

SKIM ME THROUGH
DON'T WORRY ABOUT RESULTS SECTION

A Perspective on Disgust

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We approach disgust as a food-related emotion and define it as revulsion at the prospect of oral incorporation of offensive objects. These objects have contamination properties; if they even briefly contact an otherwise acceptable food, they tend to render it inedible. Drawing on sources from many cultures, we explore the implications of this perspective on disgust. Some of the issues we consider are the nature of the objects of disgust and why they are virtually all of animal origin, the meaning of oral incorporation, the "belief" that people take on the properties of the foods they eat, and the nature of the contamination response and its relation to the laws of sympathetic magic (similarity and contagion). We consider the ontogeny of disgust, which we believe develops during the first 8 years of life. We explore the idea that feces, the universal disgust object, is also the first, and we examine the mechanisms for the acquisition of disgust. We recommend disgust as an easily studyable emotion, a model for cognitive-affective linkages, and a model for the acquisition of values and culture.

Disgust has been recognized as a basic emotion since Darwin (1872/1965). Like other basic emotions, disgust has a characteristic facial expression (Ekman & Friesen, 1975; Izard, 1971), an appropriate action (distancing of the self from an offensive object), a distinctive physiological manifestation (nausea), and a characteristic feeling state (revulsion). With these impeccable credentials, it is surprising that disgust is hardly mentioned in introductory psychology texts or texts on social psychology or motivation. No doubt this is because, apart from the study of the characteristic facial expression, there has been very little research on disgust (see Izard, 1977, for a review).

Disgust as a Food-Related Emotion

In this article, we elaborate a perspective on disgust that takes as its starting point a more circumscribed view of the emotion than is implied by the definition above. We define disgust as a food-related emotion and focus our definition not on its expression but on the properties of the organism-object interactions that elicit disgust. Our definition is as follows:

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.

We use the word *disgust* here to mean this more narrow definition and the phrase *traditionally defined disgust* to convey the broader conception. Our definition includes only a subset of the phenomena that fall under the traditional definition (see Izard, 1977; Tomkins, 1963). This subset has the characteristic facial, behavioral, physiological, and feeling properties mentioned in the first paragraph. It is our belief (to be defended below) that our construal of disgust isolates the core and the origin of the emotion. Even if this is not true, however, this article serves to elaborate one important aspect of disgust and of food rejection.

We believe that the study of disgust (in our sense) promises to illustrate and illuminate some traditional problems in psychology (e.g., the linkage of affect and cognition) and to direct attention to some unappreciated aspects of human psychology (e.g., the principle of contamination and other aspects of sympathetic magic), and that it represents a fertile area for the exchange of ideas between anthropologists and psychologists.

Our food-related definition is not unprecedented. Darwin (1872/1965) writes that disgust, "in its simplest sense, means something offensive to the taste" (p. 256). Plutchik (1980) treats disgust as "getting rid of something harmful that has already been incorporated. It may take two forms, such as expelling feces or vomiting" (p. 144). In the classic paper on disgust, Angyal (1941) defines disgust as avoidance of oral incorporation of a certain substance. These substances are identified as waste products of the human and animal body. Our definition derives from Angyal's.

The argument for an oral and food focus for disgust comes from a number of quarters. The word itself, *dis-gust*, means "bad taste." The most distinctive aspects of the universal disgust facial expression, which is elicited by many things other than potential foods, are a closing of the nares and opening of the mouth (Ekman & Friesen, 1975; Izard, 1971). Gaping is some-

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times a part of the response. Therefore, the most active parts of the face are those involved in food detection and rejection. The nostril closing serves to cut off an odor input, and the gaping causes the contents of the mouth to dribble out. The gape is seen characteristically in human infants presented with a bitter stimulus (Rosenstein & Oster, in press; Steiner, 1974) and in rats exposed to bitter tastes (Grill & Norgren, 1978). In short, the facial gestures of disgust serve to reject foods. Finally, nausea, the most characteristic physiological manifestation of disgust, is a gastrointestinally based stimulus, most directly associated with the consequences of ingestion. A major effect of nausea is to discourage further ingestion.

Our definition of disgust does not include all food rejections, but rather delineates a particular type of rejection that we discuss below. Following our explication of food rejection, we explore and expand upon the critical terms in our definition of disgust. We first consider *oral incorporation into the self* and discuss the significance of both incorporation and the conception of the self. Next, we examine the term *offensive object* and consider theories that attempt to account for the set of objects that elicit disgust. Then we consider the third critical term in our definition, *psychological contamination*, and relate this to the laws of sympathetic magic. Having completed an explication of the definition and its implications, we briefly consider the opposite of disgust and the phylogeny of disgust. Finally, we consider the ontogeny of disgust and the way in which this potent set of cultural values is transmitted across generations.

Disgust as a Type of Food Rejection

By our definition, disgust is that form of food rejection which is characterized by revulsion at the prospect of oral incorporation of an offensive and contaminating object. But in the context of distinctions between types of food rejection, some important aspects of disgust overlooked in this definition become salient. Furthermore, appreciation of some fundamental aspects of the development of disgust depend on distinguishing it from other types of food rejection. To this end, we discuss a psychological taxonomy of food rejections.

Based on interviews, responses to questionnaires, and common sense, we (Fallon & Rozin, 1983; Rozin & Fallon, 1980) have formulated a psychological classification of food rejections. It is based on three possible motivations for rejection (see Table 1).

The first is sensory-affective, the belief that the relevant object has negative sensory properties. Usually this means that it has a bad taste or odor. The second is the anticipation of harm following ingestion. This could be bodily harm, occurring either rapidly (e.g., stomach cramps) or after a long interval (e.g., cancer). The harm can be social, such as degradation of social status (as in public consumption of a "lower-class" food, acceptance of foods handled by a member of a lower caste in India, or ordering a very cheap wine at a fancy restaurant). The third type of motivation for rejection is based on ideational factors. This means knowledge of the origin or nature of the food, illustrated by the rejection of a grasshopper just because it is a grasshopper.

Motivation by either sensory-affective factors or anticipated consequences accounts for all or almost all nonhuman food re-

jections. Ideational motivations are certainly fostered by culture and may be uniquely human. They account for a substantial portion of human rejections.

We (Fallon & Rozin, 1983; Rozin & Fallon, 1980, 1981) have designated four types of food rejections on the basis of different combinations of these three motivations (Table 1, top). Each type of rejection listed below also designates a class of items that elicit it.

1. *Distaste* is a type of rejection primarily motivated by sensory factors. The focus is on bad taste and/or smell but may include texture or appearance. In a "pure" case, the substance is not thought to be harmful or undesirable on ideational grounds. Such rejections usually involve foods accepted as edible within the culture, and they account for most within-culture individual differences in food preferences. Examples of distastes in American culture (for those who dislike them) include black coffee, chili pepper, broccoli, or lima beans.

2. *Danger* is a type of rejection primarily motivated by anticipated harmful consequences. Some of these are culture-wide or even universal (e.g., poison mushrooms); others are more individualized (e.g., allergenic foods).

3. *Inappropriate* is a type of rejection primarily motivated by ideational factors. These are items not classified as foods in the culture, and they include most things in the world: cloth, paper, rocks, tree bark, sand, grass, and so on. The full list is culture dependent. Inappropriate items are typically of minimal nutritional value and are almost always inorganic matter or plant or plant products. There is not a strong affective response to them as foods, and they are usually not thought to be particularly bad tasting.

4. *Disgust* is a type of rejection primarily motivated by ideational factors: the nature or origin of the item or its social history (e.g., who touched it). Unlike inappropriate items, disgusting items have offensive properties, with the result that there is a presumption that the item would taste bad.¹ Thus, disgusts are negatively loaded on both sensory-affective and ideational motivations. Disgusting items have the capacity to contaminate and are usually animals or animal products, with feces being a

¹ The notion that disgusting items taste bad may be problematic. Whereas most people have never tasted most things they find disgusting, they are convinced that these substances would taste bad. Of course, *bad* refers not to sensory properties but to their interpretation of them. Thus, even if ground dried cockroach tasted just like sugar, if one knew it was cockroach, this particular sweet powder would taste bad. This claim for the inseparability of taste and disgust is arguable; some of our subjects claim that they can separate the two. The claim is illustrated by a hypothetical situation (supported by some informal observations) of a man sniffing decay odors from two opaque vials. The man (who likes cheese) is told that one vial contains feces, the other cheese. Unknown to him, however, the same decay odor emanates from both (the real odors are in fact confusable). The man is then asked to sniff a vial and try to distinguish between the two substances. If he thinks it is cheese, he likes the smell. If told the odor is in fact from feces, though, he suddenly finds it repellent and unpleasant. It is the subject's conception of the object, rather than the sensory properties of the object, that primarily determines the hedonic value. Although certain strong negative tastes (e.g., bitter tastes) may not be reversible by manipulation of the object source or context, we suspect that any positive taste can be reversed by contextual or object information.

Table 1
Psychological Categorization of Food Rejections

Item	Rejection Category			
	Distaste	Danger	Inappropriate	Disgust
Motivation				P
Sensory-affective	P			
Anticipated consequences		P		P*
Ideational		P*	P	P
Disgust attribute				
Oral incorporation discomfort	P	P	P	P
Offensive		P*		P
Contamination				P
Facial expression	P			P
Nausea	P*			P

Note. P = present. Upper part modified from Fallon and Rozin (1983).
* This motivation or attribute holds in some but not all cases of the category in question.

universal disgust object among adults (Angyal, 1941; Rozin & Fallon, 1981).²

The description of disgust as a food rejection category overlaps with, but is not identical to, our working definition of disgust. The mix of ideational and bad taste motivations is captured in the term *offensive* in our general definition. As we will show, some of the features of disgust that distinguish it from other emotions do not uniquely delineate it among food rejections (Table 1, bottom). We will consider some of these features.

The focus on oral incorporation distinguishes the emotion of disgust from all other emotions. However, all four types of food rejection involve oral incorporation, although the degree of focus on oral incorporation varies across rejection categories (Fallon & Rozin, 1983). Distasteful items are undesirable primarily when in the mouth (or in some cases, when close enough to be smelled). There is rarely objection to them in the world (e.g., on someone else's plate) or in the body (stomach, blood, etc.). Dangerous items are undesirable in the mouth and in the body (at all postingestion stages) but not in the environment. In contrast, disgusting items are undesirable at any stage of interaction where there is a potential of ingestion (preingestion [e.g., sight on a plate], contact with skin, in the mouth, or in the body). They are most undesirable, however, in the mouth (Fallon & Rozin, 1983).

A negative attitude toward incorporation into the body is a characteristic feature of both disgust and danger. The suspected presence of harmful microorganisms or potent toxins in a food gives that food contaminative properties, although it may not be offensive. Unlike disgust, however, contamination is not a necessary aspect of danger (consider fattening foods, or milk for lactose-intolerant people).

The characteristic facial expression of disgust is also elicited by distasteful items. In the infancy literature (Peiper, 1963; Rosenstein & Oster, in press; Steiner, 1974), bitter substances are the stimuli of choice for eliciting this expression. This shared facial expression, in our view, is accounted for by the shared

feature of bad taste in disgusting and distasteful items. The shared facial expression may suggest a common developmental origin for disgust and distaste (see section on ontogeny). There might be qualitative differences between disgust and distaste faces, but none have yet been identified. The disgust-distaste face is not a characteristic feature of either dangerous or inappropriate rejections and is rarely elicited by items in these categories (Table 1, bottom).

There is substantial overlap between disgusting and dangerous objects. In fact, an adult's first justifications for rejecting many disgust items (e.g., feces, cockroach) are often that they will cause harm. Upon further questioning, however (e.g., "Would you eat a sterilized cockroach?"), it almost always becomes clear that over and above any possible harm, the item itself is offensive. This is not the case for dangerous items. Detoxified poison mushrooms or an allergenic food that no longer produces symptoms in a previous sufferer are acceptable items.

Disgust and nausea are closely linked. However, nausea is neither a necessary nor a sufficient condition for disgust (Ekman & Friesen, 1975). It is not sufficient because nausea occurs often as a component of some more general illness not associated with a particular object. Nausea may also occur in conditioned taste aversions, that is, in response to a food that preceded nausea in the past (Logue, Ophir, & Strauss, 1981; Pelchat & Rozin, 1982), although the food manifests no other features of disgust (Rozin & Fallon, 1980). On the other hand, mild disgust responses often occur without noticeable nausea, and strong disgust responses are often transient (brief, self-terminated exposure to the object or thought that elicits disgust) and may terminate before nausea can develop. Therefore, the correlation between nausea and disgust is substantial but imperfect.

In summary, all the features of disgust successfully distinguish disgust-as-food-rejection from other food rejections. No other category shows both the characteristic facial expression and contamination properties. However, any single feature of disgust may be shared. Most critical to our discussion is the distinction between disgust and distaste. We hold that although disgust may develop from distaste (and, perhaps, danger), these two types of food rejection have qualitatively different properties in the adult. The ideational basis for rejection (offensiveness and contamination) are present only for disgust. The domain of aversion is general for disgust but limited to the mouth (plus odor) for distaste, and nausea is a much more prominent concomitant of disgust than of distaste. In the section on ontogeny,

² We find this taxonomy convenient and helpful in thinking about disgust. However, it has some shortcomings. First, it is based primarily on data from college students in the northeastern United States. Although we have informally gathered evidence from other segments of the American population, as well as from other cultures, it may need modifying to handle the full range of motivations for food rejection. For example, the motivation for rejection of beef by Hindus, or of all forms of meat by some vegetarians, is respect or sacredness (Simoons, 1961, 1974a, 1974b). Second, most actual rejections share properties of more than one psychological category (Fallon & Rozin, 1983). Thus, whereas lima beans (if disliked), a carcinogenic food, clean sand, and a sterilized insect fall neatly within each of the categories, spoiled milk and moldy bread have both disgust and danger properties (and perhaps distaste as well). Moreover, for some individuals, cigarettes and black coffee have both danger and distaste properties.

we will again consider this distinction and the sense in which disgust may be considered an extension of distaste that occurs in the process of development. With these issues and definitions in mind, we now proceed to analyze the key terms in our definition of disgust.

Incorporation Into the Self

In our definition of disgust, the idea of oral incorporation into the self is central. By *self* we mean the biologically well-defined "bodily self," that entity roughly delimited by the skin. We recognize that there are many senses of self, which presume varying degrees of cognitive capacity. The capacity that we assume for this discussion is minimal and would certainly include young children.

The Psychology and Biology of the Mouth and the Borders of the Self

The special role of the mouth in incorporation is derived from a simple anatomical fact: By its nature, the mouth is the entry point to the gastrointestinal system. It is the most proximal monitor of foods and is the quintessential incorporative organ. The senses of taste, smell, and other aspects of oronasal sensation (touch, temperature, texture, irritation, and shape-sensing in the mouth) all contribute to the perception of "mouth objects" and serve to identify and evaluate potential foods as they provisionally enter the body. The mouth is, for most purposes, the last checkpoint before irreversible entry into the body (Rozin & Fallon, 1981). For humans, vomiting, under some voluntary control, represents a later but seldom-used mode of rejection. Given these biological realities, it is not surprising that the mouth is the focus of disgust and of other aspects of food rejection (Fallon & Rozin, 1983).

The mouth seems to function as a highly charged border between self and nonself. The sense of "being in the body" may be most salient in the mouth because it is the critical point of transition. For example, the intensity of disgust reactions seems greater for objects in the mouth than for the same object already incorporated (e.g., in the stomach; Fallon & Rozin, 1983). However, the psychological microanatomy of the mouth is intriguing and unknown. Biologically, we can consider the border between the lip and the skin of the face as the border of the self (inside and outside of the body), inasmuch as the lip is made of endoderm and hence should be considered part of the gastrointestinal system, whereas the skin is ectoderm.

Alternatively, a biological perspective could argue that the real self-outside border is the lining of the gut, because the gut can be viewed as a tube through the body, and hence the lumen of the gut is not part of the body. Presumably, on this account, if one rammed a tube (pacem, human subject committees) through the navel and out the back (defly exiting to the right or left of the spinal column) and then passed disgusting items through the tube, people should not be disgusted. On the other hand, the gut is psychologically as well as physically inside the body and is so viewed by children (Nagy, 1953) and, we are sure, by adults. In an important sense, the gut is really inside the body, in that entry into the gastrointestinal system is more or less irreversible and thus represents *de facto* entry into the

body. One can get a feeling for this by imagining a small sealed and indigestible plastic capsule containing a dead cockroach. Consider swallowing it, with full confidence that it will emerge sealed and unscathed in your feces. For many people, there remains a feeling of disgust about this experience.

Empirically, the issue is how the intensity of disgust varies in the course of the normal ingestional sequence from the sight to the swallowing of food. Specifically, is there a discontinuity on entry into the mouth, and if so, does this occur at a particular point in the course of entry? Possible sites for this self-outside interface could be the lip border, contact with any surface in the mouth, or simply the perception that something is in the mouth, without the necessity of physical contact. On the basis of some exploratory studies (Edwards & Rozin, 1986), we suspect that there is not a clearly defined critical entry point but, rather, that the intensity of the disgust response increases as the object's presence in the mouth becomes more salient. Perception of entry, contact, notable sensory properties (texture, flavor, and temperature) of the disgusting object all intensify disgust.

The Psychological Limits of the Bodily Self

One's own body products have a peculiar status with regard to the self. Feces and urine in one's own body, either by their nature or through a process of adaptation, do not elicit a disgust response. As soon as they leave the body, however, they become disgusting (although in American culture, at least, they are less disgusting than someone else's body substances). Allport (1955) noted that although one is not disgusted by saliva in his or her own mouth, it becomes offensive outside of the body so that one is disgusted at drinking from a glass into which he or she has spit. We have confirmed this in a questionnaire in which we asked subjects to rate their liking for a bowl of their favorite soup and for the same bowl of soup after they had spit into it. There was a drop in rating for 49 of 50 subjects (Rozin, Millman, & Nemeroff, 1986). The same is true for chewed food, which we accept in our mouths but refuse to consume once we have spit it out. Some Brahmin Indians are so offended by saliva that they are sensitive to it in their own mouths and are upset if it appears on their lips (Harper, 1964). Allport also points out that we do not mind sucking our own blood from a cut finger but would be upset about tasting that same blood after it has left our body (e.g., on a bandage). He used the apt term *ego-alien* to describe these effects.

The question of the psychological microanatomy of the mouth applies to the self's own substances. At what point in the process of ejecting saliva or chewed food does the object become ego-alien? For example, if the tongue is extended, with chewed food on it, is it acceptable to return the food to the mouth, or has it passed into the outside world?

With respect to disgust, the borders of the self can extend beyond the bodily self, depending on the context. They may, for example, extend to one's children for pride of accomplishment or for empathic pain. Normally disgusting substances or objects that are associated with admired or beloved persons cease to be disgusting and may become pleasant. Body substances including saliva and vaginal secretions or semen can achieve positive value among lovers, and some parents do not find their young children's body products disgusting. In the case of both lovers

and children, the source of the object can be considered a social extension of the biological self.

The Meaning of Incorporation: You Are What You Eat

Angyal (1941) claims that incorporation of offensive objects is debasing or demeaning. We suggest that an explanation for this may come from the simple and primitive notion, explicitly present in many traditional cultures, that one assumes the properties of what one ingests ("You are what you eat" or "*Man ist was man isst*"). Frazer (1890/1959) in his anthropological classic, *The Golden Bough*, concludes: "The savage commonly believes that by eating the flesh of an animal or man, he acquires not only the physical but even the moral and intellectual qualities which were characteristic of that animal or man" (p. 573). His examples include a prohibition against eating hedgehogs among soldiers in Madagascar, to prevent the soldiers from becoming timid and shrinking, and the ancient Greek belief that eating the flesh of the wakeful nightingale would prevent one from sleeping. Similarly, one might expect ingestion of offensive objects to cause one to become offensive (debased) in some way. The act of ingestion would transfer the offensiveness to the self. We see this in our own culture when a person becomes offensive to us by consuming something that we find disgusting.

Understanding the process of digestion, through which distinctive eaten entities are all reduced to a common set of molecules, mitigates against the belief that you are what you eat. For this reason, and the desire of adults in developed countries to appear rational, one finds little overt evidence for belief that you are what you eat in American culture. A nonarticulated belief of this sort could nonetheless influence reactions. Young children (Contento, 1981; Nagy, 1953) and almost certainly adults in some traditional cultures do not know of or believe the modern view of digestion.

We (Nemeroff & Rozin, 1986) recently obtained evidence for an unacknowledged belief that you are what you eat from an American college student sample, using Asch's (1946) impression formation technique. Subjects read one of two one-page descriptions of a culture. The versions were identical except that one culture was described as hunting and eating marine turtle but hunting wild boar only for its tusks, whereas the other was described as hunting and eating wild boar but hunting marine turtle only for its shell. Note that in each version, members of each culture hunt both species, but they eat only one species. Ratings of the personalities of members of the culture (on bipolar scales) revealed more boarlike characteristics (e.g., fast runners) in the boar eaters and more turtlelike characteristics (e.g., good swimmers) in the turtle eaters. The extent of such unstated beliefs has yet to be explored.

The Nature of Objects of Disgust

We turn now from examination of the first feature of our definition, incorporation into the self, to the second major feature, offensive objects. We will map out the range of disgusting (offensive) objects and then discuss ideas or theories that attempt to account for the nature of offensiveness and, hence, for the objects in the category.

The Animal Focus of Disgust

Humans are omnivorous. The virtues of deriving nutrients from a wide variety of sources are obvious. There is, however, an attendant risk. The incidence of toxins or nutritionally imbalanced foods is high in nature. Hence, in the essential process of exploration for new foods, the omnivore (or other generalist) risks nutritional imbalance, poisoning, or both. The vital importance of nutrition and the severe risks of poisoning may together account for the strong affective responses associated with eating and for the ambivalence associated with this process. This conflict, the "omnivore's dilemma" (Rozin, 1976; Rozin & Rozin, 1981), is represented by the opposing tendencies to fear and to explore new foods, or to like both familiar and novel foods.

There is a corresponding ambivalence toward objects of disgust. They are offensive, and yet, because almost all of them are animal in origin, most are highly nutritious. Some body products (e.g., urine, feces) have limited nutritional value, but these account for a small percentage of all disgusting objects.

Angyal (1941) suggested that all disgust objects are animals or animal products, and we confirmed this claim through questionnaires and interviews (Fallon & Rozin, 1983; Rozin & Fallon, 1980). Almost all objects that qualify as disgusting by our criteria are animals or parts of animals, animal body products, or objects that have had contact with any of the above or that resemble them. A major animal source is interpersonal: The prospect of consuming things contacted by people who are disliked or viewed as unsavory often elicits disgust.

Some individuals use the word *disgust* to describe particular vegetable items. However, according to our analysis, these items do not have the psychological attributes characteristic of disgust (Rozin & Fallon, 1980). They are almost always simply bad-tasting items (distastes), with no offensive or contaminating properties.

Problems of Categorization

The array of disgust objects varies across cultures but almost always includes body waste products (e.g., feces, urine, mucus; Angyal, 1941). The question is whether, in spite of this cross-cultural variation, there is a set of principles that determines or predicts what will be disgusting.

Attempts to arrive at such principles are confounded by a number of factors:

1. In many cases, it is not objects but contexts that are disgusting. The same object may or may not be disgusting depending on its context or its history, for example, who handled it (Meigs, 1978, 1984).
2. The distinctions that we take to be critical in defining disgust have not been brought together before. As a result, research on food rejections, especially ethnographic studies dealing with taboos, do not usually provide sufficient information to determine whether reported taboos have disgust properties.
3. Because most disgusting items are nutritious, nutritional pressures may cause an individual to accept an item that is considered disgusting by his or her culture or may cause a culture to accept an item that is considered disgusting by most cultures.
4. Although there may be a coherent central core of disgust-

ing items, new items may become disgusting by specific experiences (e.g., associations). The resulting conglomeration of disgust objects may obscure the basic category structure.

Theories

We start from the presumption that the category of disgust objects consists almost entirely of animals and their products, including both human contacts in a negative context and objects associated with these other disgusts. Certain types of items are especially prone to be disgusting and tend to be so in most cultures. These include body waste products, decayed animal matter, carnivorous animals, scavengers, and animals close to humans in appearance (e.g., primates) or social-emotional relations (e.g., pets). Working within this characterization, we will consider a number of different theories that help define the class of disgust objects.

Animalness. We begin with a very broad theory. In addition to the claim that almost all disgusts are of animal origin, we believe that *all* animals or animal products are potentially disgusting. That is, at some basic level (and perhaps at some point in human evolution), animalness was a necessary and sufficient condition for disgust. Consequently, we view nondisgusting animals and animal products in any culture as exceptions to this general principle. This formulation parallels the persuasive arguments of Soler (1973/1979) that the Hebrews' animal prohibitions (pig, camel, insects, etc.) are best viewed not as exceptions but as the rule. He notes that all but a few animal species are prohibited. According to the Bible, the Hebrews were originally vegetarians; after the great flood, certain exceptions were made. In Western cultures the great majority of animals are disgusting when considered as food (e.g., all insects and almost all other invertebrates, all reptiles, almost all amphibians, and almost all mammals). Of course, among hunter-gatherers and some other hunting societies, the range of acceptable animals is wider, but it still includes a minority of available animal species.

Other evidence for the importance of animalness (at least in modern society) is that meat and viscera are usually prepared in a form that disguises their animal nature (Angyal, 1941). Servings usually consist of small pieces, often stewed or mixed with other foods, and particularly distinctive parts such as skin and heads are often neither eaten nor served. A salient reminder of the animal nature of food (e.g., cutting into a vein or exposing a raw piece of meat in the center of a steak) causes disgust reactions in some people (Angyal, 1941).

Why animals? If we assume that there is a widespread belief that people take on the properties of what they eat, we must explain why animals, but not plants, are disgusting. Perhaps our greater similarity to animals makes it more likely that we would take on their properties. The fact that they produce feces may also be important. The great preponderance of animals among taboos has led Tambiah (1969) to suggest that "animals are vehicles for embodying highly emotionally charged ideas." In contrast to plants, animals seem to have more relevant and salient characteristics of the sort that might be expressed in a human.

Another explanation assumes that humans see themselves as quite distinct from (and superior to) other animals and wish to avoid any ambiguity about their status by accentuating the human-animal boundary (e.g., Ortner, 1973; Tambiah, 1969;

see also the discussion on anomaly). This view is consistent with the fact that there is a widespread aversion to consuming animals that are physically similar to humans or in close interactive relations with humans (e.g., pets). Ortner notes that there is one human body secretion whose ingestion is not specifically tabooed (and, in our terms, elicits minimal if any disgust), namely, tears. She points out that this is the one body product that may be uniquely human and, hence, does not remind us of what we have in common with animals.

The importance of the animal-human boundary is dramatically illustrated in DesPres's (1976) analysis of the psychology of survival in concentration camps. In a chapter entitled "Excremental Assault," he describes how the absence of any toilet facilities or means of cleaning oneself caused the inmates to think of themselves as animals and the guards to think of them in the same way. He posits that, as a result, the guards found it easier to torture and kill inmates, and the inmates were more resigned and less resistant to the guards' assaults. DesPres's striking point is that the survivors were people who took great pains to preserve their human dignity by engaging in washing rituals, even if they had to use muddy or filthy water; cessation of such activities was a strong indication that an individual would soon either die or be selected for extermination.

The strong disgust reaction to animals may be related to or accentuated by our attraction to them. Unlike many other rejected potential foods, animals are usually high in nutritive value. Indeed, meat is the favorite food of mankind. At the same time, there is clearly a great ambivalence about eating animals. As Tambiah (1969) puts it, "Animals are good to think and good to prohibit," and this ambivalence may further intensify emotional reactions (Tomkins, 1963). Simoons's (1961) scholarly review of animal food taboos repeatedly exposed the strong attraction to and abhorrence of animals as food.

Spoilage and decay. Because spoiled or decayed items are often objects of disgust, and because such items may be disease vectors, it is natural to suggest that these particular substances form the core of disgusts. This view could account for the widespread disgust for animals on the grounds that (a) animals are all potentially decayed; (b) many animals consume decayed material or garbage or, as carnivores, consume other animals; (c) many animals, particularly carnivores, produce putrid feces.

On this view, the core avoidance is of spoiled animal matter. Whatever its truth, spoilage avoidance is not present in the first years of life (see section on ontogeny). Spoilage avoidance could be a late-maturing aspect of cognitive-emotional development or, more likely, a regular part of the acquisition of culture.

Meigs (1978) offers the most articulated view of decay as a basis for pollution (disgust). Based in part on her ethnographic studies in New Guinea, she defines the objects of pollution broadly to include decaying matter, substances capable of imminent decay, and carriers and symbols for these. She holds that pollution occurs when there is a threat to entry to the body by such substances in a context where such entry is not desirable.

Spoilage and decay are clearly related to disgust, but they seem unable to account for the full range of disgusts. In its weakest form, however, this view would simply hold that apparent decay increases the likelihood that an object will be considered disgusting or increases the intensity of disgust.

Distance from humans. The animal-human distinction dis-

cussed above implicates distance from humans as a critical variable. According to Tambiah (1969), accepted sexual partners and accepted foods are at "intermediate distances" from the self. It follows that food items or persons either very close to or very far from a person are rejected. In the domain of sexual relations, prohibitions include one's close relatives and, in many cultures, the most distant people (e.g., strangers, people from another region). In the domain of food, distant (very different) and hence rejected items include worms, insects, and other invertebrates (see Leach, 1964, for further explication of this idea). Very similar and hence rejected items include other humans, primates, and pets (which are emotionally close to humans, though not very similar in form). This interesting view accounts for some disgusting objects, but not all. Only a small minority of animals at "intermediate distances" are usually acceptable as food, and many "distant" animals such as shellfish and other invertebrates are commonly consumed.

Anomaly. Mary Douglas (1966) has put forth a provocative and influential theory to account for the class of tabooed or polluting objects, which might have implications for disgust as well. Her view is based on the assumed predilection of humans to create clear-cut classifications of the objects in their world. Anomalous items, such as those that are unique or those that simultaneously instantiate properties of different classes, are disturbing and hence become the objects of taboo or pollution. Douglas argues, for example, that many of the kosher prohibitions refer to animal species that are anomalous in the Middle East. With respect to any human classification scheme, anomalous items represent disorder, matter out of place, or "dirt." Viscous substances, often thought to be disgusting or polluting, occupy an uncertain position between liquid and solid. Feces and other bodily excretions qualify as anomalous in terms of whether or not they are part of the self. They may also challenge the basic living-dead dichotomy. Primates and pets challenge the basic human-animal distinction (see also Tambiah, 1969).

There is much to be said for this view as a partial explanation of pollution and disgust. However, the anomaly theory has difficulty in accounting for some of the most common and powerful disgusts. As applied to feces, the argument is forced. The large number of disgusts based on acceptable objects in negative contexts (e.g., touched by unsavory persons; see Meigs, 1978, 1984, for further comments) and the large number of disgusting but common animals such as insects cannot easily be explained as anomalies. The biggest limitation of Douglas's view as a complete explanation of disgust is that it cannot account for the virtually exclusive focus on animals and their products in the face of many "anomalies" in the plant and inorganic worlds.

Feces: The primary disgust substance. Another view holds that feces are the prime or core disgust substance. They probably elicit the most intense disgust response and are close to being a universal disgust (Angyal, 1941). There are on record a few cases of feces ingestion in traditional cultural settings. Eskimos, for example, may consume the feces of grazing mammals in the course of consuming their unemptied guts. However, disgust for the putrid feces of humans or mammalian carnivores is virtually universal. The only exceptions that we know of among adults involve consumption in ritual contexts or consumption by mentally disturbed individuals (Angyal, 1941).

Feces are probably the first object of disgust to appear in de-

velopment (see section on ontogeny). In language and in the lay mind, they are surely the most debasing of substances. Under the circumstances, it is surprising that they have not previously been considered as the core of disgust (although this position is consistent with Angyal's views). Of course, feces have some of the critical disgust properties that are singled out by other theories of disgust objects. They are a spoiled animal product. With some license, they can be seen as a threat to human distinctiveness, because they are an aspect of humans that is shared with other animals, and they are anomalous or difficult to categorize. However, the disgust for feces need not be dependent on these other formulations.

Much of the argument for and against feces as the core disgust is ontogenetic, and is covered in the later section on ontogeny, where we consider the role of toilet training in disgust.

Summary

We believe that more than one of the theories we have presented (and perhaps others, as yet unformulated) will be necessary to account for the disgust category. We are persuaded that animalness is of central importance, because almost all animals and their products are considered disgusting to eat throughout the world and because almost all disgusting objects are of animal origin. A special role for feces also seems likely, in that feces are the universal disgust and probably arouse the most intense disgust reaction.

Contamination

We now examine the third defining attribute of disgust, psychological contamination. The basic phenomenon is that past physical contact between an acceptable food and a disgust substance (physical contamination) causes rejection of the acceptable food. This can occur even if the physical trace of the disgust substance is imperceptible. We will use the word *contamination* to refer to psychological contamination, that is, people's interpretation of or response to situations in which physical contamination may have occurred. We believe that in all cultures there are some substances that can generate psychological contamination by physical contact. Although it probably has some adaptive value as protection against microbial (physical) contamination, psychological contamination seems on balance to be maladaptive, in that in most instances it motivates rejection of nutritive substances.

A critical issue in understanding contamination is evaluating the importance of the existence of a physical trace, that is, true physical contact at some point in the past. When Americans are asked why they reject a disgust-contaminated food, they almost invariably refer to the presence of this trace. When a disgust substance is extracted from an acceptable food (e.g., a cockroach or fly is removed from a glass of milk with a spoon), they maintain that a physical trace may remain ("A little bit of fly may still be in there"; Fallon, Rozin, & Pliner, 1984; Rozin & Fallon, 1980).

Although the possibility of an undetectable trace is certainly important in motivating rejection, it is not necessary. For example, nurses in a children's hospital were inappropriately consuming glasses of juice meant for the children. This problem

was handled by serving the juice in new urine-collection bottles. The nurses no longer drank the juice, even though there was no possibility of a physical trace of urine in this case. Many people are reluctant to eat a favorite food if it has contacted an item that looks like a disgusting item. For example, about half the subjects we have surveyed report a substantial drop in the acceptability of a favorite soup after it has been stirred by a brand-new fly swatter or brand-new comb (Rozin, Fallon & Mandell, 1984). In these cases, there is no possibility of a trace of a disgusting substance. In these most indirect cases, disgust is evoked by an object associated with a disgusting item. More commonly, disgust is elicited by objects that have contacted a disgusting item or by objects that physically resemble a disgusting item.

Contamination and the Laws of Sympathetic Magic

This dual (trace and resemblance) aspect of contamination corresponds to the kinds of phenomena that led to the induction of the laws of sympathetic magic. These laws were described by James Frazer (1890/1959) and Marcel Mauss (1902/1972) to account for a wide variety of magical practices and beliefs in traditional cultures. One law, which Frazer calls *contagion*, can be summarized as once in contact, always in contact. In more detail, "things which have once been in contact with each other continue ever afterwards to act on each other" (p. 35). Mauss (1902/1972) points out that another aspect of this law is that the part is equal to the whole; that is, a tiny part of an object (e.g., an animal) embodies all the attributes of the whole object. Contagion can occur by direct contact between an offensive (or revered) person or animal and a previously neutral object, as when a person grows, cooks, or touches a food. In magical practices, the vehicle for contagion is often a personal residue; fingernail parings, spittle, or other personal residues retain essential properties of their original owner and can be used for sorcery. The vehicle for this transmission is an "essence" (usually a product of animate entities), which contains the essential properties of the host and can be transmitted by contact.

The second principle of sympathetic magic is *similarity*, which Frazer summarizes as "like produces like" (p. 35). That is, resemblance in some properties indicates a fundamental similarity or identity. Furthermore, if two things are "similar," then action taken against one will influence the other. Alternatively, the image is equal to the object (Mauss, 1902/1972). Both laws, contagion and similarity, account for the belief in action at a distance, a fundamental feature of what we call contamination. The two laws together are illustrated in the Malay custom in which a clay figure of an enemy (similarity) is constructed, incorporating residues (e.g., hair, fingernail parings) from that person (contagion). The figure is then scorched, causing harm to the enemy by the action of both laws (Frazer, 1890/1959). We believe that magical phenomena like those that prompted the formulation of these laws exist in developed cultures in a variety of domains other than disgust. For example, many people in our culture are reluctant to tear up extra pictures of loved ones. We have shown that subjects are less accurate at throwing darts at pictures of people they like (Rozin, Millman, & Nemeroff, 1986).

Frazer and Mauss both noted the parallel between the laws of

sympathetic magic and the laws of association as propounded by the British empiricist philosophers. These laws vary in number depending on the author, but the two laws propounded most frequently and consistently (Warren, 1921) are contiguity and similarity (Hume, 1748/1959; J. S. Mill, 1843/1963). According to Mill, the law of similarity holds that "similar ideas tend to excite one another" (p. 852), and the law of contiguity holds that "when two impressions have been frequently experienced (or even thought of) either simultaneously or in immediate succession, then whenever either of these impressions or the idea of it recurs, it tends to excite the idea of the other" (p. 852). The implication of this analogy between the laws of sympathetic magic and the laws of association is that both sets of laws are descriptions of fundamental patterns of human thought. The laws of magic were conceived to describe a set of practices among "primitives," whereas the laws of association were supposed to be universal laws of thought. Indeed, some of the disgust phenomena that we will subsume under laws of sympathetic magic could be recast as instances of association.

Because there are alternative theoretical frameworks, it is particularly important to distinguish between the phenomena of sympathetic magic (similarity and contagion) and the explanation of these phenomena, which may be in terms of the laws of sympathetic magic, the laws of association, or both. Only the laws of sympathetic magic hold that harming an image of a person (similarity) or a residue of a person, such as fingernail parings (contagion), can harm the actual person. We call this *backward causation* (Rozin, Millman, & Nemeroff, 1986). Unlike the laws of association, the laws of magic are not only principles of thought but statements about causation in the world.

We have demonstrated, in laboratory studies and through questionnaires, that the phenomena of sympathetic magic operate in the domain of disgust. We demonstrated contagion in the laboratory by dropping a dead, sterilized cockroach into a glass of palatable juice and then removing it (Rozin, Millman, & Nemeroff, 1986). Not surprisingly, subjects found this juice much less desirable than a different type of juice, which contacted an innocuous object for the same period of time. We showed contagion with a variety of questionnaire items, including one which showed that the prospect of wearing a laundered, used shirt/blouse of unknown origin is preferable to wearing one previously worn by a disliked person (Rozin, Millman, & Nemeroff, 1986). We have evidence for backward causation as well in the negative feelings many Americans report about the prospect of their residues (e.g., hair or hairbrush) coming into the possession of a personal enemy (Rozin, Nemeroff, Wane, & Sherrod, 1986).

For similarity, we demonstrated in the laboratory that there was a large preference for consuming a piece of chocolate fudge shaped as a muffin, as opposed to a piece of the same fudge shaped as dog feces. Also, there was a substantial preference for holding a rubber drain mat rather than a piece of rubber imitation vomit (from a novelty-store) between the lips (Rozin, Millman, & Nemeroff, 1986). From questionnaire items, we showed that for some subjects, new toilet tissue was much less desirable than facial tissue for blowing the nose and that a favorite soup presented in a brand-new bed pan was much less palatable than the same soup served in a soup bowl.

We can interpret people's reluctance to consume a favorite

of the personal contamination of one's lover by his or her previous lovers. Indeed, thinking about these things can be unsettling.

Contamination, by its nature, forces us into paradox and contradiction. Whites in South Africa have treated blacks in such a way as to minimize contact or contagion. While enforcing separation in residences, transportation, educational institutions, and the workplace, they regularly employ blacks in their kitchens to prepare their food. They seem to allow intimate contact with blacks, via ingestion of food, while forbidding much more casual contact. Mexican villagers who claim that they throw away food contacted by flies regularly eat foods after the ubiquitous flies have settled on them at the table. They eat tortillas made from a ground corn dough (*misa*) that often has many flies settled on it (though it is covered with plastic whenever possible to minimize contact with flies). When this salient fly contamination is pointed out, a villager's typical response is "Well, the flies only touch it for a moment" (P. Rozin, personal communication, 1978). We, of course, close our eyes to similar contaminations. This fundamental coping strategy seems absolutely essential for dealing with a largely irrational and potentially overwhelming set of beliefs and attitudes. However, in cases where dangerous microbial contamination is a true possibility (as in cases of some contacts with people or insects), high contamination sensitivity and attention to sources of contamination are adaptive.

Positive Contamination and the Opposite of Disgust

In this section, we ask whether contamination must have a negative (e.g., danger, disgust) sign. By definition, this raises the question of whether food-related disgust has an opposite.³ We will call the putative process that is the opposite to contamination *positive contamination* or *transvaluation* (Breckkenridge, 1978; Rozin & Fallon, 1981). We define the opposite of food-related disgust by inverting our definition of disgust: a positive attraction related to the prospect of consuming an appealing object. (Such an object would be appealing because of what we know of its nature or origin.) The appealing objects have the property of positive contamination (transvaluation); that is, if they briefly touch an unacceptable food, they tend to render the

(Rozin & Kalat, 1971; Zahorik, 1979). In contamination, this asymmetry makes special sense with respect to bodily harm, because there are no physical contaminants on the positive side that can match the potency and rapid action of potent toxins and harmful microorganisms.⁴

This asymmetry notwithstanding, examples of positive contamination do exist. In Western culture, it occurs most clearly in domains other than food. For example, people sometimes place a high value on clothing previously worn by loved ones (Rozin, Millman, & Nemeroff, 1986). Young sports fans sometimes covet a uniform worn or a home-run ball hit by an admired player. (The recent television advertisement for Coca-Cola that showed a young boy thrilled to be given Mean Joe Greene's towel illustrates this.) In our culture, positive transvaluation and contamination may be most distinct in the sexual-romantic domain. The enhanced valuation of lovers' possessions is common (Rozin, Millman, & Nemeroff, 1986; Rozin, Nemeroff, Wane, & Sherrod, 1986), as is the coveting of garments they have worn and attraction to some of their body substances. Positive contamination is particularly clear in the case of worn garments and body residues such as hair. Though these attractions are compatible with an explanation in terms of transvaluation and contamination, there might be other interpretations as well.

In the food domain, there is a sense in which the idea that Grandma's food tastes better just because Grandma made it represents an instance of positive contamination. There are some suggestions of transvaluation in ritual contexts. For example, it is possible that the wafer is transvalued (enhanced in value by contact or association) in the Catholic communion.

In Eastern cultures examples are more plentiful. Thus, in India, temple food offerings are believed to have been eaten first by the deity. This interaction transvalues the food, making it more valued when part of the offering is returned to the worshipper (Breckkenridge, 1978). Nonetheless, the degrading effects of contact with lower castes seem more potent than the positive effects of contact with the gods. Stevenson (1954) summarizes this situation by saying that "pollution always overcomes purity" (p. 50). Among the Hua of Papua (Meigs, 1978, 1984), it is believed that when a person contacts or interacts with a food or potential food, as in hunting an animal, growing a plant, or preparing a meal, some of his or her essence enters

soup stirred by a brand-new comb or flyswatter in terms of the operation of both laws of sympathetic magic. The similarity of the new comb or flyswatter to the disgusting used versions of each accounts for their disgusting properties; putting these objects into the soup (contagion) transfers this property to a potential food.

Personal Contamination

The laws of sympathetic magic center around personal contamination and highlight the role of interpersonal factors in disgust. (Note that interpersonal factors have no special status for the laws of association.) The two essential aspects of personal contamination are the nature of the person contacting the food (his or her unsavoriness and relation to the subject) and the nature of the contact (Goffman, 1971; Rozin, Nemeroff, Wane, & Sherrrod, 1986). People can be sources of positive or negative contamination. When the relation between the parties involves love or certain types of respect and good will, contact can enhance the value of a food (e.g., Meigs, 1978, 1984; see discussion of the opposite of disgust below). The more salient, negative side of personal contamination assumes a major role in governing social transactions and establishing social relations in India, where the history (in terms of personal contacts) of an object or piece of food has a major influence on the reactions to it (Appadurai, 1981; Marriott, 1968). Indeed, the order of Indian castes can be determined by examining who can handle whose food (Marriott, 1968).

The most contaminating parts of the body are those for which the border between inside and outside is unclear and those that are more involved with body products. Mouth, nose, genitals, and rectum are most contaminating in contrast to, say, the elbow or shoulder (Goffman, 1971). Furthermore, possessions can become extensions of the self and thus assume the contamination properties of the owner.

Contamination in Danger and Disgust

Contamination occurs with dangerous as well as with disgusting objects. Physical traces of potent, dangerous chemicals or microorganisms do occur in a variety of potential foods, and there is a clear psychological contamination (contagion) response to this threat. In contrast to most cases of disgust, this contamination response seems rational. The law of similarity holds as well in the domain of danger. Mauss (1902/1972) pointed out that in one variant of similarity, a name or other symbol representing an object comes to stand, literally, for its referent. We have shown that when a "sodium cyanide, poison" label is placed on a bottle of sugar, most people show a decreased desire to consume the contents of the bottle (Rozin, Millman, & Nemeroff, 1986). This occurs even when the subject places the label on the bottle herself. For the case of similarity, danger and disgust responses seem equally irrational.

The distinction between disgust and danger in the realm of contamination is sometimes difficult to make for two reasons. First, many objects (e.g., cockroaches, feces, flies) can in some contexts be both disgusting and dangerous. Second, the response to disgust stimuli has a component of psychological danger to it, accounting for the use of the word *fear* in Angyal's

(1941) definition of disgust. However, the fear in disgust is of harm to the psyche, as opposed to the body.

We can sometimes eliminate the possibility of physical danger in contamination situations. The "danger" reasons often given by subjects to explain why they reject foods contaminated by a disgust substance often seem to mask a seemingly less rational disgust contamination. For example, when subjects explain rejection by contamination with feces or a cockroach in terms of potential harm from microorganisms, we follow with the example of sterilized feces or roaches (Fallon et al., 1984). Subjects then recognize that they still have a strong rejection and explain this in terms of the offensiveness of the object itself, often with some surprise and embarrassment at their own beliefs and motivations. In acquired taste aversions, people do not invoke this type of cover. People often report, without prompting, that a food aversion they developed from getting sick after eating a food occurred even though they know the food did not cause the illness (Logue et al., 1981).

A salient illustration of the relative importance of disgust and danger in contamination comes from India. In general, restrictions on ingestion of food handled by castes lower than the person of reference (and other interpersonal restrictions) have to do with cooked, processed foods. These are foods in which the offending person has made a labor investment, even though in actuality the cooking process usually makes the food safer to eat. Thus, the female head of household directs all cooking and, to the furthest extent possible, keeps people of lower castes from participation in cooking. Raw foods, which in fact are much more likely to be dangerous, are much more acceptable than cooked foods when both are handled by lower castes. It is clearly the intensive association and/or contact of a person with the food that makes him or her a part of it (Appadurai, 1981; Khare, 1976; Marriott, 1968; Simoons, 1974b).

The Limits of Contamination: Getting Along in a Physically Contaminated World

Suspicion of contamination leads to rejection of many substances that are nutritive and safe. This rejection presents a potential problem because the possibility of trace contamination (e.g., by airborne particles) is extremely high, so that all or most foods might conceivably be rejected. Contamination could thus be a serious threat to adequate nutrition. Most people and cultures handle this problem by setting some limit on significant levels of contamination or simply by not thinking about certain sources of contamination. The prohibition against mixing dairy and meat in the kosher tradition is potentially crippling, inasmuch as small dairy "particles" in the air might fall in the meat stew at any time. This is handled in the Talmud by the explicit rule that a kosher food is *not* rendered nonkosher if less than 1 part contaminant (e.g., dairy product) is *accidentally* mixed with 60 parts of the food in question (e.g., meat; Berlin, 1974).

Avoiding contemplation of contamination possibilities is the more common solution. For example, we just do not think about the fact that the air we inhale was both inhaled and exhaled by others in our environment. Those who are in the habit of kissing the face of their pet dog simply do not think of the other places where that face has been, just as one does not think

food. However, even in this best example of positive contamination, the extent and intensity of negative contamination is greater.

The Phylogeny and Function of Disgust

We turn now to the origins of disgust in evolution and to its adaptive value. We presume that disgust is uniquely human. We do not know whether it is present in hunter-gatherers or nomadic groups, nor do we know when it arose in human history. With no data to constrain speculation, we suggest the meat focus of disgust and our ambivalence toward meat may be related to the fact that our species became carnivorous rather recently.

There are two possible adaptive values for disgust. One is related to the general value of keeping a nesting area clean (Izard, 1977), a practice followed among almost all birds and mammals. This presumably relates to the fact that wet and soft body products in the nest or congealed on the surface (hair, feathers) of adults and young form a substrate for the growth of harmful organisms. Ingestion of these materials can result in the transmission of disease.

Feces ingestion, however, is not uncommon in animals. In laboratory rats, about 50% of feces are consumed (Barnes, 1962). This has an adaptive value, because some vitamins and other nutrients are synthesized by the flora in the hindgut and are available for utilization by the host organism only by re-ingestion. Barnes (1962) has shown that coprophagy (feces ingestion) improves the health of rats. Richter and Rice (1945) reported increased coprophagy in rats deficient in some of the B vitamins, and it appears that this activity ameliorates some of the symptoms of B vitamin deficiencies (Barnes, 1962). There are some reports of feces ingestion by primates in the wild, though it is probably uncommon (Wrangham, 1977).

Coprophagy has its disadvantages as well. The main risk is infection, a risk that is much reduced when an animal consumes its own feces (as is typically the case with rats), because it already harbors the organisms in its own feces. The risk/benefit ratio may be particularly high for humans. The fact that humans live in large, intimate groups in stable locations may increase the chances of passing harmful microorganisms from one person to another if feces are eaten.

Many of the risks and benefits of coprophagy apply as well to other decayed substances. Humans do not seem to have an innate rejection of decayed substances (see ontogeny section), although this may occur in other species. Carnivores tend to avoid decayed meat, except for the specialists (scavengers) who thrive on it. Indeed, Janzen (1977) points out that it is an adaptive strategy of microorganisms to putrefy meats and hence save the food source for themselves.

The designation of microbial risks as the phylogenetic basis for disgust does not account for why disgust is such a distinct form of food rejection. Why are feces and other decayed substances not treated simply as additional dangerous substances?

A second adaptive justification for disgust is that it is an adaptation to culture (Rozin, 1982). Disgust provides a powerful way to transmit cultural values. Endowing the rejections of certain substances with strong negative affective value helps ensure that those rejections will be internalized and thus less subject to temptation or modification. Thus, feces and other objects of

disgust are avoided because of their intrinsic properties rather than, or as well as, for health reasons. Avoidance of dangerous substances entails the continuing belief (potentially reversible by a single example) that ingestion will cause harm. Avoidance of disgust substances is more intrinsic and, hence, less subject to reversal by information or example.

The Ontogeny of Disgust

The acquisition of disgust is a special case of the acquisition of culture or values and is a prototypical example of the interaction of affect and cognition. We first consider the sequence of events in the development of disgust and then the nature of the acquisition process.

The Sequence of Events in the Development of Disgust

A first step in understanding the ontogeny of disgust is to describe the sequence in which the characteristics of disgust appear. We will review evidence suggesting that disgust is absent at birth and develops through early and middle childhood.

The First Years of Life: The Absence of Disgust

Our conceptualization of disgust presumes a cognitive appreciation of the nature of objects and some level of conception of the self. Some students of infancy would deny the existence of both these capacities in infants (e.g., Mahler, 1968), from which follows, on grounds of incapacity, that disgust could not exist in newborns. However, rudiments of adult disgust might be present at birth. In particular, what is the infant's response to core disgust objects such as feces and other decaying animal matter? The universality of disgust for feces on the part of adults and the strong intensity of their response suggest that this may be an innate rejection (e.g., Tomkins, 1963).

Psychoanalytic theory claims that the rejection of feces is not present at birth. In Freud's view, the young child's initial attitude toward feces is positive. These children regard their "product" as part of themselves and are reluctant to part with it. Indeed this attachment to and interest in feces is a major feature of the anal stage of development (Freud, 1905/1962). According to Jones (1948), the young child's tendency, if unconstrained, is to play with, mold, and smear "excreta as a token of affection and pleasure, a demonstration usually misinterpreted by the recipient" (p. 424). This assertion is supported by general observations of positive reactions by infants and young children to feces and other body products and to decaying material (Senn & Solnit, 1968).

Evidence supporting the psychoanalytic view comes from studies of the responses of infants and young children to decay odors and disgust objects. A number of studies report that young children are generally quite tolerant of what adults call disgust or decay odors (but see Steiner, 1974). Petó (1936) studied facial and verbal responses to a wide range of odors (including decay) in Hungarian children ranging in age from 1 month to 10 years. Children under 3 years of age showed very few rejections of any odorants; only 3 of 92 children in this age range showed any signs of rejecting disgust odors. About half the children in the 5- to 6-year age range showed such signs. Stein, Ot-

tenberg, and Roulet (1958) tested responses of children 3 to 12 years of age to three odorants, two of which (synthetic sweat and feces) are disgust odors for adults. They report positive responses to these odors in all 3-year-olds, with a sharp drop-off in positive responses to sweat and feces by age 5. Other studies (Engen & Corbit, 1970; Kniep, Morgan, & Young, 1931; Moncrieff, 1966) also suggest a positive response to decay odors for the first few years of life.

We cannot conclude from these studies that young children do not avoid adult disgust substances. Children in the first years of life might avoid disgust substances but fail to reject their odors, perhaps because they do not recognize the relation between these odors and their source. It is also possible that children have a negative response to these odors but that it is masked or reversed by demand characteristics or a tendency of children at this age to respond positively (Engen & Corbit, 1970).

A recent study directly examined American children's acceptance of a wide variety of substances from all the adult acceptance and rejection categories (Rozin, Hammer, Oster, Horowitz, & Marmora, 1986). These substances, clearly identified and presented one at a time on a plate, were offered to the children, who were asked if they would like to taste them. The results confirmed anecdotal reports; many children under 2 years of age will put almost anything into their mouths. The percentage of children under 2 years of age ($N = 13$) who put disgusting items in their mouths were as follows: 62% for imitation dog feces (realistically crafted from peanut butter and odorless cheese); 58% for a whole, small, dried fish; 31% for a whole sterilized grasshopper; and 8% for a sterilized lock of human hair. Thus, from a set of adult disgust substances, only hair was widely rejected by these young children. The incidence of rejection of adult disgust substances rises markedly after 2 years of age.

There is some cross-cultural evidence for this shift in acceptability. For example, among the Tallensi, on the West Coast of Africa, young children hunt and eat toads, mice, and snakes, whereas adolescents and adults are repelled by them (Fortes & Fortes, 1936). In general, it seems that in the first year or two of life, children will put almost anything that fits into their mouths and that much of what they learn in the first years of life is what *not* to eat (Rozin et al., 1986).

We conclude that disgust is not present at birth. Sometime well before 5 years of age, at least in Western cultures, general negative responses to objects that are disgusting to adults appear. We turn next to the general sequence of events from about age 4 years.

The Preschool Years to Adolescence: The Development of Disgust and Contamination

The development of disgust and contamination sensitivity has been explored in 4- to 12-year-old American children (Fallon et al., 1984). In response to illustrated stories, children indicated their liking for a favorite beverage after small amounts of contaminants (including poison, grasshopper, and dog feces) fell into it and then were removed in successive stages (taken out with a spoon, contents spilled and glass refilled, glass washed three times and refilled). Although all children rejected the dis-

gust substances in "pure" form, and most rejected the beverage with the disgust substances in it, children younger than 7 or 8 years rarely rejected the beverage after the contaminant was removed with a spoon. These findings were confirmed using actual contamination of beverages (with flies or used combs; Rozin, Fallon, & Augustoni-Ziskind, 1986b).

Age differences in response were apparent in the reasons children offered for rejection of the various substances. For objects such as grasshopper and feces, children younger than 8 years explained their rejections in terms of danger or distaste. It was only after this age that the children justified their rejection in terms of the nature or origin of the item (e.g., "It's because it's a bug").

One feature of the traditional disgust emotion and of our food-related disgust is a characteristic facial expression. This is shared, in adults, with the expression of distaste. The disgust face is easily elicited in infants with bitter substances (e.g., Rosenstein & Oster, in press; Steiner, 1974). Given this common expressive system and its clear occurrence in infants in response to some adult distastes, it seems reasonable to suppose that distaste exists in infants and that disgust differentiates from it.

Distaste may be the only category of food rejection in the newborn. Reasons of distaste remain the central focus of rejection until the child develops rejections based on danger and, later, disgust. We know that there is a stage in development where children report that if something is bad for them, it will taste bad. Subsequently, distaste and danger reasons become independent at a time well before disgust is clearly manifested (Fallon et al., 1984).

By itself, refusal of an item cannot distinguish between the various rejections. Four features of disgust in adults that might be employed to distinguish it from other types of rejection in children are facial expression, nausea, ideation, and contamination. None is sufficient by itself, but in combination (Table 1, bottom) they can uniquely identify disgust. Evaluating some of these features in children is problematic. The first criterion, facial expression, distinguishes danger from disgust and distaste but has not been shown to distinguish distaste from disgust in adults. No one has made a systematic search for such a distinction, however. An appropriate analysis might yield a useful and distinctive measure of disgust in young children. It is hard to determine the presence of nausea, the second criterion, in children. They do not know the word and cannot easily distinguish, verbally, between the various "belly" sensations. Our attempts to describe nausea in language that young children could understand (e.g., feeling "funny in the tummy") were unsuccessful in distinguishing between categories of rejection in 3- to 10-year-olds (Rozin, Fallon, & Augustoni-Ziskind, 1986a).

A third criterion for disgust requires explicit reference to a substance's nature as a basis for its rejection. Young children offer distaste and danger as reasons for the rejection of disgust substances. Ideational justifications are not forthcoming even after intensive probing and suggestion (Fallon et al., 1984).

The fourth criterion is contamination. The rather late appearance of contamination (after 7 years of age) may be a secondary consequence of general cognitive limitations in younger children. If one considers contamination a necessary feature of disgust, no more need be said. However, all features of disgust except contamination might be present before age 7. Contami-

nation sensitivity would then appear as the child's cognitive sophistication increased. Our interviews suggest that children below 7 or 8 years of age usually have no notion of physical traces or residues in a beverage after pieces of contaminant have been removed (Fallon et al., 1984). The children sometimes report that the beverage is the same before and after contamination. This evaluation is consistent with Piaget's (1971/1974) findings on children's understanding of solutions and with the finding that ideas of microbial contamination first appear between 5 and 7 years (Kister & Patterson, 1980). "Atomism" is not part of the young child's view of the world.

In addition to failure to appreciate the microscopic particularity of matter, children below 7 or 8 years lack what might well be other cognitive prerequisites of contamination. Rejection of a contaminated object may require the understanding that an object that bears no perceptible trace of the contaminant is the very same object that, in its history, was contaminated. That is, it requires the appreciation that two perceptibly identical objects may be different solely by virtue of their history. There is reason to believe that this notion of unique identity, of a particular type of continuity in time, is absent in young children (Guardo & Bohan, 1971). Furthermore, the distinction between the self and the outside world, which may be central to the conception of disgust, is not fully developed in young children (Bibace & Walsh, 1979). Finally, children of 5 to 8 years have minimal knowledge of the "fate of food"; most of them do not know what happens to food after it reaches their tummy, the relation between food and feces, or the fact that there is a dual pathway for ingested food (into the body as nutrients or out of the body as feces; Contento, 1981; Gellert, 1962; Nagy, 1953; see review by Carey, 1985).

Our developmental data (Fallon et al., 1984) indicate that what may be considered the two hallmarks of disgust, ideational rejection and contamination, appear at about the same time. This may be no accident. Contamination may express itself only when there is an ideational basis for rejection. It is possible that a response like contamination might first appear in children in another domain, as in the (putative) enhanced value of objects that belong to or have contacted a parent, though the absence of what we take to be cognitive prerequisites argues against this.

Summary and Conclusions

We suggest that most children below 8 years of age lack the cognitive prerequisites to experience disgust as we define it. In particular, they have limited understanding of the physiology of digestion and the process of incorporation, the particulate structure of the physical world, the distinction between the self and the outside world, and the continuity of entities in time (unique identity). The shared facial expression, which they do manifest, suggests an origin for disgust in distaste. Although 4-year-olds typically reject items found to be disgusting by adults, they do so on grounds that would cause us to classify these items as distasteful or dangerous. They fail to show either contamination or ideational rejection. Thus, there is a period in development (roughly from 2 or 3 to 7-9 years in the American children that have been studied) in which the objects of disgust are rejected, but they are not yet disgusting.

This change in the grounds for rejection can be explained in

two different ways. If one focuses on traditional definitions of emotion, which emphasize visceral and expressive responses, disgust can be viewed as an extension of the set of stimuli or contexts that elicit a fundamental rejection (distaste-disgust) emotion. In the same manner, we typically describe both the negative response to a looming object in infants and the response to the threat of nuclear war in adults as fear, presuming that the same underlying internal response is generated by different situations at different levels of cognitive sophistication. We prefer a conception in which the interaction of the subject with the object or context is a critical part of the definition of the emotion. Under these circumstances, disgust appears as a qualitatively different system because it requires contamination and ideational rejection, though it shares some properties with its presumed precursor, distaste.

By either of the two foregoing views, the acquisition of many disgusts occurs in two phases. First, the objects of disgust (for adults) come to be rejected, and later they take on ideational (offensive) and contamination properties as cognitive development progresses. How do objects treated as disgusting by adults come to be rejected? The processes may initially involve a rejection based on distaste by young children, whereas they might lead directly to a full disgust in an appropriately sophisticated person. We emphasize that at present we do not know whether, among the food rejections of 4-year-olds, a disgust substance (e.g., feces, a cockroach) is any different, psychologically, from a distaste substance (e.g., lima beans), a dangerous object (e.g., cleaning fluid), or some combination of the two. The mechanisms of early disgust acquisition that we review below, such as toilet training, may therefore have no specific disgust effects, as distinct from distaste and danger. However, we consider this unlikely. The behavior of parents and other adults toward disgusting substances is surely very different from their behavior toward distasteful (or dangerous) items. There is less emphasis on the sensory properties of disgust substances. Furthermore, observations of interactions among children and between children and parents indicate that from as early as 14 months, there is an appreciation by children that disgust substances (e.g., feces) have special significance for adults (Dunn, 1986). Young children do a great deal of joking about disgusting substances and often draw attention to these substances. There is also a great deal of discourse among children and between children and parents on this subject (Dunn, 1986).

Acquisition Process

In this section, we propose a distinction between primary and secondary objects of disgust. A primary object of disgust is one that comes to be disgusting (or rejected) without the necessary participation of other disgusting objects, whereas secondary objects of disgust require such participation. Of course, primary and secondary disgusts differ in different cultures and to some extent across individuals within a culture. Furthermore, within a culture, the same object may be a primary disgust for some and a secondary disgust for others.

Primary Disgusts

We focus first on feces as a primary disgust and the role of toilet training in establishing it. Then, we consider specific acquisition processes for other primary disgusts.

Feces and toilet training. In the psychoanalytic view, the toilet-training procedure is thought to be especially significant because children are asked to reject and be offended by something that they produce and to which they are very attached. The resulting strong negative reaction to feces is described as a reaction formation (Fenichel, 1945). Without accepting all the relevant psychoanalytic principles, one can acknowledge the appeal of the idea that the special disgust for feces is so powerful partly because it originates in a strong attachment.

We first consider whether the disgust response to feces is caused by toilet training. Because both the disgust response to feces and the occurrence of toilet training are universal, we cannot do a cause-effect analysis by looking at the consequences of the absence of either. The results we have reviewed suggest that the rejection of feces as an edible substance probably follows toilet training. However, the difficulties in specifically identifying disgust in young children make it impossible to determine whether the young child's rejection of feces, perhaps consequent on toilet training, is any different from its rejection of lima beans (but see discussion at the end of the last section on children's reactions to disgusting substances and their role in discourse [Dunn, 1986]). Disgust, as we define it, toward feces or any other substance, is not clearly present for some 3 to 6 years after toilet training.

If the disgust response to feces is caused, at least in part, by the toilet training process, then one would predict a positive correlation between the degree of parental disgust expressed during toilet training and the intensity of the disgust response to feces in the child. Furthermore, insofar as other disgusting objects are linked to feces, then toilet training "severity" should correlate with general disgust sensitivity. We already know that there is a substantial correlation (Pearson r_s around .50) between parents and their young adult children in disgust sensitivity, measured by a simple 10-item questionnaire (Rozin et al., 1984). However, the specific link to toilet training is absent. Ideally, one would correlate a measure of toilet training severity (in terms of expressed disgust by the parents) with subsequent disgust sensitivity in children. There are two serious problems with such a study. First, we have no valid measures of disgust in children (if it exists, in our sense) until age 7 years. Second, except for the case of a prospective study, it would be necessary to rely on retrospective reports of toilet training, which present difficulties in terms of reliability and validity (Robbins, 1963).

Another possibility is a cross-cultural approach, because there are large, well-documented cultural differences in toilet training. There is very little information available, however, on the extent and expression of disgust in other cultures. One striking instance supports the toilet training-disgust linkage. Eskimos (Heller & Scott, 1967) are particularly casual about toilet functions (traditionally performed in the family's one-room dwelling) and about toilet training. They also seem to be very disgust insensitive, as indicated by their fondness for a variety of foods considered disgusting in most other cultures. They like to eat the gut contents of some animals and intentionally allow meat to decay before consuming it. However, observations from India (A. Appadurai, personal communication, 1984) suggest that if true, the toilet training-disgust relation holds only in the narrow sense for feces-related disgust objects. In India, where general disgust sensitivity should be very high because of the

cultural salience of personal contamination, toilet training and general responses to feces are rather casual when compared with those of the United States.

Acquisition of primary disgusts. We shall now consider processes that could account for the creation of any primary disgust. The most likely process is transmission of the disgust experience from one person to another (e.g., parent to child). There is evidence that something like this in fact happens inasmuch as disgust-contamination sensitivity measures between parents and their young children show substantial positive correlations (Rozin et al., 1984).

The transmission of disgust (or, for the young child, rejection) across people could be mediated by verbal and/or nonverbal expressions. Tomkins (1963) points to facial expression as a most likely route. He suggests two pathways, both of which make the assumption that when one makes a facial expression appropriate to an emotion, one will experience, or tend to experience, that emotion. In one pathway, a disgust face in another person automatically or reflexively causes a disgust face in the self and hence the experience of disgust. Tomkins refers to this process as "reintegration through translation." He believes it is more effective when the other has special standing, as a parent might, for example. He also allows for a second route in which the first step ("imitation") is voluntary modeling of the other's disgust face. The application of Tomkin's views depends on the assumption that the aroused emotion will be attached to the object of attention. We consider this a very reasonable assumption but know of no data that either refute or support it.

Tomkin's formulation is based partly on the assumption of innate empathic responses by a child to facial expressions in others. These empathic responses could form the basis for Pavlovian conditioning (Aronfreed, 1968, 1970). For example, in the presence of an adult disgust object, a parent expresses disgust. This gives rise to an empathic disgust expression in the child (unconditioned stimulus [UCS]), which is paired with the presence of the object (a conditioned stimulus [CS] for the child).⁵

Many communications other than facial expressions pass between humans, and it is very likely that other nonverbal expressions, as well as verbalizations, may communicate disgust. (Indeed, although the facial expressions of distaste and disgust in adults may be similar or identical, other expressions may differentiate distaste and disgust.) The simplest paradigm that holds promise to be a model for the acquisition of disgust, fear, or other emotions in infants and young children is social referencing. In the literature on this topic, it has been shown that facial and other responses of a parent are noted by infants, particularly when the infants are in an uncertain situation, and that this parental information appropriately modulates infants' behavior (Feinman, 1985; Klinnert, Campos, Sorce, Emde &

⁵ According to Hoffman (1975) and Feshbach (1978), fully mature empathic responses presume a certain level of cognitive development, including such accomplishments as person permanence, a differentiated self-concept, and certain role-taking abilities. This formulation of empathy predicts a development of empathic response that roughly matches the development of disgust. Up to this time, most research on empathy has centered on distress. Disgust might usefully serve as another focus for such research.

Svejda, 1983). This process could be extended to account for the longer-term investment of objects with emotion-inducing properties, but this has not yet been accomplished.

Another possible route to primary disgust is essentially cognitive rather than affective. Once cognitive criteria for disgust are elaborated in the individual (e.g., contamination, ideational rejection) and these are linked to certain properties (e.g., decayed, garbage-related, anomalous), then acquisition of information about an object that endows it with such properties creates a primary disgust. Examples are the discovery that a piece of meat actually comes from an already disgusting animal ("Oh my God, that's horse meat!") or that a particular once-acceptable animal comes not from an acceptable category (e.g., fowl) but from a disgust category (e.g., predatory bird). This process can be described as a conceptual generalization.

Secondary Disgusts and the Expansion of Disgusts

We review here a number of possible mechanisms for the acquisition of secondary disgusts.

Generalization. A substance may become disgusting because it perceptually resembles an existing (primary or secondary) disgust substance. Viscous substances resemble mucus, and mud or decaying meat resemble feces.

A more conceptual generalization may also occur. This process is similar to the cognitive route to acquisition of primary disgusts. The critical difference is that for secondary disgusts, it is similarity or relatedness to an already disgusting item—by virtue of classification, environmental proximity, and so forth—that generates the disgust. For example, for some individuals, flies may acquire disgust properties because of their association with or proximity to garbage or other decaying products. We have many reports of responses resembling disgust produced by an association with feces. Dogs, for example, are rejected as food in parts of Thailand, because they eat feces (Tambiah, 1969), and one of us (P.R.) has observed that in rural Mexico grasshoppers that live around the house are rejected because there are deposits of human and animal feces around the house. However, the same species of grasshopper is collected from the fields and eaten, because the fields are considered clean. These examples can be interpreted in associative terms or as instances of the law of contagion.

Ferenczi (1914/1952) describes a hypothetical sequence of disgusts based on perceptual and conceptual generalization. He regards this process as being initiated by the transfer (displacement) of the initially positive response to feces to other related substances. The same perceptual-conceptual similarities that make these items positive alternatives to feces eventually cause them to become disgusting as well. The initial love for feces, according to this view, is displaced first to mud (odorless feces) and then in turn (as mud becomes offensive) to dirt (odorless, dry feces), sand (odorless, dry, light-colored feces), stones (odorless, dry, light-colored, hard feces), and finally to gold (money).

Pavlovian conditioning. A basic and simple process for the acquisition of disgusts is Pavlovian conditioning resulting from spatially and/or temporally contingent associations of a CS (often a neutral substance) with a UCS (a disgust substance). Simultaneous associations, a recently explored variant of Pavlovian conditioning (Rescorla, 1981), would seem to be a particu-

larly appropriate model. Under these circumstances the stimuli involved occur at the same time and in the same location. We expect that single experiences are often effective.

We have already noted the parallel between the laws of association and sympathetic magic. The contamination procedure lends itself to a simple Pavlovian (as well as magical) interpretation. When a cockroach falls into a glass of juice, there is a simultaneous spatiotemporal pairing of juice (CS) and roach (UCS). Subsequent rejection of that juice when the roach has been removed may result from conditioning, although most people account for their avoidance in terms of physical residues (contagion). We have taken the situation one step further. After contamination of Juice A with a roach and Juice B with a birthday candle holder (control), we poured *new* Juice A into a *new* glass (and the same for Juice B). This Juice A never had contact with a roach, yet there was a significant drop in rated readiness to drink Juice A relative to Juice B. A small (6 out of 50) number of subjects showed a substantial decrease in their readiness to drink Juice A (Rozin, Millman, & Nemeroff, 1986). This change could be accounted for by the magical principle of similarity (to the contaminated juice) or as a conditioned response to a new presentation of the CS. Both interpretations are viable.

The literature on affective changes in humans produced by Pavlovian processes is surprisingly meager (see Martin & Levey, 1978, for a review). Some examples of affective changes in humans include enhancement of liking for a taste when it is paired with sweetness (Zellner, Rozin, Aron, & Kulish, 1983) and enhancement of sexual desire for an object when paired with sexual excitation (Rachman & Hodgson, 1968). Some aversion therapy techniques come close to being disgust acquisition paradigms, as when unpleasant (decay) odors are used to create food aversions in the treatment of obesity (Foreyt & Kennedy, 1971).

We have collected (from about 400 students) remembered incidents in which, on the basis of a single event, likes for a variety of objects or situations turned into dislikes (Rozin, 1986). We list here 6 of 22 such instances in which disgust was involved: (a) acquired dislike of sashimi after watching the cutting open and cleaning of a fish, (b) dislike of eating at a particular cafeteria after a roach was seen near the desserts, (c) dislike of M & Ms after hearing that the outside shell was made of fly droppings, (d) dislike of spaghetti after having had a hand placed in what was described as a bowl of worms in a "haunted" house and later discovering that it was spaghetti, (e) dislike of tongue after seeing it prepared and realizing its anatomical origin, and (f) dislike of red meat after cutting into a piece of rare meat and seeing blood spurt out.

In these examples, and the juice study mentioned above, a case can be made for the increasing undesirability of a stimulus paired with a disgusting stimulus. We do not know if the CS has simply become distasteful or if it is truly a new disgust. If the latter holds, the CS should itself take on contamination properties. This is yet to be determined.

We have already referred to the role of Pavlovian mechanisms in the creation of primary disgusts with the disgust face of another person as a UCS. In everyday life, expressions of disgust by others often accompany one's own experiences of the pairing of a disgusting and a neutral object, as when one discovers a fly in one's soup at the dinner table. Therefore, two different

Pavlovian contingencies (with UCSs of the disgusting object and nonverbal expressions) may strengthen each other.

Associative predispositions and disgust. Any theory of acquisition of disgust must address the fact that almost all objects of disgust are of animal origin. Associative explanations, by themselves, cannot easily account for this specificity. The same type of problem arises with the special tendency of tastes to show a negative affective shift when followed by nausea, as opposed to other negative physiological events (Garcia, Hankins, & Rusiniak, 1974; Logue et al., 1981; Pelchat & Rozin, 1982; Rozin & Kalat, 1971). This and related problems have been solved by postulating associative predispositions (belongingness or preparedness; Garcia et al., 1974; Rozin & Kalat, 1971; Seligman, 1970; Shettleworth, 1972). For example, it is claimed that there is an innate tendency to selectively associate tastes with nausea. Similarly, we postulate that when a disgust UCS is present, it is more likely to associatively "transmit" its disgustingness to a particular class of available objects: animals and their products.

Preparedness for object classes has been invoked by Seligman (1971) to account for the high frequency of certain types of phobias. He argues that there is a predisposition to associate objects or situations that were of potential danger to pretechnological man (e.g., snakes, heights) with negative events. There is some direct evidence from conditioning studies for such a predisposition in humans (Ohman, Fredrikson, Hugdahl, & Rimmo, 1976).

An alternative to our hypothesized predisposition to associate animals and their products with disgust experiences is the position that there is a tendency to selectively associate animals with any significant event, positive or negative (e.g., Tambiah, 1969). There are no data that distinguish between these alternatives.

A nonassociative explanation of the role of animals in disgust, one that accords with the laws of sympathetic magic, is that only animals produce the essences that putatively form the vehicle of contagion.

Unmaking of Disgusts

Whereas people readily acquire disgust responses to substances, especially during the enculturation process, they rarely lose them. This presents a problem in public health, when members of a particular culture reject a nutritive, cheap, and plentiful foodstuff (e.g., fish flour, a fermented item, a particular animal species). Some routes to elimination of disgust follow readily from the mechanisms of acquisition. Cessation of disgust expressions and/or initiation of accepting expressions by adults toward the relevant object might be a successful route, though we doubt their efficacy for well-established disgusts. Conceptual reorientation might be a more effective method: A person discovers that what he thought was lamb (which he considered disgusting) is actually beef, or another discovers that what she thought was rotting milk is actually yogurt. When a disgust response to a foodstuff is eliminated, we might expect one's disgust response to related items to weaken or disappear, on the basis of generalization (perceptual or conceptual). However, as we have learned from the study of extinction of higher-order conditioning (Rescorla, 1980), second-order acquisitions

may become independent of the original conditions that established them.

Assuming a Pavlovian basis for some disgust responses, a third route for elimination of disgust responses is extinction. Seligman (1970) claims that prepared associations are both more resistant to extinction and less rational (less subject to cognitive manipulations). Hugdahl and Ohman (1977) have shown that the fear based on the prepared association of a spider with shock is more resistant to extinction than the fear of a flower paired with shock. Furthermore, the information that shock will no longer be paired with the object notably attenuates the galvanic skin response to a flower but not to a spider.

People ordinarily avoid opportunities that would provide for the extinction of the disgust response. Although individuals may frequently view disgust objects at a distance, they rarely allow close contact with these items, especially if there is any threat of ingestion. When someone is consistently forced into close contact, the strength of the disgust response can weaken by a process of extinction or adaptation. Thus tourists, in maintaining politeness or out of nutritional necessity, may feel compelled to consume an item accepted in the culture they are visiting but disgusting within their own culture. Under these circumstances, there is probably a gradual weakening of disgust. People whose work forces them into close association with disgust substances (disboweling animals, cleaning toilets, performing dentistry) tend to become neutral toward them. Under extreme exposure, as in the filth of concentration camps, some may adapt to the steady stream of offensive substances, but others retain their total abhorrence to them (DesPres, 1976). Similarly, in the famous Andes plane crash that led a Uruguayan rugby team to cannibalism, some of the surviving team members were unable to consume human meat, some slowly adapted under the greatest duress, gagging each time, and others readily accepted this diet (Read, 1974).

There are a number of life situations in which the weakening of disgusts regularly occurs. A mother's disgust is weaker for the body wastes of her infants. Between lovers, there is sometimes a loss of disgust for sexual secretions and body odors. In both cases, adaptation or extinction caused by frequent exposure may provide a satisfactory account. However, another interesting and more cognitive mechanism may be involved. The mother-child and lover relations involve, to some extent, a weakening or destruction of self boundaries. Because disgust critically involves things foreign to the self, these intimate relations may weaken disgust by blurring the self-other distinction. By such a route, one's child's or lover's body products might become at least as acceptable as one's own, and in the case of lovers, some of these generally disgusting products may take on lover-specific positive value.

In every culture, adults like some foods or drinks that are decayed or fermented. Cheese is a salient example in Europe and America, and other decayed milk products (e.g., yogurt) are widely consumed in other parts of the world. Decayed eggs are consumed in China, decayed meat in the Arctic, decayed fish in the widely consumed fish sauces of Southeast Asia, and so on. The critical question is, Are these items excluded from the disgust category from the beginning, or do they first become disgusting and then become acceptable secondarily? We have little evidence that directly addresses this question, but it seems

rare in America for elementary school-age children to like putrid cheeses. Assuming that cheese involves a disgust reversal, it would be interesting to discover how this occurs. Children would certainly have the opportunity to observe adults enjoying these substances.

Conclusions

Our purpose has been to bring a salient aspect of human behavior to the attention of psychologists. Disgust has its own distinctive properties. However, it is also a domain in which some basic aspects of human nature are particularly evident. Disgust seems primitive and irrational, yet as a product of culture it is both uniquely human and apparently absent in young children. It may be a good model system for the study of cognitive-affective linkages, because, unlike most other emotions, disgust can be ethically and realistically elicited in the laboratory, and one can produce major changes in the evaluation of objects rapidly and without trauma. It may be a prime illustration of the laws of sympathetic magic in Western culture, and it emphasizes the importance of context and culture in understanding human behavior.

This article does not pretend to be a fully articulated theory of disgust or cognitive-affective linkages. Rather, it is an excursion into what we think is an interesting part of human psychology where few psychologists have tread.

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