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INFLUENCE OF SENSATIONALIST TRADITION ON EARLY THEORIES OF THE EVOLUTION OF BEHAVIOR

By ROBERT J. RICHARDS*

Julien Offray de La Mettrie, in *L’homme machine* (1747), proposed that an ape might be taught to communicate intelligently with man by using techniques designed for the deaf. The ape, then, would no longer be a wild man, nor a defective man; he would be a perfect man, a little gentleman, with as much substance or muscle as we have for thinking and profiting from his education.¹

Only its lack of formal education prevented an ape from being recognized as one of us. In suggesting this, La Mettrie was drawing a straightforward conclusion from the epistemological tradition, stemming from Locke and Gassendi, of sensationalism. This tradition, which was based on the assumption that all cognition ultimately derived from sensory experience, stressed the continuity of animal and human reason, the associationist view of intelligence, materialistic psychology, and habit as the key to mental progress. Sensationalist conceptions of animal behavior had a significant influence on evolutionary theories of behavior during the late eighteenth and early nineteenth centuries.

* I am much indebted to Allen Debus, Leonard Krieger, and the Journal's editor for their advice concerning this paper. A briefer version was presented at the annual meeting of the International Society for the History of Behavioral and Social Sciences (Cheiron), June 1977.

¹ Julien Offray de La Mettrie, *L’homme machine*, edited with notes by Aram Vartanian (Princeton, 1960), 162. (Translations, unless otherwise indicated, are my own.) Many travelers to Africa and southeast Asia during the eighteenth century returned with fantastic tales of the “Wild-Man” or “Orang Outang,” stories of its very human characteristics, including copulating with native women. There was considerable debate among naturalists whether this ape should be included as a variety of *homo sapiens*. Buffon decided that, lacking language and reason, it was but an animal, that is, a sophisticated machine (see note 24 below). But the opinion of La Mettrie was shared by others, perhaps most insistently by that eccentric Scots jurist and philosopher James Burnet, Lord Monboddo (1714-99). In the first of his six volume *Origin and Progress of Language* (Edinburgh, 1773-92), Monboddo argued against Buffon that “the Orang Outang is an animal of the human form, inside as well as outside: That he has the human intelligence, as much as can be expected in an animal living without civility or arts” (*ibid.*, vol. 1 [2nd ed., 1774], 289). He was convinced that the Orang had the “capacity” for language and, like man, might acquire it if educated in appropriate social circumstances (*ibid.*, 299). Both La Mettrie and Monboddo felt that intellectual performance and language were the acquired products of the arts and habits associated with civil society.

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But this poses a certain paradox. Nineteenth-century evolutionary theorists usually claimed animal instinct—for example, the seemingly automatic way the hive-bee constructed its cells or the Brent goose found its way north—to be the paradigm of inherited and evolved behavior. Yet eighteenth-century French sensationalists were apt to contend that instincts, as usually understood, did not exist. Jean Antoine Guer (1713-64), an historian of animal psychology writing in 1749, exclaimed:

Instinct is a kind of infantile idea. It is purely a popular notion. It is, as I have said, a notion of the ignorant, of those who have not the least tincture of philosophy; and I do not think any philosopher ever takes it into his head to base a tight-knit and coherent system on instinct.\(^2\)

This paper discusses the development of sensationalist ideas of animal behavior and their impact on early evolutionary theories of instinct.

I. Sensationalist Theories of Animal Instinct and Intelligence. The basic elements of the sensationalist approach infused Pierre Gassendi’s (1592-1655) discussions of animal instinct and intelligence. Gassendi set his views in opposition to certain Aristotelian and Cartesian theories of animal behavior. Among the Aristotelians, for instance, were the Jesuit Fathers at Coimbra, Portugal, who wrote on instinct during the late sixteenth century.\(^3\) They explained instinctive behavior, such as the lamb’s flight from the wolf, as a function of the animal soul, in which the Creator had instilled sets of behavioral determinants for the preservation of the individual and its progeny. Descartes (1596-1650) and his later disciples, by contrast, denied that animals had substantial souls and that their actions were the result even of primitive cognition. Animals were only machines; their actions came, as it were, wired-in.\(^4\) Both Aristotelians and Cartesians refused to see in animal behavior the least stirrings of intelligence or reason. The actions of beasts, they believed, were compelled by blind instinct.

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\(^3\) “An brutae animantes solo natura instinctu in fines suos ferantur” and “Quidnam sit brutorum animantius instinctus,” *Commentariorum Collegii Conimbricensis Societatis Iesu, In octo libros Physicorum Aristotelis Stagirita, prima pars, II, ix, quest. 3 et quest. 4* (Cologne, 1602), cols. 420-29.

\(^4\) See, for example, Descartes’ letter to the Marquess of Newcastle (1646), *Oeuvres de Descartes*, edited by C. Adam and P. Tannery (13 vols; Paris, 1897-1913), IV, 573-75. Thomas Willis’s *De anima brutorum quae hominis vitalis ac sensitiva est* (1672), in *Thomae Willis Opera omnia*, ed. G. Blasius (Amsterdam, 1682), and Antoine Dilly’s *Traité de l’âme et de la connaissance des bêtes* (1676) rev. ed. (Amsterdam, 1691) developed and refined Descartes’ theory of the beast machine.
In his *Syntagma philosophicum* (posthumously, 1658), Gassendi disputed this denial of reason to beasts. He undertook a careful analysis of imagination, the highest faculty Aristotelians accorded animals, to show that its operations were symmetrical with the operations of reason in man. The Aristotelians granted that brutes could manipulate sensory images: the dog, for instance, could compare a present visual image with one stored in memory in recognizing its master. But this did not seem to Gassendi to be a judgment logically different from that exercised by men; and in his analysis of the ideas which human reason entertained, he discovered them to be only congeries of sensory images. Gassendi reinforced this assimilation of human intellect to the operations of sensory imagination by depicting instances, taken mostly from Plutarch (ca. 46-120), of the wonderful actions of animals, which seemed to confirm the attribution of reason to beasts. He cited, for example, the story of Thales' ass, which in one of its daily crossings of the river chanced to submerge its load of salt, and found that its burden became lighter as the salt melted through the bags. Thereafter the ass would always stumble as it crossed the river. In Gassendi's view it must have acted implicitly according to the syllogism: whatever is pleasurable, I will do; immersing the salt is pleasurable; therefore I will immerse it. Judgment and syllogistic reasoning were hence not beyond an animal's ability. There was, in fact, as Gassendi's friend Cureau de La Chambre (1594-1669) argued, a continuity of increased perfection in reason running through the animal kingdom to man. This conclusion Gassendi urged on Descartes, of course without avail, in their interchange over the latter's *Meditationes de prima philosophia*.

In examining animal behavior, Gassendi discriminated several examples that appeared not to be the result of blind compulsion. One

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7 *Ibid.*, 412: "And indeed, by the term reason we understand the power or principle of ratiocination, but this is only to gather one thing from the awareness of another; and nothing is easier to observe than that brutes do gather one thing from another, which is to say, they reason and have the power of reason."

8 In "Quelle est la connoissance des bestes," an addition to his *Les caractères [sic] des passions* (2nd ed.; Amsterdam, 1658), de La Chambre agreed with Gassendi that just as the human understanding composes and divides, so in the beast "the imagination does nothing else but unite and separate images of objects which the senses furnish in order to judge what is good or bad for the animal" (*ibid.*, 544). In that continuous progression of perfection, therefore, the rational soul of man should be rooted in the sensitive soul of the animal, and "the actions of the understanding should be begun and, as it were, sketched in those of the sensitive soul" (*ibid.*, 543).

sort would later impress Charles Darwin:10 the animals of the new world
did not seem to have an innate fear of man; this was something that they
had to learn. Gassendi thought the same was the case for many other
putative instincts. He granted that there had to be incipient images or
standards of pleasure native to animals by which they might immedi-
ately judge an object as something to be avoided or sought; but when
any activities—the building of nests, for example—depended on the
apprehension of a future good and the means to attain it, then, he argued,
reasoning was required.11

Sensationalist ideas are probably more familiarly associated with the
views of John Locke (1632-1704), though Locke himself was frequently
called a Gassendist for those same ideas.12 In his Essay Concerning
Human Understanding (1690), Locke applied the "historical plain
method" to the problem of animal reason, and determined that as our
own behavior reflected the operation of ideas and mental faculties, so
many of the actions of animals bespoke perception, ideas, memory, and
judgment. He concluded that if animals "have any ideas at all and are
not bare machines (as some would have them) we cannot deny them to
have some reason."13 What Locke did deny them, though, was the ability
to formulate abstract ideas,14 and so left a gap in the progression of rea-
son from animals to men.

As is well known, George Berkeley (1685-1753) and David Hume
(1711-76) dispatched Locke’s theory of abstract ideas of reflection,
and in so doing destroyed the basis for a remaining distinction between
men and animals. Using Locke's own method of closely observing mental
operations and retracing the source of ideas, Hume found that all of our
ideas, including abstract ideas, were but less lively images, or copies,
of impressions, and, consequently, that animals were as capable of the
full range of ideas as men. With skeptical twist, Hume modeled human
reasoning on that of animals. The mental operations of both, he con-

10 Charles Darwin’s Natural Selection, being the Second Part of his Big Species
Book Written from 1856-1858, ed. R. Stauffer (Cambridge, 1975), 495-98.
11 Gassendi, "De instinctu brutorum," Physicae, III, ii, 8, ch. 5, II, 415:
"Partly, instinctive motion occurs through a simple apprehension of good or evil
when it is actually present; partly, through reasoning and a cognition of a future
good or evil which in some fashion is made present to imagination. . . . Thus all
of those arts of hunting, either by attack or subterfuge, which animals practice,
are such that, in addition to [apprehended desires], they also depend on observa-
tion of what has been successful and what not, and on memory, so that what
must be done or not done can be recalled. Nor is direct observation the only
way by which animals become instructed; they are also taught and given example
by their parents or others whose actions are noticed and leave vestiges in their
imagination. In these ways actions to be performed can be rationally considered."
14 Ibid.
tended, were governed by the laws of association; and so both expressed habits of thinking and behavior which were logically similar.\textsuperscript{15}

The investigation of animal reason undertaken by classical British empiricists impressed both Erasmus Darwin (1731-1802) and his grandson Charles (1809-82). Erasmus Darwin, in developing his own theories of species transformation, cited both Locke’s arguments for animal reason and Hume’s dismissal of Lockean abstract ideas, and therewith proposed a continuous progressive movement of reason from the lowest animal to man.\textsuperscript{16} The younger Darwin, in his early notebooks, recommended to himself that “Hume’s essay on the Human Understanding well worth reading.”\textsuperscript{17} He thought Hume’s section on the Sceptical Philosophy\textsuperscript{18} resolved many doubts by showing the origin and gradual development of reason from the resources of sensation.\textsuperscript{19} Darwin’s own conception of human thinking reflected this Humean persuasion: “thinking consists of sensation of images before your eyes, or ears (language mere means of exciting association) or of memory of such sensation, & memory is repetition of whatever takes place in brain, when sensation is perceived.”\textsuperscript{20}

There were several lines of influence radiating more immediately from Locke’s \textit{Essay} regarding animal instinct and intelligence. One of these led through the Abbé de Condillac to Charles-Georges Le Roy and Pierre-Jean Cabanis.

Condillac’s (1715-1780) theory of animal behavior was representative of that of many philosopher-scientists of the mid-eighteenth century. The article of instinct in the \textit{Encyclopédie}, authored by Le Roy, was a

\textsuperscript{15} David Hume, “Of the reason of animals,” \textit{A Treatise of Human Nature} (1739), I, iii, 16, ed. L. Selby-Bigge (Oxford, 1967), 176-79. Hume thought that if the argument from like effects to like causes were applied to animals in the way it was to men, then we would see that the actions of beasts “proceed from a reasoning, that is not in itself different, nor founded on different principles, from that which appears in human nature” (ibid., 177). Hume did distinguish, however, animal actions “which are of a vulgar nature, and seem to be on a level with their common capacities, and those more extraordinary instances of sagacity, which they sometimes discover for their own preservation and the propagation of their species” (ibid.). These latter were instincts instilled by nature, but really, he thought, no different from that “wonderful and unintelligible instinct” of reason in our souls, “which carries us along a certain train of ideas, and endows them with particular qualities, according to their particular situations and relations” (ibid., 179).

\textsuperscript{16} \textit{Zoonomia} (1794), xvi, 17 (2 vols; 2nd ed.; London, 1796), I, 188.


\textsuperscript{18} Hume, \textit{A Treatise of Human Nature}, IV, 180-274.


\textsuperscript{20} C. Darwin, \textit{M Notebook}, MS pp. 61e-62e (Gruber, 277).
mirror of Condillac's argument that "either instinct is nothing or it is the beginning of knowledge." With Condillac, Le Roy concluded:

One sees that the very ordinary actions of animals, their everyday activities, suppose memory, reflection on that which is past, comparison between a present object which attracts them and the observed dangers which repel them, the distinction between those circumstances which are similar in some respects and different in others, the judgment and choice among all these relations. What then is instinct? From the effects, multiplied in animals, of the search for pleasure and fear of pain; the conclusions drawn, and inductions made by them from the events in their memory; the actions which result; this system of knowledge to which experience is joined and which each day reflection renders habitual—we can refer to none of this by the term "instinct," except that that word becomes synonymous with "intelligence."  

Condillac, like La Mettrie, advanced the program of sensationalism beyond the limits that would have been tolerated by Lockean common sense. Locke had at least supposed that our mental faculties, though of course not our ideas, were innate. Condillac, in his *Traité des sensations* (1754), rather dramatically proposed to account for all of our psychic powers by the consequences of sensation alone. Here he played Pygmalion, making a statue come mentally alive by endowing it with one sense at a time, and showing, for instance, that if the statue had but the sense of smell, then judgment, memory, and reasoning would necessarily follow. For the contrivance of the statue, Condillac was able easily to substitute an animal, and by sensible degrees grant it all the mental faculties enjoyed by man. This was the task of his *Traité des animaux* (1755).

Condillac's treatise on animals was directed against two opponents in particular: Descartes and the Comte de Buffon (1707-88), whom in this case he regarded as a Cartesian. For Buffon—in his great study *Histoire naturelle* (1749-1804), the first volumes of which appeared as Condillac wrote—also depicted animals as mere machines.  

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23 The last nine of the 44 volumes of the *Histoire naturelle* (Paris, 1749-1804) were added after Buffon's death (1788) by his collaborator Lacépède.

24 Georges-Louis Leclerc, Comte de Buffon, "De la nature de l'homme" (1749), *Oeuvres complètes de Buffon*, annotées par M. Flourens (12 vols.; Paris, 1853-55), II, 7: "What is the source of the uniformity in all the works of animals? Why does each species always do the same thing in the same way? And why is it that an individual never does any better or worse than another individual? Is there any stronger proof that their actions are only mechanical and purely material responses?"
first retired Descartes' distinction between animal corporeal sensation and human mental sensation. It was, he thought, a distinction without meaning; for to have sensations could only mean "that which we experience when our organs are stimulated by the action of objects." Buffon was an even easier target, for he admitted that animals could have painful and pleasurable sensations; Condillac thought them wonderful machines that could so feel. If animals sensed as we, then the animal statue should also come alive with judgment, memory, and reason. There was no reason to suppose that it was guided only by blind instinct.

Indeed, Condillac thought a careful examination of animal behavior would reveal that the so-called instincts were really acquired habits and that the uniformity of instinctive behavior in a species was due to similar anatomy and similar needs for survival. He believed that patterned behavior was more in evidence in animals than in men because the requirements of men were greater and more varied. Complexity of needs resulted in conflicts for which ingrained habits were insufficient; reflection again had to take control. Since animal wants were simpler, beasts were seldom compelled to exercise reflection; their language and actions did not usually rise above their practical and immediate requirements. Nonetheless, it was Condillac's opinion, one shared with Hume and most French sensationalists, that the psychic behavior of men and animals did not differ in kind, but only in degree of complication: animals were thought capable of exercising all the faculties of which men presumed themselves to be the sole possessors.

Condillac's analysis, as well as that of his predecessors, illustrates one of the important ways in which sensationalism provided a conceptual framework for detecting an evolutionary continuity between man and animals. To attribute sensation to animals, as both the Aristotelians and Cartesians did, was, by the very logic of the property predicated, to assign reason to them—at least this was the way such an analysis went.

26 Ibid., 458-59.  
27 Ibid., iii, 534: "Since all individuals of the same species are thus propelled by the same principle, act for the same ends, and employ the same means, it is necessary that they contract the same habits, do the same things, and in the same way."  
28 Ibid., 533-50. In his first major work, *Essai sur l'origine des connaissances humaines* (1746), Condillac was content to adhere closely to Locke's analysis of human understanding. In *Essai*, I, ii, 43-45 (*Oeuvres de Condillac*, I, 83-87), he explained instinct as a function of the animal imagination, which connected perceptions without the aid of reflection. He suggested that the animal's inability to reflect distinguished fundamentally its soul from the human. However, in the *Traité des sensations*, he abolished this distinction by reducing all human mental faculties to the power of sensation; and in the *Traité des animaux* he concluded that animal mentality did not differ essentially from human and that instinct was the outcome of habitual actions originating in but no longer guided by reflection.
And it was in this way, too, that Charles Darwin proceeded, when he suggested that to ascribe sensation to animals and plants led to the presumption that they had at least minimal powers of reason. At the time he considered this he was reading Hume, and went so far as to muse on whether plants had any notion of the principle of cause and effect, because they engaged in instinctive habits, which would imply their confidence in that relationship.29

Condillac's treatise on animals was purely a conceptual enterprise, supported only by familiar examples and anecdotes of animal behavior. Charles-Georges Le Roy (1723-89), while accepting many of Condillac's assumptions about the power of sensation, went on to support them with detailed studies of mammalian behavior, particularly that of foxes, wolves, and deer.

Le Roy's *Lettres sur les animaux* is little known now, but it went through several editions between 1768 and 1802, and was read by Cabanis, Frédéric Cuvier, and Charles Darwin, all with approval.30 In that series of studies, Le Roy followed the development of young animals within their particular societies. He described what he saw as the gradual unfolding of intelligence, and tried to determine the roles of the family-society and other features of the environment in controlling that development. In his estimation, an animal began with a set of species-characteristic instincts, which depended on physiological organization. These determined its needs for certain food, tolerable climate, and so on. But he denied that instinct regulated the various behavioral techniques designed to satisfy those needs, that is, those action-patterns usually described as instinctive. Instincts, according to Le Roy, were only the initiating stimuli which urged the development and applications of intelligence to the problems of survival.31

29 C. Darwin, *N Notebook*, MS pp. 12-13 (Gruber, 332): "Origin of cause & effect being a necessary notion, is it connected with the willing of the simplest animals, as hydra towards light being direct effect of some law—have plants any notion of cause & effect they have habitual action which depends on such confidence when does such notion commence?—" Darwin's tentative speculations, however, were but weak reflections of his grandfather's firmer conviction that plants had a sensorium, displayed the passion of love, and entertained "ideas of so many of the properties of the external world and of their own existence." See E. Darwin, *Zoonomia*, I, xiv, 2, p. 109.


31 Le Roy, *Lettres sur les animaux* (1768) (rev. ed.; Nuremberg, 1781), 68-69: "That which pertains properly to instinct depends entirely on organization: thus it is by instinct that the stag grazes on grass and the fox feeds on meat. It is not instinct, but the faculty of sensation and its effects that provide the ways these
The theme of animal perfectibility was taken over fairly directly from Le Mettrie, Condillac, and Le Roy by Pierre-Jean Cabanis (1758-1808), ideologue physician, confidant of Condorcet, and later senator in Napoleon’s government. Cabanis predicated of animals, as did Le Roy, a tendency toward greater perfection. Cabanis thought it of the very nature of sensibility to acquire, through associations, new habits—and he offered the acquisition of new habits as the root-cause of animal perfectibility. But Cabanis went further than Le Roy, with whose work he was well acquainted. Cabanis believed the perfectibility of animals was worked out in the phylogenic transformation of species. The ladder of rational progress suggested by Le Roy was turned by Cabanis into an escalator moving lower creatures through higher degrees of perfection.

Cabanis is one of the few writers whom Jean-Baptiste de Lamarck (1744-1829) cited at any length in his major evolutionary work Philosophie zoologique (1809). Lamarck gave public expression to his incipient evolutionary theory in his “Discours d’ouverture” delivered at the Muséum national d’histoire naturelle in 1800 and published in the following year as the preface to his Système des animaux sans vertèbres. At the turn of the century Cabanis, too, was at work on the evolutionary memoirs of his Rapports du physique et du moral de l’homme (1802). It is, therefore, difficult to determine precisely the direction of the flow of influence; indeed, both may have been originally indebted to some third source, for example, Lamarck’s colleague Lacépède, whose Histoire naturelle des poissons (1800) “revealed him,” in the estimation of Roule, “to be a consummate evolutionist.” Yet the similarities of Cabanis’ views and the advanced theory of the Philosophie zoologique are unmistakable. Cabanis, at least, seems to have focused Lamarck’s thought on the idea of an inherent tendency

animals employ to satisfy the needs of their natural appetite. Instinct determines
the object of desire, the desire produces attention, attention necessitates observation
of circumstances and impresses them in memory, memory of these facts yields
experience, and experience shows the ways. If these ways meet with success,
they constitute knowledge; if they do not, they produce reflection, which combines
new facts and gives birth to new means.”

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32 Cabanis, Rapports, neuvième mémoire, IV, 146-47.
33 Ibid., dixième mémoire, IV, 252.
34 The first six memoirs of the Rapports were delivered to the Institut national
in Paris during the term 1796-97. The last six memoirs, which include Cabanis’
evolutionary theory (especially the ninth and tenth memoirs), were first published
with the complete work in 1802.
35 Lamarck cited Cabanis frequently in Philosophie zoologique, but Cabanis,
who was not usually reticent in naming his predecessors (save La Mettrie), failed
to mention Lamarck in the Rapports.
36 Louis Roule, Lamarck et l’interprétation de la nature (Paris, 1929), 120.
toward perfection and on habit as the means by which animals structurally accommodated themselves to their environment.\textsuperscript{37} Lamarck was also impressed with Cabanis' theory of instinct, especially as it argued, in opposition to Condillac, that instinctive patterns were the result of physiological organization, not animal intelligence.\textsuperscript{38} These three conceptions—inherent perfectibility, the mechanism of habit, and instinct as the outcome of inherited physiological organization—were also to find a place in Charles Darwin's early thought. The notion of an innate tendency toward perfection in animals, for example, invaded Darwin's early notebooks: borrowing staple elements from the sensationalist tradition, Darwin modeled the progressive development of species on the disposition of simple ideas to become more complex.\textsuperscript{39} In his first formulations of evolutionary theory, the idea of perfection played much the same role as it had in the theories of Cabanis and Lamarck.\textsuperscript{40}

II. The Problem of Instinct. Aristotelians regarded instinctive behavior as a native function of the estimative faculty, that internal sense which ordered and discriminated sensory images.\textsuperscript{41} Herman Samuel

\textsuperscript{37} Cabanis discussed these elements of animal economy in the memoirs delivered to the Institut in 1796-1797 (e.g., Rapports, second mémoire, III, 110-11), though he used them specifically as mechanisms to account for species transformation only in the ninth and tenth memoirs, published in the completed Rapports.

\textsuperscript{38} Jean-Baptiste de Lamarck, Philosophie zoologique, III, v (2 vols.; Paris, 1809), II, 320.

\textsuperscript{39} C. Darwin, First Transformation Notebook, MS pp. 18-19, transcribed by Gavin de Beer, Bulletin of the British Museum (Natural History), Historical Series 2 (1960), 7: "Each species changes. Does it progress. Man gains ideas. The simplest cannot help becoming more complicated; and if we look to first origin, there must be progress."

\textsuperscript{40} In his first efforts at accounting for the facts of evolutionary descent, Darwin sketched a theory very close to that of Lamarck, with whose Philosophie zoologique he was quite familiar: i.e., monads giving rise to various organic forms by reason of a tendency toward perfection and articulated by adopting heritable habits. See C. Darwin's First Notebook on the Transformation of Species, MS pp. 1-45, and Second Notebook on the Transformation of Species (de Beer, 41-47; 89).

\textsuperscript{41} Avicenna (980-1037) elaborated the theory of the estimative sense in Kitāb al-shifā, the Sufficientiae of the medieval translation. This internal sense detected intentiones which were not available in the immediate data of the external senses, for example, the sheep's ability to perceive harm in the figure of the wolf. The distinctive and skillful behaviors of different species evinced to Avicenna that the estimative faculty was infused with a divine "inspiration" (ilhām, rendered by the Latin translator variously as cautela naturalis and instinctus insitus). See S. Van Riet's critically edited Avicenna Latinus, Liber de anima, IV, iii and V, i (2 vols.; Leyden, 1968-1972), II, 37, 73. Thomas Aquinas (1225-1274) adopted the theory of the estimative sense from Avicenna, and argued that it guided animals in the pursuit not merely of the pleasurable, but also of that which had "advantages and utilities" (commoditates et utilitates) for the individual or the species. See Thomas Aquinas, Summa theologica, I, Quest. 78, art. 4, resp., in Sancti Thomae Aquinatis, Opera omnia (41 vols.; Romae, 1882-), V, 256.
Reimarus (1694-1768), a neo-Aristotelian and natural theologian whose work on instinct won praise in the *Supplément à l'Encyclopédie* (1777), contended that adjustments of instinctive behavior to deal with contingencies showed that the brute was not a mere machine, but from birth harbored in its soul "an idea or image (Denkbild) as a guide and a plan for works and activities of this kind." Even Descartes, who quite literally took animals as machines, referred to "images" and "ideas" of animal corporeal imagination. And the English physiologist Thomas Willis (1621-75), a writer of Cartesian inclinations, yet stepped beyond Descartes to describe the cerebral dispositions determining animal instinct as "inborn notions" (*notitia ingenita*).

The theory that animals were possessed of congenital images or notions, even if different from man's, aroused the sensationalist's own instinctive aversion to innate ideas. If all ideas came from sensation, then instincts, as commonly interpreted, could have no existence. Birds constructing their nests, spiders spinning their webs—Condillac thought these must be the consequences of learning and intelligence. Guer disdained the concept of instinct as irretrievably joined to an outdated philosophy. Le Roy, though trodding the same intellectual path, was a bit more tolerant. He allowed that instinctive urges for certain kinds of food and climate were inborn, though not the patterns of behavior employed to satisfy those urges. He insisted and attempted to demonstrate empirically that the functional behavior of animals originally flowed from the applications of their intelligence.

But Aristotelians and Cartesians also had hard empirical evidence on their side. Reimarus, taking aim particularly at Gassendi, La Mettrie, Condillac, and Guer, and their attribution of reason to animals, pressed the fact in his *Allgemeine Betrachtungen über die Triebe der Thiere* (1760) that animals often exhibited completely formed and adaptive behavior prior to any opportunity for learning from experience: chicks on first emerging from the egg began to peck at seeds with coordinated movements; caterpillars which had never before seen a cocoon, skillfully wove the same patterns as their ancestors. These "skill-drives are executed from birth on, without any experience, instruction, or example, and without error; and thus certainly they are naturally innate and hereditary."

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44 See, for example, *L'homme, Oeuvres de Descartes*, XI, 177.

45 Willis, *De anima brutorum*, 32.

There were basically three related ways that evolutionists emerging from the sensationalist tradition attempted to meet the problem of instinct: through theories of prenatal learning, inheritance of cerebral determinations, and use-inheritance. In *Zoonomia* (1794), Erasmus Darwin objected to the assumption that instinctive behavior was not rational but "explained to be a *divine something*, a kind of inspiration; whilst the poor animal, that possesses it, has been thought little better than a machine!" He stoutly held to the empiricist faith that all behavior was learned. Young birds learned to construct their nests from the example of others, and intelligently adapted their materials to local conditions. The so-called congenital instincts, he believed, were learned in the womb. That the chick was able to walk, peck and swallow grain soon after cracking the egg was due, he thought, to its struggles in the amnionotic fluid, struggles which resembled its walking movements, and to its gaping and swallowing of fluid. These behaviors became impressed through the principles of association and were ready for display when the chick hatched. Incidentally, this same example of the chick being conditioned in the egg was used to rebut hereditary accounts of instinct during the 1920s and 1930s by Zing Yang Kuo, a behaviorist who retained the sensationalist's aversion to the innate. And it had an encore in the 1950s when Daniel Lehrman wielded it against Konrad Lorenz's theory of instinct.

A complementary response to the difficulties of instinct was developed out of La Mettrie's (1709-51) analysis of matter. On the very first page of *L'homme machine* (1747), La Mettrie seized on Locke's suggestion that there was nothing logically repugnant in the idea that matter could think. This suggestion conformed to ideas he had been working on a few years before in *L'histoire naturelle de l'âme* (1745). In his natural history of the soul, La Mettrie confronted the Cartesian concept of matter as mere extension. Led by notions gleaned from Willis, Glisson, and Haller, La Mettrie discovered in matter active

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47 E. Darwin, *Zoonomia*, I, xvi, p. 137. The definition of instinct which he seems to have had particularly in mind was David Hartley's. Hartley, in *Observations on Man* (2 vols.; London, 1749), I, 412, associated his view with the mechanism of Descartes and referred to instinct as "a Kind of Inspiration to Brutes, mixing itself with, and helping out, that Part of their Faculties which corresponds to Reason in us, and which is extremely imperfect in them."


50 See, for example, Zing Yang Kuo, "Ontogeny of Embryonic Behavior in Aves," *Journal of Experimental Biology*, 61 (1932), 395-430, 453-89.

powers of movement and sensation, which, however, could be fully expressed only when it was properly organized. Organized animal matter, therefore, was more than a Cartesian machine.52

But in *L'homme machine*, La Mettrie not only embraced the Cartesian description of animals as machines, but slyly extended it to man as well. Like Gassendi, he argued that animals exhibited the same cognitive capacities as man and that in both these were but the different operations of sensation.53 If animals were "pure machines," then so were men. However, La Mettrie's views had not really changed in this respect. He never quit the conviction that organized matter had powers undreamed of by Descartes. To further confute the Cartesians, he produced anatomical and pathological evidence to show the dependence of human thinking on matter of the brain.54 He was persuaded that a Cartesian spiritual substance or an Aristotelian soul was not needed for sensation and rational thought. This was the original path he took to demonstrate animal reason. La Mettrie perceived the animal to have the requisite anatomical equipment for reason; all it needed were the appropriate sensory conditions to perfect the process, hence his recommendation of language courses for the ape in order to manifest its true potential.

Cabanis adopted La Mettrie's conception of the active power of matter in offering his solution to the problem of instinct.55 Psychic behavior of men and beasts was the result of material, sensory processes: in Cabanis' telling simile, just as the stomach digests food so "the brain, after a fashion, digests impressions and organically secretes thought."56 Secreted thought and its behavioral consequences, he believed, could be stimulated not only by external sensations, but also by impressions received in the womb.57 This did not mean, however, that congenital action-patterns were to be dismissed as merely learned behavior. Unlike Erasmus Darwin, Cabanis stressed that internal impressions operated

52 De La Mettrie, *L'histoire naturelle de l'ame* (1745), in *Oeuvres philosophiques de Monsieur de La Mettrie* (2 vols.; Amsterdam, 1769), I, 97. Aram Vartanian has argued that Descartes himself, despite his metaphysical commitments, was edging toward the same theory of animal matter held by La Mettrie. See his *Diderot and Descartes* (Princeton, 1953), ch. 4. Vartanian's argument is based on what must have been Descartes' private opinions. La Mettrie's considered opposition to Descartes' theory of matter suggests that he was not so adroit at divining Descartes' secret thoughts.

53 In *L'histoire naturelle de l'ame*, 199-200, La Mettrie concluded that all intellectual faculties of man are to be "included in the faculty of sensation." This conclusion was reiterated in *L'homme machine* 165. 54 Ibid., 158-60.

55 Though Cabanis never mentioned La Mettrie in the *Rapports*, no doubt fearing the charge of atheism which tainted his predecessor's name, the similarity of approach and conception make Cabanis' debt obvious. In the introduction to his edition of *L'homme machine*, Vartanian details their doctrinal relationship.

on organic structures inherited from progenitors who had acquired them in the course of phylogenetic development.\textsuperscript{58} Instincts, the products of this interaction, were thus inherited propensities displayed without the intervention of reason or will. Lamarck concurred in Cabanis’ theory of inherited organization.\textsuperscript{59} It provided a completely naturalistic explanation and had the advantage of dispensing with Condillac’s Lockean assumption of a \textit{tabula rasa}.

Charles Darwin, in his early considerations of the evolution of behavior, also came to understand instinct as caused by heritable brain determinations. From the evidence of his early notebooks (1837-38), several paths led him to this conclusion. The theories of Cabanis and Lamarck made their impressions: echoing Cabanis’ trope, Darwin asked “Why is thought being a secretion of brain, more wonderful than gravity a property of matter.”\textsuperscript{60} His father’s and grandfather’s observations of pathology affecting the brain, with consequent disturbances of rational thought, brought him to a materialistic psychology by the same road La Mettrie traveled.\textsuperscript{61} And uniting these two strands was his enduring belief that one generation’s habits, even habits of thought, could modify heritable structures, which could then replay those same habits in subsequent generations. That is, in the notebooks composed prior to his formulation of the theory of natural selection,\textsuperscript{62} Darwin developed the idea that certain trains of thought—sensory associations, in his view—could affect the matter of the brain, so much so that the brain might run off those thoughts unconsciously when, for example, one performs habitual acts without advertence. Darwin presumed that similar unconscious brain determinations were the substrate of instinct; and because cerebral structures were heritable, he had a vehicle for the inheritance of instinctive behavior.

Thus the solution of early evolutionists to the problem of how behavior was adapted to circumstances at first appearance—the problem of instinct—avoided the assumption of some Aristotelians that the

\textsuperscript{58} \textit{Ibid.}, 105-06. \textsuperscript{59} Lamarck, \textit{Philosophie zoologique}, II, iii, 320.

\textsuperscript{60} C. Darwin, \textit{Second Transmutation Notebook}, MS pp. 165-66 (de Beer, 101). There is no evidence that Darwin read Cabanis directly, but the latter’s comparison of the brain and stomach was well known. Lamarck cited the comparison in \textit{Philosophie zoologique}, II, iii, 208. Lamarck, however, objected to Cabanis’ image on the ground that the brain was merely a passive instrument; he believed the nervous fluid flowing through it should be regarded as the agent of thought (\textit{ibid.}). Darwin did not bother to refine his own materialistic psychology to decide the question. For passages indicating the more general influence of Lamarck on Darwin’s psychology, see C. Darwin, \textit{N Notebook}, MS pp. 90-91 (Gruber, 347), and \textit{Second Transmutation Notebook}, MS pp. 171-73 (de Beer 102-03).

\textsuperscript{61} C. Darwin, \textit{M Notebook}, MS pp. 1-79 (Gruber, 266-80).

\textsuperscript{62} See for instance, \textit{ibid.}, MS pp. 46-81 (Gruber, 274-80), and \textit{Second Transmutation Notebook}, MS pp. 166-71 (de Beer, 101-02).
Creator endowed beasts with appropriate images, and rendered superfluous, not to say slightly ridiculous, John French's suggestion in the lead article of the new Zoological Journal (1824) that animal instinct was due to the immediate intervention of preternatural intelligence. The solution proposed, however, should be distinguished from the Cartesian belief that animals run off behavior as merely reactive machines. But to explain how the solution differed from the Cartesian alternative, let me consider further a contribution of sensationalism to evolutionist thought just touched on—use-inheritance, the agent of evolutionary transformation.

III. Instinct through Use-Inheritance. Cabanis, Lamarck, and Charles Darwin admitted that species-specific behaviors appeared in animals antecedent to relevant environmental experience. To account for this, however, they could not simply acquiesce in Aristotelian or Cartesian theories of pre-established harmony of innate behavior and environmental requirements. The transformationists had to show, not that behavior and structure were adapted—Reimarus, Cuvier, and Paley could argue that—but that they were adaptable. Yet they had to insist on innate components to behavior. Their resolution of this difficulty is an indication of the significant, but usually unacknowledged role that ideas about behavior have played in the development of general evolutionary theories.

The mechanism which quite obviously adapted organisms to immediate environmental requirements was intelligent behavior. Sensationalists contended that the development of intelligence in animals and men was largely a process of acquiring complex modes of association. This was precisely Condillac's, Le Roy's, and Erasmus Darwin's explanation of types of behavior usually termed instinctive. Erasmus Darwin thought it of the very essence of animal sensitivity that it tended to acquire progressively more complex responses. This is what propelled that first living filament to give issue to the multitude of species. According to Erasmus Darwin, the rudimentary behavior of that filament, which God had created, formed structures adapted to organic needs. It was through what amounted to organ learning that ever new species appeared and

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Continually improved. Cabanis, though without knowledge of Erasmus Darwin, maintained a like position. But this is not surprising, since both elaborated the consequences of a similar framework of thought.

The general mechanism which Erasmus Darwin and Cabanis proposed for species evolution was the inheritance of acquired characteristics. This theory has a long history. The Hippocratic author of *Airs Waters Places* ascribed the origin of the Scythian long-heads to the practice of shaping and binding the heads of their newly born. He believed this to affect the heritable seed, so that even after the custom was no longer followed the trait perdured. Buffon assumed that certain varieties of domestic dogs were created by cropping the parents' tails and ears, with this mutilation being passed to the pups. From the ancient period to the nineteenth century, it was a common enough belief concerning generation. There were, however, two versions of the doctrine. One presumed that passive modifications were inherited—scars, mutilations, diseases, and the direct effects of the environment, climate, and food. The other version of the doctrine supposed that active modifications were primarily inherited. This became known in the nineteenth century as use-inheritance, and it claimed that long practiced habits gradually molded the heritable structures of behavior and anatomy in

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65 *Ibid.*, xxxix, 4, pp. 507-09. In pursuit of their desires and needs, animals, according to Erasmus Darwin, adopted habits which altered their anatomy, with these alterations passing to their progeny. He concluded: "all warm-blood animals have arisen from one living filament, which THE GREAT FIRST CAUSE enured with animality, with the power of acquiring new parts, attended with new propensities, directed by irritations, sensations, volitions, and associations; and thus possessing the faculty of continuing to improve by its own inherent activity, and of delivering down those improvements by generation to its posterity, world without end!" (*ibid.*, 509)

66 Cabanis, *Rapports*, neuvième mémoire, IV, 146-74: "But the rule of habit is not limited to the profound and ineffaceable imprints made on each individual; these, at least in part, are able to be transmitted by way of generation. The abilities of certain organs to act, to produce certain movements, to execute certain functions which are considerable, in a word—those particular faculties which are developed in a great degree—those are able to be propagated from generation to generation; and if these causes of the initial habitual action do not cease to operate on many successive generations, they thus form a newly acquired nature, which, in its turn, is able to be changed only insofar as these same causes cease to operate for a long period and particularly when different causes begin to impress on the animal economy another set of determinations." Cabanis, however, did differ from Erasmus Darwin on an important detail. Cabanis believed that the appearance of elemental life was not due immediately to the hand of the Creator, but to spontaneous generation (*ibid.*, dixième mémoire. IV. 246 n.1).


68 Buffon "De la dégénération des animaux" (1766), *Oeuvres*, IV, 116.
a species. George Romanes, a disciple of Charles Darwin, told the
tale of a cat that had been taught to beg, just as a dog; the cat bore
kittens which, without prompting, displayed the same habit. An
examination of the history of the doctrine of inheritance of acquired
characteristics reveals that, except for a few ambiguous references, the
theory of use-inheritance did not appear until the late eighteenth century.
And aside from some vague remarks of Diderot, which were not pub-
lished until the mid-nineteenth century, it was only with Erasmus Darwin,
Cabanis, and Lamarck refining the empiricist conception of habit as
the key to mental development that the mechanism of use-inheritance
received its first considered expression.

Let me conclude this discussion of the influence of sensationalist
views of animal behavior by mentioning the roles of use-inheritance and
instinct in Charles Darwin's early theories of evolution. The first idea
about mechanisms of evolution which Darwin explored in his Transmu-

69 For example, John Sebright, whose early work Observations upon the
Instinct of Animals (London, 1836) Charles Darwin admired, made habit become
hereditary the source of instinct (ibid. 15-16).

70 George Romanes, Mental Evolution in Animals (London, 1883), 195.

71 In his posthumously published (1875) Éléments de physiologie (Paris,
1964), Diderot denied the immutability of species (only the molecule was eternal)
and suggested need as the active source of organic transformation: "The influence
of needs on organization is such that it is able to produce organs, or at least to
transform them" (ibid., 43).

72 In the second memoir of the Rapports (III, 110), Cabanis discussed the
reciprocal relationship between organically based needs and the response of habits
which could alter the structure of an organism to expand its faculties and stimulate
new needs. But it was not until the ninth memoir that he employed habit as a
mechanism for evolutionary advance (see note 66 above). In the "Discours
d'ouverture" of 1800, included as the preface to his Système des animaux sans
vertèbres (Paris, 1801), Lamarck made use-inheritance one of the chief means
by which nature wrought her creations: "The principal circumstances are con-
stituted by the influence of the climate, the variations of atmospheric temperature
and surrounding environment, the diversity of locations, the varieties of habits,
movements, actions, the means of living, and the ways of self-preservation,
defense, and propagation. But as a result of these diverse influences, the faculties
become accommodated to each other and strengthen themselves through use;
and they become diversified through new habits which have been practiced for a
long time. Insensibly the conformation, the firmness, in a word, the nature and
state of the parts, as well as the organs, participate in the consequences of all of
these influences, retain them, and propagate them through generation" (ibid., 13).
Lamarck reiterated this view in Recherches sur l'organisation des corps vivans
(Paris, 1802), 50-52. In the Philosophie zoologique, however, he modified his
earlier theory slightly, or at least clarified it, by pointing out that the environment
could work no direct influence on the higher animals; only needs and new habits,
which arose from a changed environment, could operate directly to alter their
heritable structures (ibid., I vii, 221-22). Erasmus Darwin's similar views on
the effects of needs and habits were unknown to Cabanis and Lamarck.
\textit{Transmutation Notebooks} (1837-39) was that the gradually changing environment had continually to modify species if they were to survive under new conditions.\textsuperscript{73} This process, he thought, could be accelerated and adaptive branching encouraged if some members of a species became geographically isolated from the rest. The direct influence of the new environment would then take them on a different path from the original stock.\textsuperscript{74} Darwin also speculated that another mechanism might be at work in keeping freshly emerging groups separate. It occurred to him that an instinctive repugnance to inter-breeding might prevent varieties from blending back into a single stock.\textsuperscript{75} The mechanisms of direct adaptation and isolation were investigated in the first and early part of the second of his notebooks.

In the first notebook, Darwin cited Frédéric Cuvier (1773-1838) on the production of instinct. In his essay on “The Domestication of Mammiferous Animals” (1828), Cuvier affirmed:

> But we could only produce domestic individuals and not races, without the occurrence of one of the most general laws of life—the transmission of a fortuitous modification into a durable form, or a fugitive want into a fundamental propensity, of an accidental habit into an instinct.\textsuperscript{76}

Frédéric Cuvier’s brother, the famous naturalist Georges Cuvier (1769-1832), expressly denied such a law,\textsuperscript{77} which was, after all, virtually Lamarck’s use-inheritance. Darwin copied out this passage in his notebook and added to it: “I take the higher grounds and say life is short for this object and others, that is, not too much change.”\textsuperscript{78} Here he seems to have been working toward the view, more fully developed in his second and third notebooks,\textsuperscript{79} that acquired habit could be changed into heritable instinct, though only over a span of generations. He elaborated on this in the following passage:

> Reflect much over my view of particular instinct being memory transmitted without consciousness, a most possible thing see man walking in sleep.—

\textsuperscript{73} C. Darwin, \textit{First Transmutation Notebook}, MS pp. 2-4 (de Beer, 41).

\textsuperscript{74} \textit{Ibid.}, MS pp. 7-21, 61, 83, 90, 101-02, 213-14, etc. (de Beer, 42-43, 49, 50, 51, 53, 66).

\textsuperscript{75} C. Darwin, \textit{Second Transmutation Notebook}, MS p. 51 (de Beer, 87): “Instinct goes before structure (habits of ducklings & chickens young water ouzels) hence aversion to generation, before great difficulty in propagation.” In the manuscript for his \textit{Big Species Book} (Charles Darwin’s \textit{Natural Selection}, 257-59), he discussed at some length other ecological factors promoting isolation and consequent speciation.


\textsuperscript{78} C. Darwin, \textit{First Transmutation Notebook}, MS p. 118 (de Beer, 55).

an action becomes habitual is probably first stage, & an habitual action implies want of consciousness & will & therefore may be called instinctive.—But why do some actions become hereditary & instinctive & not others. We even see they must be done often to be habitual or of great importance to cause long memory, structure is only gained slowly. Therefore it can only be those actions which many successive generations are impelled to do in same way.\textsuperscript{80}

In his notebooks, Darwin generalized this conception of instinct into what he regarded as a new theory of the mechanism of hereditary transformation of both behavior and structure. The hypothesis he proposed was an application of the doctrine of use-inheritance: an animal engaged in certain practices in response to environmentally determined needs; if these were routines continued over a long period and by successive generations, they would become instinctual; and long-term instinct would gradually modify the heritable structures of the organism. In the second notebook on the transformation of species, Darwin summarized his new theory: "According to my views, habits give structure, therefore habits precede structure, therefore habitual instincts precede structure."\textsuperscript{81}

Instincts for Charles Darwin were determined by inherited brain structures; hence they did not require conscious intent. This interpretation gave him an employment of use-inheritance which he believed to be fundamentally different from Lamarck’s. Lamarck, as Darwin read him, assumed that an organism developed new anatomical structures from practices consciously intended to satisfy felt needs, a mechanism that would ill explain the evolution of the lower animals and plants—thus Darwin’s expostulation “Lamarck’s willing absurd.”\textsuperscript{82} Darwin proposed instead instinct as the unconscious medium of transformation: animals developed certain habits in response to environmental contingencies; if these practices were sustained for several generations, they would gradually alter brain structures and thereby become instinctive, though not willful. Darwin offered a rather vivid analogy to illustrate this:

Analogy a bird can swim without being web footed yet with much practice and led on by circumstances it becomes web footed. Now man by effort of memory can remember how to swim after having once learnt, & if that was a regular contingency the brain would become web-footed & there would be no act of memory.\textsuperscript{83}

Instinctive behavior, in Darwin’s estimation, would then come to mold the very anatomical structures of the organism, producing in it the kinds of modifications which would adapt it to the exigencies of survival.

\textsuperscript{80}C. Darwin, \textit{Second Transmutation Notebook}, MS p. 171 (de Beer, 102-03).
\textsuperscript{81}Ibid., MS p. 199 (de Beer 106).
\textsuperscript{82}Ibid., MS p. 63 (de Beer, 89).
\textsuperscript{83}Ibid., MS p. 173 (de Beer, 103).
Before he formulated his theory of natural selection, Darwin used a principle of direct influence of the environment to account for adaptations. But he seems to have concluded that direct environmental impingements really could not explain the fine accommodation of animals to their circumstances. His more considered view was that use-inheritance, producing first appropriate instincts, might more readily accomplish the task. Yet even after he gave his theory of natural selection definite form in the latter part of 1838, he never completely quit his earlier conceptions of use-inheritance and instinct. Many of the features of his original view perdured as his ideas evolved through the notebooks and passed to the early essays, the draft for his Big Species Book (1856-58), and the editions of the Origin of Species (1859-72). Thus in the Origin, use-inheritance is one of the sources of variation upon which natural selection works; and its opposite, disuse, is offered as the principal cause of rudimentary and atrophied organs. From the essays of 1842 and 1844 through the Origin, Darwin argued that the “most wonderful instincts” were produced by natural selection operating on variations of simpler instincts; yet he allowed that simpler instincts might result from ingrained habits. And enlarging on Frédéric Cuvier’s thesis, he proposed that most of the domestic instincts were due to the combined effects of selection and habits become hereditary.

The legacy of sensationalist ideas appears manifold in Darwin’s thought. He assimilated earlier conceptions of progressive advance and continuity between man and animals, the rational abilities of brutes, the associationist view of intelligence, materialistic psychology, and the developmental importance of habit. These notions provided the material for the construction of his evolutionary theory. But, despite Darwin’s precautions, they also left it tainted with “Lamarckianism,” something neo-Darwinians such as Lloyd Morgan, August Weismann, Hugo De Vries, and James Mark Baldwin would strive to dissolve at the turn of the century.

IV. Conclusion. I have indicated some of the ways sensationalist conceptions about animal conduct influenced early theories of evolution. Sensationalist views of animal intelligence can be traced back through

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the Plutarchians, and such musing as Montaigne's on whether he might not be more of a pastime to his cat than his cat to him. The sensation-
alist reaction to the innate came gradually to accommodate Aristotelian
and Cartesian views of animal instinct, producing a significant impact
on emerging theories of evolution. The principal vehicle for this accom-
modation was the concept of use-inheritance. Cabanis, Lamarck, and,
in some measure, Erasmus Darwin showed how sensationalist notions
about animal learning and habit could be made to account for
innately determined instincts: i.e., adaptive habits were acquired during
phylogeny and manifested in individual development. Charles Darwin's
early theory elaborated these ideas and his later view, though centered
on the mechanism of chance variation and selection, yet retained elements
of these older notions.

In the development of evolutionary theories, concepts of animal
behavior functioned intimately, and continue to do so, as Edward
Wilson's recent book Sociobiology (1975) testifies. It is a massive study
of animal behavior, an underlying theme of which is "that a single strong
thread does indeed run from the conduct of termite colonies and turkey
brotherhoods to the social behavior of man." The claim and style
of argument to support it are not entirely new. Darwin was fully per-
suaded that "the senses and intuitions, the various emotions and faculties,
such as love, memory, attention, curiosity, imitation, reason, &c., of
which man boasts, may be found in an incipient, or even sometimes in
a well-developed condition in the lower animals." Nor is the spirit of
Wilson's work foreign to La Mettrie's belief that the ape, with proper
education, might take his place with man. The passionate response
these writers have met is another reason to study the history of concepts
about animal behavior, which is not simply a study of men's ideas about
a distant subject, of merely scientific interest. It is a history of men's
evolving ideas about themselves.

University of Chicago.

89 Plutarch (De sollertia animalium and Bruta animalia ratione uti of his
Moralia, first cent.) and his later disciples, especially Hieronymus Rorarius (Quod
animalia bruta saepe ratione utantur melius homine, 1547) and Michel de Monta-
taigne (Apologie de Raimond Sebond, 1580), interpreted animal instincts as in-
telligently acquired behavior which often outstripped the wisdom of human actions.

90 Michel de Montaigne, Apologie de Raimond Sebond, in Essais, II, xi,
Oeuvres complètes de Michel de Montaigne (12 vols.; Paris, 1924-41), II, 287.

91 Edward O. Wilson, Sociobiology (Cambridge, Mass., 1975) 129.

92 C. Darwin, The Descent of Man (1871) (2nd ed.; New York, 1936; reprint
of edition of 1874), 494-95.