

69. W. T. Fitch, "Evolutionary developmental biology and human language evolution: Constraints on adaptation," *Evolutionary Biology* 39 (2012), 613–637.

70. S. J. Gould, "Exaptation: A crucial tool for evolutionary psychology," *Journal of Social Issues* 47 (1991), 43–65.

71. Fitch, Hauser, and Chomsky, "The evolution of the language faculty"; W. T. Fitch, *The Evolution of Language* (Cambridge: Cambridge University Press, 2010), 203; T. Deacon, "Universal grammar and semiotic constraints," *Language Evolution*, Morten Christiansen and Simon Kirby, editors (Oxford: Oxford University Press, 2003), 111–139.

72. Maynard Smith et al., "Developmental constraints and evolution"; Kirschner and Gerhart, *The Plausibility of Life*; De Robertis, "Evo-devo"; F. Jacob, *The Possible and the Actual* (Pantheon, 1982); Y. Narita and S. Kuratani, "Evolution of the vertebral formulae in mammals: A perspective on developmental constraints," *Journal of Experimental Zoology* 304B (2005), 91–106; S. B. Carroll, "Genetics and the making of *Homo sapiens*," *Nature* 422 (2003), 849–857; S. B. Carroll, "Evo-devo and an expanding evolutionary synthesis: A genetic theory of morphological evolution," *Cell* 134 (2008), 25–36; S. F. Gilbert, "The morphogenesis of evolutionary developmental biology," *International Journal of Developmental Biology* 47 (2003), 467–477; W. T. Fitch, "Evolutionary developmental biology and human language evolution: Constraints on adaptation," *Evolutionary Biology* 39 (2012), 613–637.

73. Pinker and Jackendoff, "The faculty of language;" Newmeyer, "On the supposed 'counterfunctionality' of universal grammar."

74. J. C. Ahouse, "The tragedy of a priori selectionism: Dennett and Gould on adaptationism," *Biology and Philosophy* 13 (1998), 359–391; Fodor, *The Mind Doesn't Work That Way*; D. J. Buller, *Adapting Minds: Evolutionary Psychology and the Persistent Quest for Human Nature* (MIT Press, 2005); R. C. Richardson, *Evolutionary Psychology as Maladapted Psychology* (MIT Press, 2007).

ERIKA LORRAINE MILAM

## DUNKING THE TARZANISTS ELAINE MORGAN AND THE AQUATIC APE THEORY

### INTRODUCTION

Elaine Morgan had sass. In chapter four of *Descent of Woman*, published in 1972, she asked her readers to take science into their own hands. "Try a bit of fieldwork," she suggested. "Go out of your front door and try to spot some live specimens of *Homo sapiens* in his natural habitat. It shouldn't be difficult because the species is protected by law and in no immediate danger of extinction." After completing observations of twenty random people, she suggested, substitute them when you are reading statements about universal human nature. The result?

That window cleaner is one of the most sophisticated predators the world has ever seen.

The weapon is my grocer's principal [*sic*] means of expression, and his only means of resolving differences.

The postman's aggressive drive has acquired a paranoid potential because his young remain dependent for a prolonged period.

Morgan then added that you might imagine you were observing the wrong species. "But," she continued, "if you're going to be any good as an ethologist, you must learn to trust the evidence of your own senses above that of the printed word and the television image. Remember, you have been living among thousands of these large carnivores all your life, on more intimate terms than those on which Jane Goodall lived among the chimpanzees."<sup>1</sup>

In positing such a scenario, Morgan was engaged in serious work. All popular theories of human evolution to date, she insisted, were based on a male-centered notion of human evolution. Where were the evolutionary scenarios that began, "When the first ancestor of the human race descended from the trees, she had not yet developed the mighty brain that was to distinguish her so sharply from all the other species . . .?"<sup>2</sup> This formed one of two major points she wished to make in *Descent of Woman*. The second was to advance a theory of aquatic adaptation that preceded life on the savannah.

In our semi-adaptation to a watery world, we lost our body hair, gained a layer of subcutaneous fat to keep us warm, learned to walk upright (keeping our head above water while foraging for tasty snacks in the shallows), came to use stones and manufacture tools for breaking open shells, and developed the ability to control our breathing when diving beneath the surface—a precondition for true spoken language and an obvious boon to any individual trying to communicate with most of her body submerged. These activities, Morgan noted, were associated with gathering, not hunting, an activity in which women's contributions were becoming acknowledged. In short, we acquired precisely those traits that distinguish us from the rest of the animal world while living around water, not in the arid grasslands.

*Descent of Woman* fit well into the contemporary genre of public science that aimed to present scientific arguments in ways accessible to people with common sense but little scientific training. Such books provided scientific authors with a way of rendering their ideas in a more conversational tone than they might allow themselves in standard academic venues and provided nonscientifically trained authors, like Morgan, with opportunities to contribute to highly visible debates over scientific ideas.<sup>3</sup> By relying on arguments and evidence intelligible to nonscientific audiences, these books sold extremely well but were also left open to marginalization by the scientific community. Morgan was Oxford-educated (in English), the mother of three children, lived in Wales, and had been writing screenplays and dramas for the BBC for decades (see figure 12.1). When she turned her attention to nonfiction, it was largely out of irritation with the popular books of the time that emphasized the evolution of *man*.<sup>4</sup> The aggressive masculinity they advanced left little room for women, and in stark opposition to these volumes, Morgan was read as a radical feminist with a sense of humor.

The legacy of her book today exists in both the gender and science literature, where she is cited as one of the first authors to call attention to the widespread male bias in anthropological theories, and in the small, but steadily growing literature on the idea that humans may have undergone an aquatic phase in our evolutionary past. On the one hand, her work highlights a historical moment when anthropologists and evolutionary biologists self-consciously mobilized to change the dominant theories of human evolution by including women as self-determining actors. Even as an outsider with no scientific training, Morgan's book contributed to this groundswell. On the other hand, advocates of the aquatic ape increasingly sought to distance the theory from its historical origins. The sarcastic wit of Morgan's *Descent of Woman*, combined with her lack of scientific training, eventually hurt their



Figure 12.1: Elaine Morgan.  
Courtesy of Elaine Morgan.

cause more than it helped. As a result, in the decades following the book's publication, these legacies have become increasingly divergent.

### THE TARZANISTS

To understand Morgan's arguments, we first need to explore the era in which she was writing. In the late 1960s, many evolutionary theorists and popular writers believed that early humanity was defined by the ability of men to manufacture weapons and engage in cooperative hunting.<sup>5</sup> The movie *2001: A Space Odyssey*, for example, envisioned the dawn of humanity as the moment at which a human ancestor picked up a bone and realized it could be weaponized to hunt tapir.<sup>6</sup> Writer Arthur C. Clarke, together with director Stanley Kubrick took this idea from Australian paleoanthropologist Raymond Dart, whose ideas had been popularized by best-selling author (and Hollywood writer) Robert Ardrey.<sup>7</sup> Kubrick's depiction of the dawn of humanity reflected the dominant conception of the forces defining human evolution at the time. It was the hunt that required intragroup cooperation and communication, and only men could hunt.

When Ardrey published *African Genesis* in 1961, it was merely the first in a series of books depicting man as an aggressive hunter.<sup>8</sup> Ardrey, an early advocate of Dart's "killer ape" theory, suggested that "even in the first long days of our beginnings we held in our hand the weapon, an instrument somewhat older than ourselves."<sup>9</sup> Weapons preceded humanity, weapons fathered humanity: "A rock, a stick, a heavy bone—to our ancestral killer ape it meant the margin of survival. But the use of the weapon meant new and multiplying demands on the nervous system for the co-ordination of muscle and touch and sight. And so at last came the enlarged brain; so at last came man."<sup>10</sup> In his next foray into anthropology—*The Territorial Imperative*—it became clear that by mankind Ardrey really meant men, and the violence with which he was preoccupied was associated with male members of a group defending their common territory against outsiders.<sup>11</sup> Evolutionary pressures on groups of men, intent on hunting to support the women and children safe in camp and cooperating to defend their home from hostile incursions, drove the increased intelligence that came to characterize all humanity.

Sociologist Lionel Tiger similarly built on the work of primatologists and concentrated on the importance of male bonding and competition. In *Men in Groups*, Tiger argued that as males became more specialized as hunters, their behavior became increasingly dissociated from the ways females act. Three main behavioral "links" that held the community together, he posited, the male-female reproductive link, the female-offspring generative

link, and the male-male cooperative hunting link. Of these, it was the latter all-male interactions that drove evolutionary changes in "perception, brain-size, posture, hand formation, locomotion, etc."<sup>12</sup>

Zoologist Desmond Morris, on the other hand, was initially more preoccupied with sex than violence or male-male bonding. In the first paragraph of the introduction to *The Naked Ape*, Morris suggested that *Homo sapiens* "is proud that he has the biggest brain of all the primates, but attempts to conceal the fact that he also has the biggest penis."<sup>13</sup> In contrast to Ardrey and Tiger, he emphasized the development of a pair bond between adult males and females.<sup>14</sup> The pair bond ensured that females remained faithful to their individual males when hunting duties called males away from camp; it reduced serious sexual rivalries between males which aided in the development of male cooperation; and the young benefited from a cohesive family unit. Such a process, he was careful to add, "was never really perfected," but was a crucial component of his new ecological role as a "lethal carnivore."<sup>15</sup>

It was while reading a scant two pages that Morris devoted to a possible aquatic phase in human history that Elaine Morgan first came across the idea.<sup>16</sup> She eventually contacted the theory's originator—Sir Alister Hardy—and asked whether he would mind if she worked on a book responding to the contemporary theories of human evolution and developing his suggestion. Like Ardrey, she may have believed that artists and writers were well-developed students of human nature, despite their lack of anthropological training.<sup>17</sup> Hardy, who began wrestling with the aquatic theory thirty years earlier, had initially refused to publish anything on it lest he ruin his nascent academic career (at the time, he had plenty of experience at sea and in marine biology, but lacked a permanent post).<sup>18</sup> In 1960, as a recently knighted and well-established professor of zoology at Oxford, he agreed to write a brief article in *The New Scientist* proposing an aquatic past for humanity.<sup>19</sup> Although he intended to publish his own book on the topic, he was more than happy to let Morgan run with the idea.

### WOMEN'S LIB PREHISTORY

Elaine Morgan's frustration with "the Tarzanists" is palpable when reading *Descent of Woman*. She began by noting, "The legend of the jungle heritage and the evolution of man as a hunting carnivore has taken root in man's mind. . . . He may even genuinely believe that equal pay will do something terrible to his gonads." The scientific facts used to buttress such arguments were unassailable, she insisted, but not the interpretations of those facts. She further noted that the term "man" was ambiguous, denoting both the entire species and also the males of the species. The trick was not to confuse

the two. Adding carefully that although this might sound like “a piece of feminist petulance” to some, Morgan hoped to convince her readers that her semantic point vitiated much of the “speculation” concerning the evolutionary origins of humanity.<sup>20</sup>

Further, Morgan contended that based on the available evidence it was impossible to distinguish weapons from tools and impossible to know which sex invented them. “A knife is a weapon or a tool according to whether you use it for disemboweling your enemy or for chopping parsley.” In fact, she reasoned, it was likely that early humans used tools for both purposes—the strict dichotomy between herbivores and carnivores in our past was never clean-cut.<sup>21</sup> Morgan also noted that although male hunters were widely acknowledged as being the inventors of tools and pottery, there was no solid evidence supporting this assumption. She caricatured the dominant theory of pottery invention as follows:

One day he noticed with secret chuckle that the little woman was wearing herself out trotting to and fro carrying seed home by the handful. He quietly laid aside his beautiful symmetrical weapons and forsook his male-bonded companions for a few weeks while he devoted himself to the problem, and finally invented the pot. He gave her a few prototypes and a crash course of instruction, patted her on the head, and sped away across the savannah to rejoin the hunting party.<sup>22</sup>

That was equally likely, she contended, as assuming that a woman invented her partner’s weapons, saying, “Play quietly among yourselves today, children: I’m busy inventing the bow and arrow for your father.” Both tales were equally plausible and equally unsubstantiated.<sup>23</sup>

Why, then, were such assumptions about the importance of men to the evolutionary progress of humanity so widespread? Morgan chalked this up to a combination of male pride and egotism. She extensively quoted Ardrey’s *Territorial Imperative* in order to rebut his characterization of men as baboons. A male baboon, he had written, “is born a bully, a born criminal, a born candidate for the hangman’s noose. He is as submissive as a truck, as inoffensive as a bulldozer, as gentle as a power-driven lawnmower. He has predator inclinations and enjoys nothing better than killing and devouring the newborn fawns of the delicate gazelle.” Morgan imagined that a male reader would naturally find this characterization appealing. She pictured him polishing his glasses, thinking: “Yeah, that’s me all right. Tell me more about the bulldozer and how I ravaged that delicate gazelle.” The reason such theories continued to be popular was because Ardrey’s typical reader, and the author, got “no end of a kick out of thinking that all that power and

passion and brutal virility is seething within him, just below the skin, only barely held in leash by the conscious control of his intellect.”<sup>24</sup>

It was high time, she thought, to expose these arguments for what they really were—myths, yes, but politically useful myths. Morgan argued that man-the-hunter theories were used to “bolster up with pseudo-history and pseudo-anthropology the belief that it is ‘against nature’ for women to play a part in economic life; that ‘from time immemorial’ men have said ‘she shall have no other food and that will make her my slave’; and that we are descended from females whose sole function was to placate the hunters and keep them happy and mind the babies.”<sup>25</sup> In particular, Morgan cited the wide acclaim and recognition that Tiger received for *Men in Groups*. His idea of “male bonding” dominated discussions of human social interactions, with almost no attention paid to equally important (for Morgan) female-female relations.<sup>26</sup> Additionally, based on evidence from modern hunter-gatherer societies, she noted that the bulk of the total diet of early humans was probably the result of gathering vegetable matter, not hunting meat.<sup>27</sup> Women *were* important to the evolutionary history of humanity, but had been ignored by the “blood-and-thunder boys.”<sup>28</sup>

*Descent of Woman* sold extremely well, and reviews of the book quickly picked up on her none-too-subtle revisionist agenda. *Playboy*, for example, hailed it as a “stunning tour de force.” They hypothesized that, “even the most militant male chauvinist will find it difficult to cling to all his prior convictions in the face of the evidence marshaled here.”<sup>29</sup> Similarly, *Life* magazine described *Descent of Woman* as a lively “women’s-lib prehistory.”<sup>30</sup> Several reviewers missed that Morgan didn’t have any anthropological training, describing her as “a female anthropologist,” and “a scholarly woman, educated at Oxford in the fields of paleontology, ethology, and anthropology.”<sup>31</sup> Yet even when people recognized her outsider status, they still acknowledged the force of her arguments against the standard evolutionary history of humanity. Her reviewer in the *New York Times*, for example, characterized *Descent of Woman* as “a potent commentary on the state of the social sciences in general, and anthropology in particular.”<sup>32</sup>

By the late 1970s, scientists also cited Morgan’s *Descent of Woman* as an early critique of “man the hunter” theories of human evolution.<sup>33</sup> Yet these citations often wielded a double-edged sword. Although Morgan’s critique was useful, it came packaged along with her interest in Hardy’s aquatic ape. Physical anthropologist Adrienne Zihlman, for example, argued that Morgan’s sensible and “substantial critique of existing evolutionary dogma did not get the attention and credibility it deserved,” because it had been “contaminated by Morgan’s own elaboration and support of a very dubious theory of

human origins, the 'Aquatic Ape' hypothesis."<sup>34</sup> Zihlman regretted Morgan's advocacy for two reasons. First, the myths against which Morgan had been fighting were still present over a decade later. Second, readers might get the mistaken impression that Morgan's book was the best feminist anthropology could offer. "A feminist revision of human evolution," Zihlman insisted, "does not require life in the water."<sup>35</sup>

### THE AQUATIC APE

Why then, you might wonder, was Elaine Morgan so invested in the idea that humans had an aquatic past? Morgan wanted a viable theory to fill the hole left by her banishment of "man the hunter." She insisted that, in concentrating solely on the males of the species, evolutionary narratives like those advanced by Ardrey, Morris, and Tiger overstated the capacity of females (and therefore the species as a whole) to survive. From a female perspective, without protective weapons of any sort or easy hiding places, weighted down with a nursing infant, "the only thing she had going for her was the fact that she was one of a community, so that if they all ran away together a predator would be satisfied with catching the slowest and the rest would survive a little longer." In other words, when this sweet "generalized vegetarian pre-hominid hairy ape" experienced the "first torrid heat waves of the Pleistocene," she would have been unable to avoid being eaten by predators.<sup>36</sup> Both our putative ancestor and Morgan needed an escape route, and that's what the water provided.

A watery environment, Morgan posited, could explain a wide variety of our uniquely human characteristics. As our putative ancestor ran into the water up to her waist or even her neck to escape predators, she was forced into upright, bipedal walking. Lakeshores and seashores provided much easily accessible food, but hard shells needed to be broken open to access the tasty tidbits they contained—the use and eventual manufacture of tools thus started with gathering food, and were only later adapted as weapons for hunting. Living in caves along the seashore would have provided shelter and also an explanation for the origins of family structure. The loss of our body hair would then be the result of the first stages of adaptation to an aquatic environment.<sup>37</sup> Even our capacity for speech could have emerged as a result of learning breath control for swimming and diving. Communicating while wading can be difficult, Morgan suggested, because our limbs would be covered with water (preventing active gesturing or the use of body language) and the water would additionally mask the chemical particles that form part of our olfactory communication.<sup>38</sup>

Morgan presented evidence for her claims that nonscientifically trained readers could easily understand and relate to. For example, she explained the incredible sensitivity of our fingertips as resulting from the need to grope for food under the water, and the development of a subcutaneous layer of fat as a way to keep us warm. She noted that our heartbeat slows down when we dive to great depths and further pointed out that newborn babies can swim. She also explained long hair on the heads of women as an adaptation allowing babies to grab ahold of their mother in the water and her "pendulous, dollop breasts" as easy hand-holds for breastfeeding babies—not as traits that were controlled by the sexual preference of men.<sup>39</sup> In a broad survey of the animal kingdom, she argued, only aquatic mammals exhibit traits like breath control, a slowed heartbeat while diving, a layer of subcutaneous fat, and functionally hairless skin.

After this aquatic phase of our prehistory, she posited, the rains once again returned to Africa, the Pliocene merged into the Pleistocene, and man the hunter learned to roam the savannah in search of prey.<sup>40</sup>

Morgan was aware that her interest in the aquatic ape might be perceived as outside the normal bounds of science. In an interview she remarked that perhaps it was easier for her than for an established scientist (one can only assume she meant Hardy), because she had "nothing to lose, no high academic position to think of." She added, "if you talk about flying saucers you're branded a kook. I don't believe in flying saucers but I suppose this kind of thing looks flying-saucerish to the Establishment."<sup>41</sup> In fact, this was exactly what "Establishment" science initially thought. Her reviewer in the *New York Times*, for example (although he had lauded her critique of contemporary anthropology), suggested that her characterization of human ancestors as including "a breed of sea beasts" should be consumed along "with a grain or two of salt."<sup>42</sup> Several years later, physician Jerold Lowenstein and anthropologist Adrienne Zihlman wrote a brief article for *Oceans* magazine in which they compared the "Aquatic Ape Theory" to "the existence of bigfoot" and "visitors from outer space."<sup>43</sup> After analyzing key aspects of the evidence, they concluded, "the Aquatic Ape Theory does not hold water, anatomically, biochemically, behaviorally or archaeologically. With a similar combination of imagination, a grab bag of unrelated 'facts' and a popular literary style, one could make an equally convincing case that our ancestors evolved in the air—as von Daniken has more or less done in his cult book *Chariots of the Gods?*"<sup>44</sup>

Despite this dismissal, and with some urging from an American fan, Morgan wrote a second book, *The Aquatic Ape*, in 1982, in which she re-presented her

evidence in more scientific terms.<sup>45</sup> This time, she included figures illustrating her points and, notably, her prose no longer contained the sarcastic critique which had been so well received in her first book. Scientists remained skeptical. One reviewer noted, “Until some hard evidence is found though, I fear we are left with several equally convincing theories floating in a sea of speculation.”<sup>46</sup> Lowenstein, too, remained unconvinced, remarking, “It is fun to make up evolutionary fables.”<sup>47</sup> Unfazed by such criticisms, she published *The Scars of Evolution* in 1990 and *The Descent of the Child* five years later, each updating her evidence to reflect more recent findings.<sup>48</sup> And although most scientists continued to dismiss her ideas as speculative or pseudoscientific,<sup>49</sup> a small number became intrigued.

The first sign of interest came in the form of a 1987 conference organized to debate the theory, which included both advocates and detractors.<sup>50</sup> Most of the supporters, however, lacked anthropological training, including, for example, Derek Ellis (a marine ecologist from the University of Victoria in Canada) and Marc Verhaegen (a Belgian physician). Ellis argued that the aquatic ape was ecologically viable and called for scientists to test the theory, rather than dismissing it out of hand (anthropologists, of course, felt it *had* been evaluated).<sup>51</sup> Verhaegen, along with a handful of other scientists, began to amass new kinds of evidentiary support for an aquatic phase in human history.<sup>52</sup> They argued that chimpanzees and bonobos were known to walk upright while wading in shallow water and when carrying objects in their arms,<sup>53</sup> that recent paleontological evidence suggested that early hominins spent more time in swampy or coastal forests than on the savannah,<sup>54</sup> and that foods high in fatty acids (like fish) could have been important to the increased brain development of our ancestors.<sup>55</sup>

Anthropologists, with a few notable exceptions, have been far more reticent. The first convert was Philip Tobias, former student of Raymond Dart. Like Ellis, he came to insist that the savannah hypothesis didn't hold water, and that the aquatic ape needed a fair hearing.<sup>56</sup> More recently, well-respected professors Richard Wrangham (biological anthropologist), Dorothy Cheney (primatologist), and Robert Seyfarth (psychologist) published a paper in which they suggested that early human ancestors used aquatic environments to forage for fallback foods, like water lilies and floodplain herbs, when their preferred foods were unavailable, and the aquatic environment in which these foods are found could have helped human ancestors become bipedal.<sup>57</sup>

There are several important points to note about this history of the aquatic ape. The theory itself remains extremely controversial; all of these claims have been challenged in the scientific literature.<sup>58</sup> Additionally, none of the

recent papers supporting an aquatic (or semi-aquatic) environment for human ancestors mention or cite Morgan or Hardy by name—to find the connection, you must look in the footnotes of the papers they do cite. Scientific theories can thus become separated from their most ardent supporters, even (perhaps especially) in cases where the equation is almost iconic.<sup>59</sup>

Historians of science have spilled much ink on the demarcation question, asking how scientists and philosophers have tried to cleanly differentiate legitimate scientific inquiry from “non-science,” “pseudoscience,” “pathological” science, or even simply “bad” science.<sup>60</sup> In considering Morgan's case, however, we can see that in addition to these hard demarcations, scientists in the 1970s also used feminist science as a tool of soft demarcation. By labeling Morgan's *Descent of Woman* “feminist anthropology” they both sidestepped her critique and used the aquatic ape to delegitimize feminist science as a whole (precisely the reason Zihlman attacked the book as pseudoscientific). Emulating the efforts of many fringe scientists, Morgan responded by re-articulating her argument and her evidence with each new publication, in an attempt to rehabilitate her claims by presenting them in a style and language scientists would take seriously.<sup>61</sup> Notably, as the first step in this process, she removed all traces of her feminist critique of other theories of human evolution.

In order for Morgan's ideas to be accepted as scientific, they had to be stripped of her sharp feminist wit, dissociated from Morgan herself, and repackaged as legitimate science. In this form, her ideas are now getting the professional hearing she always wanted. In 2005, Morgan was asked whether or not she still felt like an “outsider” in biology. “Not nearly as much as I used to,” she replied.<sup>62</sup>

#### FURTHER READING

- Haraway, Donna. *Primate Visions: Gender, Race, and Nature in the World of Modern Science*. New York: Routledge, 1989.
- Milam, Erika. “Making Males Aggressive and Females Coy: Gender Across the Animal-Human Boundary,” *Signs: Journal of Women in Culture and Society* 37 (2012): 935–959.
- Montagu, Ashley, ed. *Man and Aggression*. Oxford: Oxford University Press, 1968.
- Morgan, Elaine. *Descent of Woman*. New York: Stein and Day, 1972.
- Sperling, Susan. “The Troop Trope: Baboon Behavior as a Model System in the Postwar Period,” in *Science Without Laws: Model Systems, Cases, Exemplary Narratives*, ed. Angela Creager, Elizabeth Lunbeck, and M. Norton Wise. Durham, NC: Duke University Press, 2007, 73–89.
- Weidman, Nadine. “Popularizing the Ancestry of Man: Robert Ardrey and the Killer Instinct,” *Isis* 102 (2011): 269–299.

NOTES

1. Elaine Morgan, *Descent of Woman* (New York: Stein and Day, 1972): 57.
2. Morgan, *Descent of Woman*, 3.
3. James A. Secord, "Knowledge in Transit," *Isis* 95/4 (2004): 654–672; Katherine Pandora, "Popular Science in National and Transnational Perspective: Suggestions from the American Context," *Isis* 100/2 (2009): 346–358.
4. Morgan, *Descent of Woman*, 56.
5. Robert Ardrey, *African Genesis* (New York: Atheneum, 1961); Robert Ardrey, *Territorial Imperative: A Personal Inquiry into the Animal Origins of Property and Nations* (New York: Atheneum, 1966); Konrad Lorenz, *On Aggression*, trans. Marjorie Kerr Wilson (New York: Harcourt Brace Jovanovich, 1966); Desmond Morris, *The Naked Ape: A Zoologist's Study of the Human Animal* (New York: McGraw Hill, 1967); Lionel Tiger, *Men in Groups* (New York: Random House, 1969).
6. Stanley Kubrick, director, *2001: A Space Odyssey* (MGM, 1968), 141 min.
7. Eric Johnson, "Ariel Casts Out Caliban," *Times Higher Education* (April 21, 2011); E. G. Marshall and Nicolas Noxon, *The Man Hunters*, 16mm (MGM, 1970), 52 min.
8. The most scholarly of these volumes was Richard B. Lee and Irven DeVore, eds., *Man the Hunter* (Chicago: Aldine, 1968). On Ardrey and pop anthropology, see Nadine Weidman, "Popularizing the Ancestry of Man: Robert Ardrey and the Killer Instinct," *Isis* 102 (2011): 269–299.
9. Ardrey, *African Genesis*, 1.
10. Ardrey, *African Genesis*, 29.
11. Ardrey, *Territorial Imperative*, 6–7.
12. Tiger, *Men in Groups*, 44–49, 44. Tiger aimed at a more academic readership than the other authors discussed so far, as evidenced, for example, by his extensive use of footnotes.
13. Morris, *Naked Ape*, 9.
14. In his next book, Morris changed his tune, writing that businessmen in boardrooms, like both baboons and men of the Stone Age, fought to maintain their status in the eyes of their peers; Morris, *Human Zoo*, "Status and Super Status," 15–38. For a more extreme example of the same trend, see Antony Jay, *Corporation Man: Who He Is, What He Does, Why His Ancient Tribal Impulses Dominate the Life of the Modern Corporation* (New York: Random House, 1971).
15. Morris, *Naked Ape*, 37–39, 38.
16. Morris, *Naked Ape*, 43–45; Morgan, *Descent of Woman*, 24–25.
17. Weidman, "Popularizing the Ancestry of Man," 288–289.
18. N. B. Marshall, "Alister Clavering Hardy, 10 February 1896–22 May 1985," *Biographical Memoirs of Fellows of the Royal Society* 32 (1986): 222–273.
19. Sir Alister Hardy, "Was Man More Aquatic in the Past?" *The New Scientist* (March 17, 1960): 642–645.
20. Morgan's sematic point was later adopted by anthropologists and linguists. See, for example, Virginia L. Warren, "Guidelines for the Nonsexist Use of Language," *Proceedings and Addresses of the American Philosophical Association* 59/3 (1986): 471–484.

21. Morgan, *Descent of Woman*, 156.
22. Morgan, *Descent of Woman*, 165.
23. Morgan, *Descent of Woman*, 165.
24. Morgan, *Descent of Woman*, 180–181.
25. Morgan, *Descent of Woman*, 159.
26. Morgan, *Descent of Woman*, 190–193.
27. Morgan, *Descent of Woman*, 160–163.
28. Morgan, *Descent of Woman*, 179.
29. "Books," *Playboy* (June 1972): 20.
30. Hugh Kenner, "Reviewer's Choice," *Life* 73/2 (July 14, 1972): 20; see also Mary Morain, "The Endocentric [sic] Bias," *The Humanist* 33/2 (1973): 44.
31. Jurate Kazickas, "Is the Missing Link a Mermaid?" *The Stars and Stripes* (July 6, 1972): 14–15; Morain, "The Endocentric Bias," 44.
32. John Pfeiffer, "The Descent of Woman," *New York Times* (June 25, 1972): BR6.
33. Richard B. Lee, "Politics, Sexual and Non-Sexual in an Egalitarian Society," *Social Science Information* 17/6 (1978): 871–895, 871; Marie Withers Osmond, "Cross-Societal Family Research: A Macrosociological Overview of the Seventies," *Journal of Marriage and Family* 42/4 (1980): 995–1016, 1004; Martin J. Waterhouse, [review Nancy Tanner, *On Becoming Human* (Cambridge, 1981)], *Man* 17/2 (1982): 352; Margaret W. Conkey and Janet D. Spector, "Archeology and the Study of Gender," *Advances in Archeological Method and Theory* 7 (1984): 1–38, 7 and 14; Hilary Callan, "The Imagery of Choice in Sociobiology," *Man* 19/3 (1984): 404–420, 418; Donna J. Haraway, "Primateology Is Politics by Other Means," *PSA: Proceedings of the Biennial Meeting of the Philosophy of Science Association*, vol. 2 (1984): 489–524, 503; Robert Attenborough, "Between Men and Women" *Nature* 319 (January 23, 1986): 271–272; Nancy Tuana, "Re-Presenting the World: Feminism and the Natural Sciences," *Frontiers: A Journal of Women Studies* 8/3 (1986): 73–75; Matt Cartmill, "Paleoanthropology: Science or Mythological Charter?" *Journal of Anthropological Research* 58/2 (2002): 183–201.
34. Adrienne Zihlman, "Gathering Stories for Hunting Human Nature," *Feminist Studies* 11/2 (Summer 1985): 365–377, 367; see also Robert Attenborough, "Between Men and Women," *Nature* 319 (January 23, 1986): 271–272, and Helen E. Longino, "Science, Objectivity, and Feminist Values," *Feminist Studies* 14/3 (1988): 561–574.
35. Jerold M. Lowenstein and Adrienne L. Zihlman, "The Wading Ape: A Watered-Down Version of Human Evolution," *Oceans* 13 (May/June 1980): 3–6, 6.
36. Morgan, *Descent of Woman*, 17, 14, 15, 17.
37. Morgan, *Descent of Woman*, 21–22.
38. Morgan, *Descent of Woman*, 113–130.
39. Morgan, *Descent of Woman*, 28, 30.
40. Morgan, *Descent of Woman*, 131.
41. Jordan Bonafonte, "The Naked Ape Is All Wet, Says a Liberated Lady," *Life* (July 21, 1973): 77.
42. Pfeiffer, "The Descent of Woman," BR6.

43. Jerold Lowenstein and Adrienne Zihlman, "The Wading Ape: A Watered-Down Version of Human Evolution," *Oceans* 13 (May/June 1980): 3–6, 3.
44. Lowenstein and Zihlman, "The Wading Ape," 6; Erich von Däniken, *Chariots of the Gods? Unsolved Mysteries of the Past*, trans. Michael Heron (New York: Putnam, 1968). A couple of years later, Zihlman compared the aquatic ape to Immanuel Velikovsky's *Worlds in Collision* (New York: Macmillan, 1950); Adrienne Zihlman [review of John Gribbin and Jeremy Cherfas, *The Monkey Puzzle: Reshaping the Evolutionary Tree* (New York: Pantheon Books, 1982)], *American Anthropologist* 85/2 (June 1983): 458–459. See also Ian Tattersall and Niles Eldredge, "Fact, Theory, and Fantasy in Human Paleontology," *American Scientist* 65/2 (1977): 204–211, 207.
45. Elaine Morgan, *The Aquatic Ape* (New York: Stein and Day, 1982); Barbara Miner, "Author Waters Down Anthropological Views," *Hutchinson News* (April 2, 1983): 10; Kate Douglas, "Natural Optimist" [interview with Elaine Morgan], *New Scientist* 186/2496 (2005): 50–53.
46. Jennifer Rees, "Trigger of Change," *New Scientist* 94/1307 (May 27, 1982): 592.
47. Jerold M. Lowenstein, "Swimmers or Swingers," *Oceans* 17 (July/August 1984): 72.
48. Elaine Morgan, *Scars of Evolution* (London: Souvenir Press, 1990); Elaine Morgan, *Descent of the Child: Human Evolution from a New Perspective* (Oxford University Press, 1995).
49. Andrew Hill, "Scientists' Bookshelf," *American Scientist* 72/2 (1984): 188–189; Adrienne Zihlman, "Review: Evolution, a Suitable Case for Treatment," *New Scientist* 1752 (January 19, 1991); Nina Jablonski, "Naked Truth," *Scientific American* (February 2010): 42–49, 45; Paul Griffiths, "The Historical Turn in the Study of Adaptation," *The British Society for the Philosophy of Science* 47/4 (1996): 511–532, 523.
50. Machteld Roede, Jan Wind, John Patrick, and Vernon Reynolds, eds., *Aquatic Ape: Fact of Fiction: Proceedings from the Valkenburg Conference* (London: Souvenir Press, 1991).
51. Derek V. Ellis, "Is an Aquatic Ape Viable in Terms of Marine Ecology and Primate Behaviour?" in *Aquatic Ape*, 36–74; Derek V. Ellis, "Wetlands or Aquatic Ape? Availability of Food Resources," *Nutrition and Health* (Journal of the McCarrison Society) 9 (1993): 205–217. Such calls for additional testing are a standard tactic among "fringe" science groups. Ellis should not be confused with the marine conservationist and painter, Richard Ellis, who has also written on the topic: "Everybody Back into the Water," in *Aquagenesis: The Origin and Evolution of Life in the Sea* (Viking, 2001): 243–267.
52. Marc Verhaegen, "Aquatic versus Savannah: Comparative and Paleo-environmental Evidence," *Nutrition and Health* 9 (1993): 165–191; Marc Verhaegen, "Aquatic Ape Theory, Speech Origins, and Brain Differences with Apes and Monkeys," *Medical Hypotheses* 44 (1995): 409–413; Marc Verhaegen and Pierre-François Puech, "Hominid Lifestyle and Diet Reconsidered: Paleo-Environmental and Comparative Data," *Human Evolution* 15 (2000): 151–162; Marc Verhaegen, Pierre-François Puech, and Stephen Munro, "Aqarboreal Ancestors?" *Trends in Ecology and Evolution* 17/5 (2002): 212–217.
53. K. D. Hunt, "The Evolution of Human Bipedality: Ecology and Functional Morphology," *Journal of Human Evolution* 26 (1994): 183–202; E. Esteban Sarmiento, "Generalized Quadrupeds, Committed Bipedes and the Shift to Open Habitats: An Evolutionary Model of Hominid Divergence," *American Museum of Natural History Novitates* 3250 (1998): 1–78, 36.
54. Verhaegen, Puech, and Monroe, "Aqarboreal Ancestors?"
55. Stephen Cunnane, Laurence Harbige, and Michael Crawford, "The Importance of Energy and Nutrient Supply in Human Brain Evolution," *Nutrition and Health* 9/3 (1993): 219–235; C. Leigh Broadhurst, Stephen Cunnane, and Michael Crawford, "Rift Valley Lake Fish and Shellfish Provided Brain-Specific Nutrition for Early Homo," *British Journal of Nutrition* 79/1 (1998): 3–21; Stephen Cunnane, "Hunter-Gatherer Diets—A Shore-Based Perspective," *American Journal of Clinical Nutrition* 72/6 (2000): 1584–1585; C. Leigh Broadhurst, Yiqun Wang, Michael Crawford, Stephen Cunnane, John Parkington, and Walter Schmidt, "Brain-Specific Lipids from Marine, Lacustrine, or Terrestrial Food Resources: Potential Impact on Early African *Homo Sapiens*," *Comparative Biochemistry and Physiology B, Biochemistry & Molecular Biology* 131/4 (2002): 653–673.
56. Kate Douglas, "Taking the Plunge," *New Scientist* (November 25, 2000).
57. Richard Wrangham, "The Delta Hypothesis: Hominoid Ecology and Hominin Origins," in *Interpreting the Past: Essays on Human, Primate and Mammal Evolution in Honor of David Pilbeam*, eds. D. E. Lieberman, R. J. Smith, and J. Kelley (Boston: Brill Academic, 2005): 231–242; Richard Wrangham, Dorothy Cheney, Robert Seyfarth, and Esteban Sarmiento, "Shallow-Water Habitats as Sources of Fallback Foods for Hominins," *American Journal of Physical Anthropology* 149 (2009): 630–642.
58. Debates over the aquatic ape are also alive and well on the Internet. See, for example, [www.riverapes.com](http://www.riverapes.com) (pro) and [www.aquaticape.org](http://www.aquaticape.org) (con). Accessed on March 13, 2013.
59. On the association of "fringe" scientific theories with charismatic gurus, especially in the 1960s and '70s, see David Kaiser, *How the Hippies Saved Physics: Science, Counterculture, and the Quantum Revival* (New York: Norton, 2011).
60. For recent publications on the question, see Thomas Geiryn, *Cultural Boundaries of Science: Credibility on the Line* (Chicago: University of Chicago Press, 1999); James Rodger Fleming, *Fixing the Sky: The Checkered History of Weather and Climate Control* (New York: Columbia University Press, 2010); Naomi Oreskes and Erik Conway, *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming* (New York: Bloomsbury, 2010); Michael Gordin, *The Pseudoscience Wars: Immanuel Velikovsky and the Birth of the Modern Fringe* (Chicago: University of Chicago Press, 2012). In terms of evolutionary theory specifically, see Philip Kitcher's *Abusing Science: The Case Against Creationism* (Cambridge, MA: MIT Press, 1982).
61. For similar efforts, see Michael Gordin, "Experiments in Rehabilitation," in *The Pseudoscience Wars*, 106–134.
62. Douglas, "Natural Optimist," 52.



# Outsider Scientists

ROUTES TO  
INNOVATION  
IN BIOLOGY

EDITED BY  
OREN HARMAN AND  
MICHAEL R. DIETRICH

THE UNIVERSITY OF CHICAGO PRESS  
Chicago and London

**Oren Harman** is the chair of the Graduate Program in Science, Technology, and Society at Bar-Ilan University, Ramat Gan, Israel. **Michael R. Dietrich** is professor in the Department of Biological Sciences at Dartmouth College.

The University of Chicago Press, Chicago 60637  
The University of Chicago Press, Ltd., London  
© 2013 by The University of Chicago  
All rights reserved. Published 2013.  
Printed in the United States of America

22 21 20 19 18 17 16 15 14 13 1 2 3 4 5

ISBN-13: 978-0-226-07837-3 (cloth)  
ISBN-13: 978-0-226-07840-3 (paper)  
ISBN-13: 978-0-226-07854-0 (e-book)

Library of Congress

Cataloging-in-Publication Data

Outsider scientists : routes to innovation in biology /

edited by Oren Harman and Michael R. Dietrich.

pages cm

Includes bibliographical references and index.

ISBN 978-0-226-07837-3 (cloth : alkaline paper) —

ISBN 978-0-226-07840-3 (paperback : alkaline paper) —

ISBN 978-0-226-07854-0 (e-book)

1. Biologists—Biography. 2. Biology—History.

I. Harman, Oren Solomon, editor. II. Dietrich, Michael R., editor.

QH26.O98 2013

570.92'2—dc23

2013016559

DOI: 10.7208/chicago/9780226078540.001.0001

Ⓢ This paper meets the requirements of  
ANSI/NISO Z39.48-1992 (Permanence of Paper).

*To outsiders everywhere  
who are still looking in*