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Development in the Food Domain

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Food selection occupies a major portion of the time of humans and yet is virtually ignored in the developmental literature. There are some problems of general interest in developmental psychology that can be successfully studied in the food domain. Some of these are discussed in this article: internalization (the development of food likes and dislikes), category formation (e.g., establishment of the edible/inedible distinction), the development of cognitive-affective linkages (disgust and contagion), transgenerational communication of preferences, and the transition to food independence at weaning.

Except for breathing and excretion, ingestion is the most pressing of needs and one of the most frequent. Ingestion and associated activities, such as food selection, engage far more choice, cognition, and acquisition of knowledge and attitudes than do the other basic biological needs. It is astonishing that something as fundamental and close to survival as eating has been so modulated and transformed by the powerful forces of culture, to the point that a great many food traditions seem far from the basic nutritional needs (but see Harris, 1985, for a counterview).

In the broadest sense, food selection involves search, selection, preparation, and ingestion of food. These activities occupy a major part of the waking day of most animals, including humans. In addition, in many cultures, food and eating are a major arena for the enactment of moral issues and social relationships. Such, for example, is the case in Hindu India (Appadurai, 1981), a culture that involves several times more people than those residing in North America. Food attitudes and preference form a substantial part of any human culture and, hence, are a major part of the corpus for socialization. One of the most significant categorizations that any animal makes, perhaps the most important, is what is edible and what is not.

Eating is an extraordinarily personal activity; it threatens the self in that it involves incorporation of material from the outside world into the self. It is affectively laden. Food is one of the primary sources of pleasure to humans. As well, in the United States, it is a frequent source of fear and distress in its role as a fattener of figures or as a carrier of carcinogens.

Psychologists have devoted little time to studying food selection, either in adults or in children. Most introductory psychology texts spend many pages on energy regulation, obesity, and thirst and do not even mention the problem of food selection. Of the 100 articles that appeared in the 1987 issues of Developmental Psychology, only 1 concerned food, and it was about the consequences of breast feeding versus bottle feeding. It is hard to account for this neglect. The powerful role of culture, a force not favored by psychologists, may have discouraged investigation, and a fascination with body form and weight and problems of regulation may have deflected interest that would otherwise have been directed at food selection.

The Problem of Food Selection

Omnivorous animals like humans, rats, and cockroaches have an enormous advantage: They can accept a wide range of foods. But this comes with a serious risk, the possibility of ingesting toxic foods or imbalanced diets (Rozin, 1976). On the basis of external sensory information, there is no way of predicting with any kind of certainty whether any of a wide range of objects in the environment is non-nutritive, toxic, nutritive but lacking in essential nutrients, or a complete food. The univore solution to this dilemma is for a species to feed on one or a few types of foods (e.g., just insects or just eucalyptus leaves). This food recognition can be genetically programmed. At the other extreme—the general herbivores or omnivores, including humans—it is necessary to learn what is edible and what is not and what can be eaten with what and in what amounts. Corn is a good but incomplete food; it is very low in a few essential amino acids. If corn is eaten with beans, the profile of essential amino acids is good and protein needs can be met. The corn-bean combination forms the heart of Mexican cuisine. At some point, certain humans discovered this adaptive combination.

Because adequate food selection is so close to survival for omnivores, the problems of distinguishing edible from inedible items, avoiding toxins, and eating an appropriately balanced diet must be solved early. Humans and other mammals have a brief period of respite as univores living on an excellent, totally adequate food: milk. But the young mammal, having abandoned mother's blood and then mother's milk as sources of nutrition, must make its way in the incredibly complex world of objects, any of which can be edible or harmful. Humans, at least, have cultural guidance. More and more, we find that other mammals also learn about foods from conspecifics (Galef, 1988), although there is no evidence that there is explicit, intentional teaching about food in any species but our own.

Learning about what is edible—and in what culinary and other contexts—is one of the most important and complex chal-
lenges that face a young child. Furthermore, it generates one of the most persistent parent-child problems in early life: In the age range of 2-5 years, one of the most common complaints by parents is that their children eat a very narrow range of foods (Bakwin & Bakwin, 1972; Pelchat & Pliner, 1986). The nutritional risks of an almost exclusively peanut butter/milk/cookie diet may be exaggerated. However, the parent-child conflict produced by fighting over food may extend well beyond the food domain and affect the parent-child relationship.

Adaptive Food Selection in Humans

It is possible that we survive by blundering through, eating this and that and getting a reasonable diet that is balanced and low in toxins, simply by sampling widely and spreading the risk. Knowing the perils of nature and the very high level of toxins in many natural potential food sources, especially leaves, this seems unlikely. It may work for cockroaches, who produce a great many offspring, but the value of individual lives in preserving a line of descent is very high for humans and most other mammals. In fact, as shown most clearly in the classic work of Richter (1943), rats faced with a choice of a variety of pure nutrients self-select an adequate diet and show growth at least as good as do rats fed a chow diet created by animal nutritionists. Furthermore, when the rats are thrown out of nutritional balance by imposed deficiencies in sodium, calcium, or other nutrients, they tend to modify their selection adaptively. We have two "models" for how this might occur (Rozin, 1976b). One is innate recognition of a needed nutrient, with sodium as the prototypical case. The other is a general ability to learn to eat what makes one better, or to avoid what makes one worse. There is strong evidence for both innate and learned models, but neither can account for maintenance of nutritional balance on a cafeteria in the absence of any prior or current deficiency. With respect to learning, it is not clear what effects of eating specific nutrients in a nondeficient animal would support acquisition. Richter's cafeteria findings in need-free rats might result from the ease with which one can prosper on a cafeteria composed of benignly selected nutrients by just consuming from all sources (Galef & Beck, in press; Rozin, 1976b), or they might involve innate or acquired preferences that we do not currently understand.

Davis (1928, 1939) performed classic food-selection experiments on a group of human infants. These infants began a total self-selection regime just after weaning and had minimal if any prior experience with any food other than milk. Davis reported that the infants thrived. The mechanisms are unclear, and it is quite likely that, given the highly nutritive food sources offered (milk, fruit, vegetables, meat, and grains) and the absence of extra sweeteners or elaborate preparations, a broad semirandom selection would do. It is notable that the two favored foods in these studies, milk and fruit, were also the two sweetest foods (Davis, 1928; Rozin, 1976b). The upshot of this work is that we do not know the extent to which the human infant is capable of detecting nutrient deficiencies and recognizing the appropriate foods. It is likely that there is such a mechanism for sodium (Beauchamp, Bertino, & Moran, 1982; Wilkins & Richter, 1940), and others may exist as well.

Humans (and rats) require many different nutrients. For any nutrient for which there is a significant chance for a deficiency or harmful surplus to develop, one would expect some sort of system of regulation or limits. In order to accomplish this, one would need two components: an ability to detect a deficiency (or surplus) and a way of recognizing those items in the environment that could correct the imbalance (Rozin, 1976b).

The evidence to date, for rats and probably for humans, is that there are innate regulatory systems that indicate deficits in sodium, water, and energy. In addition, there are perceptual recognition systems that correspond to these systems. The taste of sodium is innate enhanced in desirability by sodium deficiency; a taste for sweets (correlated with calories) may be innately enhanced by energy deficiency; and a taste for water may be innately enhanced by water deficiency (Strickler & Sterritt, 1967). There may be other such systems, particularly for protein (Deutsch, Moore, & Heinrichs, 1989) or fat, but the data are not definitive. For the other nutrients, there seems to be neither a tight regulation nor an innate recognition system. Rats, and presumably humans, can learn to avoid foods whose ingestion is followed by illness and to prefer foods whose ingestion is followed by recovery from illness or improved well-being (Garcia, Hankins, & Rusiniak, 1974; Rozin, 1976b).

There are other important mechanisms in food choice. One is a tendency to be suspicious but interested in new foods (Barrett, 1963; reviewed in Rozin, 1976b). A related adaptation is a tendency to vary food choice, manifested as avoidance of monotony or sensory specific satiety (Rolls, Hetherington, Burley, & van Duijvenvoorde, 1986). Ingesting a variety of foods makes it more likely that a balanced diet will be selected and minimizes the possibility of ingestion of high levels of any specific toxin.

Adult Classification of Edibles and Inedibles

Every adult in every culture has a set of attitudes toward objects in the world as to their appropriateness and desirability as food. The acquisition of this categorization and the assignment of objects to appropriate categories may be a major feature of food enculturation. Fallon and I (Fallon & Rozin, 1983; Rozin & Fallon, 1980) have explored these attitudes in American adults, using a combination of questionnaires and interviews. We believe that there are three basic reasons for accepting or rejecting potential foods. Each of these (Table 1) in one form motivates acceptance and in the opposite form motivates rejection. The three reasons are reviewed here.

Sensory-affective factors. Some items are accepted or rejected because of liking or disliking for their sensory aspects: taste, smell, and, to a lesser extent, appearance. Items accepted primarily on such grounds are good tastes, whereas those rejected on such grounds are distastes. Most commonly, when we say we like or dislike a food, we are referring to sensory-affective factors. Individual differences in hedonic responses to particular sensory-affective factors probably account for most within-culture variance in food preferences (e.g., liking for hot pepper, lima beans, beer, and yogurt; Schutz & Judge, 1984).

Anticipated consequences. Some items are accepted or rejected primarily because of beliefs about the consequences of ingesting them. These may refer to rapid effects such as satiation, nausea, or increased social status or to more delayed
effects such as increased risk of contracting cancer or gaining weight. Items rejected because of negative anticipated consequences are called dangerous, whereas those accepted because of positive anticipated consequences are called beneficial.

**Ideational factors.** Some substances are rejected or accepted primarily because of our knowledge of what they are, their origins or their symbolic meanings. Ideational factors probably play a modest role in food acceptance and a major role in food rejection (because most rejected items, such as paper, stones, and leaves, are just not food). There are two distinct categories of ideational rejection: (a) inappropriate and (b) disgusting.

Inappropriate items are considered inedible and, hence, are refused. They account for most items in the world: sand, paper, bark, grass, and so forth. These items may or may not be viewed as bad tasting or dangerous. They are inoffensive. The primary reason for rejection is that they are not considered to be food. Most culturewide rejections seem to fall into this category.

Disgusting items are also rejected on ideational grounds, but they are considered offensive. They have a strong negative sensory–affective loading and are likely to elicit nausea. They are so offensive that they are contaminants: If they touch an edible food, they tend to render it inedible. Disgusting items (Table 1), unlike other categories of items, are heavily loaded on two dimensions in our taxonomy. Almost all disgusting items are animals or animal products, with feces as the apparently universal disgusting substance (Angyal, 1941; Rozin & Fallon, 1987).

This taxonomy is a simplification. Most rejections and acceptances are motivated by reasons that fall into more than one category. Thus, milk is good tasting and beneficial; cockroaches are disgusting but also may be dangerous. Nonetheless, some items fall pretty well within a single category; that is, there is a primary reason for accepting or rejecting them.

**Some Basic Issues in the Development of Food Selection**

In the remainder of this article, I consider a set of issues in food selection that have developmental implications. Over the past decade, these issues have been studied by myself and my colleagues.

**Transition to Adult Food Habits**

In its most elemental form, the mammal receives its nutrient originally from placentially delivered blood, next, and abruptly, from maternally delivered milk, and finally, more gradually, from the range of foods eaten by adults. The weaning process is often thought to be one of the major life transitions, with implications for many aspects of personality and adjustment. In addition to the broad implications of this food-related happening (of course, weaning is much more than a shift in nutrition; see Galef, 1981), it raises some basic problems in the more localized food domain. How does the young omnivore select foods after weaning? In the case of humans, food selection occurs with careful attention of elders, ready to instruct on proper eating. In the case of other animals, the evidence is that much may be learned from older animals, although specific instruction (teaching) seems to be absent (Galef, 1988).

There are two sides to weaning, with respect to food habits. One is to adjust to independent living and, hence, to explore and learn about new foods. The other is to shed food attachments from the nursing period. For mammals other than humans, and for humans prior to the domestication of animals, milk is a food that is available only in infancy. It would be maladaptive for a young mammal to set out in search of milk, a special and favorite food, after weaning, because it is unavailable in nature. Rozin and Pelchat (1988) have considered this problem within an adaptive framework and have argued that there are a number of adaptations that promote an easy transition by reducing the attractiveness of milk. First, data from both rats and humans indicate that lactose, the unique milk sugar, is particularly unsweet and unpalatable (Moskowitz, 1971; Richter & Campbell, 1940; reviewed in Rozin & Pelchat, 1988). Furthermore, for rats at least, milk protein (primarily casein) may also be unique in a negative way; although rats who are protein deficient will selectively consume a variety of proteins, they do not show a preference for milk protein (Deutsch, Moore, & Heinrichs, 1989).

Second, lactase, the enzyme that digests lactose, drops to very low levels at about the time of weaning for all mammals except a small subset of lactose-tolerant humans. This drop is under genetic control (Johnson, Kretchmer, & Simoons, 1974; Simoons, 1969, 1970). Rats and most humans may learn to avoid milk toward the end of weaning, when lactase levels are very low, because the ingestion of substantial amounts of milk produces discomfort in the lower gastrointestinal system (Lieberman & Lieberman, 1978; Rozin & Pelchat, cited in Rozin,
There is evidence from both rats (Pelchat, Grill, Rozin, & Jacobs, 1983) and humans (Pelchat & Rozin, 1982) that avoidances of milk are acquired in lactose-intolerant individuals. These are not food aversions; that is, milk becomes more of a dangerous than a distasteful substance.

Third, although milk is regularly associated, during nursing, with parental attention, warmth, and satiation, the development of any preference based on these associations may be prevented by blockage of conditioning during the early suckling period. Much recent research indicates that suckling engages a different ingestional system than does the adult form of ingestion (Hall & Williams, 1983). In particular, Martin and Alberts (1979) have shown that infant rats fail to learn aversions to flavors included in milk while they are sucking. This nipple protection effect disappears in the 3rd week of life, when the weaning process begins. The net effect of nipple protection and its disappearance may be to reduce the learned preference for milk early in nursing and to facilitate development of an avoidance as milk becomes indigestible.

There are two additional adaptations that, although not specific to milk and weaning, act to reduce the preference for milk. One is that omnivorous or generalist mammals tend not to develop strong preferences for foods. Laboratory experiments indicate that preference acquisition is usually a slow and modest-sized process, in contrast with the rapid acquisition of aversions (reviewed in Rozin & Kalat, 1971). This adaptation makes sense; an omnivore would be ill advised to specialize on a particular food. Second, early food imprinting does not seem to occur in mammals or in omnivorous animals, as well it should not. There is no convincing evidence for a primacy effect, that is, a greater influence of earlier as opposed to later exposure to a food among omnivorous animals. The lack of imprinting and primacy would both operate to reduce a milk preference (reviewed by Rozin & Pelchat, 1988).

In spite of all of these factors, milk seems to be quite palatable to house pets and is one of the favorite foods among lactose-tolerant people of northern European stock (Peryam, Polemis, Kamen, Eindhoven, & Pilgrim, 1960). Data are not available from the vast majority of humans, who, like our ancestors and all mammals, are lactose intolerant.

**Edible/Inedible Distinction**

The edible/inedible distinction is surely one of the most biologically significant of all distinctions, ranking with the recognition of one's own species. The costs of errors are great, and yet with the genetic specification of edible entities in generalists and the highly restricted food experience of the nursing mammal, the problem seems almost insurmountable. There is significant social information arising largely passively from conspecifics (Galef, 1988) in nonhumans. In the case of humans, there is extensive social guidance. And well there must be, because it seems that the human infant below 2 years of age is inclined to mouth almost any object that it can physically place in its mouth. Davis (1939) has reported that in the cafeteria regime, her postweaning infants mouthed everything, including silverware. Rozin, Hammer, Oster, Horowitz, and Marmara (1986) offered children ranging from 1 year 6 months to 5 years of age a variety of items in a food context. The items included normal foods, inedible items (spoon, paper), items offensive to adults (e.g., a whole dried fish, human hair, imitation dog feces), and dangerous items (imitation liquid soap). Children under 2 years of age were inclined to place almost all of these items in their mouths, hair being the major exception. By 3 years of age, many items rejected as inedible by adults were also rejected by the children. These results suggest that one of the major things that children learn about food in the first years of life is what is not food. There is much to be learned about how children, particularly those in traditional cultures, safely negotiate these early years, with substantial risks of ingesting toxins, sharp objects, and the like. Indeed, adaptively speaking, it is puzzling that even given the presence of parental guidance, young children are so willing to mouth strange objects. Studies of the development of the edible/inedible classification would certainly be in order.

**Context and Acceptability**

Context is a major factor in the interpretation of all behavior. Culinary systems are made up, in large part, of rules about appropriate contexts for eating foods. A major part of the acquisition of culture with respect to food involves learning these contextual rules. One critical contextual element is time, the taking of meals and the customs concerning appropriate foods at particular meals or times. These may well be acquired piecemeal. One major contextual constraint for eating in American culture is the limitation of certain foods to the breakfast context. Birch, Billman, and Richards (1984) reported that preschoolers are already aware that certain foods are only appropriate at breakfast.

A more pervasive set of contextual constraints concern combinations of food. Much culinary knowledge deals with what foods are served or mixed together. It appears that American preschool children hold to the charmingly simple view that if they like A and they like B, then they will like A + B, even when A is meat and B is whipped cream or chocolate (Rozin, Fallon, & Augustoni-Ziskind, 1986).

**Intrinsic Value and Food: Getting to Like and Dislike Foods**

The issue of intrinsic value, or internalization, is fundamental in developmental psychology. Much of the research in this area centers on moral values, certainly a central issue for humans. However, much of internalization relates to preferences, and among these, food is of particular importance. The distinction here is between consuming a food because of costs or consequences of ingestion (its price, availability, certain strictures, and anticipated consequences) and consuming it for its own sake, that is, because it tastes good (Rozin, 1982, 1984; Rozin & Fallon, 1980). As indicated in the preceding discussion of classification of foods by adults, foods that fall in the former category are called beneficial (like medicines) and those that fall into the latter category are called good tastes. The parallel distinction on the negative side generates foods that are avoided but not disliked (dangerous entities) and those that are disliked (distastes). For example, people with shellfish allergies (shellfish
in the dangerous category) usually like shellfish and would return to eating them if they were assured that they would no longer have an allergic reaction. On the other hand, people who have an aversion to shellfish because they got food poisoning, with associated nausea and vomiting after consuming them typically dislike the taste of shellfish, even though they know that shellfish would not normally make them sick (Pelchat & Rozin, 1982). A critical variable that causes a change in intrinsic value in the aversion situation is nausea (Pelchat & Rozin, 1982). For acquired likes, social factors seem to be the predominant forces (Birch, 1987; Rozin, 1988). Empirical work, largely by Birch (reviewed in Birch, 1987), indicates that perception by a child that a respected other likes a food seems to foster liking. This finding fits well with the research of Lepper (1983) and Deci and Ryan (1985), suggesting both the importance of social valuation in the maintenance of intrinsic value and the destructive effect of coercion or apparent compliance. Although most of the nonfood research has been directed at the loss of intrinsic value, a good part of the food research has focused on the creation of likes.

Birch and her colleagues (e.g., Birch, Birch, Marlin, & Kramer, 1982) have also shown the operation of the overjustification effect in the area of food preferences; rewarding a child for consuming a food tends to reduce the preference for it below baseline after rewards cease. Although American parents seem aware of the inefficacy of rewarding ingestion of a specific food in order to increase the preference of that food, they are unaware of the virtue of using a target food as a reward in order to enhance liking (Casey & Rozin, 1989).

The predominance of social factors and the overjustification effect fit well with the natural history of acquisition for liking for chili pepper by children in Mexico (Rozin & Schiller, 1980). The critical factor seems to be participation by preschoolers in a family meal context in which the older members clearly enjoy the chili pepper, and in the absence of specific rewards for consuming piquant foods.

**Preference Transmission Across Generations: The Family Paradox**

Considering all of the people in the world, common sense suggests that the most informative single piece of information that would predict food preferences is culture or ethnic group. Surprisingly, there is no other piece of information that accounts for much of the within-culture variance (Rozin, 1984, 1988). All models of preference acquisition, from mere exposure through social influence, point to the parents as the main vehicle of culturewide preference transmission because they dictate the foods offered, create the context within which the foods are consumed, and are the main source of social exchange at mealtime. Assuming this to be true, one is led to the prediction that a good portion of within-culture variance in food preferences should be attributed to family factors as well. The particularities of a family's preferences would be communicated in the same way as the culturewide preferences. However, a series of studies have reported zero to low (approximately .3) correlations between food preferences of the parents and their children (Birch, 1980; Pliner, 1983; Rozin, in press; Rozin, Fallon, & Mandell, 1984). This surprisingly weak relation appears whether the offspring subjects are young children or young adults and whether preferences are determined by ratings of offered foods or verbal reports. This is the family paradox; the family is very likely to be a powerful force for instilling culturewide preferences, but a very weak one for instilling family-specific preferences. One explanation for the paradox is that the child receives a totally consistent message from both parents and all others with respect to culturewide food preferences. On the other hand, although there is some concordance between parents on preferences varying within culture (Price & Vandenbergh, 1980; Rozin, Fallon, & Mandell, 1984), parents will often be discordant on particular preferences. Hence, the low parent-child correlations might result from mixed messages. A first evaluation of this possibility indicates a modest increase in midparent-child food preference correlations when parents are congruent on the preference (Rozin, in press).

The paradox is deeper yet. The mother has a special role in the food socialization of her children. The nursing process provides a powerful mother-child linkage. Furthermore, even in most modern cultures, the mother handles most of the food preparation and child feeding. Hence, one would reasonably predict that the mother's food preferences should correlate more highly than the father's with the preferences of their children. This obvious prediction is not consistently supported by the data. Four articles have reported no difference between mother-child and father-child correlations (Burt & Hertzler, 1978; Pliner, 1983; Pliner & Pelchat, 1986; Rozin, in press) and two have found a slight effect favoring the mother (Birch, 1980; Rozin et al., 1984). There is a possible explanation for this anomaly. Mothers may be more influenced by the father's food preferences than by their own in making food purchases (Burt & Hertzler, 1978; Weinberger, Archer, Healy, & Matarazzo, 1985). Insofar as parents induce preferences by providing exposure to particular foods, the father might have a greater influence. However, insofar as parent's emotional displays while consuming foods are critical, one would still expect a dominant role for the mother. Much needs to be done to clarify these murky waters.

**Disgust**

Rozin and Fallon (1987; modified from a definition by Angyal, 1941) defined disgust as "revulsion at the prospect of (oral) incorporation of an offensive object. The offensive objects are contaminants; that is, if they even briefly contact an acceptable food, they tend to render that food unacceptable" (p. 23). The category of disgust, substances rejected as offensive on ideational grounds, is not present in the first year or two of life (Rozin, Hammer, Oster, Horowitz, & Marmaros, 1986). In the 16-29-month age range, the average subject accepted (put in his or her mouth) 35% of four adult disgust items. It is not until the age of 3-6 years that children come to reject decay odors, one of the hallmarks of disgust substances (Petö, 1936; Stein, Ottengberg, & Roulet, 1958). Given that feces is the universal disgust (Angyal, 1941; Rozin & Fallon, 1987), it is natural to assume that toilet training is the focal event in the origin of disgust. However, full-blown disgust, which by our definition includes rejection of food on ideational grounds (its origin or nature), a sense of offensiveness, and contamination properties,
does not appear until about age 7, way beyond the period of toilet training (Fallon, Rozin, & Pliner, 1984; Rozin, Fallon, & Augustoni-Ziskind, 1985, 1986; but see Siegal, 1988, for evidence of an earlier age of onset).

Disgust is a powerful emotion and an excellent example of the acquisition of values; the disgust response to potential foods is surely the strongest negative emotional response to foods. It would seem to be an ideal situation in which to explore the mechanisms of internalization. The minimal data available suggest that distaste is an innate negative category, illustrated by the innate rejection of bitter tastes. The distaste expression seems to be identical to the disgust face, but we await a more careful analysis. A danger category seems to emerge before a clearly differentiated disgust or inappropriate category (Rozin, Fallon, & Augustoni-Ziskind, 1985, 1986). Although disgust items are rejected by many children at the beginning of the second year of life, this rejection does not appear distinctively different from danger or distaste. Two critical features of disgust, the ideational base of offensiveness and the contamination response, do not appear until after 6 years of age (Fallon et al., 1984; Rozin & Fallon, 1987; Rozin, Fallon, & Augustoni-Ziskind, 1985, 1986; but see Siegal, 1988).

Contagion and Contamination

Contamination is illustrated by rejection of a good food that has made contact with a disgusting entity. In a more general framework, this effect is an illustration of the sympathetic magical law of contagion (reviewed in Rozin & Nemeroff, 1990). This law, explicated by James Frazer (1890/1959) and Marcel Mauss (1902/1972), holds that when two things make contact, their properties are exchanged and they may be permanently affected. The effect may be summarized as "Once in contact, always in contact." This and other laws of sympathetic magic were proposed as fundamental beliefs of members of traditional cultures. It has been demonstrated (Rozin, Millman, & Nemeroff, 1986; Rozin, Nemeroff, Wane, & Sherrod, 1989) that contagion is operative as well in the beliefs and attitudes of educated American adults as, for example, in their rejection of a food that has contacted a cockroach, or a sweater that had been worn by a disliked person, or in the enhanced value of an item of clothing that had been worn by a loved one. Each of 140 adult subjects surveyed in a questionnaire showed some instances of contagion beliefs (Rozin et al., 1989).

Although children reject prototypical disgust substances by the time they are 2 to 3 years of age, the contagion feature of disgust is absent until about 7 years of age. In one study (Fallon et al., 1984), illustrated stories were presented to children in the 4- to 10-year-old range. In each story, a different negative object (e.g., a piece of poison, a live grasshopper, a piece of dog feces) falls into a favorite beverage. The beverage is then progressively decontaminated; first, the offending entity is removed; second, the beverage is spilled and the glass refilled with fresh beverage; and third, the second step is repeated, but the glass is washed three times with soap and water before being refilled. Children indicate their willingness to drink the beverage at each stage by pointing to one of a series of cartoon faces, varying from happy to sad in appearance. Although children below 6 or 7 years old dislike the disgust entity (grasshopper or dog feces) and usually dislike the beverage when the disgusting item is in the beverage, they do not dislike the beverage when the contaminant has been removed. These results were confirmed in two other studies. In one study (Rozin, Fallon, & Augustoni-Ziskind, 1986), acceptability was determined by verbal report of willingness to drink from the top of a glass of juice that had a tiny piece of a disgusting or dangerous entity in the bottom. In another (Rozin et al., 1985), a sterilized, real fly or an apparently unused comb were introduced into a glass of juice; again, children under 7 years of age typically drank the juice after the offending entity was removed.

A recent modified replication of the study, in which actual disgust objects were introduced, indicates that rejection because of contamination may occur in children as young as 4 years of age (Siegal, 1988). This study used a somewhat different procedure and used Australian subjects, but these differences do not seem to account for the discrepancy in reported age of onset of a sensitivity to contamination. The problem awaits further study.

All of the examples of contagion that I have discussed deal with disgusting or dangerous items. It is possible that positive contagion (e.g., enhancement of the value of a food prepared or bitten by the mother) may have a different developmental trajectory and might develop before negative contagion. In addition, one often hears anecdotes about young children who will not eat a food if it touches a food they dislike or who become very attached to a particular blanket or other item because of past contact with it and will accept no others (even when the parents search for an item with the same appearance). Either of these cases could be examples of contagion in young children.

Contagion does not seem to be a primitive or infantile idea. Some reflection on what is presumed in the contagion belief suggests that contagion is a sophisticated belief. There is usually no visible, and often no sensory, record of contagion. It is the history of an entity that is critical in determining current attitudes to it. Contagion is based on the idea that appearance is not equal to reality, a point of view that is not typical of the preschooler (Flavell, 1986). Contagion as an articulated belief may require some conception of invisible entities that are exchanged at the time of contact. Invisible entities such as tiny particles may not be within the conception of preschool children (Smith, Carey, & Wiser, 1985). In short, contagion is an idea that is universal. It is prevalent in adults in traditional cultures but is also clearly present in American adults and presumably adults in other western/developed cultures but absent in young children in these cultures. Particularly because contagion ties into ideas about illness, it seems like a worthwhile focus for further study.

Conclusions

The main thrust of this article is to call attention to the importance of food, eating, and food selection in the wider social sphere, in both development and adult function. Food is at the center of infant life and infant–mother relations and retains a central role in daily life. Many of the problems that come up in the study of food, such as internalization and category formation, are among the most fundamental in psychology and, par-
particularly, in developmental psychology. Because eating is a central, public, and affectively laden human activity, the domain of food selection is particularly appropriate for the exploration of some of these fundamental psychological issues.

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Received November 20, 1988
Revision received July 1, 1989
Accepted October 5, 1989