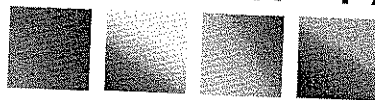


## CHAPTER 47



# Disgust

PAUL ROZIN, JONATHAN HAIDT, and CLARK R. McCAULEY

Rozin, P., Haidt, J., & McCauley, C. R. (2008). Disgust. In M. Lewis, J. M. Haviland-Jones & L. F. Barrett (Eds.), *Handbook of emotions*, 3rd ed. (pp. 757-776). New York: Guilford Press.

For North Americans, elicitors of disgust come from nine domains: food, body products, animals, sexual behaviors, contact with death or corpses, violations of the exterior envelope of the body (including gore and deformity), poor hygiene, interpersonal contamination (contact with unsavory human beings), and certain moral offenses (Haidt, McCauley, & Rozin, 1994; Rozin, Haidt, & McCauley, 1993; Rozin, Haidt, McCauley, & Imada, 1997). What unites these disparate domains? Although all involve negative or unpleasant events, there are many negative events, such as pain and loss, that are not disgusting. The primary goal of this chapter is to make sense of this varied set of elicitors—that is, to describe the meaning of disgust within evolutionary, developmental, and cultural contexts. We argue for a path of development in individuals and cultures that extends from the presumed origin of disgust as a rejection response that protects the body from “bad” foods, to a rejection system that protects the soul from the full range of elicitors listed above.

### DEFINING DISGUST

There are two classic papers describing disgust, published some 70 years apart. The first, a chapter in Darwin's *The Expression of the Emotions in Man and Animals* (1872/1965), defined disgust as referring to “something revolting, primarily in relation to the sense of taste, as actually perceived or vividly imagined; and secondarily to anything which causes a similar feeling, through the sense of smell, touch and even of eyesight” (p. 253). Darwin related disgust not only to the experience of revulsion but to a characteristic facial expression. The second paper, by psychoanalyst Andras Angyal (1941), held that disgust is revulsion at the prospect of oral incorporation of an offensive object. He identified body waste products as a focus of disgust, and related the strength of disgust to the degree of intimacy of contact. Our own description of disgust, or what we call “core disgust,” follows on Angyal's definition above, adding this sentence: “The offensive objects are contaminants; that is, if they

even briefly contact an acceptable food, they tend to render that food unacceptable" (Rozin & Fallon, 1987, p. 23).

Most definitions focus on the mouth and real or imagined ingestion. Tomkins (1963, 1982) held that of all the emotions, disgust has the clearest linkage to a specific motivation (hunger), and functions to oppose this motive. Ekman and Friesen (1975) see disgust as an aversion that centers on oral rejection. Wierzbicka (1986) defines disgust as a bad feeling about another person's action, "similar to what one feels when one has something in one's mouth that tastes bad and when one wants to cause it to come to be out of one's mouth" (p. 590).

Some have proposed systems other than ingestion as the origin of disgust. Freud (1905/1953) predictably linked it to sex, and others (e.g., Renner, 1944; Plutchik, 1980) see its origin as a defense against infection, with the skin playing a central role. Curtis and her colleagues (Curtis & Biran, 2001; Curtis, Aunger, & Rabie, 2004) have presented evidence that the best single account for what is currently disgusting is infection potential, and have suggested that protection from infection provides the adaptive reason for the evolution of disgust. The fact that contamination sensitivity is a basic feature of disgust supports this claim. Kelly (2007) proposes that disgust has a dual origin. His entanglement hypothesis posits a convergence of an orally focused toxin avoidance system (present in nonhumans) and a broader parasite avoidance system that arose during human evolution.

It seems likely that threats of disease and infection shaped the disgust response as humans increased their intake of foods of animal origin and as group densities increased. Both of these major changes increased parasite risk. Still, we find the arguments for a food origin convincing (Rozin & Fallon, 1987). The English term "disgust" itself means "bad taste," and the facial expression of disgust can be seen as functional in rejecting unwanted foods and odors. The most distinct physiological concomitant of disgust—nausea—is a food-related sensation that inhibits ingestion. Finally, the brain region most often activated in studies of disgust (including non-food-related stimuli, such as mutilations and disgust faces) is the anterior insula (Husted, Shapira, & Goodman, 2006), which, among its other functions, is the gustatory cortex in primates (Rolls, 1994).

## COMPONENTS OF DISGUST

Almost all of the literature on emotion prior to 1990 focused on fear, anger, happiness, and sadness. However, disgust seems to have "arrived" in the 1990s. Between 1997 and 2006, PsycINFO listed 178 articles with "disgust" in the title (see also Olatunji & Sawchuk, 2005). In the same period, two academically oriented books about disgust were published (W. I. Miller, 1997; S. B. Miller, 2004), and two influential trade books about psychology devoted considerable attention to disgust (Bloom, 2004; Pinker, 1997). One stimulus to the investigation of disgust has probably been the fact that it appears primitive and basic, while at the same time the broad range of elicitors implicates disgust in many uniquely human concerns, including morality and divinity. For this reason, we have described disgust in the title of one publication as "the body and soul emotion" (Rozin, Haidt, & McCauley, 1999), and this contrast has provoked considerable interest (e.g., Bloom, 2004). A related framing of disgust conceives it as the emotion that is the guardian of the borders of both the bodily self and the social self (Fessler & Haley, 2006; S. B. Miller, 2004; Rozin, Nemeroff, Horowitz, Gordon, & Voet, 1995).

Paul Ekman (1992) has provided the clearest articulation of the characteristics of an emotion, and disgust meets all nine of his criteria. We consider here four of Ekman's criteria.

### Behavioral Component

Disgust is manifested as a distancing from some object, event, or situation, and can be characterized as a rejection.

### Physiological Component

Disgust is associated with a *specific* physiological state—nausea—that is typically measured by self-report. Another specific physiological aspect of disgust has been suggested by Angyal (1941), who pointed to increased salivation, itself associated with nausea, as a concomitant of disgust. We know of no experimental studies of the relation of disgust to nausea or salivation. More conventional psychophysiological investigations of disgust suggest that it is associated with some degree of parasympathetic autonomic response, particularly lowered heart rate, whereas fear and anger are associated

with a predominantly sympathetic response (Levenson, Ekman, & Friesen, 1990; Levenson, 1992).

### Expressive Component

The expressive component of disgust has been studied almost entirely with reference to the face. The characteristics of the "disgust face" have received particular attention from Darwin (1872/1965), Izard (1971), Ekman (Ekman, 1972; Ekman & Friesen, 1975), and Rozin, Lowery, and Ebert (1994). Scholars are not in complete agreement about a prototypical disgust face, but the three main components seem to be the gape (Action Unit [AU] 25 or 26 in the Facial Action Coding System [FACS; Ekman & Friesen, 1978]), retraction of the upper lip (AU 10), and the nose wrinkle (AU 9). Activity centers around the mouth and nose, and the movements tend either to discourage entry into the body (e.g., nose wrinkle) or to encourage discharge (gape with or without tongue extension). Facial electromyographic measurements confirm the observational data, involving some of the same facial muscles, and including some of the muscles around the eyes (Wolf et al., 2005). Laughter is a common response (as opposed to the disgust face) in some disgust-eliciting situations (Hemenover & Schimmack, 2007).

The *Nāṭyaśāstra* (Masson & Patwardhan, 1970), an ancient Hindu treatise on drama (see Shweder, Haidt, Horton, & Joseph, Chapter 25, this volume), treats disgust as one of eight or nine basic emotions. As described by Hejmadi (2000), the multiple portrayals of disgust designated in this document are dynamic (as opposed to the standard "frozen face" used in almost all Western research), and involve actions of the whole body, especially the hands. Americans as well as Indians are able to identify these disgust expressions remarkably well (Hejmadi, Davidson, & Rozin, 2000).

### Qualia

*Qualia*, the mental or feeling component of emotion, may be at once the most central component of disgust and the most difficult to study. The *qualia* of disgust is often described as revulsion. In comparison to other emotions, the experience of disgust appears to be rather short in duration (Scherer & Wallbott, 1994).

## CORE DISGUST

We believe that disgust was shaped by evolutionary forces that elaborated upon an older food rejection system based on distaste. In this and subsequent sections, we describe how core disgust differs from distaste, and then how disgust may have expanded to a much wider range of elicitors—including reminders of our animal nature, and certain types of interpersonal contact and moral violations.

Core disgust is one of four categories of food rejection, the others being distaste (rejection motivated by bad sensory properties), danger (rejection motivated by fear of bodily harm), and inappropriateness (rejection of a food culturally classified as not edible) (Fallon & Rozin, 1983; Rozin & Fallon, 1987). Like inappropriateness, disgust is defined by ideational forces: beliefs about the nature or origin of a potential food. Unlike inappropriate entities, disgusting entities are presumed to be both distasteful and dangerous. The appraisal that elicits core disgust requires (1) a sense of potential oral incorporation (and hence a linkage with food or eating), (2) a sense of offensiveness, and (3) contamination potency (Angyal, 1944; Rozin & Fallon, 1987).

### Oral Incorporation

Rozin and Fallon (1987) noted that the mouth is the principal route by which material things enter the body, and hence can be thought of as the gateway to the body. Aversion to an offensive entity in the mouth is usually stronger than aversion to the same entity on the body surface near but not inside the mouth, or inside the stomach (Rozin et al., 1995).

The threat of oral incorporation is framed by a widespread belief that one takes on the properties of the food one eats ("You are what you eat"). In *The Golden Bough*, Frazer (1890/1922) noted: "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 are characteristic of that animal or man" (p. 573). This belief is consistent with our general experience that when two things combine (in this case, a food and a person), the product resembles both. Nemeroff and Rozin (1989) found, using the Asch impression-listing technique, that American college students attribute boar-like qualities

to boar eaters, and turtle-like qualities to turtle eaters.

#### Offensive Entities:

##### Animals and Their Products

Angyal (1941) held that the center of disgust is animal (including human) waste products, which he saw as debasing. Body products are a focus of disgust, and are central to the related anthropological concept of pollution (Douglas, 1966; Meigs, 1978, 1984). There is widespread historical and cultural evidence for aversion and disgust to virtually all body products, including feces, vomit, urine, and blood (especially menstrual blood). In accord with Angyal's (1941) suggestion of an animal focus for disgust, Rozin and Fallon (1987) proposed that the elicitor category for core disgust consists of all animals and their products as potential foods. Relatedly, Martins and Pliner (2006) report a dimension of livingness/animalness emerging from multidimensional scaling of ratings of the disgustingness of a wide range of novel foods. Almost all cultures eat only a small subset of potential animal foods. Angyal (1941) pointed out that in many cultures some care is taken to disguise the animal origin of animal food by cutting, chopping, and other culinary preparations, as well as by having names for animal foods (e.g., "pork" and "beef" in English) that are distinct from the corresponding animal names.

Animals and their products seem cross-culturally to be both the most favored of foods and the most tabooed. In short, animal foods are emotionally charged (Tambiah, 1969) and tend to give rise to ambivalent responses. Many animal taboos involve disgust. Some animals are disgusting because they bear some resemblance to body products such as mucus (e.g., slugs), or because they are commonly in contact with rotting animal flesh, feces, or other human wastes (e.g., flies, cockroaches, rats, vultures, and other scavengers). Carnivorous land animals eat raw, often decaying animal flesh, and produce putrid feces; they are disgusting at both ends. Herbivores are much less likely to be prohibited cross-culturally. Even the hunter-gatherer !Kung bushmen, who eat a much wider variety of species than most Westerners do, reject rodents, carnivores, and most insects (Howell, 1986).

Two other categories of animal food prohibitions deserve mention. Animals that are close

to humans, either in appearance (e.g., other primates) or by virtue of a relationship with humans as pets, are rarely eaten. And finally, there is a group of anomalous animals that seem to produce a mixture of fear (danger) and disgust (e.g., spiders and snakes). These animals are feared, although they are rarely harmful to humans. Davey and his colleagues (Davey, 1993; Matchett & Davey, 1991; Ware, Jain, Burgess, & Davey, 1993; Webb & Davey, 1993) offer evidence that the aversion to these animals is based more on disgust than fear.

#### Contamination

The contamination response—rejection of a potential food if it even briefly contacted a disgusting entity—appears to be powerful and universal among adults. North American college students reject liked beverages after these have briefly contacted a sterilized cockroach (Rozin, Millman, & Nemeroff, 1986), and virtually all North Americans reject foods that have been handled or bitten by either unsavory or disliked persons (Rozin, Nemeroff, Wane, & Sherrod, 1989). Although this aversion is typically justified as an avoidance of disease, removal of this justification (e.g., by sterilizing the offending dead cockroach) typically has only a small effect. Contamination may have been shaped as an adaptation for disease avoidance, but it operates largely independently of conscious beliefs about disease.

Rozin and his colleagues have suggested that contamination effects may be instances of the sympathetic magical law of contagion (Tylor, 1871/1974; Frazer, 1890/1922; Mauss, 1902/1972), which essentially holds that "once in contact, always in contact" (Rozin & Fallon, 1987; Rozin & Nemeroff, 1990). The law of contagion as applied to disgust is potentially crippling; everything people might eat or touch is potentially contaminated. Humans deal with this problem in a number of ways. First, contamination rules are developed in some cultures, such as the explicit rules establishing a threshold for contamination in the Hebrew dietary system (Grunfeld, 1982). These rules provide ritualistic relief but not necessarily psychological relief of a sense of contamination (Nemeroff & Rozin, 1992).

Most often, framing is the strategy that keeps potential contamination out of consideration—as when we do not think of the people in the kitchen who prepare our food in a

restaurant, or the animal that was the source of our meat, or the fact that our body contains a host of disgusting substances. The framing solution fails when the source of contamination is too salient.

A second law of sympathetic magic, the law of similarity, accounts for some other aspects of disgust. The law of similarity, also dating from Tylor, Frazer, and Mauss (for reviews, see Rozin & Nemeroff, 1990; Nemeroff & Rozin, 2000), holds in one form that if things are superficially similar, then they resemble each other in a deep sense as well. In other words, appearance is reality. The law of similarity is evident when objects that look like something disgusting are treated as disgusting. For example, many North Americans are reluctant to consume imitation dog feces that they know are made out of chocolate fudge (Rozin, Millman, & Nemeroff, 1986).

## ANIMAL-NATURE DISGUST

Our discussion of disgust up to this point has focused on issues surrounding food and eating. We have presented core disgust as an oral defense against harm from potential foods, or things that can easily contaminate foods such as body products and some animals. However, when we asked North American and Japanese respondents to list the things they thought were disgusting, fewer than 25% of listed examples came from the three core disgust domains of food, animals, and body products (Haidt, Rozin, McCauley, & Imada, 1997). Many of the other examples could be classified into four additional domains: inappropriate sexual acts, poor hygiene, death, and violations of the ideal body "envelope" or exterior form (e.g., gore, deformity, obesity). In the four additional domains, the focus of threat has spread from the mouth to the body in general. This spread is captured in a psychoanalytic treatment of disgust: "In summary, any modality that represents a means of entry into the self or body—the mouth, the nose, the skin, the eyes—seems to play a part in the disgust experience" (S. B. Miller, 1986, p. 300). All four of these domains involve potential sources of biological contagion and infection (e.g., venereal diseases from sex, or skin-to-skin or hair-to-hair infection from parasites on an unclean person); thus core disgust was preadapted and easily expanded to apply contamination sensitivity to these addi-

tional classes of threats. However, we think that something more symbolic was and is going on as well.

Contact with death and corpses is a particularly potent elicitor of disgust. Two of the items in our 32-item Disgust Scale (discussed in more detail later) that correlate most highly with the total score are about contact with dead bodies (Haidt et al., 1994). The prototypical odor of disgust is the odor of decay, which is the odor of death. The centrality of death in disgust suggests a more general construal of disgust within a modified psychoanalytic framework.

Becker (1973) has argued that the most important threat to the psyche is not sexuality and aggression, but the certainty of death. Only human animals know they are to die, and only humans need to repress this threat. In this framework, Becker's "denial of death" is served by disgust, which helps to suppress thoughts or experiences that suggest human mortality. Research on terror management theory has shown a strong connection between disgust and the fear of death: People who are asked to imagine their own death later show an increase in disgust sensitivity, and an increase in liking for an essay that argues for human uniqueness rather than human continuity with other animals (Goldenberg et al., 2001). Conversely, exposure to disgusting stimuli, under some conditions, increases implicit death-related ideation (Cox, Goldenberg, Pyszczynski, & Weise, 2007).

These speculations about death lead to an overarching description of disgust elicitors: Anything that reminds us that we are animals elicits disgust (Rozin & Fallon, 1987). Humans must eat, excrete, and have sex, just like other animals. Each culture prescribes the proper way to perform these actions—for example, by placing most animals off limits as potential foods, and all animals and most people off limits as potential sexual partners. People who ignore these prescriptions are reviled as disgusting and animal-like. Furthermore, humans are like animals in having fragile body envelopes that, when breached, reveal blood and soft viscera that display our commonalities with animals. Human bodies, like animal bodies, die. Envelope violations and death are disgusting because they are uncomfortable reminders of our animal vulnerability. Finally, hygienic rules govern the proper use and maintenance of the human body, and the failure to meet these culturally defined standards places a person below

the level of humans. Animals are (often inappropriately) seen as dirty and inattentive to hygiene. Insofar as we humans behave like animals, the distinction between humans and animals is blurred, and we see ourselves as lowered, debased, and mortal.

Elias (1939/1978), in *The History of Manners*, concludes that "people, in the course of the civilizing process, seek to suppress in themselves every characteristic that they feel to be 'animal'" (p. 120). Tambiah (1969) emphasizes the importance of this distinction for humans, and points to the paradox of human fascination with and aversion to animals. Ortner (1973) notes that the one body product that does not reliably elicit disgust is tears, and these are seen as uniquely human. And Leach (1964) has pointed out that animal words are used as insults in many cultures. In general, the ethnographic literature is filled with references to the fact that humans consider themselves better than animals, and work to maintain a clear animal-human boundary. Violations of that boundary—for example, treating an animal as a person in a pet relationship—are rather rare cross-culturally.

W. I. Miller's (1997) broad, historically based conception of disgust comes to a conclusion like ours: "ultimately the basis for all disgust is *us*—that we live and die and that the process is a messy one emitting substances and odors that make us doubt ourselves and fear our neighbors" (p. xiv).

### INTERPERSONAL DISGUST

The fact that contact with other people can elicit disgust was noted by Darwin (1872/1965). Furthermore, Angyal (1941) noted that other persons, as containers of waste products, are potentially disgusting. There is widespread evidence in the United States for aversion to contact with possessions, utensils, clothing, cars, and rooms used by unknown or undesirable persons (Rozin et al., 1989; Rozin, Markwith, & McCauley, 1994). Interpersonal aversion can be analyzed into four separately identifiable components: strangeness, disease, misfortune, and moral taint (Rozin, Markwith, & McCauley, 1994). Thus a sweater worn once by a healthy stranger and then laundered is less desirable than an unworn sweater (aversion to strangeness). This negativity is substantially enhanced if the stranger has had a misfortune

(e.g., an amputated leg), a disease (e.g., tuberculosis), or a moral taint (e.g., a conviction for murder). These types of contacts are both offensive and contaminating; thus they seem to be instances of disgust.

Interpersonal disgust clearly discourages contact with other human beings who are not intimates. This is probably adaptive by reducing an infection risk, and can serve the purpose of maintaining social distinctiveness and social hierarchies. In Hindu India, interpersonal contagion, mediated in part by contacts with food, is a major feature of society and a major basis for the maintenance of the caste system (Appadurai, 1981; Marriott, 1968).

### MORAL DISGUST

Studies that ask people to recall times they were disgusted elicit stories that often focus on moral violations, and that involve high levels of anger as well (Haidt et al., 1997; Izard, 1977; Nabi, 2002; Scherer, 1997). Some of these stories involve issues of sexuality, gore, or other instances of the misuse or abuse of human bodies, and are thus consistent with animal-nature disgust. However, many of the stories people tell about disgust do not involve the body at all; for North Americans, they often involve such issues as betrayal, hypocrisy, and racism. Do these disembodied moral violations really elicit disgust?

Nabi (2002) has argued that they do not. She found that the phrase "grossed out" did an excellent job of eliciting stories about core disgust, but the words "disgust" and "disgusted" elicited stories that were closer to those elicited by "anger" than those elicited by "grossed out." She suggests that the lay understanding of the word "disgust" is a mixture of disgust and anger, and that researchers should be careful about following ordinary language by assuming that the blend is a single emotion. In short, disgust is really about bodily issues, and the moral part of moral disgust is really anger (see also Royzman & Sabini, 2001).

We agree that the lay use of emotion words can be misleading, particularly in cross-cultural research (Haidt & Keltner, 1999). But there is evidence to suggest that cases of apparent moral disgust are really disgust; they are not just linguistic errors made by English speakers. First, if the broad expansion of the word "disgusting" into the sociomoral domain is a quirk



of the English language, it is also a quirk of almost every language we have looked at. French *dégoût*, German *Ekel*, Russian *otvrashchenie*, Spanish *asco*, Hebrew *go-al*, Japanese *ken-o*, Chinese *aw-shin*, and Bengali *ghenna* all have a semantic domain covering concerns about the body as well as concerns about other people's social behavior (Haidt et al., 1997). People of diverse cultures and languages apparently *feel* some similarity in their emotional reactions to feces and to sleazy politicians.

Second, research in neuroscience is increasingly focusing on the anterior insula as a crucial site of "somatic marking" (Damasio, 2003), the process by which interoceptive information (gut feelings) meets up with higher-level social cognition to produce motives for social approach or avoidance. In a functional magnetic resonance imaging (fMRI) study of people playing the "ultimatum game," those given a very low "take it or leave it" division of a pool of money usually left it, and their decision was well predicted by a surge of activity in the anterior insula (Sanfey, Rilling, Aronson, Nystrom, & Cohen, 2003)—the brain area most often linked to disgust in neuroimaging studies.

Third, Sherman, Haidt, and Coan (2007) found that in response to a video about American neo-Nazis that elicited very high ratings of disgust and moderately high ratings of anger, heart rates went down—the expected physiological response to disgust, and the opposite of the usual response to anger. Furthermore, the heart rate decrement was much larger in the subset of subjects who reported tightness or clenching in their throats (a marker of core disgust). In other words, Nazis really are disgusting, at least to some people.

These moral offenses on the outer limits of disgust's expansion show not just the property of offensiveness but also the property of contamination. Indirect contact with people who have committed moral offenses (such as murders) is highly aversive, to about the same extent as similar contact with someone with a serious contagious illness (Rozin, Markwith, & McCauley, 1994).

Shweder, Much, Mahapatra, and Park (1997) offer a theory of moral judgment that may help clarify the moral significance of disgust, contempt, and anger (the three other-condemning moral emotions; Izard's [1977] hostility triad). The theory proposes that three codes of ethics underlie the morality of most

cultures. One code, called the "ethics of community," focuses on issues of duty, hierarchy, and the proper fulfillment of one's social roles. Violations of this code seem to elicit the emotion of contempt. A second code, the "ethics of autonomy," encompasses issues of rights and justice. This is the most fully elaborated code in Western societies, where violations of this code are usually associated with anger. A third code, the "ethics of divinity," focuses on the self as a spiritual entity and seeks to protect that entity from degrading or polluting acts. We see a rough match between Shweder et al.'s three moral codes and the three other-condemning moral emotions, with disgust as the emotion elicited by violations of the ethics of divinity, the guardian of the sanctity of the soul as well as purity of the body. We call this the "CAD triad" hypothesis (community/contempt, autonomy/anger, divinity/disgust), and provide evidence supporting it from the correspondence between the three moral codes and the three emotions in Japanese and Americans (Rozin, Lowery, Imada, & Haidt, 1999).

Disgust plays a special role in the moral domain as a means of socialization. Insofar as entities viewed as immoral are also disgusting, there is no temptation to have traffic with them. For example, as cigarette smoking has moved from being a preference to a negative moral value in modern North America, there is an accompanying increase in disgust responses to cigarettes, cigarette smoke, cigarette residues (e.g., ashes), and cigarette smokers (Rozin & Singh, 1999). This process of conversion of an entity from a preference into a value has been called "moralization" (Rozin, 1997). It is often associated with the recruitment of a disgust response to the entity or activity in question.

## PREADAPTATION AND THE CULTURAL EVOLUTION OF DISGUST

We believe that the output side of disgust (physiology, behavior, expression) has remained relatively constant over human history, and that it still bears noticeable similarities to its animal precursors. However, the input side (elicitors and meanings) has been transformed and greatly expanded.

We have suggested a course of biological and cultural evolution of disgust, summarized in Table 47.1 (Rozin et al., 1993, 1997). The pro-

TABLE 47.1. Proposed Pathway of Expansion of Disgust and Disgust Elicitors

	Disgust stage				
	0. Distaste	1. Core	2. Animal nature	3. Interpersonal	4. Moral
Function	Protect body from poison	Protect body from disease/infection	Protect body and soul; deny mortality	Protect body, soul, and social order	Protect social order
Elicitors	Bad tastes	Food/eating, body products, animals	Sex, death, hygiene, envelope violations	Direct and indirect contact with strangers or undesirables	Certain moral offenses

posed origin is the rejection response to bad-tasting foods, even though taste in the mouth ultimately has little to do with the emotion of disgust. However, oral rejection remains an organizing principle of disgust reactions, in what we have called "core disgust." Core disgust can be thought of as a guardian of the mouth, and therefore as a guardian of the physical body. Food and its potential contaminants (body products and some animals) are the elicitors for core disgust.

Disgust then expanded further to become a guardian of the temple of the body, responding to direct threats of contagion or infection to parts other than the mouth, and also to any evidence that our bodies are really no different from animal bodies (i.e., animal-nature disgust in the domains of sexuality, body envelope violations, death, and hygiene). Driving a desire to distinguish ourselves from animals may be our fear of animal mortality.

Interpersonal disgust and moral disgust are not easily accounted for as reminders of our animal nature. They may both be linked to the prior forms of disgust, because they are extensions of a disease avoidance mechanism to become a broader social avoidance mechanism. This model suggests what might be called an opportunistic accretion of new domains of elicitors to a rejection system that is already in place. A parallel to this model in evolutionary biology is the concept of "preadaptation" (Mayr, 1960). Mayr suggests that the major source of evolutionary "novelties" is the coopting of an existing system for a new function. Preadaptation can operate either to replace an original function, or to accrete new functions to an existing system. A particularly appropriate example is the human mouth, whose teeth and tongue clearly evolved for food handling. However, by a process of preadaptation, they

have come to be shared by the language expression system. Teeth and tongue are critical in pronunciation, but they did not evolve for that purpose. We suggest that in both cultural evolution and individual development, a process like preadaptation occurs; in development, it can be described as the accessing of previously inaccessible systems for a wider range of activities, functions, or elicitors (Rozin, 1976).

We have described the cultural evolution of disgust as a sequence of stages that takes disgust further and further away from its mouth-and-food origins, through a process of preadaptation. But it has not really expanded that far beyond food, because, by a parallel process of preadaptation, food itself has come to serve many functions—esthetic, social, and moral—besides its original nutritive function (Kass, 1994). In parallel, the food vocabulary has taken on other, metaphorical functions, again by a process of preadaptation. Thus the very words "taste" and "distaste" have come to indicate general esthetic judgments. In Hindu India, food and eating are quintessentially social and moral activities (Appadurai, 1981).

The latter part of the 19th century included two events with important impact on the evolution of disgust in the Western world: Darwin's theory of evolution (which blurred the human-animal distinction) and the rise of germ theory following on the work of Pasteur and others. Detailed analyses of lay and elite thinking about disgust during the 19th century have been provided in two cultural histories of France (Corbin, 1986; Barnes, 2006). Prior to the development of germ theory, the French had already adapted to serious contagion risks by showing disgust to and avoidance of odors of decay and contact with ill individuals. Quarantine was in practice before germ theory, and



odor was believed to be part and parcel of the source of illness, rather than a correlate of it. Germ theory thus provided scientific justification for disgust sensibilities that were already present, and germ theory and disgust were both advanced in what Barnes (2006) has described as the marriage of lay contagion beliefs and germ theory—a “sanitary–bacteriological synthesis.”

## THE DEVELOPMENT OF DISGUST

For adults, feces seems to be a universal disgust substance (Angyal, 1941; Rozin & Fallon, 1987), with the odor of decay as perhaps the most potent sensory attribute associated with disgust. It is also conceivable that vomit is a primary substance for disgust. Since feces, vomit, and decay are associated with disease vectors, it would be reasonable to suppose that there would be an innate rejection of such things. However, neither one seems to be reliably rejected by nonhuman animals or young children (Rozin, Hammer, Oster, Horowitz, & Marmara, 1986). Rather, it appears that infants may be attracted to feces, and that disgust is a powerful cultural force that turns this attraction into aversion (Freud, 1910/1957; Jones, 1912/1948). The preponderance of evidence suggests that there are no innately negative nonirritant odors, and that a rejection of decay odors (without a referent object present) appears somewhere between 3 and 7 years of age (Petó, 1936; Schmidt & Beauchamp, 1988; Stein, Ottenberg, & Roulet, 1958; but see Steiner, 1979).

As far as we know, there is no sense of offensiveness or rejection outside of the sensory realm in either infants or nonhumans, and hence no gape elicitors other than negative tastes. Disgust seems to require enculturation—a supposition confirmed by Malson's (1964/1972) review of some 50 feral humans, none of whom showed any sign of disgust.

Toilet training is probably the initial disgust-generating experience. For 3-year-olds, feces are rejected, but not contaminating and possibly not offensive. In the period following toilet training, children develop an aversion for substances resembling feces (e.g., mud, dirt, and mushy substances) and sometimes a marked concern for cleanliness (Senn & Solnit, 1968; Ferenczi, 1914/1952).

Further extension of aversion to core disgust elicitors is likely to occur either by generalization from existing disgusting entities (e.g., from feces to mud) or by evaluative conditioning (although attempts to capture this phenomenon in the laboratory have yielded mixed outcomes; see Schienle, Stark, & Vaitl, 2001; Rozin, Wrzesniewski, & Byrnes, 1998). There may be a predisposition or expectancy to associate certain entities, such as certain types of animals, with already disgusting entities (Davey, Cavanagh, & Lamb, 2003). Disgust may be acquired by witnessing facial displays of emotions that elicit the experience of those emotions (Tomkins, 1963), perhaps engaging processes that involve mirror neurons (Gallese, Keysers, & Rizzolatti, 2004).

Locating the onset of true disgust in development depends on subtle measures of “offensiveness” or “ideational rejection” and the appearance of contamination sensitivity. Contamination sensitivity is not present in children under 3–5 years of age (Fallon, Rozin, & Pliner, 1984; Rozin, Fallon, & Augstoni-Ziskind, 1985; Siegal, 1988; Siegal & Share, 1990; Hejmadi, Rozin, & Siegal, 2004). Contamination sensitivity is a sophisticated ability, requiring a separation of appearance and reality. There is no sensory residue of past contamination in a contaminated entity; it is the history of contact that is critical (Rozin & Nemeroff, 1990; Nemeroff & Rozin, 2000). Furthermore, contamination implies some conception of invisible entities (e.g., traces of cockroach) that are the vehicle of contamination. The notion of invisible entities and the notion that appearance is distinct from reality are cognitive achievements of considerable abstraction, and both seem to be absent in young children (Piaget & Inhelder, 1941/1974; Flavell, 1986; Rosen & Rozin, 1993; but see Siegal & Share, 1990). This cognitive limitation may be the principal barrier to a full childhood acquisition of disgust.

Adult contamination sensitivity is a mixture of at least two types of conceptions. One involves transfer of invisible material through contact, and hence is often sensitive to manipulations like washing (material essence). A second is more indelible and involves the passing of some type of “spiritual” force that is not subject to removal by chemical and physical treatments (“spiritual essence”; Nemeroff & Rozin, 1994). There is evidence that at its first appearance in children, the essence producing

contamination sensitivity is more like the indelible, "spiritual" than the material form (Hejmadi et al., 2004), and it appears somewhat earlier and in greater intensity in Hindu Indian children than in American children.

A measure of contamination sensitivity that focused on disgust contaminants showed a substantial correlation between young adults and their parents:  $r = .52$  for Americans (Rozin, Fallon, & Mandell, 1984);  $r = .33$  in Britain (Davey, Forster, & Mayhew, 1991). A study using the broader Disgust Scale (see below) found a more modest correlation ( $r = .21$ ) across three generations of Americans (Rozin & Wolf, 2007).

### CULTURAL DIFFERENCES IN DISGUST

Almost the entire literature on disgust comes from the approximately 6% of the world in which English is the native language. We believe that the cultural evolution of disgust has made few changes on the output side, as noted above, but that it has created substantial cultural variation on the input side. The simplest variations can be seen when cultures differ in the particular elicitors of disgust within one of the domains we have described. For example, most cultures value some kind of decayed/fermented food that is disgusting in most other cultures, but such food varies quite a bit (e.g., cheese for Europeans, decayed meat for Inuit, fermented fish sauce for Southeast Asians). Similarly, cultures differ about whether dogs are best friends or dirty scavengers, about whether or not corpses should be touched during mourning, or about whether mouth-to-mouth kissing is erotic or disgusting.

It is primarily in the last two steps of the expansion of disgust—interpersonal and moral disgust—that cultural differences seem to be greatest. Interpersonal and moral disgust appear to be particularly elaborated in Hindu India, compared to Western nations in which people rarely worry about the caste or background of the people cooking their food. Purity is a moral virtue to be protected in India, and in this respect, food is a "biomoral" substance (Appadurai, 1981). Moral disgust in the United States seems to focus on acts that strip others of their basic humanity (of their souls, Bloom [2004] would say; e.g., acts of brutality, cruelty, and racism), as well as to more mundane acts

of sleaziness and insincerity (such as hypocrisy and fawning). In Japan, participants applied the word *ken-o* more to situations in which there had been a failure to achieve a good fit in social relationships, such as when somebody else ignored them or criticized them unfairly. American moral disgust may be guarding against threats to an individualist, rights-based social order, whereas Japanese *ken-o* may be guarding against threats to a more collectivist, interdependent social order (Haidt et al., 1997).

An additional cultural difference is found in the moral significance attached to the activities that disgust regulates. Haidt, Koller, and Dias (1993) asked North Americans and Brazilians of higher and lower socioeconomic status about a number of actions that were disgusting yet harmless, including incestuous kissing, eating one's dead pets, and eating a chicken one has just had sex with. They found that North Americans of high socioeconomic status separated their emotional reactions from their moral judgments, while other groups were more likely to condemn disgusting actions, even when they were harmless. W. I. Miller (1997) suggests that many Westerners may be uncomfortable using disgust as a moral emotion, because it is often at odds with our egalitarian ethos: Disgust puts people down, and it is easily used to condemn people who are obese, are deformed, or have sexual preferences at odds with the majority. It is partly for this reason that Nussbaum (1999) argues that disgust should play little or no role in the legal system or the legislature. She disagrees strongly with Kass's (1997) claim that disgust sometimes embodies "wisdom" about being human that is difficult for us to articulate rationally.

### INDIVIDUAL DIFFERENCES IN DISGUST SENSITIVITY

Based on our theorizing about the expansion of disgust, we created a paper-and-pencil measure of individual differences in disgust sensitivity toward seven kinds of elicitors (Haidt et al., 1994). Three were core disgust elicitors (food, animals, and body products), and four were animal-nature disgust elicitors (inappropriate sexuality, envelope violations, death, and poor hygiene). We also included an eighth category of magical thinking across the various kinds of elicitors. The 32-item Disgust Scale (DS) in-

cluded two true-false and two disgust-rating items for each of these eight categories. The DS has an overall alpha of .84, and it has been shown to predict hands-on disgust-relevant behavior among Americans (Rozin, Haidt, McCauley, Dunlop, & Ashmore, 1999), and Swedes (Björklund & Hursti, 2004), and to predict the behavior of people with obsessive-compulsive symptoms even after other negative affects were controlled for (Olatunji, Lohr, Sawchuck, & Tolin, 2007). It also predicts the degree to which brain regions associated with disgust are activated when subjects look at disgusting pictures in an fMRI scanner (Caseras et al., 2007).

Studies using the DS have consistently found that women score higher than men (Haidt et al., 1994), that disgust sensitivity declines with age in adulthood (Quigley, Sherman, & Sherman, 1996; Fessler & Navarette, 2005), and that it may decline faster for women than for men (Doctoroff & McCauley, 1996). Disgust sensitivity is inversely related to education and socioeconomic status (Doctoroff & McCauley, 1996). Personality correlates of the DS are consistent with disgust's role as an inhibitor of approach and consumption. It correlates positively with scales related to anxiety (e.g., Big Five neuroticism), particularly anxieties related to mortality and bodily concerns (e.g., blood-injection phobia, contamination fears), and it correlates negatively with scales related to sensation seeking and openness to experience. (See Haidt et al., 1994, for a list of articles reporting findings using the DS; see [people.virginia.edu/~jdh6n/disgustscale.html](http://people.virginia.edu/~jdh6n/disgustscale.html)) for information about the scale itself.

Our goal in creating the DS was not to achieve a high alpha by selecting items that were similar to each other. Rather, it was to create a broad instrument that would allow researchers to look for relationships between subtypes of disgust and various other behaviors and clinical conditions. For example, the sex and death subscales are good predictors of religious obsessions even after fearfulness is controlled (Olatunji, Tolin, Huppert, & Lohr, 2005), as terror management theorists would expect.

It is now clear, however, that our original subscales are not reliably discriminated in psychometric analyses. Rather, the 32 items include just three psychometrically stable factors (Olatunji et al., 2007): core disgust (most of the food, animal, and body product items); animal-

reminder disgust (most of the death and envelope violation items), and interpersonal-contamination disgust (items in which the interpersonal nature of the contact is salient). These three subscales have much higher internal consistency (alphas above .70) than the four-item scales of the original DS.

In a series of studies, Olatunji and his collaborators have found that the core and interpersonal-contamination subscales predict clinical conditions, such as the contamination aspects of obsessive-compulsive disorder (OCD) (Olatunji, Williams, Lohr, & Sawchuck, 2005). The animal-reminder scale predicts clinical conditions such as blood-injection-injury fears (Olatunji, Sawchuck, de Jong, & Lohr, 2006).

In recent years, two additional measures of disgust sensitivity have been published. The Disgust Propensity and Sensitivity Scale—Revised (Van Overveld, de Jong, Peters, Cavanagh, & Davey, 2006) offers one subscale that assesses frequency of disgust experiences, and another that assesses the degree to which disgust experiences are upsetting. The Disgust Emotion Scale (Kleinknecht, Kleinknecht, & Thorndike, 1997) offers five subscales to assess disgust toward rotten foods, small animals, injections and blood draws, mutilation and death, and bad smells. The development of these two scales was motivated in part by the low internal reliabilities of the eight DS subscales. A similar concern led to Olatunji et al.'s (2007) modification of the DS to create the 25-item, three-factor DS-R.

## DISGUST AND THE BRAIN

Since the early 1990s, there has been a great deal of research on the neural correlates of disgust. A main concern of this research is to identify areas of the brain that are activated by or mediate disgust. An early study (confirmed by some later work) demonstrated that disgust experiences are associated with increased activity in the right frontal cortex, a broad region associated with negative affect (Davidson, 1992). More specific is the finding that people with Huntington's disease, caused by late-onset degeneration of the basal ganglia, show a remarkably specific deficit in identifying disgust facial expressions (Sprengelmeyer et al., 1996; Sprengelmeyer, Rausch, Eysel, & Przuntek, 1998) that may extend to other modalities

(e.g., Mitchell, Heims, Neville, & Rickards, 2005). Disgust recognition deficits are also seen in people who have the Huntington genotype, but are still too young to show any of the classical symptoms (Gray, Young, Barker, Curtis, & Gibson, 1997).

A good part of the neuroimaging literature has aimed to establish a link among OCD, disgust, and the basal ganglia or insula (Shapira et al., 2003; Phillips et al., 2000; for a review, see Husted et al., 2006). Dozens of experiments using imaging techniques (principally fMRI), beginning with a study by Phillips et al. (1997; see also Wicker et al., 2003; Wright, He, Shapira, Goodman, & Liu, 2004), have suggested that three interconnected brain areas are characteristically activated when there is exposure to disgust faces, disgust-eliciting images, disgust-related odors, or thoughts about disgusting entities. The areas are the anterior insula, the basal ganglia, and parts of the prefrontal cortex (for a review, see Husted et al., 2006). The evidence for a linkage between the anterior insula and basal ganglia and disgust is confirmed by a demonstration that a patient with damage to both areas showed a selective impairment in both the recognition and experience of disgust (Calder, Keane, Manes, Antoun, & Young, 2000). However, one line of research questions whether insula and basal ganglia activation distinguishes disgust from fear (e.g., Stark et al., 2003; Schienle, Schafer, Stark, Walter, & Vaitl, 2005).

Research on the neural basis of disgust can also provide evidence related to psychological issues. First, the relation between the anterior insula and disgust supports the idea that disgust has particularly strong links to food and eating, since the insula is part of the gustatory cortex and is activated by unpleasant tastes and smells (Rolls, 1994). Second, with regard to the controversy about whether moral disgust is really disgust, Moll et al. (2005) have reported overlap in brain areas activated by core or animal-nature disgust elicitors and by moral disgust elicitors.

## DISGUST AND PSYCHOPATHOLOGY

Interest in disgust in relation to psychopathology has increased dramatically since 1990. Davey and his colleagues (Matchett & Davey, 1991; Davey, 1993) provided evidence for a link between disgust and some types of animal

phobias, and Power and Dalglish (1997) proposed links between disgust and many psychopathologies, including depression. A central role for disgust in anxiety disorders (specifically, phobias and OCD; see below) has been described in special issues of the *Journal of Anxiety Disorders* (McKay, 2002) and the *Journal of Behavior Therapy and Experimental Psychiatry* (Olatunji & McKay, 2006), as well as in three review articles (Woody & Teachman, 2000; Berle & Phillips, 2006; Olatunji & Sawchuk, 2005). A plausible linkage between disgust and eating disorders has also been proposed (Quigley et al., 1996; Davey, Buckland, Tantow, & Dallos, 1998; Troop, Treasure, & Serpell, 2002). Furthermore, relations between increased disgust sensitivity and schizophrenia (Schienle et al., 2003) and hypochondriasis (Davey & Bond, 2006) have been reported.

The relations between disgust and two major categories of anxiety disorders—phobias (particularly spider and blood-injury phobia) and OCD—have received most attention. Seven kinds of evidence have been advanced.

First is identification of disgust in the symptoms of the disorder. OCD has an obvious link with disgust, since a common form of OCD involves excessive cleaning and washing based on fears of contamination. Hypersensitivity to disgust (in all or some domains) is one possible account of OCD, as is a potentially separable hypersensitivity to contamination (for reviews, see Berle & Phillips, 2006; Husted et al., 2006; and Olatunji & Sawchuk, 2005). Similarly, phobias often overtly include feelings of disgust (Davey, 1993; Matchett & Davey, 1991; Woody, McLean, & Klassen, 2005; Woody & Teachman, 2000).

Second is correlation of disgust sensitivity with the disorder. For OCD, both the clinically defined disorder and individual differences in OCD tendency have been found to be associated with disgust sensitivity (e.g., Quigley et al., 1996; Rozin, Taylor, Ross, Bennett, & Hejmadi, 2005; Tolin, Woods, & Abramowitz, 2006). Findings are quite consistent, with cleaning OCD more closely related to disgust sensitivity than other forms of OCD (e.g., Mancini, Gragnani, & D'Olimpio, 2001). There are indications that sensitivity to interpersonal contamination and concern with hygiene may be specifically related to cleaning OCD (Olatunji, Williams, Lohr, & Sawchuk, 2005; Tolin et al., 2006). Disgust sensitivity is

also generally higher in individuals with small-animal or blood-injury phobias (Tolin, Lohr, Sawchuk, & Lee, 1997; Koch, O'Neill, Sawchuk, & Connolly, 2002), but there is still some question as to whether this is general disgust sensitivity or sensitivity in particular domains (for a review, see Woody & Teachman, 2000). There are also important questions about distinguishing between state and trait disgust (e.g., Woody & Tolin, 2002; Woody et al., 2005) as the principal correlates of phobias.

Third is demonstration that recognition of disgust faces or disgust situations is enhanced or compromised in the disorder. Whereas there are abundant data on disgust face recognition in Huntington's disease (Sprengelmeyer et al., 1996), there are no parallel data for phobias, and there are mixed reports on disgust face recognition in OCD.

Fourth is demonstration of deficits or enhancements in disgust expressions (facial or otherwise). There are no data on this point for OCD, but there is evidence indicating enhanced disgust facial expressions for persons with animal phobias in the presence of phobic elicitors (Lumley & Melamed, 1992; Schienle, Schafer, Walter, Stark, & Vaitl, 2005).

Fifth is demonstration of a parallel psychophysiology in disgust and the disorder in question. The signature physiological sign of disgust, nausea, has not been studied in this context for either phobias or OCD. Fainting, associated with parasympathetic activation, is a frequent feature of blood-injury phobia, and a link between disgust and fainting in blood-injury phobia has been reported (Page, 1994, 2003).

Sixth is demonstration that disgust stimuli activate (or inhibit) brain areas associated with the disorder. Supportive data exist for OCD and disgust: There are signs of an overlap in activated brain areas, with the anterior insula prominently engaged in both (e.g., Shapira et al., 2003; Husted et al., 2006).

Seventh is a more refined analysis that probes whether disgust is a direct cause, a noncausal correlate, an indirect cause, or a consequence of the disorder. In the case of phobias, the issue has largely been whether disgust increases symptoms directly, or increases them indirectly by increasing anxiety. Davey and his colleagues have addressed this issue with normal individuals, showing that while induced anxiety increases disgust, induced disgust does

not increase anxiety (Marzillier & Davey, 2005). The same group has shown that experienced disgust causes a negative interpretational bias that may enhance threat perceptions, and that this effect is not fully accounted for by a disgust-anxiety linkage (Davey, Bickerstaffe, & MacDonald, 2006; but see Sawchuk, Meunier, Lohr, & Westendorf, 2002). Davey and Bond (2006) have dissected independent roles for trait anxiety and trait disgust in hypochondriasis and health anxiety. For acquisition of disgust-related phobias, a likely mechanism is evaluative conditioning (Schienle et al., 2001).

The psychopathology literature has understandably focused on above-normal activation of disgust (and other emotions). However, we close this section by noting that very low activation of disgust may generate a highly antisocial person, since disgust is in many respects the emotion of civilization. Scores of non-disordered subjects on the DS correlate negatively with scores on the psychopathy subscale of the Eysenck Personality Questionnaire (Eysenck & Eysenck, 1975); however, it is not known whether persons with true psychopathy score lower than nondisordered individuals on measures of disgust sensitivity (J. Blair, personal communication, February 18, 2007).

## THE DELICATE BOUNDARY BETWEEN DISGUST AND PLEASURE

Given that the human body is a repository of disgusting entities, and that we live in a contaminated environment, humans are frequently poised on the edge of potential disgust. While we manage most of the time, by habituation or framing (e.g., Rozin, *in press*), to ignore the disgust elicitors all around us, there are some situations in which we seek out and enjoy disgust. The powerful negativity of disgust seems perversely to encourage its involvement and enjoyment in at least two domains: humor and romantic attachments.

Disgust plays a significant role in humor, via jokes, cartoons, and casual word play. Disgust stimuli often elicit amusement. Generally, it seems that disgust can be amusing when it is not personally threatening; when a person in formal wear (other than the self) steps in dog feces, it is amusing. Disgust plays a central role in the humor of boys and adolescent males, who use it to tease, to question or confront adult norms, and to establish status within

their peer groups (Fine, 1988). Bloom (2004) emphasizes the dignity-destroying aspect of disgust, and sees disgust humor as taking advantage of the fact that the human body is disgusting, at the same time that it abhors disgust and sees itself as at a higher plane of existence. The shift in perspective, from soul to body, is a fertile base for humor.

A number of authors, including S. B. Miller (2004), Fessler and Haley (2006), and ourselves (e.g., Rozin et al., 1995) have emphasized the self-boundary or gateway-guarding function of disgust. A distinct self generally resists mixing of the self's substance with the substance of another. Thus treating the other as self, and enjoying what are usually disgusting interactions such as mouth-to-mouth kissing between lovers, is a way of affirming love and intimacy (W. I. Miller, 1997; Bloom, 2004). As Bloom (2004, p. 180) suggests, "In love, you see the person not as a body, but as a soul."

## DISGUST IN INTERGROUP RELATIONS

Recent research in social psychology has given new attention to intergroup emotions in relation to intergroup conflict and intergroup violence, including feelings of disgust toward an enemy or minority group.

Dehumanization is often cited as part of the explanation of particularly horrific forms of intergroup violence, including genocide (Chirof & McCauley, 2006). In a theoretical analysis of dehumanization, Haslam (2006) distinguishes between "animalistic dehumanization," which makes others less human by making them more like animals, and "mechanistic dehumanization," which makes enemies less human by denying them uniquely human emotions and traits and making them more like machines. Haslam suggests that disgust is the emotional reaction associated with animalistic dehumanization, whereas indifference is the reaction to mechanistic dehumanization.

In a related analysis of perception of outgroups, Fiske, Cuddy, Glick, and Xu (2002) followed Brown (1965) in suggesting that social perceptions can be understood in relation to two dimensions: status and solidarity. Groups seen as low in status and dissimilar to one's own group (as welfare mothers were seen by participants in the study by Fiske et al.) tend to be viewed with disgust and contempt. Dis-

gust in relation to low-status and dissimilar outgroups is also implicated in results showing that disgust sensitivity is positively correlated with negative attitudes to foreigners, outgroups, immigrants, and deviant individuals (Faulkner, Schaller, Park, & Duncan, 2004; Hodson & Costello, 2007; Navarette & Fessler, 2006). To some degree, this effect is mediated by fear of infection or contamination (Faulkner et al., 2004; Navarette & Fessler, 2006).

Cottrell and Neuberg (2005) have offered a more complex categorization of perceived threats and associated emotional reactions to these threats. Groups representing physical or moral contaminants (gay men for the participants in this study) elicit disgust, whereas groups representing barriers to desired goals (fundamentalist Christians, for these participants) elicit anger. These studies have in common that group perceptions are analyzed beyond a simple dimension of positive or negative affect to distinguish the different characteristics and different threats associated with different groups. Associated with these different appraisals are different emotional reactions, including feelings of disgust for groups seen as animal-like, low-status, and dissimilar. Disgust may signal a particularly potent threat, the threat of contamination.

## CONCLUSION

Darwin and Angyal offered prescient analyses of the emotion of disgust. Despite this early attention to an all-too-common emotional experience, and the accessibility of experimental manipulations of this emotion, empirical investigation of disgust has taken off only since 1990. As a result, there are many unanswered questions. We know little about the evolutionary and ancient history of disgust. It is absent in nonhuman primates, yet extremely frequent and probably universal among contemporary humans. We do not know much about the sequence of events that introduced and expanded disgust over historical time (but see W. I. Miller, 1997, for the most thorough analysis of this expansion for Western cultures). We do not know whether the acceptance of the theory of evolution, and hence of human continuity with animals, played a role in the development or expression of animal nature disgust. We do not know how disgust originates in development;



nor what the principal causes of differences in disgust sensitivity are; nor why it is a focus of humor, especially in children. Many of the fundamental questions posed by Darwin and Angyal remain unanswered.

Our analysis suggests a cultural evolution of disgust that brings it to the heart of what it means to be human. We have suggested that disgust originated as a rejection response to bad tastes, and then evolved into a much more abstract and ideational emotion. In this evolution, the function of disgust shifted: A mechanism for avoiding harm to the body became a mechanism for avoiding harm to the soul. The elicitors of disgust may have expanded to the point where the only thing they have in common is that decent people want nothing to do with them. At this level, disgust becomes a moral emotion and a powerful form of negative socialization. We have presented a skeleton of evidence in support of this analysis, but there are many alternatives and points of difficulty. In our view, because cultures have capitalized on disgust as a way of internalizing some of their particular negative attitudes, there is no overarching abstract definition of the class of disgust elicitors. In the view of Royzman and Sabini (2001), the lack of a single abstract description of disgust elicitors compromises the status of disgust as an emotion. The elicitors of anger and fear, they suggest, are more coherent (i.e., insult and threat appraisals, respectively). Our view is that the appraisal that elicits disgust is indeed more cognitively complex than other emotions. There are multiple appraisals, as we have indicated—some quite abstract, such as reminders of our animal nature. The complexity of disgust reflects the complexity of a species that is both animal and human.

## ACKNOWLEDGMENTS

We thank the Whitehall Foundation for supporting some of the research reported in this chapter and the preparation of the original (1993) version of this chapter, and the Edmund J. and Louise W. Kahn Chair for Faculty Excellence Fund for supporting the preparation of this revision.

## REFERENCES

- Angyal, A. (1941). Disgust and related aversions. *Journal of Abnormal and Social Psychology*, 36, 393–412.
- Appadurai, A. (1981). Gastro-politics in Hindu South Asia. *American Ethnologist*, 8, 494–511.
- Barnes, D. S. (2006). *The great stink of Paris and the marriage of filth and germs*. Baltimore: Johns Hopkins University Press.
- Becker, E. (1973). *The denial of death*. New York: Free Press.
- Berle, D., & Phillips, E. S. (2006). Disgust and obsessive-compulsive disorder: An update. *Psychiatry*, 69, 228–238.
- Björklund, F., & Hursti, T. (2004). A Swedish translation and validation of the Disgust Scale: A measure of disgust sensitivity. *Scandinavian Journal of Psychology*, 45, 279–284.
- Bloom, P. (2004). *Descartes' baby: How the science of child development explains what makes us human*. New York: Basic Books.
- Brown, R. (1965). *Social psychology*. New York: Free Press.
- Calder, A. J., Keane, J., Manes, F., Antoun, N., & Young, A. W. (2000). Impaired recognition and experience of disgust following brain injury. *Nature Neuroscience*, 3, 1077–1088.
- Caseras, X., Mataix-Cols, D., An, S. K., Lawrence, N. S., Speckens, A., Giampietro, V., et al. (2007). Sex differences in neural responses to disgusting visual stimuli: Implications for disgust-related psychiatric disorders. *Biological Psychiatry*, 62, 464–471.
- Chiot, D., & McCauley, C. (2006). *Why not kill all of them?: The logic and prevention of mass political murder*. Princeton, NJ: Princeton University Press.
- Corbin, A. (1986). *The foul and the fragrant: Odor and the French social imagination*. Cambridge, MA: Harvard University Press.
- Cottrell, C. A., & Neuberg, S. L. (2005). Different emotional reactions to different groups: A sociofunctional threat-based approach to "prejudice." *Journal of Personality and Social Psychology*, 88, 770–789.
- Cox, C. R., Goldenberg, J. L., Pyszczynski, T., & Weise, D. (2007). Disgust, creatureliness and the accessibility of death-related thoughts. *European Journal of Social Psychology*, 37, 494–507.
- Curtis, V., Aunger, R., & Rabie, T. (2004). Evidence that disgust evolved to protect from risk of disease. *Proceedings of the Royal Society of London, Series B*, 271(Suppl.), S131–S133.
- Curtis, V., & Biran, A. (2001). Dirt, disgust, and disease: Is hygiene in our genes? *Perspectives in Biology and Medicine*, 44, 17–31.
- Damasio, A. (2003). *Looking for Spinoza*. Orlando, FL: Harcourt.
- Darwin, C. R. (1965). *The expression of the emotions in man and animals*. Chicago: University of Chicago Press. (Original work published 1872)
- Davey, G. C. L. (1993). Factors influencing self-rated fear to a novel animal. *Cognition and Emotion*, 7, 461–471.
- Davey, G. C. L., Bickerstaffe, S., & MacDonald, B. A. (2006). Experienced disgust causes a negative inter-

- pretation bias: A causal role for disgust in anxious psychopathology. *Behaviour Research and Therapy*, 44, 1375–1384.
- Davey, G. C. L., & Bond, N. (2006). Using controlled comparisons in disgust psychopathology research: The case of disgust, hypochondriasis and health anxiety. *Journal of Behavior Therapy and Experimental Psychiatry*, 37, 4–15.
- Davey, G. C. L., Buckland, G., Tantow, B., & Dallos, R. (1998). Disgust and eating disorders. *European Eating Disorders Review*, 6, 201–211.
- Davey, G. C. L., Cavanagh, K., & Lamb, A. (2003). Differential aversive outcome expectancies for high- and low-predation fear-relevant animals. *Journal of Behavior Therapy and Experimental Psychiatry*, 34, 117–128.
- Davey, G. C. L., Forster, L., & Mayhew, G. (1991). Familial resemblance in disgust sensitivity and animal phobias. *Behaviour Research and Therapy*, 31, 41–50.
- Davidson, R. J. (1992). Emotion and affective style: Hemispheric substrates. *Psychological Science*, 3, 39–43.
- Doctoroff, G., & McCauley, C. (1996, March). *Demographic differences in sensitivity to disgust*. Poster presented at the annual meeting of the Eastern Psychological Association, Philadelphia.
- Douglas, M. (1966). *Purity and danger*. London: Routledge & Kegan Paul.
- Ekman, P. (1972). Universals and cultural differences in facial expressions of emotion. In J. K. Cole (Ed.), *Nebraska Symposium on Motivation* (Vol. 19, pp. 207–283). Lincoln: University of Nebraska Press.
- Ekman, P. (1992). An argument for basic emotions. *Cognition and Emotion*, 6, 169–200.
- Ekman, P., & Friesen, W. V. (1975). *Unmasking the face*. Englewood Cliffs, NJ: Prentice Hall.
- Ekman, P., & Friesen, W. V. (1978). *Facial Action Coding System: A technique for the measurement of facial movement*. Palo Alto, CA: Consulting Psychologists Press.
- Elias, N. (1978). *The history of manners: Vol. 1. The civilizing process* (E. Jephcott, Trans.). New York: Pantheon Books. (Original work published 1939)
- Eysenck, H. J., & Eysenck, S. B. G. (1975). *The Eysenck Personality Questionnaire*. London: Hodder & Stoughton.
- Fallon, A. E., & Rozin, P. (1983). The psychological bases of food rejections by humans. *Ecology of Food and Nutrition*, 13, 15–26.
- Fallon, A. E., Rozin, P., & Pliner, P. (1984). The child's conception of food: The development of food rejections with special reference to disgust and contamination sensitivity. *Child Development*, 55, 566–575.
- Faulkner, J., Schaller, M., Park, J. H., & Duncan, L. A. (2004). Evolved disease-avoidance mechanisms and contemporary xenophobic attitudes. *Group Processes and Intergroup Relations*, 7, 333–353.
- Ferenczi, S. (1952). The ontogenesis of the interest in money. In S. Ferenczi (Ed.) & E. Jones (Trans.), *First contributions to psychoanalysis* (pp. 319–331). London: Hogarth Press. (Original work published 1914)
- Fessler, D. M. T., & Haley, K. J. (2006). Guarding the perimeter: The outside-inside dichotomy in disgust and bodily experience. *Cognition and Emotion*, 20, 3–19.
- Fessler, D. M. T., & Navarrete, C. D. (2005). The effect of age on death disgust: A critique of terror management perspectives. *Journal of Evolutionary Psychology*, 3, 279–296.
- Fine, G. A. (1988). Good children and dirty play. *Play and Culture*, 1, 43–56.
- Fiske, S. T., Cuddy, A. J. C., Glick, P., & Xu, J. (2002). A model of (often mixed) stereotype content: Competence and warmth. *Journal of Personality and Social Psychology*, 82, 878–902.
- Flavell, J. (1986). The development of children's knowledge of the appearance-reality distinction. *American Psychologist*, 41, 418–425.
- Frazer, J. G. (1922). *The golden bough: A study in magic and religion* (abridged ed., T. H. Gaster, Ed.). New York: Macmillan. (Original work published 1890)
- Freud, S. (1953). Three essays on the theory of sexuality. In J. Strachey (Ed. & Trans.), *The standard edition of the complete psychological works of Sigmund Freud* (Vol. 7, pp. 123–231). London: Hogarth Press. (Original work published 1905)
- Freud, S. (1957). Five lectures on psychoanalysis. In J. Strachey (Ed. & Trans.), *The standard edition of the complete psychological works of Sigmund Freud* (Vol. 11, pp. 3–56). London: Hogarth Press. (Original work published 1910)
- Gallese, V., Keysers, C., & Rizzolatti, G. (2004). A unifying view of the basis of social cognition. *Trends in Cognitive Science*, 8, 398–403.
- Goldenberg, J. L., Pyszczynski, T., Greenberg, J., Solomon, S., Kluck, B., & Cornwell, R. (2001). I am not an animal: Mortality salience, disgust, and the denial of human creatureliness. *Journal of Experimental Psychology: General*, 130, 427–435.
- Gray, J. M., Young, A. W., Barker, W. A., Curtis, A., & Gibson, D. (1997). Impaired recognition of disgust in Huntington's disease gene carriers. *Brain*, 120, 2029–2038.
- Grunfeld, D. I. (1982). *The Jewish dietary laws: Vol. 1. Dietary laws regarding forbidden and permitted foods, with particular reference to meat and meat products* (3rd ed.). London: Soncino Press.
- Haidt, J., & Keltner, D. (1999). Culture and facial expression: Open-ended methods find more faces and a gradient of recognition. *Cognition and Emotion*, 13, 225–266.
- Haidt, J., Koller, S., & Dias, M. (1993). Affect, culture, and morality, or is it wrong to eat your dog? *Journal of Personality and Social Psychology*, 65, 613–628.
- Haidt, J., McCauley, C. R., & Rozin, P. (1994). A scale to measure disgust sensitivity. *Personality and Individual Differences*, 16, 701–713.
- Haidt, J., Rozin, P., McCauley, C. R., & Imada, S.

- (1997). Body, psyche, and culture: The relationship between disgust and morality. *Psychology and Developing Societies*, 9, 107–131.
- Haslam, N. (2006). Dehumanization: An integrative review. *Personality and Social Psychology Review*, 10, 252–264.
- Hejmadi, A. (2000). *Rasa or aesthetic emotion: An ancient Hindu perspective*. Unpublished manuscript.
- Hejmadi, A., Davidson, R., & Rozin, P. (2000). Exploring Hindu Indian emotion expressions: Evidence for accurate recognition by Americans and Indians. *Psychological Science*, 11, 183–187.
- Hejmadi, A., Rozin, P., & Siegal, M. (2004). Once in contact, always in contact: Contagious essence and conceptions of purification in American and Hindu Indian children. *Developmental Psychology*, 40, 467–476.
- Hemenover, S. H., & Schimmac, U. (2007). That's disgusting! . . . But very amusing: Mixed feelings of amusement and disgust. *Cognition and Emotion*, 21, 1102–1113.
- Hodson, G., & Costello, K. (2007). Interpersonal disgust, ideological orientations and dehumanization as predictors of intergroup attitudes. *Psychological Science*, 18, 691–698.
- Howell, N. (1986). Feedbacks and buffers in relation to scarcity and abundance: Studies of hunter-gatherer populations. In R. Scofield (Ed.), *Beyond Malthus* (pp. 156–187). Cambridge, UK: Cambridge University Press.
- Husted, D. S., Shapira, N. A., & Goodman, W. K. (2006). The neurocircuitry of obsessive-compulsive disorder and disgust. *Progress in Neuro-Psychopharmacology and Biological Psychiatry*, 30, 389–399.
- Izard, C. E. (1971). *The face of emotion*. New York: Appleton-Century-Crofts.
- Izard, C. E. (1977). *Human emotions*. New York: Plenum Press.
- Jones, E. (1948). Anal-erotic character traits. In E. Jones, *Papers on psychoanalysis* (pp. 413–437). Boston: Beacon Press. (Original work published 1912)
- Kass, L. R. (1994). *The hungry soul*. New York: Free Press.
- Kass, L. R. (1997, June 2). The wisdom of repugnance. *The New Republic*, pp. 17–26.
- Kelly, D. R. (2007). *Towards a cognitive theory of disgust*. Manuscript in preparation.
- Kleinknecht, R. A., Kleinknecht, E. A., & Thorndike, R. M. (1997). The role of disgust and fear in blood and injection-related fainting symptoms: A structural equation model. *Behaviour Research and Therapy*, 35, 1075–1087.
- Koch, M. D., O'Neill, H. K., Sawchuk, C. N., & Connolly, K. (2002). Domain-specific and generalized disgust sensitivity in blood-injection-injury phobia: The application of behavioral approach/avoidance tasks, 16, 511–527.
- Leach, E. (1964). Anthropological aspects of language: Animal categories and verbal abuse. In E. Lenneberg (Ed.), *New directions in the study of language* (pp. 23–64). Cambridge, MA: MIT Press.
- Levenson, R. W. (1992). Autonomic nervous system differences among emotions. *Psychological Science*, 3, 23–27.
- Levenson, R. W., Ekman, P., & Friesen, W. V. (1990). Voluntary facial action generates emotion-specific autonomic nervous system activity. *Psychophysiology*, 27, 363–384.
- Lumley, M. A., & Melamed, B. G. (1992). Blood phobics and nonphobics: psychological differences and affect during exposure. *Behaviour Research and Therapy*, 30, 425–434.
- Malson, L. (1972). *Wolf children* (E. Fawcett, P. Ayrton, & J. White, Trans.). New York: Monthly Review Press. (Original work published 1964)
- Mancini, F., Gragnani, A., & D'Olimpio, F. (2001). The connection between disgust and obsessions and compulsions in a non-clinical sample. *Personality and Individual Differences*, 31, 1173–1180.
- Marriott, M. (1968). Caste ranking and food transactions: A matrix analysis. In M. Singer & B. S. Cohn (Eds.), *Structure and change in Indian society* (pp. 133–171). Chicago: Aldine.
- Martins, Y., & Pliner, P. (2006). "Ugh! That's disgusting!": Identification of the characteristics of foods underlying rejections based on disgust. *Appetite*, 46, 75–85.
- Marzillier, S. L., & Davey, G. C. L. (2005). Anxiety and disgust: Evidence for a unidirectional relationship. *Cognition and Emotion*, 19, 729–750.
- Masson, J. L., & Patwardhan, M. V. (1970). *Aesthetic rapture: the Rāsadhyāya of the Nāṭyaśāstra*. Poona, India: Deccan College.
- Matchett, G., & Davey, G. C. L. (1991). A test of a disease-avoidance model of animal phobias. *Behaviour Research and Therapy*, 29, 91–94.
- Mauss, M. (1972). *A general theory of magic* (R. Brain, Trans.). New York: Norton. (Original work published 1902)
- Mayr, E. (1960). The emergence of evolutionary novelties. In S. Tax (Ed.), *Evolution after Darwin: Vol. 1. The evolution of life* (pp. 349–380). Chicago: University of Chicago Press.
- McKay, D. (2002). Introduction to the special issue: The role of disgust in anxiety disorders. *Journal of Anxiety Disorders*, 16, 475–476.
- Meigs, A. S. (1978). A Papuan perspective on pollution. *Man*, 13, 304–318.
- Meigs, A. S. (1984). *Food, sex, and pollution: A New Guinea religion*. New Brunswick, NJ: Rutgers University Press.
- Miller, S. B. (1986). Disgust: Conceptualization, development, and dynamics. *International Review of Psychoanalysis*, 13, 295–307.
- Miller, S. B. (2004). *Disgust: The gatekeeper emotion*. Hillsdale, NJ: Analytic Press.
- Miller, W. I. (1997). *The anatomy of disgust*. Cambridge, MA: Harvard University Press.

- Mitchell, I. J., Heims, H., Neville, E. A., & Rickards, H. (2005). Huntington's disease patients show impaired perception of disgust in the gustatory and olfactory modalities. *Journal of Neuropsychiatry and Clinical Neurosciences*, 17, 119-121.
- Moll, J., deOliveira-Souza, R., Moll, F. T., Ignacio, F. A., Bramati, I. E., Caparelli, D. E. M., et al. (2005). The moral affiliations of disgust: A functional MRI study. *Cognitive and Behavioral Neurology*, 8, 68-78.
- Nabi, R. L. (2002). The theoretical versus the lay meaning of disgust: Implications for emotion research. *Cognition and Emotion*, 16, 695-703.
- Navarette, C. D., & Fessler, D. M. T. (2006). Disease avoidance and ethnocentrism: The effects of disease vulnerability and disgust sensitivity on intergroup attitudes. *Evolution and Human Behavior*, 27, 270-282.
- Nemeroff, C., & Rozin, P. (1989). "You are what you eat": Applying the demand-free "impressions" technique to an unacknowledged belief. *Ethos: The Journal of Psychological Anthropology*, 17, 50-69.
- Nemeroff, C., & Rozin, P. (1992). Sympathetic magical beliefs and kosher dietary practice: The interaction of rules and feelings. *Ethos: The Journal of Psychological Anthropology*, 20, 96-115.
- Nemeroff, C., & Rozin, P. (1994). The contagion concept in adult thinking in the United States: Transmission of germs and interpersonal influence. *Ethos: The Journal of Psychological Anthropology*, 22, 158-186.
- Nemeroff, C., & Rozin, P. (2000). The makings of the magical mind. In K. Rosengren, C. Johnson, & P. Harris (Eds.), *Imagining the impossible: Magical, scientific, and religious thinking in children* (pp. 1-34). New York: Cambridge University Press.
- Nussbaum, M. C. (1999). "Secret sewers of vice": Disgust, bodies, and the law. In S. A. Bandes (Ed.), *The passions of law* (pp. 19-62). New York: New York University Press.
- Olatunji, B. O., Lohr, J.-M., Sawchuk, C.-N., & Tolin, D.-F. (2007). Multimodal assessment of disgust in contamination-related obsessive-compulsive disorder. *Behaviour Research and Therapy*, 45, 263-276.
- Olatunji, B. O., & McKay, D. (2006). Introduction to the special series: Disgust sensitivity in anxiety disorders. *Journal of Behavior Therapy and Experimental Psychiatry*, 37, 1-3.
- Olatunji, B. O., & Sawchuk, C. N. (2005). Disgust: Characteristic features, social manifestations, and clinical implications. *Journal of Social and Clinical Psychology*, 24, 932-962.
- Olatunji, B. O., Sawchuk, C. N., de Jong, P. J., & Lohr, J. M. (2006). The structural relation between disgust sensitivity and blood-injection-injury fears: A cross-cultural comparison of US and Dutch data. *Journal of Behavior Therapy and Experimental Psychiatry*, 37, 16-29.
- Olatunji, B. O., Tolin, D. F., Huppert, J. D., & Lohr, J. M. (2005). The relation between fearfulness, disgust sensitivity and religious obsessions in a non-clinical sample. *Personality and Individual Differences*, 38, 713-722.
- Olatunji, B. O., Williams, N. L., Lohr, J. M., & Sawchuk, C. N. (2005). The structure of disgust: Domain specificity in relation to contamination ideation and excessive washing. *Behaviour Research and Therapy*, 43, 1069-1086.
- Olatunji, B. O., Williams, N. L., Tolin, D. F., Sawchuk, C. N., Abramowitz, J. S., Lohr, J. M., et al. (2007). The Disgust Scale: Item analysis, factor structure, and suggestions for refinement. *Psychological Assessment*, 19, 281-297.
- Ortner, S. B. (1973). Sherpa purity. *American Anthropologist*, 75, 49-63.
- Page, A. C. (1994). Blood-injury phobia. *Clinical Psychology Review*, 14, 443-461.
- Page, A. C. (2003). The role of disgust in faintness elicited by blood and injection stimuli. *Journal of Anxiety Disorders*, 17, 45-58.
- Pető, E. (1936). Contribution to the development of smell feeling. *British Journal of Medical Psychology*, 15, 314-320.
- Phillips, M. L., Marks, I. M., Senior, C., Lythgoe, D., O'Dwyer, A. M., Meehan, O., et al. (2000). A differential neural response in obsessive-compulsive disorder patients with washing compared with checking symptoms to disgust. *Psychological Medicine*, 30, 1037-1050.
- Phillips, M. L., Young, A. W., Senior, C., Brammer, M., Andrew, C., Williams, S. C. R., et al. (1997). A specific neural substrate for perceiving facial expressions of disgust. *Nature*, 389, 495-498.
- Piaget, J., & Inhelder, B. (1974). From conservation to atomism. In J. Piaget & B. Inhelder, *The child's construction of quantities* (pp. 67-116). London: Routledge & Kegan Paul. (Original work published 1941)
- Pinker, S. (1997). *How the mind works*. New York: Norton.
- Plutchik, R. (1980). *Emotion: A psychoevolutionary synthesis*. New York: Harper & Row.
- Power, M., & Dalgleish, T. (1997). *Cognition and emotion: From order to disorder*. Hove, UK: Psychology Press.
- Quigley, J. F., Sherman, M., & Sherman, N. (1996, March). *Personality disorder symptoms, gender, and age as predictors of adolescent disgust sensitivity*. Poster presented at the annual meeting of the Eastern Psychological Association, Philadelphia.
- Renner, H. D. (1944). *The origin of food habits*. London: Faber & Faber.
- Rolls, E. T. (1994). Central taste anatomy and physiology. In R. L. Doty (Ed.), *Handbook of clinical olfaction and gustation* (pp. 549-573). New York: Marcel Dekker.
- Rosen, A., & Rozin, P. (1993). Now you see it. . . Now you don't: The preschool child's conception of invisible particles in the context of dissolving. *Developmental Psychology*, 29, 300-311.
- Rozman, E. B., & Sabini, J. (2001). Something it takes to be an emotion: The interesting case of disgust.

- Journal for the Theory of Social Behaviour*, 31, 29–59.
- Rozin, P. (1976). The evolution of intelligence and access to the cognitive unconscious. In J. A. Sprague & A. N. Epstein (Eds.), *Progress in psychobiology and physiological psychology* (Vol. 6, pp. 245–280). New York: Academic Press.
- Rozin, P. (1997). Moralization. In A. Brandt & P. Rozin (Eds.), *Morality and health* (pp. 379–401). New York: Routledge.
- Rozin, P. (in press). Hedonic “adaptation”: Specific adaptation to disgust/death elicitors as a result of dissecting a cadaver. *Judgment and Decision Making*.
- Rozin, P., & Fallon, A. E. (1987). A perspective on disgust. *Psychological Review*, 94, 23–41.
- Rozin, P., Fallon, A. E., & Augustoni-Ziskind, M. (1985). The child’s conception of food: The development of contamination sensitivity to “disgusting” substances. *Developmental Psychology*, 21, 1075–1079.
- Rozin, P., Fallon, A. E., & Mandell, R. (1984). Family resemblance in attitudes to food. *Developmental Psychology*, 20, 309–314.
- Rozin, P., Haidt, J., & McCauley, C. R. (1993). Disgust. In M. Lewis & J. M. Haviland (Eds.), *Handbook of emotions* (pp. 575–594). New York: Guilford Press.
- Rozin, P., Haidt, J., & McCauley, C. R. (1999). Disgust: The body and soul emotion. In T. Dalgleish & M. Power (Eds.), *Handbook of cognition and emotion* (pp. 429–445). Chichester, UK: Wiley.
- Rozin, P., Haidt, J., & McCauley, C. R. (2000). Disgust. In M. Lewis & J. M. Haviland-Jones (Eds.), *Handbook of emotions* (2nd ed., pp. 637–653). New York: Guilford Press.
- Rozin, P., Haidt, J., McCauley, C. R., Dunlop, L., & Ashmore, M. (1999). Individual differences in disgust sensitivity: Comparisons and evaluations of paper-and-pencil versus behavioral measures. *Journal of Research in Personality*, 33, 330–351.
- Rozin, P., Haidt, J., McCauley, C. R., & Imada, S. (1997). The cultural evolution of disgust. In H. M. Macbeth (Ed.), *Food preferences and taste: Continuity and change* (pp. 65–82). Oxford: Berghahn.
- Rozin, P., Hammer, L., Oster, H., Horowitz, T., & Marmara, V. (1986). The child’s conception of food: Differentiation of categories of rejected substances in the 1.4 to 5 year age range. *Appetite*, 7, 141–151.
- Rozin, P., Lowery, L., & Ebert, R. (1994). Varieties of disgust faces and the structure of disgust. *Journal of Personality and Social Psychology*, 66, 870–881.
- Rozin, P., Lowery, L., Imada, S., & Haidt, J. (1999). The CAD triad hypothesis: A mapping between three moral emotions (contempt, anger, disgust) and three moral codes (community, autonomy, divinity). *Journal of Personality and Social Psychology*, 76, 574–586.
- Rozin, P., Markwith, M., & McCauley, C. R. (1994). The nature of aversion to indirect contact with other persons: AIDS aversion as a composite of aversion to strangers, infection, moral taint and misfortune. *Journal of Abnormal Psychology*, 103, 495–504.
- Rozin, P., Millman, L., & Nemeroff, C. (1986). Operation of the laws of sympathetic magic in disgust and other domains. *Journal of Personality and Social Psychology*, 50, 703–712.
- Rozin, P., & Nemeroff, C. J. (1990). The laws of sympathetic magic: A psychological analysis of similarity and contagion. In J. Stigler, G. Herdt, & R. A. Shweder (Eds.), *Cultural psychology: Essays on comparative human development* (pp. 205–232). Cambridge, UK: Cambridge University Press.
- Rozin, P., Nemeroff, C., Horowitz, M., Gordon, B., & Voet, W. (1995). The borders of the self: Contamination sensitivity and potency of the mouth, other apertures and body parts. *Journal of Research in Personality*, 29, 318–340.
- Rozin, P., Nemeroff, C., Wane, M., & Sherrod, A. (1989). Operation of the sympathetic magical law of contagion in interpersonal attitudes among Americans. *Bulletin of the Psychonomic Society*, 27, 367–370.
- Rozin, P., & Singh, L. (1999). The moralization of cigarette smoking in America. *Journal of Consumer Behavior*, 8, 321–337.
- Rozin, P., Taylor, C., Ross, L., Bennett, G., & Hejmadi, A. (2005). General and specific abilities to recognise negative emotions, especially disgust, as portrayed in the face and the body. *Cognition and Emotion*, 19, 397–412.
- Rozin, P., & Wolf, S. (2007). *Family resemblance in preferences and values across three generations of Americans*. Manuscript in preparation.
- Rozin, P., Wrzesniewski, A., & Byrnes, D. (1998). The elusiveness of evaluative conditioning. *Learning and Motivation*, 29, 397–415.
- Sanfey, A. G., Rilling, J. K., Aronson, J. A., Nystrom, L. E., & Cohen, J. D. (2003). The neural basis of economic decision-making in the ultimatum game. *Science*, 300, 1755–1758.
- Sawchuk, C. N., Meunier, S. A., Lohr, J. M., & Westendorf, D. H. (2002). Fear, disgust, and information processing in specific phobia: The application of signal detection theory. *Journal of Anxiety Disorders*, 16, 495–510.
- Scherer, K. R. (1997). The role of culture in emotion-antecedent appraisal. *Journal of Personality and Social Psychology*, 73, 902–922.
- Scherer, K. R., & Wallbott, H. G. (1994). Evidence for universality and cultural variation of differential emotion response patterning. *Journal of Personality and Social Psychology*, 66, 310–328.
- Schienze, A., Schafer, A., Stark, R., Walter, B., Franz, M., & Vaitl, D. (2003). Disgust sensitivity in psychiatric disorders: A questionnaire study. *Journal of Nervous and Mental Diseases*, 191, 831–834.
- Schienze, A., Schafer, A., Stark, R., Walter, B., & Vaitl, D. (2005). Relationship between disgust sensitivity, trait anxiety and brain activity during disgust induction. *Neuropsychobiology*, 51, 86–92.

- Schienze, A., Schafer, A., Walter, B., Stark, R., & Vaitl, D. (2005). Elevated disgust sensitivity in blood phobia. *Cognition and Emotion*, 19, 1229-1241.
- Schienze, A., Stark, R., & Vaitl, D. (2001). Evaluative conditioning: A possible explanation for the acquisition of disgust responses? *Learning and Motivation*, 32, 65-83.
- Schmidt, H., & Beauchamp, G. (1988). Adult-like odor preferences and aversions in three-year-old children. *Child Development*, 59, 1136-1143.
- Senn, M. J. E., & Solnit, A. J. (1968). *Problems in child behavior and development*. Philadelphia: Lea & Febiger.
- Shapira, N. A., Liu, Y., He, A. G., Bradley, M. M., Lessig, M. C., James, G. A., et al. (2003). Brain activation by disgust-inducing pictures in obsessive-compulsive disorder. *Biological Psychiatry*, 54, 751-756.
- Sherman, G., Haidt, J., & Coan, J. (2007). *Nazis really are disgusting*. Unpublished manuscript, University of Virginia.
- Shweder, R. A., Much, N. C., Mahapatra, M., & Park, L. (1997). The "big three" of morality (autonomy, community, divinity), and the "big three" explanations of suffering. In A. Brandt & P. Rozin (Eds.), *Morality and health* (pp. 119-169). New York: Routledge.
- Siegal, M. (1988). Children's knowledge of contagion and contamination as causes of illness. *Child Development*, 59, 1353-1359.
- Siegal, M., & Share, D. L. (1990). Contamination sensitivity in young children. *Developmental Psychology*, 26, 455-458.
- Sprengelmeyer, R., Rausch, M., Eysel, U. T., & Przuntek, H. (1998). Neural structures associated with recognition of facial expressions of basic emotions. *Proceedings of the Royal Society of London, Series B*, 265, 1927-1931.
- Sprengelmeyer, R., Young, A. W., Calder, A. J., Karnat, A., Lange, H., Homberg, V., et al. (1996). Loss of disgust: perception of faces and emotions in Huntington's disease. *Brain*, 119, 1647-1665.
- Stark, R., Schienze, A., Walter, B., Kirsch, P., Sammer, G., Ott, U., et al. (2003). Hemodynamic responses to fear and disgust-inducing pictures: An fMRI study. *International Journal of Psychophysiology*, 50, 225-234.
- Stein, M., Ottenberg, P., & Roulet, N. (1958). A study of the development of olfactory preferences. *Archives of Neurology and Psychiatry*, 80, 264-266.
- Steiner, J. E. (1979). Human facial expressions in response to taste and smell stimulation. In H. W. Reese & L. P. Lipsitt (Eds.), *Advances in child development and behavior* (Vol. 13, pp. 257-295). New York: Academic Press.
- Tambiah, S. J. (1969). Animals are good to think and good to prohibit. *Ethnology*, 8, 423-459.
- Tolin, D. F., Lohr, J. M., Sawchuk, C. M., & Lee, T. C. (1997). Disgust and disgust sensitivity in blood-injection-injury and spider phobia. *Behaviour Research and Therapy*, 35, 949-953.
- Tolin, D. F., Woods, C. M., & Abramowitz, J. S. (2006). Disgust sensitivity and obsessive-compulsive symptoms in a non-clinical sample. *Journal of Behavior Therapy and Experimental Psychiatry*, 37, 30-40.
- Tomkins, S. S. (1963). *Affect, imagery, consciousness: Vol. 2. The negative affects*. New York: Springer.
- Tomkins, S. S. (1982). Affect theory. In P. Ekman (Ed.), *Emotion in the human face* (2nd ed., pp. 353-395). Cambridge, UK: Cambridge University Press.
- Troop, N. A., Treasure, J. L., & Serpell, L. (2002). A further exploration of disgust in eating disorders. *European Eating Disorders Review*, 10, 218-226.
- Tylor, E. B. (1974). *Primitive culture: Researches into the development of mythology, philosophy, religion, art and custom*. New York: Gordon Press. (Original work published 1871)
- Van Overveld, W. J. M., de Jong, P. J., Peters, M. L., Cavanagh, K., & Davey, G. C. L. (2006). Disgust propensity and disgust sensitivity: Separate constructs that are differentially related to specific fears. *Personality and Individual Differences*, 41, 1241-1252.
- Ware, J., Jain, K., Burgess, L., & Davey, G. C. L. (1994). Disease-avoidance model: Factor analysis of common animal fears. *Behaviour Research and Therapy*, 32, 57-63.
- Webb, K., & Davey, G. C. L. (1993). Disgust sensitivity and fear of animals: effect of exposure to violent or repulsive material. *Anxiety, Coping, and Stress*, 5, 329-335.
- Wicker, B., Keysers, C., Plailly, J., Royet, J. P., Gallese, V., & Rizzolatti, G. (2003). Both of us disgusted in my insula: The common neural basis of seeing and feeling disgust. *Neuron*, 40, 655-664.
- Wierzbicka, A. (1986). Emotions: Universal or culture-specific? *American Anthropologist*, 88, 584-594.
- Wolf, K., Mass, R., Ingenbleek, T., Kiefer, F., Naber, D., & Wiedemann, K. (2005). The facial pattern of disgust, appetite, excited joy and relaxed joy: An improved facial EMG study. *Scandinavian Journal of Psychology*, 46, 403-409.
- Woody, S. R., McLean, C., & Klassen, T. (2005). Disgust as a motivator of avoidance of spiders. *Journal of Anxiety Disorders*, 19, 461-475.
- Woody, S. R., & Teachman, B. A. (2000). Intersection of disgust and fear: Normative and pathological views. *Clinical Psychology: Science and Practice*, 7, 291-311.
- Woody, S. R., & Tolin, D. F. (2002). The relationship between disgust sensitivity and avoidant behavior: Studies of clinical and nonclinical samples. *Journal of Anxiety Disorders*, 16, 543-559.
- Wright, P., He, G., Shapira, N. A., Goodman, W. K., & Liu, Y. (2004). Disgust and the insula: fMRI responses to pictures of mutilation and contamination. *NeuroReport*, 15, 2347-2351.