

Also by Frans de Waal

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The Ape  
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*Cultural Reflections  
by a Primatologist*

Frans de Waal

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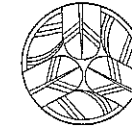
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thing. It is also known that bonobos call each other so as to congregate before they build nests for the night, whereas chimpanzees usually sleep on their own. The two species' temperaments seem radically different, with chimpanzees being independent-minded, and bonobos highly sociable and solidary.

As soon as camera crews are able to enter the Congo again, and have the guts to film bonobos the way they are, people will understand that everything being said about these apes is no exaggeration. They are not the product of some overactive sexual imagination, or of wishful thinking. That they delight feminists, the gay community, and pacifists should not be held against them. If one of our closest relatives fails to fit the prevailing views about aggressive males and passive females, one possibility to consider is that the prevailing views are mistaken.

Either that, or there is something wrong with those males.



## Animal Art

### *Would You Hang a Congo on the Wall?*

*"The ape would try new ideas, make new patterns, but only very slowly. Old patterns were repeated and only slightly altered as time went by. The war between wildness and security, between strangeness and familiarity, these were being worked out by the ape, at its simple level, just as human artists were working them out at their highly complex and advanced level."*

Desmond Morris, 1997<sub>101</sub>

**W**hen advanced paintings and engravings were discovered on rocks in South Africa, the first reaction of Western experts was that these creations could not possibly have come from the indigenous San, or Bushmen, as this would mean that the San had discovered the power of art on their own. The actual artists must have come from the outside.

In line with this view, Henri Breuil, the great French expert on Upper Paleolithic art, named a Namibian painted figure *The White Lady of Brandberg* because he could tell her racial origin and felt she must have been Mediterranean. Others believed that prehistoric Europeans, navigating around Africa in search of hunting grounds, had produced the paintings. But after closer examination, the evidence is now overwhelming that the San were responsible for the rock art, that Breuil's white lady was neither Caucasian nor female, and that some of the art is older than the famous Lascaux cave paintings in France.<sup>102</sup>

The reaction to the San rock art is emblematic. It reminds one of the reception of the first European cave paintings. In 1879, a little girl and her father looked at the ceiling of a low cave in Altamira, Spain, and saw dozens of bison, horses, boars, deer, and a wolf in the flickering light of their oil lamp. The father, an amateur archeologist, reported the find, but did not live to see it accepted as genuine prehistoric art, which happened only decades later. Initially, the cave paintings were dismissed as the product of modern artists. It was just not conceivable that primitive minds could have produced images of such elegance, realism, and artistic beauty.<sup>103</sup>

Underlying the skepticism surrounding these and other early finds is the idea that it is only recently, and only in very few human populations, that cultural sophistication has reached a level permitting artistic images. Art is supposed to set civilized man apart from the rest. It is regarded as even more characteristically human than language and culture, a

capacity we are extremely reluctant to grant even to primitive folk. If the trait is that exclusive, animals obviously deserve no mention at all.

Yet biologists feel that animals are no strangers to aesthetic expression. The New Guinean bowerbird's nest decorations are as good an example as any. The thatched nests can be so large and well-constructed that they once were mistaken for the huts of timid people, who never showed up. The nests often have a doorway with carefully arranged colorful objects, such as berries, flowers, or iridescent beetle wings. The male who built the bower keeps flying in new ornaments, shifting everything around with a critical eye, fussing over the arrangement, moving back to look at the whole from a distant angle—like a human painter with his painting—and then continuing the rearrangement. He is very sensitive to the fading of his flowers, replacing them with fresh ones as soon as necessary. Young males build crude “practice” bowers, tearing them down, then starting over again, until the construction holds up as it should. They also frequently visit the completed bowers of adult males in the neighborhood and see how the ornaments are laid out. There are ample learning opportunities here, and it has been noted that bower decorations differ in color and arrangement from region to region, which suggests culturally transmitted styles.<sup>104</sup>

Is this art? One could counter that it isn't: bowerbird males are genetically programmed to engage in this activity just to attract females. Yet, while it is true that females select mates

on nest quality and their equivalent of a stamp collection, the argument is not nearly as good as it sounds. To contrast these birds with our species requires that one demonstrates that human art does not rest on an inborn aesthetic sense and is produced purely for its own sake, not to impress anyone else. Both are unlikely. In fact, Geoffrey Miller argues in a recent book that impressing others, especially members of the opposite sex, may be the whole point of human art!<sup>105</sup>

What if our artistic impulse is ancient, antedating modern humanity, and perhaps even our species? What if it rests on a delight in self-created visual effects and a penchant for certain color combinations, shapes, and visual equilibriums that we share with other animals? Would admission in any of these areas diminish the significance of and pleasure derived from human art? Isn't it possible that our basic distinctions in art, our musical scales, and our preference for symmetrical compositions, go deeper than culture, and relate to basic features of our perceptual systems?

What better way to connect humans and animals culturally than investigate the common ground in the visual arts and music? There obviously remain vast differences, but from an evolutionary perspective it would be strange indeed if the beauty that we recognize in nature, and that has inspired so many human artists over the ages, would have an impact only on our own species. Our eyes and ears are very similar to those of many other life forms, and until very recently we dwelled in the same kind of environment. The ancestral environment

must have shaped our senses, making us seek certain impressions more than others. This argument has regularly been made in architecture, such as the claim that the famous *Court of Lions* in the Alhambra, in Granada, evokes a universal emotional response because standing inside the columned arcade, looking at the lighter part in the center, harks back to walks through the forest looking out at open areas. It is easy to agree, therefore, with the following recommendation by Nicholas Humphrey: "If I were asked for a prescription for where architects and planners should go to learn their trade, it would be this: Go out to nature and learn from experience what natural structures men find beautiful, because it is among those structures that men's aesthetic sensitivity evolved."<sup>106</sup>

### Can't Stand Schönberg

Everyone with an ear for music appreciates the moving, pleasing quality of birdsong, especially that of species with variable, long-phrased repertoires such as the nightingale or blackbird (a European relative of the American robin). In the time before radio and television, this was the sort of "music" most often heard in the evening, and was treasured by poets and romantic lovers alike. As the twelfth-century Marie de France most famously put it in her poem *Laüstic*, anyone who hasn't heard the nightingale sing doesn't know the joys of the world.

Conversely, animals can be quite sensitive to human music. There are stories of dogs who hide under the couch for piano

works by atonal composers but not for those by, say, Mozart. One music teacher told me that her dog would heave an audible sigh of relief if she stopped playing complex, fast-moving pieces by Franz Liszt and proceeded to something calmer. And there are reports of cows that produce more milk listening to Beethoven (although, if this is true, shouldn't one hear more classical music on farms?).

In the laboratory, sparrows have been tested on their preference for composers. Out of four birds, two liked to sit on a perch that turned on Bach rather than perches associated with the twelve-tone music of Schönberg, or white noise. The choices of the other two birds were less clear. Did I detect some hidden glee when the investigators dryly concluded that Schönberg may possess some "aversive stimulus properties"?<sup>107</sup>

Birds listen as carefully to sounds as any musician. They have to, because they learn from each other. Many birds are not born with the song they sing: the symphonies they offer us for free in forests and meadows are cultural. White-crowned sparrows, for example, develop their normal song only when they have been exposed early in life to the sounds of an adult of their species. Many songbirds have *dialects*—differences in song structure from one population to another. One theory about this is that if a female can tell from a male's song that he is a local boy, she may prefer him as a mate, as he may be genetically adapted to regional conditions. Given the variability in song from location to location it is hard to maintain that

birdsong is instinctive in the usual sense. There is room for creativity and modification. Some individuals act as star performers, setting new trends in their region.<sup>108</sup>

Inasmuch as birdsong is shaped by oral tradition, this is a potential area of crossover between animal and human culture. A composer may be inspired by what he or she hears in nature, and translate a bird's vocal innovations into a human cultural medium. At a recent meeting, the late Luis Baptista of the California Academy of Sciences reviewed the evidence in a delightful lecture, *Why Birdsong Is Sometimes Like Music*, full of comparisons between the West's great composers and the smaller feathered ones studied by Baptista and his ornithological colleagues.<sup>109</sup>

That composers have often found inspiration in nature is reflected in the titles of their works, such as *Der Wachtelschlag* (The Quail Song)—a title used by three different composers: Beethoven, Schubert, and Haydn—as well as Vivaldi's *Il Gardinellino* (The Goldfinch) and Mozart's *Spatzenmesse* (Sparrow Mass). Bird sounds can be discovered in many works, such as chickadees in Bruckner, pigeons in Britten, and nightingales in Respighi. The most popular bird may be the cuckoo, the unmistakable call of which can be heard in many works, from Beethoven's *Pastorale* to J. S. Bach's fugue *Thema all' Imitatio Gallina Cucci*, which pitches a cuckoo in counterpoint against a chicken, and lets the first win.

Birdsong often follows a sonatalike structure in that it starts out with a theme, followed by variations on it, after which the

original theme is recapitulated. The similarity is no accident given that both people and birds get bored by repetitions, and hence need to break the monotony without losing sight of the unifying theme in their compositions. Successful themes are handed down for many generations. Thus, the rondo in Beethoven's Violin Concerto in D Major, which premiered in 1806, features a melody that was independently recognized as the song of a blackbird by both a British ornithologist, in 1953, and a German concert pianist, in 1980. This could mean that Beethoven was inspired by a blackbird-invented melody that these songbirds have kept going, through transgenerational imitation, for over a century.

But the most striking and amusing case is that of a Mozart composition that has baffled musicologists ever since it appeared in 1787.

### Mozart's Little Fool

Music historians have found it hard to accept that one of the most idolized Western composers, Wolfgang Amadeus Mozart, could have arranged a solemn ceremony, with veiled, hymn-singing mourners, and a special poem by the composer himself, for the burial of a mere bird. Could it be that, since Mozart's father had died in the same week, the funeral was related to this family tragedy instead? This conjecture hardly explains, though, why on this sad occasion, on June 4, 1787, the great composer's recital began with these lines:

*A starling bird rests here,  
a fool whom I held dear.  
Who in his prime still,  
swallowed death's bitter pill.<sup>110</sup>*

Anyone familiar with the European starling, *Sturnus vulgaris*, knows how apt this description is (the German word for "fool" in Mozart's poem, *Narr*, also means "jester" or "clown"). The same ordinary bird is now common in the United States because a different kind of fools released over one hundred of them in New York's Central Park in the 1890s as part of an effort to introduce the entire avian cast of the Shakespearean theater. With several hundred million starlings now blackening the skies across the North American continent, the amount of agricultural havoc created by this well-intended decision has been immeasurable.

Starlings *are* clowns, and no one knows this better than the people who have raised these overactive birds at home. They imitate all sorts of sounds made by other animals, people, and objects, such as telephones, rattling keys, and clinking dishes. In the households of academics, they have been known to pick up phrases, such as "basic research" and "I think you're right," which they use at inopportune moments, resulting in amusing commentaries. One bird had a custom of landing on a shoulder while uttering "Basic research, it's true, I guess that's right." Another bird, squirming while being held for treatment of its feet, screeched "I have a question!"

27. May 1784 Vogel Stahr! 34 Kr.



Das war schön!

Piano Concerto no. 17 in G Major, K. 453



Mozart's starling whistled a tune on May 27th, 1784, that thrilled Mozart (top). With a minor modification, the final movement in Mozart's pianoconcerto No. 17 features the same theme. (From Nottebohm, 1880).

Two American birdsong experts, the wife-and-husband team Meredith West and Andrew King, explain the joy of keeping pet starlings at length in an article entitled "Mozart's Starling," (1990). They also provide an analysis of how these birds flexibly combine and recombine song phrases, adding whistles and typical starling squeals to tunes that were once sung to them. They fracture the phrases, sing them off-key, and delete parts that seem absolutely critical to the human ear. For example, one bird would whistle the notes corresponding to "Way Down Upon the Swa-," never, despite thousands of promptings, adding the notes to "-nee River."

In describing the peculiarities of starling mimetics, the authors try to throw light on Mozart's fascination with his bird. He entered the purchase of his starling in his diary and added

the transcription of a song it whistled, commenting *Das War Schön!* ("that was beautiful"). It was a familiar tune, almost identical to a theme in the final movement of Mozart's Piano Concerto in G Major. But how could the bird have sung this tune on the date it was bought, May 27, 1784, when Mozart had catalogued his concerto as finished on April 12 of the same year? Speculations hinge on the possibility that Mozart, like many animal lovers, had visited the pet shop in the weeks preceding the purchase, and had transmitted the tune to the bird. The composer was known to whistle a lot, and starlings don't need to hear a melody many times to copy it. Who knows, the composer may have bought the bird out of delight over its mimicry.

Others have speculated about transmission in the opposite direction, that is, from the bird to the composer. To some Mozart fans this may sound sacrilegious, but the alternative is perhaps even worse: independent genius!

With ears trained quite differently from those of musicologists, West and King also listened to Mozart's *A Musical Joke*, the first piece he wrote following the death of both his father and the starling. This piece is commonly interpreted as a parody of the popular music of Mozart's day, or else as a commentary on the father-son relationship. But Mozart's relationship with his father surely didn't deserve this kind of mocking commemoration. Instead, the two bird experts note the piece's starling-like qualities. Consider the following description of K. 522 from a record jacket:

In the first movement we hear the awkward, unproportioned, and illogical piecing together of uninspired material.... [Later] the andante cantabile contains a grotesque cadenza which goes on far too long and pretentiously and ends with a comical deep pizzicato note . . . and by the concluding presto, our "amateur composer" has lost all control of his incongruous mixture.<sup>111</sup>

West and King comment:

Is the piece a musical joke? Perhaps. Does it bear the vocal autograph of a starling? To our ears, yes. The "illogical piecing together" is in keeping with the starlings' intertwining of whistle tunes. The "awkwardness" could be due to the starlings' tendencies to whistle off-key or to fracture musical phrases at unexpected points. The presence of drawn-out, wandering phrases of uncertain structure also is characteristic of starling soliloquies. Finally, the abrupt end, as if the instruments had simply ceased to work, has the signature of starlings written all over it.<sup>112</sup>

Baptista adds to this analysis by noting the final cadence in *A Musical Joke*, which is written in two voices in counterpoint. Funny? Perhaps, but birds produce sounds with a syrinx that has two vocal cords, which can act independently, allowing a two-voice phenomenon that would make Bach proud. Baptista agrees, therefore, that the composition must have been Mozart's final farewell to his four-penny bird. In this light, many of the jargon-laden analyses that I have read be-

come truly amusing. Almost all musicologists assume either that Mozart got lost in his own music (calling this particular composition superficial, and devoid of significance) or that he spoofed contemporary colleagues who had trouble composing. But they all miss the real joke! One Czech colleague, Leopold Kozeluch, is even said to have attacked Mozart on a visit to Prague because he felt parodied.

It has come to light that *A Musical Joke* was composed in fragments during exactly the three-year period that Mozart owned his darling starling. Its completion a week after the bird's death suggests that it was a requiem for his avian friend. People who share Mozart's love for birds (he also kept canaries), and who know the naughty and endearing qualities of the starling, have no trouble believing he felt a great loss. Birds develop strong attachments, showing a tender and happy side to those they love and trust. They may gently nibble at their owner's ear, for example, making soft sounds of contentment, where they might peck someone else's. We people have a natural tendency to reciprocate when we notice how much we mean to another being. In Mozart's case, this special bond was enriched by mutual inspiration between the professional composer and his feathered amateur colleague.

### Pigeons and Impressionists

Of all paintings by famous artists on the market and in museums, ten to forty percent are estimated to be fakes—perfectly good paintings, but by different artists than is claimed for



them. But with art experts staking their reputations on existing classifications, it is hard to change opinions. When forger Han van Meegeren claimed that he was behind some of the best-known works attributed to Jan Vermeer, no one wanted to believe him. During the German occupation of the Netherlands, he was arrested for selling the enemy a painting by the Dutch master. The only way for him to prove that he himself had produced the art—a lesser offense than collaboration—was to paint one more “Vermeer” while in prison.

This is why we need more pigeons, the only experts unfazed by big names, astronomical prices, and paper authentication. Near a sports field at Japan’s oldest and most prestigious university, Keio University in Tokyo, Shigeru Watanabe runs a modest but crowded laboratory in which students and collaborators are constantly placing birds and other animals in test chambers to measure one perceptual ability after another, such as whether pigeons can detect the difference between healthy and sick members of their species, between Schönberg and Bach, or between a Monet and a Picasso. To the astonishment of the art world, which considered discrimination among painters an acquired taste attainable only by one aesthetically sensitive species, Watanabe’s pigeons have no trouble with the latter task.

One group of pigeons was rewarded for pecking at pictures of Monet’s paintings, and another for pecking at Picasso’s. After the training was over, the same birds were presented with new paintings, never seen before, but by the same artists. They gen-

eralized from the pictures on which they had been trained to the unfamiliar set. So, a pigeon trained on Picasso’s *Girls in Avignon* and *Nude Woman with a Comb* would also peck at *Woman Looking at the Glass* and *Natura Morta Spagnola* by the same artist. Similarly, birds trained on Monet would generalize from one set of paintings by this artist to another. Since we don’t assume that the pigeons see two-dimensional images as representations of the real world, it is unlikely that their distinctions were based on objects recognizable to us (women versus fruit, for example). One might therefore conclude that the cue must be the color scheme, together with the presence or absence of sharp edges. However, when Watanabe modified the paintings by presenting them in black and white or with blurred lines, the birds were still able to make the discriminations.

There is more. When the same birds were asked to peck at paintings by other artists of the same period, the Monet-trained birds preferred other impressionists, such as Renoir, whereas the Picasso-trained birds preferred other cubists, such as Braque. So, pigeons can pick out not only individual styles, but entire schools of visual art. Watanabe thinks his pigeons make complex visual distinctions in the same way we do, using multiple cues all at once. The fact is, they distinguish painters better than many a visitor to the Louvre.<sup>113</sup>

But what about the *production* of visual art? Although animal art is on the market, some of it really doesn’t qualify because it is randomly produced. There is, for example, the case of the orangutan at a major zoo who would search for a rock,

then bang it against the glass wall of his enclosure with such superhuman force that it would shatter and he could escape. Despite the zoo's efforts to remove all rocks, he kept finding them, or digging them up. The wall-shattering became such a predictable event that the zoo paid for its regular purchases of expensive bulletproof glass by setting up a small business. The fractured slabs of glass were successfully sold as orangutan-produced tabletops, making, no doubt, for excellent conversation pieces.

Such unintentional animal "art" is widespread. One of the classic examples is the way the Japanese artist Hokusai won the favor of his shogun, in 1806, by unrolling a lengthy piece of paper on the ground and covering it with big blue loops. He then took a cock, its feet dripping with red paint, and made it walk across the paper. To the Japanese eye, the result looked immediately like a river with floating red maple leaves.

The animal-as-paint-tool was exploited more recently by dipping cats' paws in paint so that they put colorful marks all over the place. This led to a tongue-in-cheek photo book (perhaps to be placed on the orangutan coffee table) that included touching portraits of the artists, complete with personal traumas and van-Gogh-like transformations:

When Charlie was six months old, he was inadvertently shut inside a refrigerator for five hours. Somehow, that event seems to have been a turning point in his life—transforming him virtually overnight into a prolific painter.

As soon as Minnie left Lyon and went to live at the little vineyard in Aix-en-Provence, her paintings changed dramatically, and so did the reviews.<sup>114</sup>

This book mocks the very idea of animal art by grossly overstating the case for it. It has a make-believe bibliography to show how seriously the authors studied their topic, with titles such as *Paws for Thought: The Magic & Meaning of Litter Tray Relief Patterns* and *Why Dogs Don't Paint*. The final chapter analyzes destruction of upholstery as a form of artistic expression.

There are, however, serious studies of intentional visual art by animals. Some of these are being conducted in the field, such as the observation of bowerbirds mentioned earlier. Others have used a rather anthropocentric approach by handing our closest relatives the tools of the painter.

### Apes with an Oeuvre

First there was the ancient Roman myth of Dibutade, who did the next best thing to taking a Polaroid: before her lover left on a long journey, she recorded his face by tracing his profile on the wall. But in 1942, in a letter to *Nature*, Julian Huxley gave us the contemporary origins-of-art story. He had observed a gorilla at the London zoo carefully track the outline of his own shadow on the wall. The gorilla did so thrice, and Huxley recognized "a relationship to the possible origins of human graphic art."<sup>115</sup>



*Nadie Kohts watches her young chimpanzee, Yoni, draw with pencil on paper, in Moscow, 1913. (Reproduced with permission of Oxford University Press).*

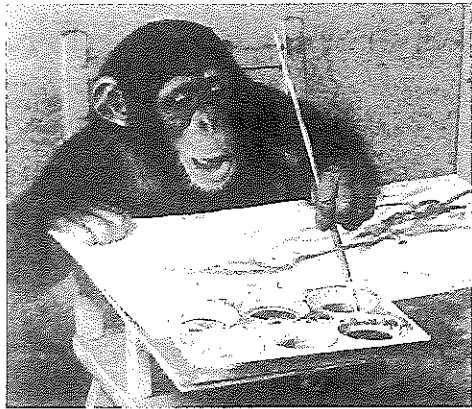
It is only logical that the quest for the origin of the artistic impulse brought us to the ape. Others had made similar observations before Huxley. In the 1920s, in Moscow, Nadie Ladygina-Kohts studied the perception of shape and color in her young chimpanzee, Yoni, and watched him enthusiastically draw with pencils on paper. Experiments on ape art were also conducted in the 1940s at the Yerkes Laboratories by Paul Schiller, who pioneered a simple test: he marked pieces of paper with lines or shapes and gave them to a chimpanzee, Alpha, to see what she would do with them. Alpha didn't simply splash paint randomly, but carefully heeded the markings, incorporating them in the end product. If Schiller put marks

in three of a paper's corners, for example, Alpha would invariably scribble another mark in the fourth.<sup>116</sup> Yet the full extent of ape art became known only after an artist/ethologist began to pay attention, in the 1950s.

Desmond Morris, author of the all-time popular-science best-seller *The Naked Ape* (1967), as well as of many other works, has been a pioneer of the burgeoning genre of literature—of which the present book is an example—that compares human and animal behavior. He has proposed many provocative ideas, for instance, that human talk serves the same function as primate grooming, and that the invention of marriage was a necessary step when our forebears began to hunt in groups because it helped regulate male competition. Perhaps because some scientists consider him a mere vulgarizer, they have elevated some of his ideas to theory without so much as a nod to the author who inspired them. Morris started his career as a serious and respected ethologist, however, training at Oxford University under Niko Tinbergen.

Morris is also a surrealist painter in a style reminiscent of Miró. Art may even be his first love, and his paintings have been featured in several illustrated books and at major exhibitions. It was his sensitivity to art, combined with his opportunity as a zoologist to interact with Congo, a young chimpanzee, that provided Morris with rare insights into the nature of the artistic impulse.

Congo became a regular guest on Morris's television show, *Zootime*, and reached fame with an exhibition of his work in



*Complex fan-pattern painting by Congo, a chimpanzee widely recognized for his excellent taste in color and sense of balance. Like other painting apes, Congo showed great concentration on the job, and was visibly annoyed if anyone tried to remove his work before he was done. (Photographs by Desmond Morris, both reproduced with his kind permission).*

1957. His paintings were not merely a curiosity: they were widely recognized as beautiful. Congo had a refreshingly energetic style, and he seemed to strive for symmetrical coverage, rhythmical variations, and eye-catching color contrasts.

Congo stayed within the borders of the paper, never going off the edge, and made rudimentary compositions, such as a heavy dot surrounded by bold circular strokes, or a fan-shaped widening of lines. His art was considered beyond the level of that of a young child in terms of both composition and artistic boldness. The latter may have been due to the fact that chimpanzees are physically stronger and have better motor control than young children. Their paintings immediately strike us as forceful statements, whereas a young child's art tends to look tentative and hesitant.

Picasso hung a Congo on his wall. The paintings of other apes—one of whom was named Pierre Brassou to trick art critics—have been accorded serious, sometimes glowing reviews by experts who, unlike Picasso, thought that the artists were human.

One illustration of the power of ape art is how hard it is to emulate. Thierry Lenain, a Belgian art philosopher, recounts in *Monkey Painting* how an Austrian painter, Arnulf Rainer, tried to copy each and every body move and brush stroke of a painting chimpanzee. In 1979, Rainer squatted next to the ape, hoping to produce works of the same clarity and intensity. The human painter, however, evidently had the preconceived notion that apes are wild creatures devoid of emotional con-

trol. As a result, instead of imitating the ape, Rainer acted the way he *thought* an ape would paint. But he had it all wrong; apes can be as concentrated and controlled as people. As Lenain's account of a filmed session shows, it was the human painter who got too wild for the ape's taste:

We see [Rainer] in the grip of a kind of trance, banging the paper, spitting on it, waving his brush nervously, throwing it down. The chimpanzee by contrast paints peacefully to start with, but is gradually influenced by the agitation of its imitator. It stops drawing, starts jumping about energetically and chases Rainer across the room. . . . Painting is not a violent activity for chimpanzees.<sup>117</sup>

If the ape's owner had not put an end to the pursuit of Rainer, the painter might have learned that an ape, even a young and relatively small one, has the muscular strength of several grown men bundled into one. Hence, an ape can charge a painting with energy and rhythm with far less effort than a person can.

In addition, ape painters don't seem to follow the rules that human artists do. Instead of worrying about the cumulative impact of an entire series of brush strokes and dabs, apes give the impression of taking a kinesthetic and visual pleasure in each separate action. We don't know the aesthetic secrets of the chimpanzee that Rainer tried to imitate, but the fact is that the human painter failed miserably in his attempt to

achieve the same directness and sovereignty of expression. When Lenain examined fifteen works simultaneously produced by ape and human, he concluded that "[t]he chimpanzee's compositions are straightforward and clear. The imitations, on the other hand, are fuzzy, tangled webs of lines, completely illegible, almost to the point of hysteria."

The title of the English translation of Lenain's book, *Monkey Painting*, is unfortunate because, apart from a capuchin monkey named Pablo, all major nonhuman primate artists have been apes.<sup>118</sup> But the book contains an intriguing theory of primate art that is dramatically different from the ideas of Desmond Morris, who emphasized the similarities between ape and human. Lenain stresses the differences, and looks at ape art as a form of visual disruption. He believes that the painting ape disrupts the empty white space in front of him or her, testing and probing, and ultimately destroying what existed before. In contrast, Morris recognized a sense of aesthetic order and balance in the works of apes.<sup>119</sup>

Morris's art-as-order hypothesis has major points in its favor. First of all, apes seek a balanced and orderly arrangement in their paintings. Following Schiller's lead, Morris would place a mark off center, say to the left, and give the paper to Congo. Congo would tend to balance the composition by painting on the right side of the paper. He was not simply attracted to the empty space there, because the closer Morris placed his mark to the center of the page, the closer to the center on the other side Congo painted; and the farther to the left Morris put the

mark, the farther to the right Congo worked, to keep the painting balanced.

Another indication that apes do not just make disruptive marks comes from the fact that they have a sense of completion of a painting. This is in contrast to what some early observers claimed. They argued that ape paintings are actually a human product: apes happily paint away until the product starts to look like a piece of abstract art to the people around it, who then take it away from the ape and hang it in a gallery. That would mean that the art is all in the human eye, that an ape has no conception of making a finished product.

But coming between an ape and his or her work can be dangerous! There are many stories of apes vehemently objecting to interruptions before they have finished their paintings. For example, Bella, a chimpanzee at the Amsterdam Zoo, painted with great concentration and was generally extremely peaceful until she lost her temper one day—with dire consequences for the keeper who tried to remove her materials in the midst of artistic activity. Morris also reported that Congo became greatly annoyed if he saw that a painting on which he was still working was about to be removed; nor did Congo like to be urged to continue once he had put down his brush, indicating that he was done. One day, Morris managed to take away a painting of an incomplete fan shape. When Congo got it back a while later, he simply continued where he had left off, carefully finishing the pattern.

A telling experience is that of Lucien Tassarolo, a French painter, who used to work side by side with a female chim-

panzee, Kunda, on a canvas that both of them would sign at the end—Tassarolo with a signature, Kunda with a handprint. Tassarolo was impressed by Kunda's precision and harmonious choice of colors. The figurative elements that he added to their work were not always appreciated by the ape, however. Sometimes she reacted enthusiastically, but on occasion she rubbed Tassarolo's contributions out and waited to continue painting until he had come up with something else.

That doesn't sound like an ape seeking to disrupt order. Underlying Kunda's behavior must have been a sense of how the completed product should look. I am not saying that the product represents much value to the ape once it has been brought about, or that destructive tendencies never occur. Indeed, as soon as the production phase is over, apes have been known to tear their works to shreds. On other occasions, they have exhibited an indifference to their finished paintings that humans find hard to understand. In this regard, the apes are very different from human artists: their goal is not to create an enduring visual image that will please, inspire, provoke, shock, or produce whatever effect it is that the human painter seeks to achieve.

The evidence, then, is that painting apes have a sense of both balance and completeness, enjoy the visual effect of what they do, and create regularities and patterns, but are not out to produce a lasting product. As far as they are concerned the product can be thrown away once they are done with it. So, even though their painting activity is best described as the deliberate creation of visually pleasing patterns, rather than as a

form of disruption, it differs from our artistic activity in that it does not appear to be a means to an end.<sup>120</sup>

### The Germ of Aesthetics

Some people feel that calling what apes produce “art” mocks human achievements. Indeed, the use of primates as caricatures of ourselves has a long history, including an entire genre of seventeenth- and eighteenth-century art depicting capuchins or macaques sitting behind an easel, paintbrush at the ready, staring at a female nude or still life just as a human painter would. Whether those paintings were a commentary on the slavish copying by some human artists, or self-mockery by the painters, the underlying message was one of opposition between animal and art. If art is by definition a human domain, a monkey with a paintbrush can only be a joke.

The age-old “monkey artist” theme had to pop up, of course, when ape paintings became an issue in the 1950s. One famous chimpanzee, Baltimore Betsy, was customarily photographed in front of her work with captions such as “Just a little something I dashed off, but not bad.” Such catering to the general public’s sense of humor undermined any attempt to explain what is interesting about ape paintings.

Moreover, apes came in handy in a cultural war zone of the time concerning gestural art and action painting characterized by vigorous, dynamic brush strokes and random effects of spilling and dripping. Since ape art looks similar, it became a

weapon against these schools, with critics expostulating that if an ape can do what certain human artists are doing, the humans must be operating at a rather primitive level. Salvador Dali, for example, couldn’t resist making the following calculated jab at another painter: “The hand of the chimpanzee is quasi-human, the hand of Jackson Pollock is almost animal.”<sup>121</sup>

People accused Morris of trying to ridicule modern art, but that was never his goal. If people get over their giggles and consider the issue at hand, they will see that there is a serious question behind it. Why do the members of our species all over the world produce art? What is it that drives them? Why waste time and energy on this sort of activity? Is it a form of play, a form of exploration, a mental game, a way of impressing others? Morris simply wanted to show that we are not the only species to take pleasure in self-created visual effects, hence that the aesthetic sense probably has older roots than is often assumed.

But where does ape art end and human art begin? The main dividing line seems to be representation. In spite of isolated claims of apes producing recognizable images (for example, Koko, the gorilla, is said to have painted a bird, a dog, and a toy dinosaur), I have never been able to recognize the purported images in their paintings. Human art seems to me unique in its depiction of reality. Observing that the human child moves on to representations after an abstract phase, Morris and his wife, Ramona, concluded in *Men and Apes* that “unhappily this is the point at which the apes get stuck.”

Yet even if substantial differences between human and ape art remain, they should not distract us from the undeniable common ground. Obviously, we feel that there is more to our art than enjoyment of visual effects: the human artist imagines and strives for an end product. Human art is a conscious act of creation. On the other hand, without satisfaction derived from intermediate stages—from the activity itself and its immediate results—we might never have reached this point. It is in this regard that ape art, rather than insulting our ego, provides a glimpse of the wellspring of the universal human artistic impulse.

## Section 2

# What Is Culture and Does It Exist in Nature?

*If culture is the transmission of habits and information by social means, it is widespread in nature. Animals may have no language or symbols; but they develop new technologies, food preferences, communication gestures, and other habits that the young learn from the old (or the other way around). As a result, one group may behave quite differently from another, and culture can no longer be claimed as an exclusively human domain.*

*Despite abundant evidence for this idea, there exists enormous opposition to it. Counterclaims focus on the learning process, which most of the time seems rather simple compared to human cultural transmission, or on the peak achievements of human civilization, with the remark that nothing of the kind is within the ape's reach. Animal culture is further-*



physician from the country of Peter Paul Rubens called the defeminized bodies in the magazine "anatomical heresy."

92. Diamond (1990).

93. Animals may show homosexual behavior but are generally not homosexual in the sense of having an exclusive or predominant orientation toward same-sex partners.

94. Parish (1993).

95. Kano (1998).

96. Bagemihl (1999, p. 117).

97. Stanford (1998). In the most detailed comparison to date, I observed the sexual behavior of bonobos at the San Diego Zoo and that of chimpanzees at the Field Station of the Yerkes Primate Center in Atlanta. The average adult bonobo initiated sex once every 65 minutes, in contrast to once every 6 hours for the average chimpanzee under similar conditions (de Waal, 1995). Even if these rates show that bonobos have sex far more often than chimpanzees, it is also evident that they are not doing it all the time. I must admit, though, that once when I tried to make this point by explaining that bonobos had sex only once every hour, an editor wrote in the margin of my manuscript that this sounded very much like all the time to her.

98. Kuroda (1984).

99. One sex therapist in California, Susan Block, has selected the bonobo ("the horniest chimps on earth") as her favorite animal, advertising her business on her Web site with: "whether you want to help save the bonobos or just save your own sex life, I'll be here for you."

100. Parish and de Waal (2000).

#### 4. Animal Art

##### Would You Hang a Congo on the Wall?

101. Introduction by Morris to Lenain (1997).

102. Deacon (1999).

103. Leakey and Lewin (1992).

104. Gilliard (1969).

105. Miller (2000).

106. Quoted in Hildebrand (1999).

107. Porter and Neuringer (1984) and Watanabe and Nemoto (1998).

108. Marler and Tamura (1964). This is not to say that there is no biological effect on how a bird sings. Many birds learn the song of their own species more accurately than that of another species, and if exposed to both,

tend to learn the former, which means that learning is biased toward their own species.

109. L. F. Baptista, at the Annual Meeting of the American Association for the Advancement of Science, Washington, D. C., 2000. The speaker died a few months later.

110. My translation from the first part of Mozart's poem: "Hier ruht ein lieber Narr, ein Vogel Staar. Noch in den besten Jahren, muß er erfahren des Todes bitterm Schmerz."

111. Liner notes accompanying *A Musical Joke* by W. A. Mozart, Deutsche Grammophon 400 065-2.

112. West and King (1990, p. 112).

113. Watanabe et al. (1995). During my visit to his lab, I asked Watanabe why he tested his birds on Western painters and composers—why not Japanese? He answered that the reviewers of international journals are impressed only by birds discriminating among art that they know, or have heard about.

114. Busch and Silver (1994).

115. Huxley (1942).

116. Schiller (1951). Alpha was the first-born chimpanzee of the Yerkes colony at Orange Park in Florida, the precursor of the Yerkes Regional Primate Research Center, where I now work, which is part of Emory University in Atlanta, Georgia.

117. Lenain (1997).

118. The book's translation out of French erroneously uses the term "monkey" as synonymous with "ape," perhaps because the distinction is less clear in French (*singe* and *grand singe*, respectively). In contrast to monkeys, apes belong to the hominoids, a small, distinct primate family consisting only of bonobos, orangutans, gorillas, chimpanzees, gibbons, and humans.

119. Lenain (1997) notes how disruption of order requires that one recognizes order, hence has a sense of it. So he doesn't see his position as totally at odds with Morris's. However, where Morris postulates a positive tendency to create something, Lenain sees the ape as trying to get rid of something else. The height of either confusion or brilliance is reached when Lenain states: "It is perfectly conceivable that a kind of 'sense of disorder' reigns in the image field so straightforwardly that it may manifest itself mainly *in the guise of a sense of order.*"

120. Apes find painting pleasurable and self-reinforcing. They do it enthusiastically without any outside reward. To test this, Morris reinforced one chimpanzee with tidbits for any artistic expression. The result was a dra-

matic loss of interest: the ape worked as quickly as possible, only to hold out a hand for the reward (Morris, 1962).

121. Levy (1961).

### 5. Predicting Mount Fuji, and a Visit to Koshima, Where the Monkeys Salt Their Potatoes

122. This is a paraphrasing of Imanishi's insightful discussion of culture (Itani and Nishimura, 1973), which now seems rather unremarkable, but was published in 1952, at about the time that Western scientists were still engaged in a polarized debate about whether behavior depended on learning or instinct.

123. Kurland (1977).

124. Sugiyama (1967).

125. Sommer (1994).

126. In some species, females seem to make paternity a confused issue—for example, by having sexual encounters with males even when they are not fertile. If males are unable to exclude their own offspring from infanticide, their strategy becomes counterproductive according to theories proposed by Hrdy (1979).

127. Mayr (1997). My own experience in this regard was the discovery of reconciliation. That cooperative animals need to repair their relationships after fights sounds logical enough, but reconciliation behavior was not predicted or even remotely considered by evolutionary biologists, who traditionally have shown far more interest in win-lose than win-win arrangements. My initial hunches, based on seeing chimpanzees kiss and embrace after a fight, are now supported by studies of a host of species (Aureli and de Waal, 2000; de Waal, 2000).

128. Wolpert (1992).

129. Nishida (1990).

130. Asquith (1986).

131. Asquith (1989, pp. 136–137).

132. Imanishi (1952).

133. *Ko* means "happy" in Japanese, and *shima* means "island." Koshima island is therefore redundant. Other famous monkey sites in Japan also have built-in habitat descriptions, such as Yakushima, Takasakiyama, Arashiyama, Ryozenyama, Jigokudani, and Katsuyama (*yama* means mountain, *dani* means valley).

134. My enthusiastic interpreter was Satsuki Kuroki. On my visit to the island, I was accompanied by Kunio Watanabe, a scientist from the Primate Research Institute in Inuyama, who has worked at Koshima for many years. See Watanabe (1994).

135. Kawamura wrote the pioneering papers on the Koshima monkeys, laying out the argument for cultural propagation. He also ascribed intergroup differences to differing traditions, noting how some monkey troops eat eggs, while others do not, or how paternal care is restricted to some troops. To avoid battles with Japanese skeptics, he used the term "subculture" rather than "culture." Most of his studies appeared in Japanese only (Itani and Nishimura, 1973).

136. In the first five years, which Kawai (1965) called the period of "individual propagation," 15 out of 19 monkeys between the ages of two and seven years acquired the behavior, but only 2 out of 11 adults. During the following period of "pre-cultural propagation," almost all infants born to potato washing mothers learned the habit. Ten years after Imo's discovery, ninety-seven percent of the monkeys under the age of twelve years showed the habit.

137. Noso died a few months after my visit, and the beta male, Kemushi, took his place.

138. Watanabe (1989).

139. Keyes (1982, pp. 14–17).

140. At five other Japanese provisioning sites, monkeys developed potato washing. At these sites, the behavior never spread, though; it remained restricted to a few isolated individuals. These observations do show that Imo did not exactly discover the monkey equivalent of the wheel: the cleaning of food in water develops quite readily (Visalberghi and Fragaszy, 1990a).

141. Keyes (1982). For a thorough debunking of this piece of pseudoscience, see Amudson (1985).

142. Galef (1990).

143. Steven Green visited Japan in 1968 and 1969, and attended potato feedings at Koshima (Green, 1975).

144. Galef (1990), an investigator of laboratory rats, failed to consider this constraint on food provisioning. His remarkable free association about what *may* have occurred at Koshima, forty years after the fact, has never before been critically examined. The scientists involved didn't know how to politely respond to harsh criticism concerning an issue—imitation—that they themselves had never emphasized.

## Bibliography

- Aisner, R., and Terkel, J. (1992). Ontogeny of pine-cone opening behaviour in the black rat (*Rattus rattus*). *Animal Behaviour* 44: 327-336.
- Alcock, J. (1998). Unpunctuated equilibrium in the *Natural History* essays of Stephen Jay Gould. *Evolution and Human Behavior* 19: 321-336.
- Alexander, R. A. (1987). *The Biology of Moral Systems*. New York: Aldine de Gruyter.
- Allen, B. (1997). The chimpanzee's tool. *Common Knowledge* 6: 34-51.
- Alp, R. (1997). "Stepping-sticks" and "seat-sticks": New types of tools used by wild chimpanzees (*Pan troglodytes*) in Sierra Leone. *American Journal of Primatology* 41: 45-52.
- Amudson, R. (1985). The hundredth monkey phenomenon. *The Skeptical Enquirer* 9: 348-356.
- Armhart, L. (1998). *Darwinian Natural Right: The Biological Ethics of Human Nature*. Albany, NY: SUNY Press.
- Asquith, P. J. (1986). Anthropomorphism and the Japanese and Western traditions in primatology. In J. G. Else and P. C. Lee (eds.), *Primate Ontogeny, Cognition, and Social Behavior*, pp. 61-71. Cambridge: Cambridge University Press.
- Asquith, P. J. (1989). Provisioning and the study of free-ranging primates: History, effects, and prospects. *Yearbook of Physical Anthropology* 32: 129-158.
- Asquith, P. J. (1991). Primate research groups in Japan: Orientations and East-West differences. In L. Fedigan, and P. Asquith (eds.), *The Monkeys of Arashiyama: Thirty-five Years of Research in Japan and the West*, pp. 81-98. Albany, NY: SUNY Press.
- Atkins, K. A. (1996). A bat without qualities? In M. Bekoff and D. Jamieson (eds.), *Readings in Animal Cognition*, pp. 345-358. Cambridge, MA: MIT Press.

- Aureli, F., Cozzolino, R., Cordischi, C., and Scucchi, S. (1992). Kin-oriented redirection among Japanese macaques: An expression of a revenge system? *Animal Behaviour* 44: 283-291.
- Aureli, F., and de Waal, F. B. M. (2000). *Natural Conflict Resolution*. Berkeley: University of California Press.
- Austin, W. A. (1974). *The First Fifty Years: An Informal History of the Detroit Zoological Park and the Detroit Zoological Society*. Detroit: The Detroit Zoological Society.
- Badcock, C. R. (1986). *The Problem of Altruism: Freudian-Darwinian Solutions*. Oxford: Blackwell.
- Bagemihl, B. (1999). *Biological Exuberance: Animal Homosexuality and Natural Diversity*. New York: St. Martin's.
- Bailey, M. B. (1986). Every animal is the smartest: Intelligence and the ecological niche. In R. Hoage and L. Goldman (eds.), *Animal Intelligence*, pp. 105-113. Washington, D. C.: Smithsonian Institution Press.
- Balda, R. P., and Kamil, A. C. (1989). A comparative study of cache recovery by three corvid species. *Animal Behaviour* 38: 486-495.
- Barkow, J. H. (1975). Prestige and culture: A biosocial interpretation. *Current Anthropology* 16: 553-572.
- Batson, C. D., Early, S., and Salvarani, G. (1990). Perspective taking: Imagining how another feels versus imagining how you would feel. *Personality and Social Psychology Bulletin* 23: 751-758.
- Beach, F. A. (1950). The snark was a boojum. *American Psychologist* 5: 115-124.
- Beatty, H. (1951). A note on the behavior of the chimpanzee. *Journal of Mammalogy* 32: 118.
- Beck, B. B. (1980). *Animal Tool Behavior: The Use and Manufacture of Tools by Animals*. New York: Garland.
- Bischof, N. (1991). *Gescheiter als alle die Laffen*. Hamburg: Rasch & Röhrling.
- Boehm, C. (1999). *Hierarchy in the Forest: The Evolution of Egalitarian Behavior*. Cambridge, MA: Harvard University Press.
- Boesch, C. (1991). Teaching in wild chimpanzees. *Animal Behaviour* 41: 530-532.
- Boesch, C., and Boesch, H. (1983). Optimization of nut-cracking with natural hammers by wild chimpanzees. *Behaviour* 83: 265-286.
- Boesch, C., and Boesch, H. (1984). Possible causes of sex differences in the use of natural hammers by wild chimpanzees. *Journal of Human Evolution* 13: 415-440.

- Boesch, C., and Boesch-Ackermann, H. (1991). Dim forest, bright chimps. *Natural History* 9/91: 50-56.
- Boesch, C., and Tomasello, M. (1998). Chimpanzee and human cultures. *Current Anthropology* 39: 591-614.
- Bonner, J. T. (1980). *The Evolution of Culture in Animals*. Princeton, NJ: Princeton University Press.
- Boyd, R., and Richerson, P. J. (1985). *Culture and the Evolutionary Process*. Chicago: University of Chicago Press.
- Budiansky, S. (1998). *If a Lion Could Talk*. New York: Free Press.
- Burghardt, G. M. (1985). Animal awareness: Current perceptions and historical perspective. *American Psychologist* 40: 905-919.
- Busch, H., and Silver, B. (1994). *Why Cats Paint: A Theory of Feline Aesthetics*. Berkeley, CA: Ten Speed.
- Byrne, R. W. (1995). *The Thinking Ape*. Oxford: Oxford University Press.
- Byrne, R. W., and Russon, A. E. (1998). Learning by imitation: A hierarchical approach. *Behavioral and Brain Sciences* 21: 667-721.
- Call, J., Judge, P. G., and de Waal, F. B. M. (1996). Influence of kinship and spatial density on reconciliation and grooming in rhesus monkeys. *American Journal of Primatology* 39: 35-45.
- Cenami Spada, E. (1997). Amorphism, mechanomorphism, and anthropomorphism. In R. W. Mitchell, N. S. Thompson, and H. L. Miles (eds.), *Anthropomorphism, Anecdotes, and Animals*, pp. 37-49. Albany, NY: SUNY Press.
- Chapais, B. (1988). Rank maintenance in female Japanese macaques: Experimental evidence for social dependency. *Behaviour* 104: 41-59.
- Chelser, P. (1969). Maternal influence in learning by observation in kittens. *Science* 166: 901-903.
- Cheney, D. L., and Seyfarth, R. M. (1990). *How Monkeys See the World*. Chicago: University of Chicago Press.
- Corbey, R. (November 8, 1997). Beschaving is meer dan mes en vork. *NRC Handelsblad*.
- Crist, E. (1999). *Images of Animals: Anthropomorphism and Animal Mind*. Philadelphia: Temple University Press.
- Cullen, D. (1997). Maslow, monkeys, and motivation theory. *Organization* 4: 355-373.
- Curio, E. (1978). Cultural transmission of enemy recognition: One function of mobbing. *Science* 202: 899-901.
- Custance, D. M., Whiten, A., and Bard, K. A. (1995). Can young chimpanzees imitate arbitrary actions? Hayes and Hayes (1952) revisited. *Behaviour* 132: 839-858.

- Damasio, A. R. (1994). *Descartes' Error: Emotion, Reason, and the Human Brain*. New York: Putnam.
- Damasio, A. R. (1999). *The Feeling of What Happens*. New York: Harcourt.
- Darwin, C. (1964 [1859]). *On the Origin of Species*. Cambridge, MA: Harvard University Press.
- Darwin, C. (1981 [1871]). *The Descent of Man, and Selection in Relation to Sex*. Princeton, NJ: Princeton University Press.
- Darwin, C. (1998 [1872]). *The Expression of the Emotions in Man and Animals*. Third Edition. New York: Oxford University Press.
- Dawkins, R. (1976). *The Selfish Gene*. Oxford: Oxford University Press.
- Dawkins, R. (1998). *Unweaving the Rainbow: Science, Delusion and the Appetite for Wonder*. New York: Houghton Mifflin.
- Deacon, J. (1999). South African rock art. *Evolutionary Anthropology* 8: 48–63.
- Deichmann, U. (1996). *Biologists under Hitler*. Cambridge, MA: Harvard University Press, pp. 179–205.
- Desmond, A. (1994). *Huxley: From Devil's Disciple to Evolution's High Priest*. New York: Perseus.
- Diamond, M. (1990). Selected cross-generational sexual behavior in traditional Hawaii: A sexological ethnography. In J. R. Feierman (ed.), *Pedophilia: Biosocial Dimensions*, pp. 378–393. New York: Springer.
- Drea, C. M., and Wallen, K. (1999). Low status monkeys "play dumb" when learning in mixed social groups. *Proceedings of the National Academy of Sciences* 96: 12965–12969.
- Ducros, A., Ducros, J., and Joulian, F. (1998). *La Culture est-elle Naturelle?* Paris: Errance.
- Durham, W. H. (1991). *Coevolution: Genes, Culture, and Human Diversity*. Stanford, CA: Stanford University Press.
- Ehrenreich, B. (1999). The real truth about the female body. *Time*, March 8: 57–65.
- Eibl-Eibesfeldt, I. (1994). *Wider die Mißtrauensgesellschaft*. Munich: Piper.
- Epstein, R., Lanza, R. P., and Skinner, B. F. (1981). "Self-awareness" in the pigeon. *Science* 212: 695–696.
- Flack, J. C., and de Waal, F. B. M. (2000). "Any animal whatever": Darwinian building blocks of morality in monkeys and apes. *Journal of Consciousness Studies* 7 (1–2): 1–29.
- Fouts, R. (1997). *Next of Kin*. New York: Morrow.

- Freeman, D. (1983). *Margaret Mead and Samoa: The Making and Unmaking of an Anthropological Myth*. Cambridge, MA: Harvard University Press.
- French, M. (1985). *Beyond Power*. New York: Ballantine.
- Freud, S. (1989 [1913]). *Totem and Taboo*. New York: Norton.
- Freud, S. (1989 [1930]). *Civilization and Its Discontents*. New York: Norton.
- Galef, B. G. (1982). Studies of social learning in Norway rats: A brief review. *Developmental Psychobiology* 15: 279–295.
- Galef, B. G. (1990). The question of animal culture. *Human Nature* 3: 157–178.
- Gallup, G. G. (1970). Self-awareness in primates. *Science* 67: 417–421.
- Gallup, G. G. (1982). Self-awareness and the emergence of mind in primates. *American Journal of Primatology* 2: 237–248.
- Garcia, J., Ervin, F. R., and Koelling, R. A. (1966). Learning with prolonged delay of reinforcement. *Psychonomic Science* 5: 121–122.
- Ghiglieri, M. (1988). *East of the Mountains of the Moon: Chimpanzee Society in the African Rain Forest*. New York: Free Press.
- Ghiselin, M. (1974). *The Economy of Nature and the Evolution of Sex*. Berkeley: University of California Press.
- Gilliard, E. T. (1969). *Birds of Paradise and Bowerbirds*. London: Weidenfeld & Nicolson.
- Goodall, J. (1990). *Through a Window*. Boston: Houghton Mifflin.
- Goodall, J. (1992). Unusual violence in the overthrow of an alpha male chimpanzee at Gombe. In T. Nishida, W. C. McGrew, P. Marler, M. Pickford, and F. B. M. de Waal, (eds.), *Topics in Primatology: Vol. 1, Human Origins*, pp. 131–142. Tokyo: University of Tokyo Press.
- Gould, S. J. (1981). *The Mismeasure of Man*. New York: Norton.
- Gould, S. J. (July 2, 1999) The human difference. *The New York Times*.
- Green, S. (1975). Dialects in Japanese monkeys: Vocal learning and cultural transmission of locale-specific vocal behavior? *Zeitschrift für Tierpsychologie* 38: 304–314.
- Greenberg, G., and Haraway, M. M. (1998). *Comparative Psychology: A Handbook*. New York: Garland.
- Guinet, C., and Bouvier, J. (1995). Development of intentional stranding hunting techniques in killer whale (*Orcinus orca*) calves at Crozet Archipelago. *Canadian Journal of Zoology* 73: 27–33.

- Günther, M. M., and Boesch, C. (1993). Energetic costs of nut-cracking behaviour in wild chimpanzees. In H. Preuschoft and D. J. Chivers (eds.), *Hands of Primates*, pp. 109–129. Vienna: Springer.
- Halstead, L. B. (1985). Anti-Darwinian theory in Japan. *Nature* 317: 587–589.
- Harris, J. R. (1998). *The Nurture Assumption: Why Children Turn Out the Way They Do*. London: Bloomsbury.
- Hebb, D. O. (1971). Comment on altruism: The comparative evidence. *Psychological Bulletin* 76: 409–410.
- Henrich, J., and Boyd, R. (1998). The evolution of conformist transmission and the emergence of between-group differences. *Evolution and Human Behavior* 19: 215–241.
- Heyes, C. (1995). Self-recognition in mirrors: Further reflections create a hall of mirrors. *Animal Behaviour* 50: 1533–1542.
- Hildebrand, G. (1999). *Origins of Architectural Pleasure*. Berkeley: University of California Press.
- Hinde, R. A. (1966). *Animal Behaviour: A Synthesis of Ethology and Comparative Psychology*. New York: McGraw-Hill.
- Hinde, R. A. (1982). *Ethology: Its Nature and Relations with Other Sciences*. Glasgow: Fontana.
- Hinde, R. A., and Fisher, J. (1951). Further observations on the opening of milk bottles by birds. *British Birds* 44: 393–396.
- Hirata, S., Myowa, M., and Matsuzawa, T. (1998). Use of leaves as cushions to sit on wet ground by wild chimpanzees. *American Journal of Primatology* 44: 215–220.
- Hobbes, T. (1991 [1651]). *Leviathan*. Cambridge: Cambridge University Press.
- Hodos, W., and Campbell, C. B. (1969). *Scala Naturae*: Why there is no theory in comparative psychology. *Psychological Review* 76: 337–350.
- Hollard, V. D., and Delius, J. D. (1982). Rotational invariance in visual pattern recognition in pigeons and humans. *Science* 218: 804–806.
- Hrdy, S. B. (1979). Infanticide among animals: A review, classification, and examination of the implications for the reproductive strategies of females. *Ethology & Sociobiology* 1: 13–40.
- Hrdy, S. B. (1999). *Mother Nature: A History of Mothers, Infants, and Natural Selection*. New York: Pantheon.
- Huffman, M. A. (1996). Acquisition of innovative cultural behaviors in non-human primates: A case study of stone handling, a socially transmitted

- behavior in Japanese macaques. In C. M. Heyes and B. G. Galef (eds.), *Social Learning in Animals: The Roots of Culture*, pp. 267–289. San Diego, CA: Academic Press.
- Huffman, M. A. (1997). Current evidence for self-medication in primates: A multi-disciplinary perspective. *Yearbook of Physical Anthropology* 40: 171–200.
- Hume, D. (1985 [1739]). *A Treatise of Human Nature*. Harmondsworth, UK: Penguin.
- Humphrey, N. K. (1976). The social function of intellect. In P. P. G. Bateson and R. A. Hinde (eds.), *Growing Points in Ethology*, pp. 303–321. Cambridge: Cambridge University Press.
- Huxley, J. (1942). The origins of human drawing. *Nature* 142: 637.
- Huxley, T. H. (1989 [1894]). *Evolution and Ethics*. Princeton, NJ: Princeton University Press.
- Imanishi, K. (1952). *Man*. Tokyo: Mainichi-Shinbunsha (in Japanese).
- Inoue, R., and Anderson, A. (1988). The Terrier's Way. *Nature* 332: 758.
- Inoue-Nakamura, N., and Matsuzawa, T. (1997). Development of stone tool use by wild chimpanzees. *Journal of Comparative Psychology* 111: 159–173.
- Itani, J. (1985). The evolution of primate social structures. *Man* 20: 593–611.
- Itani, J., and Nishimura, A. (1973). The study of infrahuman culture in Japan: A review. In E. W. Menzel (ed.), *Precultural Primate Behavior*, pp. 26–50. Basel: Karger.
- Jacob, F. (1998). *Of Flies, Mice, and Men*. Cambridge, MA: Harvard University Press.
- Jewell, D. (July 14, 1997). Brave hearts. *People*.
- Kalikow, T. J. (1980). Die ethologische Theorie von Konrad Lorenz: Erklärung und Ideologie, 1938–1943. In H. Mertens and S. Richter (eds.), *Naturwissenschaft, Technik und NS-Ideologie*, pp. 189–214. Frankfurt: Suhrkamp.
- Kano, T. (1992). *The Last Ape: Pygmy Chimpanzee Behavior and Ecology*. Stanford, CA: Stanford University Press.
- Kano, T. (1998). Comments on C. B. Stanford. *Current Anthropology* 39: 410–411.
- Kawai, M. (1965). Newly-acquired pre-cultural behavior of the natural troop of Japanese monkeys on Koshima islet. *Primates* 6: 1–30.
- Kellogg, W. N., and Kellogg, L. A. (1967 [1933]). *The Ape and the Child*. New York: Hafner.

- Kennedy, J. S. (1992). *The New Anthropomorphism*. Cambridge: Cambridge University Press.
- Keyes, K. (1982). *The Hundredth Monkey*. Coos Bay, OR: Vision Books.
- Killen, M., and de Waal, F. B. M. (2000). The evolution and development of morality. In F. Aureli and F. B. M. de Waal (eds.), *Natural Conflict Resolution*, pp. 352–372. Berkeley, CA: University of California Press.
- Köhler, W. (1925). *The Mentality of Apes*. New York: Vintage Books.
- Kroeber, A. L. (1928). Sub-human cultural beginnings. *Quarterly Review of Biology* 3: 325–342.
- Kroeber, A. L. (1963 [1923]). *Anthropology: Culture Patterns & Processes*. New York: Harcourt.
- Kummer, H. (1971). *Primate Societies*. Arlington Heights: Davidson.
- Kummer, H. (1995). In *Quest of the Sacred Baboon*. Princeton, NJ: Princeton University Press.
- Kunz, T. H., and Allgaier, A. L. (1994). Allomaternal care: Helper-assisted birth in the Rodrigues fruit bat, *Pteropus rodricensis*. *J. Zool., London* 232: 691–700.
- Kurland, J. A. (1977). *Kin Selection in the Japanese Monkey*. Contributions to Primatology, vol. 12. Basel: Karger.
- Kuroda, S. (1984). Interaction over food among pygmy chimpanzees. In R. L. Susman (ed.), *The Pygmy Chimpanzee*, pp. 301–324. New York: Plenum.
- Ladygina-Kohts, N. N. (in press). *Infant Chimpanzee and Human Child* (F. B. M. de Waal, ed.). New York: Oxford University Press.
- Leakey, R., and Lewin, R. (1992). *Origins Reconsidered*. New York: Doubleday.
- Lefebvre, L. (1995). Culturally-transmitted feeding behaviour in primates: Evidence for accelerating learning rates. *Primates* 36: 227–239.
- Lenain, T. (1997). *Monkey Painting*. London: Reaktion Books.
- Levy, M. (1961). Dali, the quantum gun-at Port Lligat. *The Studio* 162: 83–85.
- Liessmann, K. P. (1996). *Der gute Mensch von Österreich*. Vienna: Sonderzahl.
- Linton, R. (1936). *The Study of Man: An Introduction*. New York: Appleton-Century-Croft.
- Lorenz, K. Z. (1962 [1952]). *King Solomon's Ring*. New York: Time.
- Lorenz, K. Z. (1966 [1963]). *On Aggression*. London: Methuen.
- Lorenz, K. Z. (1981). *The Foundations of Ethology*. New York: Simon & Schuster.

- Lorenz, K. Z. (1985). My family and other animals. In D. A. Dewsbury (ed.), *Leaders in the Study of Animal Behavior*, pp. 259–287. Lewisburg, PA: Bucknell University Press.
- Lumsden, C., and Wilson, E. O. (1981). *Genes, Mind, and Culture*. Cambridge, MA: Harvard University Press.
- Mann, A. (1972). Hominid and cultural origins. *Man* 7: 379–386.
- Manning, A. (Feb. 10, 1996). On the origins of behaviour. *New Scientist*.
- Marler, P., and Tamura, M. (1964). Culturally transmitted patterns of vocal behavior in sparrows. *Science* 146: 1483–1486.
- Marshall, A. J., Wrangham, R. W., and Arcadi, A. C. (1999). Does learning affect the structure of vocalizations in chimpanzees? *Animal Behaviour* 58: 825–830.
- Marshall, Thomas E. (1993). *The Hidden Life of Dogs*. Boston: Houghton Mifflin.
- Maslow, A. (1936). The role of dominance in the social and sexual behavior of infra-human primates. Series of articles in the *Journal of Genetic Psychology*, vols. 48–49.
- Masson, J. M., and McCarthy, S. (1995). *When Elephants Weep: The Emotional Lives of Animals*. New York: Delacorte.
- Masters, R. (1989). *The Nature of Politics*. New Haven, CT: Yale University Press.
- Matsuzawa, T. (1994). Field experiments on use of stone tools by chimpanzees in the wild. In R. W. Wrangham, W. C. McGrew, F. B. M. de Waal, and P. Heltne (eds.), *Chimpanzee Cultures*, pp. 351–370. Cambridge, MA: Harvard University Press.
- Mayr, E. (1997). *This is Biology: The Science of the Living World*. Cambridge, MA: Belknap.
- McGrew, W. C. (1979). Evolutionary implications of sex differences in chimpanzee predation and tool use. In D. A. Hamburg and E. R. McCown (eds.), *The Great Apes*, pp. 441–463. Menlo Park, CA: Benjamin/Cummings.
- McGrew, W. C. (1992). *Chimpanzee Material Culture: Implications for Human Evolution*. Cambridge: Cambridge University Press.
- McGrew, W. C., and Tutin, C. E. G. (1978). Evidence for a social custom in wild chimpanzees? *Man* 13: 243–251.
- McGrew, W. C., Ham, R. M., White, L. J. T., Tutin, C. E. G., and Fernandez, M. (1997). Why don't chimpanzees in Gabon crack nuts? *International Journal of Primatology* 18: 335–374.

- Mead, M. (1950). *Male and Female: A Study of the Sexes in a Changing World*. New York: Penguin.
- Medawar, P. B. (1984). *The Limits of Science*. New York: Harper & Row.
- Mencius (372–289 B. C. ). *The Works of Mencius*. English transl. Gu Lu. Shanghai: Shangwu Publishing House.
- Midgley, M. (1979). *Beast and Man: The Roots of Human Nature*. London: Routledge.
- Miller, G. F. (2000). *The Mating Mind: How Sexual Choice Shaped the Evolution of Human Nature*. New York: Doubleday.
- Mineka, S., Davidson, M., Cook, M., and Keir, R. (1984). Observational conditioning of snake fear in rhesus monkeys. *Journal of Abnormal Psychology* 93: 355–372.
- Mitchell, R. W., Thompson, N. S., and Miles, H. L. (1997). *Anthropomorphism, Anecdotes, and Animals*. Albany, NY: SUNY Press.
- Montagu, M. F. A. (1968). *Man and Aggression*. New York: Oxford University Press.
- Moore, B. R., and Stuttard, S. (1979). Dr. Guthrie and *Felis domesticus* or: Tripping over the cat. *Science* 205: 1031–1033.
- Moore, J. A. (1993). *Science as a Way of Knowing: The Foundations of Modern Biology*. Cambridge, MA: Harvard University Press.
- Morgan, C. L. (1894). *An Introduction to Comparative Psychology*. London: Scott.
- Morgan, C. L. (1903). *An Introduction to Comparative Psychology*, 2nd edition. London: Scott.
- Morris, D. (1962). *The Biology of Art: A Study of the Picture-Making Behaviour of the Great Apes and Its Relationship to Human Art*. London: Methuen.
- Morris, D. (1967). *The Naked Ape*. New York: Dell.
- Morris, R., and Morris, D. (1966). *Men and Apes*. New York: McGraw-Hill.
- Mulder, M. (1979). *Omgang met Macht*. Amsterdam: Elsevier.
- Myowa-Yamakoshi, M., and Matsuzawa, T. (1999). Factors influencing imitation of manipulatory actions in chimpanzees. *Journal of Comparative Psychology* 113: 128–136.
- Nagel, T. (1974). What is it like to be a bat? *Philosophical Review* 83: 435–450.
- Nakamichi, M., Kata, E., Kojima, Y., and Itoigawa, N. (1998). Carrying and washing of grass roots by free-ranging Japanese macaques at Katsuyama. *Folia primatologica* 69: 35–40.

- Nakamura, M., McGrew, W., Marchant, L. F., and Nishida, T. (2000). Social scratch: Another custom in wild chimpanzees? *Primates* 41: 237–246.
- Nimchinsky, E. A., Gilissen, E., Allman, J. M., Perl, D. P., Erwin, J. E., and Hof, P. R. (1999). A neuronal morphologic type unique to humans and great apes. *PNAS* 96: 5268–5273. Proceedings of the National Academy of Sciences.
- Nishida, T. (1990). A quarter century of research in the Mahale Mountains: An overview. In T. Nishida (ed. ), *The Chimpanzees of the Mahale Mountains*, pp. 3–35. Tokyo: University of Tokyo Press.
- Nishida, T., and Hosaka, K. (1996). Coalition strategies among adult male chimpanzees of the Mahale Mountains, Tanzania. In W. C. McGrew, L. F. Marchant, and T. Nishida (eds. ), *Great Ape Societies*, pp. 114–134. Cambridge: Cambridge University Press.
- Nottebohm, G. (1880). *Mozartiana*. Wiesbaden: Breitkopf & Härtel.
- Oakley, K. (1957). *Man the Tool-Maker*. Chicago: University of Chicago Press.
- Ogawa, H. (1995). Recognition of social relationships in bridging behavior among Tibetan macaques. *American Journal of Primatology* 35: 305–310.
- Otoni, E. B., and Mannu, M. (in press). Semi-free ranging tufted capuchin monkeys (*Cebus apella*) spontaneously use tools to crack open nuts. *International Journal of Primatology*.
- Parish, A. R. (1993). Sex and food control in the “uncommon chimpanzee”: How bonobo females overcome a phylogenetic legacy of male dominance. *Ethology & Sociobiology*, 15: 157–179.
- Parish, A. R., and de Waal, F. B. M. (2000). The other “closest living relative”: How bonobos (*Pan paniscus*) challenge traditional assumptions about females, dominance, intra- and inter-sexual interactions, and hominid evolution. In D. LeCroy and P. Moller (eds. ), *Evolutionary Perspectives on Human Reproductive Behavior*. *Annals of the New York Academy of Sciences* 907: 97–113.
- Payne, K. (1998). *Silent Thunder: In the Presence of Elephants*. New York: Penguin.
- Porter, D., and Neuringer, A. (1984). Musical discriminations by pigeons. *Journal of Experimental Psychology: Animal Behavior Processes* 10: 138–148.
- Povinelli, D. J., et al. (1997). Chimpanzees recognize themselves in mirrors. *Animal Behaviour* 53: 1083–1088.



- Premack, D., and Premack, A. J. (1994). Why animals have neither culture nor history. In T. Ingold (ed.), *Companion Encyclopedia of Anthropology*, pp. 350–365. London: Routledge.
- Preston, S. D., and de Waal, F. B. M. (in press). The communication of emotions and the possibility of empathy in animals. In *Altruistic Love: Science, Philosophy, and Religion in Dialogue*. Oxford: Oxford University Press.
- Ridley, M. (1996). *The Origins of Virtue*. London: Viking.
- Roberts; M. (1996). *The Man Who Listens to Horses*. New York: Random House.
- Roes, F. (1997). An interview of Richard Dawkins. *Human Ethology Bulletin* 12(1): 1–3.
- Roes, F. (1998). A conversation with George C. Williams. *Natural History* 5: 10–15.
- Russell, B. (1927). *Outline of Philosophy*. New York: Median.
- Russon, A. E. (1996). Imitation in everyday use: Matching and rehearsal in the spontaneous imitation of rehabilitant orangutans (*Pongo pygmaeus*). In A. E. Russon, K. A. Bard, and S. T. Parker (eds.), *Reaching into Thought: The Minds of the Great Apes*, pp. 152–176. Cambridge: Cambridge University Press.
- Sacks, O. (1985). *The Man Who Mistook His Wife for a Hat*. London: Picador.
- Sakura, O. (1998). Similarities and varieties: A brief sketch on the reception of Darwinism and Sociobiology in Japan. *Biology & Philosophy* 13: 341–357.
- Savage-Rumbaugh, S., and Lewin, R. (1994). *Kanzi: The Ape on the Brink of the Human Mind*. New York: Wiley.
- VanSchaik, C. P., Deaner, R. O., and Merrill, M. Y. (1999). The conditions for tool use in primates: Implications for the evolution of material culture. *Journal of Human Evolution* 36: 719–741.
- Schiller, P. H. (1951). Figural preferences in the drawings of a chimpanzee. *Journal of Comparative Psychology* 46: 101–111.
- Sept, J. M., and Brooks, G. E. (1994). Reports of chimpanzee natural history, including tool-use, in 16th- and 17th-century Sierra Leone. *International Journal of Primatology* 15: 867–878.
- Serpell, J. (1996). *In the Company of Animals: A Study of Human-Animal Relationships*. Cambridge: Cambridge University Press.

- Shepard, P. (1996). *The Others: How Animals Made Us Human*. Washington, D. C.: Shearwater.
- Shweder, R. A. (1991). *Thinking through Cultures*. Cambridge, MA: Harvard University Press.
- Sinclair, M. (1986). Imanishi and Halstead: Intra specific competition? *Nature* 320: 580.
- Small, M. F. (1998). *Our Babies, Ourselves*. New York: Anchor.
- Smith, A. (1937 [1759]). *A Theory of Moral Sentiments*. New York: Modern Library.
- Sober, E. (1998). Morgan's Canon. In D. D. Cummins, and C. Allen (eds.), *The Evolution of Mind*, pp. 224–242. Oxford: Oxford University Press.
- Sober, E., and David Wilson, D. S. (1998). *Unto Others: The Evolution and Psychology of Unselfish Behavior*. Cambridge, MA: Harvard University Press.
- Sommer, V. (1994). Infanticide among the langurs of Jodhpur: Testing the sexual selection hypothesis with a long-term record. In S. Parmigiani, and F. S. vom Saal (eds.), *Infanticide and Parental Care*, pp. 155–187. Chur: Harwood.
- Stanford, C. B. (1998). The social behavior of chimpanzees and bonobos. *Current Anthropology* 39: 399–407.
- Sugiyama, Y. (1967). Social organization of Hanuman langurs. In S. A. Altmann (ed.), *Social Communication among Primates*, pp. 221–253. Chicago: University of Chicago Press.
- Sugiyama, Y., and Koman, J. (1979). Tool-using and -making behavior in wild chimpanzees at Bossou, Guinea. *Primates* 20: 513–524.
- Tanaka, I. (1995). Matrilineal distribution of louse egg-handling techniques during grooming in free-ranging Japanese macaques. *American Journal of Physical Anthropology* 98: 197–201.
- Thomas, R. K. (1998). Lloyd Morgan's canon. In G. Greenberg, and M. M. Haraway (eds.), *Comparative Psychology, A Handbook*, pp. 156–163. New York: Garland.
- Thompson, R. K. R., and Contie, C. L. (1994). Further reflections on mirror usage by pigeons: Lessons from Winnie-the-Pooh and Pinocchio too. In S. T. Parker et al. (eds.), *Self-Awareness in Animals and Humans*, pp. 392–409. Cambridge: Cambridge University Press.
- Thorpe, W. H. (1979). *The Origins and Rise of Ethology*. London: Praeger.
- Tinbergen, T. (1963). On aims and methods of ethology. *Zeitschrift für Tierpsychologie* 20: 410–433.

- Tokuda, K. (1961-62). A study of sexual behavior in the Japanese monkey. *Primates* 3(2): 1-40.
- Tomasello, M. (1999). *The Cultural Origins of Human Cognition*. Cambridge, MA: Harvard University Press.
- Tomasello, M., and Call, J. (1997). *Primate Cognition*. New York: Oxford University Press.
- Tomasello, M., Kruger, A. C., and Ratner, H. H. (1993). Cultural learning. *Behavioral & Brain Sciences* 16: 495-552.
- Tomasello, M., Savage-Rumbaugh, E. S., and Kruger, A. C. (1993). Imitative learning of actions on objects by children, chimpanzees, and enculturated chimpanzees. *Child Development* 64: 1688-1705.
- Trazt, E. P., and Heck, H. (1954). Der afrikanische Anthropoide "Bonobo", eine neue Menschenaffengattung. *Säugetierkundliche Mitteilungen* 2: 97-101.
- Tylor, E. B. (1871). *Primitive Culture*. London: Murray.
- Vermeij, G. 1996. The touch of a shell. *Discover* 17(8): 76-81.
- Vicchio, S. J. (1986). From Aristotle to Descartes: Making animals anthropomorphic. In R. J. Hoage, and L. Goldman (eds.), *Animal Intelligence: Insights into the Animal Mind*, pp. 187-207. Washington, D. C.: Smithsonian Institution Press.
- Virey, J.-J. (1817). Art: Histoire naturelle. In *Nouveau dictionnaire d'histoire naturelle appliquée aux arts*, pp. 542-564. Paris: Deterville.
- Visalberghi, E., and Frigaszy, D. M. (1990a). Food washing behaviour in tufted capuchins and crabeating macaques. *Animal Behaviour* 40: 829-836.
- Visalberghi, E., and Frigaszy, D. M. (1990b). Do monkeys ape? In S. Parker, and K. Gibson (eds.), *"Language" and Intelligence in Monkeys and Apes: Comparative Developmental Perspectives*, pp. 247-273. Cambridge: Cambridge University Press.
- Vogel, C. (1985). Evolution und moral. In H. Maier-Leibnitz (ed.), *Zeugen des Wissens*, pp. 467-507. Mainz: Hase & Koehler.
- de Waal, F. B. M. (1986). The brutal elimination of a rival among captive male chimpanzees. *Ethology & Sociobiology* 7: 237-251.
- de Waal, F. B. M. (1989a). *Peacemaking among Primates*. Cambridge, MA: Harvard University Press.
- de Waal, F. B. M. (1989b). Behavioral contrasts between bonobo and chimpanzee. In P. Heltne, and L. A. Marquardt (eds.), *Understanding Chimpanzees*, pp. 154-175. Cambridge, MA: Harvard University Press.

- de Waal, F. B. M. (1991). Complementary methods and convergent evidence in the study of primate social cognition. *Behaviour* 118: 297-320.
- de Waal, F. B. M. (1995). Sex as an alternative to aggression in the bonobo. In P. Abramson, and S. Pinkerton (eds.), *Sexual Nature, Sexual Culture*, pp. 37-56. Chicago: University of Chicago Press.
- de Waal, F. B. M. (1996a). *Good Natured*. Cambridge, MA: Harvard University Press.
- de Waal, F. B. M. (1996b). Macaque social culture: Development and perpetuation of affiliative networks. *Journal of Comparative Psychology* 110: 147-154.
- de Waal, F. B. M. (1997). *Bonobo: The Forgotten Ape*, with photographs by F. Lanting. Berkeley: University of California Press.
- de Waal, F. B. M. (1998 [1982]). *Chimpanzee Politics: Power and Sex among Apes*, revised edition. Baltimore, MD: Johns Hopkins University Press.
- de Waal, F. B. M. (1999). Cultural primatology comes of age. *Nature* 399: 635-636.
- de Waal, F. B. M. (2000). Primates: A natural heritage of conflict resolution. *Science* 289: 586-590.
- de Waal, F. B. M., and Aureli, F. (1996). Consolation, reconciliation, and a possible cognitive difference between macaque and chimpanzee. In A. E. Russon, K. A. Bard, and S. T. Parker (eds.), *Reaching into Thought: The Minds of the Great Apes*, pp. 80-110. Cambridge: Cambridge University Press.
- de Waal, F. B. M., and Berger, M. L. (2000). Payment for labour in monkeys. *Nature* 404: 563.
- de Waal, F. B. M., and Johanowicz, D. L. (1993). Modification of reconciliation behavior through social experience: An experiment with two macaque species. *Child Development* 64: 897-908.
- de Waal, F. B. M., and Luttrell, L. M. (1988). Mechanisms of social reciprocity in three primate species: symmetrical relationship characteristics or cognition? *Ethology and Sociobiology* 9: 101-118.
- de Waal, F. B. M., and Seres, M. (1997). Propagation of handclasp grooming among captive chimpanzees. *American Journal of Primatology* 43: 339-346.
- Walker, A. (1998). *By the Light of My Father's Smile*. New York: Ballantine.
- Watanabe, K. (1989). Fish: A new addition to the diet of Japanese macaques on Koshima Island. *Folia primatologica* 52: 124-131.
- Watanabe, K. (1994). Precultural behavior of Japanese macaques: Longitudinal studies of the Koshima troops. In R. A. Gardner, A. B.

- Chiarelli, B. T. Gardner, and F. X. Plooiij (eds. ), *The Ethological Roots of Culture*, pp. 81-94. Dordrecht: Kluwer.
- Watanabe, S., and Nemoto, M. (1998). Reinforcing properties of music in Java sparrows (*Padda oryziyora*). *Behavioural Processes* 43: 211-218.
- Watanabe, S., Sakamoto, J., and Wakita, M. (1995). Pigeons' discrimination of paintings by Monet and Picasso. *Journal of the Experimental Analysis of Behavior* 63: 165-174.
- Watson, J. B. (1930 [1925]). *Behaviorism: Revised Edition*. Chicago: University of Chicago Press.
- West, M. J., and King, A. P. (1990). Mozart's starling. *American Scientist* 78: 106-114.
- Westermarck, E. (1912). *The Origin and Development of the Moral Ideas*, vol. 1. London: Macmillan.
- White, L. A. (1959). *The Evolution of Culture*. New York: McGraw-Hill.
- Whitehead, H. (1998). Cultural selection and genetic diversity in matrilineal whales. *Science* 282: 1708-1711.
- Whiten, A. (1998). Imitation of the sequential structure of actions by chimpanzees. *Journal of Comparative Psychology* 112: 270-281.
- Whiten, A., Goodall, J., McGrew, W. C., Nishida, T., Reynolds, V., Sugiyama, Y., Tutin, C. E. G., Wrangham, R. W., and Boesch, C. (1999). Cultures in chimpanzees. *Nature* 399: 682-685.
- Whittemore, H., and Hebard, C. (1995). *So That Others May Live*. New York: Bantam.
- Williams, G. C. (1988) Reply to comments on "Huxley's evolution and ethics in sociobiological perspective." *Zygon* 23: 437-438.
- Wilson, E. O. (1995). *Naturalist*. New York: Warner.
- Wilson, E. O. (1998). *Consilience: The Unity of Knowledge*. New York: Knopf.
- Wimsatt, W. C. (1999). Genes, memes, and cultural heredity. *Biology and Philosophy* 14: 279-310.
- Wolf, A. P. (1995). *Sexual Attraction and Childhood Association: A Chinese Brief for Edward Westermarck*. Stanford, CA: Stanford University Press.
- Wolpert, L. (1992). *The Unnatural Nature of Science*. London: Faber & Faber.
- Woodward, R., and Bernstein, C. (1976). *The Final Days*. New York: Simon & Schuster.
- Wrangham, R. W., and Peterson, D. (1996). *Demonic Males: Apes and the Evolution of Human Aggression*. Boston: Houghton Mifflin.

- Wrangham, R. W., McGrew, W. C., de Waal, F. B. M., and Heltne, P. (1994). *Chimpanzee Cultures*. Cambridge, MA: Harvard University Press.
- Wright, R. (1994). *The Moral Animal; The New Science of Evolutionary Psychology*. New York: Pantheon.
- Wright, R. (Dec. 13, 1999). The accidental creationist: Why Stephen Jay Gould is bad for evolution. *The New Yorker*, pp. 56-65.
- Yamakoshi, G. (1998). Dietary responses to fruit scarcity of wild chimpanzees at Bossou, Guinea: Possible implications for ecological importance of tool use. *American Journal of Physical Anthropology* 106: 283-295.
- Yoshimi, K. (1998). Imanishi Kinji's biosociology as a forerunner of the semiosphere concept. *Semiotica* 120: 273-297.
- Zhao, Q. -K. (1996). Etho-ecology of Tibetan macaques at Mount Emei, China. In J. E. Fa, and D. G. Lindburg (eds. ), *Evolution and Ecology of Macaque Societies*, pp. 263-289. Cambridge: Cambridge University Press.