The Infant Separates Himself from His Mother

When the infant leaves his mother, his opportunities to learn the environment are much increased.

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At some point in time an infant leaves its mother. It is our purpose to call attention to this behavior in man and animal, to examine its biological and psychological consequences, and to relate the behavior to current principles of behavior theory. The argument is first presented very generally. The general presentation is followed by a review of the literature on nonhuman primates, and then by an outline of some procedures for experimental analysis of this behavior, based upon recent work in our laboratory.

The infant's leaving the mother is well-nigh universal behavior throughout the animal kingdom. Here, however, we limit the presentation to species of the class Mammalia. And within that class the focus is the human infant, although the discussion moves freely between him and infants of other species. Recent studies of nonhuman primates (see, for example, *1–5*) offer some data on the infant's separating himself from his mother, but the behavior has not often been precisely documented in other mammals, even in the human infant (*6*). With only a few exceptions, the behavior has seldom been the primary subject of study.

Let us consider this behavior. At some point in his life the mammalian infant leaves his mother's side. The first excursion is typically short in extent, and brief. In many species the mother promptly retrieves the infant making his first excursions, but the excursions are not thereby suppressed; they occur again and again. With time, and experience, the distance traveled increases, and so does the time spent away from the mother.

The infant's separating himself from his mother depends, of course, on his ability to move his body by his own efforts. As soon as the human infant is able to move thus—it takes him all of 7 months—he does so, even if he can progress only by inching along on his belly. Later he creeps, and then walks away from his mother. He goes out the door and enters another room. In time he walks out of the house, plays in the yard all morning, goes to school, goes still farther away to high school, then to college and to work. He crosses the country, and now he may go even to the moon. Eventually he sets up his own home and produces infants who, in turn, repeat the process.

Biological and Psychological Significance

The infant's separating himself from his mother is of biologic importance. It is of consequence for the preservation of both the individual and the species—of the individual, since it confers the advantage of greater familiarity with the environment and thus increases the likelihood of adaptation to the environment; of the species, since it allows the mother to care for the next offspring and leads eventually to the formation of breeding pairs.

The infant's separating himself from his mother is also of psychological importance for it enormously increases his opportunities to interact with the environment and thus to learn its nature. For, while he is in physical contact with his mother, his universe is confined to her person and the environment near her. There are limits to what the most attentive mother can bring to him. Even when he is carried about, his contacts with the universe are necessarily circumscribed. When, however, he leaves her side by himself, many new kinds of learning can occur.

The infant comes in contact with an increasing number and variety of objects. Through touching them he learns their shapes, dimensions, slopes, edges, and textures. He also fingers, grasps, pushes, and pulls, and thus learns the material variables of heaviness, mass, and rigidity, as well as the changes in visual and auditory stimuli that some objects provide. He moves from place to place within a room, and from one room to another. From the consequent changes in visual experience, coupled with his own kinesthetic sensations, he learns the position of objects relative to other objects (*7*). He also learns the invariant nature of many sources of stimulation. In a word, he learns the properties of the physical world, including the principles of object constancy and the conservation of matter.

Although in considering what can be learned by the infant as he moves away from his mother we have been speaking of the human infant, parallels can be drawn for the infant of other species. Similarly, although we have been considering what can be learned about the *physical* environment, parallels can be drawn for the *social* environment.

Relation to Attachment

Up to this point we have presented a class of behavior rather generally; now its relations with some other classes of behavior can be considered.

The first of these other classes of behavior is the infant's attachment to his mother, and of course for some species this also includes attachment to the nest and the littermates. It is clear that mammals of necessity stay with their mothers for some time; that at an early age they distinguish their mothers from other individuals; that they often respond more positively to their mothers and to other familiar individuals than to less familiar individuals; and that they are upset by the departure of these familiar social objects. Attachment, furthermore, persists throughout the life of some spe-

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cies, although the form of the behavior changes.

We use the term *detachment* for the behavior of interest here, for balance with *attachment*, and for contrast (*8*). Detachment occurs later in the life of some infant mammals than the first evidence of attachment. This is the case with the rodents, carnivores, and primates. But detachment does not signal the end of attachment, nor is it simply the opposite of attachment. Attachment and detachment should be viewed as an interplay of classes of behavior, developing side by side and coexisting for the life of the individual.

Finally, the kind of separation we are talking about is not to be confused with the separation of "separation anxiety" (*9*). We know from observation and from our laboratory studies that the infant who *separates himself* does so without anxiety.

Relation to Exploratory Behavior

When an infant leaves his mother, moves toward objects, and touches and fingers them, his behavior may be characterized as exploratory. Exploratory behavior has proved a troublesome class of behavior to handle conceptually (*10*) (Is the organism exploring or just active?). But exploratory behavior is so obvious in the young animal that the concept cannot be ignored just because it does not yet fit easily into traditional behavior theory.

The psychological advantages proposed as resulting from the child's leaving his mother's side are those very products assumed to result from exploratory behavior—an increase in a store of perceptions; new opportunities to learn what can be done with an object and what results from manipulating it; and an increase in new techniques for controlling external events. Furthermore, in our early attempts to study the infant's leaving his mother, we see that some of his behavior appears to be under the control of those same factors that control exploratory behavior—among them, novelty, complexity, and change.

Mother's Role in the First Separations

What is the human mother's role in the infant's leaving her side? In our culture, even from the beginning, the

Fig. 1. Distance traveled from mothers by infant rhesus monkeys of different ages (see text).

mother often physically separates herself from the infant, in contrast to some other mammals who seldom leave when the infants are young, or to the primates, whose young maintain physical contact with them. The mother's leaving cannot be responsible for the infant's leaving her, because even in cultures where the mother separates herself less often, the infant also leaves at some point in time. The human mother *permits* the infant to leave. Although she is watchful, she nevertheless appears to retrieve the infant less often than many other mammals do. Later, as the human infant progresses farther and faster, the mother does restrain and retrieve him more often, but she is generally ingenious in constructing an environment where restraining and retrieving are less necessary, since such foresight reduces her caretaking duties.

Primate Studies

In the last decade or so, many investigators of nonhuman primate behavior have followed the lead of Harlow and Zimmermann (*11*) in studying

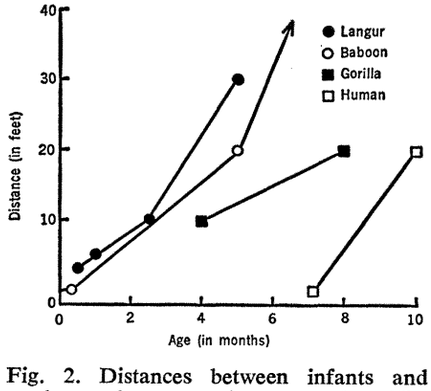

Fig. 2. Distances between infants and mothers of some primate species. The data points represent the earliest ages and the maximum distances reported. (The curve for the baboon reaches 90 feet at the end of 10 months.)

the interaction between mother and infant. We have drawn data from the reports of field and laboratory studies of several primate species to support the thesis that the infant does separate himself from his mother. These studies supply information on when the infant leaves, how far he goes from his mother, how long he stays away, how often he leaves, and how the mother responds to his first departures.

Measures of separation. Several investigators have reported that, as the primate infant matures, he goes farther and farther from his mother. Kaufmann (*12*) provides explicit data concerning the rhesus monkey (*Macaca mulatta*) on Cayo Santiago, Puerto Rico. The distance infants *walked away* from their mothers increased rapidly over the first 2 months of age (Fig. 1). In Fig. 1 the data points for the curve labeled "first seen" are the lower limits of the age range Kaufmann reported at each distance, and those for the curve labeled "commonly seen" are the midpoints of the age range, for a sample of 30 infants observed from birth.

Vessey (*13*) provides additional data for rhesus monkeys; he found that the *average* distance between mother and infant increased linearly after the first 8 weeks to 30 feet (9 meters) at the end of the first year. The measures were based on minute-by-minute observations, averaging 1 hour per week, of nine rhesus infants born into the colony at La Parguera, Puerto Rico. Six of the infants were male and three were female; no difference by sex was found.

Data for some other primates are shown in Fig. 2. The curves are based on the distances between mother and infant reported by Jay (*14*) for langur monkeys (*Presbytis entellus*), by De Vore (*15*) for the baboon (*Papio*, olive and yellow), and by Schaller (*16*) for the gorilla (*Gorilla gorilla beringei*). We have used the exact ages and distances reported by the investigators, but it should be pointed out that these observations were not the subject of their main interest. In general, the text of the reports implies that the distances resulted from the infant's movement away from his mother, rather than from the mother's movements. The first point of the curve for human infants in Fig. 2 is based on Nancy Bayley's (*17*) age placement for forward progression; the second point is based on the distance that 10-month-old infants traveled from their mothers in our lab-

oratory. This point differs from the other distances in that, given the dimensions and arrangement of the particular rooms used, it is the farthest the infant could travel. Informal observation of infants in their own homes suggests that the distance can be much greater.

The *time* a primate infant spends away from his mother at one time also increases with age. Altmann (*18*) recorded in the field that the howling monkey (*Alouatta palliata*) at the age of 15 days stayed away from his mother for 10 seconds; at 26 days, for 1 minute; and at 1 month (only 5 days later), for as long as 4 minutes. Infant langurs in the field, according to Jay (*14*), also separated themselves from their mothers for 4 minutes at the age of 1 month, but at 1 year they stayed away, playing, for more than 20 minutes at a time. In the laboratory, Kaufman and Rosenblum (*4*) found that, in the case of both bonnet (*Macaca radiata*) and pig-tailed (*M. nemestrina*) infants, the mean duration of their vertical separations from the mother (separations involving progress to a different level of the cage) increased up to the fourth and fifth month; that the duration was stable thereafter may be attributed to the space limitations of their living quarters.

As he grows older, not only does the nonhuman primate infant go farther from his mother and stay away longer, he also leaves more frequently. Kaufman and Rosenblum (*4*) reported that the *frequency* of the bonnet infants' moving away from their mothers, while remaining on the same level of the cage (horizontal departures), increased from 4.5 departures at the age of 1 month to 9 departures at 4 months, per 1000 seconds of continuous observation. Concurrently, the frequency of going to another level of the cage (vertical departures) increased from 0 at the age of 1 month to 16 at 15 months. Similar changes in the pig-tailed infants' behavior also occurred; horizontal departures increased over the first 6 months, while vertical departures increased from 0 to 6 over the first 11 months. Furthermore, throughout the 15 months of observation, both bonnet and pig-tailed infants left their mothers more frequently than their mothers left them (*19*).

The data summarized so far show that the nonhuman primate infant leaves his mother, and that, as he grows older (and more experienced), he leaves more frequently, goes farther, and stays away longer.

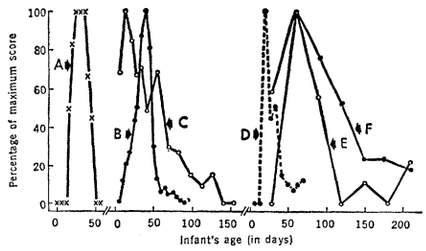

Fig. 3. Frequency with which primate mothers restrained and retrieved their infants (see text).

The mother's response. As the primate infant matures, the mother is not passive. Her behavior undoubtedly contributes to the changes seen in her infant's departures. It has been shown by various investigators that she restrains him from departing and retrieves him once he has left. Her thwarting of his attempts to suckle and her punishing him when he approaches occur much later; although they affect his subsequent behavior, they are not relevant to the central issue of this article.

Data on the mother's restraining and retrieving are shown in Fig. 3. Curve A, derived from the data of Doyle, Andersson, and Bearder (*20*), shows the frequency with which the galago mother (*Galago senegalensis moholi*) retrieved an infant that had left the nest. Curves B and C are based on data for the rhesus monkey. (Because of the differences in the measures and time-sampling procedures of the investigators, the scores for the various sets of data are expressed as percentages of the maximum score reported, a procedure that permits comparisons of events over time but not, of course, comparisons of actual frequencies.) Curve B is based on the data of Harlow, Harlow, and Hansen (*1*) for the rhesus monkey and combines frequencies for the mother's restraint and retrieval of the infant. Curve C, from the work of Hinde and Spencer-Booth (*2*), represents the percentage of rhesus infants restrained by their mothers. Curves D, E, and F are derived from the work of Rosenblum and Kaufman (*21*) with bonnet and pig-tailed macaques. Curve D shows the percentages of time the pig-tailed mother prevented her infant from leaving; curves E and F give the frequency of retrieval by bonnet and pig-tailed mothers.

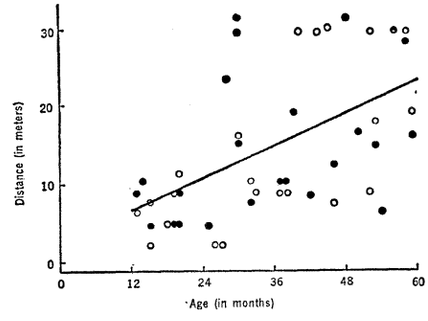

Fig. 4. Distance traveled from mothers by children of different ages. (Solid circles) Males; (open circles) females.

The data of Jensen, Bobbitt, and Gordon (*22*) on this subject are not presented in Fig. 3 because they are given not as actual frequencies but as frequencies *relative* to other classes of behavior. Still, the data of these workers also show that the mother's "retaining" of the infant relative to all her manipulations increased over the first few weeks, and then decreased.

Despite the differences in procedures of observation and in classes of behavior reported, the data show (i) that these nonhuman primate mothers restrain their infants from leaving and retrieve them once they have left, and (ii) that the frequency of the behavior increases over the early days of the infant's life and then decreases. It is clear that the mother's behavior reflects the increasing frequency of the infant's attempts to leave—the topic of central concern here—and that, over time, he gets his way.

Studies of Human Children

In the past 2 years we have studied children in the process of separating themselves from their mothers. Two studies are reviewed here to show that the behavior can be subjected to experimental analysis. The first was carried out in a seminaturalistic setting with children between 1 and 5 years of age, the other in the laboratory with 10-month-old infants.

Relationship between age and distance. To measure the relationship between a child's age and the distance he will travel from his mother, 48 children were studied, three boys and three girls at each half-year of age between 12 and 60 months. We placed a mother and child at one end of an unfenced lawn, with the mother sitting in a chair and the child starting at the mother's knee but left free to roam for the 15 minutes of the study. The mother was

instructed to remain in her chair but was encouraged to respond otherwise to the child in her usual manner. Neither mother nor child had been in the yard before. The yard contained a couple of trees, two birdbaths, a set of planted terraces to one side, and a small paved patio and the house to the other. Aside from these usual objects, no lures were provided. The yard was L-shaped, running along the back of the house and around its corner to the road. The first leg of the L, in front of the child, was 27.4 meters long and 12.2 meters wide; the second leg began 15.2 meters from the child's starting position and extended 39.6 meters to the road; it too was 12.2 meters wide. Thus the child could get out of range of the mother's vision; the trial was ended, however, for any child who went 15.2 meters past the corner, a precaution taken to guard against his getting into the road.

Observers stationed at windows in the house traced the child's path on a map of the yard. Small rods were inserted at the borders of the lawn, inconspicuous in the tall grasses, to mark off 10-foot (3.05-meter) squares for the use of the observers in plotting the child's course. Distance was calculated as the midpoint of each square the child entered. In 25 of a sample of 26 records, the two observers, working independently, agreed exactly on the farthest square the child entered.

The mean farthest distance traveled from the mother by 1-year-olds was 6.9 meters; by 2-year-olds, 15.1 meters; by 3-year-olds, 17.3 meters; and by 4-year-olds, 20.6 meters. Figure 4 shows that variability after the second year of life was considerable; for example, one 2½-year-old boy went 31.5 meters but another went only 7.5 meters. Nevertheless a linear regression of distance relative to age was significant at P less than .01. The equation for the estimated regression line was

$$\hat{Y} = 2.43 + 0.35X$$

This suggests that, for each added month of age, the children went about a third of a meter farther.

Clearly this relationship cannot be linear for ages much below 1 year; the predicted average of 4.9 meters at 7 months (the average age of first forward progression) would be too great. Furthermore, the boundaries imposed not only by the topography of the lawn but also by the experimenter's stopping a child at an arbitrary point appear to have restricted the distance the older children might have gone.

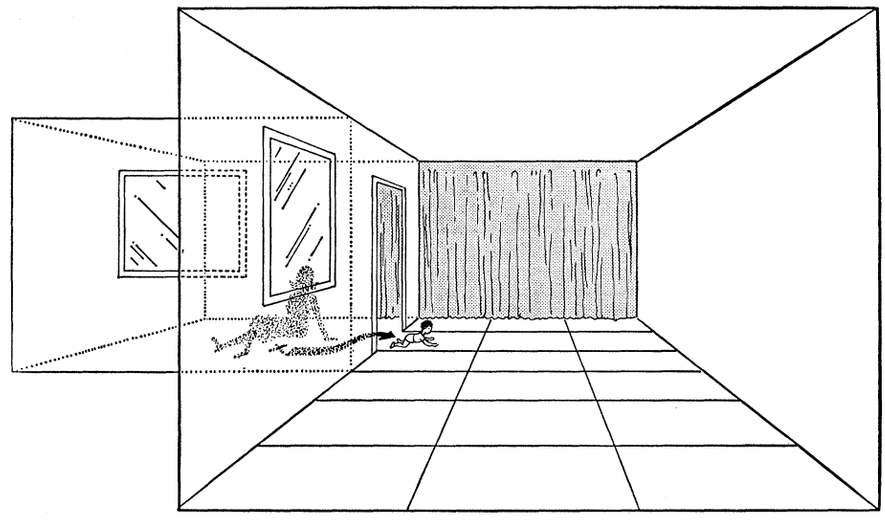

Fig. 5. The experimental situation for studying the human infant's departure from his mother.

No evidence of a difference by sex appeared in these small samples. The regression for each sex was significant, and the two regressions did not differ reliably ($F = 0.37$, 2 and 44 d.f.). Of the ten children who went out of sight of their mothers, it is interesting to note, two were males and eight were females. Unlike rhesus infants, as reported by Kaufmann (*12*), the human child, according to the regression equation, would not attain a distance of 30 feet until the age of 19 months, a distance reached by rhesus monkeys at 2 months. But the comparison can be only suggestive because the children were placed in an environment with which they were unfamiliar; the mothers reported that at home children went much farther (*23*). One could of course use a longer session or repeated sessions to increase familiarity. Interesting objects could be placed at varying distances from the mother to lure the child farther, or another child could be present, as a means of measuring the effect of social facilitation.

Environmental stimuli and the infant's leaving his mother. In the laboratory we have investigated some properties of the environment that lead the 10-month-old human infant away from his mother (*24*). A simple situation composed of mother, infant, two adjacent rooms, and a few toys provided the laboratory setting. The mother placed the infant beside her in one of the rooms, and the door to the second room was left open. The properties of the environment were altered by varying the number and location of toys within the second room, and by having the toys sometimes present from the start and sometimes added later.

Two observers behind windows fitted with one-way glass independently recorded how long an infant took to enter the second room, how long he stayed there, how far he went, what he touched and manipulated, how often he returned to his mother, and how much time he spent in contact with her. Vocal behavior was tape-recorded and subsequently analyzed as either distress or nondistress sounds. The agreement between observers was substantial, product-moment correlations being in the neighborhood of .95 for the duration of actual events.

The subjects were normal, home-reared infants, 10 months of age, an age that insured that most of them could locomote by some means. In fact, about two-thirds of the infants could creep proficiently on their hands and knees. Of the other third, half were still crawling on their bellies and the other half were already toddling. The infants were selected by age alone from the register of births at the University Hospital at Chapel Hill, North Carolina, and thus reflected the socioeconomic characteristics of a small university town.

The experimental area consisted of two rooms—a small room in which the test was started, called the "starting room," and a larger room, called the "open field"; both were unfurnished (Fig. 5). The small room measured 2.7 by 2.7 meters; the large room, 2.7 by 5.5 meters. The floor of the large

room was divided, by narrow masking tape, into cells approximately 0.9 meter (1 yard) square. Neither the mother nor the infant had seen the rooms prior to the test.

To start the test, the mother sat on the floor of the starting room and placed the infant facing herself. She had been told that she could look at and smile at her infant, and that she could talk softly to him in short phrases when he was near her, but that she should allow him to leave or to stay.

Twenty-four infants were studied. In experiment 1 the open field was empty for 12 of the subjects (group 0); for the other 12 (group 1) it contained a toy—a plastic pull toy—in the cell just outside the starting room (the cell that the infant has reached in Fig. 5). The experiment lasted for 10 minutes.

All 24 infants left their mothers and, without fussing or crying, crept out of the room in which the mother sat and entered the larger room, whether it was empty or contained a toy.

The two groups, group 0 and group 1, spent similar amounts of time in the larger room (Fig. 6A). (This statement, and all succeeding statements of difference, are supported by P values of less than .05, obtained in Wilcoxon two-tailed matched-pairs signed-ranks tests.) The presence of the toy did not keep group 1 infants in the open field longer than group 0 infants. This result may be attributed to an unanticipated response of group 1 infants: they brought the toy *into* the starting room.

The major difference between the two groups was a difference in the amount of time spent with the mother. When group 0 infants were in the starting room they spent more time with the mother than group 1 infants did; group 1 infants spent at least half the time playing with the toy.

Of interest, also, was the observation that infants did not go out, come back, and stay in the starting room; rather, they went out again and returned again, some infants alternating many times whether or not the environment contained a toy. One infant went out of the starting room 13 times.

Experiment 2 followed directly after experiment 1. The same infants were now exposed to essentially the same environment but with certain changes in the toys. Half the infants who had no toy in experiment 1 now had one toy, and the other half had three toys, arranged diagonally across the larger room from upper left to lower right.

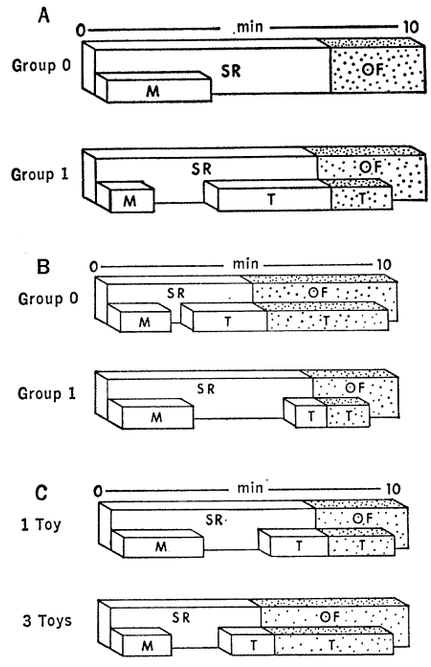

Fig. 6. (A) Experiment 1: effect of a toy. (B) Experiment 2: effect of previous experience. (C) Experiment 2: effect of number of toys. *SR*, Starting room; *OF*, open field; *M*, mother; *T*, toy or toys. The sizes of *SR* and of *OF* denote time spent in each; the sizes of *M* and *T* denote time spent in contact with that object in each environment.

Similarly, half of those who previously had the toy in experiment 1 now had the same single toy in the same place, and half now had the three toys, also spaced across the larger room.

Group 0 infants now entered the open field sooner and spent more time there than group 1 infants did (Fig. 6B). They also made contact with a toy more quickly and spent more time playing with it.

An independent analysis of the effect of three toys as compared with one toy for both groups of infants showed that three toys drew them farther from the mother. Three toys also kept them out of the mother's room longer and elicited more play in the open field than one toy did (Fig. 6C).

The results, in summary, showed that infants left their mothers and entered a new environment. How quickly they entered it, how far they went, and how long they stayed away were responses controlled by the number and location of the stimulating objects and by whether the objects were part of the new environment from the beginning of the test or were added later.

That infants leave their mothers and, with no distress, go from one room to another is a matter of everyday observation. But the finding that infants crept into the experimental environment of this study and moved freely about with no distress contrasts sharply with the marked distress and almost complete inhibition of locomotion shown, in an earlier study (*25*), by infants *placed* alone in that same environment.

An infant's entering a room that contains a toy would seem to demand no explanation. But an infant's entering a room that does not contain a toy, or any other prominent object, raises the question of what evokes entry. Devoid though the room was of any prominent object, it nevertheless was brighter than the starting room, and it contained many visual stimuli—a doorstop, curtains, lines and angles. If an infant can creep at all, creeping into a new environment must often have been reinforced previously by such changes in visual stimulation.

The infant's return to the starting room and his reentry into the large room may be considered illustrative of Ainsworth's (*6*, p. 78) "exploration from the mother as a secure base," and is reminiscent of the report by Harlow and Zimmermann (*11*) of infant rhesus monkeys that, after several sessions in an open field, used the cloth cylinder on which they had been raised "as a base of operations," moving away and returning to it between contacts with stimuli in the environment. But if the mother is considered a base, the data of our study show that the infants did not always *touch* base; on one-third of the returns, to *see* seemed sufficient. Furthermore, Ainsworth's term *secure* implies the affording of safety, and would be more appropriate here if the return to the mother were a flight from the larger environment. Of this there was no evidence. Quite the contrary; the return was often accompanied by facial and vocal expressions of pleasure and not by signs of fear or of relief from fear.

Problems for Further Study

Many questions about the process by which the infant separates himself from his mother still await investigation. Questions about the role of environmental stimuli in effecting his departure lend themselves most easily to experimental analysis. We propose that the visual properties of objects, both social and nonsocial, control the infant's leav-

ing the mother and making contact with the objects. As we have shown, such properties also determine how long it takes him to leave, how far he goes, and whether he gets out of sight of his mother. The feedback properties of objects determine the duration of contact, the nature and extent of manipulation, and hence the time spent away from the mother; they may also control the child's subsequent return to the objects. The properties of the ambient environment may similarly affect the infant's leaving his mother. For example, we have noticed in the laboratory that the infant is more likely to enter a brightly illuminated room than a dimly lighted one. The mother's behavior in laboratory studies will certainly be a determinant of the infant's behavior. Her talking, caressing, or playing games may keep him at her side. If she moves to a new position or leaves the room, will he follow?

So far we have been reporting laboratory studies. Naturalistic studies in the child's own home can supply complementary information. As in the primate studies, the frequency of contacts, approaches, and departures by both infant and mother can be charted at different ages, and charted in a given child over a period of time. Which behaviors of the infant evoke maternal restraining and retrieving behavior? Alternatively, how does the mother foster or encourage his departures? These questions specify variables of maternal behavior that should be viewed as a set of environmental stimuli modifying the infant's leaving her side. Although the first movement away from her side is his, her response may alter its subsequent occurrence. Similarly, the behavior of other members of the family deserves attention (*26*).

Once again, the details of study have been outlined for the human infant. It is clear, however, that the same questions and the same procedures, with minor variations, apply to other mammals. Although many accounts of the development of behavior in young mammals contain some information on the infant's leaving the mother and nest (see, for example, *27*), we found no substantial body of data on this topic for mammals other than the primates.

The lines of inquiry proposed up to this point seem straightforward and clear. One sees how the stimulating conditions can be varied and the behaviors measured. Less clear are the procedures for demonstrating the psychological advantages that moving away from the mother may confer on the infant. Reasonable and likely as these advantages seemed when proposed earlier in this article, they nevertheless await confirmation in tests on the young, developing organism.

If we look beyond the period of infancy, the full significance of the child's separating himself from his mother comes into view. Leaving her side is but the first step in the continuous process of achieving psychological independence.

Summary

In this article we have defined a class of behavior which has not often been the subject of formal study. Its universality among infants of all species is not basis enough for its engaging scientific attention. Far more important are its biological and psychological consequences; we propose that among these consequences are increased opportunities for learning on the part of the infant. Primarily by his own physical contacts with objects, near and distant, he learns the structural arrangements of objects in space and the tactual and other feedback properties of objects, both social and nonsocial.

The human infant, unlike many other mammals, separates himself from his mother at the first moment any mode of locomotion is possible. He does not wait until he can creep or walk efficiently. The separation, once effected, increases in distance and duration over the life of the individual.

The behavior is patent, it can be measured, it need not be inferred, and, as we have demonstrated, it can be experimentally manipulated. Further, it lends itself nicely to comparisons among species.

We do not propose that the infant's detachment from his mother is a negation of attachment to his mother, but current preoccupation with the attachment of the young to the mother should not obscure the importance of detachment. Its study can present the same challenge that the infant seems to find in going forth on his own.

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