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Organism, Apprentice, and Person

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The application of the notion of system to mother and infant, begun 20 years ago (e.g., Sander, 1962) and made explicit in the 1970's, was an important step forward for the field of developmental psychology. It qualifies as a major paradigm shift, redefining the unit of analysis from "baby" to "dyad" or even "family," making it clear that there were behavioral effects of the infant upon adults as well as the other way around, and tempting a look at interaction in all its complexity rather than pretending to isolate the parental stimulus and the infant's response.

It is now time to end our infatuation with that vague generality. As a rallying cry and anthem, it has done its job; but if the concept of social system is to have any explanatory value it will have to be defined more precisely. One finds that the newborn infant is not, in fact, truly a member of a social system. The only system to be found in parent-infant interaction is the ordinary evolved kind of system found throughout the animal kingdom. The important question is how human infants *become* members of social systems. Those systems exist in families before the infants are born. They are transmitted culturally, transforming infants from mere organisms in interaction to *persons*, each with a mind and a self, which internalize roles within those social systems.

The first goal of this chapter is to distinguish between membership in a social system and other kinds of social interaction, which, complex and bidirectional as they are, require neither shared intention nor any knowledge on the part of infants about their coordination with others. The second goal is to show that there is a bridge between these limited interactions

and the kind of system membership that begins at around the end of the first year. The bridge between organism and person is a period of apprenticeship, in which infants' developing skills are used by parents as means toward ends that are somewhat beyond infants' capacities on their own; where the adult, in other words, serves as the planning, memory, and attention-directing component in a higher order skill of which the infant's sensorimotor schemas perform as subskills.

THE SYSTEM

Any organism in and of itself is an open system. In fact, the very model of an open system is the integral organism. When the concept of open system is used to describe a unit within an organism, such as the leaf of a plant, the cardiovascular system of an animal, or a human skill as narrow as serving a tennis ball or as broad as speaking French, one is making an analogy between those physiological or psychological systems and a whole living organism. Similarly, when one uses the concept of open system to describe a functioning unit of more than one organism with common goals dependent upon the mutual coordination of their behavior—a mating pair, a herd, a tribe, a multinational corporation, and so forth—one is making an analogy between the way they function and the way the organs of a body function together. The distinction between open and closed systems is essentially the distinction between organic and inorganic matter, with reference to the fact that organic matter can, under the right circumstances, become organized into a directed system functioning as a whole, exchanging energy with its environment, resisting entropy, and creating information. Every living plant and animal has those properties, and so does every living cell, tissue, or organ. Whether a behavioral system like tennis or French has those properties, however, and whether a group of organisms like a herd of caribou or IBM does, are empirical questions.

The term "social system" has a more specific meaning. It is usually reserved for open systems consisting of two or more humans, rather than for pairs, flocks, or herds of animals. There is an important difference between the latter kinds of open system and human social systems. In the animal world, membership in the system is a matter of evolved behavior. Bees, whose system is fairly complex, know their own roles and know what to expect of each other strictly by inheritance, not by their having grown up together in the hive. To be sure, other social animals learn about particular individuals' idiosyncrasies. One chimpanzee may be especially intolerant of others feeding too close to him, for example. Nonetheless, the system itself and the different roles within it have evolved over many generations; the information that maintains those roles is transmitted genetically. In contrast, humans continuously develop new social systems, modify them, join

new ones with new functions and new rules, and transmit information about them culturally. Social systems are in fact as different from any multi-animal systems as human language is from any form of animal communication, and this is no coincidence.

Two criteria must be met before an interaction between organisms deserves to be called a social system. One is that they are working toward shared goals; the second criterion is that their coordination is based on a shared history, a knowledge of one another as individuals. It is the latter criterion that bees, for example, fail to meet because their adaptation to one another is achieved by evolution rather than by experience. The bees do, of course, satisfy the first criterion. Conversely, one can find examples of animals that study one another's behavior carefully and learn what to expect of one another (for example, a predator and its prospective prey), but then the first criterion is not met: they are two organisms adjusting to one another but not subordinating their independent functioning to a joint goal. It is difficult to find examples in the animal world that satisfy both criteria—it could be argued that a man and his dog or horse sometimes constitute a social system—but it is clear that human beings are members of many social systems and that their behavior is constrained by such memberships at practically every moment.

It does not follow, however, that every pair of interacting humans is a social system. Two strangers entering an elevator interact in interesting ways as they negotiate where each will stand, who will exit first, and so forth, but they do not constitute a system. They share certain goals, but the experience that enables them to achieve those goals is experience in interacting with others, not with each other. So their interaction is a matter of temporary adjustment, not of mutual adaptation. As for infants and mothers, they present more or less the converse of that situation. One can see mutual adaptation of various kinds soon after birth, but the sharing of intentions and the intentional subordination of autonomous behavior to actions requiring anticipation of what the partner will do and what the partner expects one to do—those kinds of coordination do not appear in the first 5 or 6 months.

THE ORGANISM

In some important respects the author's view of the newborn is derived from what Brazelton (this volume) has taught: that at birth, perhaps even in utero, human infants are programmed to stimulate mothers in certain ways and to be sensitive to certain kinds of stimulation that mothers are programmed to provide; that their ability to control their state of sleep/waking/arousal/distress by intrinsic regulatory processes as well as by appealing to the mediation of adults is crucial for their functioning as organisms; and

that the ways they affect mothers and other caregivers are crucial in enlisting adult involvement in their subsequent development. Bruner (this volume) also has discussed the special character of parents' involvement in children's play, noting that the learning of many skills including linguistic ones depends upon adults helping the child carry out intended actions. The author argues, however, that there are differences as well as commonalities among the roles parents play in various types of interaction over the first year of life, and that these differences correspond to changes in the infant's relationship to the parents' system.

In the first few months, as remarkable as the infant is, it is still only an organism, whose interaction with adults can be understood in terms of evolved mechanisms meeting none of the criteria of a social system. One can find intentionality in some of the infant's behavior, but not the intention to communicate or to affect adults in any way. The reason the infant does affect them is partly because of the parents' intentions and partly because of mutual contingencies that have been adapted to one another in the species.

At birth, the infant has at least one well developed skill. Sucking, as it is integrated with rooting, swallowing, and breathing, is certainly the most coordinated behavior in the neonate's repertoire. Besides the coordination with swallowing and breathing, and besides the rhythmic organization of the sucking itself, there is the burst-pause pattern that is apparently unique to humans (Wolff, 1968). By definition all newborn mammals suck, but only the human newborn pauses every 10 seconds or so with the nipple still in the mouth, and waits—for what? The pause has one significant effect: mothers tend to jiggle their infants, not every time they pause, but more often in the pause than during bursts of sucks. In a series of observational and experimental studies, the author and his co-investigators found that jigging did not have quite the effect mothers and hospital nurses thought it had, of stimulating the sucking, unless the mother jigged for just a second or two and then stopped. Mothers learn to do just that over the first 2 weeks of feeding their infants. As a result infant and mother tend to take turns, alternating between a burst of sucking and a jiggle; when one starts, the other is significantly more likely (although not certain) to begin. The author has reported elsewhere the details of this complex interaction (Kaye & Wells, 1980) and will here try to describe briefly the nature of the regulating mechanisms responsible for it.

Individual sucks are rhythmical, but only within bursts. Neither the durations of the bursts of sucks nor the durations of the pauses between bursts are rhythmical; they appear approximately as random (Poisson) distributions. This means that once the infant begins sucking, there is a given probability of each suck's being followed by another suck roughly 1 second later, and this probability remains the same with successive sucks in the

burst. Let us call that stochastic parameter S . The nervous system does not need to keep track of the number of sucks in a burst. Since S is a stationary stochastic process, it makes the sucking highly rhythmic within a burst but completely random as to the number of sucks in a burst. A burst ends whenever a suck is missed, which has the probability $1 - S = P$. Then a pause ensues. So far as the mechanism in the baby is concerned, it is a binary process (it either sucks or does not suck); but its consequence is the pattern of sucks that appear to be organized in bursts separated by pauses. This pattern has contingent effects upon the mother or upon any other adult who happens to be feeding the baby.

The pauses, too, are of variable length, ending when sucking resumes. Let us call the probability that sucking will resume during the next second, B for "burst onset." Thus the probability that the pause will continue for one more second is $1 - B$. It turns out that when the infant is left on the nipple without jigging—whether it is the mother's breast, an artificial nipple, or a pacifier—the probability coefficient B , like P and S , does not change as the seconds tick away. The likelihood of a burst after 10 seconds of pause is about the same as it was after only 3 or 4 seconds had elapsed. In other words, the sucking mechanism need not keep track of the duration of the pause any more than it has to keep track of the duration of the burst. The stochastic switch B works in a similar way to the stochastic switch S , each with its own respective parameter. Figure 1 presents a model of these processes.

Experimental manipulation of the schedule of reinforcement with fluid (Hillman & Bruner, 1972), or of the taste of the fluid delivered (Crook & Lipsitt, 1976), produces primarily effects upon S , manifested in the duration of the bursts. Experimental control of the jigging and other extra oral stimulation primarily affects B , manifested in the pause durations. Whereas the likelihood of a burst onset at any given time after the baby has paused is a constant value so long as the mother does not jiggle, Kaye and Wells

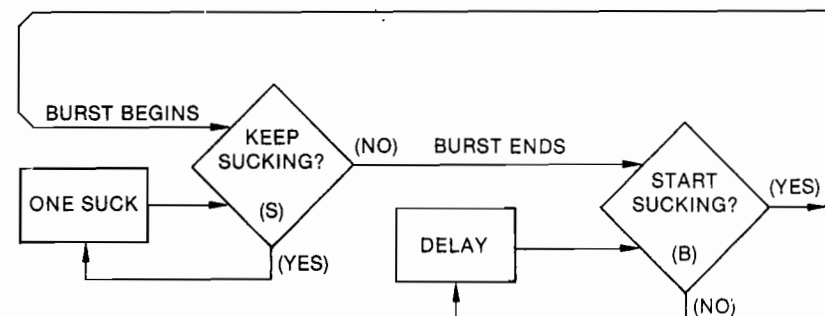


Figure 1. Model of the mechanism producing rhythmic sucking in bursts of random duration separated by pauses of random duration, as observed in newborn human infants.

found that jiggling suppressed that value (again to a constant value), and the cessation of jiggling elevated it significantly above what it would have been had the mother not jiggled in the first place. If the baby did not resume sucking within a few seconds, the value of B dropped back to its baseline, or no-jiggling level.

One can represent the mechanisms involved in these so-called "interaction" contingencies as fairly simple stochastic processes with no awareness in the infant of any interaction with another person. However, that is not how a mother herself experiences the situation. She feels the infant was involved in feeding, then got lazy or dozed off or stopped paying attention to what he was doing, and had to be jostled back onto the job. Mothers are not aware that their jiggling actually lengthens the pause, that only jiggling and stopping is an effective way to hasten the next burst, or that they tend to shorten their jiggling over the first 2 weeks. They do feel, however, that their intervention is important, that they are doing something active and necessary to keep the infants sucking. Notice that in responding to the pause a mother is doing the same thing she does in response to pauses in adult conversation. When a partner stops talking, in the absence of certain floor-holding cues one feels obligated to say something. Maternal jiggling may be a special case of a more general phenomenon, the tendency to respond to any disruption of an ongoing stimulus. However, it is only a tendency; the mother often does not jiggle. Her behavior, like the baby's, is stochastic rather than obligatory.

Four important points have been stressed about this phenomenon of bursts and pauses (Kaye, 1982a): 1) the pauses apparently serve no other function than to get the mother involved in the feeding; 2) they are unique to humans; 3) by making the mother and infant tend to take turns, the pauses and her effect upon them contribute to the mother's illusion that she and the baby are communicating, and they establish a precedent for using the basic alternation of turns in nonverbal interactions with the young infant; 4) despite the dialogue-like exchange, the only real accommodation is on the part of the mother. The infant's contribution is a self-regulating mechanism of some kind (Figure 1), which happens to be preadapted to just the sort of intervention human mothers will make.

The semblance of turn taking in feeding is echoed a few weeks later in face-to-face play. In fact, the author first noticed mothers' reactions to pauses in sucking when under Brazelton's tutelage, while he was beginning his study of alternating cycles of arousal in the face-to-face situation (Brazelton, Koslowski, & Main, 1974). Other investigators, especially Stern et al. (1977), Fogel (1977), and Tronick, Als, and Adamson (1979), have noted the importance of the fact that infants' facial expressions, smiles, and other indices of arousal are treated as turns in conversation, to which

mothers respond with exaggerated facial expressions of their own as well as with verbal repartee.

Kaye and Fogel (1980) showed, however, that it takes some time before the infant's expressive behaviors actually cluster into any nonrandom organized pattern. At 6 weeks, smiles, vocalizations, and wide-mouthed expressions were randomly distributed in time. Their likelihood of occurrence was simply expressible in terms of a stochastic parameter like B , without the additional higher probability corresponding to S , which would have produced more expressions in close proximity to the first. So there were no bursts of expressions at 6 weeks to compare with the earlier bursts of sucking. The clustering into bursts began to be seen at 3 months and was not very striking until 6 months, as shown in Figure 2, in which a straight slope in the log-survivorship function indicates a random distribution of intervals. At 3 and 6 months, especially when the infants were looking at their mothers and when the mothers' faces were actively smiling or exaggerating, the infants' expressions tended to cluster within 5 seconds of each other, to an extent significantly greater than chance (established by comparing the slopes with straight lines).

The organization of sucking is inborn, whereas facial expressions only become organized over the course of face-to-face experience, in a process that has barely begun at 6 weeks. Clearly there is an important difference between sucking and facial expressions. Sucking is specific to the baby's side of the interaction. Facial expressions are comparable in form to maternal behaviors toward the infant; in other words, imitation surely plays a role in this organization. By 26 weeks, when the infant's facial expressions have begun to cluster into dialogue-like turns, the infant has been watching and imitating for months.

Actually the clustering of an infant's behavior into runs separated by pauses does not in itself constitute turn taking. Like the burst-pause cycles in feeding, it only makes the exchange of turns easier by providing a natural point of entry for the mother. Kaye and Fogel made a similar discovery with respect to the infants' cycles of attention. At all three ages (6, 13, and 26 weeks), these cycles and the mothers' cycles of stimulation were random rather than periodic cycles. Exactly as was found with the burst-pause cycles in sucking, the probability of looking at the mother is not a function of how much time has passed since looking away from her, and the probability of looking away is not a function of time since the onset of the gaze. Similarly, the probability of a mother's beginning to produce some display is independent of the passage of time since the last display. The durations of these displays, too, are randomly distributed. This means that there is nothing rhythmic about the two partners' cycles, and thus that they cannot anticipate one another's behavior by any kind of temporal entraining.

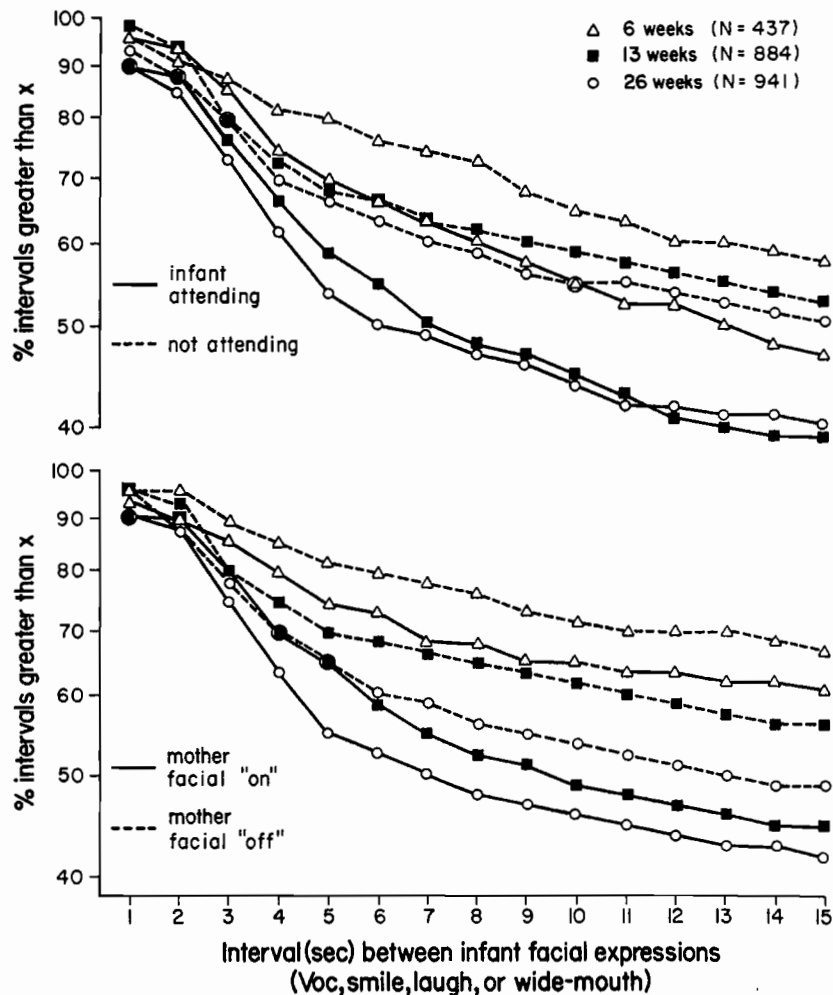


Figure 2. Log-survivorship distribution for intervals between successive facial or vocal expressions by infants, as a function of attention versus nonattention to mothers and of mothers' active versus passive faces.

Figure 3 shows how the infant's expressiveness is related to the onset of alert orientation to the mother's face, and to her greeting toward the infant. A "greeting" is defined as the first smile or other exaggerated facial expression after each one of the onsets of infant attention within the face-to-face session. The contingency functions show that at 6 weeks the mother's greeting was necessary but not sufficient to elicit a greeting from the infant. At 13 weeks, it was more effective but also less necessary than it had been at 6 weeks. At 26 weeks, it was neither necessary nor effective; spon-

taneous greetings were as likely as elicited ones. (The comparison of spontaneous and elicited contingency functions, as a function of time since the onset of attention, allows us to compare the two conditions with a common zero point (Kaye, 1982b).)

Another change over the three sessions was in the average period of the infants' cycles of attention, from about 20 seconds of attention and 18 seconds of inattention at 6 weeks, to 7.5 seconds versus 13 seconds at 3 months, to 5 seconds versus 12 seconds at 6 months. In other words, the ratio of attention to inattention declined and the rate of changes in attention more than doubled. Yet these cycles remained, as has been said, random; the change with age can be accounted for by increases in stochastic parameters just like those labeled *B* and *P* in describing the sucking cycles. As for the mothers' cycles of stimulation, they were also randomly varying cycles. Unlike the babies' attention cycles, their parameters did not change over the three sessions. It may seem odd, even a contradiction in terms, to say that mothers' displays depend upon the baby's attention and yet are random. All that is being said, however, is that the mothers' cycles are not a function of time, in the way that, for example, respiration is a function of time. The mothers' cycles are indeed contingent upon what the baby is doing, but that too is independent of time. (Time series analysis describes this as a matter of zero autocorrelation.)

Vocalizations within an adult dialogue also happen to have this Poisson-process quality (Jaffe & Feldstein, 1970). Each partner's contributions to the dialogue can be described in terms of their mean length of turn, yet the individual turns will fluctuate randomly (negative exponentially) around that mean, so time cannot be used as a cue by the partner in knowing when to take the floor. Infants do not have to learn to produce

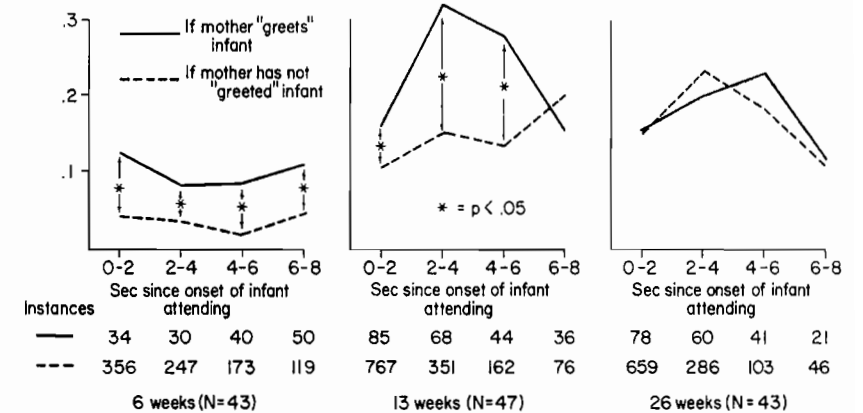


Figure 3. Contingent probability of infant greeting mother as a function of time from onset of attention to her, depending on whether she greets infant first.

arrhythmic cycles, for they are endowed with at least one at birth: the burst-pause pattern of sucking. They do have to learn to recognize signals for the exchange of turns. That is what is going on in Figure 3.

It is clearly adaptive for mothers to confine their facial displays to the time when their infants are looking at them, if those displays are for the infant's benefit. For the same reason, it is adaptive for there to be an alternation between the mother's expressions and the infant's, something like conversational turn taking, within the periods of infant attention. In fact, a mother could achieve alternation if she would always wait for the baby to take a turn (to smile, vocalize, or whatever) and only take her turn when the baby was quiet. Then, however, she would often have to wait a long time, so there would be considerable portions of the attentive period when neither of them was taking a turn (as is often the case when the baby is looking elsewhere). The maternal strategy, therefore, is to produce as much alternation as she can, but to err in the direction of synchrony rather than silence.

Synchrony takes two principal forms. One is what Duncan (1972) called "back-channels," such as "uh-huh" or a nod of the head. These are expressions that do not interrupt the other. When the infant begins to smile, the mother can mirror the smile back to the infant and even exaggerate it without interrupting the infant or attempting to take the floor. The same is true of vocalizations. In other words, these kinds of expression do not require alternation of turns in the way that verbal utterances do.

The other main form of synchrony is chorusing. The word has been used for prolonged simultaneous vocalizing (Schaffer, Collis, & Parsons, 1977; Stern et al., 1977) but applies just as well to nonvocal expressions. The mother tends to coax simultaneous behavior from the baby rather than inject simultaneous behavior into the baby's turn as is the case with back-channels. By coaxing simultaneous behavior from the baby, the synchrony is prolonged.

Anderson, Vietze, & Dokecki (1977) videotaped 3-month-olds and their mothers in 90 minutes of normal awake time not restricted to face-to-face play. Their results support the author's generalization from the face-to-face sessions analyzed by Fogel (1977) and Kaye and Fogel (1980). Anderson and co-workers found that both the mother and the infant were significantly more likely to vocalize when the other was vocalizing (that is, to interrupt the other). However, these contingencies were small compared with the differences between mother and infant. Mothers were much more likely to vocalize regardless of the infants' behavior, and infants were much more likely to stop vocalizing regardless of their mothers' behavior. If chorusing had depended on the way the infants sang their parts, there would have been no chorus.

Any time a young infant happens to do anything that can be interpreted as a turn in a conversation, adults will treat it as such. The next best

thing, however, is either to take the turn for the infant or to try to coax one out of the infant.

THE APPRENTICE

By 6 months, interactions between infant and parents move into a different phase. Because the infant attends more to objects (and has the skills with which to grasp and explore some of them), the parent is often put in the role of interpreting the infant's intentions and completing the infant's attempted actions. The author has called this specialization of the more general discourse frame the "instrumental frame" (Kaye, 1982a). In the same period, there is the "feedback frame" through which adults enhance the consequences of infants' own actions (for example, chanting "Whee!" when a baby succeeds in batting a mobile). Social interference in the object-directed activities of babies is such a commonplace occurrence that few authors have remarked its absolute uniqueness to our own species.

This parental involvement has an enormously important effect. It makes the infant's intentions shared intentions, simply by means of the parent's interpretations of infant actions. At the same time, parents are able to induce certain intentions by placing attractive objects where they are sure to elicit a reach, or by modeling certain sounds or movements over and over until the infant imitates them (Kaye & Marcus, 1978, 1981). So there is a sharing of intentions in both directions, but largely due to the structure imposed by adults. The infant acts upon various intentions without having internalized them.

By 8 to 10 months, the shared intentions are joined by a shared memory. The parent has a good idea, from experience with the infant, what kinds of events interest the infant and how he or she is likely to react. At the same time, the infant begins to acquire a one-sided memory of the meaning of certain arbitrary conventional signs. By one-sided it is meant that the infant comprehends certain words and gestures without producing them, and produces certain consistent signs (for example, a grunt and an extended hand toward an object out of reach) that the infant would not comprehend (that is, by responding appropriately) if an adult were to perform them.

The function of adults at this stage is comparable to the function of the superordinate structure within a skill. One is here comparing the *social* open system to the open systems within an individual's behavioral repertoire. In both cases, as in the organism itself, there is a hierarchical structure of subsystems serving a higher goal. Whenever a subroutine is called, something at the higher level has to serve as placeholder, pathfinder, or attention redirector, so that after the subroutine has done its job execution returns to the main program. If I stop at the post office on my way to work, it is not enough to know what to do inside the post office. Part of me must

remember that I am on my way to work and that my bicycle is parked outside. The development of sensorimotor skills can be described partly as an increasing capacity for that kind of higher order memory and attention. Bruner (1973), following William James (1890) and others, has pointed out how the mastery of subroutines frees the infant's attention for the task of coordinating and planning. At any given age, a particular skill is coordinated only to a degree, beyond which its successful execution depends upon how the objects it involves happen to be arranged. This has been observed in an analysis of the detour-reaching task at 6 months (Kaye, 1977), in the problem of finding hidden objects at 8 months (Gratch, 1975), in following moving objects (Bower, Broughton, & Moore, 1971), and so on.

When a mother dangles her necklace before her 3-month-old's hands, or a father holds a peg at just the right angle so that the plastic ring in his 10-month-old's hand fits onto it, or a grandmother takes turns with a 2-year-old at placing blocks on a tower, these adults are all taking upon themselves the functions of higher order planning, memory, and attention so as to construct complex actions out of the simpler schemas the infant has mastered. Clark (1978) gives some excellent examples, from transcriptions of his research films, of how infants' object-directed actions are transformed by their parents into conventional gestures:

Janet (age 8 months) is sitting up on the floor playing with a partly filled, plastic bottle of baby shampoo, which she seems to find very interesting.

M: "Janet, give that to mummy, darling." Holds her hand, palm upwards, toward the bottle.

J: Looks at M and then at the hand.

M: "Give that to mummy." Moves hand forward to hold the bottle.

J: Is watching the hand as it moves.

M: Pulls gently at the bottle, J having made no attempt to give it to her. "Thank you." (Clark, 1978, p. 243).

The second half of the first year, roughly speaking, is a period when most of the interaction infants engage in is dependent upon higher order structures offered to them by the social system. There is clearly intention, not only to act upon objects but also to participate in the social situation. Adult interpretations of the intentions behind infant acts are usually grounded in observable behavior (persistence toward a goal and so forth) rather than in fantasies attached to what is really random or intrinsically organized behavior. However, infants are still not governed by rules or by a planful coordination of their own acts with anticipated acts by the partner. The only partner who has a concept of the system's goals at each moment and of the roles of each partner is the parent, whereas the infant is essentially in the role of an apprentice, like a junior cobbler entrusted with stamping out soles but not yet planning and executing the whole shoe. The fully skilled craftsperson, in this case, stands ready to extend more and more responsibility as the apprentice becomes capable of taking it on.

THE PERSON

The word "person" is not to be bestowed lightly on just any human being. There is a valid distinction between person and nonperson, best characterized in terms of membership or nonmembership in social systems. The author discussed the transition to personhood in a recent book (Kaye, 1982a), arguing that mind, self, and language all coincide with this basic transition. All internalize others' expectations about the child's behavior along with conscious expectations about the behavior of those others. Mutual expectations are inherent in the use of symbols, which are reversible signs. In gesturing to another person, one anticipates the other's interpretation of the gesture, which means that one would comprehend the gesture's meaning if the other were to produce it. That is not true of the earliest signs infants learn to comprehend or produce, but from the time it becomes true, the growth of the lexicon is extremely rapid and representation is immediately reversible, making possible what is sometimes misnamed "deferred imitation."

It should be noted that the transition is gradual, and interactions remain asymmetrical for many years (Bruner, this volume; Edwards, 1978; Kaye & Charney, 1981). Parents still take the lead in managing dialogues, in channeling the child's play, and of course in planning his or her life, but the child's role is nonetheless now a membership in the system. A junior membership is different from an apprenticeship. The partner in a system, however junior, has in mind a theory of its functioning, an understanding of what is expected of oneself within it, and a self-conception that is very much an introjection of how other members see the partner. In any domain in which the infant is only an apprentice, the infant is allowed to interact with others and to profit from that interaction cognitively without having to assume a partner's responsibilities.

In the communicative exchanges of early personhood, the debt to a prior apprenticeship is as important as the continued reliance on adult leadership. Consider the "original word game" (Brown, 1958) of object-naming,

in which child and caretaker (usually mother) supply each other with names for pointed-at objects and pictures, or point out things named by the other. Typically the "game" is linguistically mediated by much more than mere object-names; it is full of questions and answers, locative and deictic expressions like "What's that?", "There it is", "That's a kangaroo", "It's a box", "It's over there", and so on. Moreover these expressions are integrated into a context of sequenced looks and gestures which are crucial to their function in the total communication setting. (D. Edwards, quoted by Lock, 1978, p. 9).

This is a social system, of which the child is a member because the child shares in a set of mutual expectations and recognizes violations of its rules. Children's acceptance of those rules means that they have been co-opted by

the pre-existing system, the community to which the parents already belong. In other words, the parent-infant system is not constructed jointly by individuals coming together in a cooperative endeavor. It is more like a two-stage asymmetrical assimilation process, in which parents first adjust to their infant's inborn rhythms, repetitive action patterns, and attentional preferences, and thereby, after a period of unwitting participation in interactive exchanges, the infant internalizes conventional gestures (symbols), subordinating autonomous action schemas to an inherently social mode of thought.

This is not the place to belabor the point. The purpose herein was only to show that the concept of system, instead of being the answer to our question, merely raises the question: How do infants become members of systems? The answer is that parents capitalize on certain aspects of the newborn organisms that, so far as we can tell, evolved for that very purpose, so as to involve the infants in social frames. These frames then facilitate the development of certain kinds of sensorimotor skills, certain kinds of representation based upon arbitrary conventional signs, and certain kinds of reversible discourse based upon the memory of mutually shared experience and mutually shared goals.

The claim that infants are not really persons until they possess language and self-consciousness may appear offensive at first. In reality it makes our theory of infancy more accurate without taking anything away from the remarkable organism that the newborn is or the remarkable interactions that infants and adults engage in during the first year of life. Neither would anyone deny that to the parents the infant is a person from birth, and well before birth. Those fantasies are not to be disparaged in comparison with the more objective image psychologists should have. For the fantasies are, in fact, part of the evolved apparatus with which parents are provided (the evolution in this case being cultural, not only genetic), so that they treat the infant as a person from the start. It is an apparatus about which still relatively little is known. It ought to be the primary focus of research for the next decade. Psychology is now becoming aware that "the amazing newborn," as the title of a recent film summarized the findings of the 1970's, has an amazing parent. Left to their own devices, infants' intrinsic amazement would not amount to much. An infant's most important innate functions are extrinsic ones.