

Chapter 21

Disgust: The Body and Soul Emotion

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Disgust is on virtually every list of “basic emotions”, from the second century *Natyashastra* from India (Masson & Patwardhan, 1970; Hejmadi, 1998; Shweder, 1993), through Darwin’s (1872) *Expression of the Emotions in Man and Animals* and on to contemporary textbooks. Like other basic emotions, disgust links together cognitive and bodily responses; it can be well analyzed within the Tomkins/Ekman (Ekman, 1984) framework as an affect “program”, in which outputs (behaviors, expressions, physiological responses) are triggered by inputs (cognitive appraisals of environmental events). It is the thesis of this chapter that disgust, as experienced by humans around the world, shows a high degree of constancy or conservatism on the output side (i.e. expression, nausea and behavioral tendency), but has undergone an extraordinary transformation and expansion on the appraisal side (Rozin, Haidt & McCauley, 1993; 1997a; Haidt et al., 1997). This expansion varies with history and culture in a way that takes disgust far beyond its animal precursors on the appraisal side.

THE DISGUST PROGRAM

The constellation of responses associated with the emotion of disgust is relatively stable across situations, cultures and even species, and consists of expressive

movements (particularly in the face), certain physiological events, and behaviors or behavioral tendencies.

The Expression of Disgust

The disgust face is familiar and recognized in many and perhaps all cultures (Ekman, 1984; Ekman et al., 1987; Izard, 1971; Haidt & Keltner, 1998). The three major muscle groups involved (Darwin, 1872; Ekman & Friesen, 1975; Izard, 1971) are the gape (lowering of the lower jaw), with or without tongue extrusion, the nose wrinkle, and the upper lip raise. The gape and nose wrinkle are most associated with disgust situations related to food. The upper lip raise, the movement least related functionally to eating or rejection of food, is most associated with what we call elaborated disgust (elicitors like dead bodies, physical contact with strangers, and certain moral violations) (Rozin, Lowery & Ebert, 1994).

Physiology

Unlike other emotions, disgust has a unique physiological signature, associated with the experience of nausea. Also, whereas anger and fear involve sympathetic arousal, disgust may be parasympathetically organized and sympathetically neutral or de-arousing (Ekman, Levenson & Friesen, 1983; Levenson, Ekman & Friesen, 1990).

Behavior

The behavior associated with disgust is typically a distancing from the disgusting situation or object. Distancing may be accomplished by an expulsion or removal of an offending stimulus (as in spitting out or washing) or by a removal of the self from the situation (turning around, walking away) or by withdrawal of attention (closing or covering the eyes, engaging in some distraction or changing the topic of a conversation).

THE EXPERIENCE OF DISGUST: QUALIA

There is a sense of "offense" associated with disgust, related to a sense of deviance or imperfection: something is not as it should be. Scherer & Walbott (1994) report, based on questionnaires from college students from 37 countries on five continents, that in comparison to most other basic emotions, disgust is reported to be relatively short in duration and relatively low in experienced intensity.

PREADAPTATION AND THE EXPANSION OF DISGUST ELICITORS

We describe the expansion of disgust elicitors in cultural evolution as an instance of the evolutionary concept of preadaptation (Mayr, 1960): the use and modification of an already existing structure/system that had evolved for a different purpose (Rozin, Haidt & McCauley, 1993; 1997a). For example, the mouth evolved as an aperture involved in eating and breathing. The tongue and teeth are adaptations for handling food. However, as language evolved in humans, the expressive aspect co-opted the mouth, conveniently located as the output of the breathing system, and employed the tongue, teeth and muscular control over the oropharynx in the service of speech. Hence, the mouth can be said to have been preadapted to take on a speech function.

We propose that disgust originated in the widespread distaste/oral rejection response seen in many mammals in response to certain categories of tastes, e.g. bitter tastes, and that the output side of this distaste program was appropriated by a wide range of elicitors, appraisals and meanings. We trace a trajectory from animal disgust origins centered on food selection and protecting the body from harmful ingestants to ideational disgust serving to protect the soul from harmful influences. Disgust expands from "out of mouth" to "out of mind". This general pattern of extension has also been suggested by Oatley & Johnson-Laird (1987) as characteristic of evolution of the emotions. The same pattern may also be manifested in development, a process which may parallel preadaptation, and may be described as increased accessibility (Rozin, 1976).

CORE DISGUST

Early landmarks in consideration of disgust are the contributions of Charles Darwin (1872), from the evolutionary standpoint, and of Andras Angyal (1941), from a psychoanalytic perspective. Both of these penetrating analyses recognize the broad range of meanings and elicitors of disgust, yet conceptualize the food system as the phylogenetic and ontogenetic origin of disgust. We concur and describe *core disgust* as the prototype and origin of disgust (Rozin & Fallon, 1987). Our definition of core disgust derives from Angyal (1941): "Revulsion at the prospect of (oral) incorporation of an offensive substance. That substance has contamination properties: if it contacts an otherwise edible substance, it renders it inedible" (Rozin & Fallon, 1987, p. 23: the first sentence is from Angyal, 1941). Our argument for this definition, and the feeding system as the origin of disgust, is as follows (Rozin & Fallon, 1987):

1. The physical signature of disgust is nausea, a gastro-intestinal, usually food-related sensation, which discourages ingestion and may lead to ejecting (vomiting) something already ingested.

2. The facial expression of disgust focuses on the mouth and nose, and has strong components of rejection of tastes and smells.
3. The parallel manifestation of gaping and vomiting in non-human mammals is clearly and virtually exclusively associated with the food system.
4. Etymologically, the word "disgust" (or its relative, *degout* in French) literally means bad taste.

In our view, the disgust emotion program evolved from a pre-adapted part of the feeding system: the mammalian distaste response (Rozin & Fallon, 1987). This response involves the gape and related facial expressions, is linked to behavioral withdrawal, and is probably associated with nausea. It is widespread in mammals (see Grill & Norgren, 1977, for detailed description for *Rattus norvegicus*), and clearly manifested in newborn human infants (Steiner, 1979; Rosenstein & Oster, 1988). It is present as well in adult humans in their reactions to bad-tasting food, such as foods that are very bitter.

But distaste is quite different from disgust. For distaste, the rejection is made on the basis of sensory properties; there is no sense of offense if the bad-tasting substance is introduced into the stomach in a way that bypasses the oral senses (e.g. a pill). Neither does distaste involve contamination; people rarely reject a desired food if a distasteful food merely touched it. In our taxonomy of food rejections (Rozin & Fallon, 1980; Fallon & Rozin, 1983), *distaste* is motivated by undesirable sensory properties, *danger* by undesirable consequences of ingestion, and *disgust* by offensive properties having to do with the nature or origin of the potential food.

We consider disgust, including core disgust, to be uniquely human. The complex conceptual apparatus required for reactions based on the nature and origin of disgust elicitors, and for ideas of contamination that do not depend on sensory qualities, are unavailable to non-human animals. We now consider three critical aspects of core disgust, all deriving from the definition provided above (see Rozin & Fallon, 1987, for a fuller discussion).

Oral Incorporation

Core disgust can be thought of as a gatekeeper for the mouth, guarding against oral incorporation of improper substances. Eating is the principal process through which materials outside of the self are taken into the self. This extremely intimate act, accomplished almost always through the mouth, activates a deep, strongly felt cognition: "you are what you eat". Based on everyday experiences with mixing of substances, it is entirely reasonable to believe that mixing a body with a food will impart some properties of the food to the body. The "you are what you eat" principle is overt and salient in traditional cultures (see review in Nemeroff & Rozin, 1989). We have shown using indirect methods that this belief is also present in college undergraduates (Nemeroff & Rozin, 1989): people eating wild boar are seen as more aggressive and hairier than

people eating sea turtles. “You are what you eat” explains why people feel so strongly about consuming offensive substances: they will make the consumer offensive!

Animals as the Source of Offensive Substances

We have argued that elicitors of core disgust are generally of animal origin (Rozin & Fallon, 1987). Virtually all food-related items of disgust, cross-culturally, are of animal origin. Plant foods that are disliked are generally regarded as distasteful, but not disgusting (i.e. they don't contaminate everything they touch). Our more recent description of core disgust (Rozin, Haidt & McCauley, 1993) describes the elicitors of core disgust as animals (roaches, maggots, rats), food (monkey meat, ketchup on ice-cream), and body products (feces, vomit, saliva).

Contagion

Anthropologists at the turn of the century (Tylor, 1871/1974; Frazer, 1890/1959; Mauss, 1902/1972) described contagion as one of the laws of sympathetic magic. The basic idea is “once in contact, always in contact”. When two entities make contact, there is a permanent passage of properties. Hence, when an earthworm briefly contacts a food, the earthworm “properties” enter the food. The critical properties of contagion (Rozin & Nemeroff, 1990) seem to be that: (a) physical contact is required; (b) the effect of contact is dose-insensitive—very brief contact suffices to accomplish most of the potential effect; (c) the effect is permanent; and (d) that negative contagious effects are more common and more powerful than positive contagious effects. We have shown, contrary to the original claim that sympathetic magical thinking is characteristic only of people in traditional cultures, that it is widespread in Western-developed cultures (Rozin, Millman & Nemeroff, 1986).

Contagion is a defining feature of disgust, and extends throughout the varied domains of disgust. The negative contagion produced by disgust elicitors seems to be universal among adults but absent in young children (Fallon, Rozin & Pliner, 1984) and, so far as we know, any non-human species (see Rozin & Nemeroff, 1990, for a review). Initial research on the cognitions involved in contagion suggests that “mental models” of contagion include principles of association, the idea of a “material essence” transferred by contact, and the idea of a non-material, “spiritual essence”, also transferred by contact (Nemeroff & Rozin, 1994).

Core disgust is only the beginning of the story of disgust. When we asked Americans and Japanese (Imada, Yamada & Haidt, 1993) to give three examples of what is disgusting (*ken'ō* in Japanese), core disgust items (foods, animals, body products) accounted for only 24% of American responses and 27% of Japanese

responses. The majority of responses illustrated the expansion of disgust into other domains of life, to which we now turn.

ANIMAL-NATURE DISGUST

In our various open-ended studies we have found frequent references to four additional kinds of elicitors: poor hygiene (body odor, not washing frequently); inappropriate sex (as with animals or siblings); body envelope violations (as with gaping wounds, or amputated limbs); and contact with death (as with touching a corpse). These four domains, together with the core domains (animals, food, body products), have in common that they deal with essentials of animal life: eating, excreting, grooming, reproduction, injury, death and decay. Given the ethnographic prominence of the assertions that humans are not animals, and that humans are above animals, we can summarize a possible meaning for the seven domains of elicitors as reminders of our animal nature (Rozin & Fallon, 1987; Rozin, Haidt & McCauley, 1993). If humans are to convince themselves that they are different from animals, these are seven areas in which work must be done to hide (as with defecation and menstruation for Americans) or humanize (as with table manners and funeral rites) biological necessities.

The rejection/withdrawal/offense response previously used for offensive foods is now harnessed to the offensive idea that we are animals. The contagion properties of core disgust elicitors are also extended to the animal nature elicitors, such that a sweater worn by a person who has an amputated leg is less desirable than a sweater worn by a normally equipped person (Rozin, Markwith & McCauley, 1994).

Disgust is thus the emotion of civilization, and of socialization. It is part of affirming our unique humanity. This conception of disgust as a rejection of our animal nature is congruent with Norbert Elias' (1939/1978) ideas on the civilizing process, and the development of sensitivities in Europe from medieval to modern times. Elias (1939/1978) argues that: "... people in the course of the civilizing process seek to suppress in themselves every characteristic that they feel to be 'animal'" (p. 120). We call this expanded form of disgust "animal-nature disgust" (Rozin, Haidt & McCauley, 1993; 1997; Haidt et al. 1997). This framing of disgust is very much in keeping with the concept of disgust as it is elaborated in Miller's book, *The Anatomy of Disgust* (1997) and with Kass' (1994) treatment of the extension of food as a body related entity to food as a soul-related entity.

There is one property that humans share with animals that is particularly upsetting to the self conscious *Homo sapiens*. It is mortality—death and decay of the flesh. Humans are presumably the only species that understands this extremely threatening state of affairs, and it seems reasonable to assume that distancing the self from animals and animal properties might be a way of dealing with fear of death. The psychoanalyst Ernest Becker, in *The*

Denial of Death (1973), argues that mortality is *the* great human problem. He suggests that the elaborate psychological defense machinery proposed by Freud, including mechanisms of repression and denial, serve principally to deal with the prospect of death, rather than with sexual desires and aggressive impulses. If Becker is right, then disgust at animality, and at corpses in particular, should play an important role in the mental economy of humankind.

The analysis of item intercorrelations in a disgust sensitivity scale that we created reveals that items dealing with contact with death are among the most predictive of total disgust sensitivity (Haidt, McCauley & Rozin, 1994). This argues for an important role for attitudes to death, as does the fact that the quintessential odor of disgust is the odor of decay, a result of microbial action and, in particular, of death.

We propose animal nature disgust as the first major elaboration of disgust in its cultural evolution; in this scheme, the function of disgust moves further toward protecting the soul, as well as the body (Rozin, Haidt & McCauley, 1993; 1997a; Haidt et al., 1997).

INTERPERSONAL DISGUST

There are many disgust experiences that are not easily understood in terms of core or animal-nature disgust. Many of these experiences involve interactions or contact with other persons. Contact or intimacy with persons outside of one's social circle is often aversive and disgusting, at least to the Americans, Japanese and Indians we have studied. For this reason, many people in these countries are reluctant to wear clothing bought in used clothing stores. In a study on aversion to people with AIDS, Rozin, Markwith & McCauley (1994) found that unknown people were contaminating; subjects were less willing to wear a washed sweater worn briefly by a healthy stranger than the same sweater new. Unknown people who had experienced a misfortune (e.g. a limb amputation as a result of a car accident) were more contaminating, and people with infectious diseases (like tuberculosis) or moral taints (e.g. a convicted murderer) were still more contaminating.

We call what we have been discussing "interpersonal disgust". We think interpersonal disgust makes sense as a re-use of the original disgust "program" applied to the social domain. Just as core disgust rejects most animals and animal products for consumption, and sexual disgust rejects most potential sexual objects, so interpersonal disgust rejects most people as partners for intimate social contact (e.g. sharing food, clothing, linens and casual touch). In all three cases, disgust makes us extremely selective, critical and judgmental. Interpersonal disgust is particularly salient in Hindu India, since the caste system is in large measure defined and maintained by transaction rules, primarily for food. One's purity and status are lowered by eating food prepared by someone of lower caste (Appadurai, 1981).

SOCIO-MORAL DISGUST

There is one final category of situations cited by subjects as elicitors of disgust. This is a large and puzzling category: socio-moral violations. Most socio-moral violations are not disgusting (e.g. robbing a bank) and many of the most disgusting socio-moral violations appear to be disgusting because they involve aspects of core or animal-nature disgust (e.g. the sexual molestation of children, or brutal murders that involve mutilation or other body envelope violations). However, whenever we ask people to describe disgusting situations, we get frequent descriptions of situations that do not seem to make contact with the concerns of core or animal-nature or interpersonal disgust: situations such as hypocrisy, racism, betrayal and disloyalty, or "sleazy" behavior, such as lawyers who chase ambulances.

When we began our research on socio-moral disgust we thought that this category might just reflect an exaggerated or metaphoric use of the English language, in which certain kinds of violations are called "disgusting" even though the reaction will never involve a disgust expression or nausea. However, most of the other languages we have looked at have a word expressing a similar compound of bodily concerns (about food, feces, sex) with social and moral concerns, for example French *degout*, German *Ekel*, Spanish *asco*, Russian *otvrastchenie*, Hebrew *go-al*, Japanese *ken-o*, Oriya (India) *ghrna*, and Chinese *aw-shin*. We therefore believe that socio-moral disgust is not a quirk of the English language. We believe it reflects a common path in the cultural evolution of many societies in which disgust is extended into the social domain, and used to reject certain classes of violators who are beyond redemption (Kekes, 1992). A bank-robber has a normal (human) desire for money; he uses unacceptable means to get money, and for his crime he must "pay back" society in some way. However, people who reveal themselves to have deep characterological flaws that make them unfit for participation in society are rejected and ostracized by the socio-moral disgust of their peers. Thus, racism (for liberals) or lack of loyalty (for conservatives) makes a person revolting and perhaps contaminating in a way that a bank-robber is not.

With interpersonal and moral disgust we complete our description of elaborated disgust. We suggest that interpersonal and moral disgust are the latest additions to the disgust elicitors, in cultural evolution and perhaps even in individual development, but we acknowledge that evidence for this suggestion is meagre.

AN ALTERNATIVE FRAMING OF DISGUST

Miller (1997) proposes a different way of categorizing kinds of disgust. He proposes that there are two basic kinds of disgust: a "Freudian" kind, which

acts as a barrier to satisfying unconscious desire, and the “disgust of surfeit”, which is activated by overindulgence in food, drink, sex, or other areas of desire that are consciously acted upon. We think that the disgust of surfeit is an important kind of disgust not previously attended to by disgust researchers. However, we do not see the need to bring in a Freudian apparatus of conscious vs. unconscious desires. We think it more parsimonious to view surfeit-disgust as another example of pre-adaptation. If disgust already functioned to discourage the eating of potentially contaminated foods, then it was well-suited as an “off switch” to discourage eating excessive amounts of uncontaminated foods, especially for an omnivorous species that seeks wide variety in diet. Surfeit disgust may have also taken on additional meanings during the civilizing process as people developed disgust for the over-indulgence of basic animal appetites. A popular stereotype conceives many animals as voracious and gluttonous in feeding and promiscuous in mating. Gluttons may therefore disgust by appearing animal-like.

DISGUST IN CULTURAL PERSPECTIVE

We have described disgust as closely linked to the protection and internalization of culture-based sensitivities, in accord with Elias (1939/1978) and Miller (1997). However, cultural sensitivities vary greatly across cultures and historical eras, and we have some indications that disgust and its role in society does, too. Our comparison of American disgust with Japanese *ken-o* (Haidt et al., 1997) found that the kinds of experiences subjects described were very similar in the core and animal reminder domains, but they diverged greatly for socio-moral events. Americans described reactions to people who grossly violate the autonomy or dignity of other individuals (e.g. senseless murders and acts of cruelty and racism), particularly helpless individuals such as children, while Japanese were more likely to describe situations from everyday life in which their own fit into the social order was blocked or threatened (e.g. being criticized, or failing to live up to important standards). This pattern of similarity in core disgust and divergence in socio-moral disgust fits with Oatley & Johnson-Laird’s (1987) cognitive theory of emotions, in which universal basic emotions are elaborated into culturally variable complex emotions.

One way to make sense of cultural variations in moral life is through Shweder’s theory of the Three Ethics of Morality (Shweder et al., 1997). This theory proposes that moral thought and discourse can be conducted in three different languages, or ethics. The ethic of autonomy focuses on the autonomous individual as the central entity and tries to maximize the rights, freedom and welfare of that individual. This is the dominant moral ethic in the modern Western world. A second system, the ethic of community, focuses on collective entities (e.g. family, community, nation) and strives to maximize the integrity and honor of those entities against such affronts as disorder and disrespect. A third system, the ethics of divinity, focuses on the spark of divinity that exists in all

people, and strives to protect that divinity from pollution and degradation while guiding people to live in an elevated and god-like way. All three ethics may be available to individuals in all cultures, but cultures appear to show preferences and differential patterns of use of the three ethics.

We have suggested that Shweder's three moral systems map on to the three other-directed moral emotions, with anger linked to autonomy, contempt to community, and disgust to divinity (Rozin et al., 1999a). Since the ethics of divinity focuses on purity, and is concerned that people behave like gods rather than like animals, it makes sense that disgust and its rejection of animality becomes a central moral emotion in this ethic. We have gathered supporting evidence for this moral-emotional mapping: among Japanese and American subjects, short scenarios describing one or the other type of Shweder violation are generally assigned to the appropriate emotion word (from a choice of the three) or to the corresponding facial expression of that emotion.

It seems that the contemporary Western devotion to a rights-justice ethics of autonomy severely restricts the moral domain of disgust. Haidt, Koller & Dias (1993) asked Brazilians and Americans of upper and lower social class about a variety of disgusting yet harmless actions, such as eating one's pet dog (after it was killed by a car) and having sexual intercourse with a dead chicken. All groups agreed that the actions were disgusting, but the upper-class groups, particularly the American college students, said that the actions were not wrong, since they did not hurt anyone. That is, these subjects separated their personal emotional reactions (disgust) from their moral judgments. Miller (1997) suggests that this separation may be driven by a kind of liberal discomfort with the breadth of a disgust-based morality, under which people who elicit disgust would be declared morally deficient through no fault of their own (e.g. the handicapped, the retarded, the ugly and, for many people, homosexuals).

If upper-class Americans have a narrow moral domain limited to the ethics of autonomy, then the opposite end of the spectrum is represented by traditional Hindu India, where the ethics of community and divinity are extremely well elaborated. In such a society, interpersonal and sociomoral disgust appear to work somewhat differently. The moral domain seems particularly large for Hindus, for whom almost every aspect of daily life can be imbued with moral significance and socially regulated (Shweder, Mahapatra & Miller, 1987). The issues of core disgust (food, animals and body products) become central to the mechanics of purity and pollution. Appadurai (1981) describes food, for Hindus, as a "bio-moral" substance. Thus, although there are things that are disgusting to Hindus and not to Americans, and vice versa, the big differences between the cultures may be the much wider range of entities, disgusting in both cultures, which enter the moral domain in Hindu India.

THE DEVELOPMENT OF DISGUST

It seems that up to about two years of age, children show no aversion to feces and other "primary" disgust elicitors (Rozin, Hammer, Oster, Horowitz & Marmara,

1986). Toilet training may be the primal socialization into core disgust (Angyal, 1941; Rozin & Fallon, 1987).

Although the development of disgust has been little studied, the development of contagion, a proposed criterial feature of disgust, has been explored. Contagion is not present in young preschool children, even though they may reject the contaminating substance itself. Original studies on American children indicated an onset of contagion thinking in the context of disgust or toxins in the 6–7 year-old range (Fallon, Rozin & Pliner, 1984; Rozin, Fallon & Augustoni-Ziskind, 1985), but later studies on Australian children, using more sensitive measures, provide evidence for some contagion sensitivity by the age of four years (Siegal & Share, 1990).

In early as well as in later development, it often happens that an event or object that was previously morally neutral becomes morally loaded. We have called this process “moralization” (Rozin, 1997). In the course of this process, as for example in the case of cigarette smoking in the USA, or meat-eating among vegetarians, the emotion of disgust is recruited. Thus moral vegetarians find meat more disgusting than do “health” vegetarians (Rozin, Markwith & Stoess, 1997b).

At this time, there is little evidence for or against our suggestion that child development recapitulates the cultural expansion of disgust elicitors, beginning with core disgust. What is clear, primarily from common sense and common observation, is that disgust becomes a major, if not *the* major force for negative socialization in children; a very effective way to internalize culturally prescribed rejections (perhaps starting with feces) is to make them disgusting.

THE NEUROBIOLOGY OF DISGUST

A recent series of studies adds an important new dimension to the understanding of disgust from a neurobiological perspective. Sprengelmeyer et al. (1996) have described a striking deficit in the recognition of facial and vocal expressions of disgust in patients with Huntington’s disease. This deficit, presumably resulting from damage to the basal ganglia, is noticeably more severe for disgust expressions than for those of any other basic emotion. Disgust sensitivity, measured by a paper and pencil test, was intact. The specificity of this syndrome offers intriguing and unexpected possibilities concerning both the neural and psychological organization of emotion. There is also evidence for a link between disgust (perhaps via contagion sensitivity) and the cleaning compulsions that are common symptoms of obsessive-compulsive disorder (OCD) (Ware et al., 1994). This has neurological significance, since the basal ganglia are implicated in obsessive-compulsive disorder (Rapoport, 1988). The disgust–OCD link has been confirmed and expanded by a recent study reporting that people with OCD show a severe deficit in the recognition of disgust faces (like the Huntington’s disease patients) (Sprengelmeyer et al., 1998). The suggestion of a disgust recognition deficit in OCD patients is surprising, since one might expect that the

presumed higher disgust sensitivity of OCD patients would be linked to higher sensitivity in recognizing disgust expressions.

THE ALLURE OF DISGUST

Although we have emphasized withdrawal as the behavioral manifestation of disgust, disgust elicitors can be attractive or entertaining in some circumstances. Novelty stores sell realistic imitations of vomit, mucus and slime (apparently mostly to young boys). *Beavis and Butthead*, a television show popular with adolescents, often dwells on disgusting situations (e.g. inappropriate excretion of body fluids; Oppliger & Zillmann, 1995). There is a whole genre of jokes that center on disgust, and disgust humor is particularly salient, perhaps dominant, in young children (Dunn, 1988). In our laboratory experiments on disgust, in which subjects are asked to engage in disgusting experiences up to the point where they don't want to continue, we observe a mixture of disgust expressions and laughter, and subjects rate their laboratory experience overall as interesting and enjoyable (Rozin, Haidt, McCauley, Dunlop & Ashmore, 1999b).

The allure, or perhaps ambivalence, of disgust has been well-articulated by Miller (1997), who takes a Freudian approach to understanding the complexity of human reactions to disgust. From our point of view, the allure of disgust is an instance of a large set of human activities that involve playing with and testing the limits of propriety or safety established by culture (see Apter, 1992). We have described this type of enjoyment with regard to liking for chilli pepper (Rozin, 1990), for roller coasters and for horror movies (McCauley, 1998). In all cases, the body responds with withdrawal and/or negative autonomic events but the mind knows the threat is not real. This disparity between body and mind, or mind over body, seems to produce pleasure. Only constrained or apparent risks are attractive, however; real, out-of-control experiences of disgust or fright are rarely sought or enjoyed (see Miller, 1997, for a similar perspective).

INDIVIDUAL DIFFERENCES IN SENSITIVITY TO DISGUST

We constructed a paper-and-pencil scale to measure individual differences in disgust in the USA and in Japan (Haidt, McCauley & Rozin, 1994). The 32-item Disgust Scale included four items for each of the seven core and animal-nature disgust domains, and four similar items tapping sympathetic magical thinking. In addition to revealing wide variation in disgust sensitivity, the Disgust Scale demonstrated positive intercorrelations of disgust sensitivities across the different domains of elicitors—that is, evidence that the domains converged on a common dimension of sensitivity to disgust. Some behavioral validation emerged from a series of “hands on” laboratory experiences in which the Disgust Scale predicted the degree to which subjects would actually engage in a wide range

of disgust activities ($r = -0.41$; Rozin, Haidt, McCauley, Dunlop & Ashmore, 1999b).

Correlations with other scales have begun to locate disgust sensitivity in relation to other individual difference measures (Haidt, McCauley & Rozin, 1994). The Disgust Scale showed a moderate positive correlation (0.39) with fear of death and a moderate negative correlation (-0.46) with sensation seeking.

Davey and his colleagues argue that phobias involving predatory animals (sharks or lions) invoke fear, whereas phobias involving animals that do not threaten significant physical harm (rat, spider, snake, slug, maggot) are motivated primarily by disgust (Matchett & Davey, 1991; Webb & Davey, 1993; Ware et al., 1994). This distinction is buttressed by a number of experimental and psychometric findings, including relations between disgust sensitivity and non-predatory animal phobias.

In our initial Disgust Scale research (Haidt, McCauley & Rozin, 1994), women were substantially more sensitive to disgust than men; the mean difference amounted to more than half a standard deviation in the distribution of Disgust Scale scores. Other work has corroborated this gender difference (Druschel & Sherman, 1994; Oppliger & Zillmann, 1995; Quigley, Sherman & Sherman, 1996).

Besides gender, the demographic variable most correlated with Disgust Scale scores is social class. We were surprised to find that blue-collar workers in our initial studies were more disgust-sensitive than students and middle-class managers (Haidt, McCauley & Rozin, 1994). This result was confirmed by Doctoroff & McCauley (1996), who found education negatively correlated with Disgust Scale scores ($r = -0.32$).

Individual differences in disgust are probably related to psychopathology. We have already mentioned links between animal phobias or obsessive compulsive disorder and disgust. These and related psychopathological aspects of disgust are richly discussed by Power and Dalgleish (1997).

CONCLUSION

Disgust is basic, pervasive, and extraordinarily broad in its domain. The interaction of biology and culture is clear, because the output side of disgust remains largely ruled by the biological forces that originally shaped it, while the input/appraisal/meaning part has been greatly elaborated, and perhaps transformed in some cases—so much so that in Miller's (1997) extended analysis, a case is made that its deep meaning is perhaps qualitatively transformed from its animal or infantile origins. Although the range of disgust, as applied to matters as diverse as social miss-steps in Japan, or excess indulgence in Western countries, is indeed daunting, we feel that a preadaptation/cultural-evolution framework can account for most of the substantial history of the meanings of disgust. The rich and varied meanings, and the contrasting conservativeness of the response side of disgust,

make the study of disgust a particularly promising road toward integrating the biological and cultural roots of emotion.

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