

MOTHERS, MACHINES, AND MORALS: HARRY HARLOW'S WORK ON PRIMATE LOVE FROM LAB TO LEGEND

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“Love is a wondrous state, deep, tender and rewarding.” But because of its intimate and personal nature, scientists had considered love to be “an improper topic for experimental research.” Thus in his 1958 presidential address to the American Psychological Association did Harry Harlow express concern about his fellow psychologists’ lack of interest in a motive that “pervades our entire lives.” In his view, psychologists were failing in their mission “to analyze all facets of human and animal behavior into their component variables” (Harlow, 1958, p. 673). Harlow’s talk, “The Nature of Love,” changed the status of mother love within the walls of the laboratory and beyond. Harlow presented his experiments with rhesus monkeys and “surrogate” mothers, dolls made of cloth and wire. He showed that even when the wire mothers provided the infants with milk, the young rhesus spent much of their time clutching the cloth mother. These experiments have become legendary in the scientific community and in popular culture.

According to this legend, Harlow showed that maternal care in infancy was essential for adult sexual adjustment and mental health. This work thus corroborated in nonhuman primates the views of psychoanalysts such as John Bowlby and René Spitz, who argued that maternal deprivation had devastating consequences for children’s emotional development. Bowlby and Spitz identified maternal love as a biological need and, therefore, a necessary element for a child’s adequate development. In some versions of this legend Harlow is presented as part of a triumvirate, with Konrad Lorenz and Bowlby. In this triad, Lorenz provided the theoretical foundation to understand human behavior as a set of instincts or innate behavioral patterns; Bowlby contributed observational work on children; and Harlow provided experimental corroboration in primates of the instinctual nature of social behavior. As in all animal fables, Harlow’s monkeys thus revealed to humans a deep truth about nature: Profound disturbances result from thwarting biological instincts. The moral of this legend is one about the power of biology and the determinant effects of factors like mother love, which are necessary to fulfill an organism’s innate needs.

However, my historical examination of Harlow’s work and its reception among contemporary scientists and the public shows that Harlow’s views and the monkeys’ behavior were more complex than the standard legend allows. It is beyond the scope of this paper to analyze the complex ways in which Harlow’s research on monkeys, Lorenz’s research on imprinting, and Bowlby’s research on children were related and appropriated by each other and by diverse constituencies. Here, I focus on the relation between Harlow’s and Bowlby’s work. Bowlby and later Mary Ainsworth presented Harlow’s work as providing crucial empirical support for

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their ethological theory of attachment behavior, which postulates that children have an instinctual need for maternal care and disruption of the mother–infant bond has severe consequences for the infant’s psychological development. They also saw Harlow’s work as confirming the belief in a critical period of early development that determines an individual’s adult character. Historical commentaries have basically reproduced or taken for granted this account of Harlow’s experiments, thus contributing not only to its survival, but also to a re-casting of history.¹ My analysis shows that Harlow did not support Bowlby’s views about the essential need for mother love.

This paper also problematizes another interpretation of Harlow’s work that deserves separate mention. In her thought-provoking examination of Harlow’s experiments, Donna Haraway argued that he “could design and build experimental apparatus and model the bodies and minds of monkeys to tell the major stories of his culture and his historical moment.” In her view, “the laboratory rhesus monkeys complied in the production of discourse in the rhetorics of their own pliable bodies” (Haraway, 1989, p. 240). The assumption underlying this interpretation is that the rhesus monkeys were passive subjects, “discursive constructs” elaborated by the experimenter. But monkeys did not always comply with the experimenter’s expectations. They were not passive receivers modeling with their bodies and behavior scientists’ theories or even social metaphors. Neither was the transfer of experiments into society a straightforward affair. There was no monolithic understanding, and society was not a passive receiver of scientists’ pronouncements. In sum, neither Harlow, nor society, nor the monkeys told a simple story.

HARRY HARLOW

Born as Harry Israel in 1905, the future APA president grew up in the American Midwest and Southwest. Harlow was not Jewish, but his advisors at Stanford University thought that in job applications his Jewish-sounding name would affect his chances of obtaining a good academic position. They suggested a name change.² After obtaining a PhD in psychology for his work on maternal behavior in rats as well as a new name, Harry Harlow arrived during the early years of the Great Depression in Madison, Wisconsin, to start his work on comparative psychology.

But Harlow found no animal laboratory—and little sympathy for his effort to breed rats in a classroom below the dean’s office. On a hint, he paid a visit to the Madison Zoo and made what he claimed was his first important discovery: After working with primates, one could never go back to “rodentology.” For his research on monkeys Harlow first made do at the Madison Zoo and in several makeshift research spaces until an old cheese factory was remodeled into the Primate Laboratory in 1954.³

1. See, for example, Eibl-Eibesfeldt (1972, Chapter 10); Hrdy (2000); Morgan (1994, p. 117); Allport (1997, p. 167); Blum (2002); Karen (1998, pp. 119–125); and most textbooks in psychology.

2. Letter of W. R. Miles, professor of experimental psychology at Stanford, to Lon H. Israel, Harlow’s father, advising that his son “should change his name” (May 28, 1930). Harlow’s extensive archival materials are in possession of his former long-time secretary and friend Helen A. LeRoy in Madison, Wisconsin. Since the papers are not catalogued, I provide the information relevant to the folder and box only when available. Copies of all archival materials used here are also in possession of the author (hereinafter cited as Harlow Papers). On the problems about one’s name at the time, see Winston (1996).

3. On Harlow’s life and work, see Blum (2002); LeRoy (2008); LeRoy and Kimble (2003); Sidowski and Lindsley (1989); Suomi and LeRoy (1982).

From his early years in Wisconsin, Harlow showed a maverick genius for devising research instruments and clever experiments. He developed the Wisconsin General Test Apparatus (WGTA), a special booth with a battery of learning and memory tasks that provided a standardized intelligence test for monkeys. Psychologists across the country adopted the WGTA and thus the machine also became instrumental in standardizing the practices of psychologists. With this apparatus, Harlow discovered the existence of learning sets, that is, the fact that monkeys can learn to learn by forming strategies for problem solving. Psychologists had run thousands of rats through mazes by this time, but after putting them through some trials, they discarded them. Monkeys were too expensive for such a procedure. Choosing, instead, to give his monkeys problem after problem, Harlow realized that they achieved near-perfect performance. He thus showed that monkeys learn to learn (Harlow, 1949, 1955; Harlow & Harlow, 1949; Harlow & Meyer, 1949).

After learning himself that there might be benefits in doing things differently from his colleagues, Harlow proceeded to reverse another standard practice in psychological research. While everybody was subjecting hungry animals to testing in order to motivate them to perform well, Harlow decided to feed his animals just before they were tested. Surprisingly (or perhaps not), the monkeys performed better than they had on an empty stomach. The image of rhesus monkeys solving a variety of problems with their mouths stuffed with peanuts dealt a heavy blow to the drive reduction theory of motivation, which postulated that a primate's main motivation is the reduction of so-called primary drives like hunger. With one of his post-doctoral students, Robert Butler, Harlow also proved that monkeys are curious about the world, *just* for the sake of curiosity. Butler had shown that mature adult monkeys enclosed in a dimly lit box with a little door will open and reopen the door hour after hour for no other reward than seeing what is outside the box. Harlow later discovered that baby monkeys are also curious for curiosity's sake, not because they get a peanut or other reward. Curiosity leads them to solve puzzles and to peek into the world beyond their cage (Harlow, 1953, 1954).

Thus, by the time he started to study love in the mid 1950s, Harlow already had considerable experience with monkeys and fame. He had established himself as a leading comparative psychologist. From 1950 to 1952, he was the Army's Chief Psychologist and he helped to create the Human Resources Research Office, a major military social science research center in Washington, D.C. Besides his work on learning and motivation on monkeys, he had also done extensive work on the cortical localization of intellectual functions and on radiation effects. In 1951 he became the editor of the major journal in comparative psychology, the *Journal of Comparative and Physiological Psychology*. The same year he was elected a member of the National Academy of Sciences. In 1958 he became president of the American Psychological Association. In his presidential speech he presented his new research on mother love, research that would turn him into one of the most famous and influential psychologists of the twentieth century.

IN SEARCH OF THE ORIGINS OF LOVE: CONTACT OR FOOD?

After problems with importing rhesus monkeys from India led scientists in the United States to start their own breeding colonies, the University of Wisconsin became one of the first research sites to establish a breeding colony in 1956.⁴ The breeding colony was successful because researchers followed strict procedures to keep the monkeys isolated from each other.

4. For Harlow's own account of the development of his research on infants, see Harlow (1977).

After an infant was born, usually at night, the mother would cut the amniotic cord, eat the placenta, and clean the infant. The next day, within twelve hours after birth, the research team removed the infant from the mother. It was too dangerous for infants to stay with their mothers after birth because rhesus monkeys are very susceptible to tuberculosis and the illness spreads like an epidemic. On one occasion, Harlow's team almost lost the entire colony of monkeys. So scientists put the baby monkeys in individual cages, and their experimental lives began. For the next three decades the staff of Harlow's lab recorded all details about the monkeys' bodies and behavior: body changes, menses, coitus, grooming, looks, moods, fights, and embraces.⁵ One of the first things caretakers noticed seemed quite odd: The infants developed a strong attachment to the folded gauze diapers covering their cage floors.

It is not surprising that alone in a cage a baby monkey would grasp the only soft thing available. But without the diapers, the rhesus babies often did not survive (Harlow, 1958, p. 673). This was strange because wild rhesus monkeys live in a wide range of environments, from deserts to forests, mountains to swamps, villages to crowded cities. Why did they die in great numbers in a laboratory where they had all the comforts of modern life—controlled temperature, regulated diet, and constant care? Could a blanket make a difference between life and death? What caused the monkeys' attachment to the blanket, which they hugged, soiled, and grabbed for dear life? Thus, Harlow was drawn to examine infant development in monkeys and, more specifically, their social and emotional development. Harlow had written his dissertation on maternal care and had taught and written about emotions as early as 1932, but it was not until the mid-fifties that he turned to the experimental analysis of love (Harlow & Stagner, 1932; Harlow & Stagner, 1933).

Research on emotions had acquired increasing scientific and social popularity since World War II. As I have argued elsewhere, the shock of the war, the problems of readjustment in constructing the postwar order, and concern about the effects of the war on children all played a role in turning attention towards the emotional side of human behavior. This concern about the emotional basis of social behavior fueled a renewed interest in the role of instincts in animal and human behavior, a topic that became the center of discussions between American comparative psychologists such as Harlow, T. C. Schneirla, Daniel Lehrman, and Frank Beach and European ethologists Konrad Lorenz and Niko Tinbergen. In trying to understand the development of emotions, many of these researchers focused on parental care and the role of the mother–infant dyad. Lorenz, for example, was famous for his work on imprinting and the mother–infant relationship in ducks and geese. While animal researchers debated the tie between infant and mother, so did psychologists and psychiatrists working on child development (Vicedo, 2009, in press).

In the mid-1950s, British psychiatrist and psychoanalyst John Bowlby was one of the most visible defenders of the view that human infants have an instinctual need for maternal care and love. In 1951 the World Health Organization published his report, *Maternal Care and Mental Health* (Bowlby, 1951). Here he presented his views on mother love as the consensus among a variety of child analysts, including child analysts David Levy, René Spitz, and Margarethe Ribble. Without mother love, children become emotional cripples, according to Levy, chief of staff of the New York Institute for Child Guidance, professor of psychiatry at Columbia University, and a respected psychoanalyst. He argued that a child has a basic need for affection, a “primary affect hunger,” that is basic for development (Levy, 1937, p. 644). René Spitz carried out research on children separated from their mothers in a prison for women and in a foundling home. He reported that debilitating conditions, “hospitalism” and

5. For a description of the care practices in the lab, see Blomquist and Harlow (1961).

“anaclitic depression,” which could even lead to death, affected children deprived of maternal care and love (Spitz, 1945, 1946a, 1946b, 1948, 1949).⁶ Margarethe A. Ribble arrived at similar conclusions. In her opinion, the “biological symbiosis” between mother and child was essential for the infant’s “nervous integration” (Ribble, 1941, p. 460; see also Ribble, 1943). Despite important differences among these authors, they all agreed that children needed their mother to develop into emotionally healthy adults.⁷

Harlow situated his early presentations of his work on “affectional responses in infant monkeys” within the context of that body of research, citing Lorenz’s work on imprinting as well as the work of child psychoanalysts (Harlow, 1958, p. 674; Harlow & Zimmermann, 1958, p. 501; 1959, p. 421). In 1957 Bowlby heard about Harlow’s experiments from animal researcher Robert Hinde. Bowlby immediately wrote to Harlow and enclosed a draft of his paper “The Nature of the Child’s Tie to His Mother” (Bowlby, 1958). Pointing out their convergent interests, Bowlby requested copies of Harlow’s papers and expressed his desire to visit him the following year, when he would be at the Center for Advanced Study in the Behavioral Sciences at Palo Alto, California. This letter prompted Harlow to include a reference to Bowlby’s work in his 1958 presidential address, at least in its published version. From this moment on, Harlow and Bowlby maintained close contact through visits and conferences (Van der Horst, LeRoy, & Van der Veer, 2008, p. 375).

As reported in his 1958 presidential address, Harlow aimed to test “the relative importance of the variables of contact comfort and nursing comfort” in the formation of an infant’s love for mother. In Harlow’s view, the most widespread account was a model that divided motives into primary and secondary drives. Primary drives were hunger, thirst, elimination, and sex. Secondary drives, like love, were derived from the primary ones. According to this model, the initial love responses of the human being are those of the infant to the mother. The mother is associated with the reduction of the primary drives, especially hunger, and that association leads to the infant’s attachment to mother. Harlow also reported reviewing psychoanalysts’ attempts to discover the nature of love in the infant by “using ill and aging human beings as subjects.” Harlow did not think much of psychoanalytic theories that ranged “from a belief that the infant has an innate need to achieve and suckle at the breast to beliefs not unlike commonly accepted psychological theories.” Indeed, in Freud’s model, the infant also attaches to mother because she provides food. From this relationship, children learn to expand their capacity for love to other individuals (Harlow, 1958, p. 674).

Harlow found contemporary theories that postulated infants’ love for mother grew out of their appreciation for the nourishment she provides unsatisfactory for two main reasons. First, they failed to account for the persistence of infant–maternal ties after the mother had performed her function as food provider. Second, those theories did not explain how love for mother could become the wellspring of love for other individuals. But as an exception to this model, Harlow noted briefly Bowlby’s view that infants possess an innate need for intimate physical contact with the mother (Harlow, 1958, p. 674).

Yet, he noted, “As far as I know there exists no direct experimental analysis of the relative importance of the stimulus variables determining the affectional or love responses in the neonatal and infant primate.” Harlow argued that the human neonate would not be a good experimental subject because by the time the infant develops motor responses that can be “precisely

6. On Spitz, see Gaskill (1976). For a selection of Spitz’s papers with commentaries, see Ende (1983).

7. A shorter version of the report became an international bestseller: John Bowlby, *Child Care and the Growth of Love* (1953). In 1965, Bowlby published a second edition that included some review chapters by Margaret Ainsworth (Bowlby, 1965). On Bowlby, see Bretherton (1992); Karen (1998).

measured,” the determining conditions have been lost “in a jumble and jungle of confounded variables.” The solution then: to use the infant macaque monkey (Harlow, 1958, p. 674).

Harlow’s experiment involved raising infant rhesus monkeys with dolls as “surrogate mothers.” These “surrogate mothers” differed in the “quality of the comfort” they could supply. One surrogate made of wood was covered with sponge rubber and sheathed in terry cloth. A light bulb behind her radiated heat. Harlow thought this surrogate was an ideal mother, “soft, warm, and tender, a mother with infinite patience, a mother available twenty-four hours a day, a mother that never scolded her infant and never struck or bit her baby in anger,” whereas real mothers often failed their children by breaking down emotionally and physically. In creating a substitute, Harlow claimed he had “engineered a very superior monkey mother,” a “mother-machine” with maximal maintenance efficiency, since failure of any system or function could be resolved by the simple substitution of black boxes and new component parts. The other surrogate mother was a similar “machine,” but it had a body of wire (Harlow, 1958, p. 676). Harlow placed the cloth mother and the wire mother in different cubicles attached to the infant’s living cage. For four newborn monkeys the cloth mother lactated, but the wire mother did not. For another four the condition was reversed.

The results? The monkeys took their milk from the mother with a bottle, but they spent almost the whole day clutching the cloth mother machine (Harlow, 1958, p. 676) (see Figure 1). Harlow concluded that the wire mother was “biologically adequate but psychologically inept.” In his humorous way, he summed up his interpretation:

The disparity is so great as to suggest that the primary function of nursing as an affectional variable is that of insuring frequent and intimate body contact of the infant with the mother. Certainly, man cannot live by milk alone. Love is an emotion that does not



FIGURE 1.
Baby rhesus monkey with surrogate mothers. Courtesy of Harlow Primate Lab,
University of Wisconsin-Madison.

need to be bottle- or spoon-fed, and we may be sure that there is nothing to be gained by giving lip service to love. (Harlow, 1958, p. 677)⁸

On the basis of this experimental work, Harlow drew larger conclusions about the role of the mother for her child's emotional development. He argued that mothers, "human or sub-human," provide two fundamental things for a baby: a haven of safety and a source of security. According to him, it was evident that the mother provides a haven of safety because in times of fear, the "frightened or ailing child clings to its mother, not its father; and this selective responsiveness in times of distress, disturbance, or danger may be used as a measure of the strength of affectional bonds" (Harlow, 1958, p. 678). Harlow, however, did not refer to observations or experiments that had assessed the different responses of infant monkeys to mothers and to fathers.

For the view that mother was also a source of security Harlow presented experimental evidence drawn from his so-called "open-field test" or "strange situation." Harlow put four of the original eight monkeys raised with dual surrogates into a strange environment, a room measuring six feet by six feet by six feet that contained objects known to elicit curiosity and manipulatory responses in baby monkeys. The infants were taken to the strange room twice a week for eight weeks, one time alone and the other time with the cloth surrogate mother. After a couple of adaptation sessions, the baby monkeys rushed to the cloth mother, clutched her, and rubbed their bodies against her. They used the mother surrogate as a base of operations, venturing away from her to explore and manipulate something in the strange room and returning to her comfort before venturing forth again. However, when the cloth mother was absent, the infants froze in a crouched position, rocking, sucking, and frantically clutching their bodies. The same behavior occurred in the presence of the wire mother. There was no difference between the infants fed by the cloth mother and those by the wire mother (Harlow, 1958, p. 679–680) (see Figures 2 and 3).

Next, to "measure love," Harlow devised the Love Machine, an apparatus similar to the Butler box used to demonstrate curiosity in monkeys. When the first four baby monkeys in the dual mother-surrogate group were between 40 and 50 days old, Harlow put them in a box with a little door they could open to see outside. Harlow presented them with four stimuli—cloth mother, wire mother, infant real monkey, and empty box—for a 30-minute period on



FIGURE 2.

Response to cloth mother in open-field test (Harlow, 1958, p. 680). Publisher: American Psychological Association. Reprinted with permission.

8. See also Harlow and Zimmerman (1958, 1959); Harlow (1959a, 1959b, 1960a, 1960b).



FIGURE 3.

Object exploration in presence of cloth mother. (Harlow, 1958, p. 680). Publisher: American Psychological Association. Reprinted with permission.

successive days. The monkeys showed a striking preference for looking at the cloth mother's face (Harlow, 1958, p. 681).

Finally, Harlow compared surrogate mothering with real mothering. He reported observing the behavior of two infants raised by their own mothers. In his opinion, love for the real mother and love for the surrogate mother was similar. In both cases there was "togetherness" (Harlow, 1958, p. 684).

Harlow also presented visual evidence: A 20-minute movie revealing the "unspeakable love" between infant and mother. Words and images: Harlow knew the power of both, and he further combined them in poems coupled with images of mother–infant pairs of different animal species (Harlow, 1958, pp. 677–678) (see Figure 4).⁹

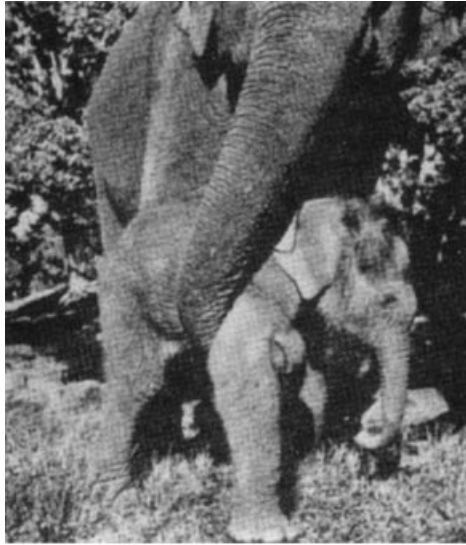
With the movie, the poetry, the jokes, and the explicit extrapolation from infant monkeys to human infants, Harlow's was no standard APA presidential address. It became an instant success within the scientific community and outside of it. His studies became widely known and he received acclaim from many colleagues. "It was absolutely superb: The substance, the wit and the delivery. More power to you," the eminent psychologist Edward Tolman wrote to him.¹⁰ And contrary to the fate of many academic talks, news of Harlow's experiments traveled far beyond the academic walls. His work was reported in *Newsweek*, the *New York Times*, *US News and World Report*, and in many regional and local newspapers. Even his poems were published in the *New York Times Sunday Magazine*. Over the years, the mother machine made it into science journals, art magazines, and comic strips (see Figure 5). Sometimes modified, often misrepresented, always simplified, Harlow's experiments with surrogate mothers fired the public imagination and reached iconic status in psychology and popular culture.¹¹

But what did Harlow's results about the infant rhesus monkey's need for contact comfort imply for contemporary theories of child development and views about child care?

9. Harlow included pictures of mother–infant pairs of rhinoceros, hippopotamus, snakes, elephants, and crocodiles. Each had its own poem.

10. Edward Tolman to H. Harlow, September 10, 1958, Harlow Papers.

11. Clippings in Harlow Papers. Three of Harlow's poems appeared in the *NYT*, Oct 19, 1958, pg. SM50.



The Elephant

Ylla

Though mother may be short on arms,
Her skin is full of warmth and charms.
And mother's touch on baby's skin
Endears the heart that beats within.

FIGURE 4.

The elephant (Harlow, 1958, p. 678). Publisher: American Psychological Association. Reprinted with permission.

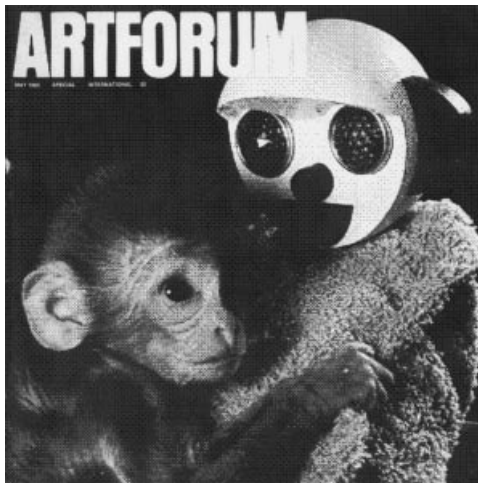


FIGURE 5.

Representation of Harlow's mother machine on the cover of Artforum (May 1983). Picture courtesy of Artforum. Reprinted with permission.

THE MACHINE (OR THE FATHER) IN THE NURSERY

In describing the relationship between infant and mother as “togetherness,” Harlow was appropriating a metaphor that sent a powerful message during the 1950s in American society. As historians have documented, amid widespread anxiety and insecurity in the increasingly tense climate of the Cold War, togetherness became the rallying call for a postwar order based

upon traditional gender roles. Having gone through a terrible economic depression, and having waged war only 30 years after the war that was supposed to have ended all wars, Americans were in need of some comfort. Not only had many lost dear ones and ideals. For millions of citizens the postwar world resembled Harlow's experimentally induced strange situation. Women had moved into the workforce to support the war effort and many seemed eager to stay there. Blacks were joining together to knock down the barriers separating them from the American Dream. Amidst the increasing domestic tensions and a terrifying escalation of international conflicts, Americans tried to hold on to the familiar sources of warmth, especially dear mom. American historians have shown how specific economic and social measures were used after World War II to shore up the patriarchal family: the man as provider and the woman as homemaker and mother. In addition, the rhetoric of family togetherness was used to encourage traditional parental roles (May, 1988; Cott, 2000; Plant, 2010; Mintz & Kellogg, 1989; Weiss, 2000).¹²

According to a number of scientists, the idea that the patriarchal family was the best arrangement for mother to provide the contact comfort her children needed was supported not only by traditional mores, but by contemporary research as well. Many scientists working on child development used the power of science to shore up the need for a stay-home mother. In the mid-fifties, for example, Bowlby and other psychoanalysts working on maternal deprivation became prominent voices against mothers of young children working outside the home. They argued for the functional role of the traditional nuclear family with its clearly delimited gender and parenting roles. Some child psychologists, including psychoanalysts Spitz, Ribble, and Bowlby, urged mothers to stay home and devote themselves to raising their children (Vicedo, forthcoming). And along came Harry Harlow with experimental proof that babies needed their mothers' embrace. Or did they?

Making a significant substitution in the conclusion to his APA 1958 address, Harlow ended up talking not about mothers, but about fathers:

The socioeconomic demands of the present and the threatened socioeconomic demands of the future have led the American woman to displace, or threaten to displace, the American man in science and industry. If this process continues, the problem of proper child-rearing practices faces us with startling clarity. It is cheering in view of this trend to realize that the American male is physically endowed with all the really essential equipment to compete with the American female on equal terms in one essential activity: the rearing of infants. (Harlow, 1958, p. 685)

Thus, Harlow argued that an artificial machine had proved that the father could be as good as the natural mother, in monkeys as well as humans.

An animated public debate ensued about the implications of Harlow's claims about mothers, machines, and fathers. The long article that covered his experiments in the *New York Times* put up front a disturbing thought: "A 'mother machine' raises the question of how necessary is mother love." Could a machine take over mother's place? Technological advancement was central to the new American postwar order, as Vice President Richard Nixon argued in his infamous 1959 "kitchen debate" with Soviet leader Nikita Khrushchev. Nixon claimed that the superiority of American democracy over other ways of life was marked by its technological advancements. So, if Harlow was right that a machine could provide the haven of safety needed by an infant, what would prevent the machine from moving from the garden into the nursery? Perhaps, like the infant rhesus monkey, all a child needed was a doll with big eyes to clutch to.

12. For the use of scientific work on the mother-infant dyad to support the patriarchal family, see Vicedo (forthcoming).

However, the author of the *New York Times* article, Marston Bates, zoology professor at the University of Michigan, explained that Harlow's apparatus was not really a mother machine, but a machine for postnatal care. As he explained it, postnatal care was a problem in the economy of nature for which nature had provided a solution for each different species. Nature had also made the decision for humans. Unless society got a "psychologist to fix a machine," human mothers were stuck with their offspring, asserted Bates with confidence (Bates, 1958, p. 44).

But even if an adequate machine for human infant care was still in the realm of technological fiction, Harlow had presented an alternative closer at hand: Dad. If, as Harlow claimed, contact comfort was all an infant needed, the message was clear. As a newspaper report put it: "Anyone can be a mother."¹³ And, if anyone could be a mother, so could the father. Furthermore, Harlow had made explicit the equivalence between the machine and the father. Thus, the introduction of the machine into the nursery not only constituted a technological threat to the natural benefits of mother love; it also threatened to disrupt parental roles assumed to be deeply rooted in nature.

In the press, the implications of Harlow's experiments became more and more threatening to the mother. According to a report in a Virginia newspaper, he had "concluded from experiments that fathers could rear infants, replacing mother love." In Detroit the news grew bleaker: "A University of Wisconsin psychologist has confirmed what most men suspected all along: That fathers make better mothers than the mothers do." The message: "Who is the Best Mom? It's Dad, Says Expert."¹⁴ Thus, not only could fathers mother, they could do it better than real moms. According to a report of an address Harlow gave at Florida State University, he claimed, "The American male is physically endowed with all the really essential equipment to compete with the American female on equal terms with the rearing of infants." Thus it was entirely possible that men would replace women at home.¹⁵

Some women greeted this possibility as a blessing. An editor who presented some of Harlow's results to her local cooperative nursery school wrote to him that the mothers were fascinated. They were "almost indecently delighted with your conclusion about fathers and child rearing." This reports editor also included a very special cover page designed by another woman who was impressed with Harlow's work. It was a picture of a woman with movie-star looks, dressed in electric blue leggings and a flashy pink tank top, reclined with a long cigarette holder and a small monkey perched on her neck. The caption read: "And After Motherhood,—What?" Clearly, these women saw the possibility of liberation, thanks to Harlow and the rhesus monkey (see Figure 6).¹⁶

To other women, the idea that fathers could do what mothers were doing was rather unsettling. The *modus vivendi* of the 1950s assumed that the roles of the male and female were different, by the laws of nature and for the functional well-being of society. In the context of the Cold War togetherness craze, with mothers busy in the suburbs, often bored and overworked but sustained by their confidence that their job at home was essential for their children's and society's well-being, Harlow's conclusion could not sit well. Many women were resentful. One of them brought her concerns to the top of the academic ladder. "Raising monkeys and raising children

13. Unidentified source. Clippings in Harlow papers.

14. *Detroit Free Press*, May 1, 1959, clipping in Harlow Papers.

15. Report of address in Folder: Reprint Correspondence, "The Nature of Love and Phil. Soc.," Harlow papers.

16. Polly Parker to Harry Harlow, May 22, 1958, Harlow Papers.



FIGURE 6.
Announcement in Harlow's Papers. Courtesy of Helen LeRoy.

have no comparison," wrote a mother of eight children to the president of the University of Wisconsin.¹⁷

This mother put her finger on a key issue: Could one extrapolate from the need of the infant rhesus monkey for contact to the human baby's need for love? In the *New York Times*, Bates had also argued that experiments with monkeys were not relevant for deciding how to raise human babies. In *The Springfield News Sun*, Maynard Kniskern accused Harlow of moving recklessly across too many boundaries. "‘Infant macaque monkeys . . . have the same feelings of affection as humans.’ This is a wildly unscientific statement," he claimed. He charged: "Dr. Harlow hasn't the faintest idea of whether infant macaque monkeys experience 'feelings of affection,' much less whether what they feel is in any manner akin to what human infants feel." In Kniskern's view, Harlow's experiment could reveal little or "nothing about human babies. It doesn't even tell us much about baby monkeys. We still don't know how infant monkeys 'feel'

17. Letter from Mrs. Albert Viall to the Office of the President, February 2, 1966, Copy in Harlow Papers.

about mothers: we simply know how a few of them react to an assortment of dolls fabricated by Dr. Harlow and his aides” (Kniskern, 1958, p.10a).

These criticisms focused on two crucial questions about Harlow’s work, as there were two levels of comparison involved, between feelings and between species. In observing the rhesus monkey’s need for comfort and contact, was Harlow grasping the infant monkey’s need for love? Do humans have the same affectional needs as rhesus monkeys?

Regarding the first question, clearly Harlow was after love and thought he was getting at it, although others found his optimism unjustified. Harlow believed that rhesus monkeys would lead him to a complete explanation of love. He confidently claimed: “Indeed, the strength and stability of the monkey’s affectional responses to a mother surrogate are such that it should be practical to determine the neurological and biochemical variables that underlie love” (Harlow & Zimmerman, 1959, p. 431). But some critics argued that the relation Harlow was measuring was simply the degree of proximity of the infant monkey to the cloth mother. Harlow retorted by saying that perhaps proximity was all that his critics knew of love, but he was grateful he had known more.

In Harlow’s experiments, what was that thing called love? Sometimes Harlow defined love as a complete sense of security, while other times he said love was crucial for the development of security. His experiments showed that the cloth mother provided some sense of security for the infant monkeys. The infant monkeys in the strange situation seemed relaxed when the cloth mother was present, whereas they were terrified in her absence. But the precise relationship between love and security remained unclear. A sense of security was much desired in American society during the Cold War. If keeping close to one’s mother could provide that, perhaps it did not matter whether that was the cause or the result of love. Harlow knew that nobody is interested in finding out the degree of proximity to a contact machine needed by a rhesus infant. Many more people are interested in security. And in love, who isn’t?

Still other critics insisted that Harlow might not even be observing the monkeys’ need for security, but only the creation of fetishism in monkeys. The psychoanalyst Erik Erikson, a great admirer of Harlow, confessed that he believed Harlow’s experiments had little to do with love:

Dr. Harlow, in a way which is admittedly humorous and analogistic, uses such phrases as mother-love in connection with experiments which in themselves, are most ingenious. Maybe I am a sentimental clinician who cannot accept the idea of calling a wire cage a mother. But I cannot help thinking that there is probably something scientifically wrong in this nomenclature. To my mind, all the functions of a mother animal in the life of a monkey are here taken care of by human beings . . . to me, these are experiments in creating fetishism in monkeys.¹⁸

Thus, the monkey surrogate mother was not an object of love, but a fetish that attracted monkeys and, others argued, even humans. In response to a laudatory review of Harlow’s presidential address in the *American Psychologist*, Solomon D. Kaplan, from the Lincoln State Hospital in Nebraska, argued that Harlow’s surrogate doll served as a fetish for humans. To study the nature of patriotism, Kaplan jokingly suggested using the Stars and Stripes to create a surrogate monkey flag with crossed bananas on a background of peanuts! (Kaplan, 1960, p. 219). Proximity, security, fetishism . . . was that love for rhesus infants? Even if that was the case, another question remained: What can rhesus love tell us about human love?

The second crucial question raised about Harlow’s work was whether his results about monkeys were in any way relevant to humans. In his earlier work, Harlow showed that monkeys are curious, as we are, and they learn to think, as we do. But do they love like we love?

18. Erikson made this comment in a discussion of Harlow’s work published in Harlow, 1960a, p. 344.

Harlow often joked about extrapolating from monkeys to humans. In his zesty way, he quipped that monkeys are not little people with tails, and “men are not monkeys most of the time” (Harlow, 1964a, p. 100; see also Harlow & McKinney, 1971, p. 372). He believed one should be careful in making the comparisons, but he had no doubt that one could extrapolate:

It is my conviction that one cannot directly generalize from monkeys to man, but I believe there are many parallels in the psychosocial development of monkeys and the psychosocial development of human beings. I believe that our data on rearing of infant monkeys under controlled and varied social conditions illuminate much human data on both normal and disturbed children. (Harlow, 1964a, p. 107)

Harlow even presented a numerical conversion table: “To find a rough developmental equivalent for human babies, one multiplies the monkey’s age by 4 or 5” (Harlow, 1964b, p. 154). In many presentations of his findings, he claimed the existence of the same basic affectional systems in all Anthropodia: monkeys, apes, and humans.

It is also important to note that the agencies supporting Harlow’s research were interested in the human implications of his studies, as it became clear when public controversy erupted over the wisdom of providing federal support for his work. The debate ranged from West to East, from the humor pages of newspapers to prestigious scientific journals like *Science*, from the U.S. House of Representatives to the U.S. Senate. The first shot came in 1962 from Senator Harry Byrd. The press turned it into a national affair, as the *Arizona Election News* alerted the public that \$50,000,000 of their hard-earned tax dollars had been used to “pay for studies to find out if baby monkeys love their mothers.” The alleged amounts varied in different newspapers, as did the assessments of Harlow’s research. In one cartoon the issue was put forward in graphic clarity. A monkey is represented asking another monkey nursing an infant about the national debt. The caption underneath read: “The new Frontier plans to spend \$1,201,925.22 to study the affection of the monkey’s offspring.”¹⁹

The interesting point for us here is that all who wrote in Harlow’s defense did so because of the relevance of his experiments to humans. In response to an editorial of the *Daily News* that criticized Harlow’s work as trivial, a group of scientists from the University of Illinois rose to vindicate it. Outraged as much at the arrogance of outsiders who assumed they could assess the significance of scientific research as at the specific criticisms of Harlow, they pointed out that “his findings are so relevant to the comprehension of human psychopathology that one of us has incorporated them into the neurophysiology lectures to our medical students.” A psychiatrist wrote that he regarded Harlow’s work as “an exceedingly valuable area of investigation for giving clues and leads which may be of direct benefit to human beings.”²⁰

When elected officials had to debate whether the country should spend public funds to find out if infant monkeys loved their mothers, Harlow’s defendants followed the same strategy. In response to Massachusetts representative Edward P. Boland’s inquiry about a grant from the National Institute of Mental Health given to support research on affection in monkeys, Wisconsin Republican representative Melvin H. Laird rose to defend Harlow. He noted that Harlow’s work had been lampooned as a study of monkey business, but the issues were serious: “This caricature is all in good fun until it is taken seriously and used as a weapon to attack appropriations for medical research.” His defense of Harlow rested on a detailed presentation of his scientific credentials and on drawing out, one by one, the important implications of Harlow’s results for human problems. In a statement prepared to respond to public criticisms, the National Institute of Mental Health also noted that they did not support Harlow because they were “especially interested in the

19. *Chicago Sunday Tribune*, February 4, 1962, Harlow Papers.

20. Letters to *Chicago Daily News*, February 7, 1962, Harlow Papers.

study of monkey behavior itself,” but because they were interested “in the implications which these studies may have for a deeper understanding of human behavior.”²¹

In sum, there is no question about what Harlow and those who supported his work—from colleagues to funding agencies to many among the general public—were after. For them, the monkey was an instrument to understand the human, and proximity was just a means to love.

But contemporary commentators disagreed about what Harlow’s team found out regarding love or proximity in rhesus infants and about the implications of those results for humans. The experimental work with monkeys did not tell a uniform and monolithic story. The only uncontroversial result at this time was that infant monkeys needed contact with something soft to survive. For Harlow and many others, it seemed pretty reasonable to assume that human infants would also need some kind of comfort-contact. As in monkeys, perhaps a machine for maternal care could provide that contact or, as Harlow had argued, father could substitute for mother. However, scientists did not speak with a single voice about this issue. Most importantly, in trying to figure out the implications of Harlow’s experiments for human infants and for child care, society was not a passive receiver of scientific knowledge. The implications of Harlow’s results for child rearing were a matter of contested debate. The translation of the significance of Harlow’s results with infant monkeys to human infants was open to a variety of interpretations. Therein lay the results’ widespread and controversial appeal.

Baby monkeys and baby humans have at least one thing in common: They grow up. While scientists, politicians, and mothers were arguing about the needs of rhesus monkeys, the infants became young adults, but they did not behave as such.

THE MACHINE PRODUCES MONSTERS: BRING BACK NATURAL MOTHER LOVE

When the monkeys “mothered” by the machine surrogates grew up, they became very troubled individuals. When males and females were paired upon reaching maturity, they showed little interest in each other (Harlow, 1961, p. 84). It turned out that the twenty-four-hour-welcoming-mother-machine was not so good for raising infants to become “normal” adults. In a sense, she was too good. She never pushed the infant away from her warm contact. So what originally appeared to be a virtue turned out to be a vice. The mechanical mother was “soft” and always welcoming. But too much mother love—or proximity to mother—was as bad as or worse than too little of it.

Harlow identified two stages in good mothering. In the first, the mother provides contact, comfort, and security. The mother machine had passed this test with flying colors. In the second stage the mother gradually relaxes the bonds between her and the infant. She does this by pushing the infant out into the world, to peers and play. According to Harlow, the patterns of childhood play are gradually overridden by the aggressive and sexual patterns. Play is an essential precursor to other social interactions. Without it, these subsequent patterns of adolescent and adult behavior will not develop normally (Harlow, 1961; see also Harlow & Harlow, 1961).

Harlow tested this hypothesis by creating a “social-mother situation” in which each of a pair of monkeys was raised with its own cloth mother surrogate while it was also free to make contact with another baby monkey partner. The data reported were “favorable to our theory that prolonged fixation to the mother surrogate adversely affects the subsequent capability of forming adequate infant-infant social contacts” (Harlow, 1961, p. 85). Deprived of play, monkeys remained infantile. They all became physiologically sound, healthy adults, but they would just sit, staring into space, apparently uninterested in other monkeys or mates, or incapable of

21. *Congressional Record-House*, March 27, 1962, p. 3.



FIGURE 7.

Rhesus monkeys in incorrect mating posture. Courtesy of Harlow Primate Lab, University of Wisconsin-Madison.

relating to them. When females were paired with experienced males, the males tried to copulate but could not, since the females simply sat down. The males who were raised by mechanical mothers were equally ineffective sexually (see Figure 7). Could there be any clearer sign of maladjustment than lack of interest in heterosexual sex or inability to perform what is commonly viewed as a natural, instinctual activity for which individuals need no training? Actually, for a female, the answer is “yes”: lack of interest in her own infants. Harlow got some females who had been raised by the mother machines pregnant through artificial insemination. When they gave birth, these “motherless mothers” had no interest in their babies. In fact, they abused them. If the caretakers had not taken their babies away, most mothers would have killed them (see Figure 8). Thus, the mother machine, source of constant and unconditional contact comfort, produced monsters—sexually incompetent males and infanticidal females.

The press reported the awful results: “Monkey Mothers Upheld in Tests. Imitation Parents Found to Foster ‘Hopeless and Helpless’ Neurotics.” Like in a medical trial, the value of the mother machine could only be assessed in the long run. According to the *New York Times*, the results were now in, “in favor of real mothers.” Several newspaper articles explained how “strange things” had happened since the first presentation of the mother machine. “The Troubled Monkeys of Madison” made evident that mother love could not be dispensed with so easily. The machine was no substitute for the real mother.²² Nobody said what that implied for fathers. But it seemed that mother—the real one of flesh and blood—was here to stay.

No one greeted the news with more joy than the psychoanalysts working on maternal deprivation. Finally, “hard” science, experimental studies, had confirmed their theories about the essential role of maternal care. In Harlow’s work, the absence of the rhesus infants’

22. Emma Harrison, “Monkey Mothers Upheld in Tests.” *New York Times* (1961, September 4), pg. 17, Leonard Engel, “The Troubled Monkeys of Madison.” *New York Times* (1961, January 29), p. 62, 64. Emma Harison, “Mother Trouble Affects Monkeys.” *New York Times* (1962, May 10) pg. 75.



FIGURE 8.

Abusive mother. Courtesy of Harlow Primate Lab, University of Wisconsin-Madison.

mothers in childhood seemed to be the cause of their immaturity and emotional disturbances in adulthood. That was exactly what David Levy, René Spitz, Margaret Ribble, John Bowlby, and many other psychologists and psychiatrists with a psychoanalytic orientation had been arguing for about two decades before Harlow's publications.

Both Spitz and Bowlby greeted Harlow's results as confirmation of their belief that maternal care and love were necessary for an infant's well-being. Spitz heard Harlow present his work at an American Association for the Advancement of Science symposium on the *Expression of Emotions in Animals and Men* and spoke with him briefly afterward. In 1961, after seeing a report of Harlow's latest results in the *New York Times*, he wrote: "I am not sure you are aware of my work on emotionally deprived infants. If you are, you probably realize that your work comes as extraordinary welcome confirmation of everything which I have found in the human infant, when placed in similar circumstances." Harlow answered that Spitz's work had actually encouraged him to study the effect of early inadequate affectional patterns on subsequent behaviors. And in carrying out this research, he was struck by the "basic similarity of our monkey 'syndromes' and the syndromes described by you for affectionally deprived human infants." From then on, Spitz and Harlow kept in close contact personally and professionally.²³

Bowlby, who also kept in touch with Harlow since their initial correspondence in 1958, now used Harlow's results to support his view that the infant had an instinctual or innate need for maternal care. In a 1962 WHO report reviewing Bowlby's views about the devastating effects of maternal deprivation, his collaborator Mary Ainsworth noted that Harlow's experiments supported Bowlby's ideas, especially Harlow's finding "that monkeys which had been separated from their mothers at birth and reared either in the absence of any mother-surrogate or with only an

23. R. Spitz to Harlow, February 13, 1961. Harlow to Spitz, February 20, 1961. Harlow to Spitz, July 20, 1961. Harlow to Spitz, January 22, 1963. All in Harlow Papers.

inanimate cloth mother-surrogate failed, at maturity, to show normal sexual behaviour” and displayed “an abnormal absence of maternal behavior” (Ainsworth, 1962, p. 128).²⁴

Harlow was aware that psychologists and psychoanalysts blamed a variety of conditions on the disruption of the mother–infant dyad. He knew those claims well: “Personality malfunctions that have been attributed to maternal inadequacy include such syndromes as marasmus, hospitalism, infantile autism, feeble-mindedness, inadequate maternal responsiveness, and deviant or depressed heterosexuality.” Furthermore, Harlow often claimed that his work on monkeys spoke directly to those problems (Harlow & Harlow, 1962, p. 213).

When Harlow initiated studies of separation of infants from real mothers, he and his team compared their new results to the ideas of scientists working on humans. After reviewing Bowlby’s views, they hypothesized that similar processes may underlie the development of maternal–infant ties in human and monkeys:

If the mechanisms producing Bowlby’s separation syndrome are as biologically basic as the activation of “basic instinctual responses,” a similar syndrome should be produced in infant monkeys following maternal separation. There is great similarity in the variables which Bowlby (1958) has described in his Component Instinctual Response theory and the variables producing the infant monkey’s tie to its mother. (Seay, Hansen, & Harlow, 1962, p. 123)

Harlow declared that the scientific findings of his group’s continuing experimental work on mother–infant separation were “generally in accord with Bowlby’s theory of primary separation anxiety as an explanatory principle for the basic primate separation mechanisms.” The initial reactions of all mothers and all infants after separation indicated a high degree of emotional disturbance. The infants were devastated, showing signs similar to the first two phases described by Bowlby in humans: protest and despair. The third phase of detachment described by Bowlby or the signs of aggression against the mother did not appear in infant rhesus. Overall, however, Harlow’s team gave the imprimatur to Bowlby’s findings: “The results of this investigation appear to be in general accord with expectations based upon the human separation syndrome described by Bowlby” (Seay, Hansen, & Harlow, 1962, pp. 131, 130).

For Bowlby, Ainsworth, Spitz, and many others, Harlow’s results offered confirmation of the view that maternal deprivation had a determinant and insurmountable effect on infant development. These child analysts welcomed Harlow’s work as experimental proof of their conclusions about children as well as an indication of the instinctual nature of love for mother. Bowlby, for example, always pointed out how his theory was based on biological knowledge and cited Harlow’s work as providing experimental proof of his theories.

Harlow’s monkeys, however, soon proved to be more resilient than expected. As he proceeded with his experiments, Harlow separated himself from “the general accord” forged by writers on maternal deprivation.

THE POWER OF PEERS

Bowlby, Spitz, and other child analysts studied infants in hospitals and orphanages. These children had all been deprived of much more than their mothers. A serious criticism of their work was that one cannot establish the impact of the presence or absence of maternal care by studying children in war zones and hospitals. Many of those children also suffered from diseases, cognitive deprivation, and separation from all their loved ones, family, and friends. Many of them were also living in strange environments, under conditions very

²⁴ The 1962 report cites Harlow (1958, 1960, 1961).

different from their homes. So separation from their mothers was just one factor among many that could have damaged their emotional lives, as critics such as psychologists Samuel R. Pinneau and Lawrence Casler, among others, pointed out (Pinneau, 1955; Casler, 1961). How, then, could it be established that separation from mother was the most important factor or even a key precipitating factor in their disturbances?

Likewise, Harlow's infant monkeys had also been deprived of more than mother's arms. The adult males and females who did not perform sexually and the mothers who did not provide maternal care had had no mother love. But they had also been isolated from peers and grown up in an impoverished social environment. Harlow knew that their bizarre behavior could result from several types of deprivation: "We cannot be sure, of course whether their failure to show normal maternal behavior stems from their motherless (or inadequately mothered) infancy, from their lack of association during the first years of life with other infants and young monkeys, or from both factors" (Harlow & Harlow, 1961, p. 55).

What is needed for an infant's well-being—the contact of mother, peers, or both? In order to ascertain the impact of separation from different individuals, Harlow's team carried out experiments to compare the development of infant monkeys raised with a mother but not friends, and infants raised without a mother but with friends. The experiments led Harlow to a startling conclusion:

In the monkey, at least, it would thus appear that under favorable circumstances, real mothers can be bypassed but early peer experiences cannot. Thus, when playmates were denied, the infant monkeys were socially crippled, and when this variable was provided early, the infants survived both passive and brutal mothering and even no mothering at all. (Harlow, 1962a, p. 10)

Harlow did not deny that it was better for the monkeys to be raised with their mothers as well. But he believed that mothers were not absolutely necessary, and they were certainly not sufficient.

Harlow's next step was to see why those four monkey mothers, "which had had no real monkey mother of their own and also no opportunity to interact during childhood with other monkeys," became "hopeless, helpless, heartless mothers." So he established an experimental set-up to compare how young monkeys interacted with real mothers and surrogates both in the absence and in the presence of peers. Harlow observed that real mothers facilitated the interaction of their infants with peers. Thus, he concluded that an important function of the mother was to provide a bridging mechanism to the world of friends: "Real mothering is not a necessary condition for normal monkey social development although it may facilitate infant-infant interactions" (Harlow, 1963, pp. 592–593).

Harlow did not deny the significance of the mother, but he rejected the view that mother, and mother alone, could guarantee adult adjustment:

No one will question that real, normal monkey motherhood is an important variable in imparting normality to rhesus monkeys as revealed in social adjustment in infancy, adolescence, and adulthood. Furthermore, real monkey motherhood is doubtless a variable of far more importance in the wild than in the protected situation of an experimental laboratory. Nor would anyone seriously question that normal human mothering is an important variable in the social development of the child. Even so, these researches attest to the enormous importance of affectional relations between infants and preadolescent peers. In the monkey, at least, it would thus appear that under favorable circumstances, real mothers can be bypassed. (Harlow & Seay, 1964, p. 110)

Perhaps wary of changing his position on such a delicate issue, he added that "at the present time, we tentatively conclude that adequate peer experience can compensate for lack

of real mothering, and we hypothesize that real mothering cannot compensate for lack of peer association” (Harlow, 1964b, p. 168).

In sum, it is better to have both mother and friends; but if one had to select one or the other, peers seemed better able to compensate for the lack of mother than the other way around. Harlow concluded: “The data from the isolation experiments and from the various experiments providing differing experiences with mothers or peers lead us to conclude that peer experience during early development is the *sine qua non* for adequate adolescent and adult monkey behavior. In spite of no mothering, surrogate mothering, or indifferent or brutal mothering, monkeys given regular opportunity to associate with peers from early in life develop behavior similar to or indistinguishable from that of monkeys provided the luxury of both normal mothering and normal peer experience” (Harlow, 1964b, pp. 172–173; see also Seay, Alexander, & Harlow, 1964).

Harlow agreed with child analysts that early social deprivation had profound consequences for later behavior. In fact, in further experiments subjecting infant monkeys to various degrees of social isolation, he showed that deprivation produced bizarre social behavior. Monkeys raised in isolation or subjected to it for a long time were deprived of various cognitive and emotional interactions that affected their development in profound ways. Extreme isolation was so disturbing for infant monkeys that they were later unable to engage in any form of social relation (Suomi & Harlow, 1971; McKinney, Suomi, & Harlow, 1971).

But on the central question raised by child psychologists and psychoanalysts regarding the role of mother in the emotional development of the infant, Harlow concluded from his experiments in the mid-1960s that the infant monkey could make do with peer love. As he put it: “[T]he combination of mother and peers is the most advantageous for personality development. . . . But, and this is most important, monkeys deprived of real mothers nevertheless develop normal personalities if they are provided with peers for regular interaction” (Harlow, 1964a, p. 107). This did not mean that mothers were irrelevant. But it did mean that those unlucky ones who grow up without one could survive with other types of love.

Harlow was not shy in broadcasting his revised conclusions about the role of mothers and peers in rhesus infant development. As soon as his first experiments in this area were carried out, the results made it to the *New York Times*. According to an article entitled “Child Adjustment Linked to Friends,” Harlow declared that a mother’s role might be secondary—or even dispensable—in her child’s social adjustment.²⁵ In the next couple of years, he became increasingly bold in pointing out that his results contradicted common psychoanalytical explanations: “Our present conclusion is that in spite of completely inadequate, even brutal, mothering, the infants developed normal affectional behavior toward peers and normal heterosexual behaviors” (Harlow, 1964b, p. 171).

The idea that mother love was not the essential ingredient for an individual’s normal emotional and social development contradicted standard explanations provided by human researchers such as Bowlby and Ainsworth. As Harlow noted: “This finding contrasts with current psychiatric and psychoanalytic theory stressing the importance of the mother’s role and minimizing the part played by interactions among peers in the development of the normal adult personality” (Harlow, 1963, p. 594).

From Freud’s day to the present time, the preoccupation of psychiatry, psychology, and anthropology with early mother–child relationships had had a pervasive and unfortunate

25. “Child Adjustment Linked to Friends,” *New York Times*, October 15, 1962, p. 45.

influence on research and theory, argued Harlow. The psychoanalytic overemphasis on parent-child relationships had even led Anna Freud to an erroneous interpretation of her findings during World War II. In a study of orphaned children, Anna Freud had found that these children formed a strong bond with each other, which helped them to cope with difficult situations. According to her, this was possible because those children did not have an early mother or father image in their unconscious minds. Harlow saw things differently: “[Anna Freud] attributes the success of child-child bonds to the absence of earlier parent-child bonds whereas I would emphasize the importance of child-child bonds per se regardless of presence or absence of parent-child bonds” (Harlow, 1964a, pp. 105–106).

After his experiments with infants raised with peers, Harlow elaborated a conception of infant development that included a richer emotional universe as well as a more complex conception of love. Over the years, Harlow came to the conclusion that love is manifold. He and his wife Margaret K. Harlow developed the idea of multiple affectional systems, first speaking about the infant-mother affectional system and gradually adding four more: (1) infant for the mother, (2) between infants or juveniles, (3) heterosexual, (4) mother-infant, and (5) father-infant. They argued that love developed not from a single system but from many systems, each one of them building on the other, adding to or compensating for the previous one. In their view, just as age-mate affection partially compensates for inadequate mothering, so maternal affection partially compensates for inadequate peer socialization. Thus, it was inappropriate to pit the importance of one affectional system against another. The existence of diverse systems that can compensate for each other provides an enormous social safeguard, since both mothers and age-mates may be deficient or unavailable (Harlow, 1964b).

The existence of several “affectional systems” made sense from an evolutionary perspective, explained Harlow. If love were necessary for survival, it would seem too risky to rely on one affectional system. In primates, socialization is essential to survival, and the hazards of socialization are many. Harlow argued that the biological utility of compensatory social mechanisms was obvious. That effective social safeguards should have developed over the course of evolution was in no way surprising. To prevent the disastrous consequences implied by a failure of one system, evolution had instituted other compensatory systems. These were not surrogate mothers, but surrogates for love: “From an evolutionary point of view there is gain in having two independent affectional systems that can each in part compensate for deficiencies in the other” (Harlow & Harlow, 1969, p. 36; see also Harlow & Harlow, 1965; Harlow, 1966). Life is too precious to bet everything on one love.

THE MORAL OF THE STORY: SURPRISE!

All animal fables end with a moral. To draw a moral about the innate need for maternal love and care, psychologists such as Bowlby, Ainsworth, and Spitz focused on Harlow’s early results. Ignoring Harlow’s later findings, they continued to highlight the essential role of maternal love in early infancy, almost to an exclusive extent when compared to other relationships. Bowlby, for example, never cited Harlow’s research on the role of peers. As late as 1980, Bowlby discussed the importance of Harlow’s findings as follows: “Furthermore, confidence that we are on the right track has been enormously enhanced by experimental studies of rhesus monkeys. Harlow (Harlow et. al., 1966), for example, found that females which had been deprived of mothering during their own infancy grow up to be mothers which not only neglect their infants but violently reject them.” Bowlby noted that although his ideas about the crucial importance of maternal love were still controversial, they were “much less so today than earlier, thanks in large part to the related studies of rhesus monkeys undertaken by Harry

Harlow in the U.S. and Robert Hinde over here (Hinde 1974)” (Bowlby, 1980, pp. 650, 652, 655; 1977, pp. 201–210).²⁶

Given Bowlby’s need for biological evidence to support his ethological theory of attachment behavior, he continued to use Harlow’s early work even after Harlow had elaborated more complex views about affectional systems. It is beyond the scope of this paper to explain the reasons why Bowlby engaged in what Michael Lewis and Stephen Suomi have referred to as selective referencing (Lewis & Suomi, in press). Bowlby’s attachment theory rested on three legs: maternal deprivation studies, Lorenz’s views about the instinctual nature of the mother–child dyad, and Harlow’s experimental work. But, as I have argued elsewhere, psychologists showed the methodological and epistemological flaws in maternal deprivation studies in human infants, and comparative psychologists like Daniel Lehrman and T. C. Schneirla subjected Lorenz’s views on instincts to devastating criticisms. In this context, for Bowlby, Harlow’s work was key to maintaining the experimental support for attachment theory. Thus, Bowlby and Ainsworth kept emphasizing the significance of the instinctual relationship between infant and mother. For them, as for many textbook accounts and historical accounts, Harlow’s work with monkeys revealed the power of biology and the deterministic role of infancy.²⁷

But all good stories end with a surprise. So I have kept the most intriguing results for the end. The infamous rhesus motherless mothers in Harlow’s lab still had one last wondrous surprise in their experimental lives. After being cruel, brutal, and even lethal to their first newborn, most became regular moms when they gave birth to their second and third infants. This, Harlow recognized, was “a finding predicted by no member of the Primate Laboratory staff” (Harlow et al., 1966, p. 61). Could there be anything more surprising than a murderous mother? Perhaps a brutal first-time mother who becomes a loving mother to her second infant. Yet this fact is practically never reported in accounts of Harlow’s experiments. It is a different ending, and it changes the moral of the story.

Contrary to Bowlby and Ainsworth, I do not see this as a story about the deterministic power of biology. Harlow’s experiments did not support the idea of instinctual behaviors as programmed actions that could not be modified by the environment, because lack of social interactions resulted in a breakdown of the two behaviors most commonly taken as natural, sex and maternal care. As shown by the motherless mothers who turned into adequate mothers, Harlow’s experiments also did not support the view that early experiences determine adult performance, because socially crippled monkeys were able to become “functioning” members of primate society. Over time, Harlow himself rejected the necessity of mother love in the development of rhesus infants, while emphasizing the important role of peers and social stimulation.

Moving now from Harlow’s results and their scientific interpretation to the role of those experiments within American culture, I also do not see this as a story about the determinism of experimental science over the bodies of rhesus monkeys. Contrary to Haraway’s reading, the monkeys did not always comply with Harlow’s modeling of social issues in the laboratory.

26. Bowlby (1977, p. 202) cites Harlow (1958) and child studies, but not the critical ones: “Simultaneously and independently, Harlow (1958) published the results of his first studies of infant rhesus monkeys reared on dummy-mothers. A young monkey, he found, will cling to a dummy that does not feed it provided the dummy is soft and comfortable to cling to.” Also Bowlby (1988, p. 23): “For the next decade a stream of experimental results from those two scientists (see summaries in Harlow and Harlow [1965] and Hinde and Spencer-Booth, 1971), coming on top of the Ainsworth review, undermined the opposition.” For historical literature supporting the view that Harlow’s experiments corroborated Bowlby’s views on the significance of maternal love, see footnote 1.

27. For example, Degler (1991, p. 222) argues that Harlow’s work “constituted an important step in the rehabilitation of the concept of instinct.” He sees this work as a major blow against the behavioristic emphasis on the role of experience and training in behavior.

Furthermore, although Haraway focuses on “the boundary of translation and traffic between the laboratory and other areas of 1950–1975, U.S. middle class, white culture,” she only examines the traffic from society to laboratory, not from the laboratory to society. Thus, she concludes that the “primate body is a discursive construct and therefore a literal reality, not the other way around” (pp. 408, 241). In this vision, the monkeys are passively constructed through laboratory practices that translate social mores. Yet my analysis shows that monkeys did not always comply with expectations. And society did not bring to the lab a monolithic discourse, as numerous members of the wider society, from journalists to politicians to mothers to women’s clubs, became active members in discussing the validity of Harlow’s extrapolations from rhesus infants to human infants and vice versa. The experiments were variously interpreted sometimes as supporting the natural role of women as mothers, other times as destabilizing established gender roles in parenting.

CONCLUSION

I have followed Harlow’s experimental work on the role of mother love and the development of affectional systems, his changing interpretations of the results, and its reception in the wider society from the late 1950s to the late 1960s. My examination does not support what I have called Harlow’s legend, the account that sees Harlow’s work as providing experimental confirmation for Bowlby’s views about the instinctual need for mother love. At first Harlow supported Bowlby’s view about the key role of mother in infant development, but later he departed from this position in order to emphasize the role of peers. This legend not only misrepresents Harlow’s views about the diversity of affectional systems and the power of peers; it also erases the indeterminacy and complexity inherent in the development of science in a given historical context.

Looking at Harlow’s experiments over time shows how experimenters, experiments, and rhesus monkeys all influenced each other in a process that underscores the open-ended character of science, biology, development, and love. By describing the twists and turns in Harlow’s experiments over many years rather than focusing on one particular experiment or paper, we can appreciate the complexity of experimental results as well as the active role of experimental subjects, scientists, and various social actors in interpreting and appropriating those results in diverse ways. When his experimental subjects refused to behave according to the standard theories of the day, Harlow changed his interpretation of primate emotions. The socio-historical setting did not determine a specific interpretation of the significance of his experiments for humans. Harlow’s extrapolations from rhesus to humans proved rather controversial, and different audiences drew different implications. The monkeys also revealed their own plasticity and resiliency, belying expectations about the determinant power of biology and early childhood experiences.

In the legend and its vision of the order of nature there is no place for contingency and no space for monstrous infanticidal mothers who later turned into loving caretakers. Mothers who turn into monsters fall outside the natural order; they simply become unnatural, no longer part of the natural realm. As unfeeling entities they become closer to the machine and, in some small way, this re-establishes a comforting order, for it allows us to separate the natural from the unnatural, the feeling from the unfeeling, the subject from the object. But monsters that turn into mothers are transgressing the boundary in an even more problematic direction, from the outside to the inside, from the unfeeling to the feeling. They thus reveal the real monstrosity of nature: its permeability and its flexibility. The lack of determinism is the real monstrosity of nature, the real monster for science and for our hopes of controlling behavior and emotions.

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REFERENCES

- Ainsworth, M. D. (1962). The effects of maternal deprivation: A review of findings and controversy in the context of research strategy. In World Health Organization, *Deprivation of maternal care: A reassessment of its effects* (pp. 97–165). Geneva: WHO.
- Allport, S. (1997). *A natural history of parenting*. New York: Three Rivers Press.
- Bates, M. (1958, October 19). Life with mother (animal world). *New York Times*, SM44, 44–50.
- Blomquist, A. J., & Harlow, H. F. (1961). The infant rhesus monkey program at the University of Wisconsin Primate Laboratory. *Proceedings of the Animal Care Panel*, 11, 57–64.
- Blum, D. (2002). *Love at Goon Park: Harry Harlow and the science of affection*. Cambridge, MA: Perseus.
- Bowlby, J. (1951). Maternal care and mental health. *Bulletin of the World Health Organization*, 3, 355–534.
- Bowlby, J. (1953). *Child care and growth of love*. Based on J. Bowlby, *Maternal, care and mental health*. Abridged and edited by M. Fry. Harmondsworth, Middlesex, UK: Pelican.
- Bowlby, J. (1958). The nature of the child's tie to his mother. *International Journal of Psychoanalysis*, 39, 350–373.
- Bowlby, J. (1965). *Child care and the growth of love*, enl. ed. Baltimore, MD: Penguin.
- Bowlby, J. (1977). The making and breaking of affectional bonds. *British Journal of Psychiatry*, 130, 201–210.
- Bowlby, J. (1980). By ethology out of psycho-analysis: An experiment in interbreeding. *Animal Behavior*, 28, 649–656.
- Bowlby, J. (1988). *A secure base: Clinical applications of attachment theory*. London: Routledge.
- Bretherton, I. (1992). The origins of attachment theory: John Bowlby and Mary Ainsworth. *Developmental Psychology*, 28, 759–775.
- Casler, L. (1961). Maternal deprivation: A critical review of the literature. *Society for Research in Child Development*, 26, 1–63.
- Cott, N. F. (2000). *Public vows: A history of marriage and the nation*. Cambridge, MA: Harvard University Press.
- Degler, C. (1991). *In search of human nature*. New York: Oxford University Press.
- Eibl-Eibesfeldt, I. (1972). *Love and hate: The natural history of behavior patterns*. New York: Holt, Rinehart & Winton.
- Ende, R. N. (Ed.). (1983). *René A. Spitz: Dialogues from infancy: Selected papers*. New York: International Universities Press.
- Gaskill, H. S. (1976). In memoriam: René A. Spitz 1887–1974. In R. S. Eissler, A. Freud, M. Kris, & A. J. Solmit (Eds.), *The psychoanalytic study of the child*, Vol. 31 (pp. 1–3). New Haven, CT: Yale University Press.
- Haraway, D. (1989). *Primate visions: Gender, race, and nature in the world of modern science*. New York: Routledge.
- Harlow, H. F. (1949). The formation of learning sets. *Psychological Review*, 56, 51–65.
- Harlow, H. F. (1953). Mice, monkeys, men, and motives. *Psychological Review*, 60, 23–32.
- Harlow, H. F. (1954). Motivational forces underlying learning. In University of Kentucky, Dept. of Psychology, *Learning theory, personality theory, and clinical research: The Kentucky symposium* (pp. 36–53). New York: Wiley.
- Harlow, H. F. (1955). The brain and learned behavior. *Computers and Automation*, 4, 6–14.
- Harlow, H. F. (1958). The nature of love. *American Psychologist*, 13, 673–685.
- Harlow, H. F. (1959a). Basic social capacity of primates. *Human Biology*, 31, 40–53.
- Harlow, H. F. (1959b). Love in infant monkeys. *Scientific American*, 200, 68–74.
- Harlow, H. F. (1960a). Affectional behavior in the infant monkey. In M. A. B. Brazier (Ed.), *Central nervous system and behavior* (pp. 307–357). New York: Josiah Macy Jr. Foundation.
- Harlow, H. F. (1960b). Of love in infants. *Studies of monkeys show how affection for mothers is formed*. *Natural History*, 69, 18–23.
- Harlow, H. F. (1960c). Primary affectional patterns in primates. *American Journal of Orthopsychiatry*, 30, 676–684.
- Harlow, H. F. (1961). The development of affectional patterns in infant monkeys. In B. M. Foss (Ed.), *Determinants of infant behavior* (pp. 75–97). London: Methuen.
- Harlow, H. F. (1962a). Affectional systems of monkeys, involving relations between mothers and young. *International Symposium on Comparative Medicine Proceedings* (pp. 6–10). New York: Eaton Laboratories.
- Harlow, H. F. (1962b). The heterosexual affectional system in monkeys. *American Psychologist*, 17, 1–9.
- Harlow, H. F. (1963). Motivation in monkeys—and men. In F. L. Ruch (Ed.), *Psychology and life*, 6th ed. (pp. 589–594). Chicago: Scott, Foresman.

- Harlow, H. F. (1964a). A behavioral approach to psychoanalytic theory. *Science and Psychoanalysis*, 7, 93–113.
- Harlow, H. F. (1964b). Early social deprivation and later behavior in the monkey. In A. Abrams, H. H. Garner, & J. E. P. Toman (Eds.), *Unfinished tasks in the behavioral sciences* (pp. 154–173). Baltimore, MD: Williams & Wilkins.
- Harlow, H. F. (1966). The primate socialization motives. *Transactions and Studies of the College of Physicians of Philadelphia*, Ser. 4, 33, 224–237.
- Harlow, H. F. (1977). Birth of the surrogate mother. In W. R. Klemm (Ed.), *Discovery processes in modern biology* (pp. 134–150). Huntington, NY: Robert E. Krieger.
- Harlow, H. F., & Harlow, M. K. (1949). Learning to think. *Scientific American*, 181, 36–39.
- Harlow, H. F., & Harlow, M. K. (1961). A study of animal affection. *Natural History*, 70, 48–55.
- Harlow, H. F., & Harlow, M. K. (1962). The effects of rearing conditions on behavior. *Bulletin of the Menninger Clinic*, 26, 213–224.
- Harlow, H. F., & Harlow, M. K. (1965). The affectional systems. *Behavior of Nonhuman Primates*, 2, 287–334.
- Harlow, H. F., & Harlow, M. K. (1969). Effects of various mother-infant relationships on Rhesus monkey behaviors. In *Tavistock Seminar on Mother-Infant Interaction, Determinants of Infant Behavior IV, Proceedings* (pp. 15–36). London: Methuen.
- Harlow, H. F., Harlow, M. K., Dodsworth, R. O., & Arling, G. L. (1966). Maternal behavior of rhesus monkeys deprived of mothering and peer association in infancy. *Proceedings of the Philosophical Society*, 110, 58–66.
- Harlow, H. F., & McKinney, W. T., Jr. (1971). Nonhuman primates and psychoses. *Journal of Autism Child & Childhood*, 1, 368–375.
- Harlow, H., & Meyer, D. R. (1949). The development of transfer of response to patterning by monkeys. *Journal of Comparative Physiological Psychology*, 42, 454–462.
- Harlow, H. F., & Seay, B. (1964). Affectional systems in rhesus monkeys. *Journal of the Arkansas Medical Society*, 61, 107–110.
- Harlow, H. F., & Stagner, R. (1932a). Psychology of feelings and emotions: I. Theory of feelings. *Psychological Review*, 39: 570–589.
- Harlow, H. F., & Stagner, R. (1932b). Psychology of feelings and emotions: II. Theory of emotions. *Psychological Review*, 40: 184–195 and 368–380.
- Harlow, H. F., & Zimmermann, R. R. (1958). The development of affectional responses in infant monkeys. *Proceedings of the American Philosophical Society*, 102, 501–509.
- Harlow, H. F., & Zimmermann, R. R. (1959). Affectional responses in the infant monkey. *Science*, 130, 421–432.
- Harlow, M. K., & Harlow, H. F. (1966). Affection in primates. *Discovery*, 27, 11–17.
- Hrdy, S. B. (2000). *Mother nature: Maternal instincts and the shaping of the species*. London: Vintage.
- Kaplan, S. D. (1960). Monkey tricks and voodoo psychology. *American Psychologist*, 15, 219–220.
- Karen, R. (1998). *Becoming attached: First relationships and how they shape our capacity to love*. New York and Oxford: Oxford University Press.
- Kniskern, M. (1958, September 7). “Love” in baby monkeys. *Springfield News Sun*, 10 a.
- LeRoy, H. A. (2008). Harry Harlow: From the other side of the desk. *Integrative Psychological and Behavioral Science*, 42, 348–353.
- LeRoy, H. A., & Kimble, G. A. (2003). Harry Frederick Harlow: And one thing led to another. In G. A. Kimble & M. Wertheimer (Eds.), *Portraits of pioneers in psychology*, Vol. 5 (pp. 279–297). Washington, DC: American Psychological Association.
- Levy, D. M. (1937). Primary affect hunger. *American Journal of Psychiatry*, 94, 643–652.
- Lewis, M., & Suomi, S. J. (in press). A case in selective referencing: Monkey infant and mother relationships and their effect on subsequent development.
- Lickliter, R. (2008). Theories of attachment: The long and winding road to an integrative developmental science. *Integrative Psychological and Behavioral Science*, 42, 397–405.
- May, E. T. (1988). *Homeward bound: American families in the Cold War era*. New York: Basic.
- McKinney, W. T., Suomi, S., & Harlow, H. (1971). Studies in depression. *Psychology Today*, 4, 61–63.
- Mintz, S., & Kellog, S. (1989). *Domestic revolutions. A social history of American family life*. New York: Free Press.
- Montagu, A. (Ed.). (1975). *The practice of love*. Englewood Cliffs, NJ: Prentice-Hall.
- Morgan, E. (1994). *The descent of the child: Human evolution from a new perspective*. London: Penguin.
- Pinneau, S. R. (1955). The infantile disorders of hospitalism and anaclitic depression. *Psychological Bulletin*, 52, 429–452.
- Plant, R. J. (2010). *Mom: The transformation of motherhood in modern America*. Chicago: University of Chicago Press.
- Ribble, M. A. (1941). Disorganizing factors of infant personality. *American Journal of Psychiatry*, 98, 459–463.
- Ribble, M. (1943). *The rights of infants: Early psychological needs and their satisfaction*. New York: Columbia University Press.
- Seay, B., Alexander, B. K., & Harlow, H. F. (1964). Maternal behavior of socially deprived rhesus monkeys. *Journal of Abnormal and Social Psychology*, 69, 345–354.
- Seay, B., Hansen, E., & Harlow, H. F. (1962). Mother–infant separation in monkeys. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, 3, 123–132.
- Sidowski, J., & Lindsley, D. B. (1989). Harry Frederick Harlow. *National Academy of Sciences Biographical Memoirs*, 58, 219–257.

- Spitz, R. A. (1945). Hospitalism: An inquiry into the genesis of psychiatric conditions in early childhood. *The Psychoanalytic Study of the Child*, 1, 53–74.
- Spitz, R. A. (1946a). Hospitalism: A follow-up report. *The Psychoanalytic Study of the Child*, 2, 113–117.
- Spitz, R. A. (1946b). Anaclitic depression: An inquiry into the genesis of psychiatric conditions in early childhood, II. *The Psychoanalytic Study of the Child*, 2, 313–342.
- Spitz, R. A. (1948). The importance of mother-child relationship during the first year of life. *Mental Health Today*, 7, 7–13.
- Spitz, R. A. (1949). The role of ecological factors in emotional development in infancy. *Child Development*, 20, 145–155.
- Suomi, S., & Harlow, H. F. (1971). Abnormal social behavior in young monkeys. In J. Hellmuth (Ed.), *Exceptional infant: Studies in abnormalities*, Vol. 2 (pp. 483–529). New York: Brunner Mazel.
- Suomi, S., & LeRoy, H. A. (1982). In memoriam. Harry F. Harlow (1905–81). *American Journal of Primatology*, 2, 319–342.
- Suomi, S., Van der Horst, F. C.P., & Van der Veer, R. (2008). Rigorous experiments on monkey love: An account of Harry Harlow's role in the history of attachment theory. *Integrative Psychological and Behavioral Science*, 42, 354–369.
- Van der Horst, F.C.P., & Van der Veer, R. (2008). Loneliness in infancy: Harry Harlow, John Bowlby and issues of separation. *Integrative Psychological and Behavioral Science*, 42, 325–335.
- Van der Horst, F.C.P., LeRoy, H., & Van der Veer, R. (2008). "When strangers meet": John Bowlby and Harry Harlow on attachment behavior. *Integrative Psychological and Behavioral Science*, 42, 370–388.
- Vicedo, M. (2009). The father of ethology and the foster mother of ducks: Konrad Lorenz as an expert on motherhood. *ISIS*, 100, 263–293.
- Vicedo, M. (in press). The social nature of the mother's tie to her child: John Bowlby's theory of attachment in post-war America. *British Journal for the History of Science*.
- Weiss, J. (2000). *To have and to hold: Marriage, the baby boom and social change*. Chicago: The University of Chicago Press.
- Winston, A. (1996). "As his name indicates": R. S. Woodworth's letters of reference and employment for Jewish psychologists in the 1930s. *Journal of the History of the Behavioral Sciences*, 32, 30–43.