the body relate to events in the mind either as a result of their interaction or as a result of a correspondence or harmony between them. Dualistic philosophers of the first school of thought recognized an interaction between the corporeal body and the immaterial mind and generally visualized this interaction taking place in a specific physiological locale. Descartes, for example, is well known for his description of a direct and immediate interaction between the body and the soul in the pineal gland, which he referred to as the physiological seat of the soul.[312] Other dualistic philosophers in this historical period, rather than acknowledging an interaction to occur, preferred to explain the apparent relationship between events in the body and mind by claiming a simple parallelism, correspondence, or harmony exists between the events in the two realms.

Gottfried Wilheim Leibniz (1646-1716) described a universal pre-established harmony in which

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[312] Descartes, "Meditations," 34-35; René Descartes, "The Passions of the Soul (1649)," in Vesey, Body and Mind, 46-48 (hereinafter referred to as Descartes, "Passions").

> God produces different substances according to the different view which he has of the universe, and by the intervention of God the nature proper to each substance carries with it that what happens to one corresponds to what happens to all the others, without acting immediately on one another.[313]

In particular, Leibniz denied that the soul and the body could act upon one another. Instead, he declared

> that everything that happens to the soul and to each substance is a consequence of its notion; hence the idea itself or essence of the soul carries with it that all its appearances or perceptions must be born . . . from its own nature, and precisely in such a way that they correspond of themselves to what happens in the whole universe, but more particularly and more perfectly to what happens in the body which is assigned to it, because, in some fashion and for a time, it is according to the relation of other bodies to its own that the soul expresses the state of the universe.[314]

According to Leibniz, events in the body accord with those in the soul "because it is the nature of the soul to express whatever happens in the body, having been created from the start in such a way that the sequence of its thoughts will agree with the sequence of the movements."[315]

Another dualist, Nicolas Malebranche (1638-1715), also refuted the possibility of an interaction between body and mind. He asserted that, on the contrary,

> it is evident that a body, that extension, a purely passive substance, cannot operate by its own activity upon a mind, upon a being of another nature and infinitely more excellent than it.

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[313]Gottfried Wilhelm Leibniz, "The Discourse on Metaphysics (1685-6)," in Vesey, Body and Mind, 64 (hereinafter referred to as Leibniz, "Discourse").

[314]Ibid., 66.

[315]Gottfried Wilhelm Leibniz, "Draft of the Letter from Leibniz to Arnauld," November 28-December 8, 1686, in Vesey, Body and Mind, 69.

> Thus, it is clear that, in the union of soul and body, there is no other bond than the efficacy of divine and immutable decrees, an efficacy never without its effects. God has then willed, and wills without ceasing that the various disturbances of the brain shall always be followed by the various thoughts of the mind with which it is in union.[316]

The apparent reciprocal relation between physiological and mental events is, in Malebranche's opinion, due to the constant operation of the will of God. For,

> it is God alone who produces in your soul all those different feelings which it experiences, on the occasion of the changes which take place in your body, in consequence of the general laws of the conjunction of the two natures of which man is constituted; laws which are nothing but the efficient and constant volitions of the Creator. . . .[317]

The Brain: The "Seat of the Soul"

In the Observations on Man, Hartley unequivocally asserted that the body and the mind are mutually and reciprocally connected. He argued it is undeniable that "the Body and the Mind, depend upon each other for their Functions," and he presented empirical evidence to support his assertion that the soul is connected to the bodily organs.[318] Hartley largely spoke of the soul as connected to the nerves, spinal marrow and brain. He described these three physiological structures to be "equally related to the sensitive Soul, or Principle,"

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[316]Nicolas Malebranche, "Dialogues on Metaphysics and Religion (1688)," in Vesey, Body and Mind, 76 (hereinafter referred to as Malebranche, "Dialogues").

[317]Ibid., 78; see also ibid., 86.

[318]Hartley, Observations on Man, I, 30; see also ibid., 6, 167, 511.

since, as has been indicated above, all three structures are composed of the white medullary substance. Based upon observation, however, Hartley ultimately found ". . . Reason to suppose . . . that the spinal Marrow and Nerves are only Instruments subservient to the Brain;" consequently, he described "the Brain itself [as subservient] to the Soul" and concluded that the mind or soul has its physiological "seat" in the brain.[319]

Hartley seated both the sensitive and rational components of the human soul in the most internal parts of the brain. He argued that "the Sensorium, or the Seat of the sensitive Soul, . . . in Men at least, ought to be placed in the internal Parts of the Brain,"[320] "in the innermost Regions of it,"[321] but in "the external Parts of the Medulla . . . [rather than] the internal."[322] In addition to locating "the common Sensory in the Brain,"[323] he also declared, "The

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[319]Ibid., 31; see also ibid., 81. A mechanist in the Boerhaavian tradition, Hartley does not adhere to the animist theory proposed by Georg Ernst Stahl (1660-1734) according to which the soul is diffused over the entire body (see King, "Stahl and Hoffmann," 118 ff). Instead he follows Thomas Willis who located the soul in the brain and nervous system (see Michael Foster, Lectures on the History of Physiology During the Sixteenth, Seventeenth and Eighteenth Centuries (Cambridge: At the University Press, 1924), 269-270 and 274 for a discussion of Willis' theory) and, in quite a revolutionary manner, seated the rational soul in the brain alone (see Rousseau, "Nerves, Spirits and Fibres," 141-145 and 148-149).

[320]Hartley, Observations on Man, I, 81.

[321]Ibid., 31.

[322]Ibid., 32; see also ibid., 11, 32, 81, 152, 206.

[323]Ibid., 206.

Brain is . . . the Seat of the rational Soul, i. e. of the Soul, as far as it is influenced by Reasons and moral Motives. . . ."[324]

Thus, in Hartley's opinion, the soul, sensitive and rational, is closely connected not only to the brain, but to its internal medullary substance.[325] He furthermore remarked "that the Perfection of our mental Faculties depends upon the Perfection of this Substance," and he connected man's state of mind to its general condition.[326]

Vibration as the Efficient Cause of Sensation

On the whole, then, Hartley claimed it must be admitted "that there is a certain Connexion, of one Kind or other, between the Sensations of the Soul, and the Motions excited in the medullary Substance of the Brain. . . ."[327] But is this connection one of interaction or correspondence? Hartley was aware of opposing views concerning the relationship between mind and body. He was familiar with the Cartesian concept of their interaction via the pineal gland and with Leibniz's and Malebranche's denial that such an interaction can take place; moreover, he remarked, "It may afford the Reader some Entertainment, to compare my Hypothesis with what Des Cartes and Leibnitz have advanced, concerning animal Motion, and the Connexion between the Soul and Body. My general Plan [he asserted] bears a near Relation to theirs."[328] As his theory is presented in the Observations on Man,

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[324] Ibid., 81; see also ibid., 110. [325] Ibid., 232.

[326] Ibid., 8-9; see also ibid., 165, 189, 212, 253, 374.

[327] Ibid., 512.

[328] Ibid., 110-111.

it does bear some similarity to both systems, for Hartley has employed both causal terminology and the language of psycho-physical parallelism in his description of the relationship between the vibrations of the medullary substance and the consequent state of the soul.

On the one hand, Hartley spoke of sensation as "arising from" vibrations.[329] He also referred to vibrations as "attending," "accompanying," or "connected to" sensation.[330] He characterized sensation as "corresponding" or "proportional to" vibrations.[331] He also employed more specifically causal terminology to describe the relation between vibration and sensation: Vibrations "excite," "generate," "produce," or "cause" sensation.[332]

Allying himself with the psycho-physical parallelists on the other hand, he maintained there is no interaction between the body and soul. He observed in this regard,

> Both Leibnitz's pre-established Harmony, and Malebranche's System of occasional Causes, are free from that great Difficulty of supposing, according to the scholastic System, that the Soul, an immaterial Substance, exerts and receives a real physical Influence upon and from the Body, a material Substance. And the Reader may observe, that the Hypothesis here proposed stands clear also of this Difficulty. If he admits the simple Case of the Connexion between the Soul and Body, in respect of Sensation, as it is laid down in the First Proposition; and only supposes, that there is a Change made in the medullary Substance, proportional and correspondent to every Change in the Sensations;

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[329] Hartley, "Introduction," Observations on Man, I, ii; see also Hartley, Observations on Man, I, 41, 374, 511.

[330] Hartley, Observations on Man, I, 33 and 59, 58, 33-34, respectively.

[331] Ibid., 33, 111, 130.

[332] Ibid., 130, 40 and 58-59, 232, 33-34, respectively.

> the Doctrine of Vibrations, as here delivered, undertakes to account for all the rest, the Origin of our Ideas and Motions, and the Manner in which both the Sensations and these are performed.[333]

This apparent inconsistency can be dissolved, however, by recognizing that Hartley used the term cause in the sense of an Aristotelian efficient cause, that is an instrumental agency. This interpretation is documented by his statement that ". . . Sensations are conveyed to the Mind, by the Efficiency of corporeal Causes upon the medullary Substance. . . ."[334]

In passing, Hartley also acknowledged the possibility that a body other than the medullary substance of the brain might mediate between the body and soul and thus serve as the immediate instrument of sensation, thought, and motion. "If," he wrote,

> we suppose an infinitesimal elementary Body to be intermediate between the Soul and gross Body, which appears to be no improbable Supposition, then the Changes in our Sensations, Ideas, and Motions, may correspond to the Changes made in the medullary Substance, only as far as these correspond to the Changes made in the elementary Body. And if these last Changes have some other Source besides the Vibrations in the medullary Substance, some peculiar original Properties, for Instance, of the elementary Body, then Vibrations will not be adequate Exponents of Sensations, Ideas, and Motions.[335]

On the whole, Hartley concluded that, "however impossible it may be to discover in what way Vibrations cause, or are connected with Sensations, or Ideas,"[336] he would nevertheless

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[333]Ibid., 111.

[334]Ibid., 72.

[335]Ibid., 34.

[336]Ibid., 33-34.

> suppose, or postulate, in my first Proposition, that Sensations arise in the Soul from Motions excited in the medullary Substance of the Brain. I do indeed bring some Arguments from Physiology and Pathology, to shew this to be a reasonable Postulatum, when understood in a general Sense. . . .[337]

Hartley claimed, in fact, that there was no need for him further to specify the precise connection he believed exists between body and mind,

> for it is all one to the Purpose of the foregoing Theory, whether the Motions in the medullary Substance be the physical Cause of the Sensations, according to the System of the Schools; or the occasional Cause, according to Malbranche; or only an Adjunct, according to Leibnitz. However, this is not supposing Matter to be endued with Sensation, or any way explaining what the Soul is; but only taking its Existence, and Connexion with the bodily Organs in the most simple Case, for granted, in order to make further Inquiries.[338]

For practical purposes, then, Hartley declared he would refer to vibrations in the medullary substance of the brain as the efficient cause of sensation, although he did not ultimately wish to be understood as having implied a physical connection exists between mind and body. He merely wished to suppose that mental sensation arises from, is performed by means of, and occurs in proportion to and in correspondence with physical vibrations, and upon this foundation he wished to construct his psychological theory.

Vibrations and the Sensation of Pleasure and Pain

Hartley referred to the vibration in the medullary substance by means of which a sensation occurs in the mind as a "sensory vibration," and he maintained different sensory vibrations produce different

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[337] Ibid., 511. [338] Ibid.

sensations in the mind or soul.[339] Just as vibrations in the medullary substance vary in degree, kind, place, and line of direction, their corresponding sensations vary accordingly: "Let," Hartley suggested, "all the Differences of Kind, Place, and Line of Direction, be combined in all their Varieties, the Degree being supposed everywhere evanescent; and we shall have all the particular Vibrations from whence each mere Sensation arises."[340]

If variations in the degree of vibration are then allowed, all the various vibrations from which the pleasures and pains arise will be generated, for in Hartley's analysis each mere sensation is perceived in the mind as either a pleasure or a pain according to the degree of the corresponding sensory vibration.[341] Thus, he explained, ". . . We may account for the different Kinds and Degrees of Pleasure and Pain, from the Four Differences of Vibrations mentioned above, viz. those of Degree, Kind, Place, and Line of Direction, and their various Combinations with each other."[342]

Hartley maintained that "all our internal Feelings [i. e. sensations and ideas] seem to be attended with some degree either of Pleasure or Pain," but he specified, "I shall, for the most part, give the Names of Pleasure and Pain only to such Degrees as are considerable; referring all low, evanescent ones to the Head of mere Sensations

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[339] Ibid., 58-59; see also ibid., 194, 197, 225, 232, 401.

[340] Ibid., 41.

[341] Hartley, "Introduction," Observations on Man, I, ii; Hartley, Observations on Man, I, 31 and 41.

[342] Hartley, Observations on Man, I, 39-40.

and Ideas."[343] "The most vigorous of our Sensations," then, he "termed sensible Pleasures and Pains. . . ."[344]

Hartley also differentiated a pleasure from its "opposite" pain on the basis of degree of sensation: He determined that ". . . Pain is in general greater than Pleasure . . . from its consisting in stronger Vibrations."[345] A pleasant sensation, he supposed, is accompanied by a sensory vibration of a moderate degree, while a disagreeable sensation arises from a violent sensory vibration.[346]

He furthermore pictured the limits of pleasure and pain as contiguous.[347] Since the magnitude of a sensation corresponds to the magnitude of the sensory vibration producing it, the degree of the sensory vibration "may either fall within the Limits of Pleasure, or go beyond them. . . ."[348] Thus, a sensation passes from pleasure to pain as the corresponding vibration increases in intensity; similarly, a pain becomes a pleasure when the vibrations decrease in intensity, "just as in Algebra, when an affirmative Quantity in the Data is changed into a negative one."[349] This limit between pleasure and pain Hartley

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[343] Hartley, "Introduction," Observations on Man, I, ii.

[344] Hartley, Observations on Man, I, 34.

[345] Ibid., 31.

[346] Ibid., 153.

[347] Ibid., 164.

[348] Ibid., 36; see also ibid., 31.

[349] Ibid., 188.

identified as a physical one--the amount of vibration necessary to occasion a solution of continuity in the small medullary particles of the brain. For, he explained,

> one may easily conceive how moderate and pleasant Impressions may agitate the medullary Particles in so moderate a Degree, as that they shall again return to their former Situations and Connexions, when the Agitation is over; whereas violent and painful ones may force the Particles from thence, and give Rise to new ones; _i. e._ to the Solution of Continuity.[350]

Returning to the newly-born infant, whose medullary substance is vibrating in a preternatural state of vibration A (as a result of the impression an external object A made upon one of its sensory organs) and whose mind is experiencing its first corresponding and proportional sensation, this sensation is probably a painful one. Regardless of the degree of vibration of the medullary substance, this initial sensation is painful because, Hartley asserted, "the Organs of the new-born Infant are so delicate, as to receive Pain from many of those Impressions which afterwards yield Pleasure."[351]

The Retention of Vibration in the Medullary Substance

Now, Hartley suggested,

> let us suppose the first Object to impress the Vibrations _A_, and then to be removed. It is evident from the Nature of vibratory Motions, that the medullary Substance will not, immediately upon the Removal of this Object, return to its natural State _N_, but will remain, for a short Space of Time, in the preternatural State _A_, and pass gradually from _A_ to _N_.[352]

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[350] _Ibid._, 37.

[351] _Ibid._, 40.

[352] _Ibid._, 60-61.

Similarly, Hartley also supposed ". . . Sensations remain for a short time after the Impression is removed; and these remaining Sensations grow feebler and feebler, till they vanish."[353] Although he conceded that in some senses, such as taste and smell, the traces may not be perceptible, for the most part he maintained each sensation leaves "a perceptible Effect, Trace, or Vestige, for a short time" in the mind, as the vibrations producing the sensation die away in the brain.[354] Finally, according to Hartley's theory, "the new-born Child should fall back into its natural State of Sleep, as soon as these Vibrations cease, and return again to a State of Vigilance, only from the Renewal of vigorous Impressions; and so on alternately, agreeably to the Fact."[355]

This being the case, then suppose the child to be roused again by the reimpression of object A upon its senses, for the object to be removed and the impression to consequently cease, for the child to drift into sleep, and then to be rearoused by the same sensory impression several times in succession. Hartley declared

> it seems to follow, that the medullary Substance will be longer in passing from *A* to *N*, after the second Impression, than after the first, after the third Impression than second, &*c*. till, at last, it will not return to its natural original State of Vibrations *N* at all, but remain in the preternatural State *A*, after the Vibrations have fallen to a diminutive Pitch, their

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[353] *Ibid.*, 57; see also *ibid.*, 9 and 10.

[354] *Ibid.*, 57; see also *ibid.*, 10, 11, 58.

[355] *Ibid.*, 45.

> Kind and Place, or chief Seat, and their Line of Direction, continuing the same. This State may therefore be fitly denoted by a, and, being now in the Place of the natural State N, it will be kept up by the Heat of the medullary Substance, and the Pulsation of its Arteries.[356]

On the whole, Hartley believed this transition is facilitated by "the above-mentioned Disposition of animal Bodies to accomodate themselves to, and continue in, almost any State that is often impressed," which is itself a direct result of that "proper ultimate Structure" of the medullary substance which enables it to retain "a State that is frequently impressed" by altering the distances and mutual actions and, hence, their natural tendency to vibrate. This transition from one state of vibration to another is particularly accelerated by the predisposition of the regions of the brain to certain specific vibrations.[357]

To denote the new diminutive state of vibration a, of the medullary substance of the brain, or its new disposition to the sensory vibration A, Hartley coined the term "vibratiuncle" or "miniature." Vibratiuncles or miniatures, he explained, correspond "to the original sensory ones . . . in . . . that they agree in Kind, Place, and Line of Direction; and differ only in being more feeble, *i. e.* in Degree."[358]

Simple Ideas of Sensation

Just as the repetition of a sensory vibration in the medullary substance eventually alters the tendency of vibration of the

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[356] *Ibid.*, 61.

[357] *Ibid.*, 61-62.

[358] *Ibid.*, 58; see also *ibid.*, 59 and 64.

medullary substance and leaves a corresponding vibratiuncle behind, sufficient repetition of a sensation in the mind also permanently changes the state of the mind. "Sensations," Hartley proposed, "by being often repeated, leave certain Vestiges, Types, or Images, of themselves [in the mind], which may be called, Simple Ideas of Sensation."[359]

These simple ideas of sensation differ in degree from the initial sensation and from the initial nonpermanent vestiges of sensation. Hartley considered the initial sensation to be the strongest in degree. Vestigial sensations "in their first State, are intermediate between Sensations and Ideas," yet "in some Part of their Declension, [they are] of about the same Strength with Ideas. . . ."[360] Thus, while a simple idea of sensation ranks below a sensation in strength, it is obviously stronger than a vanishing vestigial sensation.

Since Hartley considered these simple ideas of sensation to arise from and correspond to physical vibratiuncles in the manner that has been described above, he often referred to ideas as "seated" in the physiological organs in which their corresponding vibrations occur. He supposed "the miniature Vibrations belonging to Ideas" take place only in certain parts of the brain, the other parts being "appropriated to the natural, vital, and animal Motions. . . ."[361] Since the vibratiuncles occur primarily in the medullary substance of the brain in

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[359] Ibid., 56. [360] Ibid., 57.

[361] Ibid., 392.

Hartley's theory, he spoke of "the internal Parts of the Brain . . . [as] the peculiar Residence of Ideas. . . ."[362] Occasionally, Hartley loosely equated the vestiges of the vibrations in the sensory organs, nerves, and brain themselves with ideas, and as a result he spoke of ideas as "left" in a particular part of the body, such as the optic nerve, the spinal marrow, or the brain, rather than in the immaterial mind.[363]

Now suppose a second external object B to be impressed upon one of the infant's other four sensory organs. As in the preceding impression, a vibration will be set up in the particles of the medullary substance and the interjacent aether of the appropriate sensory nerve, and this vibration will be transmitted through the spinal marrow to the medullary substance of the brain. The vibration will, however, enter the brain in a different region, since it was impressed upon a different sensory organ; consequently, it will also be propagated across the medullary substance with a different line of direction. Vibration B, then, will pervade all the regions of the medullary substance of the brain, upsetting the state of vibration _a_ in each region, particularly in the primary region of vibration B, with an effect inversely proportional to the distance of each region from its point of entrance. Simultaneous with the propagation of vibration B across the brain, the corresponding sensation is perceived by the infant's mind. After a short period of time, vibration B vanishes

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[362] _Ibid._, 387; see also _ibid._, 81, 395, 402, 405.

[363] _Ibid._, 146, 168, 210, 284.

from the medullary substance of the brain, leaving no perceptible effect, whereupon the medullary substance returns to its recently imposed preternatural state of vibration _a_. The corresponding sensation also vanishes from the mind, and the child returns to sleep.

As was the case with the earlier vibration A, suppose vibration B to be sufficiently repeated in the infant's brain so that the medullary substance does not entirely return to its previous state of vibration _a_, but remains instead permanently affected by vibration B. According to Hartley's theory, the whole medullary substance is then in a new state of vibration, _b_ modified by _a_ or _a_ modified by _b_.

Hartley hypothesized

> that of the Vibrations which are excited in each Region, no one can prevail over all the rest, but each must leave an Effect, in proportion to its Strength and Frequency. We may conceive therefore, that each Region of the medullary Substance will have a Tendency generated in it, to vibrate with Vibrations of the same Frequency (but weaker in Degree) as those which the several appropriated Objects impress upon it respectively; and that diminutive Vibrations resembling them will rise in Succession in each Region.[364]

But even though "the secondary Vibrations . . . will be over-ruled, in great measure, in each Region, by the primary Vibrations peculiar to that Region," every vibration will leave a perceptible effect upon every region of the medullary substance.[365] Thus the diffusion of vibration B across the medullary substance a sufficient number of times will modify and change the vibration of each region from its state of vibration _a_, so that in the primary region of vibration B the

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[364] _Ibid._, 63. [365] _Ibid._

vibratiuncle b modified by a exists, and in the primary region of Vibration A the vibratiuncle a modified by b exists. Those regions in between possess either the vibratiuncle b modified by a, or a modified by b, according to the relative strength and frequency of the vibrations a and B in each region.[366]

As was the case earlier, the transition of the medullary substance from its state of vibration a to a modified by b or b modified by a marks the creation of a second simple idea of sensation, denoted by b, corresponding to the external object B in the mind.

In Hartley's physiological psychology, simple ideas of sensation, that is diminutive vestiges, copies, or offsprings of impressions made on the senses by external objects, will continue to be created in the mind in the manner described above:[367] As the additional objects C, D, E, and so on, are continually impressed on the senses, the vibration of each region of the medullary substance of the brain is modified greatly or slightly in turn, and the corresponding simple ideas of sensation c, d, and e, respectively, are created in the sensorium.

Thus, the initial natural state of vibration N of the infant's medullary substance

> will soon be over-ruled by the great Force and Variety of the Impressions made on the new-born Infant, which must also dispose each Region of the Brain to lean to some or other of those Vibrations which are excited in it primarily. Hence we may conceive, that a very complex Set of Vibrations, arising from the Mixture and Combinations of Degree, Kind, Place, and Line of Direction, exists always in the medullary Substance, being kept up by its Heat, and the Pulsation of its Arteries, when other Causes are wanting, almost in the same manner as in a Concert of Music the Air is agitated by Vibrations of a very complex Kind.[368]

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[366] Ibid., 67-68. [367] Ibid., 56-57, 80-81, 72, 74, 212.

[368] Ibid., 63-64.

To the objection "that such a Number of different Vibrations, as seems to be required [by this theory] . . . , can scarce exist together in the medullary Substance," Hartley replied that just as ". . . Vibrations as different from each other do, in fact, exist together in common Air, in such a manner as to be perceived distinctly" and without confusion, so can the requisite complex mixture of vibrations exist in the medullary substance so as to be attended to, distinctly perceived, and corresponded to by the soul.[369]

All in all, Hartley argued his theory of vibrations agreed well with the phenomena of the generation of ideas and thought in general, since

> as in a Concert, some one Instrument generally strikes the Ear more than the rest, so of the complex Vibrations which exist in the medullary Substance, some one Part will prevail over the rest, and present the corresponding Idea to the Mind. Some Region must be disposed, at each Instant, to vibrate stronger than the rest; and of the specific Vibrations which are generally impressed upon this Region, some one will have a more favourable Concurrence of Circumstances than the rest. And thus it will follow . . . that sensory Vibrations, by being sufficiently repeated, will beget a Disposition to miniature Vibrations corresponding to them respectively; or, using the Apellations above-assumed, that A, B, C, &c. will beget a, b, c, &c.[370]

Furthermore, these vibratiuncles will beget the corresponding simple ideas a, b, c, and so on, in the mind.

Association and the Formation of Compound Ideas

Hartley believed these simple ideas will recur in the mind whenever the impressions producing the sensations with which they correspond occur. Moreover, he speculated that the sensations producing

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[369] Ibid., 232. [370] Ibid., 64.

these simple ideas can be "associated" to form "compound sensations" which beget "compound ideas", so that the occurrence of one sensation in the compound sensation can occasion the recall of the other component simple ideas of the compound idea corresponding to the compound sensation of which the initial sensation is a part.[371]

This association of sensations together into compound sensations is, in Hartley's opinion, the "first and simplest Case of Association. . . ." "Sensations," Hartley explained, "may be said to be associated together, when their Impressions are either made precisely at the same Instant of Time, or in the contiguous successive Instants." He remarked that "the Word Association, in the particular Sense here affixed to it, was first brought into Use by Mr. Locke."[372]

Hartley distinguished ". . . Association into Two Sorts, the synchronous, and the successive,"[373] and he described the association of sensations into a compound sensation and the recall of all the component sensations following the impression of one in the following manner: If the external objects A and B are repeatedly synchronically impressed, vibrations A and B repeatedly modify each other in the medullary substance; the compound vibratiuncle a, b is left in the brain, and the corresponding sensation a, b is created in the mind. Thus when object A is impressed, the vibration A

> must lean, even in its primary Seat, to the Modifications and Changes induced by B, during their thousand joint Impressions;

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[371] Ibid., 57 and 65-66. [372] Ibid., 65.

[373] Ibid.

> and therefore much more, in receding from this primary Seat, will it lean that Way; and when it comes to the Seat of B, it will excite B's Miniature a little modified and changed by itself.[374]

Consequently the idea b will present itself to mind. In the case of successive association, Hartley postulated,

> If A and B be Vibrations impressed successively, then will the latter Part of A, viz. that Part which, according to the Third and Fourth Propositions, remains, after the Impression of the Object ceases, be modified and altered by B, at the same time that it will a little modify and alter it, till at last it be quite overpowered by it, and end in it. It follows therefore, by a like Method of Reasoning, that the successive Impression of A and B, sufficiently repeated, will so alter the medullary Substance, as that when A is impressed alone, its latter Part shall not be such as the sole Impression of A requires, but lean towards B, and end in b at last.[375]

Recall of one idea in a successively associated compound idea must observe the order of impression, however. "It is to be observed," Hartley commented

> that, in successive Associations, the Power of raising the Ideas is only exerted according to the Order in which the Association is made. Thus, if the Impressions A, B, C, be always made in the Order of the Alphabet, B impressed alone will not raise a, but c only.[376]

This ability of a vibration corresponding to one element of a successively associated compound idea to raise the ideas of the other elements is not, however, infinite. Hartley declared

> that the Influence of A may, in some Degree, reach through B to C; so that A of itself may have some Effect to raise c, as well as by means of b. However, it is evident, that this Chain must break off, at last, in long Successions, and that sooner or later, according to the Number and Vigour of the repeated Impressions.[377]

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[374]*Ibid.*, 68.

[375]*Ibid.*, 69.

[376]*Ibid.*, 66.

[377]*Ibid.*, 69.

By way of quantification, Hartley further conjectured,

> The Power of miniature Vibrations to raise other Miniatures may, perhaps, be made clearer to Mathematicians, by hinting, that the Efficacy of any Vibration to raise any other, is not in the simple Ratio of its Vividness, but as some Power thereof less than Unity; for thus _b_ may raise _c_, a weaker Vibration than _b_, _c_ may raise _d_, &c. with more Facility than if the Efficacy was in the simple Ratio of the Vividness, and yet so, that the Series shall break off at last.[378]

Complex and Decomplex Ideas

For Hartley, an idea is any internal feeling but a sensation, and these can be grouped into two categories, "ideas of sensation" and "intellectual ideas." The ideas of sensation can be either simple or compound, as has been shown above.[379] With respect to intellectual ideas, Hartley referred to the ideas of sensation as indeed simple in nature. In his introduction, he noted,

> It will appear in the Course of these Observations, that the _Ideas of Sensation_ are the Elements of which all the rest are compounded. Hence _Ideas of Sensation_ may be termed _simple_, _intellectual_ ones _complex_.[380]

In the _Observations on Man_ Hartley spoke of two types of complex ideas, "ideas of reflection" and "intellectual ideas" proper, both of which he believed are formed from ideas of sensation.[381] He noted, however, that in maintaining that the complex ideas of reflection arise from sensation he departed "from Mr. _Locke_'s excellent

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[378] _Ibid._, 69-70.

[379] See Hartley, "Introduction," _Observations on Man_, I, ii.

[380] _Ibid._

[381] Hartley, _Observations on Man_, I, 75-76; see also _ibid._, 56, 73, 79.

Essay on Human Understanding, to which the World are so much indebted for removing Prejudices and Incumbrances, and advancing real and useful Knowlege."[382] According to Hartley, Locke had erred first in identifying reflection as "a distinct Source" of ideas and secondly in ascribing ". . . Ideas to many Words, which, as I have defined Idea, cannot be said to have any immediate and precise ones; but only to admit of Definitions."[383] On the whole, Hartley considered Locke's error in considering reflection a distinct source of ideas to be "of little Consequence. We may conceive," Hartley declared,

> that he called such Ideas as he could analyse up to Sensation, Ideas of Sensation; the rest Ideas of Reflection, using Reflection as a Term of Art, denoting an unknown Quantity. Besides which it may be remarked, that the Words which, according to him, stand for Ideas of Reflection, are, in general, Words, that, according to the Theory of these Papers, have no Ideas, but Definitions only.[384]

All in all, Hartley believed his own reduction of all ideas to sensation did not significantly deviate from Locke's work, which Hartley viewed as a pioneer, but incomplete analysis of the origins of ideas, since, as he saw it, "the first Difference, is as it were, taken away by the Second; for, if these Words have no immediate Ideas, there will be no Occasion to have recourse to Reflection as a Source of Ideas. . . ."[385]

Like the compound ideas of sensation discussed above, which are clusters and combinations of distinct simple ideas of sensation

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[382] Ibid., 360. [383] Ibid.

[384] Ibid., 360-361.

[385] Ibid., 361.

formed by the action of association, Hartley concluded that all complex ideas, including complex ideas of reflection, are also formed from clusters of ideas of sensation by means of the process of association. Unlike the compound ideas of sensation, however, complex ideas are produced when the clusters coalesce and the component ideas lose their distinct identities in the coalescence.[386]

Hartley proposed, "Simple Ideas will run into complex ones, by means of Association,"[387] and he described four general cases resulting in the formation of complex ideas from simple or compound ideas of sensation. In the first case, Hartley supposed,

> Let the Sensation A be often associated with each of the Sensations B, C, D, &c. i. e. at certain times with B, at certain other times with C, &c. it is evident . . . that A, impressed alone, will, at last, raise b, c, d, &c. all together, i. e. associate them with one another, provided they belong to different Regions of the medullary Substance; for if any Two, or more, belong to the same Region, since they cannot exist together in their distinct Forms, A will raise something intermediate between them.[388]

In the second case, he speculated that if "the Sensations A, B, C, D, &c. be associated together, according to various Combinations of Twos, or even Threes, Fours, &c. then will A raise b, c, d, &c. also B raise a, c, d, &c. as in Case the First."[389] In both of these cases, Hartley concluded "that any one of the Sensations will excite the Ideas of the rest, at the same Instant, i. e. associate them together."[390] The third case involves a series of successively associated impressions; Hartley explained

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[386] Ibid., 74.

[387] Ibid., 73.

[388] Ibid.

[389] Ibid.

[390] Ibid.

> that *A* will raise *b*, *c*, *d*, &c. *B* raise *c*, *d*, &c. And though the Ideas do not, in this Case, rise precisely at the same Instant, yet they come nearer together than the Sensations themselves did in their original Impression; so that these Ideas are associated almost synchronically at last, and successively from the first. The Ideas come nearer to one another than the Sensations, on account of their diminutive Nature, by which all that appertains to them is contracted.[391]

In the fourth case, Hartley considered a compound impression A+B+C+D and its corresponding vibratiuncle. When the vibratiuncle recurs "the Parts are farther associated, and approach perpetually nearer to each other, agreeably to what was just now observed; *i. e.* the Association becomes perpetually more close and intimate."[392]

Once the simple or compound ideas of sensation have been associated more closely in any one of the above ways, Hartley insisted that further recall of one recalls all the others associated with it,

> and so associate all of them together still farther.
>
> And, upon the Whole, it may appear to the Reader, that the simple Ideas of Sensation must run into Clusters and Combinations, by Association; and that each of these will, at last, coalesce into one complex Idea, by the Approach and Commixture of the several compounding Parts.[393]

A complex idea, then, is a blending of simple and compound ideas of sensation by the action of association. Hartley further remarked with respect to the nature of a complex idea that just as "in very compound Medicines, the several Tastes and Flavours of the separate Ingredients are lost and overpowered by the complex one of the whole Mass: So that this has a Taste and Flavour of its own, which appears to be simple and original," so the separate original parts

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[391] *Ibid.*, 74. [392] *Ibid.*

[393] *Ibid.*

of a complex idea may not be distinguishable from each other after the coalescence has occurred. The complex idea, then, may not even "appear to bear any Relation to . . . the external Senses upon which the original Sensations, which gave Birth to the compounding Ideas, were impressed."[394]

Furthermore, from these complex ideas, or ". . . Combinations of simple Ideas united intimately by Association," and from other simple ideas of sensation, "decomplex ideas" can also be formed by association.[395] "But here," Hartley acknowledged, "the Varieties of the Associations, which increase with the Complexity, hinder particular ones from being so close and permanent, between the complex Parts of decomplex Ideas, as between the simple Parts of complex ones. . . ."[396]

Memory and Imagination

Hartley's use of vibration and association in his explanation of man did not end with his analysis of the generation of ideas. In Hartley's opinion, man is completely determined by his impressions and associations; consequently, in the Observations on Man Hartley reduced all the contents and operations of the human mind to the action of association upon ideas, the products of vibration and external impressions.[397]

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394 Ibid., 75; see also ibid., 469.

395 Ibid., 76; see also ibid., 77, 79, 80.

396 Ibid., 77.

397 Ibid., 82.

On the whole, he described the human mind as possessing sensations and ideas which are attended by pleasure or pain and "as indued with the Faculties of Memory, Imagination or Fancy, Understanding, Affection, and Will."[398] Hartley defined memory as "that Faculty, by which Traces of Sensations and Ideas recur, or are recalled, in the same Order and Proportion, accurately or nearly, as they were once actually presented."[399] This faculty of memory, or orderly recall, he contrasted against the faculty of imagination or fancy, which he described as responsible for the recall of ". . . Ideas, and Trains of Ideas, . . . in a vivid manner, and without regard to the Order of former actual Impressions and Perceptions. . . ."[400] Both types of recall, however, he explained as due to the action of association.

On the whole, Hartley observed

> that every succeeding Thought is the Result either of some new Impression, or of an Association with the preceding. And this is the common Opinion. It is impossible indeed to attend so minutely to the Succession of our Ideas, as to distinguish and remember for a sufficient Time the very Impression or Association which gave Birth to each Thought; but we can do this as far as it can be expected to be done, and in so great a Variety of Instances, that our Argument for the Prevalence of the . . . Principle of Association in all Instances, except those of new Impressions, may be esteemed a complete Induction.[401]

According to Hartley's theory, then, any idea currently present in the mind is brought to mind by the action of association, if it is not a vestige of an immediately preceding sensation. Consequently,

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[398] Hartley, "Introduction," Observations on Man, iii; see also ibid., ii.

[399] Ibid., iii; see also Hartley, Observations on Man, I, 374.

[400] Hartley, "Introduction," Observations on Man, I, iii.

[401] Hartley, Observations on Man, I, 383.

both memory and imagination operate according to the mechanism of association of ideas.

Hartley maintained that memory, "in its full Extent, consists" solely of ". . . Associations of Associations,"[402] and he asserted that the operation of association upon external impressions and their vestiges, or ideas, seemed "sufficient to explain the chief Phaenomena of Memory. . . ."[403] He observed,

> First, That Memory depends intirely or chiefly on the State of the Brain. For Diseases, Concussions of the Brain, spirituous Liquors, and some Poisons, impair or destroy it; and it generally returns again with the Return of Health, from the Use of proper Medicines and Methods. And all this is peculiarly suitable to the Notion of Vibrations. If Sensations and Ideas arise from peculiar Vibrations, and Dispositions to vibrate, in the medullary Substance of the Brain, it is easy to conceive, that the Causes above alleged may so confound the Sensations and Ideas, as that the usual Order and Proportion of the Ideas shall be destroyed.[404]

In a manner similar to his connection of the superiority of the human medullary substance with its unique quality to change in reaction to frequent impressions and to retain a state often impressed upon it, Hartley commented, "The most perfect Memory is that which can both receive most readily, and retain most durably."[405]

Hartley analyzed the elements of memory into "particulars," "rudiments," and "past Facts." He referred to a "particular" as the basic element of memory and supposed "10 single Particulars . . . constitute a Rudiment. . . ." Furthermore, a "past Fact" consists "of

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[402] Ibid., 67.

[403] Ibid., 78; see also ibid., 81.

[404] Ibid., 374; see also ibid., 380-381 and 387.

[405] Ibid., 381.

1000 single Particulars, or of 100 such Clusters as are called the Rudiments of Memory. . . ." He also noted that "the single Impressions, which make the small Clusters, are not combined together at Hazard, but according to a general Tenor in Nature, [and] . . . the Clusters which make Facts succeed each other according to some general Tenor likewise."[406]

These rudiments of memory Hartley believed to be formed by "the perpetual Recurrency of the same Impressions, and Clusters of Impressions," which "leave Traces, in which the Order is preserved. . . ."[407] Just "as the frequent Impression of the Objects themselves" leaves ideas in the mind, the frequent recurrence of the traces in the mind "contributes to fix them, and their Order, in the Memory. . . ."[408]

If a past fact consists of a thousand particulars, as described above, it will be fixed in a man's mind by association in the following manner: First, Hartley observed,

> there are only 100 Links wanting in the Chain; for he has already learnt considerable Exactness in the subordinate Circumstances of the 100 Clusters; and perfect Exactness is not to be supposed or required.--Secondly, The 100 Clusters recur again and again to the Imagination for some time after the Fact, in a quick and transient manner . . . and this both makes the Impression a little deeper, and also serves to preserve the Order.[409]

All in all, Hartley theorized, when "the Person attempts to recollect soon after the Impression, the Effect remaining in the Brain is sufficient to enable him to do this with the Accuracy required

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[406] Ibid., 375-376. [407] Ibid., 374.

[408] Ibid., 375. [409] Ibid.

and experienced," for the corresponding clusters of ideas and their associations will be very vivid in the mind. But "if a longer Time intervenes, before he attempts to recollect, still the Number of involuntary Recurrencies makes up in some measure for the Want of this voluntary Recollection."[410]

Hartley allowed that recollection of such a past fact after it has been fixed in the memory can be aided by the natural association of the parts and by the vividness of ". . . The visible Impressions which concur in the past Fact. . . ."[411] He explained,

> . . . When a Person desires to recollect a thing that has escaped him, suppose the Name of a Person, or visible Object, he recals the visible Idea, or some other Associate, again and again, by a voluntary Power, the Desire generally magnifying all the Ideas and Associations; and thus bringing in the Association and Idea wanted, at last.[412]

Recollection can also be facilitated by the words associated with a past fact. In this regard Hartley noted

> that we think in Words [and that] both the Impressions and the Recurrencies of Ideas will be attended with Words; and these Words, from the great Use and Familiarity of Language, will fix themselves strongly in the Fancy, and by so doing bring up the associated Trains of Ideas in the proper Order, accurately or nearly.[413]

Yet, he admitted that the power of recollection is not always sufficient to bring to mind the desired idea, for "the Power of Recollection declines in general, and is intirely lost by degrees."[414]

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[410] Ibid., 375; see also ibid., 378.

[411] Ibid., 376.

[412] Ibid., 381.

[413] Ibid., 376.

[414] Ibid., 375-376.

In addition to explaining man's power of memory, Hartley insisted that association also explains the mental faculty of imagination, fancy, or disordered recall of ideas and trains of ideas, such as occur in imagination, reverie, and dreams. As was the case in his analysis of memory, Hartley deduced the operation of imagination from the current state of the physical body, from recent impressions and ideas, and from association. The apparent difference between the products of memory and imagination he accounted for on the basis of different states of the body, different strengths of the ideas recalled, and different strengths of the associations involved.[415]

Hartley claimed "that in all the Cases of Imagination and Reverie the Thoughts depend, in part, upon the then State of Body or Mind."[416] He described, for example, how the state of the stomach or brain "will make all the Thoughts warp their own way, little or much."[417] The state of the body, particularly of the brain, especially affects the course of imagination in dreams, which "are nothing but the Imaginations, Fancies, or Reveries of a sleeping Man. . . ."[418] In dreams, "the bodily Causes" hurry "us on to new and new Trains [of ideas] successively," with the degree of regard for previously established associations between the ideas involved proportional to the nearness of the brain to the waking state in which the associations were first formed.[419] Although he acknowledged, ". . . Association has some Power

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[415] Ibid., 377, 380-381, 383-384. [416] Ibid., 383.

[417] Ibid., 383-384. [418] Ibid., 384.

[419] Ibid., 386; see also ibid., 388.

even in wild and inconsistent Dreams,"[420] in general he believed ideas are presented during sleep "at Hazard, as one may say, and with little Regard to prior Associations. . . ."[421] The course of a dream is primarily determined by the state of the body, and the material for the dream is drawn from recent impressions, since there is a greater disposition to their corresponding vibrations in the brain.[422] In a dream, "the State of the Body suggests such Ideas, amongst those that have been lately impressed, as are most suitable to the various Kinds and Degrees of pleasant and painful Vibrations excited in the Stomach, Brain, or some other Part."[423] Dreams, then, are composed of imperfect and interrupted associations, and the perceptions experienced in dreams are those that correspond to the vibrations of the medullary substance in a waking state.[424]

Memory and imagination also differ with respect to the strength of the ideas recalled and the associations involved. Hartley speculated that "the specific Nature of Memory [may] consist in the great Vigour of the Ideas, and . . . Associations" recalled. Thus, he "asked, In what the Recollection of a past Fact, consisting of 100 Clusters, as above, differs from the Transit of the same 100 Clusters over the Fancy, in the way of a Reverie?" His reply was that the product of memory differs from the product of imagination ". . . Partly in the Vividness of the Clusters, partly and principally in the Readiness and Strength of the

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[420] Ibid., 388; see also ibid., 384.

[421] Ibid., 398.

[422] Ibid., 387.

[423] Ibid., 385.

[424] Ibid., 387.

Associations, by which they are cemented together."[425]

Understanding, Assent, and Dissent

Hartley also considered human understanding, "that Faculty, by which we contemplate mere Sensations and Ideas, pursue Truth, and assent to, or dissent from, Propositions,"[426] to be "intirely dependent upon Association. . . ."[427] He maintained that our notion of agreement or disagreement with a proposition is nothing more than a complex idea which, like all other complex ideas, is formed by the action of association upon vestiges of experience.[428] According to Hartley,

> It appears . . . that Assent and Dissent, whatever their precise and particular Nature may be, must come under the Notion of Ideas, being only those very complex internal Feelings, which adhere by Association to such Clusters of Words as are called Propositions in general, or Affirmations and Negations in particular.[429]

Since ". . . Propositions . . . excite, as soon as heard, Assent or Dissent; which . . . consist chiefly of additional complex Ideas, not included in the Terms of the Proposition," association is the mechanism by which a man arrives at a judgment concerning the validity of a proposition.[430]

In the Observations on Man, Hartley analyzed assent into two types, rational assent and practical assent. "Rational Assent . . . to any Proposition," he explained,

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[425] Ibid., 377-378.

[426] Hartley, "Introduction," Observations on Man, I, iii.

[427] Hartley, Observations on Man, I, 343; see also ibid., 81-82.

[428] Ibid., 79, 324, 333. [429] Ibid., 324.

[430] Ibid., 79; see also ibid., 325-328.

> may be defined [as] a Readiness to affirm it to be true, proceeding from a close Association of the Ideas suggested by the Proposition, with the Idea, or internal Feeling, belonging to the Word Truth; or of the Terms of the Proposition with the Word Truth.[431]

Practical assent, on the other hand, "is a Readiness to act in such manner as the frequent vivid Recurrency of the rational Assent disposes us to act. . . ." "Practical Assent," he continued, "is therefore the natural and necessary Consequence of Rational, when sufficiently impressed."[432]

Rational assent, which in general precedes practical assent, can be a product of various methods of reasoning, among them induction and analogy. Although Hartley recognized "that rational Assent has different Causes in Propositions of different Kinds, and Practical likewise; [and] that the Causes of Rational are also different from those of Practical," he nonetheless maintained "that there is, however, a great Affinity, and general Resemblance, in all the Causes; [and] that rational and practical Assent exert a perpetual reciprocal Effect upon one another. . . ."[433] Thus, rational and practical assent, as well as the voluntary action resulting from practical assent, were reduced by Hartley to the operation of association upon the vestiges of impression.[434]

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[431] _Ibid._, 324.

[432] _Ibid._, 324-325.

[433] _Ibid._, 332.

[434] _Ibid._, 329.

Affection and the Intellectual Pleasures and Pains

Hartley also employed the concept of association to explain the faculty of affection, which excites man "to pursue Happiness, and all its Means, fly from Misery, and all its apparent Causes."[435] Indeed he emphasized, ". . . I have endeavoured to shew in these Papers, that all Reasoning, as well as Affection, is the mere Result of Association."[436]

In his introduction to the first volume, Hartley declared, "The Affections have the Pleasures and Pains for their Objects; as the Understanding has the mere Sensations and Ideas."[437] The pleasures and pains upon which the affections work he divided into the following seven classes:

1. Sensation;
2. Imagination;
3. Ambition;
4. Self-Interest;
5. Sympathy;
6. Theopathy; and,
7. The Moral Sense. . . .[438]

The first class of pleasures and pains, that is those of sensation, are immediate results of the physical impression of external objects upon human sensory organs. As has been discussed above, these

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[435] Hartley, "Introduction," Observations on Man, I, iii.

[436] Hartley, Observations on Man, I, 499.

[437] Hartley, "Introduction," Observations on Man, I, iii.

[438] Ibid., ii. From Hartley's discussion, it is unclear whether he meant these seven classes to comprise the intellectual pleasures and pains or the intellectual passions and affections. In the "Introduction," (ibid., iii) he referred to the seven categories as ". . . Pleasures and Pains;" in the body of the Observations on Man (I, 416), he also referred to them as pleasures and pains. In at least one instance,

sensible pleasures and pains arise from sensations with exalted corresponding sensory vibrations.

The other six classes of pleasures and pains Hartley referred to as the intellectual pleasures and pains, and he contended that "none of the intellectual Pleasures and Pains can be original."[439] According to Hartley's theory, all the intellectual pleasures and pains "are . . . nothing but the sensible ones variously mixed and compounded together;"[440] furthermore, he declared they "can be deduced . . . from the sensible Pleasures and Pains, by means of the general Law of Association."[441] Although he thus perceived the intellectual pleasures and pains to be "of a factitious and acquired Nature,"[442] he insisted that "the sensible Pleasures and Pains are evidently Originals. They are therefore the only ones, i. e. they are the common Source from whence all the intellectual Pleasures and Pains are ultimately derived."[443]

Because "the several Parts of these complex [intellectual] Pleasures [and Pains] are sufficiently united by Association" so that they "appear to be pure and simple ones" and because they mutually influence each other in their formation, Hartley admitted the intellectual pleasures and pains are very difficult to analyze into their

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however, he referred to categories 2-7 as "intellectual Affections" (Observations on Man, I, 368). In this discussion, the categories 2-7 will be considered in both senses, although category 1 is clearly only an instance of a pleasure or pain.

[439] Hartley, Observations on Man, I, 417; see also ibid., 368.

[440] Ibid., 83. [441] Ibid., 416; see also ibid., 368 and 445.

[442] Ibid., 83.

[443] Ibid., 417; see also ibid., 82-83, 144-145, 319, 368.

component sensible pleasures and pains.[444]

Nonetheless, he described a process by which, "admitting the Powers of leaving Traces, and of Association, compound or mental [pleasures and] Pains will arise from simple bodily ones by means of Words, Symbols, and associated Circumstances:"[445] The complex mental pleasures and pains are formed when the violent miniature vibrations corresponding to the ideas of the sensible pleasures and pains unite by association and coalesce, just as the other complex ideas are formed when simple and compound ideas unite and coalesce.[446] He illustrated the formation of the intellectual pleasures and pains by means of an analogy to the formation of colors:

> Thus, let the seven primary Colours, with their Shades, represent the original sensible Pleasures; then will the various associated Pleasures of human Life, supposing that we enjoyed a State of unmixed Happiness, be represented by the compound vivid Colours. . . . White, which is compounded of all the Colours reflected copiously, and which yet, as far as the Eye can discern, bears no Resemblance to any of them, would represent a State of great mental Happiness, ultimately deduced from all the sensible Pleasures, and in which, notwithstanding, the Person himself distinguishes no Traces of any of these.[447]

"Besides White," he continued,

> there are other compound Colours, which bear little or no Resemblance to any of the primary ones, as well as many in which some primary Colour is evidently predominant. These represent the several Kinds and Degrees of inferior compound Pleasures, some of which are, according to the common Estimation, quite foreign to the Senses, whilst others are manifestly tinged with pleasant Sensations, and their Miniatures.[448]

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[444] Ibid., 83; see also ibid., 319-320 and 369.

[445] Ibid., 144.

[446] Ibid., 81-83; see also ibid., 144 and 319.

[447] Ibid., 321.

[448] Ibid., 321-322.

Since the intellectual pleasures and pains are thus formed by the operation of association, Hartley consequently maintained it to be "evident, that the Objects of the intellectual Pleasures and Pains derive their Power of thus affecting the Mind from Association."[449] Specifically, Hartley considered the intellectual pleasures and pains of imagination to arise from ". . . Natural or artificial Beauty or Deformity;" ambition to arise from ". . . The Opinions of others concerning us;" self-interest from ". . . Our Possession or Want of the Means of Happiness, and Security from, or Subjection to, the Hazards of Misery;" sympathy from ". . . The Pleasures and Pains of our Fellow-Creatures;" theopathy from ". . . The Affections excited in us by the Contemplation of the Deity;" and the moral sense from ". . . Moral Beauty and Deformity."[450]

In Hartley's physiological psychology, these "complex [intellectual] Pleasures and Pains, formed from Miniatures of the sensible ones, become the Means of gaining other and greater Pleasures," for when they are exalted in degree, they become intellectual passions and affections.[451] When the parts of a complex vibration "so alter and exalt one another, as that the resulting Agitations in the medullary Substance may no longer be miniature Vibrations, but vivid ones, equal to those excited by Objects impressed on the Senses," "the corresponding complex Ideas are proportionally exalted, and so pass

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[449] Ibid., 373.

[450] Hartley, "Introduction," Observations on Man, I, ii-iii.

[451] Hartley, Observations on Man, I, 319; see also ibid., 368.

into intellectual Affections and Passions."[452]

Since he described these intellectual passions and affections as ". . . States of considerable Pleasure or Pain," he argued "they must be Aggregates of the Ideas, or Traces of the sensible Pleasures and Pains" "united by Association." They are therefore not innate, instinctive, or "implanted," but factitious in nature.[453] Hartley acknowledged that

> because Mankind are for the most part pursuing or avoiding something or other, the Desire of Happiness, and the Aversion to Misery, are supposed to be inseparable from, and essential to, all intelligent Natures. But this does not seem to be an exact or correct Way of Speaking. The most general of our Desires and Aversions are factitious; i. e. generated by Association; . . . . And, whoever will be sufficiently attentive to the Workings of his own Mind, and the Actions resulting therefrom, or to the Actions of others, and the Affections which may be supposed to occasion them, will find such Differences and Singularities in different Persons, and in the same Person at different Times, as no-way agree to the Notion of an essential, original, perpetual Desire of Happiness, and Endeavour to attain it; but much rather to the factitious associated Desires and Endeavours here asserted. And a due Regard to this will, as it seems to me, solve many Difficulties and Perplexities found in Treatises upon the Passions. The Writers upon this Subject have begun in the synthetical Method prematurely, and without having premised the analytical one. For it is very true, that, after general Desires and Endeavours are generated, they give Rise in their Turn to a Variety of particular ones. But the original Source is in the particular ones, and the general ones never alter and new-model the particular ones so much, as that there are not many Traces and Vestiges of their original mechanical Nature and Proportions remaining.[454]

As a result of his analysis, Hartley identified ". . . Five grateful Passions, Love, Desire, Hope, Joy, and pleasing Recollection,"

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[452] Ibid., 80.

[453] Ibid., 368; see also ibid., 370-371, 417, 455.

[454] Ibid., 370-371.

as well as

> . . . Five ungrateful ones, Hatred, Aversion, Fear, Grief, and displeasing Recollection. And the whole Ten, taken together, comprehend, as appears to me, all the general Passions of human Nature.[455]

These intellectual passions and affections are formed from the intellectual pleasures and pains, which were themselves formed from the sensible pleasures and pains by the mechanism of association.

<u>The Derivative Nature of the Will</u>

Hartley also reduced the exertion of the will and the consequent non-automatic human action to factitious and mechanical actions. In Hartley's system the will is nothing more than a complex ". . . Idea, or State of Mind (*i. e.* Set of compound Vibratiuncles);" thus, like any other complex idea, it too is a product of vibration and association.[456] Indeed, Hartley classified the will as an intellectual passion or affection. He explained that

> . . . The Will appears to be nothing but a Desire or Aversion sufficiently strong to produce an Action that is not automatic primarily or secondarily. At least it appears to me, that the Substitution of these Words for the Word *Will* may be justified by the common Usage of Language. The Will is therefore that Desire or Aversion, which is strongest for the then present Time. For if any other Desire was stronger, the muscular Motion connected with it by Association would take place, and not that which proceeds from the Will, or the voluntary one, which is contrary to the Supposition. Since therefore all Love and Hatred, all Desire and Aversion, are factitious, and generated by Association; *i. e.* mechanically; it follows that the Will is mechanical also.[457]

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[455]*Ibid.*, 373.

[456]*Ibid.*, 103; see also *ibid.*, 258.

[457]*Ibid.*, 371; see also *ibid.*, 258 and 103-104.

Since the will is a product of the mechanism of association, the voluntary recall of an idea to mind, which is generally considered to be an act of will, is also a product of association. Hartley commented,

> Here it is to be observed, that an Idea cannot be said to be voluntarily introduced, till it be previously determined by some of its Associates. If I desire to introduce a visible Idea of any Kind, an Individuum vagum, and that of an Horse offers itself, it was not owing to the Command of my Will, that it was an Horse, and nothing else, but to the Connexion which the Idea of an Horse had with some other Idea or Impression, which then happened to take place.[458]

He described the general process of the voluntary recall of an idea by means of association as follows:

> It is to be observed farther, that the associated Circumstance, which determines what Idea shall be called up voluntarily, does, for the most part, raise it. Thus, if a Person desires me to call up the Idea of an Horse, the very Sound of the Word proceeding from his Mouth will do it, for most part, immediately. If not, I go back, by my Memory, to the Trace left by the Word, and thence to the Idea, or to some common Associate of both the Word and Idea, capable of raising the last.[459]

Automatic and Voluntary Motion

Hartley furthermore explained all human action and muscular motion on the basis of the two doctrines of vibration and association. According to his theory, all human action is of a mechanical nature, since

> every Action, or bodily Motion, arises from previous Circumstances, or bodily Motions, already existing in the Brain, *i. e.* from Vibrations, which are either the immediate Effect of Impressions then made, or the remote compound Effect of former Impressions, or both.[460]

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[458] *Ibid.*, 211. [459] *Ibid.*, 211-212.

[460] *Ibid.*, 501; see also *ibid.*, 503.

Hartley found that his study of vibration and association consequently forced him to accept the concept "of the Mechanism or Necessity of human Actions, in Opposition to what is generally termed Free-will,"[461] although he admitted this doctrine at last with "the greatest Reluctance."[462] "By the Mechanism of human Actions," Hartley explained,

> I mean, that each Action results from the previous Circumstances of Body and Mind, in the same manner, and with the same Certainty, as other Effects do from their mechanical Causes; so that a Person cannot do indifferently either of the Actions A, and it contrary a, while the previous Circumstances are the same; but is under an absolute Necessity of doing one of them, and that only.[463]

He defined philosophical free will, "which is opposed to Mechanism," as the ". . . Power of doing either the Action A, or its contrary a; while the previous Circumstances remain the same," or the ". . . Power of beginning Motion. . . ."[464]

Hartley divided human action and bodily motion into two basic categories, automatic and voluntary motion. But according to his physiological psychology all human action and bodily motion is fixed and determined, just as the course of nature is, whether it proceeds directly from vibrations, as in the case of automatic motion, or whether it proceeds from an internal motive, as in voluntary motion.[465] In

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[461] Ibid., 500.

[462] Hartley, "Preface," Observations on Man, I, vi. See Chapter II for an account of the development of Hartley's theory and his acceptance of determinism.

[463] Hartley, Observations on Man, I, 500.

[464] Ibid., 500-501.

[465] Ibid., 501, 503, 508.

either type of motion, man does not, in Hartley's opinion, have the power to begin motion in a philosophical sense.

According to Hartley,

> The automatic Motions are those which arise from the Mechanism of the Body in an evident manner. They are called automatic, from their Resemblance to the Motions of Automata, or Machines, whose Principle of Motion is within themselves.[466]

Original automatic motions depend "upon Sensation" and "are rather to be ascribed to the Body than the Mind. . . ."[467] Thus the original automatic motions can be explained solely by the doctrine of vibrations; they are the only type of motion Hartley identified as not "excited by an associated Circumstance. . . ."[468]

The Process of Motion

In Hartley's system, all bodily motions are accomplished by the efficiency of vibrations in the motory nerves, that is those nerves which run from the brain to the muscles. These vibrations Hartley referred to as motory vibrations, and he identified five types involved in the production of automatic motions.[469] The first type of motory vibration occurs when sensory vibrations ascending towards the brain arrive at the common origin of the sensory and motory nerves, at which point part of the vibrations proceed down the motory nerves to agitate

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[466] Hartley, Introduction," Observations on Man, I, iii.

[467] Hartley, Observations on Man, I, 85 and 104, respectively.

[468] Ibid., 235; see also ibid., 109.

[469] Ibid., 86-87, 91, 99.

the muscles.[470] The sensory vibration that continues on to the brain after the first type of motory vibration has split off down the motory nerves above, enters the medullary substance of the brain, diffuses, and then descends from the medullary substance of the brain to the motory nerves, where it excites gentle, feeble, and continual motory vibrations of the second type.[471] The third type of motory vibration Hartley identified as those vibrations constantly present in the muscles due to the heat of the blood and the pulsation of the arteries.[472] Both the second and third types of motory vibrations Hartley maintained are involved in producing the regular automatic motions, such as respiration and the motion of the heart.[473] A fourth type of motory vibration is that vividly excited in the membranes. The vibration contracts the membranes, thus forcing vibrations into the neighboring muscles, via connecting nervous fibrils, and results in an increase in the vibrations in the muscles. This type of vibration, along with the first type, accounts for automatic motions such as sneezing.[474] Into the fifth class of motory vibrations Hartley grouped any vibration propagated from any one part of the body to another with which it has a nervous connection.[475]

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[470] Ibid., 91-92.

[471] Ibid., 98.

[472] Ibid., 92, 98, 244.

[473] Ibid., 94, 243, 251.

[474] Ibid., 92-93 and 97.

[475] Ibid., 93.

When any of these five types of motory vibrations follow directly from a preceding sensory vibration, an ideal vibratiuncle, or another motory vibration without any intervention of the will, the actions which result are called automatic. Since automatic actions proceed from vibrations "which are . . . evidently of a mechanical Nature," Hartley considered them to be fixed and determined.[476]

The Motives Behind Action

Voluntary motions are those which follow "that Idea, or State of Mind . . . which we term the Will, directly, and without our perceiving the Intervention of any other Idea, or of any Sensation or Motion. . . ."[477] In contrast to automatic motions which he referred to the mechanism of the body, Hartley described voluntary motions as "those which arise from Ideas and Affections, and which therefore are referred to the Mind; the immediately preceding State of the Mind, or of the Ideas and Affections, being termed Will. . . ."[478] Voluntary action, then, depends upon ideas rather than sensations.[479]

Despite its origin in the mind, however, Hartley argued that voluntary or motivated motion is mechanical in nature, and he attributed the performance of voluntary motion to motory vibrations of type two, described above.[480] Even when a motion occurs following an express act of will or volition, Hartley concluded it is "impossible

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[476] Ibid., 503; see also ibid., 109. [477] Ibid., 103.

[478] Hartley, "Introduction," Observations on Man, I, iv; see also ibid., i and iii.

[479] Hartley, Observations on Man, I, 85.

[480] Ibid., 92 and 503.

. . . that the Person should have done otherwise than the very thing which he did."[481] He considered it evident

> and allowed by all, that the Actions of Mankind proceed, in many Cases, from Motives, i. e. from the Influence which the Pleasures and Pains of Sensation, Imagination, Ambition, Self-interest, Sympathy, Theopathy, and the Moral Sense, have over them.[482]

In fact, he generalized "that there are in all Instances [of human voluntary action] Motives of a proper Kind and Degree, which generate each Action. . . ." Hartley believed "where the Motives are the same, the Actions cannot be different; where the Motives are different, the Actions cannot be the same." Motives are thus "the mechanical Causes of Actions, as natural Phaenomena are for the mechanical Operation of Heat, Diet, or Medicines." Since these motives, as defined above, are themselves the mechanical results of sensation and association, motivated voluntary action is directly deducible from vibration, sensation, and association.[483]

Since all human automatic and voluntary action is merely the result of the mechanical operation of the body and/or the mind, man is denied philosophical free will, that is the power to choose between contrary possible courses of action independently of preceding circumstances. "But," Hartley interjected,

> if by Free-will be meant any thing different from [philosophical free will] . . . , it may not perhaps be inconsistent with the Mechanism of the Mind here laid down. Thus, if Free-will be defined the Power of doing what a person desires or wills

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[481] _Ibid._, 503; see also _ibid._, 105 and 107-109.

[482] _Ibid._, 501.

[483] _Ibid._, 502; see also _ibid._, 103-104, 109, 391.

> to do, of deliberating, suspending, choosing, &c. or of resisting the Motives of Sensuality, Ambition, Resentment, &c. Free-will, under certain Limitations, is not only consistent with the Doctrine of Mechanism, but even flows from it; since it appears from the foregoing Theory, that voluntary and semivoluntary Powers of calling up Ideas, of exciting and restraining Affections, and of performing and suspending Actions, arise from the Mechanism of our Natures.[484]

Men do possess a certain "practical Free-will, or . . . voluntary Power over our Affections and Actions, by which we deliberate, suspend, and choose," but Hartley reduced this power to a product of "the Frame of our Natures,"[485] just as he reduced sensation, ideation, and motion in general.

The Physiology of Muscular Contraction

Hartley maintained that muscular motion is chiefly excited by vibrations descending from the brain, but, whatever the origin of the motory vibrations, once they are set in motion and begin their descent along the spinal marrow and motory nerves to the muscles,[486] the mechanism of muscular contraction operates in the following general manner: The motory vibrations are propagated along the motory nerves to the muscles in the same manner in which sensory vibrations are communicated from the organs of sensation to the corresponding regions of the brain; that is, by the interaction of the small active medullary particles of the nerves and the particles of the interjacent aether.

Hartley described the muscles of the human body as either "red fleshy" or pale, and these are composed of red muscle fibers

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[484] Ibid., 501; see also ibid., 507.

[485] Hartley, "Preface," Observations on Man, I, vii and viii, respectively.

[486] Ibid., 7, 86-87, 101, 257.

or white, "pale Fibres," respectively.[487] Hartley agreed with Boerhaave that these "muscular Fibres" "may perhaps be . . . mere Productions of the ultimate Nerves."[488] Both types of muscles contain white medullary particles and ". . . Blood-globules. . . ."[489]

All of these muscular components were described by Hartley as possessing latent interparticulate attractive powers, "perhaps of the electrical Kind."[490] This electrical virtue may, Hartley speculated, "be the general Cause of [interparticulate] Cohesion;"[491] at any rate, it figures as "one of the principal Requisites for Contraction" in Hartley's mechanism of muscular motion.[492] The red fibers, Hartley noted, have a stronger attractive or electrical virtue than the white fibers, but the attractive virtue of the white fibers, though weaker, is more durable.[493] The attractive powers of the particles of the medullary substance, which were described earlier, are the weakest powers possessed by the three muscular components.[494]

Hartley also considered the globules of blood to possess this requisite attractive virtue. He explained,

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[487] Ibid., 41 and 97.

[488] Ibid., 24.

[489] Ibid., 88; see also ibid., 41.

[490] Ibid., 88; see also ibid., 28, 41-42, 90, 95, 97, 172.

[491] Ibid., 90.

[492] Ibid., 95.

[493] Ibid., 41 and 97.

[494] Ibid., 47.

> That the Blood-globules of Animals are electrical, may be conjectured from the Electricity of those of the Muscle-shell Fish, observed by Dr. Hales; and that the red Blood has a principal Share in muscular Contraction, is highly probable, from the red Colour of all the great Muscles of the Body, and from the Weakness of all young Animals, and of such as want a due Share of red Blood. At the same time, it appears from exanguious and transparent Animals, that pale Fibres, and colourless Fluids, have all the necessary Requisites for muscular Contraction, in certain Degrees.[495]

The ability of a muscular fiber to contract thus appears to be correlated both with the amount of attractive virtue the muscle fiber itself possesses and with the amount of blood circulating through the fiber.[496] On the basis of an ". . . Experiment of Dr. Hook's, in which he kept a Dog alive, by a mere continued Stream of fresh Air passing through the Lungs, without any such alternate Motion of the Chest as takes place in common Respiration," Hartley conjectured, "that one principal Use of the Air, which is an Electric *per se*, in Respiration, is to restore to the Blood, as it passes thro' the Lungs, that Electricity which it has lost in circulating thro' the Body. . . ."[497] The electrical attractive virtue of the muscle fibers which is requisite for contraction is thus imparted to the blood during respiration, and the blood then communicates this virtue to the muscles during its circulation through the fibers.

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[495] *Ibid.*, 88.

[496] *Ibid.*, 42 and 97.

[497] *Ibid.*, 94-95. Here Hartley referred to an experiment done by Robert Hooke (1635-1702). For a discussion of the experiment, see Richard S. Westfall, "Hooke, Robert," *Dictionary of Scientific Biography*, VI (1972), 485.

Hartley maintained a moderate degree of contraction always exists in the muscles as a by-product of the constant vibration of the medullary substance of the brain; these vibrations in the brain always affect the motory nerves to some slight degree and are therefore communicated to the muscles.[498] In keeping with his concept of the constant minute level of contraction of the muscles, Hartley accepted the prominent seventeenth-century physician and physiologist Richard Lower's (1631-1691) supposition that "the small ultimate Fibres of the Muscles . . . bend alternately to the Right and Left, as an Eel does, at exceedingly short Intervals," which Hartley believed had been substantiated by Antoni van Leeuwenhoek (1632-1723) and Stephen Hales' observations.[499]

Hartley explained the process of muscular contraction as he had explained sensation--on the basis of interparticulate attraction. He remarked,

> Dr. Pemberton conjectures, that the Cause of the Contraction of muscular Fibres is no other than the common Cause of the Cohesion of the small Particles of the muscular Fibres increased. And this seems very probable; for the Muscles are hard during Contraction, soft during Relaxation; and Hardness and Softness are evidently nothing but Variations in the Cohesion of the small Particles of Bodies.[500]

According to Hartley, the process of muscular contraction begins when

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[498]Hartley, Observations on Man, I, 92.

[499]Ibid., 89.

[500]Ibid., 89; see also ibid., 88. The Pemberton referred to here is Henry Pemberton (1694-1771), a personal friend of Sir Isaac Newton and a popularizer of the Newtonian philosophy and scientific method.

the motory vibrations descend along the motory nerves to the muscles. When the motory vibrations "arrive at the muscular Fibres, [they] are communicated to them, so that the small Particles of these Fibres shall be agitated with like Vibrations."[501] These ". . . Vibrations thus excited in the Fibres, put into Action" the latent electrical attractive virtue that exists between the particles of the muscle fibers, the white medullary particles, and the blood globules.[502] When excited to an unnatural degree, the ". . . Electricity, or other attractive Virtue"[503] shortens the muscle fibers by increasing their "Flexures," "and consequently the whole Muscle, is made shorter by this Increase of Attraction in its Particles; whilst yet their Approach to each other is so small, as that the whole Bulk of the Muscle is but little diminished. . . ."[504] As a result of this narrowing of the interparticulate ". . . Spheres of Action" during contraction, the muscle becomes hard and further vibration of its small particles becomes impossible.[505] The unusual degree of interparticulate attraction excited by the vibration then subsides, the flexures in the muscle fibers draw out to resume their original position, and "a State of Relaxation" occurs.[506] After returning to this state of relaxation, any motory ". . . Vibrations

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[501] _Ibid._, 88.

[502] _Ibid._; see also _ibid._, 41, 88, 90.

[503] _Ibid._, 97; see also _ibid._, 86, 88, 90.

[504] _Ibid._, 89.

[505] _Ibid._, 123; see also _ibid._, 90.

[506] _Ibid._, 89; see also _ibid._, 89-91.

which descend along the motory Nerves [will again] pass freely into the muscular Fibres, increase the Attractions of the Particles, and bring on the opposite State, that of Contraction; and so on alternately."[507]

The Association of Muscular Motions

In Hartley's explanation of sensation and ideation, after sufficient repetition an incoming sensory vibration leaves behind a permanent vestige of itself, that is, an ideal vibratiuncle, in the white medullary substance of the brain. Likewise, Hartley maintained that the motory vibrations which initiate muscular motion also "generate a Propensity to corresponding motory Vibratiuncles" in the medullary substance. The similarity between sensation, ideation, and muscular motion does not, however, end there, for Hartley confidently asserted, "All that has been delivered above, concerning the Derivation of ideal Vibratiuncles from sensory Vibrations, and concerning their Associations, may be fitly applied to motory Vibrations and Vibratiuncles."[508]

According to Hartley's physiological psychology, then, not only does there exist a motory vibratiuncle in the medullary substance which corresponds to every motory vibration and consequent muscular motion, but these may be associated together just as sensory and ideal vibratiuncles are. "The motory Vibratiuncles," Hartley explained, "will cohere to one another, by Associations both synchronous

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[507] *Ibid.*, 90-91.

[508] *Ibid.*, 101.

and successive" to form complex and decomplex vibratiuncles. In the same manner, "the simple Parts, of which complex and decomplex Motions are compounded, may cohere closely, and succeed readily to each other."[509]

The Law of Association

In addition to their ability to associate with one another, these motory vibratiuncles and their corresponding muscular motions are also able to associate with both sensory and ideal vibratiuncles. Hartley believed it is evident that "motory Vibratiuncles which are derived from the motory Vibrations of the Second and Third Classes" are naturally connected to the sensory vibratiuncles which produce them.[510] Motory vibrations are also connected "with sensory Vibrations, foreign to them, i. e. such as had no Share in generating the motory Vibratiuncles under Consideration;" thus, he ultimately reasoned, "Particular Motions of the Body may therefore by Association be made to depend upon Sensations, [even those] with which they have no natural and original Connexion."[511] Similarly, Hartley theorized that

> motory Vibratiuncles will also cohere to ideal ones by Association. Common Ideas may therefore excite motory Vibratiuncles, and consequently be able to contract the Muscles, provided the active Powers lodged in their Fibres and Blood-globules be sufficiently exalted for this Purpose.[512]

In Hartley's opinion, then, the apparent connections between various human sensations, ideas, and muscular motions are all

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[509] Ibid.

[510] Ibid., 101; see also ibid., 98 and 102.

[511] Ibid., 102.

[512] Ibid.

explainable in terms of vibration and association. He declared,

> As muscular Motion has Three Connexions deducible from Association, viz. [with sensations, ideas, and other muscular motions] . . . , so the Sensations and Ideas have the same Three Connexions. Hence the whole Doctrine of Association may be comprised in the following Theorem, viz.
>
> If any Sensation A, Idea B, or muscular Motion C, be associated for a sufficient Number of times with any other Sensation D, Idea E, or muscular Motion F, it will, at last, excite d, the simple Idea belonging to the Sensation D, the very Idea E, or the very muscular Motion F.[513]

Association and Individuality

As a result of his physio-psychological analysis of man, Hartley concluded that for all practical purposes man is nothing more than the product of the action of association upon sensation. He described "the Frame of the Human Body and Mind" as nothing more than "the Sum total of all our Senses" and considered the doctrines of vibration and association "to contain the Laws of the Bodily and Mental Powers respectively. . . ."[514] Any differences between the thought and behavior of one man and another are, therefore, neither natural nor innate; they are products of the mechanisms of vibration and association. Hartley allowed that any ". . . Differences [between men] are greater or less, according to the Difference, or Resemblance, in Age, Constitution, Education, Profession, Country, Age of the World, &c. i. e. in their Impressions and Associations."[515] This being the case, Hartley

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[513] Ibid.

[514] Ibid., [iii], 323, 6, respectively.

[515] Ibid., 78; see also ibid., 421 and 430.

suggested,

> If Beings of the same Nature, but whose Affections and Passions are, at present, in different Proportions to each other, be exposed for an indefinite Time to the same Impressions and Associations, all their particular Differences will, at last, be overruled, and they will become perfectly similar, or even equal. They may also be made perfectly similar, in a finite Time, by a proper Adjustment of the Impressions and Associations.[516]

Association and Man's Spiritual State

Hartley viewed man's spiritual state, as well as his mental state, to be a product of vibration and association. As was discussed earlier, he began his explanation of man's spirituality by attributing the generation of the moral sense to the mechanism of vibration and association.[517] Combining this with his concept of differentiation between men as resulting from their different impressions and associations, Hartley concluded that different men's moral and spiritual states can be explained by the doctrines of vibration and association.

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[516] Ibid., 82. Hartley's statement that men can be molded through education, that is, by conscious external regulation of their impressions and associations, along with his idea that an understanding of association allows us to analyze behavior to its components so that we can more easily correct and improve behavior (ibid., 81-82, 84, 234) exerted great influence upon republican philosophers of education in the late eighteenth and early nineteenth centuries. One educator particularly affected by Hartley's association theory was Benjamin Rush (1746-1813). Rush outlined a plan for the creation of a knowledgeable citizenry by means of the control of impressions and associations that could be accomplished through public education. See Donald J. D'Elia, "Benjamin Rush, David Hartley, and the Revolutionary Uses of Psychology," Proceedings of the American Philosophical Society, CXIV (1970), 109-118, for a discussion of Hartley's influence upon Rush.

[517] Hartley, Observations on Man, I, 497-499 and 504. Hartley's discussion of the human spiritual state is primarily to be found in Volume II of the Observations on Man.

Hartley was aware that his view of the body, mind, and soul of man as products of necessity or mechanism verged on heresy.[518] Its saving grace, however, was that Hartley envisioned the mechanisms of vibration and association propelling man towards happiness, moral and spiritual perfection, and the eventual union of every individual with God.

Hartley evaluated the present condition of human life on earth as a ". . . Mixture of Happiness and Misery, which has been our Portion ever since the Fall," yet he maintained man would not continue in this fallen state: With respect to mankind as a whole, he was certain that in future ages human misery and suffering would be eradicated.[519] Regarding individual men, he was equally confident that each man can progress towards a state of perfection and happiness even during his lifetime on earth.[520] He assured his readers "that all tends to Happiness ultimately. . . ."[521] Hartley noted, however, that "our ultimate Happiness appears to be of a spiritual, not corporeal Nature;"[522] thus he viewed man as "a Being, whose Happiness

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[518] Hartley, "Preface," Observations on Man, I, vi-viii, and Hartley, Observations on Man, I, 500-501. See Chapter II above for a fuller discussion of Hartley's dilemma over the doctrine of necessity.

[519] Hartley, Observations on Man, I, 315-316.

[520] Ibid., 466. See Margaret Leslie's article, "Mysticism Misunderstood: David Hartley and the Idea of Progress" (Journal of the History of Ideas, XXXIII (1972), 625-632; hereinafter referred to as Leslie, "Mysticism Misunderstood") for an illuminating discussion of Hartley's concept of association as the mechanism of an individual's progress from his fallen state of carnality to love of and reunion with God.

[521] Hartley, Observations on Man, I, 509.

[522] Ibid., 84.

consists in the Improvement of his Understanding and Affections."[523] In the long run, he maintained "the Love of God . . . [is] our only true Happiness."[524]

In the Observations on Man, Hartley presented association as the mechanism by means of which individual and collective man proceeds towards perfection and ultimate happiness. He described "a State of great mental Happiness, [as] ultimately deduced from all the sensible Pleasures," and he suggested "that the Mixture of Pleasures and Pains, which we now experience, will gradually tend to a Collection of pure Pleasures only, and that Association may be the Means of effecting this. . . ."[525] He illustrated the operation of the mechanism of association in propelling man towards personal happiness in the following manner:

> Let the Letters a, b, c, d, e, &c. represent the sensible Pleasures; x, y, and z, the sensible Pains, supposed to be only Three in Number; and let us suppose all these, both Pleasures and Pains, to be equal to one another: If now the Ideas of these sensible Pleasures and Pains be associated together, according to all the possible Varieties, in order to form intellectual Pleasures and Pains, it is plain, that Pleasure must prevail in all the Combinations of seven or more Letters; and also, that when the several Parts of these complex Pleasures are sufficiently united by Association, the Pains which enter their Composition will no longer be distinguished separately, but the resulting mixed and complex Pleasures appear to be pure and simple ones, equal in Quantity to the Excess of Pleasure above Pain, in each Combination. Thus Association would convert a State, in which Pleasure and Pain were both perceived by Turns, into one in which pure Pleasure alone would be perceived; at least, would cause the Beings who were under its Influence to an indefinite Degree, to approach to this last State nearer than by any

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[523] Ibid., 208.

[524] Ibid., 504.

[525] Ibid., 321; see also ibid., 84 and 315-316.

> definite Difference. Or, in other Words, Association . . . has a Tendency to reduce the State of those who have eaten of the Tree of the Knowlege of Good and Evil, back again to a paradisiacal one. Now, though the Circumstances of Mankind are not the same with those supposed in this Corollary, yet they bear a remarkable Resemblance thereto, during that Part of our Existence which is exposed to our Observation. For our sensible Pleasures are far more numerous than our sensible Pains; and tho' the Pains be, in general, greater than the Pleasures, yet the Sum total of these seems to be greater than that of those; whence the Remainder, after the Destruction of the Pains by the opposite and equal Pleasures, will be pure Pleasure.[526]

In Hartley's theory, association contributes to the perfection of man first by generating in him a sense of morality which acts to perfect man and carry him towards love of God.[527] Association also enables man to perfect himself because it gives him "a Power . . . of correcting what is amiss, and improving what is right. . . ."[528] Once men have accepted themselves and their behavior as products of the mechanism of association, Hartley contended that "we may learn how to cherish and improve good . . . [associations], check and root out such as are mischievous and immoral, and how to suit our Manner of Life, in some tolerable Measure, to our intellectual and religious Wants."[529]

This ability to engineer the formation of our associations also enables man to achieve a pure love of God, which Hartley believed is, like all other pleasures and pains except those of sensation, of a factitious nature.[530] Hartley described the action of association

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[526] _Ibid._, 82-83; see also _ibid._, 463.

[527] _Ibid._, 497.

[528] _Ibid._, 84.

[529] _Ibid._, 81.

[530] _Ibid._, 489-490 and 497.

in propelling man towards love of and union with God as follows:

> It does indeed appear . . . that as we advance in Perfection, the Associations relating to the one only, ultimate, infinite Cause, must at last overpower all the rest; that we shall pay no Regards but to God alone; and that all Resentment, Demerit, Sin, and Misery, will be utterly annihilated and absorbed by his infinite Happiness and Perfections.[531]

Moreover,

> Since God is the Source of all Good, and consequently must at last appear to be so, *i. e.* be associated with all our Pleasures, it seems to follow . . . that the Idea of God, and of the Ways by which his Goodness and Happiness are made manifest, must, at last, take place of, and absorb all other Ideas, and He *him*self become, according to the Language of the Scriptures, *All in All*.[532]

In the first volume of his *Observations on Man*, Hartley presented to the public a series of propositions and deductions, as well as proofs from experience and by analogy, which provided a foundation for the expression of his general psychological theory of association. According to this theory, all human sensation, ideation, muscular motion, moral codes, present spiritual condition, and progress towards spiritual perfection and union with God is a result of the mechanisms of physical vibration and mental association. Hartley thus stands as a "radical mechanist," in the sense that he has subjected both body and mind to the rule of law.[533]

Hartley was aware this was a somewhat novel approach to the study of the human mind and human behavior, but he believed it was potentially a fruitful one. It was not, however, until the late

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[531] *Ibid.*, 506-507.

[532] *Ibid.*, 114.

[533] See King, "Stahl and Hoffmann," 130.

eighteenth and early nineteenth centuries that other philosophers, such as James Mill (1773-1836), became convinced of the usefulness of the psychology of association.[534] It has been suggested that the acceptance of the theory was at least partially delayed because of the trappings of "Newtonian" physical science it so gaudily displayed.[535] In the next chapter, the "Newtonian" elements of Hartley's theory of association psychology will be identified and the origins of its "Newtonianism" will be explored.

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[534]See Huguelet, "Introduction," xii-xiii; Barbara Bowen Oberg, "David Hartley and the Association of Ideas," Journal of the History of Ideas, XXXVII (1976), 441, note 2; Young, "Hartley," 139-140.

[535]See Leslie, "Mysticism Misunderstood," 627; Young, "Hartley," 140; Huguelet, "Introduction," xii. This suggestion is supported by Joseph Priestley's comment in 1775 that Hartley's book "could not have failed to have been more generally read, and his theory of the human mind to have prevailed, if the work had not been clogged with a whole system of moral and religious knowledge . . . foreign to it," along with his observation that Hartley's theory had been objected to "as difficult and intricate" because of the doctrine of vibration and its physiological basis (Joseph Priestley, "The Preface," Hartley's Theory of the Human Mind, on the Principle of the Association of Ideas . . . (London: n. p., 1775), [iii]). For a brief discussion of Priestley's edition of Hartley's work, see Ronald B. Hatch, "Joseph Priestley: An Addition to Hartley's Observations," Journal of the History of Ideas, XXXVI (1975), 548-550.

CHAPTER IV

THE "NEWTONIANISM" OF THE OBSERVATIONS ON MAN

As was noted in the Introduction above, David Hartley has been described as "perhaps the most inventive and certainly . . . the most influential psychologist of the eighteenth century. . . ."[1] This evaluation of Hartley's work is justified partially on the grounds that Hartley extended and systematized Locke and Gay's concept of association to account for all human thought and behavior.[2] Such an assessment of Hartley's significance is also based upon the popular view of him as one of the earliest philosophers to employ the methods and concepts of contemporary natural philosophy in his explanation of the human mind.[3] The latter accomplishment is of particular interest to the historian of science and forms the subject of this chapter.

Hartley's Application of Natural Philosophy to Psychology

There is general agreement in the secondary literature that

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[1] Gay, Enlightenment, 181.

[2] See Chapter III above for an analysis of Hartley's reduction of human thought and behavior to sensation and association.

[3] See the Introduction, 3-4, above for a general discussion of the tradition, essentially begun by John Locke, which Hartley was following.

Hartley's Observations on Man is "the central document in the history of attempts to apply the categories of science . . . to the study of man and society."[4] As was noted in Chapter III above, Hartley considered psychology a branch of natural philosophy; consequently, he incorporated the concepts and applied the methods of the specific type of natural philosophy he accepted to his study of the mind.

Although the theory elaborated in the Observations on Man has been variously described as Baconian, Cartesian, and/or Lockean in nature, psychologists and historians of psychology have agreed that Hartley also transferred the concepts and methods of "Newtonian" natural philosophy to his study of mind.[5] To date, however, no extensive study of the "Newtonian" aspects of Hartley's work has been presented, and no clear idea as to the "Newtonianism" of his theory can be gleaned from the numerous existing allusions to and brief treatments of his application of "Newtonian" natural philosophy. Although historians often loosely apply the word "Newtonian" without serious ill-effects, discussions of Hartley's work have been rendered at best uninformative, frequently unclear, and at worst misleading by this practice.[6]

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[4] Robert M. Young, "Hartley, David," Dictionary of Scientific Biography, VI (1972), 139; hereinafter referred to as Young, "Hartley."

[5] See the Introduction, 13-16, above for an enumeration of many concepts and methods in Hartley's work that have been labelled "Newtonian" by previous writers.

[6] Although R. B. MacLeod ("Newtonian and Darwinian Conceptions of Man; and Some Alternatives," Journal of the History of the Behavioral Sciences, VI (1970), 207-209; hereinafter referred to as MacLeod, "Conceptions of Man") has achieved clarity in his discussion of the "Newtonian conception of man" by differentiating Newton's thought from that of his followers, the meaning of the term Newtonian varies from work to work and even within discussions of Hartley's theory. See for instance the ambiguous use of the term Newtonian in Oberg, "Progress Toward Perfection,"

In order to move towards a better understanding of the dependence of Hartley's psychological theory upon contemporary natural philosophy and the historical relationship between the development of psychology and natural philosophy in general, this chapter will attempt to improve upon existing discussions by (1) identifying more precisely the "Newtonian" characteristics of Hartley's Observations on Man and (2) pinpointing their origins in "Newtonian" natural philosophy.

"Newtonian" Natural Philosophy

An immediate advance can be made over current secondary literature by distinguishing possible meanings of the word Newtonian and then maintaining this distinction throughout the examination of Hartley's work. On a very basic level, Newtonian can signify either

(1) the philosophy of Newton,

(2) the philosophy of Newton's followers, or

(3) the philosophy of Newton and/or his followers.[7]

17, 19, 23, 25-27, 41; Bower, Hartley and Mill, 28; Huguelet, "Introduction," xv; Kantor, Evolution of Psychology, II, 220; Walls, "Mechanism," 146 and 149; Corinna Delkeskamp, "Medicine, Science, and Moral Philosophy: David Hartley's Attempt at Reconciliation," The Journal of Medicine and Philosophy, II (1977), 162-164, 166, 168; Theodore Mischel, "'Emotion' and 'Motivation' in the Development of English Psychology: D. Hartley, James Mill, A. Bain," Journal of the History of the Behavioral Sciences, II (1966), 126 and 126 note 11 (hereinafter referred to as Mischel, "Emotion and Motivation").

[7]By citing only Newton's works as sources of the "Newtonian" concepts and methods of Hartley's work, previous historians have implied that the word Newtonian, when applied to Hartley, refers only to the philosophy of Newton himself (see, for example: Oberg, "Progress Toward Perfection," 17-46; Bower, Hartley and Mill, 27-29; Kantor, Evolution of Psychology, II, 219-220; Lewes, History of Philosophy, II, 605; Watson, Great Psychologists, 201; Kallich, "Introduction," iv-v, vii, xiv-xv, xiv note 11; Young, "Hartley," 139; Benjamin Rand, "The Early Development of Hartley's Doctrine of Association," Psychological Review, XXX (1923), 312-313, 315, 317 (hereinafter referred to as Rand, "Development"). Only

Before examining the "Newtonianism" of Hartley's Observations on Man and its origins, it will perhaps be beneficial to clarify the distinctions between these terms by reviewing the major characteristics of Newton's philosophy, as well as that of his Newtonian followers.

Newton's Ideal Scientific Method

Although Newton's works exhibit several methods of approach and proof and although his own methodological rules and advice occasionally stand in contrast to the methods he actually employed,[8] a composite of Newton's remarks on the proper methodology of natural philosophy in the Principia and the Opticks yields the following ideal, suggested method of investigation, proof, and presentation available to his readers.

Paralleling the operation of analysis in mathematics, natural philosophy ideally begins with experiment and observation of the particular phenomena of nature. From these are inferred particular propositions,

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Mischel ("Emotion and Motivation," 125) has noted Stephen Hales as one other source of Hartley's "Newtonianism." It is therefore historically unacceptable to treat Hartley's "Newtonianism" as if it sprang from his reading of Newton alone, for many of the works Hartley was exposed to and the men with whom he was in personal contact accepted, praised, and elaborated the philosophy of Newton. Distinguishing between the philosophy of Newton (denoted herein by the word Newton's), the philosophy of Newton's followers (denoted by the term Newtonian), and the philosophy of Newton and/or his followers, where it was the same or has not at the present time been differentiated (denoted by "Newtonian"), will improve the present understanding of the historical connections between natural philosophy, particularly the physical sciences, and the development of psychology.

[8] I. Bernard Cohen, Franklin and Newton: An Inquiry into Speculative Newtonian Experimental Science and Franklin's Work in Electricity as an Example Thereof, Memoirs of the American Philosophical Society, XLIII (Philadelphia: The American Philosophical Society, 1956), 16-17 (hereinafter referred to as Cohen, Franklin and Newton); I. Bernard Cohen, "Newton, Isaac," Dictionary of Scientific Biography, X (1974), 68 (hereinafter referred to as Cohen, "Newton").

then generalized by induction and without reliance upon hypotheses.[9] These generalized propositions are then to be compared against ". . . Experiments or other certain Truths."[10] "And if no Exception occur from Phaenomena, the Conclusion may be pronounced generally," and called a general Principle" or law of nature.[11] This law of nature is then to be considered "accurately or very nearly true, notwithstanding any contrary hypotheses that may be imagined, till such time as other phaenomena occur, by which . . . [it] may either be made more accurate,"[12] or "be pronounced with such Exceptions as occur."[13]

Newton maintained the next step in "the Business of experimental Philosophy" is to "enquire the Cause" or "Agent" of the general Principle, again by induction from experiment and observation:[14] "By this way of Analysis we may proceed from Compounds to Ingredients, and from Motions to Forces producing them; and in general, from Effects to their Causes, and from particular Causes to more general ones, till the Argument end

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[9]See "Query 31," Isaac Newton, Opticks: or, a Treatise of the Reflections, Refractions, Inflections, and Colours of Light (2nd ed., with additions; London: Printed for W. and J. Innys . . . , 1718), 351 and 380 (this edition of this work hereinafter referred to as Newton, Opticks); "Query 28," Newton, Opticks, 244; "Rule IV," Isaac Newton, The Mathematical Principles of Natural Philosophy . . . Translated into English by Andrew Motte . . . In Two Volumes (London: Printed for Benjamin Motte . . . , 1729), II, 205 (this edition of this work hereinafter referred to as Newton, Principia); "General Scholium," Newton, Principia, II, 392.

[10]"Query 31," Newton, Opticks, 380.

[11]Ibid., 380 and 388, respectively.

[12]"Rule IV," Newton, Principia, II, 205.

[13]"Query 31," Newton, Opticks, 380.

[14]Ibid., 351 and 369.

in the most general."[15] And so the process of analytical investigation by observation and experiment and the formation of general principles by induction continues.

Although, according to Newton, argument by induction is not a ". . . Demonstration of general Conclusions," it remains "the best way of arguing which the Nature of Things admits of, and may be looked upon as so much the stronger, by how much the Induction is more general."[16]

On the whole, then, Newton explained,

> the main Business of natural Philosophy is to argue from Phaenomena . . . and to deduce Causes from Effects, till we come to the very first Cause, . . . ; and not only to unfold the Mechanism of the World, but chiefly to resolve these and such like Questions. . . . How do the Motions of the [illegible]dy follow from the Will. . . ? Is not the Sensory of Animals that place to which the sensitive Substance is present, and into which the sensible Species of Things are carried through the Nerves and Brain, that there they may be perceived by their immediate presence to that Substance? . . . . Of which things the Images only carried through the Organs of Sense into our little Sensoriums, are there seen and beheld by that which in us perceives and thinks. And tho' every true Step made in this Philosophy brings us not immediately to the Knowledge of the first Cause, yet it brings us nearer to it, and on that account is to be highly valued.[17]

But should this be impossible, Newton declared that just

> to derive two or three general Principles . . . from Phaenomena, and afterwards to tell us how the Properties and Actions of all corporeal Things follow from those manifest Principles, would be a very great step in Philosophy, though the Causes of those Principles were not yet known.[18]

That is, even if the analysis is not complete, it will ideally be followed by synthesis, which "consists in assuming the Causes discover'd, and

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[15] Ibid., 380.

[16] Ibid.

[17] "Query 28," Newton, Opticks, 344-345.

[18] "Query 31," Newton, Opticks, 377.

established as Principles, and then explaining the Phaenomena proceeding from them, and proving the Explanations."[19]

Thus, the complete methodology of natural philosophy recommended by Newton involves, first, discovery of general principles by analysis and induction from phenomena and observation, secondly, verification of the principles by comparison with phenomena, observations, and other general principles, and finally, a description of the phenomena as proceeding from the general principles, arranged synthetically and proven deductively. It is, however, common knowledge that neither Newton's *Principia* nor his *Opticks* exemplifies this ideal method of natural philosophy in its totality.

The Method and Content of the PRINCIPIA

The *Principia* does approach the ideal described above, not so much in terms of investigation but in terms of arrangement and demonstration instead. The *Principia* begins with a series of definitions and axioms or laws of motion, and from these Newton logically deduced the propositions contained in Books I, II, and III. Thus the *Principia* does not illustrate analysis or induction from phenomena, except in the sense that Newton described his initial definitions, such as "Definition V" of the term *centripetal force*, and axioms themselves as general principles arrived at by induction from phenomena and consistent with observation. On the whole, however, the observations and phenomena from which Newton generalized these definitions and axioms are themselves idealized experiments and observations.[20]

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[19] *Ibid.*, 380-381; see also "The Author's Preface," Newton, *Principia*, I, n.p.

[20] See "Definition V," Newton, *Principia*, I, 4; "Definition I,"

After presenting these initial definitions and axioms, however, Newton even further departed from a consideration of the physical world. Newton informed his readers that he would lay "aside all physical considerations" in his study of bodies and forces in the Principia and instead make use of the language of mathematics as well as its method of demonstration.[21] His object was not to study the physical characteristics of bodies, nor "the species or physical qualities of forces, but . . . the quantities and mathematical proportions of them. . . ."[22] Thus in the Principia, Newton treated bodies as "point masses" or as masses devoid of any material characteristics other than quantity of matter, motion, and position.[23]

According to Newton's ideal methodology, after the principles have been derived from phenomena and generalized by induction, they should be compared with phenomena, observations, and other general principles before being pronounced generally true. In the Principia, Newton followed this precept, frequently referring to physical experiments which

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Newton, Principia, I, 2. According to Cohen ("Newton," 77) and Paul K. Feyerabend ("Classical Empiricism," in Robert E. Butts and John W. Davis, eds., The Methodological Heritage of Newton (Toronto: University of Toronto Press, 1970), 163-164 (article hereinafter referred to as Feyerabend, "Classical Empiricism"; anthology hereinafter referred to as Butts and Davis, Methodological Heritage)), in Book III of the Principia, the "phenomena" are quite idealized: They are laws which have been proven earlier in the work. For a more detailed discussion of Newton's use of analysis in the Principia, see the above articles, as well as Cohen, Franklin and Newton, 137-138.

[21]Newton, Principia, I, 219; see also ibid., II, 79.

[22]Ibid., I, 262. See also Cohen, Franklin and Newton, 115-118.

[23]See Cohen, Franklin and Newton, 115-118.

substantiate the result of his mathematical demonstration. He also compared his results with other generally accepted theorems.[24]

In the *Principia*, Newton hoped that natural philosophers would extend their analyses beyond the formation of a general principle, although he was unable, particularly in the case of gravity, to illustrate the process. Instead, he provided an example of a synthetic demonstration of phenomena, "in the form of propositions (in the mathematical way)," from the point at which the analysis had ended.[25]

Beginning as it does with references to previously undertaken analysis and induction from "phenomena," followed by a comparison of the propositions with observation and experiment, and ending with the explanation of phenomena of the "System of the World" in terms of a series of mathematically demonstrated propositions, the *Principia* approaches a complete and finished, ideal work of natural philosophy.[26]

The Method and Content of the OPTICKS

It is generally agreed that the *Opticks*, on the other hand, hardly ends the analysis to begin the synthesis. In contrast to the *Principia*, the *Opticks* is not a presentation of the results of an investigation of natural phenomena; it is rather a presentation of an investigation-in-progress. The method of analysis is more evident in the *Opticks* than in the *Principia*. Whereas in the *Principia* observations are rather idealized and are concerned with the mathematical properties of bodies

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[24] See, for instance, Newton, *Principia*, II, 34 and 95-110; also see Cohen, *Franklin and Newton*, 121.

[25] Newton, *Principia*, II, 201; see also *ibid.*, 34 and 200-201, and the "General Scholium," Newton, *Principia*, 392.

[26] Cohen, *Franklin and Newton*, 184.

in nature, the Opticks contains observations of a more empirical nature, and these observations encompass a wider range of properties.

On the whole, the Opticks is an exploration of the actual physical properties of matter rather than the abstract mathematical properties considered in the Principia. Since Newton believed that the optical properties and characteristics of bodies, such as color, provided a key to unlock the knowledge of their physical properties and characteristics, he focused primarily upon the optical properties in the Opticks. Observations are also made of the electrical, thermal, thermo-chemical, mechanical, and general chemical properties of the matter of which the bodies are composed as well. All in all, the Opticks stands as a more physical, observationally- and experimentally-oriented work than the Principia.[27]

In the Opticks, Newton inferred particular propositions from his observations, experiments, and analogies, rendered them general by induction, and, following his own advice on method, compared them against experiment and observation before pronouncing them generally true.[28] He also directly challenged his readers to repeat and improve his experiments

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[27] See Newton, Opticks, 207 and 230, for Newton's comments about the potential usefulness of an understanding of the optical properties of bodies. For an example of the basic observational and empirical nature of the Opticks and of the physical and mathematical generalizations which Newton based upon these observations, see ibid., 168-218. Also see Cohen, Franklin and Newton, 115, 118, 120, 162, for a discussion of the more empirical nature of the Opticks as compared to the Principia.

[28] See Newton, Opticks, 219-220, 226, 272, 282, 268, for examples of inference by analogy. According to Newton, experiments manifest the conclusions drawn by mathematical reasoning (ibid., 214); see ibid., 74, for an example of an experiment contrived by Newton to test the truth of a mathematical generalization. Also see Cohen, "Newton," 55-56.

in order to confirm his conclusions themselves.[29]

According to Newton's ideal method of investigation in natural philosophy, after a general principle is thus arrived at, an attempt should be made to continue the analysis by inquiring into the cause or agent of the principle. Whereas Newton did not undertake further analysis in the Principia, this phase of investigation is particularly evident in the Opticks--in fact this accounts for its speculative nature. "In the two first Books of these Opticks," Newton commented,

> I proceeded by this [method of] Analysis to discover and prove the original Differences of the Rays of Light in respect of Refrangibility, Reflexibility, and Colour, and their alternate Fits of easy Reflexion and easy Transmission, and the Properties of Bodies, both opake and pellucid, on which their Reflexions and Colours depend.[30]

In Book III, Newton intended to continue his analysis of the causes of optical phenomena, but after the eleventh observation "on the Inflexions of the Rays of Light, and the Colours made thereby," he admitted he had been interrupted.[31] "In this third Book," he confessed, I have only begun the Analysis of what remains to be discover'd about Light and its Effects upon the Frame of Nature. . . ."[32] Since he could not "now think of taking these things into farther consideration" and although his optical studies remained unfinished as published, Newton concluded "with proposing some Queries,"[33] some ". . . Hints to be examin'd and improved

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[29] See Newton, Opticks, 82, for example.

[30] "Query 31," Newton, Opticks, 381.

[31] Newton, Opticks, 292.

[32] "Query 31," Newton, Opticks, 381.

[33] Newton, Opticks, 313.

by the farther Experiments and Observations of such as are inquisitive."[34] In the "Queries," then, Newton presented his well-known and very influential speculations concerning the material and immaterial causes of optical phenomena, human sensation, the conduction of heat, animal motion, and other natural phenomena. Although he pointed to small particles of matter, their interparticulate forces, and the action of the aether as the possible causes of these various natural phenomena, the "Queries" stand as examples of incomplete analyses into the properties of light and matter.[35]

It is at this stage that the Opticks ends. While in the Principia Newton followed analysis with synthesis, as he believed should ultimately be done in the investigation of natural phenomena, the Opticks ends abruptly in the process of analysis. Having discovered some general principles of the phenomena of light and colors, which he acknowledged "may be assumed in the Method of Composition for explaining the Phaenomena arising from them," but not having completed the analysis, Newton was unable to demonstrate the phenomena of light and colors synthetically by deduction from first principles in the Opticks.[36]

Newtonian Methodological Traditions

Generally speaking there were two separate Newtonian methodological traditions which flourished side-by-side during the course of the

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[34] "Query 31," Newton, Opticks, 381.

[35] See Cohen, Franklin and Newton, 192, for a general discussion of the "Queries."

[36] "Query 31," Newton, Opticks, 381; here Newton also emphasized the necessity of synthesis and referred his readers to an example of it in the first book of the Opticks.

eighteenth century: a "mathematico-deductive" tradition derived from Newton's Principia and a "speculative-experimental" tradition which received its major inspiration from Newton's Opticks. On the whole, eighteenth-century natural philosophers worked solely within only one of the two traditions. Rarely were works produced exhibiting a combination of the two approaches, and, indeed, there was a certain hostility between followers of the separate methodologies.[37]

It is common knowledge that in the eighteenth century natural philosophers and other intellectuals as well formed an image of Newton as a great observer, experimenter, and direct investigator of nature based upon their reading of his Opticks. The Opticks thus established an "experimental" attitude towards nature, the Opticks became the focal work, and the experimental approach flourished among Newtonian natural philosophers. Natural philosophers in the experimental tradition, such as Boerhaave and Hales, emphasized observation, experiment, the collection of facts and accumulation of data, and the discovery of new phenomena. They approved of speculation, query, and hypothesis when it promised to lead to new experiments, new laws, or new theories, as it had in Newton's Opticks. Axioms were not, however, to be speculative in nature; they were to be derived experimentally or based upon appeal to observation or general agreement of natural philosophers. These philosophers believed even Newton's inverse-square law had been a product of induction; consequently, they maintained their own laws must be inductively derived as well. Their new

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[37]Cohen, Franklin and Newton, 17-19, 152-156, 178-179; Schofield, Mechanism and Materialism, 94; Gerd Buchdahl, The Image of Newton and Locke in the Age of Reason, Newman History and Philosophy of Science Series (London: Sheed and Ward, 1961), 19 (hereinafter referred to as Buchdahl, Newton and Locke).

laws were not to be proven by deduction from first principles, particularly a priori ones, but by experience and experiment, as Newton had proceeded in the Opticks. It was understood that synthesis and systematization was to follow, but in the speculative-experimental tradition emphasis was placed upon analysis and investigation.

Natural philosophers in this tradition followed Newton's "Queries" into realms of study as diverse as chemistry, physiology, heat, electricity, magnetism, and psychology. In the physical sciences, they investigated the size, mass, state of motion, electrical properties, thermal properties, thermo-chemical properties, chemical properties, optical properties, and mechanical properties of bodies. The last six topics of investigation were studied by Newton in the Opticks and, as a result, they also formed the major topics investigated by natural philosophers in the speculative-experimental tradition during the eighteenth century.

At the basis of these investigations lay Newton's dynamic corpuscularity and, later in the century, his aetherial medium. By mid-century experimental natural philosophy was much more popular than the separate mathematico-deductive tradition of Newtonian natural philosophy. Indeed, the term "Newtonian natural philosophy" was generally understood to refer to experimental, corpuscular natural philosophy.[38]

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[38]Buchdahl, Newton and Locke, 12-16 and 25; Cohen, Franklin and Newton, 7, 15, 17-18, 68, 115, 118-121, 125, 139, 140-141, 145, 154-156, 179, 181; Cohen, "Newton," 55-56; Schofield, Mechanism and Materialism, 94; Arnold Thackray, Atoms and Powers: An Essay on Newtonian Matter-Theory and the Development of Chemistry, Harvard Monographs in the History of Science (Cambridge, Massachusetts: Harvard University Press, 1970), 125, 137-138, 141, 141 note 26 (hereinafter

In the mathematico-deductive Newtonian tradition, on the other hand, the focus was not upon the physical properties of bodies and their causal mechanisms. Instead, natural philosophers in this tradition undertook an abstract treatment of bodies, their motions, and the forces between them, emulating Newton's Principia, rather than his Opticks. They sought to express the mathematical principles of nature, that is, the laws of motions and forces that followed from certain postulated conditions. These mathematico-deductive Newtonian natural philosophers then sought to present these laws in a systematic form in which they were derived by deduction from first principles, since they believed that by so doing they could bestow the certainty of mathematics upon them. This Newtonian methodological tradition was not as popular among eighteenth-century natural philosophers as was the experimental one, but outside the realm of natural philosophy philosophers in the century of the Enlightenment frequently, overtly, and fruitfully applied the mathematico-deductive methodology to other fields, such as politics and theology.[39]

Hartley's "Newtonian" Method

It is commonly acknowledged that enthusiasm for the application of the "Newtonian" method was very great in the eighteenth century,

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referred to as Thackray, Atoms and Powers); Gerd Buchdahl, "Gravity and Intelligibility: Newton to Kant," in Butts and Davis, Methodological Heritage, 76 and 80.

[39]Cohen, Franklin and Newton, 17-18, 115-118, 120-121, 127-128, 152, 179; Buchdahl, Newton and Locke, 4-5, 14, 19; Thackray, Atoms and Powers, 5 and 124-125; L. L. Laudan, "Thomas Reid and the Newtonian Turn of British Methodological Thought," in Butts and Davis, Methodological Heritage, 103-105 and 103 note 2.

and the majority of psychologists and historians of psychology have depicted Hartley as having proceeded according to "Newtonian" methods in his study of the human body, mind, and behavior.[40] His methodology has specifically been characterized as "classic empirical," "scientific, empirical," "scientific or analytical," "reductionist," "physical," "observational," "experimental," and "inductive." It has also been described as "abstract," "classically rationalist," "deductive," "mathematical," "geometrical," "quantitative," and "mechanical."[41] Popular accounts also describe Hartley as having employed Newton's scientific methods,[42] "the method of analysis and synthesis followed by Newton,"[43] as well as Newton's geometrical method of presentation by means of propositions, corollaries, and scholia.[44]

These descriptions of Hartley's "Newtonian" methodology do not provide a view of the historical relationship between Hartley's

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[40] Oberg, "Progress Toward Perfection," 5, 12, 17, 19, 26-32, 41, 45; Walls, "Mechanism," 149-150; Brett, History of Psychology, 439; Barbara Bowen Oberg, "David Hartley and the Association of Ideas," Journal of the History of Ideas, XXXVII (1976), 447 (hereinafter referred to as Oberg, "Hartley and Association"). MacLeod ("Conceptions of Man," 209-217) has discussed the general application of "Newtonian" methodology to psychology in the eighteenth-century, although he has not specifically referred to Hartley's work.

[41] For specific individual source citations, see Introduction, 15-16, above.

[42] Oberg, "Hartley and Association," 442.

[43] Émile Bréhier, The History of Philosophy, Vol. V: The Eighteenth Century, trans. by Wade Baskin (Chicago: University of Chicago Press, 1967), 89; see also Rand, "Development," 315.

[44] Kallich, "Introduction," v; Rand, "Development," 315.

method, Newton's method, and that of Newton's followers. In the following pages an attempt will be made to develop a clearer picture of Hartley's "Newtonian" methodology and its historical sources. This can be accomplished by comparing and contrasting Hartley's method and approach with Newton's ideal method and the two Newtonian methodological traditions described above, by heeding Hartley's own comments on methodology and sources, and by identifying other sources as well.

Hartley was well aware that Newton had recommended analysis as the first step in the "proper Method of Philosophizing," and he agreed that analysis must precede synthesis in any philosophical endeavour.[45] Hartley described the proper method as one moving by either induction or analogy from phaenomena to the discovery and establishment of general laws or, as he termed them, "genuine Truths." This was to be followed by the explanation of other phenomena on the basis of these laws. Hartley was convinced that this method of analysis and synthesis had not only been recommended but also followed by Sir Isaac Newton in his own investigations.[46]

In "Query 31," Newton had implied that the method of analysis followed by synthesis would benefit studies outside natural philosophy, particularly that of "moral Philosophy. . . ."[47] Thus spurred by both Newton's suggestion and the contemporary Newtonian application

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[45] Hartley, Observations on Man, I, 6; see also Chapter III, 198, above.

[46] Hartley, Observations on Man, I, 346; see also ibid., 6, and Chapter III, 101-102, above. Oberg ("Hartley and Association," 447) implied Hartley's admiration for the method of discovering and establishing laws in natural philosophy was "Newtonian" in origin, but Hartley believed the source was Newton himself.

[47] Newton, Opticks, 381.

of the analytical method to the study of mind,[48] Hartley applied the process of analysis to his examination of human sensation, thought, muscular motion, and spiritual state.[49]

Even though the first step in the ideal method of philosophizing recommended by Newton is that of analysis by means of observation and experiment, the Observations on Man itself does not begin with a series of observations or experiments. Nor does it begin with either the induction of particular propositions from phenomena or the generalization of previously-induced particular propositions by induction from phenomena--the second and third steps in the ideal method of natural philosophy suggested by Newton's works. Instead, the Observations on Man begins with a series of definitions on which to base the argument of the rest of the work, and throughout the work Hartley consciously proceeded from the "known" to the "unknown" in a synthetic, deductive manner.[50] In the style of the Principia, the Observations on Man follows a synthetic, deductive arrangement. It displays the product and proof, rather than the process of Hartley's investigation.

This is not to say, however, that Hartley did not undertake any analysis, but that his work begins by assuming as hypotheses a set of propositions arrived at by two earlier investigators.[51] Hartley

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[48]As was noted in the Introduction above, MacLeod ("Conceptions of Man") credited Locke with having first been stimulated by Newton to approach mind analytically.

[49]See Hartley, Observations on Man, I, 71, for an explicit example of Hartley's application of both analysis and synthesis to human thought and behavior.

[50]See Chapter III, 101-102, above.

[51]For Hartley's comments on the place and usefulness of hypotheses in natural philosophy, see Hartley, Observations on Man, I, 346-347.

informed his readers that he had taken his first hypothesis, the doctrine of vibration, "from the Hints concerning the Performance of Sensation which Sir Isaac Newton has given at the End of his Principia, and the Questions annexed to his Optics" and his second hypothesis, the doctrine of association, "from . . . Mr. Locke, and other ingenious Persons. . . ."[52]

As was discussed in Chapter III above, Hartley considered the doctrine of vibration to be somewhat conjectural in nature and occasionally referred to it as the "Hypothesis of Vibration."[53] Yet its origin in Newton's Principia led Hartley to accept it as at least a highly useful hypothesis, if not a certain one. As in the fourth step of the method suggested by Newton's works, Hartley then compared the doctrine of vibration against experiment and other "truths," for example, against the phenomena of sensible pleasure and pain, and found it to be consistent.[54] And, on the whole, Hartley maintained that until some inconsistency between phenomena and the doctrine of vibration appeared, the doctrine of vibration, or any other useful hypothesis, could be used to explain, account for, and organize phenomena, even if there was no direct observational evidence of its truth. Thus he supposed or postulated as the basis of his theory that

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[52]Ibid., 5. According to a catalogue of books purported to be of Hartley's personal library (Hartley-Russell Collection MSS, D/EHy F-55), Hartley owned a copy of the 1713, "1723 . . . (Amsterdam)," 1726, and "1739 . . . (Geneva)" editions of Newton's Principia, a copy of a "1728 System of the World," and copies of the 1704, 1721, and 1728 editions of Newton's Opticks, as well as a copy of "Newton's Optical Lectures (London, 1728)." It thus appears Hartley was quite familiar with Newton's natural philosophy as presented in both the Principia and the Opticks.

[53]Hartley, Observations on Man, I, 30.

[54]See Chapter III, 194-199, above.

vibrations in the medullary substance give rise to sensation.[55]

With respect to the doctrine of association, however, Hartley felt no hesitancy to immediately affirm its truth. He believed it could be arrived at by induction and therefore should be considered certain.[56]

The next step in the ideal methodology advocated by Newton would be to attempt to analyze these two general principles further, that is to seek the causes of vibration and association. But Newton in the "General Scholium" to the *Principia* and the "Queries" of the *Opticks* had already analyzed or reduced, to Hartley's satisfaction, the doctrine of vibration to the particulate nature of the nerves, brain, and muscles, their powers of attraction and repulsion, and their interaction with the aetherial medium.[57] Beyond this point, Hartley continued the analysis in two ways, one deriving from the speculative-experimental Newtonian tradition and Newton's *Opticks* and the other deriving from the mathematico-deductive tradition based upon Newton's *Principia*.

In the first, Hartley followed the speculative-experimental method of Newton's *Opticks* in his further analysis of the physiological aspects of the doctrine of vibration. In his examination of vibration, Hartley paid particular attention to the physical properties

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[55]See Chapter III, 167-168, above.

[56]Hartley, *Observations on Man*, I, 15-16, 34-45, 71-72, 111, 383; see also Chapter III, 186, above.

[57]See Newton, *Principia*, II, 393.

upon which Newton had focused his attention in the Opticks: Hartley focused upon the optical, electrical, thermal, thermo-chemical, mechanical, and general chemical properties of the parts of the body involved in vibration, sensation, and muscular motion.[58]

Also within the speculative-experimental Newtonian tradition is Hartley's attempt, for instance, to further analyze the physical force of cohesion by speculating that electricity "may therefore be the general Cause of Cohesion. . . ."[59]

Hartley frequently employed the speculative method of Newton's "Queries," as, for example, when he closed a discussion of the location of the sensorium in the body by declaring, "I only hint these things, not presuming even to conjecture, but only to excite those who have proper Opportunities, to inquire carefully into these Matters."[60]

Like Newton and especially Newtonians of the mathematico-deductive tradition, Hartley stressed the importance of the mathematicization of nature. Since Hartley considered natural philosophy itself to consist in the application of mathematics to natural phenomena and since he included psychology as a part of natural philosophy, he consciously strove to apply mathematical reasoning and techniques to his study of mind.[61] In natural philosophy, medicine, and "the Analysis of

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[58] See Chapter III and Chapter IV, 229, above.

[59] Hartley, Observations on Man, I, 90.

[60] Ibid., 32. Hartley often adopted the speculative query form of presentation. For another example, see ibid., 181-182.

[61] See Chapter III, 113-115, above. For his opinion of the potential usefulness of mathematics, see Hartley, Observations on Man, I, 351.

Mind, &c. it is necessary to inquire . . . upon how many . . . Causes each Effect depends; also, whether the Ratios be simple or compound, direct or inverse."[62]

Lest it escape the attention of his readers, in one instance he specifically brought an analogy between his method and mathematical methods of reasoning to their attention.[63] In other cases however, Hartley's application of mathematics was more direct, as, for example, when he sought to mathematicize his study of different sensations by considering the vibrations of the nerves, brain, and muscles as analogous to vibrations of musical strings or waves of light. Hartley divided them into different kinds or frequencies and then applied to them the mathematical techniques of wave analysis illustrated by Newton in the *Opticks*.[64]

Hartley's mathematical analysis of the place, direction, and degree of vibration in the medullary substance derives from the techniques of force analysis displayed by Newton in the *Principia*: In his attempt to describe the complex vibration of a particular area of the medullary substance, Hartley treated the incoming vibrations affecting the area as if they were forces acting between two particles (the other particle being analogous to the point of entry of the vibration into the medullary substance). Hartley consequently invoked the inverse-square law, utilized by Newton to measure the force of gravitation and attraction between two bodies and extended by his followers to measure forces

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[62] Hartley, *Observations on Man*, I, 351.

[63] *Ibid.*, 15-16.

[64] See *ibid.*, 41-42.

in other fields of physical science, to describe the degree of motion produced by the incoming vibrations.[65]

Hartley furthermore relied upon his quantitative analysis of the degree of vibration in the medullary substance to differentiate between the qualitative perception of pleasure and pain.[66] In his explanation of pleasure and pain, he relied as well upon an analogy with positive and negative numbers.[67]

Another case of Hartley's desire to mathematicize his study of vibration is more algebraic than arithmetic in nature. By representing an initial sensory vibration by an algebraic symbol such as A and its corresponding remaining vibratiuncle by a, Hartley was able to symbolically portray the quantitative difference between the vibrations A and a, as well as to move towards an algebraic representation of the compound or complex qualitative state of vibration of a particular area of the medullary substance, such as in his description of a state of vibration a modified by b. Moreover, this algebraic symbolization of vibration enabled him to analyze algebraically, for example, the compound state of vibration a modified by b, and its corresponding vibratiuncle ab, into its simple causal elements a and b,[68] very much as Newton had done with motion and the directional forces producing it in the *Principia*.

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[65]See Chapter III, 175, above.

[66]See Chapter III, 169-171, above.

[67]See Hartley, *Observations on Man*, I, 188.

[68]See Chapter III, 172-177, above.

Hartley's further analysis of the doctrine of association also displays the methodological influence of Newton's own writings as well as influences derived from the Newtonian traditions. It is generally agreed that Locke's principle of association is conceptually analogous to the force of gravitation, attraction, or cohesion in the physical realm. Newton had declared in the "General Scholium" to the Principia that he had not been able to discover the cause of gravity and was unwilling to hypothesize about its cause; nonetheless, he was certain "gravity does really exist, and act according to the laws which we have explained, and abundantly serves to account for all the motions of the celestial bodies, and of our sea."[69] Hartley, however, did not simply assume that association, like gravity, simply exists. As was noted above, Hartley argued association could "be esteemed a complete Induction" from experience.[70] Then, in the manner of Newton's ideal method and the speculative-experimental Newtonian tradition, Hartley took the first step in assigning association a cause. Adhering to the speculative-experimental methodology, which advocated the use of conjectures consistent with phenomena in cases which do not allow analysis by means of observation and induction, Hartley assigned mental association the efficient cause of physical vibration in the human body. Thus, Hartley maintained, if association is founded in and deducible from the doctrine of vibrations, then all sensation, ideas, and motion are also conducted according to the

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[69] Newton, Principia, II, 392.

[70] Hartley, Observations on Man, I, 383; see also Chapter III, 186, above.

vibrations of the infinitesimal medullary particles of the human body. Even if he could not discover the actual connection between vibrations and sensations, ideas, and motions, Hartley believed that accepting the connection as a first principle would lead him to an account of the origin of all our ideas and motions, as well as of the performance of sensation, ideas, and motion.[71]

Accepting this connection allowed Hartley to base his analysis of sensations, ideas, and motions upon the mathematical characteristics of their corresponding vibrations. Paralleling Newton's treatment of bodies in the <u>Principia</u>, Hartley essentially viewed vibrations, sensations, ideas, and motions as if they were "point masses."[72] They possess quantity of degree and/or frequency; they display motion through the body or in the mind; they also have position in the brain or, with respect to one another, in the mind. Thus he attempted to analyze them in terms of these mathematical characteristics.

In the first place, he differentiated sensations, corresponding to intense vibrations, from ideas, corresponding to miniature vibrations or vibratiuncles, on the basis of degree or quantity of the corresponding vibration, and algebraically represented them as <u>A</u> and <u>a</u>, respectively.[73] On the basis of their corresponding vibrational characteristics, impressions, ideas, and motions could be described as simple and denoted by one algebraic symbol, or they could be described as compound, complex, or decomplex and denoted by several

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[71]Hartley, <u>Observations on Man</u>, I, 19, 30-33, 85-87, 108, 111.

[72]See Chapter IV, 227, above.

[73]See Chapter III, 172-174.

symbols, such as A, B or A+B or a, b or a+b, and so forth. A train of ideas could be denoted by a string of algebraic characters, such as a, b, c. This algebraic symbolism enabled Hartley to describe the recall of ideas, for example, in a manner paralleling the basic transitive law of algebra (in a train of associated ideas a, b, c, the impression of a can raise b, and then c).[74] Here Hartley mathematically measured the power of one vibratiuncle or idea to raise another as of "some Power . . . less than Unity. . . ."[75] On the whole, this algebraic representation of sensations, ideas, and muscular motions allowed Hartley to give a law-like description of the mechanism of association in terms which would bestow upon it the universality and certainty of mathematics:

> If any Sensation A, Idea B, or muscular Motion C, be associated for a sufficient Number of Times with any other Sensation D, Idea E, or muscular Motion F, it will, at last, excite d, the simple Idea belonging to the Sensation D, the very Idea E, or the very muscular Motion F.[76]

Use of algebraic symbolism furthermore enabled Hartley to illustrate the manner in which association automatically propels man towards perfection and ultimate happiness.[77]

After having completed a mathematical analysis of Newton's doctrine of vibration and Locke's doctrine of association, Hartley

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[74] See Chapter III, 179 ff, or Hartley, Observations on Man, I, 66-74.

[75] Hartley, Observations on Man, I, 69-70; see also Chapter III, 181, above.

[76] Hartley, Observations on Man, I, 120; see also Chapter III, 212-213, above.

[77] See Chapter III, 216-218, above, or Hartley, Observations on Man, I, 82-83.

adhered to both Newton's ideal method of philosophizing and the two Newtonian methodological traditions, by assuming the two doctrines as causes or first principles and demonstrating from them "the general Laws, according to which the Sensations and Motions are performed, and our Ideas generated."[78] According to Hartley, science had been advanced by Newton and others by a method in which "every preceding Discovery . . . [is] made the Foundation for a subsequent one,"[79] i.e. by the deductive method. Consequently, in the manner of the mathematico-deductive tradition stemming from the *Principia*, Hartley often referred to the proof of his propositions by deduction from previous propositions.[80]

But deduction does not form the actual mode of proof of the propositions in the *Observations on Man*. Although Hartley mentioned the deductive proof, he actually proved the propositions by appealing to observation, as Newton had done in the *Opticks* and as his followers in the speculative-experimental Newtonian tradition advocated. Proposition I, describing the role of the medullary substance in sensation and motion, for example, Hartley reported

> seems to be sufficiently proved in the Writings of Physicians and Anatomists; from the Structure and Functions of the several Organs of the Human Body; from Experiments on living Animals; from the Symptoms of Diseases, and from Dissections of morbid Bodies.[81]

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[78] Hartley, *Observations on Man*, I, iv.

[79] *Ibid.*, 349-350.

[80] See, for example, *ibid.*, 67.

[81] *Ibid.*, 7; see also *ibid.*, 8; for other examples of empirical evidence and proof, see *ibid.*, 16, 19, 33, 59-61.

Proposition 3, that ". . . Sensations remain in the Mind for a short Time after the sensible Objects are removed," is also proven on the basis of Hartley's own observations, as well as by direct citations from "Experiment 10," Book I, and "Query 16" from Newton's Opticks.[82] Similarly Hartley's proof of Proposition 5, concerning the origin and propagation of vibrations, rests heavily upon speculations prompted by Newton's discussion of the aether "in the last Paragraph of his Principia, the Questions annexed to his Optics, and a Letter from him to Mr. Boyle, lately published in Mr. Boyle's Life."[83] Here Hartley specifically referred to Queries 18 and 31 and exhibited knowledge of and an ability to apply to his study of mind the details and terminology of Newton's explanation of light, such as "the alternate Fits of easy Transmission and Reflexion. . . ."[84]

If, however, proof could not be obtained by induction from direct observation, or by invoking authority or general opinion, analogy could be employed both as a guide and a test of truth.[85] Since he considered analogy particularly helpful in "minute or obscure" realms,[86] Hartley relied heavily upon analogies between observable physical phenomena and unobservable physical or mental phenomena as a

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[82] Ibid., 9-11. [83] Ibid., 14.

[84] Ibid., 22; see also ibid., 26.

[85] See ibid., 340, and Chapter III, 102-105, above, for a discussion of Hartley's views on the use of analogy.

[86] Hartley, Observations on Man, I, 343; see also Chapter III, 103-105, above.

guide to and evidence of statements about physical or mental events.[87] He was particularly fond of analogies between colors and ideas. For example, he referred to Newton's analysis of "compound" white light into "simple" spectral colors in the Opticks to substantiate the analysis of a "compound" mental state into "simpler" states of sensation that are the results of vibrations, as are colors.[88]

On the whole, then, Hartley preferred proof by observation, rather than deduction, to the extent that there often appear in the Observations on Man propositions proved solely on the basis of observed phenomena, general opinion, or analogy, while there is rarely any proof that relies solely on deduction.[89] This prevalence of proof by observation combined with his belief that the consistency between phenomena and his propositions was evidence of their truth[90] and his frequent citations from the Opticks and the aetherial sections of the Principia, illustrate and confirm Hartley's participation in the speculative-experimental Newtonian methodological tradition.

After having thus demonstrated the general laws of sensation, the generation and association of ideas, and muscular motion by the method of proof by observation, common consent, or analogy, as was the

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[87]For examples of Hartley's use of analogy, see Hartley, Observations on Man, I, 16-17, 63-64, 77, and Chapter III, 125, 148-149, 184-185, 196, above.

[88]Hartley, Observations on Man, I, 75-76, and Newton, Opticks, 108-109. See also Hartley, Observations on Man, I, 321-322, or Chapter III, 196, above, for a good example of Hartley's use of analogy between colors and ideas.

[89]See Hartley, Observations on Man, I, 79, for an instance of proof by reference to deduction alone.

[90]Ibid., 25.

preferred method in the speculative-experimental Newtonian tradition, Hartley then deduced the particular phenomena of each type of sensation, mental activity, and muscular motion from the general laws.[91] This was intended to be the check against the phenomena that Newton had advised, for while Hartley was performing the synthesis he inquired "how far the Phaenomena of each illustrate, and are illustrated by, the foregoing general Laws."[92] Finally, in the manner of Newton's Principia, Hartley viewed the above as phenomena themselves and inferred from them by induction the general law of association.

Newton's and the Newtonian World View

In addition to stressing a certain ideal procedure to follow in the investigation of questions in natural philosophy, as well as a preferable method of proof and presentation of the results of the investigation, Newton also based his investigations upon an underlying picture of the world, or world view. In the eighteenth century, Newtonian natural philosophers shared a basic world view which was historically derived from, although not wholly identical to Newton's own conception of the universe.[93]

Essentially, Newton and Newtonians like Locke and Samuel Clarke (1675-1729) pictured the universe as an orderly system: Nature is characterized by a regularity, constancy, and recurrence of events, whether the events are sensible or insensible to man. In the Opticks

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[91] See, for example, Hartley's analysis of memory and imagination on the basis of association as described in Chapter III, 185-192, above.

[92] Hartley, Observations on Man, I, iv.

[93] According to Buchdahl (Newton and Locke, 9), Newton did not, for instance, agree with the Newtonian deterministic view of the universe.

and in the "General Scholium" to Book III of the Principia, Newton described the universe as created by a prescient God according to his design and purpose; furthermore, it is a dynamic system over which God must constantly preside (for it is not a self-regulating mechanism) and in which He always exists. On the other hand, some Newtonians, particularly Clarke, maintained the order of natural events is a development of God's divine plan. Each natural substance is following a course of events in accordance with the laws of action God established for it in the beginning. In their opinion, natural phenomena are regular, fixed, settled events, and they occur without special Divine intervention. Newtonians, but not Newton himself, thus tended to view natural phenomena, whether apparent or invisible, as fixed and rigidly determined. Both Newton and his followers saw nature as a unified system: All its parts are closely linked together, unified by universal mechanical laws of nature, such as the law of gravitation. In addition, Newton described nature as "consonant and conformable unto herself;"[95] consequently, phenomena in different realms of nature are analogous to one another. Furthermore, when phenomena have been identified as analogous, Newton pointed out that the laws governing the activity of the analogous phenomena must be analogous as well.

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[94]For the above, see: "Query 28" and "Query 31," Newton, Opticks; "Preface" and "General Scholium," Newton, Principia; Buchdahl, Newton and Locke, 4-7, 9, 26-27, 34; Schofield, Mechanism and Materialism, 12; Willey, Eighteenth Century, 126; F. E. L. Priestley, "The Clarke-Leibniz Controversy," in Butts and Davis, Methodological Heritage, 45-47, 49, 51-55 (article hereinafter referred to as Priestley, "Clarke-Leibniz").

[95]"Query 31," Newton, Opticks, 372.

In the eighteenth century, Newtonians such as Bishop Butler and Roger Cotes accepted and popularized Newton's view of the harmony and consonance of nature, of the analogy between phenomena in different realms of nature, and of the analogy between the laws of activity of analogous phenomena.[96]

The Substructure: Mechanistic or Materialistic?

Underlying this common conception of the universe as an orderly, lawful, and unified system developing according to the Creator's scheme, Newtonians agreed there is an equally orderly, lawful, and unified microscopic substructure of corpuscular matter and interparticulate forces. In the eighteenth century, however, Newtonian thought about the specific nature of this corpuscular matter and its activity underwent a definite change: Historically, Newtonians first adhered to a mechanistic matter theory, but about mid-century a group of Newtonians arose who advocated a more materialistic theory as a result of their acceptance of the aether. Both Newtonian groups correctly and confidently pointed to passages in Newton's works as the source of their conflicting Newtonian concepts of matter.[97]

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[96]Newton specifically utilized analogies between colors and musical tones and between the corpuscles of light and gross bodies in his own investigations. For examples see: Newton, Opticks, 134-137; Newton, Principia, I, 311-320; Isaac Newton, "An Hypothesis explaining the Properties of Light, discoursed of in my several Papers," in Thomas Birch, The History of the Royal Society of London . . . (3 vols.; London: Printed for A. Millar . . . , 1757), III, 248-260 and 262-269 (hereinafter referred to as Newton, "Hypothesis of Light"). For a discussion of Newton's use of analogy and its effect on the Newtonian world view, see: Cohen, "Newton," 60 and 74; Buchdahl, Newton and Locke, 4 and 6-7; Priestley, "Clarke-Leibniz," 54; Willey, Eighteenth Century, 137; Philip C. Ritterbush, Overtures to Biology: The Speculations of Eighteenth-Century Naturalists (New Haven: Yale University Press, 1964), viii and 1-2.

[97]See Schofield, Mechanism and Materialism, 15-16 and 19.

The mechanists identified the first edition of the Principia (1687), the first Latin edition of the Opticks (1706), particularly the newly added Queries 20-23, as the source of their point of view. Today this type of Newtonian matter theory is referred to as "dynamic corpusculareanism," in order to differentiate it from earlier corpuscular theories, such as that of Descartes, that did not employ interparticulate forces.[98]

Mechanistic Newtonians attributed the production of natural phenomena to the various combinations and motions of primary particles of matter produced by interparticulate forces, especially those of attraction and repulsion. According to the mechanists, these primary particles of matter are solid, extended, hard, impenetrable, and inert. Although they are homogeneous in nature, the particles also possess determinate sizes and shapes. They act on one another at a distance, rather than by force of contact, and they are able to do this as a result of the "active powers," virtues, or forces which they possess and diffuse through space. These powers, the chief of which is attraction (or mutual gravitation) and the next of which is repulsion, vary with the nature, quantity, and quality of the particles and affect other particles in a manner inversely proportional to the distance between the two particles. According to dynamic corpusculareanism, particles of light, for instance, act upon bodies by exerting their attractive powers, thus causing the particles of the illuminated body to vibrate. Even the phenomenon of sound is a result of a wave-like

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[98] Ibid., 7-12.

motion in which the particles of the transmitting body do not strike one another; they merely vibrate or oscillate about a fixed position and transmit their activity from one particle to the next by means of the forces of attraction and repulsion.

Although Newton specified that these forces are mathematical, rather than physical, and viewed attraction as only the endeavor of two particles to approach one another, according to his theory the very smallest homogeneous particles exert the most powerful attractive forces and aggregate into bigger particles, which possess a weaker attractive force, but a stronger gravitational force. The larger, secondary particles continue to aggregate, until at last the gross particles perceived by our senses are formed. These gross particles possess an additional vis inertiae, or inherent force, which resists changes in activity and endeavors to maintain them in their present states of rest or motion. Hence, the current state of rest or motion of a particle or body can only be changed by impressing a force upon it, and, if the force is a motive force, the change in rectilinear motion will be made in the same direction as that in which the force is impressed. It is upon the interaction and combination of these larger order particles that the sensible phenomena of optics, chemistry, and other fields of natural philosophy depend. In like manner Newtonian mechanists of the eighteenth century attributed the visible phenomena of nature to the motion of small and large particles produced by the exertion of their forces through space on one another.[99]

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[99]Newton, Principia, I, 1-20 and 261-262; ibid., II, 163-199 and 202-205; Queries 1-4 and 28-31, Newton, Opticks; Newton, Opticks, 64-71, 237-251, 293-295. See also: Schofield, Mechanism and Materialism, 7-8, 10-11, 15; Cohen, "Newton," 70 and 75-77.

In Newton's early papers on optics, particularly his "Hypothesis on Light" sent to the Royal Society in 1675[100] and his "Letter to Boyle" of February 28, 1679, Newton combined a corpuscular theory of light, by which he explained its linear phenomena, with the concept of a material aether, the use of which enabled him to explain the wave phenomena of light. In these early papers he also suggested the aether as a possible explanation for other natural phenomena such as sensation, animal motion, heat, and even gravitation. With the publication of the first edition of the Principia in 1687, however, Newton abandoned his aetherial hypothesis in favor of the dynamic corpuscular-eanism discussed above. Indeed, Newton even included in the Principia an experiment refuting the existence of the aether. In 1713, in the "General Scholium" to Book III of the second edition of the Principia, Newton again advocated the material aetherial spirit as an alternate explanation of the same phenomena he had described in the earlier "Hypothesis on Light" and "Letter to Boyle," except for the phenomena of gravitation. By the time the second English edition of the Opticks appeared in 1717, Newton had little reservation about the aether and even pointed to it as the cause of gravitation. Consequently, in the newly added Queries 17-24 Newton confirmed the existence of the aether, described its physical characteristics and properties, and emphasized its usefulness as an explanatory device.[101]

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[100] See footnote 96 above for full citation.

[101] See Newton, Principia, II, 95-110; Cohen, "Newton," 54, 60, 80; Schofield, Mechanism and Materialism, 12-14.

According to this materialistic hypothesis but in contrast to his earlier dynamic corpusculareanism, Newton described the universe as composed of qualitatively different particulate substances. The particulate aether, which Newton believed could probably be identified with electric and magnetic effluvia, is very subtle in nature and is, therefore, able to fill all space. The aether even pervades the pores of gross bodies, the gross bodies being composed of particles of inert matter. The aether varies in density in the universe according to its distance from these gross bodies. The aetherial fluid is less dense in their pores, but its density increases as it increases in distance from them. Even at its densest, however, the aether in space offers no resistance to the gross bodies moving through it. Since the particles of aether repel one another, the aetherial medium is very elastic in nature and in fact is the one active material substance in the universe. Because of this view of the characteristics and properties of the aether, Newton was able to utilize the repulsive action of the aether to explain the occurrence of natural phenomena such as gravitation and the refraction of light without referring to forces or powers inherent in any other material particles.[102]

Newton's use of the aether in the "General Scholium" of Book III of the Principia and in the new "Queries" added to the 1717 edition of the Opticks provided his followers with an alternative to the earlier mechanistic dynamic corpusculareanism. This alternative was not readily embraced by Newtonians; consequently, Newton's aetherial

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[102] Schofield, Mechanism and Materialism, 14-16.

hypothesis had little effect upon British natural philosophy in the period from its appearance in 1713 to 1740. In the 1740's, however, a change in attitude towards the aether accompanied a general shift away from mechanistic explanation and towards materialistic explanation in natural philosophy. The aether itself became a much more acceptable explanatory hypothesis following the publication of an anonymous pro-aetherial tract entitled An Examination of the Newtonian Argument for the Emptiness of Space and of the Resistance of Subtile Fluids (1740), Bryan Robinson's influential A Dissertation on the Aether of Sir Isaac Newton (1743), and Newton's "Letter to Boyle" and "Letter to Oldenburg," both published in 1744. Thus, around mid-century, natural philosophers could choose from two acceptable "Newtonian" theories of matter. Increasing numbers of them began to adopt the materialistic explanation instead of the mechanistic one, and those who did so began to search for the causes of phenomena in unique substances with special qualities rather than in the motions of homogeneous particles of matter endowed with the forces of attraction and repulsion.[103]

The Transference of Concepts from Natural Philosophy

Historians of psychology have identified numerous concepts that have been transferred from natural philosophy into the realm of the study of mind since the late seventeenth century. It has been said

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[103] Ibid., 15-16, 95, 103-115.

that philosophers of mind accepted and transferred concepts from corpuscular philosophy in general[104] and concepts from Newtonian corpuscular physics in particular to their study of mind.[105] This transfer of concepts from Newtonian cosmology[106] led to a view of mind as analogous to the corpuscular Newtonian universe which was composed of fixed and empty space and particulate matter moving through that space in time.[107] Newtonian mechanical concepts[108] and concepts of nature[109] were also transferred to the study of mind, thus the particles of mind were viewed as aggregating, fusing, or linking due to the effect of forces outside themselves, especially the force of attraction and occasionally the force of repulsion.[110] The forces themselves were

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[104] J. R. Kantor, "Newton's Influence on the Development of Psychology," The Psychological Record, XX (1970), 89; hereinafter referred to as Kantor, "Newton's Influence."

[105] MacLeod, "Conceptions of Man," 217; Richard Lowry, "Galilean and Newtonian Influences on Psychological Thought," The American Journal of Psychology, LXXXII (1969), 391; hereinafter referred to as Lowry, "Galilean and Newtonian Influences."

[106] Lowry, "Galilean and Newtonian Influences," 392.

[107] Edwin B. Newman, "Newton, Physics, and the Psychology of the Nineteenth Century," The American Journal of Psychology, LXXXII (1969), 403 (hereinafter referred to as Newman, "Newton and Psychology"); Kantor, "Newton's Influence," 89; MacLeod, "Conceptions of Man," 209.

[108] Newman, "Newton and Psychology," 403.

[109] MacLeod, "Conceptions of Man," 209.

[110] Ibid., 209-210; Lowry, "Galilean and Newtonian Influences," 392 and 396; Newman, "Newton and Psychology," 403; Willey, Eighteenth Century, 111-112 and 137.

believed to interact arithmetically and according to a fixed law.[111] In addition to these concepts of natural philosophy, modern psychology has been described as based upon Newton's dualistic model of perception, Newton's placement of the sensorium in the brain, the "Newtonian" model of color vision,[112] and the Newtonian conception of man discussed in the Introduction and Chapter III above.

Hartley's Use of "Newtonian" Concepts: The Existing View

Historians have, furthermore, pointed out many concepts of contemporary natural philosophy that appear in Hartley's Observations on Man. Hartley has been described as having utilized the concepts of mechanism and of corpuscular physics.[113] His physiological psychology incorporated current concepts of motion[114] and concepts of the corpuscular aether.[115]

Hartley has been described as following Boyle and Newton,[116] and many of the methods and concepts which appear in the Observations on Man have been identified as drawn from Newton or as "Newtonian" in character. Hartley is characterized as having accepted Newton's

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[111] Newman, "Newton and Psychology," 403; Elie Halévy, The Growth of Philosophical Radicalism, trans. by Mary Morris (Boston: Beacon Press, 1928), 6, as referred to in Oberg, "Hartley and Association," 453 (hereinafter referred to as Halévy, Radicalism).

[112] Kantor, "Newton's Influence," 83-90.

[113] See Introduction, 13-14, above.

[114] Oberg, "Hartley and Association," 442.

[115] Kallich, Introduction," vii; Oberg, "Hartley and Association," 442.

[116] Kallich, "Introduction," vi.

scientific assumptions[117] and as having incorporated the recent scientific developments of Newton into his physiological psychology.[118] In particular, Newton's concept of matter as made up of infinitesimal particles in motion,[119] Newton's theory of the corpuscular aether,[120] and the Newtonian concept of the aether[121] have been noted as functioning in Hartley's theory. Hartley is said to have depended upon both Newton's[122] and the Newtonian account of motion.[123] He accepted Newton's theory of motion by vibration[124] and relied upon Newton's description of physical impulses as vibratory in nature.[125] There is no doubt that, as has been frequently noted, Newton's doctrine of vibration figures in Hartley's physiological psychology.[126] Even the strictly physiological aspects of Hartley's theory did not escape Newton's influence: His theory of the physical basis of sensation and memory has been described

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[117] Oberg, "Hartley and Association," 442.

[118] Kantor, Evolution of Psychology, II, 219.

[119] Ibid., 220.

[120] Kallich, "Introduction," vii; Rand, "Development," 317; Huguelet, "Introduction," viii and ix; Schofield, Mechanism and Materialism, 199.

[121] Oberg, "Hartley and Association," 442.

[122] Watson, Great Psychologists, 201.

[123] Oberg, "Hartley and Association," 442.

[124] Ibid., 444; Huguelet, "Introduction," ix.

[125] Watson, Great Psychologists, 201.

[126] Ibid.; Kantor, Evolution of Psychology, II, 220; Oberg, "Hartley and Association," 442; Huguelet, "Introduction," viii; Schofield, Mechanism and Materialism, 199.

as a derivation of Newton's speculations.[127] Hartley's vibrational neurological theory has been traced back to Newton's speculations on nervous action,[128] in which he described the nerve as a solid filament[129] and the nervous impulse as transmitted by means of vibrations in the corpuscular aether[130] along the nerves to the brain[131] to cause it to vibrate.[132] Hartley has also been shown to rely upon Newton's suggestion of an analogy between the transmission of light and the transmission of the nervous impulse via the aether.[133] He has been cited as one of many early psychologists who accepted Newton's dualistic model of perception[134] and the idea of association which paralleled Newton's theory of universal attraction.[135]

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[127]Young, "Hartley," 139.

[128]Kantor, "Newton's Influence," 89; Kantor, Evolution of Psychology, II, 223; Huguelet, "Introduction," ix.

[129]Rand, "Development," 317; Kantor, "Newton's Influence," 89-90.

[130]Schofield, Mechanism and Materialism, 199-200; Richard Hunter and Ida Macalpine, Three Hundred Years of Psychiatry: 1535-1860: A History Presented in Selected English Texts (1964 reprint; London: Oxford University Press, 1963), 379; hereinafter referred to as Hunter and Macalpine, History of Psychiatry.

[131]Young, "Hartley," 139.

[132]Rand, "Development," 313.

[133]Hunter and Macalpine, History of Psychiatry, 379.

[134]Kantor, "Newton's Influence," 83-88.

[135]Young, "Hartley," 139-140; Halévy, Radicalism, 6, in Oberg, "Hartley and Association," 453.

A Closer Examination of Hartley's "Newtonian" Concepts

From the examination of Hartley's theory presented in Chapter III and the discussion of his methodology above, it is apparent that Hartley did indeed accept many "Newtonian" concepts that had been transferred by earlier philosophers of mind from the physical sciences. To illuminate the historical relationship between concepts found in Hartley's physiological psychology, in the works of Newton, and in the works of Newton's followers, an examination of Hartley's theory in relation to Newton's and the Newtonian world view and the Newtonian mechanistic and materialistic traditions will be helpful.

In the Observations on Man, Hartley shared Newton's and the Newtonian view of nature as orderly, regular, recurrent, and following the design of the Creator. Hartley accepted the Newtonian view of the world as a self-regulating system in which events are fixed and rigidly pre-determined, rather than Newton's view which required constant Divine intervention. He incorporated into his physiological psychology Newton's and the Newtonian view of nature as unified by mechanical law and therefore consonant and conformable in all its parts. As was shown in the earlier description of Hartley's methodology, he especially depended upon Newton's and the Newtonian belief that phenomena in different realms of nature are analogous and that they are consequently governed by the same or analogous laws.[136]

Hartley also followed Newton and the Newtonians in believing that underlying the visible system of the universe there is an equally

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[136]See also Chapter III, 104-105, above, for a discussion of Hartley's view of the universe as replete with analogy.

orderly, lawful, and unified substructure of corpuscular matter and interparticulate forces;[137] furthermore, visible natural phenomena could be explained by reduction to these particles and forces.[138] Hartley thus participated in the mechanistic tradition of dynamic corpuscularity which had, as outlined above, been expressed by Newton and adopted by many Newtonians, particularly from the time of the publication of Newton's Principia until the 1740's. Mechanistic dynamic corpuscularity was the dominant Newtonian matter theory during Hartley's years at Cambridge, during his early medical career, during the time in which he began composition of the Observations on Man, and, most importantly, at the time at which he gave his mental theory of association a physiological basis. It is therefore not surprising that Hartley's analysis of the physiological aspects of sensation, ideation, and muscular motion shows obvious traces of concepts derived from Newtonian mechanistic dynamic corpusculareanism.

As outlined in Chapter III above, Hartley considered the human body to be composed of the same elements as the external world; therefore, it contains the same particles endowed with the same powers of attraction and repulsion.[139] The nerves and the sensitive part of the brain, in particular, are composed of several orders of particles of the medullary substance, a substance whose general properties of vascularity, uniformity, continuity, softness, regular texture, and regional differentiation are due to its particulate nature and the

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[137] See Chapter III, 105-107, for Hartley's acceptance of the particulate nature of matter.

[138] See Chapter III, 110-111, above.

[139] See Chapter III, 111-113, above.

active attractive and repulsive powers of its particles.[140]

That the medullary particles do possess attractive and repulsive powers Hartley reasoned by analogy from Newton's "Query 31" in which, Hartley recalled, Newton had shown "so many Instances and Evidences . . . of attractive and repulsive Powers in the small Particles of various Bodies. . . ."[141] Moreover, he concluded, agreeably to Newton's conjecture that the great activity of the aetherial particles is due to their extreme smallness, that the infinitesimal medullary particles are also very active in nature.[142] As in the physical world, the active powers of the particles within the human body also vary among themselves in inverse proportion to their size. This is the case in the various orders of medullary particles, as well as in the case of the particularly active, smaller particles of the medullary fluid that pervades the pores of the medullary substance of the brain.[143]

The medullary substance's general properties of vascularity, uniformity, continuity, softness, regular texture, and regional differentiation are precisely the properties which render its ". . . Second, Third, &*c*. Orders" of particles able to communicate the vibrations, that is, small motions backwards and forwards, essential to the production of sensation, ideation, and muscular motion.[144]

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[140] See Chapter III, 121-123 and 125-133, above.

[141] Hartley, *Observations on Man*, I, 20.

[142] *Ibid*.

[143] See Chapter III, 106 and 122-123, above.

[144] Again the source is Newton (see Hartley, *Observations on Man*, I, 12). See also *ibid*., 87.

According to Hartley, the human body obeys the same laws as the external world; therefore, impressions in the brain must arise from the powers and properties of matter and must also be explainable on the basis of the laws of matter and motion. The particular law Hartley invoked was the "Doctrine of Vibration," which Hartley acknowledged had been formulated by Newton. Hartley reported the doctrine of vibration had been utilized by earlier writers as an explanation of sensation and motion, although he did not specify by whom.[145]

In Hartley's physiological psychology, the vibrations responsible for sensation, ideation, and muscular motion result, as described in Chapter III above, from an initial impression of an external vibratory or non-vibratory object and continue not as a result of particle impact, but due to the change from attraction to repulsion and back to attraction produced when the distance between each two adjacent particles continually changes.

Hartley further incorporated Newton's and the Newtonian concept of the vis inertiae, or inherent force possessed by particles in nature, into the physiological foundation of his psychological theory. This concept comes into play during Hartley's consideration of the change of the medullary substance from one state of vibration to another and its ability to maintain that state of vibration, that is, to be modified, so that in the parallel mental realm an idea is acquired.[146]

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[145] See ibid., 12, and Chapter III, 114 and 136-153, above.

[146] See Chapter III, 123-125, above.

In essence, the particles of the medullary substance possess a vis inertiae, which enables them to maintain a certain vibration or state of motion until sufficient force is impressed, by repetition, upon them to cause a modification of the vibration. Further paralleling vis inertiae in the external world, the change that occurs in a medullary particle as a result of the impression of a vibration will be dependent upon the direction of the impressing force and the strength of the force, which Hartley determined is inversely proportional to the square of the distance of the medullary particle from the point of entrance of the force or vibration into the medullary substance as a whole.[147]

Mechanical dynamic corpuscularity also formed the foundation of Hartley's view of the operation of the mind. Hartley included mind in the realm of nature, and he considered psychology as a part of natural philosophy, accepting the "Newtonian conception of man" inaugurated by John Locke. Locke viewed man as subject to natural law, and, more importantly, he postulated that mind was analogous to nature, that it could be understood in terms of analogous concepts, and that it was subject to laws analogous to natural law. The result of Locke's transference of Newton's dynamic corpuscularity to the study of mind was a view of mind as a complex miniature cosmos in which simple particulate ideas interact and fuse into larger compound and complex ones due to the regular and lawful action of the interparticulate force of attraction.[148]

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[147] See Chapter III, 153-156, above.

[148] See Lowry, "Galilean and Newtonian Influences," 392; MacLeod, "Conceptions of Man," 207-210; Kantor, "Newton's Influence," 89; G. S. Rousseau, "Nerves, Spirits and Fibres: Towards Defining the Origins of Sensibility," Studies in the Eighteenth Century: Papers Presented at the David Nichol Smith Memorial Seminar, III (1976), 138-142 and 150.

Accepting this point of view allowed Hartley to consider states of mind as particles analogous to the various orders or sizes of particles in nature: Sensations are the "largest" order of mental particles, whether simple or compound; simple ideas are vestiges of sensations and, hence, are of diminutive size.[149] With respect to other mental particles, simple ideas are the smallest and, paralleling the physical world, they are therefore the most attractive.[150]

Association, or the cohesion of one mental particle to another, occurs at any time when the particles are juxtaposed to one another, either in the same or successive instants of time, and the force of attraction is able to operate between them. Compound ideas are produced by the mechanical association or cohesion of simple ideas. Complex ideas are clusters of ideas of sensation, but here the particles inextricably blend, coalesce, and lose their distinct identities. Decomplex ideas are composed of complex and/or simple ideas. Their constituent parts are larger than those of complex and compound ideas; therefore, as in the physical realm, the interparticulate force of attraction is not as strong between them.[151]

In explaining the mechanism of memory, Hartley gave an even more quantitiative description of the relative "sizes" of ideas and the process of their association or "linkage": The basic element of memory is a "particular"; ten particulars cluster to compose a

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[149]See Chapter III, 184, above.

[150]See Chapter III, 105-106, above.

[151]See Chapter III, 182-185, above.

"rudiment," and a "past fact" consists of one thousand particulars, that is, one hundred rudiments.[152] Although the concepts of physical particles of varying orders or sizes and the interparticulate force of attraction fundamental to Newton's and the Newtonian mechanistic tradition of dynamic corpusculareanism are basic to Hartley's explanation of the analogous mental realm, nowhere, however, does the interparticulate force of repulsion figure in the operation of mind.

Extending the concept of dynamic corpuscularity even further into his explanation of human behavior, Hartley also treated muscular motion as if it were particulate in nature. Motions and their corresponding "motory Vibratiuncles" are initially simple, but they may associate to form compound, complex, and decomplex motions and motory vibratiuncles.[153] Ultimately, viewing all human physical and mental phenomena as heterogeneous particles of various orders allowed Hartley to express his understanding of their apparent connection in the general law of association.[154]

Although Hartley thus relied heavily on the prevalent Newtonian matter theory of mechanical dynamic corpuscularity in his physiological psychology, there are also elements from the materialistic Newtonian tradition which was just beginning to gain popularity concurrently with Hartley's development of the physiological basis of his psychology during the years 1738-1745. As was discussed above, between 1740 and 1744 there appeared in England four works which contributed to the

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[152]See Chapter III, 185-192, above.

[153]See Chapter III, 211-212, above.

[154]See Chapter III, 212-213.

acceptability of the aether hypothesis in natural philosophy, two of which were from Newton's own hand: his "Letter to Boyle" and his "Letter to Oldenburg," both of which were published in 1744. Hartley made reference to only one of these works in the Observations on Man, the "Letter to Boyle,"[155] although he was familiar with other sources of the aether hypothesis in Newton's own works and cited them in his discussion of the aetherial medium. He was, for example, familiar with the "General Scholium" of the Principia and specifically pointed out that Newton there affirmed all sensation and voluntary motion was due to the power, action, and subtle vibrations of the aether.[156]

As was noted in Chapters II and III, Hartley was hesitant to affirm the existence of the aether, even though he believed there was experimental evidence in favor of it.[157] In this Hartley reflects the general tenor of contemporary natural philosophy. By way of preface to his incorporation of the aether in his physiological psychology, Hartley advised that

> the Reader will do well to consult what Sir Isaac Newton has himself advanced concerning the Existence of this Aether, and the Properties and Powers which he has ascribed to it, in the last Paragraph of his Principia, the Questions annexed to his Optics; and a Letter from him to Mr. Boyle, lately published in Mr. Boyle's Life. As to myself, I am not satisfied, that I understand him perfectly on this Subject.[158]

Nonetheless, he believed its usefulness as an explanatory hypothesis was "an indirect Evidence in its favour. . . ."[159] On the other hand,

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[155]Hartley, Observations on Man, I, 14.

[156]Ibid., 111.

[157]Ibid., 44.

[158]Ibid., 14.

[159]Ibid., 15.

Hartley considered both the doctrine of vibrations and the existence of the aether to be ontologically conjectural. Yet their relationship in his physiological psychology was such that, he exclaimed,

> We may therefore either deduce the Doctrine of Vibrations here proposed from the Consideration of the Aether, or the Existence of the Aether from the Doctrine of Vibrations, according as either of these can be first established.[160]

Ultimately, in the Observations on Man, Hartley assumed the existence of the aether[161] and considered it to be diffused through the pores of the human body.[162] He deduced from this "a probable Account"[163] of sensation, the generation of ideas, and muscular motion by means of "the subtle Influences of the small" particles of the human body,[164] i.e. their interparticulate forces of attraction and repulsion and other active powers,[165] and their interaction with the aetherial particles interspersed between them. Writing in the third and fourth decades of the eighteenth century, Hartley's work well illustrates the trend towards adopting a materialistic explanation over a mechanistic one, which was then beginning to emerge in the wider field of natural philosophy.

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[160] Ibid., 44.

[161] See Chapter III, 107-110, above for a discussion of Hartley's view of the aether and its properties.

[162] See Chapter III, 133-134, above.

[163] Hartley, Observations on Man, I, 24-25.

[164] Ibid., 72; see also Chapter III, 114.

[165] The muscular fibers and blood globules, for example, possess an electrical attractive virtue in addition to the usual interparticulate powers of attraction and repulsion. See Chapter III, 207-211, above.

Direct Sources of Hartley's Newtonianism

From the above examination of Hartley's approach to the study of mind and the concepts utilized in his explanation in light of Newton's work and the several contemporary Newtonian methodological and conceptual traditions, it has become apparent that there are "Newtonian" elements in the Observations on Man that cannot be traced solely to Hartley's reading of Newton. It has been shown that Hartley was greatly influenced by the two Newtonian methodological traditions, especially the speculative-experimental one. He was also influenced by both Newtonian mechanistic dynamic corpusculareanism and the first wave of Newtonian materialism.

The question thus arises, "From what sources did Hartley gain his knowledge of these Newtonian traditions?" As was noted in the Introduction, Hartley could have been exposed to these traditions either by reading Newtonian literature exhibiting them or by personal contact with Newtonians who promoted them. Rather than examining the Newtonian literature Hartley may have read, however, the following sections will initiate an analysis of the Newtonian sources of Hartley's physiological psychology by focusing on three Newtonians with whom Hartley was in personal contact at various times in his life: Nicholas Saunderson, John Mickleburgh, and Stephen Hales.

Hartley, Saunderson, and Mickleburgh

As was noted in Chapter I above, while Hartley was a student at Cambridge, he "studied mathematics, together with natural and experimental philosophy, under the celebrated professor [Nicholas]

Saunderson";[166] another source lists Hartley as enrolled in the "Second Course in Chymistry" offered in 1728 by John Mickleburgh.[167] Both Saunderson's and Mickleburgh's lectures can be described as Newtonian in character, and both men were themselves unwaveringly loyal to Newtonian philosophy, although to different traditions.[168]

Saunderson and the Mathematico-Deductive Tradition

Saunderson had acquired a spectacular reputation during the first quarter of the eighteenth century for possessing an "extraordinary Proficiency . . . in Mathematical Learning," in spite of having been handicapped by blindness at the age of one.[169] After he arrived in

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[166]Hartley, Esq., "Sketch," iv.

[167]Gunther, "Appendix," 469.

[168]Material for this reconstruction of Saunderson's "lectures" has been derived from Thomas Nettleton, et al., "Memoirs of the Life and Character of Dr. Nicholas Saunderson, Late Lucasian Professor of the Mathematics in the University of Cambridge" (in Saunderson, Algebra; hereinafter referred to as Nettleton, "Memoirs"), not from any specific set of Saunderson's lecture notes. There do exist "Lecture Notes," two sets, from Mickleburgh's lectures in the Caius College Library (MS. 619/342 red.) (see L. J. M. Coleby, "John Mickleburgh, Professor of Chemistry in the University of Cambridge, 1718-56," Annals of Science, VIII (1952), 167 and 167 note 5; hereinafter referred to as Coleby, "Mickleburgh"). The date of these sets of notes is, however, uncertain. Coleby (ibid., 168) implied that Mickleburgh lectured from the first set of notes in 1726. More recently, Schofield (Mechanism and Materialism, 47 note 12) determined the notes must have been written later than 1727 on the basis of internal evidence and has tentatively attributed the date of 1731 to them. Schofield also believed Mickleburgh lectured from these notes in 1733 (ibid.). At any rate, it is reasonable to argue that the lectures Hartley heard in 1728, if not given by Mickleburgh from these two sets of notes, were not radically different from them in content.

[169]Nettleton, "Memoirs," ii-iv.

Cambridge in 1707, Saunderson began "instructing the University Youth in the Principles of Newtonian Philosophy. . . ."[170] Evidently he gained almost immediate popularity: His biographers recorded that

> his Fame in a few Months had filled the University, so that Men of Learning and Curiosity grew ambitious and fond of his Acquaintance. His Lecture, as soon as opened, was attended by many from several of the Colleges, and in some time was so crowded, that he could hardly divide the Day among all who were desirous of his Instruction. . . .[171]

In 1711, he was awarded an honorary degree of Master of Arts, so that he could be appointed Lucasian Professor of Mathematics, with Newton's personal recommendation. Then in 1729, while Hartley was a student at Cambridge, George II visited Cambridge and awarded Saunderson an honorary Doctor of Law degree.[172]

Saunderson had been intimately associated with two key contributors to contemporary Newtonian natural philosophy, Edmond Halley (1656?-1743) and Roger Cotes (1682-1716), as well as with Newton himself.[173] Throughout his career, Saunderson displayed an unwavering philosophical loyalty towards Newton. He reputedly regarded Newton as infallible, so that Saunderson's biographers recollected, "If he had ever differed in Sentiment from any of . . . [Newton's] Mathematical and Philosophical Writings, upon more mature Consideration, he said,

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[170] Ibid., vi.

[171] Ibid., v.

[172] Ibid., vi-viii.

[173] Ibid., vi-vii. Halley had provided the motivation and financial backing behind the publication of the first edition of Newton's Principia in 1687, and Cotes, first Plumian Professor of Astronomy and Natural Philosophy at Cambridge, had collaborated with Newton on the revision of the first edition of the Principia that appeared in 1713. These two men were thus excellent sources of Newtonian natural philosophy.

he always found the Mistake to be his own."[174] Saunderson also derived portions of his lectures directly from the works of Newton. They were principally based upon Newton's Arithmetica universalis,[175] strictly a mathematical text, upon the Principia,[176] and upon the Opticks as well.[177]

On the whole, Saunderson considered mathematics ancillary to the study of natural philosophy,[178] and in his lectures he tended to stress its utilitarian aspects. He extolled "the Excellence and Advantage of . . . [mathematics] above every other Method of Reasoning"[179] and believed both "the Geometric and Analytic Methods of Reasoning" were useful

> on different Occasions. . . . The Geometric being the most Intuitive, and conveying the strongest and clearest Ideas to the Mind, he allowed preferable, where equally obvious and easy of Application. But as it was often otherwise, the Analytic advancing us in Science much faster and farther than we could have gone by all the Methods of the Ancients, and being the very Art and Principle of Invention, He thought the Moderns were greatly assisted by the use of it.[180]

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[174]Ibid., xvi.

[175]Nettleton, "Memoirs," v; Isaac Newton, Arithmetica universalis; sive de compositione et resolutione arithmetica liber (Cantabrigiae: Typis Academicis, 1707). The Arithmetica universalis consists of a hurriedly-composed summary of eleven years of lectures in an introductory algebra course given by Newton at Cambridge, and it was first published in 1707 without Newton's consent (see Derek T. Whiteside, "Introduction," The Mathematical Works of Isaac Newton, The Sources of Science (New York and London: Johnson Reprint Corporation, 1967), II, xix-xx and note 36).

[176]Nettleton, "Memoirs," v. According to Cohen (Franklin and Newton, 143), the first edition of the Principia was unavailable to readers in the eighteenth century. In view of Saunderson's association with Roger Cotes, however, Saunderson probably did have access to a copy of the first edition and may have based his lectures upon it or upon a copy of the second edition prepared by Cotes.

[177]Nettleton, "Memoirs," v.

[178]Ibid., xiv-xv and xvii.

[179]Ibid., viii.

[180]Ibid., xv.

According to his biographers, Saunderson's

> . . . Inclination led him to those Parts of the Mathematics, which are not the most abstracted, and end only in Contemplation. A Proposition must have its Uses, in order to engage his Attention. Either the Method of Enquiry must help to form the Mind, and teach new Modes of Reasoning, or the Proposition itself must tend to some Good, to the Improvement of Life or Science. He considered Mathematics as the Key to Philosophy, as the Clue to direct us through the secret Labyrinths of Nature; and thought the Mind was more highly entertained as well as improved in unravelling Her Works, than investigating the most subtile Properties of abstract Quantity.[181]

The content of his lectures included "the Theory of the Tydes, the Phaenomena of the Rainbow, [and] the Motions of the Planetary System as upheld by Gravity. . . ."[182] His biographers wrote,

> It will be a matter of surprise to many that . . . [Saunderson] should read Lectures in Optics, discourse on the Nature of Light and Colours, explain the Theory of Vision, the Effect of Glasses, the Phaenomena of the Rainbow, and other Objects of Sight: but if we consider that this Science is altogether to be explained by Lines, and subject to the Rules of Geometry, it will be easy to conceive that he might be a Master of these Subjects.[183]

Saunderson thus appears to have been a proponent primarily of the Newtonian mathematico-deductive Newtonian methodological tradition. From him Hartley received an introduction to Newton's mathematical and physical works, but with an emphasis laid upon mathematicization and upon analysis followed by synthesis as a mode of reasoning that is fruitfully applied to the study of the natural world. From Saunderson's belief that the analytical and synthetic methods of reasoning and their products can be applied to improve the quality of human existence, perhaps Hartley was led to consider the application of these methods to the study of mind and the improvement of human spiritual existence as well.

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[181] Ibid., xiv-xv. [182] Ibid., vi. [183] Ibid.

Mickleburgh and the Speculative-Experimental Tradition

Hartley was also indirectly exposed to Newton's philosophy and directly exposed to one tradition of Newtonian philosophy during his attendance at the chemistry lectures of Rev. John Mickleburgh. Mickleburgh was admitted as a sizar at Gonville and Caius College, Cambridge, in 1709. Three years later he changed to Corpus Christi College, possibly due to "the presence there of such Fellows as Stephen Hales, John Waller (second Professor of Chemistry [at Cambridge], 1713-18), and R. Danny, and of an outlook favourable to scientific experiment."[184] Mickleburgh became of Fellow of Corpus in 1714, earned his M.A. in 1716, and was awarded a B.D. in 1724. As early as 1718, he began to accumulate "livings" in the Anglican church, as was the custom. Among them was the Vicarship of St. Andrews in Cambridge. His income was also derived partially from his "business as dispensing chemist."[185]

By 1718, Mickleburgh had become known "for his Sufficient Skill in" chemistry,[186] and upon the death of Waller in that year Mickleburgh became "the third holder of the Chair of Chemistry in the University of Cambridge. . . ."[187] He held the Chair of Chemistry until his death in 1756, and during that time he "gave at least five courses of lectures, namely in 1726, 1728, 1731, 1733, and 1741."[188] Mickleburgh's lectures

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[184] Coleby, "Mickleburgh," 165.

[185] Ibid.

[186] University Grace Book θ, No. 689, August 3, 1718, as cited in Coleby, "Mickleburgh," 166.

[187] Coleby, "Mickleburgh," 165.

[188] Ibid., 167.

are a blend of theory and experimentation. Incorporating references to Newton and to Newtonians John Freind (1675-1728) and Stephen Hales,[189] Mickleburgh's lectures "show the strong hold of Newtonianism [on chemistry] by that time. . . ."[190]

Although Mickleburgh does not appear to have drawn either from Newton's Arithmetica universalis or Principia in his lectures, as Saunderson did, Mickleburgh did refer to, paraphrase, and quote directly from Newton's Opticks, especially from "Query 31."[191] For example, in his second lecture Mickleburgh defended Newton's concept of attraction against charges of being an occult quality.[192] In so doing, he paraphrased part of "Query 31"[193] and shifted Newton's emphasis to stress the applicability and value of the concept of attraction to the explanation of chemical phenomena.[194] In the fourth lecture, Mickleburgh introduced "Repellance," or the force of repulsion, to his students.[195] He compared repulsion "to an algebraic quantity varying from a positive value to zero, and then becoming negative at a certain distance between

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[189] Ibid., 169-170.

[190] Thackray, Atoms and Powers, 114.

[191] Coleby, "Mickleburgh," 169-170.

[192] Day 2, Mickleburgh's Lecture Notes, Set I, Caius College Library, Caius College MSS. 619/342 red, as cited in Coleby, "Mickleburgh," 169.

[193] Coleby, "Mickleburgh," 169.

[194] "Query 31," Newton, Opticks, 352; Coleby, "Mickleburgh," 169.

[195] Day 4, Mickleburgh's Lecture Notes, Set 1, as cited in Coleby, "Mickleburgh," 169.

the particles, supporting his argument by reference to Newton's 31st Query."[196] Mickleburgh referred to Newton's account in the Opticks of heat as the emission of light by a body in the second of his second set of lectures, and he included a reference to the "a'therial medium of Sr Isaac Newton by which he supposed light communicates heat to bodies. . . ."[197]

Mickleburgh's lectures were largely based upon the principles established by John Freind,[198] whom Mickleburgh celebrated as the "first who applied Sr Isaac Newtons Philosophy to Chymistry . . . and how happy and successful he hath been in this application who hath or will but read his Chymical Lectures will be able to judge."[199] Freind, one of the two "writers most significant in proposing a Newtonian force chemistry" in the early eighteenth century,[200] had embraced Newton's force of attraction and extended it to the explanation of chemical phenomena with the goal of making "chemistry truly mechanical."[201] Mickleburgh believed Freind's axioms formed "the basis on which Philosophy

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[196] Coleby, "Mickleburgh," 169-170. See also Newton, Opticks, 370-372.

[197] Day 2, Mickleburgh's Lecture Notes, Set II, as cited in Coleby, "Mickleburgh," 170.

[198] Schofield, Mechanism and Materialism, 47.

[199] Day 2, Mickleburgh's Lecture Notes, Set I, in Coleby, "Mickleburgh," 168. Mickleburgh referred here to Freind's Chymical Lectures: In which almost all the Operations of Chymistry are Reduced to their True Principles, and the Laws of Nature (London: By Philip Gwillim, for Jonah Bowyer, 1712).

[200] Schofield, Mechanism and Materialism, 40.

[201] Marie Boas Hall, "Freind, John," Dictionary of Scientific Biography, V (1972), 156; also see Schofield, Mechanism and Materialism, 43-46.

of Chymistry is built";[202] consequently, Mickleburgh reviewed Freind's axioms in his lectures, although he modified them by the addition of the force of repulsion as noted above.[203]

At the time of Hartley's attendance at Mickleburgh's lectures, Mickleburgh drew his students' attention to the work of Stephen Hales as well as that of Freind. Indeed, it is due to his familiarity with Hales' Vegetable Staticks[204] that Mickleburgh accepted and utilized the force of repulsion in his chemical theory.[205] Mickleburgh and Hales had been fellow students at Corpus Christi College,[206] and they had struck up a correspondence "in connection with the pneumatic experiments of the Vegetable Staticks."[207] Mickleburgh's lectures, particularly the quantitative experiments he included,[208] were based upon Hales' "elastick air" and its vibration and reactions with other chemicals.[209]

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[202]Day 2, Mickleburgh's Chemistry Lectures, Set I, in Schofield, Mechanism and Materialism, 47.

[203]Coleby, "Mickleburgh," 168-169; Schofield, Mechanism and Materialism, 47-48.

[204]Stephen Hales, Vegetable Staticks: Or, An Account of some Statical Experiments on the Sap in Vegetables . . . (London: Printed for W. and J. Innys . . . , 1727); hereinafter referred to as Hales, Vegetable Staticks.

[205]Schofield, Mechanism and Materialism, 47-48. See Chapter 10 of Allen and Schofield's forthcoming biography of Stephen Hales (Hales) for a discussion of Hales' influence on Mickleburgh.

[206]Coleby, "Mickleburgh," 165; Thackray, Atoms and Powers, 114.

[207]Allen and Schofield, Hales, 35 note 1.

[208]Coleby, "Mickleburgh," 168.

[209]See Day 2 and Day 3, Mickleburgh's Lectures Notes, Set II, as cited in Coleby, "Mickleburgh," 170-171.

Mickleburgh lauded experimentation as a fruitful method in natural philosophy, especially in chemistry. Moreover he praised "the reverend and ingenious Mr Stephen Hales" as having reduced Newton's chemical hints "into plain facts rendered even visible to our eyes by an almost infinite variety of experiments."[210] Mickleburgh's own lectures were, as was the tradition at Cambridge,[211] medically-oriented, "with very much detail on experiments and medical recipes. . . ."[212]

On the whole, then, Mickleburgh's lectures place him within the speculative-experimental Newtonian methodological tradition and the mechanical tradition of Newtonian dynamic corpuscularity. Indeed, it has been noted,

> Mickleburgh's lectures represent an end-point of dynamic corpuscularity in chemistry and the beginning of a new era. Here Freind and Hales, speculation and experiment, are linked. . . . Here the dichotomy between the mechanism of Newton, Freind, and Hales and the materialism of Boerhaave is illustrated . . . , and here implied is the challenge of the Newtonian aether. . . .[213]

Thus, as a result of his attendance at Mickleburgh's lectures in 1728, Hartley had his attention focused upon Newton's *Opticks*, the forces of attraction and repulsion, and their application to chemistry and medicine.[214] He gained knowledge of the speculative-

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[210] Day 3, Mickleburgh's Lecture Notes, Set II, as cited in Coleby, "Mickleburgh," 171.

[211] Gunther, *Early Science*, 226.

[212] Schofield, *Mechanism and Materialism*, 47.

[213] *Ibid.*, 49.

[214] Hartley's attendance at Mickleburgh's lectures may also have played some part in directing Hartley into medicine as his profession, for in 1729 Hartley left Cambridge, and in 1730 he embarked on his medical career. See Chapter I, 28-30, above.

experimental Newtonian methodology, the mechanistic dynamic corpusculareanism of Freind and Hales, and a brief introduction to the aetherial medium.

Hartley and Hales

Rev. Stephen Hales was educated both at Corpus Christi College, Cambridge, and Oxford. While "little is known of Hales' scientific interests at Cambridge, there is some indication that Hales . . . joined in anatomical dissections"[215] there and heard chemical lectures given by Mickleburgh's predecessor Vigani.[216] Later he studied the works of the Newtonian physiologists John and James Keill and the chemistry of John Freind.

On the whole, Hales accepted the mechanistic tradition of Newtonian dynamic corpusculareanism, and, in fact, in Hales' two major publications, the Haemastaticks and the Vegetable Staticks,[217] can "be seen, in its fullest detail, the power of dynamic corpuscularity to suggest, stimulate, and direct experiment."[218] Hales' "experimental genius"[219] and insistence upon quantitative measurement[220] are evident in the Haemastaticks, in which Hales measured the forces, velocities, volumes, and so forth, of physiological phenomena.[221] The Vegetable

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[215] Ibid., 69. [216] Ibid., 78.

[217] Stephen Hales, Statical Essays: Containing Haemastaticks; or An Account of some Hydraulick and Hydrostatical Experiments made on the Blood and Blood Vessels of Animals . . . (London: W. Innys and R. Manby, and T. Woodward, 1733), II. See note 204, above, for publication information on Hales' Vegetable Staticks.

[218] Schofield, Mechanism and Materialism, 69. [219] Ibid., 70.

[220] Cohen, Franklin and Newton, 271.

[221] Schofield, Mechanism and Materialism, 70-72.

Staticks, however, not only illustrates his experimental approach and his insistence upon quantitative measurement, but also his theoretical abilities. The primary conceptual base of the Vegetable Staticks is Newtonian dynamic corpusculareanism, which Hales drew directly from Newton's works. Quoting frequently from the Opticks, Hales accepted Newton's conjectures as principles to be used in natural philosophy. Hales' Vegetable Staticks thus shows close ties to the speculative Newtonian methodological tradition.[222]

Hales did extend the mechanistic tradition of dynamic corpusculareanism, however, by utilizing for the first time in the tradition the interparticulate force of repulsion in both of his major works. In the Vegetable Staticks, for example, Hales described air particles as repelling each other, while solid particles attract. Furthermore, there is a tension between attraction and repulsion in nature.[223]

In addition to the mechanistic philosophy displayed in Hales' work, elements typical of the contemporary movement towards materialism are also present. In the Vegetable Staticks, parts of the human body and bodies in nature are described as having "active principles." Hales speculated in the Haemastaticks that fibers and nerves may be endowed with "electrical Powers" that cause muscular motion or that "a vibrating electrical Virtue" may flow along them. Electrical powers were so attractive to Hales that he even experimented

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[222] Ibid., 73-74; Cohen, Franklin and Newton, 266, 275, 279.

[223] Schofield, Mechanism and Materialism, 74-75 and 77.

"to see if the body might acquire electricity by agitation of the blood."[224] The Vegetable Staticks also contains "a rare reference to the Newtonian aether, as a medium contributing to the intenseness and duration of heat by its vibrations."[225]

Hartley's personal association with Hales occurred later than his associations with Saunderson and Mickleburgh, but it was probably a more significant exposure to Newtonian natural philosophy because of the very high caliber of Hales' work. As was noted above, Hartley moved to London in the fall of 1735,[226] some eight years after Hales had published his Vegetable Staticks and two years after Hales' Haemastaticks had appeared. After 1733, Hales had begun to devote his energy to making "socially useful the results of his scientific researches . . . [rather than] to continue original scientific investigation. . . ."[227] By March 1737-38, in keeping with Hales' program, Hartley and Hales had begun a series of experiments devised to test the dissolving power of Mrs. Stephens' supposed cure for the stone.[228] By 1738, Hartley was familiar enough with Hales' publications to cite

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[224]Ibid., 73; see also ibid., 72-73 and 78-79; Cohen, Franklin and Newton, 277-278.

[225]Schofield, Mechanism and Materialism, 77 note 20.

[226]See Chapter I, 36, above.

[227]Allan and Schofield, Hales, 133. Chapter Seven in Allan and Schofield's manuscript discusses Hales' application of science to social welfare.

[228]See Chapter I, 42-44, above; Hales, Mrs. Stephens's Medicines.

them as authoritative references in his pamphlets publicizing Mrs. Stephens' cure.[229] In 1740, Hartley and Hales served together on a board of examiners appointed by Parliament to test the efficacy of the medicines following the disclosure of Mrs. Stephens' recipe, and in the same year Hartley appended a "Supplement" outlining a history of the medicines to an account that Hales published describing the experiments he and Hartley had conducted on them.[230]

In the account of these experiments contained in Mrs. Stephens's Medicines, Hales sought to explain in an analytical manner the dissolving power exhibited by the medicines as a result of the ingredients of which they were composed. More specifically, he sought to explain it as a result of the energies, active powers, attractive, repulsive and expansive forces, polarities, textures, and the union of the particles of its ingredients.[231] The experiments that Hales described are quantitative and mechanical.[232] He and Hartley weighed and measured, boiled, filtrated, and calcined the kidney and bladder stones and the soaps and waters involved.[233] Hartley completed a chemical analysis of various soaps into their ingredients and compared their various

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[229] See, for example, Hartley, "Abstract of some Experiments," 34; Hartley, Account of the Contribution, 1-2; Hartley, View of the Present Evidence, 160, 170, 177.

[230] See Chapter I, 43-44, above; Hartley, "Supplement"; Hales, Mrs. Stephens's Medicines.

[231] Hales, Mrs. Stephens's Medicines, 3-5 and 11.

[232] Ibid., 2, 7-8, 16-18.

[233] Ibid., 2, 7-8, 16-18, 24.

proportions by weight.[234] In his account of the experiments, Hales emphasized the power of experiment and observation and the great value of proof by experience. Hales also utilized argument by analogy: Using his explanation of effects observed to occur outside the body, Hales explained unobservable effects that occurred within the body.[235] Following the speculative tradition stemming from Newton's Opticks, Hales included a "Quaere" form of statement.[236] Hales' account of their experiments serves as a good example of explanation of phenomena in the methodological tradition of speculative-experimental Newtonianism and in the Newtonian conceptual tradition of mechanical, dynamic corpusculareanism.[237]

From his familiarity with Hales' published works, as well as his personal association with Hales during the course of their experiments on the stone, Hartley was exposed to the speculative, experimental, and quantitative approach and the primarily mechanistic concepts employed by a man who "may well have had an influence second only to Newton's on the development of eighteenth-century natural philosophy."[238] The Observations on Man displays the effect of Hartley's association with Hales in many ways. In his view of natural phenomena, Hartley followed Hales' and Newton's connection of vibration with heat.[239] The direct

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[234] Ibid., 8 and 14. Hales also referred to earlier experiments in which Hartley attempted to dissolve stones (ibid., 24).

[235] See especially ibid., 5. [236] Ibid., 21.

[237] See especially ibid., 3-5.

[238] Schofield, Mechanism and Materialism, 69.

[239] See Hartley, Observations on Man, I, 14 and 25-26. Hartley pointed directly to Newton, particularly "Query 18," as his source, however (ibid., 14 and 26).

influence of Hales' work is evident in Hartley's belief that air particles are electrics and self-repulsive.[240] The physiological mechanism described by Hartley follows Hales' example, since it is quantified to some degree, dependent upon the force of repulsion as well as attraction, and utilizes a tension between particulate attraction and repulsion to explain the transmission of vibration. Hartley derived his morphology of muscle fibers partially from Hales' observations,[241] and the impact of Hales' speculations appears in Hartley's assertion that the parts of the human body, particularly the medullary substance and the muscles, possess "active powers." Hartley also speculated that an "electric virtue" similar to the one Hales in the Haemastaticks considered might be the cause of muscular motion does indeed exist in the muscular fibers and nerves. Furthermore, this "electric virtue" might be acquired by respiration and replenished in the muscles by transmission via the blood globules.[242] Hales himself considered blood globules to transmit electricity, and in this regard Hartley specifically cited both Hales' and Robert Hooke's experiments on the electricity of the blood.[243] Hales also served as a source of Newtonian materialism, for in the Observations on Man, Hartley agreed with Hales' view of the aether as assisting the propagation of vibration in nature. It is likely that his work with Hales further impressed on

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[240] See Chapter III, 142, above, and Hartley, Observations on Man, I, 182.

[241] See Chapter III, 209, above.

[242] See Chapter III, 207-211, above.

[243] See Chapter III, 208, above.

Hartley the emphasis upon proof by observation and experiment and argument by analogy displayed in Newton's Opticks, emphasized earlier in Mickleburgh's lectures, and upon which Hartley heavily relied in the Observations on Man.

This examination of the contact Hartley had with Saunderson, Mickleburgh, and Hales has revealed that Hartley was exposed to all four strains of Newtonianism, although not with equal emphasis. From Saunderson, Hartley gained a respect for the mathematico-deductive methodological tradition and a desire to apply mathematics to all areas of natural philosophy. From Mickleburgh and Hales, he was exposed to speculative-experimental Newtonianism, complete with an emphasis upon quantification, and to the conceptual tradition of mechanistic dynamic corpusculareanism. From Mickleburgh but, more importantly, from Hales, Hartley received a brief exposure to the growing materialistic tradition and its potential.

These traditions are not all equally evident in Hartley's Observations on Man, however. In the long run, Mickleburgh and Hales' speculative-experimental method and mechanical dynamic corpusculareanism, along with Newton's own aetherial medium and the newly-emerging materialistic tradition, appeared to Hartley to be the most fruitful in his application of the methods and concepts of contemporary natural philosophy to the study of mind.

CONCLUSION

Historically speaking, modern psychology is a product of the interaction of philosophy, medicine, biology,[1] and, it should also be added, theology. The interrelationships between these fields are not yet clearly understood, especially the relationship between psychology and natural philosophy. At least one historian of science has voiced a need to relate the development of psychology to the development of natural philosophy as a whole.[2]

Natural philosophy and the study of mind came into contact in the seventeenth century when philosophers such as Hobbes began to extend the methods and concepts used in their explanation of the external physical world to their explanation of the internal psychic world. As they did so, they banished "occult forces" from their study of mind in the same way that in earlier periods they had banished them from the study of nature. This "natural philosophy of mind" became more acceptable in the eighteenth century primarily due to the influence of John Locke. Locke inaugurated what has been referred to as the "Newtonian conception of man," which views man and mind as analogous to nature and therefore as approachable in the same way. More specifically, Locke saw mind as complex, corpuscular, regular, law-abiding, and subject to analysis.

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[1] Robert M. Young, "Scholarship and the History of the Behavioural Sciences," History of Science, V (1966), 1.

[2] Ibid., 19.

It has been suggested that the character of modern psychology was thus in a sense determined by natural philosophy, since it "grew, in fact, from a synthesis of views of Locke and Newton within the dualistic framework set by Descartes."[3] Looking at the inception, development and characteristics of the psychology proposed by David Hartley, one of the earliest philosophers to accept and elaborate the "Newtonian conception of mind" proposed by Locke, leads to a revision of this picture of the development of psychology.

Intending to enter the Anglican clergy, Hartley matriculated at Cambridge in 1722. There he studied divinity, mathematics, and natural philosophy. He was at that time introduced to the works of Sir Isaac Newton, most importantly Newton's _Principia_ and _Opticks_, and to several popular Newtonian scientific traditions. His study with the celebrated Nicholas Saunderson acquainted him with the mathematico-deductive Newtonian methodological tradition derived from Newton's _Principia_, which emphasized the certainty of deduction of propositions from first principles, the usefulness of abstraction from phenomena, and the applicability of mathematics to the study of natural philosophy. While at Cambridge, Hartley enrolled in a series of lectures on chemistry taught by John Mickleburgh in 1728, and from him Hartley gained knowledge of the highly-popular speculative-experimental methodological tradition that stemmed from Newton's _Opticks_ and promoted an experimental approach to nature centering around observation, speculation, and proof by experience and/or analogy. Mickleburgh's lectures drew heavily from the matter theory dominant in the first four decades of the

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[3] _Ibid._, 20.

eighteenth century, Newtonian dynamic corpusculareanism. According to this theory, natural and physiological phenomena are reducible to a play of particles and their interparticulate forces of attraction and repulsion.

After having received his M.A. in 1728-29, however, Hartley left Cambridge to teach; within a year he took a leave of absence because he had developed serious second thoughts about entering the Church. Apparently Hartley had reached the conclusion that natural religion conflicted with revealed religion as represented by the Thirty-Nine Articles of the Anglican Church and that, therefore, one of the two must be in error. These doubts concerning the validity of natural and revealed religion were at least partially responsible for Hartley's change to a medical career in 1730, and they ultimately led to the composition of the Observations on Man.

Hartley began the study of the mechanism of the association of ideas, which he had learned of from Locke and Gay, who had applied it to ethics, in 1730 or 1731. At that time he approached his study of association as a study in epistemology and ethical philosophy; his overriding goal was to resolve both his own personal doubts about the truth of revealed religion as well as the apparent conflict between natural and revealed religion. In the process of resolution, Hartley composed his initial two "Progress" treatises some time prior to June of 1735. In these two treatises, Hartley argued that reason and Scripture are not at odds, but rather should be seen as two paths leading to the same single conclusion: Happiness and salvation is the ultimate end of every man. Moreover, the association of ideas is the mechanism which continually and automatically propels man towards the state of happiness guaranteed him by Scripture. On the basis of Hartley's description of the contents of the two treatises in his letters to Lister, it can be determined that Hartley has not accepted, but modified and extended the ideas of Locke. The treatises also reveal that the emergence of a systematized association psychology and a statement of the law of association had already occurred by 1735, earlier than is commonly believed.

Only much later did Newton's ideas come to play a role in the development of Hartley's psychology, and then only after Hartley's close association with the Newtonian natural philosopher Rev. Stephen Hales. Following his composition of the "Progress" treatises, Hartley continued his examination of the concept of association as part of his studies in divinity, alongside his prospering medical practice, his promotion of Mrs. Stephens' medicines for the stone, and his work, beginning in 1737-38, with the highly-respected and influential Hales. Hartley and Hales were both seeking a dissolvent for the stone, one of the most common ailments of the day, and consequently they engaged in a series of chemical experiments designed to test the efficacy of Mrs. Stephens' purported remedy. In the process of his association with Hales, Hartley became acquainted with Hales' experimental approach to the study of natural philosophy and physiology, with his dependence upon concepts drawn from Newtonian dynamic corpusculareanism, as well as with Hales' speculations on the materialistic causes of natural and physiological phenomena. In light of Hartley's work in 1737-38 with Hales, whose speculative Newtonian physiology stands out from the rest in the history of eighteenth-century natural philosophy, it is significant to note that Hartley revised his approach to the study of association in 1738 to include for the first time a detailed examination of the physiological basis of association, as well as the effect of mental phenomena upon the body.

By June of 1745, Hartley had finished a rough draft of the physiological psychology that would later be published as the Observations on Man. The following month he sent an abstract of the physiological and mental aspects of the larger work to press, as an appendix to a pamphlet concerning Mrs. Stephens' cure for the stone. In February 1745-46, this abstract, the Conjecturae, appeared. In it Hartley referred to Newton ten times; Leibniz three; Descartes, Locke, and Hales twice. Furthermore, Hartley gave therein the first extant display of his connection of Newton's theories to the study of association. Of special interest is Hartley's use of Newton's subtle and elastic aetherial medium, for it shows the influence upon Hartley of a newly-emerging and increasingly-popular contemporary conceptual tradition of Newtonian materialism. Since it is in the Conjecturae that the earliest extant historical evidence of Hartley's incorporation of Newtonian natural philosophy into his study of mind appears, the genesis of his physiological psychology can be said to have occurred between the time of his initial physiological speculations in 1738 and the rough draft of the larger work completed in 1745, rather than with the publication of the Observations on Man in 1749.

By December of 1747, Hartley had completed a new draft of the Observations on Man, and sometime between January 1747-48 and December

1748 he had sent his manuscript to the printers for a proof and had returned the corrected copy for the final printing. By January 1748-49 the printing had been finished and in the late winter of 1748 or the early spring of 1749 the Observations on Man was released to the public.

It is apparent from the analysis of Hartley's theory presented in Chapter III above that Hartley drew many concepts directly from the works of Newton, especially from the Opticks, and Hartley's approach to the study of mind and its physiological basis bears some similarity to an ideal method of investigation and proof suggested in Newton's Principia and Opticks. More closely, it resembles the method of proof Newton relied upon in the Opticks itself.

But in a century in which Newtonian natural philosophy was widespread, Hartley was exposed to Newtonian ideas as well as Newton's. As was mentioned above and developed in Chapter IV, Hartley came into contact with the Newtonian speculative-experimental methodological tradition during his study with Mickleburgh and his experimentation with Hales. He was exposed to the mathematico-deductive tradition while a student of Nicholas Saunderson. Hartley received a thorough grounding in Newtonian mechanical dynamic corpusculareanism with Mickleburgh and Hales.

Although Hartley's Observations on Man assumed the existence of the aether and attributed active powers, virtues, and qualities to particles in both the physical and mental realms, neither Saunderson, Mickleburgh, nor Hales appears to have served as a source of more than an introduction to the materialistic Newtonian tradition gaining credibility in England in the decade prior to the publication of the Observations on Man in 1749. Indeed, after recollecting that the physiological psychology took form between 1738 and 1745 and after recalling Hartley's specific references to Newton's speculations on the aether, it may be reasonable to conclude that while Hartley derived elements of his method and his dynamic corpuscularity from Newton and the Newtonians Saunderson, Mickleburgh, and Hales, the source of his participation in the Newtonian materialistic tradition lay elsewhere.

At this point, Hartley's psychology must be seen as more a product of the contemporary Newtonian traditions of natural philosophy than a synthesis of the views of Locke and Newton themselves. The task of relating the development of Hartley's theory to the character of eighteenth-century Newtonian natural philosophy has, however, just begun. The influence of other Newtonians upon Hartley and the source of Hartley's materialism is yet to be determined. After this has been done, we will have a clearer picture of the development of Hartley's thought, as well as of the relationship between natural philosophy and the development of modern psychology as a whole.

APPENDIX A:

ANNOTATED CHRONOLOGICAL BIBLIOGRAPHY OF THE WORKS OF DAVID HARTLEY AND THEIR EDITIONS

Hartley, David. Correspondence. In Warner, Rebecca, ed. Original Letters from Richard Baxter, . . . &c., &c. Bath: Printed by R. Crutwell, 1817.

Three letters spanning the years 1721-1755.

__________. Correspondence with Sir Hans Sloane. British Museum, London, England. Sloane Collection MSS. Sloane 4052, folio 264; Sloane 4053, folio 163.

Two letters concerning inoculation, written in 1732-33 and 1733-34.

__________. Some Reasons Why the Practice of Inoculation Ought to be introduced into the Town of Bury at Present. Pamphlet dated January 12, 1732-33. Bury St. Edmunds: n.p., Printed in the Year, 1733.

__________. "The Progress to Happiness deduced from Reason--& from Scripture."

Two unpublished treatises written in 1735. Not extant. Known only through Hartley's letter to Lister of December 2, 1736.

__________. Berkshire County Record Office, Royal County of Berkshire, Reading, Berkshire, England. Hartley-Russell Collection MSS.

Various letters, household and professional records, and family documents spanning the years 1735-1757. Many records and letters are in John Byrom's obsolete shorthand style.

__________. Correspondence with John Lister. Central Library, Metropolitan Borough of Calderdale, Halifax, Yorkshire, England. Shibden Hall Collection MSS.

Thirty-two letters spanning the years 1735-1756. Beginning in 1741, many letters were written in Byrom's shorthand style.

Hartley, David. Ten Cases Of Persons who have taken Mrs. Stephens's Medicines for the Stone. With an Abstract of some Experiments, tending to Illustrate these Cases. Pamphlet dated March 6, 1737-38. London: Printed for S. Harding . . . , 1738.

__________. An Account of the Contribution for making Mrs. Stephens's Medicines public; with some Reasons for it, and Answers to the most Remarkable Objections made against it. Pamphlet dated June 5, 1738.

__________. Correspondence. British Museum, London, England. Additional MSS Collection. Add. MSS 33083, folio 276 and 278-279.

Three letters written in 1738 concerning the treatment of a patient.

__________. An Introduction to the History of Man in four Parts.

Unpublished treatise, 1738. Not extant. Known only through Hartley's letter to Lister, November 23, 1738.

__________. A View of the Present Evidence For and Against Mrs. Stephens's Medicines, as a Solvent for the Stone. Containing a Hundred and Fifty-five Cases. With some Experiments and Observations. Pamphlet dated March 3, 1738-39. London: Printed for S. Harding . . . , 1739.

__________. Recueil d'experiences et d'observations sur la pierre, Et en particulier sur les effets des Remedes de Mademoiselle Stephens, pour dissoudre la Pierre. Translated by S. F. Morand. Paris: Chez Piget . . . , 1740.

__________. "A Supplement to a Pamphlet intitled, A View of the present Evidence for and against Mrs. Stephens's Medicines, &c. Being a Collection of some Particulars relating to the Discovery of these Medicines, their Publication, Use and Efficacy." Appended to Stephen Hales, An Account of some Experiments and Observations on Mrs. Stephens's Medicines for dissolving the Stone: Wherein Their Dissolving Power is inquir'd into, and shown. . . . London: Printed for T. Woodward . . . , [1740].

__________. De Lithontriptico a Joanna Stephens nuper invento dissertatio epistolaris auctore Davide Hartley, A.M. & R.S.S. Basileae: Apud Johannem Christ, 1741.

__________, and Sandys, Francis. "Another Case of a Person bit by a Mad-Dog, drawn up by David Hartley, M.A. and Mr. Fr. Sandys, communicated to the Royal Society by Francis Wollaston, Esq; F.R.S." Philosophical Transactions, XL, No. 448 (for June-July, 1738; published 1741).

Hartley, David. "An Account of the Case of a Calculus making its Way through an old Cicatrix in the Perinaeum, by David Hartley, M.A. F.R.S." Philosophical Transactions, LXI, No. 456 (for January, February, March, April, May, and June, 1740; published 1742).

Manuscript for this article is located in the British Museum, Add. MSS 4437, folio 46-49.

__________. "An Account by David Hartley, M.B. F.R.S. of Dr. Trew's Dissertation concerning the Differences of a Human Body before and after Birth, intituled, Dissertation epistolica de differentibus, deque vestigiis Divini Numinis inde collegendis; Jo. Georgio Kramero inscripta cum Tab. AEn. Auctore Christoph. Jacobo Trew, Noribergae, 1736. 4to." Philosophical Transactions, XLI, No. 457 (for July and August, 1740; published 1743).

Manuscript for this article is located in the British Museum, Add. MSS 4434, folio 45-46b.

__________. "Directions for preparing and Administering Mrs. Stephens' medicine in a solid form." Gentleman's Magazine (1746).

__________. De Lithontriptico a Joanna Stephens nuper invento Dissertatio Epistolaris . . . editio secunda. Cui Adjicitur Methodus exhibendi Lithontripticum sub formâ commodiore. Accedunt etiam Conjecturae quaedam de Sensu, Motu, & Idearum Generatione. Bathoniae: Typis T. Boddeley . . . , 1746.

__________. Observations on Man, His Frame, His Duty, and His Expectations. In Two Parts. 2 vols. London: Printed by S. Richardson . . . , 1749.

__________. Ad Virum Clarissimum Ric. Mead, M.D. Epistola, varias Lithontripticum Joannae Stephens, exhibendi methodos indicans. Auctore, Davide Hartley, A.M. Bathoniae: Typis T. Boddley, 1751.

__________. Correspondence. British Museum, London, England. Additional MSS Collection. Add. MSS 35593, folio 215.

One letter concerning Hartley's son's fellowship, written in 1755.

__________. Correspondence with Stephen Hales. Berkshire County Record Office, Royal County of Berkshire, Reading, Berkshire, England. Hartley-Russell Collection MSS.

Six letters from Hales to Hartley, spanning the years 1755-1757.

Hartley, David. Correspondence with Joseph Priestley.

Not extant.

__________. Explication physique des sens, des idees, et des mouvemens, tant volontaires qu'involontaires, Traduite de l'Anglois de M. Hartley, M.A. par M. l'Abbe Jurain. 2 vols. Reims: Chez Delaistre-Godet, 1755.

__________. Betractt. uber d. Menschen, seine Natur, seine Pflichten, seine Erwartungen; aus d. Engl. (von H. A. Pistorius). Rostock: Stiller, 1772-73.

__________. Hartley's Theory of the Human Mind, on the Principle of the Association of Ideas . . . By Joseph Priestley. . . . London: Printed for J. Johnson . . . , 1775.

__________. Hartley's Theory of the Human Mind, on the Principle of the Association of Ideas . . . By Joseph Priestley. [2nd ed.] London: Printed for J. Johnson . . . , 1790.

__________. Observations on Man, His Frame, His Duty, and His Expectations. In Two Parts . . . Reprinted from the Author's Edition in 1749. To which are now added, Notes and Additions to the Second Part. . . . [2nd ed.] London: Printed for J. Johnson . . . , 1791.

__________. Observations on Man. . . . 3 vols. [3rd ed.] London: J. Johnson . . . , 1791.

__________. The Conclusion of the Late Dr. Hartley's Observations on the Nature, Powers, and Expectations of Man; strikingly illustrated in the events of the present times, with notes and illustrations by the editor. Edited by Joseph Priestley. London: n.p., 1794.

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