Monkey love: Harry Harlow's classic primate experiments suggest that to understand the human heart you must be willing to break it

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OBEDIENCE. CONFORMITY. Cognitive. Cuing. These were the words used by psychologists in the 1950s, and Harry Harlow didn't like them. He wanted to talk about love. He was at a conference one day, and every time he used the word "love" another scientist would interrupt and say, "You must mean proximity, don't you?" until at last Harlow, a brash man who could also be strangely shy, said, "It may be that proximity is all you know of love -- I thank God I have not been so deprived."

That was just like him, to make such a statement, in public no less; he was prickly, impolite, a man who is remembered by some with real distaste and by others with fondness. But in 1959, Harlow was speaking science in a way no one had dared to before, injecting statistics with hemoglobin and heart, the Nabokov of psychology.

His experiments were long meditations on love, and all the ways we ruin it. In his research with wire monkeys, he was able to show that infant monkeys cared more for a soft surrogate mother that could not feed them than for a metal, milk-bearing one. Harlow's experiments, many captured on film, are chilling and underscore the power of proximity in our lives. From his findings a whole science of touch was born.

Little is known of Harlow's own childhood. He was born Harry Israel in 1905, to Lon and Mabel Israel of Fairfield County, Iowa. His father was a failed inventor. His mother, Harlow recollected in a partly finished autobiography, was not a warm woman.

Harlow experienced bouts of depression throughout his life; maybe here is where they began, in the long Midwestern winters. At school, he did not fit in. By age 10, he had begun to draw during every free minute he had, making a strange and beautiful land called Yazoo, populated with winged animals and horned beasts. When he was done with a picture, he would bisect the beasts with sharp black lines, so they lay on the page, all bloody color but still somehow beautiful, vivid and vivisected.

Harlow did his undergraduate and graduate work at Stanford, where he studied with Lewis Terman, the famous IQ researcher who was just then probing into gifted children. At the suggestion of Terman, he changed his Jewish-sounding name to Harlow. After he married one of Terman's former gifted children, Clara Mears, with her IQ of 155, Terman wrote a letter of congratulations that makes the match sound more like animal husbandry than human bonding: "I am happy to see the joining of Clara's extraordinary hereditary material with Harry's productivity as a psychologist."

When Harlow took a job at the University of Wisconsin-Madison in 1930, he planned to study rats, but he wound up with rhesus monkeys, a small agile breed. Ever Terman's student, he began by devising a test of monkey intelligence, a sort of simian IQ profile. But soon he began to wonder about something else.

Harlow would begin his experiments by separating the infant monkeys from their mothers and peers, and he noticed that the infants, when separated, became extremely attached to the terry cloth towels covering the cage floors. They would lie on them, grip them in their tiny fists, throw tantrums if they were taken away, just like a human infant with a ratty blanket or a stuffed bear. The monkeys loved these towels. Why?

This was a huge question. Attachment had previously been understood in terms of nutritive rewards: We love our mothers because we love their milk. Researchers Clark Hull and Kenneth Spence had said human attachment was predicated on drive reduction: Hunger is a primary drive and we want to reduce it; the same goes for thirst and sex. From the 1930s through the `50s, the theory of drive reduction and its link to love went unquestioned.

Harlow, however, began to question it. He fed the baby monkeys by hand, and when he took the little plastic bottles away, the infants just smacked their lips and maybe wiped a white dribble off their hairy chins. But when Harlow tried to take their towels away, the simians screamed like a slaughterhouse, throwing their small bodies down and clutching at bunches of cloth. This fascinated Harlow. As his biographer Deborah Blum wrote, the best way to understand the heart was to break it. And so started Harlow's brutal and beautiful career.

Rhesus macaque monkeys share roughly 94 percent of their genetic heritage with humans. But Harlow felt no kinship with his test subjects. "The only thing I care about is whether a monkey will turn out a property I can publish," he said. "I don't have any love for them. I never have. I don't really like animals. I despise cats. I hate dogs. How could you love monkeys?"

Harlow's experiment required wire cutters, cardboard cones, hot coils, steel nails, and soft cloth. He used the wire cutters to fashion a wire mother, its torso patterned with small squares, a single inflexible breast "on the ventral front." Affixed to this breast, a steel nipple pierced with a tiny hole through which the monkey milk could flow.

Then Harlow fashioned a soft surrogate, a cardboard cone bunted in a terry cloth towel. He wrote, "The result was a mother, soft, warm, and tender, a mother with infinite patience, a mother available 24 hours a day . . .. It is our opinion that we engineered a very superior monkey mother, although this position is not held universally by monkey fathers."

First Harlow took a group of newborn rhesus macaque babies and put them in a cage with the two surrogate mothers: the wire mother full of food, the cloth mother with an empty breast and a sweet smile. After the initial trauma, something amazing started to happen. Within days, the baby macaques transferred their affections from the real mother, who was no longer available, to the cloth surrogate.

The cloth mother, however, had no milk, so when the youngsters were hungry, they would dart over to the chicken-wire mother and then run back to the safety of the soft towel. Harlow graphed the mean amount of time the monkeys spent nursing versus cuddling. The disparity in favor of cuddling, he wrote, was "so great as to suggest that the primary function of nursing . . . is that of insuring frequent and intimate body contact of the infant with the mother."

Harlow was establishing that love grows from touch, not taste, which is why, when the mother's milk dries up, the child continues to love her. The child then takes this love, the memory of it, and recasts it outward, so that every interaction is a replay and a revision of this early touch. "Certainly," writes Harlow, "man cannot live by milk alone."

This was a significant discovery. The `30s to the `50s had been a cold era in childrearing. The famous pediatrician Dr. Benjamin Spock advised feeding by schedule. Nestl and Ross laboratories discovered formula, white powder, plastic nipples, tepid water from the faucet. John Watson famously wrote, in his books about how to rear children, "Do not overindulge them. Do not kiss them goodnight. Rather, give a brief bow and shake their hand before turning off the light."

Well, Harlow said you should never shake a baby's hand. You should not hesitate to hold him. What's more, he said, any old palm will do: "Love for the real mother and love for the surrogate mother appear to be very similar. . .." Harlow and company had identified "contact comfort" as an essential component of love. But what else was there?

Surely, Harlow hypothesized, the face is another variable of love. The original surrogates had primitive faces with black bicycle reflectors for eyes. Now Harlow ordered his lab assistant to make a really good monkey mask, to see what sort of attachment it would produce. However, the experimental monkey was born before the face was finished, so Harlow dropped the newborn in the cage with its terry cloth mother, who had only a blank, featureless flatland for a face. The little monkey loved the faceless mother, kissing it, nibbling it. When the ornamental monkey mask was finally attached, the baby screamed in horror, rushed to a corner of its cage, rocked violently.

Many have called Harlow's experiments cruel. But there is also something powerful and affirmative about what he gave us: the sure knowledge that our needs are more complex than simple hunger, that we seek to connect at all costs, and will always find the first face the loveliest face.

Harlow was studying love even as he himself had already fallen out of love. Clara had left with her two children, but Harlow had another woman, the Iron Maiden. The Iron Maiden was a special surrogate monkey mother Harlow had designed; she shot out sharp spikes and blasted her babies with air so cold and forceful the infant monkeys were thrown back against the bars of their cages, clinging and screaming. This, claimed Harlow, was an evil mother, and he wanted to see what would happen.

Here is where Harlow began to earn his darker reputation. Here is where he stepped from science into fairy tales. He made many of the iron maidens: Some rattled their children and stabbed them. No matter what the torture, Harlow observed, the babies would not let go. There is no partial reinforcement to explain this behavior; there is only the dark side of touch, the reality of primate relationships, which is that mothers can kill us even as they hold us.

In 1958, as the newly elected president of the American Psychological Association, Harlow traveled to the group's annual meeting in Washington, D.C., to deliver a speech called "The Nature of Love." He interspersed his speech with powerful black-and-white film clips of the sci-fi-looking surrogates and the babies who depended on them. At the end, he spoke of the "practical applications" of his research.

American women, he said, were threatening to displace men in the workplace and the university. However, he declared, there was some good news. "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 . . .."

Soon after that speech, the University of Wisconsin at Madison issued a press release announcing "Motherhood Obsolete." Harlow put out new research effectively showing that a cloth surrogate mother was more important than a nursing mother and could stand in just as well as the real mother. Harlow appeared on "To Tell the Truth," and CBS made a documentary of his work.

But something was not going well. When he took the grown-up cloth-mothered monkeys out to play and mate, they were violently antisocial. Some began to display autistic-like behavior. A New York Times reporter came out to Madison to do a follow-up and Harlow

led him to his lab, where a troop of rocking, head-banging macaques sat in cages, chewing off their fingers. "I admit it," said Harlow. "I have made a mistake."

And so he set out to correct it. Mothering, he hypothesized, must have other variables, such as motion. So he made a surrogate that could rock.

According to Leonard Rosenblum, one of Harlow's students at the time and now a renowned monkey researcher in his own right, this produced babies that were almost normal, as long as they got an hour and a half of daily play with a live monkey as well. Rosenblum says, "What this means is that there are three variables to love -- touch, motion, and play -- and if you can supply all of those, you are meeting a primate's needs."

Rosenblum goes on to repeat that with a half-hour a day of play "the kids" would be perfectly fine. "It's amazing," he says, "it's amazing how little our nervous system needs in order to turn out normal."

In some respects this is encouraging. A little jiggle, a soft sweater, and only 30 minutes of actual primate interaction. Any mother can do this: lazy, working, wired, iron. But if Harlow's findings are seemingly so reassuring, so all about love, why do they lodge in the gut like one of his experimental spikes?

We shiver through Harlow's results, but still we make use of them. His published, powerful research made its way into baby-care products -- most notably the sling and the Snugli, which have added warmth to the ways we parent infants. William Sears, the famous attachment-parenting advocate, a pediatrician who preaches sleeping with your babies, keeping them close at all times, is a Harlow-made man, whether he knows it or not.

Orphanages, social service agencies, the birthing industry all had critical policies altered based in part on Harlow's findings. Thanks in part to Harlow, doctors now know to place a newborn directly on its mother's belly after birth. Also thanks in part to Harlow, workers in orphanages know it's not enough to prop a bottle; the foundling must be held and rocked, see and smile. Thanks to Harlow and his colleagues in the study of attachment, we have been humanized -- we possess an entire science of touch, and some of this came from cruelty. There's the paradox.

Thanks to Harlow, we also have the animal rights movement, which was inspired in part by his research. Until a few years ago, the Animal Liberation Front had a demonstration at the University of Wisconsin's National Primate Research Center, where they mourned in the presence of thousands of stuffed Kmart monkeys.

Some say Harlow's words caused the trouble. "The problem with Harlow," says Rosenblum, "is the way he described things. He did it to get a rise out of people . . .. He would never say `terminated.' He would say `killed.' Why couldn't he have called the `rape rack'" -- Harlow's term for the contraption he devised to force his disturbed female monkeys to mate -- "a restraining device? If he had, he wouldn't have such a mixed reputation today."

But it's not just the words that are disturbing. I am disturbed by a cuff strangling a monkey's neck. I am disturbed by the Iron Maiden, the rape rack, despite the knowledge they gave us -- and Harlow, perhaps he was disturbed as well. For all his pronouncements about how he didn't care for his monkeys and didn't like animals, some of his students suggest that the nature of his work began to really bother him.

In 1971 Harlow's second wife, Peggy, died of breast cancer. Around that time, he went off to the Mayo Clinic in Minnesota, where he submitted to a series of electroshock treatments, himself now the animal strapped down on the table.

Back in Madison, people said he was never the same again. He no longer wanted to study maternal deprivation. The 1960s saw the rise of biological psychiatry and the hope that medications might alleviate mental conditions. That interested Harlow. Once again, he turned to his rhesus macaques.

He built a black isolation chamber in which an animal was hung upside down for up to two years, unable to move or see the world, fed through a grid at the bottom of the V-shaped device. This Harlow called "the well of despair." Indeed, it was successful in creating a primate model of mental illness. The animals, once removed, after months or years, were shattered and psychotic. Nothing Harlow did could bring them back. There appeared to be no cure. No way to contact, to comfort.

In the end, Harlow died of Parkinson's disease. He could not stop shaking.

Lauren Slater is a psychologist living in Somerville. This article is adapted from her new book, "Opening Skinner's Box: Great Psychological Experiments of the Twentieth Century" (Norton), which discusses Stanley Milgram's obedience studies, B.F. Skinner's research in behaviorism, and eight other experiments.