

RACIAL MEMORY AND INSTINCT: THE CASE OF THE HONEYGUIDE

Ev Cochrane

Like the Lernean Hydra, Lamarckism refuses to go away no matter how many times it has been pronounced dead and buried by the leading lights of science. Having elsewhere discussed new research supporting the possibility of directed mutation—i.e., mutations directed in accordance with the needs of the evolving organism, the classic Lamarckian position¹—we will here review a recent field-study which seems to suggest the necessity of some sort of racial memory.

Across the bushlands of northern Kenya, a remarkable example of cooperation between bird and man can be found, operating today much as it has for untold centuries.² This is the territory of the Boran, a nomadic tribe who continue to subsist through hunting and gathering. For as long as they can remember, the Boran have been taking advantage of the helpful behavior of a bird known as the greater honeyguide (*Indicator indicator*), which—as its name implies—is widely renowned as a guide towards choice deposits of honey.

By nature the honeyguide displays a great fondness for beeswax and bee larvae. Inasmuch as beehives are virtually inaccessible to these birds and well protected by the bees (*Apis mellifera*) themselves—the colonies are typically located in large trees, rock crevices or termite mounds—the honeyguide requires the aid of man in order to pillage the honey-cache. As the natives tell it—and now confirmed by the study of Isack and Reyer—they summon the honeyguide to the campsite by emitting a specific, penetrating

¹E. Cochrane, “Viva Lamarck: Renewed Discussion on the Inheritance of Acquired Characters,” *Aeon* 2:2 (1991), p. 5-39. See also the valuable discussion in E. Fox Keller, “Between Language and Science: The Question of Directed Mutation in Molecular Genetics,” *Perspectives in Biology and Medicine* (1992), pp. 292-306.

²The definitive study of this bird is that of H. Friedmann, “The Honey-guides,” *U.S. Nat. Mus. Bull.* 208 (1955), pp. 1-292. According to Friedmann, reports describing the guiding behavior of the honeyguide are attested as early as 1569.

whistle which can be heard from a distance of over one kilometer.³ Upon hearing the whistle, the bird responds by flying towards the campsite of the Boran, whereupon it announces itself by flying close to the humans and moving restlessly amongst conspicuous perches in the trees, all the while emitting a very characteristic call (tirr-tirr-tirr-tirr). Once it has gained the attention of a potential honey-gatherer, the bird then proceeds to guide him in a fairly direct manner to the site of the bee-colony, the latter of which may be several kilometers away. Alternately appearing and disappearing, the bird periodically returns to check on the humans, as if to make sure that they are still following, such returns becoming more frequent and agitated as the two parties near the hive. The Boran honey gatherers, in turn, whistle and bang sticks while following the bird to maintain its attention and announce their position. According to professional honey gatherers, “through its guiding pattern, the bird informs them about the direction of, the distance to, and their arrival at the colony.”⁴

Upon arriving at the site of the bees’ nest, the honeyguide perches near it and emits a very characteristic “indication” call. By all accounts, this call differs markedly from the guiding call. Should the Boran experience difficulty in locating the colony, the bird swoops down and circles it as if to further clarify the precise location of the nest.⁵ Once the nest is found and its thick walls breached, the Boran plunder the honeycombs, always leaving a few select morsels behind for the honeyguide.⁶

Although countless examples of cooperative behavior are known from the annals of naturalists and nature lovers alike, the case of the honeyguide is special because of the complexity of the behaviors and interspecific communication involved, the latter apparently being the product of multiple generations of development and refinement (in this particular *tete-a-tete*, it would appear that man is a relatively recent interloper, having replaced the ratel—*Mellivora capensis*—the latter being a badger-like animal known to serve as juggernaut to the honeyguide⁷). Long considered the stuff of legend, the now well-documented partnership pertaining between the greater honeyguide and Boran nomads presents naturalists with a vexing problem: How is it possible to explain the development and evolution of this particular symbiotic relationship?

Certainly it seems highly unlikely that an ancestral honeyguide suddenly appeared one day with a new mutation in its genome which compelled it to seek out a friendly benefactor resilient enough to conquer a colony of angry bees. Fortuitous mutations of this sort—frequently invoked in conventional interpretations with regard to the origin of structural modifications—seem more than a little far-fetched when attempting to account for the evolution of complex behaviors. Despite decades of experimentation, moreover,

³H. Isack & H. Reyer, “Honeyguides and Honey Gatherers: Interspecific Communication in a Symbiotic Relationship,” *Science* 243 (1989), p. 1344. There the authors present the results of a three-year study in which they documented to a great extent the seemingly far-fetched claims of the Boran honey-gatherers that these birds use a wide variety of very specific behaviors to lead them to a bee-hive. D. Griffin, *Animal Minds* (Chicago, 1992), pp. 164-169 provides an overview of the findings of Isack and Reyer and compares them with earlier accounts.

⁴*Ibid.*, p. 1344.

⁵*Ibid.*, p. 1345.

⁶*Ibid.*, pp. 1343-1346.

⁷R. May, “Honeyguides and Humans,” *Nature* 338 (1989), p. 707. See also the discussion of H. Friedmann, *op. cit.*, pp. 41-50.

no mutation has yet been observed to give rise to a new behavioral pattern, only to pathological distortions of already existing behaviors.⁸

A more realistic approach would take its cue from the process known as organic selection.⁹ Originally offered as a compromise between Lamarckism and Darwinian selection, this theory—as its name implies—follows Lamarck in supposing that an organism’s habitual behavior plays a decisive role in its evolution. Baldwin’s summary of the idea is as follows:

“Acquired characters, or modifications, or individual adaptations...while not directly inherited, are yet influential in determining the course of evolution indirectly. For such modifications and accommodations keep certain animals alive, in this way screening the variations which they represent from the action of natural selection and so allow new variations in the same directions to arise in the next and following generations; while variations in other directions are not thus kept alive and so are lost. The species will therefore make progress in the same directions as those first marked out by the acquired modifications and will gradually ‘pick up’ by congenital variation the same characters which were at first only individually acquired. The result will be the same as to these characters, as if they had been directly inherited.”¹⁰

Confronted with the case of the honeyguide, organic selectionists would presumably argue that the bird’s behavioral complex originated in the customary manner, through trial, error, and reinforcement over the years. As inveterate bee-watchers, it may be supposed that the wax-loving honeyguides would have had plenty of opportunity to observe rats or humans in the act of plundering a bees’ nest. Upon benefiting from scraps inadvertently left behind, the bird might well have been tempted to follow its mammalian benefactor to see if future feasts could be had. If such an experience met with success, it is understandable how a casual association between the two species could have developed.¹¹ Anyone who has ever shared table scraps with a dog—the end result

⁸R. Wesson, *Beyond Natural Selection* (Cambridge, 1993), p. 241. There Wesson quotes Fuller and Thompson to the following effect: “No gene has been demonstrated to direct a complicated series of motor responses that produce an integrated behavior pattern.”

⁹The same general concept appears under various other names as well, including the Baldwin effect (after the famous psychologist James Mark Baldwin) and genetic assimilation (a phrase coined by C.H. Waddington). Originally proposed by Baldwin, Morgan, and Cope in the past century, this theory has been defended most recently by Sir Alistair Hardy, *The Living Stream* (New York, 1965). See the extensive discussion in Ev Cochrane, “Psychology, psychologists, and evolution,” (Ames, 1981), pp. 127-160. [Master’s thesis submitted to Iowa State University] See also R. Richards, *Darwin and the Emergence of Evolutionary Theories of Behavior* (Chicago, 1987), pp. 451-503; G. Simpson, “The Baldwin Effect,” *Evolution* 7 (1953), pp. 110-117; C. Waddington’s “The evolution of adaptations,” *Endeavor* (July, 1953), pp. 134-139.

¹⁰J. Baldwin, *Development and Evolution* (New York, 1902), pp. 137-138.

¹¹In a similar manner, birds typically tag along with large herbivores to feast upon the insects that hover about the mammals.

of which is that all future meals feature a four-legged beggar—will readily understand how an association between the mammal and honeyguide could have originated.

But how are to move from a casual relationship between two species to one in which the bird chooses to act as a guide to the mammal in treks across the African bush? Supposing that honeyguides were already accustomed to tagging along with ratsels/humans during the search for honey, it seems but a natural development for the bird to turn the tables and lead the mammal to yet another bees' nest already known to it, particularly if the latter nest lie in close proximity to one just plundered. Here all that need originally be involved was that the bird direct the mammal's attention to a nearby nest, either by circling it or by raising a ruckus. No real guiding need be involved in the incipient stages of the behavior. In this way, perhaps, the bird first gained the confidence of the ratel that it could help locate honey. Given further experience, practice, and the development of mutual trust, it stands to reason that the bird might inspire the mammal to pursue ever longer forays into the bush. And before you know it, a symbiotic relationship would develop to the point where either party might approach the other, looking for assistance.¹²

While any number of “just so” scenarios are conceivable, it stands to reason that the guiding behavior of the greater honeyguide originally became established through learning and habituation in one particularly clever or adventurous bird, thereafter spreading—either through imitation or communication—to its peers and progeny.¹³ So far so good. But how are we to move from a habit acquired in one generation of birds to an instinctual behavior characteristic of the species (that the behavior is indeed instinctive in nature is commonly agreed upon¹⁴ and, in any case, is rendered near certain by the unusual circumstance that honeyguides are parasitic breeders; i.e., like the cuckoo, they lay their eggs in the nests of other birds, and thus the nestling(s) would appear to have little opportunity to learn the intricacies of symbiotic honey-guiding from its parents¹⁵)? Here the organic selectionists would argue that if the symbiotic honeyguides gained a competitive advantage over non-symbiotic birds in their struggle for survival, this would favor the greater honeyguide, giving it additional time during which the originally “acquired” character (the bird's guiding behavior) would eventually be supplemented by genetic factors, thereby becoming a permanent characteristic of the species.

Yet it is far from clear how natural selection is to operate in the present example. Of the 17 species of honeyguides, only two¹⁶ are known to participate in symbiotic

¹²For a similar attempt at reconstructing the origins of the honeyguide's behavior, see H. Friedmann, *op. cit.*, pp. 66-71.

¹³According to H. Friedmann, *op. cit.*, pp. 33, 67, honeyguides are typically solitary birds and thus it is that the vast majority of guiding excursions are led by one bird.

¹⁴H. Friedmann, *op. cit.*, p. 54, calls it a “purely instinctive behavior pattern.”

¹⁵L. Short & J. Horne, “Behavioral Notes on the Nest-Parasitic Afrotropical Honeyguides (Aves: Indicatoridae),” *American Museum Novitates* 2825 (1985), pp. 40-42. Inasmuch as honeyguides appear to monitor the progress of the nestling's infancy from afar, the possibility exists that vocal communication could play some role in their education into the ways of honeyguiding. That a “culture” of honeyguiding exists among this species, thereby accounting for the behavior in individual birds, seems highly unlikely.

¹⁶In addition to the greater honeyguide, *Indicator variegatus* is also known to guide.

honeyguiding, and thus it is difficult to believe that such behavior is a matter of life and death for the greater honeyguide (although it might well be granted that the periodic raiding of a bee-colony produces certain nutritional benefits as it entails certain risks). Friedmann arrived at a similar conclusion:

“The fact that many species of honey-guides do not guide (as far as known) and yet get enough wax regularly (practically all specimens collected have had wax in their gizzards) shows that guiding is not necessary. That it probably never was essential seems to be reflected in the fact that it did not ‘carry over’ into the other phylogenetic branches of the family.”¹⁷

In short, if the greater honeyguide’s propensity for guiding mammals doesn’t act so as to favor it over its wax-loving relatives in the struggle for survival, there is nothing for selection to act upon and thus it can play no role in the genetic stabilization of the behavior. And if the operation of selection is difficult to imagine when the guiding behavior is fully developed, how is it to act during the presumably lengthy period when the behavior was first appearing and developing by incremental stages? Here Friedmann remarked: “It is, however, difficult if not impossible to imagine the development of such a habit if it were the chief foraging method, as it would have been of no conceivable value to either until it was perfected by both.”¹⁸

As critics have pointed out, a far more serious problem faces proponents of organic selection in trying to account for the transition of the bird’s behavior from an acquired trait to a genetic one: If greater honeyguides can survive the rigors of existence through learned symbiotic behavior alone, how is it that selection enters the picture to insure that random mutations accumulate in the right direction in order to render the behavior instinctual in nature? Simply stated—It can’t.¹⁹ And in the absence of selection, proponents of organic selection can only say a little prayer and suppose that the honeyguide’s behavior ultimately becomes established through a series of especially fortuitous mutations in the bird’s genome.

Questions arise at every step of this explanation. For how many generations must the honeyguide wait around for random genetic errors to stabilize its behavior so it won’t have to go through the bothersome and inherently risky process of teaching its progeny such sophisticated strategies for acquiring beeswax (here supposing, for the sake of argument and in contradiction to the published reports, that parental education plays a role in the symbiotic behavior pursued by the honeyguide)? And how many mutations would be required to establish this remarkable behavioral complex? Certainly it would be asking a lot of one fortuitous error in genetic replication to encode the honeyguide’s various calls, object-oriented guiding, luring and signaling behavior, knowledge of bee-behavior, etc. Yet with each additional fortuitous mutation invoked to account for the behavior’s respective components the problems are compounded. One is reminded of Koestler’s description of Neo-Darwinian evolution as comparable to a monkey pounding away randomly at the typewriter in the hopes that a Shakespearean sonnet will result.²⁰

¹⁷H. Friedmann, *op. cit.*, pp. 65-66.

¹⁸H. Friedmann., *op. cit.*, p. 70.

¹⁹See here the discussion of R. Richards, *op. cit.*, pp. 494-495. There he writes as follows: “If individual accommodations were sufficient to preserve an organism, then congenital variations would have little or no utility and thus would not be naturally selected for.”

²⁰In *The Case of the Midwife Toad* (New York, 1972), p. 30, Arthur Koestler wrote as follows: “Neo-Darwinism does indeed carry the nineteenth-century brand of materialism to its extreme limits—to the

But even granting that a genetic mutation occasionally proves beneficial, how are we to account for the genome's apparent acquisition of information about the environment? For in the present case it stands to reason that for the greater honeyguide's behavior to have a genetic basis, its genome must have somehow acquired direct and highly specific information about the goings-on in the Kenyan bushlands. At the very least one must suppose that the honeyguide is born with an innate "knowledge" of bees, ratsels, humans, beeswax, guiding tactics, specific calls, etc.

Granted that knowledge is necessary to account for the honeyguide's behavioral repertoire—now become instinctual—through what mysterious process does an avian genome acquire such knowledge? Konrad Lorenz, arguably the world's foremost authority on instinctual behavior, offered the following explanation: "The adaptation of the behavior patterns of an organism to its environment is achieved in exactly the same manner as that of its organs, that is to say on the basis of information which the species has gained in the course of its evolution by the age-old method of mutation and selection."²¹ Lorenz' stature as an ethologist notwithstanding, his statement is thoroughly misleading as it is quite impossible that a mutation could provide an organism with information about the environment—in the present case, information regarding the intricacies of guiding behavior to a bird hitherto ignorant of such practices.²²

We thus seem to have reached an impasse in our quest to understand the behavior of the greater honeyguide. To suppose that a honeyguide can perform the manifold behaviors attributed to it without any prior experience, learning, or knowledge being required would appear a most untenable position from the standpoint of animal psychology. To suppose, on the other hand, that a random error(s) in genetic replication could somehow provide an untrained bird with the very knowledge necessary for pursuing its remarkable symbiotic relationship with the Boran nomads is tantamount to invoking a miracle.

But if the Neo-Darwinian theory of evolution is incapable of explaining the behavior of the honeyguide—and it is—what is the alternative to a blind faith in miracles, whether of the Neo-Darwinian or Creationist variety? If we might be allowed to entertain the Lamarckian heresy, an obvious solution to the case of the honeyguide presents itself—namely, racial memory. For Lamarck and Neo-Lamarckians alike, instinct is to be understood as racial memory or habit, behavior acquired as a result of the trials and travails of experience and subsequently incorporated into the genome by some admittedly mysterious process. According to this theory, the individual honeyguide behaves as it does not from personal experience or parental education, rather as the beneficiary of the

proverbial monkey at the typewriter, hitting by pure chance on the proper keys to produce a Shakespeare sonnet." In a review of Koestler's book, Stephen Gould offered the following retort: "The simile is hoary enough, but it is utterly inappropriate. Rather, our monkeys must be allowed to keep all the correct letters after each trial. 'Fortune and men's eyes' will soon arise." "Zealous Advocates," *Science* 176 (May 12, 1972), p. 624. In the current example, as in many others, Gould's objection is entirely unfounded, there being nothing for selection to act upon. Nor, as we will see, is there any way for random mutations to provide a genome with the necessary experience/knowledge to explain the bird's behavior.

²¹K. Lorenz, in the preface to Darwin's *The Expression of the Emotions in Man and Animals* (Chicago, 1965), p. xiii.

²²Properly speaking, a mutation can never cause an organism to acquire information about its environment, for such would require that the environment already pre-existed in some sense in its genome. Indeed, there would appear to be but one way for a genome to acquire new information according to orthodox genetic theory, and that is by the incorporation of extraneous genetic elements such as episomes and other factors.

cumulative experience and knowledge acquired by generations of ancestors for whom the symbiotic interaction with mammals was a long-established habit.

In order to understand the simplicity, logical force, and breadth of appeal of the Lamarckian position, it is necessary to briefly review its history.

RACIAL MEMORY: LAMARCK AND DARWIN

Jean-Baptiste Pierre-Antoine de Lamarck is rightly regarded as the originator of the first systematic theory of evolution. Lamarck's magnum opus, *Philosophie zoologique*, was published in 1809 and subsequently languished in obscurity until Darwin's *On the Origin of Species* made evolution a household word and the cornerstone of the biological sciences (the word biology was actually coined by Lamarck).

In Lamarck's system, an animal's behavior played a decisive role in its evolution, both in selecting its environment and in shaping structure through habitual function. According to Lamarck, an animal developed habitual patterns of behavior in response to various environmental contingencies and in an effort to accommodate felt needs. Such habitual patterns of behavior, in turn, led to changes in function and form. Habitual behavior, combined with heredity, gave rise to instincts:

“As the penchants that animals have acquired through the habits they have been forced to contract have little by little modified their internal organizations, thus rendering the exercise of (these penchants) very easy, the modifications acquired in the organization of each race are then propagated to new individuals through generation. It results from this that the same penchants already exist in the new individuals of each race even before they have the chance to exercise them.”²³

Lamarck's explanation of instinct as racial memory, although it has forborne, actually represented a significant breakthrough inasmuch as it was commonly held at the time that animals' instincts were the product of special creation (design by God).²⁴ And as the first scientific explanation of instinct offered from an evolutionary perspective, Lamarck's theory was destined to have a decisive influence upon subsequent discussions in the field. With the notable exceptions of August Weismann and Alfred Wallace, nearly every prominent naturalist of the nineteenth century adopted a “Lamarckian” explanation of instinct, including Darwin, Romanes, and Haeckel.²⁵

Darwin himself, as is well-documented, advocated the Lamarckian view of instinct as racial memory in no uncertain terms. Thus in an early notebook we read: “Now if the memory of a tune and words can thus lie dormant during a whole lifetime, quite unconsciously...surely memory from one generation to another also without

²³Quoted from R. Burkhardt, *The Spirit of System: Lamarck and Evolutionary Biology* (Cambridge, 1977), p. 170.

²⁴For a thorough review of ideas regarding instinct in the 17th and 18th centuries, see R. Richards, *Darwin and the Emergence of Evolutionary Theories of Behavior* (Chicago, 1987), pp. 22-31.

²⁵Darwin, it is true, alternately defended the Lamarckian explanation of instinct as racial habit and the “Darwinian” explanation through selection alone. Darwin appears to have been led to this uncomfortable position as a result of his inability to explain the complex instincts of the social insects through the Lamarckian position. See here the discussion of R. Richards, *Darwin and the Emergence of Evolutionary Theories of Mind and Behavior* (Chicago, 1987), pp. 142-152. For a Lamarckian explanation of the instincts of social insects see Samuel Butler, *Life and Habit* (London, 1981), pp. 220-252; H. Spencer, *Synthetic Philosophy* (London, 1898), pp. 662ff. I plan to return to this issue in a future essay.

consciousness, as instincts are, is not so very wonderful.”²⁶ In the pioneering work *The Expression of the Emotions in Man and Animals*, Darwin wrote of instincts that “some cannot be distinguished from inherited habits.”²⁷ Elsewhere we find Darwin writing as follows: “Some intelligent actions, after being performed during several generations, become converted into instincts and are inherited, as when birds on oceanic islands learn to avoid man.”²⁸

The idea that innate behavior and instinct depend on racial memory and habit pervades Darwin’s discussions of emotion, sexual selection, the origin of articulate speech, and the inordinate development of the human brain.²⁹ Indeed, it is impossible to understand Darwin’s writings in these areas apart from this principle. It was the difficulty of explaining the development of the human brain through selection alone, it will be remembered, which had so bedeviled Wallace that he sought recourse in mysticism.³⁰ Unlike Wallace, Darwin had Lamarckian inheritance to fall back upon in order to explain the anomaly represented by the human brain. For Darwin, the evolution of the human brain was closely correlated with the origin of language, the latter arising through the inherited effects of use of the vocal chords in our primitive grunting ancestors. Comparing our vocal chords with those of the apes, Darwin observed that: “In man the closely similar vocal organs have become adapted through the inherited effects of use for the utterance of articulate language.”³¹ Although the development of language was of obvious selective value, Darwin adds that “the relation between the continued use of language and the development of the brain, has no doubt been far more important.”³² In this way, Darwin accounted for the inordinate development of the human brain: “As the various mental faculties developed themselves the brain would almost certainly become larger.”³³

I, for one, find it very difficult to find fault with this argument.³⁴

HERBERT SPENCER AND THE FOUNDATION OF EVOLUTIONARY PSYCHOLOGY

Herbert Spencer, a largely self-educated man whose life spanned the death of both Lamarck and Darwin, has been called the most influential thinker of the nineteenth-

²⁶C. Darwin, *Metaphysics, Materialism & the Evolution of Mind* (Chicago, 1980), p. 7.

²⁷C. Darwin, *The Expression of the Emotions in Man and Animals* (Chicago, 1965), p. 35.

²⁸C. Darwin, *The Descent of Man* (New York, 1874), p. 76.

²⁹See the discussion in E. Cochrane, “Psychology, psychologists, and evolution,” (Ames, 1981), pp. 22-30.

³⁰A. Wallace, *Natural Selection* (London, 1870). On this question, see also the valuable discussion of R. Richards, *op. cit.*, pp. 176-184; and S. Gould, *The Panda’s Thumb* (New York, 1980), pp. 47-58.

³¹C. Darwin, *The Descent of Man* (New York, 1874), p. 56.

³²*Ibid.*, p. 99.

³³*Ibid.*, p. 60.

³⁴Interestingly enough, Darwin traced the religious impulse—at least in part—to Lamarckian effects. Of mankind’s tendency to believe in a First Cause (or a god), he wrote that it “probably depends merely on inherited experience,” adding: “Nor must we overlook the probability of the constant inculcation in a belief in God on the minds of children producing so strong and perhaps an inherited effect on their brains not yet fully developed, that it would be as difficult for them to throw off their belief in God as for a monkey to throw off its instinctive fear and hatred of a snake.” See N. Barlow ed., *The Autobiography of Charles Darwin* (New York, 1958), p. 93.

century (Spencer was born in 1820, and died in 1903).³⁵ His contributions to evolutionary theory were manifold, although they are seldom acknowledged by historians of biological thought.³⁶ It was Spencer who first used the word evolution in its modern sense, signifying a change in species over time and involving an increasing differentiation of structure and specialization of function, giving rise to successively higher levels of integration (In the first five editions of the *Origin*, Darwin never once used the word “evolution”).³⁷ And it was Spencer who first offered evolutionism as a unified philosophy of nature.³⁸ Robert Carneiro offered the following assessment of Spencer’s contributions in this area:

“Not only did Spencer anticipate many of the ideas of modern evolutionism, he also expressed them more clearly, more precisely, and more forcefully than almost anyone has since. We still have much to learn from Herbert Spencer...”³⁹

Although it is fashionable nowadays to credit Darwin with laying the foundations for modern psychology, Darwin himself acknowledged the priority of Spencer. Looking to the future, Darwin wrote: “Psychology will be securely based on the foundation already well laid by Mr. Herbert Spencer.”⁴⁰

Spencer’s primary contribution to the field was the book *The Principles of Psychology* (1855), which—although it drew little acclaim at the time it was published—was destined to have a seminal influence upon future psychologies.⁴¹ Spencer

³⁵R. Hofstadter, *Social Darwinism in American Thought* (Boston, 1955). See also the discussion of R. Young, *Mind, Brain and Adaptation in the Nineteenth Century* (Oxford, 1970), pp. 190-196. In addition to documenting the immense influence of Spencer’s psychology, Young gives a very thorough summary of the development of his thought.

³⁶The worst example of this tendency to delegate Spencer to the dustbins of history is that of Mayr, who wrote that “It would be quite justifiable to ignore Spencer totally in a history of biological ideas because his positive contributions were nil.” See E. Mayr, *The Growth of Biological Thought* (Cambridge, 1982), p. 386. More sober assessments of Spencer’s influence have been rendered by R. Roberts, *Darwin and the Emergence of Evolutionary Theories of Mind and Behavior* (Chicago, 1987), pp. 243-330; and M. Ridley, “Coadaptation and the Inadequacy of Natural Selection,” *British Journal for the History of Science* 15 (1982), pp. 45-68.

³⁷See the comments of R. Carneiro in D. Freeman, “The Evolutionary Theories of Charles Darwin and Herbert Spencer,” *Current Anthropology* 15:3 (1974), p. 223. According to P. Bowler, “Changing Meaning of ‘Evolution’,” *Journal of the History of Ideas* 36 (1975), p. 111, the word evolution came into common use with the popularity of Spencer’s philosophy.

³⁸As Hoffding has pointed out, Spencer’s vast philosophical system can be regarded as the application of Lamarckian evolutionary principles to the world and science at large. H. Hoffding, *A History of Modern Philosophy* (New York, 1955). C. Smith, similarly, has written that: “Spencer may be regarded as the nineteenth century’s philosopher of evolution. His entire synthesis is pervaded by the idea.” C. U. Smith, “Evolution and Mind,” *J. of the History of Biology* 15:1 (1982), p. 57.

³⁹R. L. Carneiro, “Structure, function, and equilibrium in the evolutionism of Herbert Spencer,” *J. of Anthropological Research* 29 (1973), p. 94.

⁴⁰C. Darwin, *On the Origin of Species* (New York, 1928), pp. 461-462.

⁴¹It is known that Spencer’s formulations had a profound effect upon the thinking of Georges Romanes, a leading pioneer in the study of animal behavior; upon William James, the founder of functional psychology; upon James Watson, the originator of behaviorism; and upon Sigmund Freud, the father of psychoanalysis. See here the extensive discussion of Robert Young, *Mind, Brain and Adaptation in the*

revolutionized the study of behavior through his attempt to interpret it in terms of evolution. Lamarck's theory of evolution, together with the mechanism of the inheritance of acquired characters, served as the twin cornerstones of Spencer's psychology. His view that evolutionary history was the single most important factor in the study of mental phenomena can be glimpsed in the following quote: "If the doctrine of evolution is true, the inevitable implication is that Mind can be understood only by observing how Mind is evolved."⁴²

An associationist in the tradition of Bain, Spencer was among the first to attempt to understand Mind as a product of interaction with shifting environments. Thus he is rightly regarded as the founder of the psychology of adaptation.⁴³ Spencer was also among the first to emphasize the importance of heredity. As Hoffding noted, prior to his time heredity had been regarded as little more than a curiosity, but from Spencer onward "it was regarded as an ever-present cooperative factor in the determination of the very highest forms of life."⁴⁴

Spencer's evolutionary perspective, together with the concept of Lamarckian inheritance, allowed him to offer a solution to the hitherto intractable debate between the empiricists (Locke, Mill)—who held that all mental phenomena arose from experience, and thus no *a priori* or innate ideas were possible—and the Kantians, who held that innate mental categories organized experiences into coherent relations. Here Spencer argued that there was substantial truth in both camps: All mental operations do stem from experience, but there are also innate categories of mental relations, the all-important catch being that the latter arise from the inherited effects of evolutionary experience.⁴⁵ In *The Principles of Psychology*, Spencer argued as follows:

"Let it be granted that in all creatures, as in ourselves, the law is and has been, that the more frequently psychical states occur in a certain order, the stronger becomes their tendency to cohere in that order, until they at last become inseparable; let it be granted that this tendency is, in however slight a degree, inherited, so that if the experiences remain the same, each successive generation bequeaths a somewhat increased tendency; and it follows, that...there must inevitably be established an automatic connection of nervous actions, corresponding to the external relations perpetually experienced."⁴⁶

Instinctual behavior had long represented a thorn in the side of empiricists. How could a bird's ability to build a nest be the product of experience or education when a bird raised in isolation likewise fashioned perfectly adequate nests? The answer, according to Spencer, was Lamarckian inheritance. Instincts are simply associative habits so well learned that they have become part of the genetic heritage of the species: "The doctrine that the connections among our ideas are determined by experience must,

19th Century (Oxford, 1970), pp. 191-196. On Spencer's influence—through John Hughlings Jackson—on Freud, see F. Sulloway, *Freud, Biologist of the Mind* (New York, 1979), p. 270ff.

⁴²H. Spencer, *Principles of Psychology* Vol. 1 (London, 1870), p. 291.

⁴³T. Leahey, *A History of Psychology* (Englewood Cliffs, 1980), p. 246.

⁴⁴H. Hoffding, *op. cit.*, p. 455.

⁴⁵Here, too, Darwin endorsed the opinion of Spencer. In *The Descent of Man*, p. 111, for example, Darwin wrote: "The ignoring of all transmitted mental qualities will, as it seems to me, be hereafter judged as a most serious defect in the works of Mr. Mill."

⁴⁶H. Spencer, *Principles of Psychology* Vol. 1 (London, 1870), pp. 547-548. See here the discussion of J. Greene, "Darwin as a Social Evolutionist," *Journal of the History of Biology* 10:1 (1977), p. 6.

in consistency, be extended not only to all the connections established by the accumulated experiences of every individual but all those established by the accumulated experiences of every race.”⁴⁷

Near the end of his career, Spencer became embroiled in a memorable debate with August Weismann, the latter being the leading proponent of the position that would come to be known as Neo-Darwinism (i.e, the view that all evolutionary change results from natural selection acting upon random changes in the genome, thereby excluding any and all Lamarckian effects).⁴⁸ It was Weismann’s arguments against the possibility of the inheritance of acquired characters that began to turn the tide against Lamarckian views in the last two decades of the nineteenth century.⁴⁹ Spencer’s rejoinder to Weismann stands as one of the classic defenses of Lamarckian evolution. In addition to presenting evidence favoring the Lamarckian position (the blindness of many cave animals, an apparent example of the degeneration of structure through disuse; the inordinate sensitivity of the human tongue, attributable to the inherited effects of manipulating food and rubbing up against teeth; etc.), Spencer also offered various challenges to the efficacy of natural selection as an agent of evolutionary change.⁵⁰ There Spencer offered his famous statement: “Close contemplation of the facts impresses me more strongly than ever with the two alternatives—either there has been the inheritance of acquired characters, or there has been no evolution.”⁵¹

It would be impossible here to provide an adequate assessment of the arguments of Spencer and Weismann. Suffice it to observe that modern biology has tended to follow Weismann’s view of the evolutionary process. It is not without interest, however, that Weismann would abandon his faith in the “all-sufficiency” of natural selection shortly thereafter, in large part because of Spencer’s critique. Modern evolutionary theory, with its belief in the “all-sufficiency” of natural selection and concomitant rejection of Lamarckian inheritance, thus stands in the curious position of advocating a theory abandoned by Weismann and emphatically disavowed by Darwin himself.

In his autobiography, while contemplating the ever-growing influence of Weismannism in biological circles, Spencer would declare: “I still hold, as I then held, that the inheritance of functionally wrought modifications is the chief and most exclusive

⁴⁷H. Spencer, op. cit., p. 529.

⁴⁸H. Spencer, “The Inadequacy of Natural Selection,” *Contemporary Review* 43 (1893), pp. 153-166, 439-456; “Professor Weismann’s Theories,” *Contemporary Review* 43 (1893), pp. 743-760.

⁴⁹In 1889, George Romanes—although himself an ardent Lamarckian—could speak of the widespread abandonment of Lamarckism as a result of Weismann’s ideas. G. Romanes, *An Examination of Weismannism* (Chicago, 1893). See also the discussion in D. Freeman, “The Evolutionary Theories of Charles Darwin and Herbert Spencer,” *Current Anthropology* 15:3 (1974), p. 216.

⁵⁰Most important here, perhaps, is the argument that natural selection cannot account for the evolution of complex coadaptations. See the discussion of M. Ridley, “Coadaptation and the Inadequacy of Natural Selection,” *British Journal for the History of Science* 15 (1982), pp. 45-68. Ridley, p. 48, quotes Sewall Wright as follows: “The apparent inadequacy of Darwin’s theory to account for the extraordinary coadaptive nature of organisms and the frequent apparent uselessness of the components of coadaptive systems by themselves...was probably the main reason that why most biologists, even into the 20th century, continued to accept the inheritance of acquired characters.”

⁵¹H. Spencer, “The Inadequacy of Natural Selection,” *Contemporary Review* 43 (1893), p. 446.

factor in the genesis of all the more complex instincts and all the higher mental powers.”⁵²

Darwin and Spencer were hardly alone in their defense of the Lamarckian view of instinct as racial memory. According to Mayr, many naturalists continued to believe in Lamarckian inheritance until relatively recently (c. 1930-1950).⁵³

But what of the various schools of psychology whose business it is to investigate and analyze the phenomena of animal behavior and instinct? As I have documented elsewhere⁵⁴, a survey of pivotal figures in the history of psychology—Wundt, Hall, Freud, Jung, Watson, Pavlov, McDougall, Bleuler—will reveal that most were indefatigable proponents of the doctrine of the inheritance of acquired characters, this despite the fact that it would be difficult to find another issue upon which these men would agree.⁵⁵

At this point a brief review of the opinions of various prominent psychologists is in order.

RACIAL MEMORY IN THE ANNALS OF PSYCHOLOGY

Wilhelm Wundt is rightly regarded as a founding father of experimental psychology, but his influence upon physiological, social, and developmental psychology was also considerable.⁵⁶ Long occupied with the phenomena of instinct, Wundt believed that instincts were originally volitional—sometimes conscious—behaviors gained, practiced, and improved upon through the generations. Drawing an analogy between complex instincts such as a bird’s ability to build a nest and the ability to play a piano, Wundt noted that even highly complex behaviors can become nearly automatic with sufficient practice:

“We may, accordingly, explain the complex instincts as developed forms of originally simple impulses which have gradually differentiated more and more in the course of numberless generations, through the gradual accumulation of habits which have been acquired by individuals then transmitted...The gradual passage of a connate disposition is to be explained as a psycho-physical process of practice through which complex volitional acts gradually pass into automatic movements following immediately and reflexly the appropriate impression.”⁵⁷

Like Wundt, Sigmund Freud remained an ardent Lamarckian throughout his long life. Without this element, much of what Freud says on individual and group psychology, anthropology, myth, symbolism, religion, and the aetiology of neuroses would not be fully comprehensible.⁵⁸

⁵²D. Duncan, *The Life and Letters of Herbert Spencer* (London, 1911), p. 547.

⁵³E. Mayr & W. Provine, eds., *The Evolutionary Synthesis: Perspectives on the Unification of Biology* (Cambridge, 1980), p. 16.

⁵⁴E. Cochrane, *op. cit.*

⁵⁵It is also significant to note that several of these figures were originally trained in biology—Watson, Pavlov, and Freud, for example.

⁵⁶D. Klein, *A History of Scientific Psychology* (New York, 1970).

⁵⁷W. Wundt, *Outlines of Psychology* (Leipzig, 1897), p. 319.

⁵⁸On this aspect of Freud’s thinking, see Frank Sulloway, *op. cit.*, pp. 92-94, 274-275.

For Freud, instinct was racial memory pure and simple, and mankind's racial heritage was no different in this respect than that of any other living creature:

“[The concept of ancestral memories helps] diminish the overwide gap human arrogance in former times created between man and beast. If the so-called instincts of animals—which from the very beginning allow them to behave in their new conditions of living as if they were old and long established ones—if this instinctual life of animals permits of any explanation at all, it can only be this: that they carry over into their new existence the experience of their kind; that is to say, that they have preserved in their minds memories of what their ancestors experienced. In the human animal things should not be fundamentally different. His own archaic heritage, though different in extent and character, corresponds to the instincts of animals.”⁵⁹

Fully cognizant that Lamarckism was rapidly losing favor with his colleagues in biology, Freud reiterated his position on the great heresy in his last book: “I admit, in all modesty, that in spite of this I cannot picture biological development proceeding without taking this factor into account.”⁶⁰

William McDougall made a name for himself in the first four decades of this century as a pioneering social psychologist who stressed the instinctual basis of human behavior and as an outspoken critic of Watson's behaviorism. Indeed, his *Social Psychology* (1907) is still regarded as a “founding book” in the field.⁶¹ McDougall emphasized the purposive aspects of behavior and instinct, arguing that their evolution demanded a Lamarckian explanation. Indeed, McDougall went so far as to argue that without the Lamarckian principle, “our understanding of man's nature, of organic evolution, and of historical development, all alike are at a deadend.”⁶²

McDougall subsequently gained a fair amount of notoriety when he announced positive results in an extensive experiment designed to test the heritability of the effects of training in rats.⁶³ Described by an historian of science as “one of the most elaborate biological experiments yet devised,”⁶⁴ McDougall's experiment spanned several decades. Near the end of his career, McDougall underscored the importance of the debate over Lamarckian inheritance:

“The question in dispute not only lies at the very heart of the problem of evolution...but also it is at the heart of the greater issue between, on the one hand, scientific

⁵⁹*Ibid.*, pp. 128-129.

⁶⁰S. Freud, *Moses and Monotheism* (New York, 1939), p. 128.

⁶¹Jerome Bruner, writing in the preface to W. McDougall's *Body and Mind* (Boston, 1961), p. xi.

⁶²W. McDougall, *The Frontiers of Psychology* (Cambridge, 1934), p. 200.

⁶³W. McDougall & J. Rhine, “Third Report on a Lamarckian Experiment,” *British Journal of Psychology* 24 (1933), pp. 213-235. On subsequent attempts to duplicate McDougall's results, see W. Agar et al, “Fourth Report on a test of McDougall's Lamarckian experiments on the training of rats,” *J. Exp. Biol.* 31 (1954), pp. 307-321.

⁶⁴P. Fothergill, *Historical Aspects of Organic Evolution* (New York, 1953), pp. 261-262.

materialism and, on the other hand, every form of science, philosophy, and religion that would regard mind as in any sense real and operative in the universe.”⁶⁵

SUMMARY

Modern evolutionary theory, it has been argued, is completely incapable of explaining the development of the unique symbiosis pertaining between the greater honeyguide and various mammals. We have seen that it is difficult to imagine how selection is to operate with regards to the fully developed symbiosis, much less during the incipient stages of the behavioral complex throughout that presumably long period when it would have been of little or no use to either bird or mammal. The Lamarckian theory, on the other hand, explains the symbiosis with relative ease and in a common sense manner which every layman can appreciate. The greater honeyguide acts as it does because its ancestors acquired extensive knowledge of mammals and bees during their long history in the African bush, such knowledge subsequently being transmitted to progeny through the inheritance of acquired characters. No experience or practice is necessary for the individual honeyguide to perform its dazzling array of behaviors for the simple reason that its ancestors have already experienced, practiced, and memorized the intricacies of honey-gathering through the mediation of mammals. The Lamarckian hypothesis has as an additional point in its favor the fact that it alone can explain the development of the behavioral complex during its incipient stages, prior to it serving any utilitarian function. All that is necessary is that associations in memory develop between the honeyguide and mammal and that these learned associations are heritable in some degree. If such be granted, it is possible to understand how an originally fortuitous meeting of a honeyguide and ratel at a beehive could—given numerous such meetings and several generations—develop to the point where additional associations, mutual trust, the requisite modes of communication, etc., would further refine the habitual operation of the symbiosis.

To this simple explanation of the honeyguide’s behavior it will no doubt be objected that there is as yet no known biochemical mechanism whereby characters acquired by the individual organism might be transmitted to its genome. The following points are relevant here: (1) the history of science bears witness that there is ample precedent for setting aside conceptual difficulties when the evidence or logic bearing upon a particular matter warrants it; and (2) recent developments in genetics make the possibility of Lamarckian inheritance increasingly likely.

With regards to the first point, there is the example provided by Newton’s theory of gravitation, long considered the very ideal of scientific reasoning. We all take the reality of gravity for granted, but who can explain the physical mechanism behind its operation? Sir Isaac himself didn't pretend to know the answer:

“It is inconceivable, that inanimate brute matter should, without the mediation of something else, which is not material, operate upon, and affect other matter without mutual contact...And this is one reason, why I desired you would not ascribe innate

⁶⁵W. McDougall, *op. cit.*, p. 177.

gravity to me. That gravity should be innate, inherent, and essential to matter, so that one body may act upon another, at a distance through a vacuum, without the mediation of anything else, by and through which their action and force may be conveyed from one to another, is to me so great an absurdity, that I believe no man who has in philosophical matters a competent faculty of thinking, can ever fall into it. Gravity must be caused by an agent acting constantly according to certain laws; but whether this agent be material or immaterial, I have left to the consideration of my readers.”⁶⁶

The evidence supporting racial memory, if not as conclusive as that supporting Newton’s theory, is nevertheless compelling. As to the actual biochemical mechanism(s) behind the phenomenon of racial memory, I confess to being as much in the dark about it as about the mechanism behind gravity itself. Future discoveries, I trust, will enlighten us on both fronts.

With regards to recent developments in genetics, signs abound that the Neo-Darwinian conception of the genome as an isolated system impervious to external influences and ruled only by random errors in replication is nearing extinction. Consider the following observation offered by a distinguished geneticist: “Genomes function as true intelligent systems which can be readjusted when conditions require.”⁶⁷ Here is a statement all Lamarckians could endorse.

That accidents in genetic replication occasionally occur goes without saying. That on very rare occasions, such accidents subsequently prove beneficial to the evolving organism is possible, perhaps even likely. But it by no means follows that such inherently accidental phenomena govern the process of genetic variation and, consequently, adaptation and evolution as well.

Certainly it is no accident that the genome has evolved highly efficient and sophisticated strategies for checking and correcting the inevitable errors in replication.⁶⁸ And however we choose to label such self-regulating processes, there would seem to be little doubt but that the genome is constantly monitoring its various components and products in accordance with some “model” of self, health, and adaptation. Are we to suppose, then, that the genome has an inherent ability to monitor and correct its own products but no power to direct new mutations in order to accommodate the ever-changing needs of the cell/organism?

At the very least, these well attested systems of auto-regulation confirm that the genome is continually receiving, processing, and organizing information about its environment. How such organization takes place, we have very little idea. How

⁶⁶Quoted from a letter to Richard Bentley, dated February 25th, 1692/3. In a previous letter to Bentley, Newton had objected as follows: “You sometimes speak of gravity as essential and inherent to matter. Pray do not ascribe that notion to me, for the cause of gravity is what I do not pretend to know.”

⁶⁷J. Shapiro, “Genomes as smart systems,” *Genetica* 84 (1991), p. 4. The full statement is as follows: “Genomes function as true intelligent systems which can be readjusted when conditions require. We still lack testable theories to explain how these readjustments are made.”

⁶⁸J. Shapiro, “Genomes as smart systems,” *Genetica* 84 (1991), pp. 3-4.

extensive is the nature and informational content of the feedback involved is anybody's guess. All that we know for certain is that some such feedback must be involved if we are to make sense of the phenomena associated with the evolution of the genome, cellular differentiation, and regeneration.

Nor should it be forgotten that the genome itself is composed of originally separate organisms which, once-upon-a-time, elected to commingle and cooperate in order to insure the survival of the respective selves.⁶⁹ That such cooperation necessarily requires incessant communication, feedback, and genetic fine-tuning between the respective parties is both obvious and undeniable. Indeed, it is arguable that the interspecific communication which pertains between the various endosymbionts of the genome is functionally analogous with that observed to operate between the greater honeyguide and the Boran nomad. Both originated as a result of evolutionary experience and biological need which, given practice and refinement, eventually became habitual and genetically conditioned. And both are decidedly goal-directed and thus purposive in nature.

It is my opinion that the many wonders of instinct, adaptation, and evolution can best be understood if genetic change is an ordered phenomenon; i.e., subject to auto-regulation on the part of the evolving genome/organism. Genomic evolution is simply the bio-chemical manifestation of an organism's acquisition of information about its environment, learning on the grand scale of phylogeny as opposed to ontogeny.⁷⁰ As the organism comes to learn more about its environment, its genome responds with the appropriate changes in order to insure that the "knowledge" gained is preserved for posterity. As mysterious as the biological processes which would allow for such informational feedback between the organism and its genome currently seem, they are no more mysterious than those processes which allow for cellular differentiation—here, it will be remembered, each of the functionally different cells has the same store of genetic information, so who or what is directing the epigenetic process and by what biochemical means? How, apart from some form of detailed feedback between the developing "somatic" cells and the genome is it possible to account for the facts of cellular differentiation? Yet once grant the possibility of such feedback between somatic cells and the genome during embryogenesis and it becomes impossible to deny similar means of feedback during the life of the organism.

The case of the honeyguide presents biologists with a dilemma: Do we accept the perfectly logical Lamarckian explanation of the symbiosis between the greater honeyguide and mammals as reflecting the inherited effects of experience and habit even though we do not yet know of any biochemical mechanism whereby such inheritance might take place? Or do we accept the Neo-Darwinian explanation of the symbiosis as a product of random mutation aided by natural selection, even though it is difficult if not impossible to imagine how selection might be involved? If racial memories are heritable,

⁶⁹L. Margulis, *Symbiosis in Cell Evolution* (San Francisco, 1981).

⁷⁰John Maynard Smith, in a recent review of evolutionary theory, offered the following observation: "A central idea in contemporary biology is that of information. Developmental biology can be seen as the study of how information in the genome is translated into adult structure, and evolutionary biology of how the information came to be there in the first place." E. Szathmari & J. Smith, "The major evolutionary transitions," *Nature* 374 (March 16, 1995), p. 231.

the honeyguide's instinctual behavior is rendered perfectly understandable. Only the precise biochemical means of the encoding and transmission of such racial memories remains mysterious. If, on the other hand, there is no such thing as racial memory, the case of the honeyguide—like a myriad of similar examples from the world of animals—must remain inexplicable and more than a little miraculous.