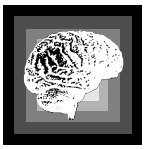

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The evolution of Harry Harlow: from the nature to the nurture of love

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Abstract
Harlow deserves a place in the early history of evolutionary psychiatry but not, as he is commonly presented, because of his belief in the instinctual nature of the mother-infant dyad. Harlow's work on the significance of peer relationships led him to appreciate the evolutionary significance of separate affectional systems. Over time, Harlow distanced himself from the ideas of John Bowlby and Mary Ainsworth as well as from Konrad Lorenz's views about imprinting and instincts. Harlow's work did not lend support to Bowlby's belief in an innate need for mother love and his thesis that the mother was the child's psychic organizer. Nor did Harlow agree with Lorenz's view of instincts as biological, unmodifiable innate needs, unaffected by learning.

Keywords
Harry Harlow, instincts, John Bowlby, maternal deprivation, mother love, origin of love, peer relations in rhesus monkeys

In 1975 Harry Harlow became the first psychologist to receive the Kittay International Scientific Foundation Award, the world's largest prize in psychiatry. The award was established in 1970 to honour investigators in the area of mental health whose work represented a major contribution with practical clinical applications. Harlow obtained this recognition for his experimental work on 'primate mother-child attachment'.

In the late 1950s, Harlow raised infant rhesus monkeys with dolls as surrogate mothers. One surrogate was covered in cloth; the other was made of bare wire, but provided milk. Contrary to the psychoanalytic belief that the infants would become attached to those mothers who provided them with nourishment, the infant monkeys spent most of their time embracing the cloth mother. Harlow's work attracted the interest of the psychiatric community for its relevance to understanding the normal development of emotions in humans and their pathological deviations. As most psychology textbooks present it now, Harlow's work provided the experimental confirmation of psychiatrist John Bowlby's and ethologist Konrad Lorenz's views about the instinctual nature of the infant-mother dyad.[1]

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In this paper, I explore Harlow's role in placing our views on the development of emotions within an evolutionary framework. I show that Harlow's views evolved over time, and diverged from Bowlby's and Lorenz's. For a while, Harlow believed that his experiments supported Bowlby's views about the infant's innate need to attach to mother. In the 1960s, contrary to Bowlby and other psychoanalysts who continued to focus exclusively on the attachment of the infant to the mother and on the pathological consequences of disrupting that bond, Harlow and his collaborators explored the influence of other relations on the emotional life of the rhesus monkeys during different life stages, from infancy to adulthood. On the basis of his experimental findings and the discussions of those results with a variety of audiences including psychoanalysts, psychologists and ethologists, Harlow refined his views. Eventually, he rejected the focus on the infant's instinctual need for attachment to mother, the notion of rigid and determinant critical periods in early infancy, and the conception of affective needs as ready-born instincts independent of learning.

I conclude that Harlow deserves a place in the history of evolutionary psychiatry because of his contribution to the understanding of the diversity of affectional systems and their evolutionary significance, and not only for showing the role of the infant's attachment to the mother in mental health.[2]

The origin of love: rhesus monkeys, machines and mothers

In the post-World War II period, three major scientific communities focused on explaining behaviour and on separating the normal from the pathological in the development of conduct and emotions: comparative psychology, psychoanalysis, and ethology. As the editor of the major journal in comparative psychology, Harlow was aware of the controversy between comparative psychologists and ethologists about the role of biological instincts in human behaviour. On 5 January 1957, he accepted comparative psychologist Frank Beach's invitation to participate in a seminar on 'Ethology and Psychology' during the summer of that year at the Center for Advanced Study in the Behavioral Sciences in Stanford, California. This key meeting of major ethologists and comparative psychologists sought to create a rapprochement between the two communities. Harlow wrote that he would present his 'Babyhood and Motherhood project'. In the correspondence, Harlow did not specify what his project was, but he was probably referring to his new research raising infant rhesus monkeys with surrogate dolls. Later, Harlow reported finding the meeting extremely helpful and believed it made clear how much comparative psychologists and ethologists were influencing each other.[3]

The following year, when Harlow presented his work on affectional systems in rhesus monkeys to a wide audience, he put it forward as a contribution to the nature-nurture debate concerning emotions. For most psychologists and for psychoanalysts, children learned to love their mothers because they associated them with reduction of the primary biological drives, particularly hunger and thirst. But, citing a personal communication, Harlow noted that British psychoanalyst and psychiatrist John Bowlby also emphasized contact and sucking as innate affectional components (Harlow and Zimmermann, 1958: 501). Indeed, in the same year Bowlby would publish his now classic paper 'The nature of the child's tie to his mother' in which he proposed his theory of component instinctual responses (Bowlby, 1958). Here, he posited species-specific instinctual responses that tied the child to the mother independently of nutritional rewards. So, did infants have an innate need for mother love, or did they learn to love their mothers because their mothers provided them with food? Given the obvious ethical objections to searching for an answer by experimenting with human neonates, Harlow presented the rhesus monkey as the ideal subject for examining the origins of our capacity to love.

Figure 1. Infant rhesus monkey with cloth and wire mother surrogates (Harlow, 1959: 76) (Courtesy of Harlow Primate Laboratory, University of Wisconsin-Madison)

Harlow compared the relative importance of nursing versus contact comfort in the infant's attachment to the mother. To avoid the confounding factor of the mother's behaviour towards the infant, he built two artificial 'dolls', inanimate mothers to act as surrogates for the baby monkeys. One was made of wood, but covered with soft rubber and wrapped in terry cloth, and had a light behind her that radiated heat. As Harlow (1958a: 676) put it, the lab designed a superior 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'. The other surrogate was made with wire-mesh and had a different face, but Harlow argued that the mothers differed in 'no essential way' other than in 'the quality of the contact comfort' which they supplied (Harlow, 1958a: 676).

These surrogate mothers were placed in different cubicles attached to the infant's living cage. In the first experiments in this project, Harlow used eight newborn monkeys. First, four of them were placed with the two surrogates, and the cloth mother was fitted with a bottle that provided milk. In the next trial, the conditions for the other four babies were reversed: the milk bottle hung from the wire surrogate (Figure 1). But the milk seemed to make little difference. The monkeys spent most of their time with the soft mother, regardless of which mother provided milk.

Next, Harlow tested the strength of the infants' attachment to their surrogate mothers in two experimental set-ups: the fear test and the open field test. In the first, he analysed the infant monkeys' response under emotional stress by placing them in a strange situation. In the open field test, Harlow put an infant in a room with objects that experimenters knew would elicit its curiosity. The baby monkeys reared with cloth mothers used the surrogate mother as 'a source of security, a base of operations' (1958a: 679). That is, they clung to her initially, but slowly moved to play with an object, then came back for a bit more contact comfort before venturing forth again in their explorations. In contrast, monkeys reared with a wire mother crouched at her feet, terrified of the objects, never moving away to explore on their own (Harlow, 1958a: 680). According to Harlow (1959: 72), their conduct resembled 'the autistic behavior seen frequently among neglected children in and out of institutions'.

For Harlow, these results proved that the cloth and wire mothers were 'physiologically equivalent but not psychologically equivalent' (Harlow, 1958a: 676). The infant monkeys preferred to stay with the cloth mother, who seemed to provide them with comfort and a sense of security. These results went 'against the idea that affection is a learned response associated with nursing' (Harlow, 1958a). Bodily contact provided the comfort that tied the infant monkey to its mother.

But, contrary to many current interpretations, Harlow did not take these results to imply that baby rhesus monkeys needed their mothers. For him, they needed comfort, and he had shown that even an inanimate machine could provide that. When Harlow translated his results with rhesus monkeys to the human realm, he argued that there could be substitutes for the mother, including the father (Harlow, 1958a: 685).[4]

Harlow's work with baby rhesus monkeys took place during a time of high interest in the implications of animal research for understanding the biological basis of human behaviour and, more specifically, the mother-child relationship. Lorenz's work on imprinting had become almost household lore. He had shown that some birds, such as ducks and geese, follow the first object they see upon hatching. However, if the object is not a member of their own species, the birds will not develop the standard behaviour of their species. For example, if a duckling imprinted on Lorenz, the duck would try to copulate with a human later on. Bowlby used these studies and his own survey of observational work in orphanages and hospitals showing that maternal care and love were essential for a child's emotional development (Bowlby, 1951, 1953), and in 1958 – as already mentioned – had published his theory of component instinctual responses (later called the ethological theory of attachment behaviour). He proposed that the mother-infant dyad had a biological basis, and that the child's tie to its mother is the result of an instinctual need, in the ethological sense of the term, that is, a species-specific behaviour that is the result of evolution by natural selection. Therefore, Bowlby argued, babies separated from their mothers or deprived of maternal love would suffer serious emotional consequences. In analogy with Lorenz's ducks, they would not develop the appropriate social behaviours in adulthood (Bowlby, 1958). Therefore, in Bowlby's view, a mother of young children should not work. During the heated post-war discussions in Britain and the USA about the social consequences of women joining the work force, views about the mother-child dyad became highly visible and important (Vicedo, 2009a, 2009b).

This scientific and social context helps us to understand why psychiatrists quickly called upon Harlow to draw out the implications of his experimental work for understanding human behaviour and emotions. Harlow was invited to several meetings with psychoanalysts and psychiatrists working on child development, and his work appeared in many psychiatry journals. In March 1959 Eugene L. Bliss, from the central office of the American Psychiatric Association, wrote to Harlow regarding a two-day symposium that the APA was organizing at the annual meeting of the American Association for the Advancement of Science in December. Bliss invited Harlow and other researchers working on animal behaviour to make psychologists and psychiatrists aware of the 'growing importance of this information to the understanding of human behavior'. The sections would cover 'the genetics of behavior, the critical period (imprinting) and the effects of variations in early experience on later behavior, instinctual behavior, and studies of free-ranging non-human primate behavior'.[5] As this invitation made explicit, contributions to animal behaviour in this period needed to position themselves in reference to the work of ethologists.

Regarding Lorenz's work, Harlow agreed with the importance of critical periods in development, but he did not think that imprinting operated in primates; in other words, there could be periods in infancy after which an infant could not develop certain behaviours. However, this was different from accepting that infants had to develop an attachment to their mother in order to develop those behaviours. Harlow did not think that imprinting played a significant role in the relation of the infant rhesus monkey to its mother. In his 1958 paper he stated:

> The role of visual and auditory following (imprinting) has been stressed by Lorenz and other ethologists as primary innate mechanisms binding the infant bird and fish to the mother. Even if similar mechanisms exist in the primate, they appear at a later developmental stage and play less important roles than they do in lower animals. (Harlow & Zimmermann, 1958: 501)

Harlow tried different variations in raising infant monkeys in the hope of clarifying the role of those mechanisms. In another set of experiments, he compared four infants reared with substitute mothers (control group) with four infants reared for 8 months with no mothers at all. Later, when given a surrogate mother, the motherless monkeys spent less time with her than those reared with surrogate mothers, and were less reassured in the open field test. Harlow concluded: 'The deprivation of physical contact during their first eight months had plainly affected the capacity of these infants to develop the full and normal pattern of affection' (Harlow, 1959: 74). He believed that these results confirmed the psychoanalytic and ethological belief in critical periods in development (Harlow, 1959: 73).

For Harlow, affection, or comfort, was necessary in infancy. But at this stage in his work, Harlow did not think monkeys needed a real flesh-and-blood mother for their emotional development. He saw the surrogate cloth mother, a mechanical gadget, as an 'eminently satisfactory mother' (Harlow, 1959: 70). Then the monkeys grew up, and Harlow's views evolved.

Peers and others: the therapeutic power of love

When the monkeys raised with surrogate mothers grew up, they became strange adolescents: They showed no interest in the opposite sex. When placed in a room with other monkeys, they sat alone, staring into space and did not interact with others. As Harlow (1961: 84) put it, they were 'undisturbed by recreational or procreational thoughts or activities'. Even when paired with normal and sexually experienced monkeys, they were unable to adopt adequate postures for copulation. Furthermore, when some females were impregnated by artificial means, they became punitive mothers. They rejected, abused and killed their infants. The surrogate artificial mothers did not turn its charges into sociable individuals. So perhaps the real mothers were not dispensable after all, as Harlow had first suggested.

At this point, Harlow's results seemed to provide experimental confirmation for the views of Bowlby, Rene Spitz and Mary Ainsworth, who argued that maternal care and love were essential for the psychological and emotional development of an infant (Ainsworth, 1962; Bowlby, 1953, 1958; Spitz, 1945, 1946). Attaching to the wrong object, and more specifically to a mechanical and heartless surrogate mother, had led to a breakdown of what we consider an animal's most natural behaviours: sex and maternal care. Ironically, in trying to replace mother, Harlow had proved her tremendous power over an infant's psyche. This fitted well with Bowlby's thesis that mother was the 'psychic organizer' (Bowlby, 1953: 182). It also seemed to fit in well with Lorenz's views on imprinting, since a bird that did not imprint on a real mother was unable to develop its species-specific instincts, including the attraction to and the ability to copulate with members of its own species.

As with his earlier work, Harlow's results were widely discussed in conferences and the press, and one response was to see them as fitting within the imprinting framework that Lorenz had popularized in the USA. For example, after a report of Harlow's latest results in the magazine *Newsweek* (Anon., 1961), one reader, James H. Middlekauff, wrote to Harlow 'surprised that nowhere in the article was the fact mentioned that perhaps the monkeys' odd behavior could be attributed to imprinting'. Harlow replied: 'I have just returned from a conference that was set up by the Menninger Clinic with one primary purpose, to bring Dr. Lorenz, who is a visiting professor there

this semester, and me together. Dr. Lorenz had previously visited my Laboratory but I was out of town at the time.'[6] Harlow was referring to a workshop on 'Approaches to Instinctive Behavior' that took place during January 1961 at the Topeka Institute for Psychoanalysis, Kansas. Anthropologist Margaret Mead and psychoanalysts Mortimer Ostow, Frederick Hacker, Karl Menninger and Gardner Murphy were also participants.

Although Harlow highlighted some common points with Lorenz, he indicated some key differences as well. First, Harlow noted that it was 'entirely possible that it is merely a terminological matter whether one wants to describe the kind of phenomena that we have demonstrated for our monkeys as imprinting or not'. Despite writing that he shared some common interests with Lorenz, Harlow repeated his view that the process of imprinting was not an adequate mechanism to account for emotional development in primates: 'However, formation of appropriate behavior patterns relating to the various affectional systems is not bound by such sharply circumscribed temporal periods as is the case of the birds and the fishes – the phenomenon to which Lorenz gave the name imprinting.' In Harlow's view, imprinting was 'probably not the mechanism in the monkey. Imprinting is not operating, obviously, in the infant-mother separation patterns, either for the monkey or for the bird.'[7] For Harlow even if imprinting was responsible for an infant's attachment to the mother in some species, it was not sufficient to explain an infant's ability to forge relationships with others. If an infant remained attached to mother, as his infant monkeys remained attached to their surrogate mothers, it would be unable to engage in social relations with other infants and other adults later on. Thus, it was necessary to explain also how an infant separated from the mother.

The solution to this problem led Harlow to diverge from Lorenz and Bowlby. Harlow began to place greater emphasis on the need to explain not only how an infant attaches to its mother, but also how the infant then moves away from its mother to interact with and develop emotions for other individuals. After all, a baby cannot retain an infantile form of attachment to its mother for the rest of its life: 'An infant monkey cannot form adequate affectional patterns for other monkey infants unless it can break the contact bond which has been established between it and the mother.' (Harlow, 1960a: 676). For him, Bowlby's and Lorenz's accounts could not explain how love for the mother eventually led to love for other individuals. An infant attaches to its mother. But how does love for the mother make love for others possible? How exactly does an infant generalize, transform or divert his love for mother to other members of the species? A mechanism that explains why and how an infant attaches to his mother does not automatically explains how later a young adult loves another conspecific.

This theoretical conundrum, combined with his experimental evidence showing that monkeys raised with mothers alone did not develop appropriate social responses, led Harlow to hypothesize the existence of other affectional systems which were not simply an extension of the infant's love for its mother. He presented the set of affectional patterns that he would explore in his work with other collaborators from then on:

1. Affectional pattern of infant for mother
2. Affectional pattern of child for child (peer for peer)
3. Heterosexual affectional pattern
4. Maternal affectional pattern (mother for infant)
5. Paternal affectional pattern (father for infant)

Extrapolating from his experiments with rhesus monkeys to primates in general, Harlow claimed that there were several affectional systems in primates, with stages of development determined by different variables (Harlow, 1960a: 676). During the sixties, Harlow started to explore these

different systems and their interrelation, in collaboration with some graduate students and with his wife, psychologist Margaret K. Harlow.

From the outset, Harlow was aware that monkeys raised with machine mothers were deprived of more than flesh and blood mothers. The infants who turned into socially incompetent adolescents had been raised in separate cages. Thus, they were also deprived of fathers, siblings, friends and all other members of a family and social group. Harlow's lab started a series of experiments to test the relative roles of mothers and peers in the socialization of infant monkeys. The lab built the 'play-pen situation', an experimental setup in which the infants were reared on a cloth mother surrogate, but could also move to a different space to play with another infant reared in the same way.

The data from this 'social-mother situation' supported Harlow's hypothesis 'that prolonged fixation to the mother surrogate adversely affects the subsequent capability of forming adequate infant-infant social contacts' (Harlow, 1961: 85). Harlow proposed that feral rhesus mothers guided their infants through two stages. In the first stage, they provide comfort and security. In the second, they literally push their infants away so that they go to interact with other monkeys. In this second stage, Harlow's work showed that peer play constituted an essential ingredient in the socialization of the infant. Progressively, patterns of play are overridden by aggressive patterns and by sexual patterns. Therefore, Harlow (1961: 84) concluded: 'Although love may be enough, love of mother alone is not'.

However, the relative importance of the role of mothers and peers in emotional development remained unclear. For example, in regard to the females who abused their infants, Harlow and Harlow (1961: 55) noted: '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.' In order to clarify this question, Harlow deprived monkeys of their mothers and raised them only with peers. The young monkeys clung to each other, in what the lab nicknamed a 'choo-choo' pattern (Figure 2). Although the monkeys exhibited bizarre behaviours, the presence of peers allowed them to develop standard social responses eventually.

After comparing monkeys raised with real or surrogate mothers who also had access to playing with peers, and monkeys raised without peers for playmates, Harlow (1963: 593) concluded that mothers were not necessary for socialization, but merely facilitated the interaction of their infants with other infants. He wrote that:

Figure 2. Choo-choo monkeys (Courtesy of Harlow Primate Laboratory, University of Wisconsin-Madison)

> 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, 1962: 10)

Harlow immediately saw that these results contradicted the view that mother was necessary and sufficient as the psychic organizer: '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: 594). He did not argue that mothers could be dispensed with, as he had done in his 1958a paper. He viewed the combination of mother and peers as the most advantageous because monkeys raised by their mothers have an 'earlier start in widened socialization, and their early interactions are more mature than those of motherless infants' (Harlow, 1964: 107). But contrary to many researchers who saw the absence of mother as having a determinant pathological effect, Harlow claimed that deprivation of mother could be overcome if monkeys were 'provided with peers for regular interaction' (1964: 107). He thus concluded that the psychologists' and psychiatrists' exclusive focus on attachment to mother was inadequate.

On the basis of these results, Harlow thought that it was necessary to revise the hitherto almost single-minded focus upon maternal care and upon the supposedly pathological consequences of its absence. As he had noted earlier, the conditions identified as pathologies and attributed to lack of mothering or bad mothering comprised a lengthy list: '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' (Harlow & Harlow, 1962: 213). But Harlow now believed that his work implied the need for a major revision of the psychoanalysts' emphasis upon the mother as the source of either healthy or pathological social relationships. He identified Freud as the major proponent of a developmental theory of personality that postulated biologically determined stages (critical periods). He believed that Sigmund Freud's focus on the parent-child relationship had been 'a major contribution'. But the fixation on early relations and the 'preoccupation with early mother-child relationships in particular has had a pervading and unfortunate influence on research and theory in psychiatry, psychology, and anthropology from his day to the present time' (Harlow, 1964: 105). For Harlow, Anna Freud's work illustrated the 'psychoanalytic overemphasis on parent-child relationships' (Harlow, 1964: 106). In her studies of children orphaned or displaced during World War II, she recognized the 'rehabilitating power of prolonged child-child relationships' after unfortunate parent-child experiences. However, in Harlow's view, she overemphasized the devastating effects of losing one's parents, rather than focusing on the positive effect of child relationships. Harlow could also have picked Spitz or Bowlby as examples of psychoanalysts who only focused on mother, but perhaps his friendship with them prevented him from making this criticism explicit.

Friendships are very powerful. Harlow showed this to be true of rhesus monkeys. Over the years, Harlow and his collaborators provided dramatic experimental evidence of the influential role of interaction with others in socialization, and even of the therapeutic power of social relations. Three sets of experiments are of special relevance in this regard. The first set involved the 'choo-choo' monkeys, those groups of infants raised together who managed to become competent adults. Second, experiments with the punitive mothers produced another unexpected result illustrative of the power of social relations. To the surprise of all the researchers in the lab, these initially incompetent mothers became adequate mothers with their second infants. Harlow and Harlow (1966: 16) explained this rehabilitation on the basis of the effects of the short period of interaction

with their first infants. Third, it is worth mentioning briefly Harlow's experiments with young monkeys as 'therapists'. He found that when monkeys showing a variety of disturbances caused by deprivation were put in a room with younger monkeys, often the young ones were able to approach and interact with the disturbed monkeys. This had a therapeutic effect that allowed many of the adult monkeys to recover, at least partially, from the effects of deprivation (Harlow and McKinney, 1971; Suomi, Harlow, and McKinney, 1972).

In humans, too, Harlow thought scientists should focus on the significance of peers for the normal development of an individual. Harlow (1964: 112) made this point explicit: 'It is my belief that some human data based on normal and disturbed individuals take on new meaning in the light of these affectional systems we have studied in monkeys.' Since he now saw interaction with peers as essential for normal development, it followed that deprivation of peers would be a source of pathology. He thus urged therapists to pay more attention to this affectional system, for 'in the peer affectional system as I conceive it, I believe lie the origins of many emotional problems that come to the analyst's couch' (Harlow, 1964: 113). At the end of a decade experimenting with monkeys subjected to different types of social deprivation, the Harlows presented an overview of the different pathological effects of depriving infant rhesus monkeys of different affections (Harlow & Harlow, 1969).

Moreover, the Harlows saw that the existence of affectional systems that could compensate for each other made sense from an evolutionary perspective, because reciprocal compensations provided a better chance of surviving socially. In discussing the maternal affection and the peer system, they noted: 'The fact that either may compensate in whole or in part for deficiencies in the other provides an enormous social safeguard, since mothers may be deficient or age-mates unavailable in the critical early period of social development' (Harlow and Harlow, 1969: 36). Thus, given the social nature of primate life, a diversity of affectional systems would be the safest evolutionary bet. As Harlow and Harlow (1969: 36) put it:

> In primates – monkeys, apes, and men – socialization is essential to survival, and the hazards of normal socialization are multiple and diverse. The biological utility of compensatory social mechanisms is obvious, and that effective social safeguards should have developed over the course of evolutionary development is in no way surprising.

Perhaps this conclusion was not surprising from an evolutionary viewpoint, but Harlow's position was a radical departure from contemporary views, and one that is not fully appreciated even in the current literature. In this evolutionary picture, there is no sole source of love. Contrary to the psychoanalytic and ethological account of the origins of love, in Harlow's scheme there was 'not one affectional system undergoing sequential changes and additions, but at least five different affectional systems coming into operation sequentially' (Harlow, 1964: 108). For him, this solved the conundrum as to how an infant's love for its mother generalized to love for others. There was simply no conundrum because there was no single point of origin for love. In sum, Harlow's views about love developed to become markedly different from the psychoanalytic position and also from the view of attachment theorists that love for the mother is the single original source for an individual's capacity to love.

Thus, Harlow's approach and conclusions now departed radically from those of child researchers such as Spitz, Bowlby and Ainsworth. Whereas Bowlby (1951, 1953, 1958, 1977) and Ainsworth (1962) focused on the role of mothers, Harlow had gone on to analyse the effects of other relationships in the development of the social abilities of young monkeys. He also tracked the infant monkeys through later stages of their lives, thus providing the first longitudinal studies of the effects of

early deprivation. Whereas Bowlby and Ainsworth kept emphasizing the pathological effects of maternal separation and deprivation of sensitive maternal care, Harlow defended the view that social interaction with peers might go a long way towards vitiating the effects of deprivation in the realm of mothering, even to the point of negating those deleterious effects.

Evolution had designed rhesus monkeys – and, by Harlow's account, humans too – in such a way that they could survive with different loves. But how much force did biology actually wield? For Lorenz and Bowlby, the baby was pre-programmed by evolution to attach to its mother. For Harlow, on the other hand, nature and nurture interacted in a complex manner.

The instinctual nature of love?

Historians such as Carl Degler have argued that Harlow's work 'constituted an important step in the rehabilitation of the concept of instinct' in American psychology (Degler, 1991: 222). If one looks at Harlow's views on the nature-nurture question over the years, however, the picture becomes more complex. As a result of his interactions with psychoanalysts and ethologists, he realized that the psychoanalysts were using the concept to refer to something different from that understood by the psychologists and ethologists, and even the latter had different views about the nature and functions of instincts. Over time, Harlow was sometimes ambiguous about his positions in this area, but he never defended the view that behaviour could be explained by appealing primarily to biological instincts.

After the 1961 meeting with Lorenz and other scholars at the Menninger Clinic, Harlow wrote to Philip S. Holzman, who had helped to organize the conference, thanking him for the invitation. He expressed his appreciation for the opportunity to meet Lorenz and discuss the similarities and differences between their research programmes: 'I was somewhat surprised to find the very deep parallelism that seemed to operate in many of the behavior patterns.' It was at this conference that Harlow made the discovery that psychoanalysts attributed a specific meaning to the word 'instinct': 'I also came out with a much better (considering how little I knew, that may not be much) idea of how psychoanalysts thought and worked, and there is no question that instinctive behaviour means something very differently for them than it does for the biologists.'[8] In Harlow's view, these discussions made it clear that psychoanalysts focused on energy, whereas biologists focused on structures. Thus, when each group spoke about instincts, they meant very different things. It is not clear what he meant by structures. We can hypothesize that he meant behaviours that are inherited in some way. In any case, he did not think the concept in biology or psychology encompassed the notion of energy.

Harlow also rejected the ethological concept of instinct, at least as defined by Lorenz. For Lorenz, instincts were innate behavioural patterns that were not affected by learning or experience. But from early on, Harlow shed doubt on 'dichotomous classifications': 'In the semi-suicidal search for operational orderliness biologists and psychologists have conceptualized unlearned behaviors as simple and stereotyped, and learned behaviors as complex and variable.' In his view, interdisciplinary data showed the need 'to re-examine the value of this nearly universally accepted dichotomous classification' (Harlow, 1958b: 9).

Aware of the variety of meanings of the word and the polemics around it, Harlow refused to use the term 'instinct'. After 20 years of examining affectional systems, Harlow presented love as one of a series of complex unlearned behaviours. For him, complex unlearned behaviours possessed three characteristics: they followed developmental maturation states in orderly fashion; they were based on multiple variables; and they were extremely persistent over long periods of time (Harlow and Mears, 1978: 263). In choosing the terms 'maturation' and 'complex unlearned behaviors',

Harlow wanted to emphasize the internal developmental aspects of emotions and behaviour. However, sometimes he asserted that maturation was the same as learning: 'I am very skeptical that there is any fundamental difference between maturation and the process of learning.' (Harlow, 1960b: 336) Perhaps the most fruitful way of approaching Harlow's views on this general question is to focus on the one affectional system he believed to be most strongly influenced by biology: maternal love and care.

First, what factors bring about the maternal affectional system? In reporting the results of the first major study of this system in rhesus monkeys, Harlow, Harlow and Hansen (1963: 267) concluded that there were three types of variables operating in the maternal role: external incentives, such as the infant's clinging, sucking, vocalizations, etc.; experiential factors, like the mother's early experiences, especially with age-mates; and finally, endocrinological influences. That is, of the variables playing a role in maternal conduct, two of them (external incentives and experiential factors) clearly belonged in the 'nurture' camp. Harlow's own studies of infant development had shown how critical early experiences were to normal infant development and, specifically, to the 'normal' development of maternal behaviour. Nevertheless, Harlow sometimes insisted on the power of innate factors: 'It is obvious that early social deprivation severely disrupts the maternal behavior pattern of the rhesus monkey. These data are not to be interpreted as indicating that the maternal behavior pattern is of necessity learned, but indicate instead that inadequate early social learning can block the expression of the normal maternal pattern.' (Seay, Alexander & Harlow, 1964: 353) In this picture, biology seems to set a predetermined course that the environment can only block in some instances, but which reasserts itself eventually.

However, whatever innate factors may be influencing normal maternal behaviour, Harlow was aware that they were neither sufficient nor necessary for that behaviour (Harlow and Harlow, 1966: 16). Although he thought that both the rhesus monkey and the human mother were 'highly baby-oriented' and eager to establish contact with infants, he also argued that whatever innate factors led to those predispositions could not account for normal maternal behaviour. He said:

> we have a wealth of data which show that any innate maternal propensities are not adequate in and of themselves to endow the rhesus mother with normal maternal capabilities. In those cases in which we have impregnated by dark and devious means female monkeys which had been denied opportunity to form age-mate affectional relationships during the first year of life we have produced mother monsters which were either indifferent to their newborn infants or cruel, brutal, and even lethal. Thus it is obvious that early age-mate association is as essential to the fruition of the later maternal affectional system as it is to the heterosexual affectional system. (Harlow, 1966: 229)

Here, the role of experiences is not simply an incidental background to an all-powerful biology: rather, experience and environmental factors play an integral part of the development of behaviour and emotions.

Harlow sometimes emphasized innate components of behaviour in reaction to what he saw as an overemphasis on learning factors in contemporary social sciences. On the topic of socialization he believed that psychologists, anthropologists and sociologists had placed too great an emphasis on the importance of learning. In his opinion, no one could deny the importance of social learning or deny that learning variables played progressively greater roles as primate social organizations become progressively more complex. But he went on to point out: 'the fixation on the role of learning by many socially minded theorists obscures the fact that success or failure of primate social learning is dependent upon many basic, complex, unlearned behaviors that progressively mature long after birth' (Harlow, 1966: 234). Among those unlearned behaviours he included feminine and

masculine behaviours, maternal behaviour changes during the periods of gestation and parturition, and the sequential development of primate play patterns. According to him, those behaviours could not to be explained by learning alone.

What did Harlow mean by innate factors, unlearned behaviour and maturation? He refused to speak in the language of instincts, until he discovered what he felt was a good definition of instinct while reading William James. In a 1969 paper on James and instinct theory, Harlow readily acknowledged that if he 'had read [James's work] earlier, [he] might have saved [himself] several years of tedious research and agonizing theorizing' (Harlow, 1969: 21). According to Harlow, James conceptualized instincts as complex, organized, unlearned responses, many of which matured long after the organism's birth. He also recognized that instincts defined as complex, late maturing reaction patterns, or response tendencies, were constantly modified by learning and experience. For James, two factors could explain why a behaviour might not be uniform among individuals of a species: first, instincts are often inhibited by habits; second, instincts could be transitory, that is, they could ripen at a certain age and then fade away. Instincts, in Harlow's reading of James, develop in a temporal sequence and 'if not stabilized, are replaced or inhibited by other instincts' (Harlow, 1969: 23). James, Harlow claimed, 'was in essence saying what we believe' (Harlow, 1969: 29).

'Probably no eminent psychologist will again write a chapter on human instincts and probably such a chapter is no longer needed', Harlow (1969: 29) asserted. As he saw it, the term 'instinct' always carried the connotation of relatively discrete responses, or chains of responses. For him, the concept did not 'adequately describe the complex, late maturing propensities or variables underlying advanced learning or thinking processes, and the multiple subtle variables underlying the acquisition of the socialization processes' (Harlow, 1969: 29). Harlow thus proposed to abandon both the concept of instinct and the concept of learning.

In 1976 some members of Harlow's group wrote a retrospective article on mother-infant experiments. After surveying a wide range of research on maternal care (mostly their own), the article presented the following conclusion:

> The results of this survey clearly indicate that adequate maternal behaviour, at least among rhesus monkey females, is not a gene-given gift. Monkeys reared without real mothers or opportunities to interact with other conspecifics early in life are unlikely to be competent in the care of their firstborn offspring. The present results are thus consistent with previous reports of motherless-mother behavior. Mother love is not entirely prepotent or instinctual. (Ruppenthal, Arling, Harlow, Sackett and Suomi, 1976: 346)

Harlow reached a similar conclusion regarding sexual behaviour:

> By rearing our monkeys in social isolation we had severely disrupted the processes underlying normal sexual and emotional development, even though their physical development was normal. This showed clearly that sexual behavior in primates is not 'innate' or 'instinctive' – whatever these overworked terms mean. Like other complex behaviors it must be the outcome of a long and complex process analogous in some respects to the process of 'learning to learn.' (Harlow, 1976: 13)

Having discovered how rhesus monkeys learn to learn in the early part of his career, Harlow ended his long and successful research career on the nature of love by emphasizing how rhesus monkeys 'learn to love'. In one of his last articles, 'The nature of complex, unlearned responses', Harlow welcomed the passing of 'the self-defeating theories of all-black unlearned and all-white learned behaviors" (Harlow & Mears, 1978: 273). Harlow had struggled throughout his scientific career to find a way of combining nature and nurture, the power of both innate drives and experiences in a primate's emotional life.[9] Having shown that monkeys are like us in that they learn to learn,

Harlow's own trajectory perhaps solidified his belief that we are like monkeys in the emotional realm. For we, too, learn to love.

Conclusion

Harlow deserves a place in the early history of evolutionary psychiatry but not, as he is commonly presented, because of his belief in the instinctual nature of the mother-infant dyad. Contemporary authors like Bowlby, Spitz and Ainsworth always focused on Harlow's early experiments and cited them in support of their own views about the significance of the mother. Many historians and contemporary psychologists have contributed to this trend.

For reasons of space, I did not explore in this paper why Harlow's colleagues and contemporaries did not always take account of the changes in his views on attachment. But, briefly, I believe it was due to the confluence of several factors. One was the social emphasis on the important role of mothers in child rearing during the Cold Era, which gave strong prominence to studies about the effects of maternal care and love (Plant, 2010; Vicedo, forthcoming a). Another factor was Bowlby's exclusive focus on the importance of mothers and his use only of those studies that supported his theory of attachment (Vicedo, forthcoming b). Recently, Lewis and Suomi (forthcoming) have argued that there has been a serious case of selective referencing regarding work on primate infant development and the specific roles of mothers and peers. In addition, Harlow agreed with some of Bowlby's ideas. For example, after studying the effects of separating infant monkeys from their mothers, Harlow and some of his students concluded that their results were 'generally in accord with Bowlby's theory of primary separation anxiety as an explanatory principle for the basic primate separation mechanisms.' (Seay, Hansen and Harlow, 1962: 131) This may have contributed to the impression that Harlow supported Bowlby's views on attachment in general.

But, as we have seen, Harlow's views evolved over time. During a period in which most researchers were focusing exclusively on the infant's relationship with the mother, Harlow showed the diversity of affectional systems in primates. His work on the significance of peer relationships led him to appreciate the evolutionary significance of separate affectional systems. As he moved towards this more complex picture of love, he distanced himself from both Bowlby and Lorenz. Harlow's work did not lend support to Bowlby's belief in an innate need for mother love and his thesis that the mother was the child's *sole* psychic organizer. Nor did Harlow agree with Lorenz's view of instincts as biological, unmodifiable innate needs, unaffected by learning. Furthermore, by positing a plurality of affectional systems, Harlow contradicted the psychoanalytic vision of a single origin of love and its model of emotional growth as developing out of a single early relationship with the mother.

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Notes

1 See, for example: Allport, 1997: 167; Hrdy, 2000; Eibl-Eibesfeldt, 1972; Karen 1998: 119–25; Morgan, 1994: 117; and many textbooks of psychology.

2 We would probably say 'affective' rather than affectional, now. However, I use affectional and affectional system because these are the terms used by Harlow and his students.

3 Harry Harlow to Ralph W. Tyler, 22 Aug. 1957, Harlow Papers. [Harlow's papers are in the care of Harlow's long time secretary and friend Helen LeRoy; copies of documents cited are also in possession of the author.] On Harlow's life and work, see: LeRoy and Kimble, 2003; Sidowski and Lindsley, 1989; Suomi and LeRoy, 1982. For discussions of Harlow's work and legacy, see Blum, 2002; Blum reproduces the standard interpretation of Harlow that I criticize and reject here. See also Haraway, 1989.
4 As I have shown elsewhere (Vicedo, 2009b), whether Harlow's work on monkeys could be extrapolated to draw inferences about human behaviour was hotly debated among the contemporary scientific community and general public.
5 Eugene L. Bliss to Harry Harlow, 28 Mar. 1959; Bliss to Harlow, 17 Apr. 1959 and 27 June 1959, Harlow Papers, 'General Correspondence'.
6 Letter from James H. Middlekauff to Harry Harlow, 18 Jan. 1960 [*sic*; the correct date was 1961]. Harry Harlow to James H. Middlekauff, 23 Jan. 1961.
7 Harry Harlow to James H. Middlekauff, 23 Jan. 1961, Harlow Papers.
8 Harry Harlow to Philip S. Holzman, Menninger Clinic, 7 Feb. 1961, Harlow Papers.
9 Perhaps fittingly, he wrote this paper with Clara Mears, his first and third wife, whom he had re-married after the death of his second wife and collaborator on the study of love, Margaret Harlow.

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