

Psychology in the Age of Newton:
Hume and Hartley on the Association of Ideas

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Abstract

I argue that the quite dissimilar associationist theories of Hume and Hartley were both strongly influenced by Isaac Newton, who made different methodological recommendations in each of his two major works. Hume, influenced by the *Principia Mathematica* in which Newton described but refused to hypothesize about a cause of gravity, likewise declines to explain the causes of perceptions or the law-like manner in which they come to be associated. Hartley was influenced by the *Optiks*, in which Newton speculated that gravitational and other physical forces are transmitted by vibrations. In Hartley's model, perceptions are vibrations carried from external objects to sense organs, nerves and brain where they give rise to ideas which were attracted, one to another, in a manner he described as associative. The influence of both thinkers on subsequent psychological theory is considered.

Introduction

The intellectual climate in Britain in the 18th century was dominated by the ideas of Isaac Newton (1643–1727) whose calculus, theory of gravity and studies of optics and light set the tone and agenda for his generation of natural philosophers, and for the next. It is, therefore, not surprising to find that important mid-century figures in the history of psychology like David Hume (1711–1776) and David Hartley (1705– 1757) were influenced by him and sought

to situate their work in relation to his, asserting that the association of ideas, a doctrine to which both men subscribed, was akin to Newton's gravitational attraction. It is, thus, initially surprising and ultimately significant that theories proposed by these two Newtonians, and the major works of each — Hume's *Treatise of Human Nature* (1739/1740) and Hartley's *Observations on Man* (1749/1752) — are so radically different, one from the other. That Newton's work should give rise to such disparate psychologies becomes less surprising when we reflect on the vast breadth of his endeavours. Newton applied different methodologies in different areas of his research, and the differences between Hume and Hartley correspond, quite markedly, to the approaches taken by Newton in his major mathematical and cosmological work *Principia Mathematica* (1687/1704) and in his more experimental investigation of light in the *Optiks* (1704/1705). As I will show below, the Newton who influenced Hume was the author of the *Principia*, while Hartley followed the injunctions of the *Optiks*.

Newton

Newton, in the Rules of Reasoning in Philosophy with which he begins Book III of the *Principia*, rejects hypothetical speculation with the assertion that in natural philosophy only propositions induced from observations could be admitted (Rule 4) and he explicitly refuses to posit that gravitational force is a universal property of matter (Rule 3). Even more famously, in the General Scholium to Book III he refuses to theorize about the cause of gravitation, about which he says, "I make no hypothesis" ("*hypotheses non fingo*"). And Hume, in a note to *T.1.2.5.26*, observes that, "If we carry our enquiry beyond the appearances of objects to the senses, I am afraid, that most of our conclusions will be full of scepticism (*sic*) and uncertainty," and goes on to assert that: "If *the Newtonian* philosophy be rightly understood, it will be found to mean no more" (italics in original). As I will show below, "*hypotheses non fingo*" was a maxim Newton applied only in the context of cosmological and mathematical studies, where specific attributes of matter other than mass and motion were irrelevant and experimentation was impossible. In his studies of light and optics, where specifics

did matter and hypotheses could be tested by experiment, Newton was more than willing to speculate, even about the ultimate nature of the gravitational force (*Optiks*, Q 31, pp. 376–7).

Hume

Hume's subject matter in Book I of the *Treatise*, "Of The Understanding," is, he believes, not one suitable for experimentation. He restricts himself to purely mental phenomena, which he calls perceptions and, like Newton in the *Principia*, he declines to engage in speculation about any possible relationship between mental objects and things or events that might exist outside of the mind, and might be the cause of perceptions. Hume simply observes that perceptions are of two kinds, impressions, of what he does not say, and ideas, which are less "lively" copies of impressions (*T.1.1.1.1*; c.f. Landy, 2006 on the copy principle). What interests him are the law-like regularities in the way that ideas naturally attract one another and come to be associated in the mind, a phenomenon he sees as analogous to the law-like behavior of gravitational attraction (*T.1.1.4.6*). The fact of mental associations is, for him, a mere observable phenomenon, about which he gives no explanation or mechanical analysis beyond noting that associations between specific ideas are established by experience. What concerns him are the patterns or principles of association, which he identifies as Resemblance, Contiguity (in time or place) and Cause and Effect (*T.1.1.4.1*). These patterns he compares to the (Newtonian) laws of attraction that operate in the natural world. He argues that it is impossible to investigate their causes, which, he says, "are mostly unknown, and must be resolv'd into original qualities of human nature, which I pretend not to explain" (*T.1.1.4.6*).

Hume's commitment to what he sees as "Newtonianism, properly understood" (*T.1.2.5.26n*) is, however, something more than a mere refusal to consider the causal factors behind the laws of mental association or attraction. His analysis of causation is, in its own right, a logical extension of the conservative empiricism of the *Principia*. For him, relations of cause and effect, themselves, can only be shown to operate as a principle by which ideas are associated in the mind. Unlike earlier epistemological empiricists, like Hobbes

and Locke, Hume does not accept the principle of causality — everything that begins to exist must have a cause — as an intuitively known and demonstratively certain fact about nature (*T.1.3.3.4n*; *T.1.3.3.6n*). He argues that only comparisons that can be between ideas themselves — i.e., analytical relations — can be intuitive and demonstratively certain (*T.1.3.1.5*). The idea of causality, which involves positing a relation between objects that can exist independently of each other (*T.1.3.2.3*), can never be certain because the only relations between “cause” and “effect” that can be observed are contiguity and sequence; the third element in any causal reasoning, the idea of “necessary connection” between the two objects, is not a property of the objects themselves but rather an idea derived from prior experience *T.1.3.2.5–16*. As a result, any ideas we might have about the causes of our perceptions can only be speculations: speculations to which we may be strongly inclined by the nature of our minds, but speculations nevertheless.

Hartley

Where Hume, the agnostic philosopher and man of letters, followed the restrained Newton of the *Principia*, David Hartley, physician, anatomist and man of strong religious faith, was influenced by the more experimentalist and speculative spirit of the *Optiks*. From this work he both takes general methodological dicta — particularly the admonition, at the end of Query 31 (p. 405), that natural philosophers should investigate his (Newton’s) speculations — and he elaborates on specific hypotheses, two of which are: 1) that vibrations are the mechanism of action at a distance, whether gravitational, electrical or magnetic, and 2) that those vibrations are carried through the aether (*Optiks*, Q. 31, pp. 376–7; *Obs. Prop. 5*, pp. 13, 26).

For Hartley, who asserts a dualist conception of human nature in the first line of the introduction to *Observations on Man* (pg. i), the associationist idea, combined with Newton’s hypothesis about vibrations, was an effort to bridge the mind-body gap, by asserting common natural laws governing both. An anatomist, he knew that nervefibers are not hollow (*VC Prop. 1*, pg. 2) and rejected Descartes’s pneumatic model of nerve action. He argued, instead, that Newton’s

aether, a medium subtle enough to permeate dense bodies as well as apparently empty space, transmitted vibrations, through the white matter of peripheral nerves to the medullar white matter of the brain (*Obs. Prop. 4 & 5, pp. 12 & 13*). These nervous vibrations themselves originate in sense organs that are stimulated by external vibrations similar to those of gravitational and other physical forces associated with external objects (*Obs. Prop. 5, pp. 13, 26*). These vibrations, besides carrying sensory information to the brain, also activate muscle action (*Obs. Prop. 15–19, pp. 85, ff*).

Furthermore, he argues, the initial sensory vibrations leave behind vestiges, or residual vibrations, which are the cause of Ideas and which resonate when similar sensations are felt on subsequent occasions (*Obs. Prop. 8, pp. 56, ff*). Repeated sequences of sensations cause the ideas, to which they give rise, to be associated such that a given sensation can stimulate not only the idea of itself but also other ideas with which it has become associated (*Obs. Prop. 10, p. 65, ff*). Also, the residual miniature vibrations caused by specific sensations compound into more complex ideas by means of association (*Obs. Prop. 12, pp. 73, ff*).

Hume & Hartley Compared

The common fruit of both Hume's and Hartley's Newtonian strategies is the analogy between gravity and the association of ideas, both of which are described as attractive and organizing. Hartley, by pursuing the implications of Newton's speculative hypotheses, is able to suggest a fairly exact mechanism for the interaction between the environment and human mental activity. But, in comparison with Hume, what he gains in precision is balanced (perhaps over balanced) by a corresponding loss of flexibility, as the vibratory mechanism seems to tie him to the one principle of association that his model explains, Contiguity (*Obs. Prop. 10, p. 65*). Hume, who is merely describing what he observes by introspection, without attempting explanation, finds, in addition to Contiguity, the principles of Resemblance and of Cause and Effect (*T.1.1.4.1*).

Their respective attitudes toward the possibility of providing causal explanation for the associative laws they discovered had profoundly different effects on subsequent generations of psychologists and psychologically oriented

natural philosophers. Hartley, because he attempts to provide a mechanism whereby the environment can affect ideas, was attractive to moralists and reformers interested in developing techniques for influencing human thought and behavior in ways that would improve social conditions and political systems. His theory of association (stripped of the Newtonian physics) passed through Joseph Priestly to Jeremy Bentham (Steintrager & Elkins, 1977) becoming part of utilitarianism within which it constituted a kind of primitive “learning theory” in ways that anticipated B.F. Skinner (2005) and the subsequent development of cognitive psychology (Baars, 1986) and, of course, neuropsychology (Aubert and Whitaker, 1996; Finger, 2001).

Hume’s influence on contemporary psychology has been less direct. Originally misread as a skeptic by his contemporaries like Immanuel Kant (2010/1781) and Thomas Reid (1941/1785), the impact of his work was primarily on idealist philosophy. Since the publication of Norman Kemp Smith’s *The Philosophy of David Hume* (2005/1941), however, Hume scholars have seen him as more naturalist than skeptic, and he is easily understood as foreshadowing evolutionary strains in contemporary psychology (Meehan, 2010).

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