

# Disgust Talked About<sup>1</sup>

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## Abstract

Disgust, the emotion of rotting carcasses and slimy animalitos, finds itself at the center of several critical questions about human culture and cognition. This article summarizes recent developments, identifies active points of debate, and provides an account of where the field is heading next.

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Disgust is the unlikely academic star of our time. In just a few years it has gone from black sheep to hot topic (see Figure 1).

Its earlier obscurity is, in a way, surprising. Disgust was featured in Darwin's (1872/2002) treatment of emotion, and Ekman and Friesen (1971) identified it as one of six basic emotions: a human universal with the same facial expression across cultures.

But disgust was snubbed during the new wave of emotion research in the 1980s and 90s. Ironically, disgust was considered insufficiently cognitive to deserve a slot in the emotion pantheon. Some researchers suggested that it was not an emotion at all, but a drive, akin to hunger or lust (Panksepp, 2007). Most dimension-based emotion taxonomies developed during this period leave out disgust altogether (for influential accounts, see J. A. Russell, 1980; Smith & Ellsworth, 1985; Barrett, 1998). Dimensional approaches that did include disgust tended to classify it as a mild form of anger or hatred, thus glossing over what might make it interestingly unique at the functional level (see, for instance, Plutchik's (1980) circumplex). For a time, the only researchers paying attention to disgust were those with one foot in anthropology (Rozin & Fallon, 1987) or biology (Lazarus, 1991).

Disgust's newfound popularity can be traced to its role in moral psychology, another field on the upswing. Driven by its visibility in moral psychology, other researchers have begun to see low lying fruit where once there was fallow ground. This activity has ranged from nailing down the basic contours of the emotion (Oum, Lieberman, & Aylward, 2011; G. D. Sherman, Haidt, & Clore, 2012; Lee & Ellsworth, in press) to exploring its reach into various facets of human experience, including morality (Rozin, Haidt, & McCauley, 1999; Schnall, Haidt, Clore, & Jordan, 2008), incest (Lieberman, Tooby, & Cosmides, 2007), art (Strohminger, 2013), cognitive bias (Han, Lerner, & Zeckhauser, 2008; Inbar & Gilovich, 2011), consumer habits (Lerner, Small, & Loewenstein, 2004), public health (Curtis, 2007), and mental health (Olatunji & Sawchuk, 2005). Recent years have also seen a rapid succession of books on the topic (Kelly, 2011; McGinn, 2011; Korsmeyer, 2011; Herz, 2012; Curtis, 2013).

As with any love affair, we run the risk of growing bored with our new plaything. Now that we have explored some of disgust's most intriguing questions, is the magic gone? In spite of the attention disgust has received in recent years, there is considerable room to doubt claims which have been made in its honor, and a number of urgent issues have hardly been explored at all. Disgust still has plenty of secrets left.

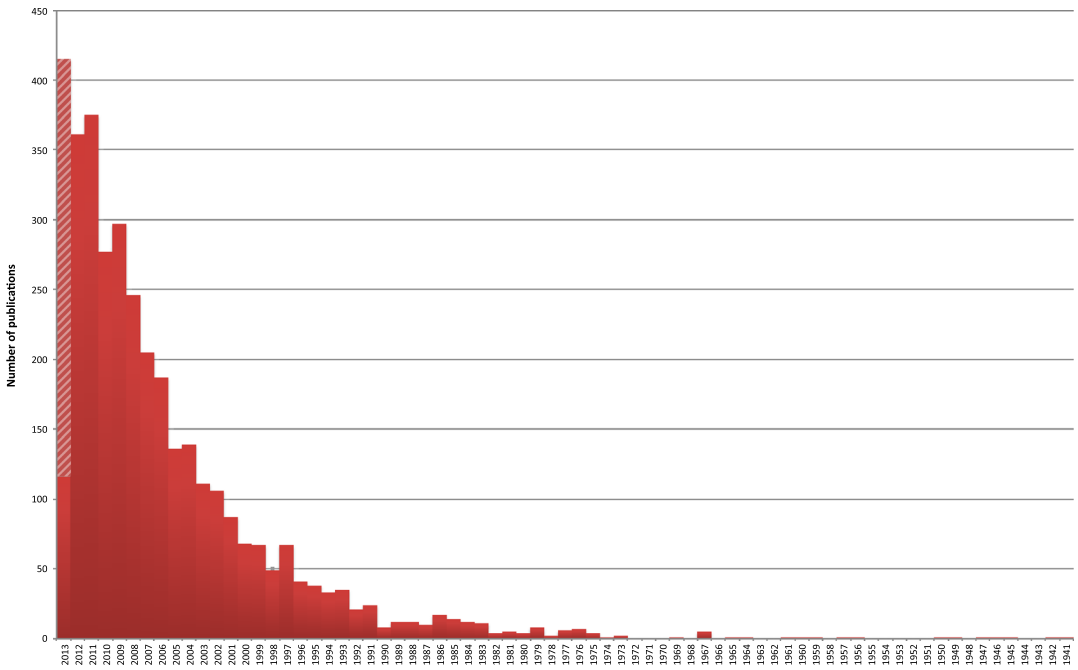


Fig. 1. Disgust: its trendiness quantified. Number of publications with the keyword 'disgust' 1941–2013. Data is from ISIWeb of Knowledge, retrieved April 2013, and is inclusive of publications in all fields. Striped bar represents end of year projection. The figure starts at the year when the first modern psychological account of disgust was published (Angyal, 1941). Before Rozin's first paper on disgust (1983), the annual average was less than one per year throughout the 20th century. 1993 is the first year disgust and morality appeared as keywords in the same paper (Haidt, Koller, & Dias, 1993).

### 1. Does Disgust Have a Single 'Core'?

Disgust reflects ambivalence. Organisms must balance the need for nutrition against the peril of toxic comestibles, the need to socialize against the threat of communicable disease, the need to reproduce against the risk of selecting a genetic dud. More generally, organisms must negotiate the value of exploration against the potential danger lurking beneath each unturned stone. Disgust is a gatekeeper emotion, policing the semi-permeable membrane between the self and the treacherous unknown (S. B. Miller, 2004).

Since this biological dilemma is ancient and ubiquitous, we find fragments of the disgust system in other animals, and embedded in a variety of forms in humans. Take, for instance, the distaste response. Mammals and neonates react to bitter and sour flavors with nose wrinkling, squinting, tongue protrusion, and frowning (Berridge, 2000; Chapman, Kim, Susskind, & Anderson, 2009). This facial expression is accompanied by spitting, face washing, and head shaking, which are designed to expunge the offending substance from the mouth and face. Distaste is a defense against two distinct types of danger, poisons and pathogens. Bitter taste receptors are attuned to botanical toxins. Sour taste buds detect acids, a byproduct of the bacterial metabolic cycle—this is why spoiled food 'goes sour'; (Lindemann, 2001). Though it is regularly claimed that distaste is designed only to protect against plant toxins (Chapman et al., 2009; Rozin, Haidt, & McCauley, 2010; Kelly, 2011), distaste's sensitivity to sourness casts serious doubt on this view.

Distaste and disgust have a few regions of overlap. Both are strongly linked to oral rejection (Angyal, 1941; Rozin & Fallon, 1987), and both serve to detect pathogens. The distaste response is at least partially conserved in disgust, which is characterized by nose wrinkling, squinting, mouth gape, and spitting (Darwin, 1872/2002; Ekman, 1992; Wolf et al., 2005).

But disgust is no mere gustatory response. It can be elicited by contact or imagined contact anywhere on the body, and is most potent for orifices and open wounds, which constitute weak spots in the body's defense against microbial invasion (Rozin, Nemeroff, Horowitz, Gordon, & Voet, 1995). The purview of the gross reads like a list of disease vectors from the Department of Health: bodily effluvia, decaying organic matter, animal by-products, scavengers, sickness, and – when visible to the naked eye – the pathogens themselves. Sensory properties associated with infectious environments can trigger disgust: not only sourness but also feter, discoloration, sliminess, stickiness, and squelching (Oaten, Stevenson, & Case, 2009; Oum et al., 2011). Behaviors can be disgusting, such as poor hygiene, sexual practices, and moral violations.<sup>2</sup> Vulnerability to disease (Duncan, Schaller, & Park, 2009) and immune suppression (Fessler, Eng, & Navarrete, 2005) increase the readiness with which people feel disgust.

Seen in this light, disgust constitutes a behavioral extension of the immune system (Schaller & Park, 2011; Curtis, De Barra, & Aunger, 2011). But this observation should be furnished with two caveats. One, the war against pathogens is waged on many fronts, and disgust is but one defense – other strategies include grooming, burying waste, the use of spices in cooking, and wariness of newcomers (Hart, 1990; Loehle, 1995; P. W. Sherman & Billing, 1999; Oaten et al., 2009). Two, disgust appears to play a number of roles in human life, only one of which is directly connected to pathogen avoidance.

### 1.1. DISGUST AS PSYCHOLOGICAL NEBULA

A common strategy for theorizing about disgust is to pinpoint what lies at its core. Disgust's essence has variously been characterized as oral rejection (Angyal, 1941; Rozin & Fallon, 1987), disease avoidance (Oaten et al., 2009), death anxiety (Kolnai, 1929/2004), and purity (Douglas, 1966/2003). Recently, there has been a move away from this model in favor of the view that disgust comprises multiple functions, none of which is necessarily primary. Tybur and colleagues (2009) argue that disgust represents the entanglement of pathogen avoidance (physical disgust), incest avoidance (sexual disgust), and propriety (moral disgust). Kelly (2011) has proposed that physical disgust is itself a blend of distaste and the behavioral immune system.

Disgust is less a monolith than it is a psychological nebula, lacking definite boundaries, discrete internal structure, or a single center of gravity (Strohming, 2014). Figure 2 provides a conceptual map of disgust. The semitransparent squares over the disgust conceptual area are areas where disgust is implicated in some way. Note that these areas also lie partly outside of the space of disgust. For example, the behavioral immune system sometimes utilizes disgust (e.g. to motivate avoidance of body waste) but not always (e.g. grooming behaviors). Nor does each item fit squarely within a single subcategory: the veneration of sexual purity touches on moral, mating, and pathogenic concerns. While this diagram takes as a source of inspiration various comprehensive theories of disgust (e.g. Rozin et al., 2010; Tybur et al., 2009; Kelly, 2011), it diverges from these proposals on certain important points. It includes sourness distaste as being related to pathogen avoidance (cf. Rozin & Fallon, 1987), allows for conceptual blends between subtypes of disgust (c.f. Haidt, McCauley, & Rozin, 1994; Tybur et al., 2009), posits a morality that is not entirely described or circumscribed by disgust (cf. Tybur, Lieberman, Kurzban, & DeScioli, 2013; Horberg, Oveis, Keltner, & Cohen, 2009), and includes cases where disgust can be alluring or enjoyable (viz. Korschmeier, 2011; Strohming, 2013). This schematic map is not intended to be in any way definitive – the current state of disgust research leaves considerable room for debate about the exact contents and relationships among subtypes of disgust. It does, however, depict disgust as a multifaceted emotion comprised of a loose collection of conceptually related criteria, that is critically involved across many domains.

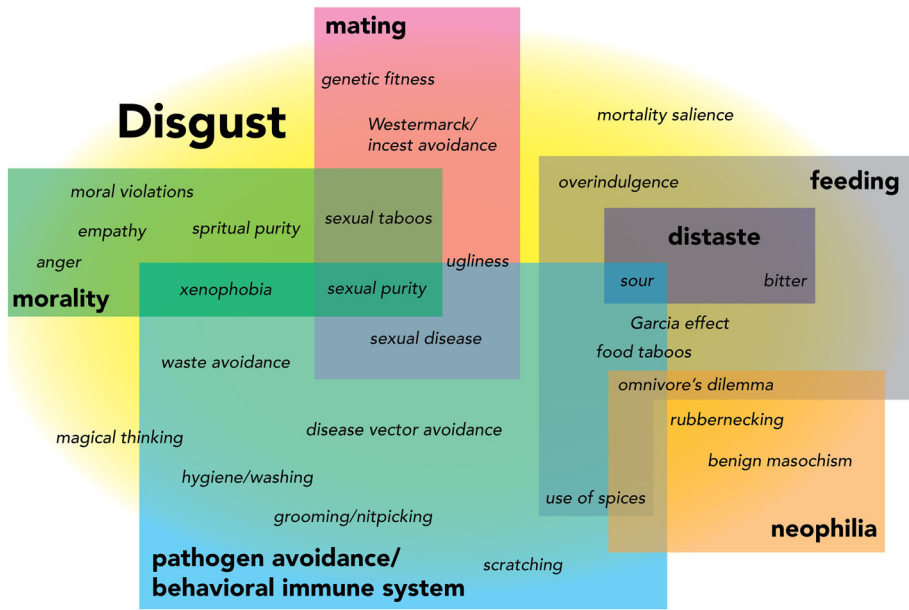


Fig. 2. A conceptual map of disgust as a psychological nebula. The soft-edged oval represents the conceptual space of disgust, and rectangular areas represent domains that relate to disgust and (in some cases) one another. Note that disgust has no central core features, but rather embodies a set of partially overlapping functions.

While the complexity of disgust has been recognized by at least a subset of theorists, there remains widespread disagreement over how to classify types of disgust into psychologically or functionally meaningful categories. The most influential taxonomy was developed by Rozin, Haidt, and colleagues, and is the basis for scales and tasks measuring individual differences in disgust sensitivity (Haidt et al., 1994; Rozin, Haidt, McCauley, Dunlop, & Ashmore, 1999). The original version posited seven types of disgust: food, animals, body products, sex, body envelope violations, death, and hygiene (Haidt et al., 1994). Later refinements collapse across these categories and add a few more: core disgust (food, animals, body products), animal reminder disgust (sex, death, hygiene, envelope violations), interpersonal disgust (dehumanized people or groups), and moral disgust (Rozin et al., 2010). In spite of the popularity of this taxonomy, there is little evidence to suggest that it represents an empirically grounded structure of disgust. Even the original paper admits that it fails as a multidimensional account of disgust typology, due to the low internal reliability of subscale items (Haidt et al., 1994). A reworked version of this scale has identified reliable factor loadings on core, contamination, and animal reminder disgust items, though it does so by removing sexual and social items (Olatunji et al., 2007).

Animal reminder disgust traces its lineage to a tradition of scholarly work contending that disgust is concerned with integrity of the soul and ambivalence about the body's impermanence (Kolnai, 1929/2004; Becker, 1973; Goldenberg, Pyszczynski, Greenberg, & Solomon, 2000; S. B. Miller, 2004; Menninghaus, 2003). These scholars note our aversion towards beastly acts and byproducts of the life cycle—defecation, fornication, death, decay. However, the idea that disgust relates to existential angst is questionable on a few grounds. Comparisons between ourselves and animals are not always unfavorable (the fealty of dogs, the bravery of lions), and many behaviors we share with animals, like walking, jumping, and sleeping, are not considered disgusting (Nussbaum, 2006; Tybur et al., 2009).<sup>3</sup> People who are older—and therefore closer to death—are less easily disgusted (Fessler & Navarrete, 2005), and habitual exposure to cadavers

and the sick leads to attenuated disgust sensitivity (Rozin, 2008; Oaten et al., 2009). Besides, if disgust were a defense mechanism for helping us avoid thoughts about death, the emotion seems poorly engineered to that purpose – indeed, disgust seems to transfix and amplify our attention to these objects.

Recently, an alternate taxonomy has been put forth binning disgust into three categories: pathogens, sex, and morality (Tybur et al., 2009). Under this view, animal reminder disgust – along with hygiene, body envelope violations, interpersonal disgust, and core disgust – is all a function of the pathogen avoidance mechanism. Sexual disgust is focused around choosing appropriate reproductive partners. Incest, for example, is a near-universal cultural taboo, ideation about which elicits strong revulsion (Lieberman et al., 2007; Fessler & Navarrete, 2004). What makes incest undesirable from an evolutionary point of view is not pathogen transmission, but the genetic risks associated with inbreeding.

Incest avoidance makes use of a preparedness mechanism known as the Westermarck effect. Mice and other mammals learn not to mate with their siblings based on the litter they are raised in (Westermarck, 1891/1921). Unrelated children reared together have difficulty experiencing attraction to one another after reaching sexual maturity, even when they are expected to marry (Shepher, 1971; Lieberman & Lobel, 2012). Descriptions of incest lead to self-reported disgust, facial expressions of disgust, and activity in disgust-related brain areas (Lieberman et al., 2007; Schaich Borg, Lieberman, & Kiehl, 2008). Descriptions of other reproductively imprudent sexual acts (sex with elderly or unattractive people, for example) can also lead to disgust (Inbar, Pizarro, Knobe, & Bloom, 2009; Tybur et al., 2009).

Whether sexual disgust constitutes its own cognitive module, however, remains to be seen. Sex touches on several disgust-related concerns: pathogen transmission, genetic risk, and moral abomination, often all in the same act (rape, homosexuality, incest). Disgust at sexual acts fits quite nicely with disease-based conceptions of disgust, since sexual contact is a principal means by which pathogens are spread. Indeed, the survival strategy of many pathogens is contingent on sexual transmission, from HIV to the now-endangered pubic louse (Armstrong & Wilson, 2006). Sex may serve as a case study in how disgust typologies do not carve nature at its joints so much as identify overlapping clusters of problems to which disgust is applied.

## 2. *Disgust Acquisition*

Disgust may be likened to language, in that it is a human universal, is developmentally delayed, and displays a constrained amount of cultural variation (Knapp, 2003).

Humans do not exhibit disgust until about the age of three. A two-year-old who would gleefully devour bugs or play with animal waste will not do so a short while later (Rozin, Hammer, Oster, Horowitz, & Marmora, 1986). This stands in stark contrast to other emotional and sensory responses, like happiness, distress, fear, and even distaste, which are exhibited from birth. What is the reason for this lag?

Given that disgust emerges around the time children are toilet trained, it has been suggested that disgust is a function of conditioning from witnessing the aversion displayed by parents (Freud, 1959; Rozin & Fallon, 1987). This explanation cannot easily be defended, since disgust appears in those who were never toilet trained, such as feral children (Malson, 1964 cited in Miller, 1997). Furthermore, the universe of disgusting objects extends far beyond dirty diapers. While the exact set of disgust elicitors varies from region to region, bodily effluvia (especially vomit and feces) and animal products are considered disgusting across all cultures, apparently without exception (Rozin & Fallon, 1987; Curtis & Biran, 2001).

The delayed onset of disgust may be related to the omnivore's dilemma (Rozin, 1976). Generalist species benefit from access to a broad spectrum of possible nourishment, but many potential foodstuffs are hazardous, and the cost for guessing wrong can be steep. Thus, omnivores must balance a promiscuous feeding strategy with a wariness of the unfamiliar. Much like there is a sensitive period for language acquisition, omnivores have a developmental window during which they are receptive to adding items to their gustatory repertoire. In humans, this sensitive period begins after weaning and ends sometime around the seventh birthday; the range of acceptable foods is largely determined by what one is exposed to during this time (Birch & Marlin, 1982; Cashdan, 1994; Bloom, 2004). This explains why young children will gladly try foods that adults find revolting, and may ultimately be the reason disgust is suppressed in early years.<sup>4</sup> As with the Westermarck effect, it is unclear whether disgust plays a role in *acquiring* this catalog of edibility; perhaps it only serves to maintain adherence later in life ('octopus tentacles? yuck!').

Disgust also regulates food preference modifications into adulthood. In the Garcia effect (also known as 'sauce-béarnaise syndrome'), nausea leads to an intense aversion to what was last eaten, even when the meal took place hours ago (Garcia, Kimeldorf, & Koelling, 1955; Seligman & Hager, 1972; Pelchat & Rozin, 1982). The Garcia effect is remarkable in that it does not require temporal proximity to the conditioned stimulus (the food), and nausea readily leads to avoidance of orally ingested substances, but not other ambient factors (like flashes of light). As with sensitive period learning, the Garcia effect may not be acquired by way of disgust (so much as nausea), but it is maintained by disgust (e.g. revulsion at the thought of eating béarnaise sauce after it gave you food poisoning).

### 3. Disgust as Metaphor

#### 3.1. MAGICAL THINKING

Disgust conforms to the laws of sympathetic magic. These are:

1. *Contagion*: Once in contact, always in contact.
2. *Similarity*: Shared properties indicate shared identity.

The turn-of-the-century cultural anthropologists who first described these laws saw them as general principles of thought (Tylor, 1871/1974; Frazer, 1889/2006; Mauss, 1902/1972). Magical thinking pervades religious ceremony (voodoo dolls, Eucharistic transubstantiation), medicine (homeopathy, using tuberous roots to cure impotence), and secular folk culture (believing that you are what you eat, the totemic value lent to artifacts touched by celebrities; Nemeroff & Rozin, 1989; Newman, Diesendruck, & Bloom, 2011; Hutson, 2012).

It was only more recently that the relationship between magical thinking and disgust was pointed out (Douglas, 1966/2003; Rozin & Fallon, 1987). People are reluctant to eat chocolate shaped like dog feces, or drink orange juice stirred with a new fly swatter (Rozin, Millman, & Nemeroff, 1986).<sup>5</sup> Attributions of contagiousness are especially sensitive to microbial harm: adults prefer not to touch objects handled by AIDS patients (Rozin, Markwith, & Nemeroff, 1992), and children consider sickness, but not injury, spreadable by contact (Raman & Gelman, 2008). But these laws can generalize to any object of disgust – for example, people prefer not to touch items owned by war criminals or pedophiles (Rozin et al., 1992; Newman et al., 2011). The strength of a spider phobia can be approximated by counting how many cookies it would take before one would be willing to eat a cookie touched by a cookie that had touched a spider (Mulken, de Jong, & Merckelbach, 1996).<sup>6</sup> Since objects that look like dog poop usually are dog poop, and disease is spread by close proximity, these heuristics have pragmatic value, in spite of their designation as 'magical' thinking.

Given that these principles appear across a variety of contexts, the provenance of magical thinking is unclear. Did it originate as a generic cognitive system that was later suited to disgust, or did magical thinking start as folk microbiology before expanding to other domains? Work specifically aimed at this question is largely missing from the literature.

### 3.2. MORAL DISGUST

A central reason for the recent surge of interest in disgust is its perceived role in moral psychology. Moral terms often recruit disgust terminology. A moral transgression can be in bad taste, it can make one feel dirty or sick. When people around the world are asked to report what makes them feel disgusted, moral offenses make up a reliable subset of responses (Haidt et al., 1994; Nabi, 2002). Consequently, several theories argue that disgust is a moral emotion, recruited especially to purity and sanctity violations, and functioning to keep the soul ‘clean’ at some metaphorical level (Rozin, Lowery, Imada, & Haidt, 1999; Nichols, 2002b; Nussbaum, 2006; Horberg, Oveis, & Keltner, 2011).

Of course, just because the same word is used doesn’t mean the same emotion is at play. Considerable energy has been devoted to demonstrating that this relationship is more than a figure of speech, and the two share at least some of the same cognitive machinery. Experimentally induced disgust and distaste lead to harsher moral pronouncements (Wheatley & Haidt, 2005; Schnall et al., 2008; Eskine, Kacirik, & Prinz, 2011).<sup>7</sup> Disgust sensitivity correlates with political conservatism, particularly on moral hot button issues like gay rights (Inbar, Pizarro, Knobe, & Bloom, 2009; Inbar, Pizarro, & Bloom, 2009); this effect holds across an extensive international sample (Inbar, Pizarro, Iyer, & Haidt, 2012). The facial muscles recruited to unfair offers in the Ultimatum Game overlap with those used when experiencing bitter tastes (Chapman et al., 2009), and moral violations activate brain areas associated with physical disgust (Moll et al., 2005; Schaich Borg et al., 2008; Hsu, Anen, & Quartz, 2008).

While moral disgust is not simply a metaphor, attempts to impose a more clear order on this relationship have met with less success. Moral violations may evoke disgust, but they can also evoke anger, often simultaneously (Chapman et al., 2009; P. S. Russell & Giner-Sorolla, 2011), making it difficult to defend the view that disgust is the only emotion driving moral condemnation. In spite of claims that disgust is only recruited to violations of the pure and sacrosanct, it can be evoked by harm and fairness violations as well, such as cheating, lying, and stealing (Nabi, 2002; Chapman et al., 2009; Danovitch & Bloom, 2009). Purity might not be a distinct domain of morality at the psychological level (Gray, Schein, & Ward, in press), in which case we would not expect to see crisp divisions in the use of disgust across moral contexts.

Disgust has been a key player in the debate over whether emotions are necessary for moral competence. Nichols (2002b) found that harmless conventional violations can become moralized when they have been modified to be more physically disgusting. This is consistent with the idea that moral development depends on the negative reinforcement learning inherent in experiencing or observing pain (Cushman, n.d.). It is precisely this deficit that is thought to be at the heart of psychopathy (Blair, 1995; Nichols, 2002a; Bartels & Pizarro, 2011). However, the two most important questions on this front – whether disgust is required for the construction of spontaneous moral judgment, and whether disgust plays a role in the acquisition of moral principles during childhood – are virtually untouched. For the time being, the ideas are more compelling than the evidence.

Disgust is a bit of a persecuted emotion. Several theorists contend that disgust interferes with moral competence, leading to irrational or deeply flawed ways of thinking about moral

problems. Nussbaum (2006) has argued that disgust operates by keeping hierarchies in place (viz. India's 'untouchable' caste), and equates unfamiliarity and ickiness with wrongness (homosexuality and stem cells; in a previous generation, *in vitro* fertilization and interracial marriage). Kelly (2011) likewise argues that disgust operates on a 'hair trigger' alarm system, thus making it oversensitive and prone to moral false alarms. Disgust has also been accused of being an 'unreasoned' emotion, since subjects are not always able to articulate the reasons underlying their judgments when they are disgusted (Haidt, Björklund, & Murphy, 2000; Hauser, 2006), even when compared with other emotions (P. S. Russell & Giner-Sorolla, 2013). But disgust does have some uniquely beneficial consequences: imagery of disgusting victims increases charitable donation (Tullett & Inzlicht, 2011), apparently because a pitiable appearance is seen as a marker of those who are truly in need. If nothing else, results like this serve as a reminder of the flexibility of emotions across contexts. This should give us pause over wholesale attacks on the utility of a single emotion (Valdesolo & DeSteno, 2011).

#### 4. *Paradoxical Allure*

Leontius, the son of Aglaion, was going up from the Piraeus under the outside of the North Wall when he noticed corpses lying by the public executioner. He desired to look, but at the same time was disgusted and made himself turn away; and for a while he struggled and covered his face. But finally overpowered by the desire, he opened his eyes wide, ran towards the corpses and said: 'Look, you damned wretches, take your fill of the fair sight.' (Plato, 1992, p. 128)

Disgust is an emotion of considerable contradiction, though this feature has been underplayed in recent work. Here, we identify areas of particular interest with regard to the allure of disgust.

##### 4.1. SEX

Sex introduces some interesting problems for a species that finds bodies repulsive. Why is it that a man will kiss a woman intimately but not share her toothbrush?

Psychoanalytic theories have couched our repugnance with bodily functions as a taboo meant to cordon us from secret, forbidden desires (Freud, 1959; W. Miller, 1997). The problem with this view is it lumps coitus and coprophagy into the same category, a move that seems suspect on a number of levels.<sup>8</sup> A more plausible explanation is that close proximity to mucous membranes and hot spurting fluids constitutes a source of ambivalence: sex is required for reproductive success, yet it is a potential source of disease. We face a similar dilemma in choosing what food to eat and which social partners to interact with. The existence of sex would seem to require a mechanism that transforms disgusting stimuli into objects of desire.

There is precious little research on this point, but what we do know offers us some intriguing hints. After viewing erotica, men report that bestiality, pedophilia, date rape, and other morally and physically repugnant activities are more appealing (Ariely & Loewenstein, 2006). When sexually aroused, women are less disgusted by gross activities, such as sticking a needle into a cow eyeball, handling a used bandage, and taking a bite of a cookie that was touching a live worm (Borg & de Jong, 2012).

For the most part, the interplay between disgust and sex remains a mystery. Does sexual arousal make us insensate to the stimuli that usually give rise to disgust, or do disgusting stimuli flip to become sexually exciting? Do flashes of disgust themselves become appealing when above a certain threshold of arousal? Why does the language of sex treat physical disgust ('filthy', 'dirty') and even moral disgust ('naughty', 'nasty') as markers of approval?



## 4.2. HUMOR

Disgust is a topic that lends itself to humor, as anyone who has been in first grade or read a paper on disgust has noticed.<sup>9</sup> Anecdotal evidence suggests that disgust stimuli frequently elicit laughter in subjects (Rozin et al., 2010). It is probably no coincidence that stimuli that have been used in psychological experiments, like fart spray and poop-shaped fudge, are sold in novelty stores for the express purpose of playing practical jokes. The subject matter of humorous utterances often veers into the lewd and ribald; as one would expect, these dirty jokes elicit an admixture of disgust and amusement (Hemenover & Schimmack, 2007). When people are primed with disgust, they find jokes funnier (Strohming, 2013), going against the commonly held notion that disgust only potentiates aversion.

What makes disgust so funny? Freud (1905/1963) postulated that taboo topics (sex, death, and excrement) lead to physical tension, and humor serves as a form of sublimation to rechannel this nervous energy. However, empirical data amassed over the past century has found that humor increases arousal rather than decreasing it, casting doubt on the release valve theory (Strohming, in press). Furthermore, the idea that physiological tension underlies humor does not explain dirty jokes very well, as disgust is a low arousal emotion (Ekman, Levenson, & Friesen, 1983; Vrana, 1993; Stark, Walter, Schienle, & Vaitl, 2005). Humor often follows on the heels of a neutralized threat, or an incongruity resolution, or when we realize something is not as bad as it seems (Koestler, 1964; Veatch, 1998; Hurley, Dennett, & Adams, 2011).<sup>10</sup> Disgust is easy to provoke, and it permeates the imagination with peculiar force, even when the source is completely hypothetical or mimetic. Disgust is therefore ripe for exactly the sort of conditions that breed comedy: perceived social or environmental threats which are quickly seen for what they are—false alarms.

An implication of this theory is that the intensity of the revulsion and the perceived reality of the threat come apart: intensity of disgust increasing humor, perceived risk decreasing it. It's one thing to enjoy toilet humor; it's another to be inside the toilet. Disgust is also not the only negative emotion implicated in humor – dark or gallows humor, for instance, trades on themes of tragedy and death. While disgust does seem more prevalent in humor than other negative emotions, it is unclear whether they actually function differently from disgust (though see Strohming, 2013). This theory-making will have to be supplemented with data in the years ahead.

## 4.3. ART AND EXPLORATION

People pay to be disgusted. They attend horror movies, circus sideshows, adventurous eating trips, and (in earlier times) public executions, all in the name of entertainment. Grotesquerie is a major player in the fine arts as well. This is not a modern innovation, but a tradition that spans centuries and represents some of the most powerful work in the canon, including Caravaggio, Goya, and Bosch (Korsmeyer, 2011). Incidental disgust has been shown to enhance enjoyment of abstract and grotesque art, suggesting that disgust is not an accidental feature of these works. And gross-out television shows, where people consume exotic delicacies such as crickets and bull testicles, are deemed more entertaining when the viewer is watching them in a dirty or stinky room (Strohming, 2013).

One way to understand these cases is to consider them within the broader phenomenon of benign masochism (Rozin, 1990). Benign masochism refers to the enjoyment of negative sensations for their own sake. Examples include roller coasters, tearjerkers, saunas, ice hotels, skydiving, sexual masochism, chili peppers, and bitter salad greens (Rozin & Schiller, 1980; Rozin et al., 2010).

Two major proposals have been put forward to explain the existence of benign masochism. The first stems from the observation that these activities, while they feel unpleasant, are actually safe (hence ‘benign’). Once one strips away cognitive beliefs about imminent danger, all that is left is the thrill of novelty or sensation (Strohming, 2013).<sup>11</sup> The second proposes that these activities are gratifying because they allow for a sense of mastery over the environment (Rozin, 1990; Bloom, 2010). Organisms benefit from learning about their surroundings, which is why exploration is intrinsically rewarding and most animals exhibit a natural curiosity. Rats, for instance, will forgo a small amount of immediate food reward for the chance to explore their enclosure. These proposals are non-mutually exclusive, and complement one another.

In the omnivore’s dilemma, the organism must balance caution about possible dangers in the world (neophobia) with desire to find extant resources (neophilia). It seems that we watch this paradox play out in culture, where our aversion towards the strange and the odious is balanced with curiosity about these very objects.

### 5. *Moving Forward*

Much ink has been spilt on disgust in recent years. While our understanding of this emotion has become increasingly sophisticated, there is still a great deal we haven’t figured out.

We know very little about the cognitive and developmental mechanisms at work in disgust. It has been observed that vegetable matter rarely makes it onto taboo food lists (with the exception of items which mimic the odor or taste of flesh, such as the durian fruit). Are there other limits in taboo food learning? Does the range of foods one learns about during childhood set the stage for the eagerness with which one interacts with strangers, or flexible thinking about moral violations?

Research has shown that the behavioral immune system is more vigilant in pathogen-rife environments, but on what basis do children infer this – climate, immune response, population density? Why is it that disease prevalence increases disgust sensitivity, but chronic exposure to disease vectors dampens it (Rozin, 2008; Oaten et al., 2009)? People can, with some effort, expand their food palate later in life; can they reverse disgust for other objects of revulsion?

It has been noted that individual sensory properties – sulphuric odors, stickiness, clamminess – are themselves enough to trigger disgust. Do we infer that these properties are disgusting based on their co-occurrence with objects of disgust, or are objects of disgust determined on the basis of their exhibiting these basic disgust properties? Aside from mere exposure, how do we come to know the gross, the dirty, and the taboo?

Why is disgust absent in the first three years of life? While regional variance favors a learning strategy for foods, playing in excrement is not a good idea no matter where you are born. Given the cross-cultural universal of disgust at animal waste (including the unacculturated, such as feral children) is this late onset of non-gustatory pathogen avoidance simply a compromise required by the food learning system? Does disgust play a role in the acquisition of food preferences, incest avoidance, and moral rules, or does it only serve as enforcer?

It has become received wisdom to think of disgust as a uniquely human emotion, but a candid survey of the literature reveals indications of disgust in other animals. There have been scattered reports of dogs (normally unfussy eaters) refusing to eat dog meat, though it is not known on what basis this rejection is made (Maslow, 1932; Gundlach, 1934). Two important precursors of disgust – the microbe detection in sour distaste and the behavioral immune system – are present in most mammals. The cross-species learning mechanisms described here – the sensitive period in food learning (and subsequent food neophobia), the Garcia effect and the

Westermarck effect – implicate disgust rather directly. It does not seem entirely radical to suppose that a rat refusing to eat its food pellets after getting sick is doing so on the basis of feeling disgust at the thought of eating any more of those pellets.

The nature of moral disgust remains the field's white whale. Is disgust required for the construction, or perception, or moral values (Nichols, 2002b)? Does disgust always lead to moral disapprobation? Given that multiple emotions are recruited to disapprobatory moral judgments, particularly anger (but also shame, embarrassment, and contempt), what unique contribution does disgust provide? How do we make sense of theories that limit the domain of moral disgust to purity violations (Rozin, Haidt, & McCauley, 1999), given that unfairness, injustice, and harm also elicit disgust?

We have identified several examples where disgust does not lead to aversion at all, but a kind of delight. Do these effects occur in spite of our repugnance (cf. Carroll, 1990), or because of it? Under what circumstances is the disgusting not also abominable?

As this inventory demonstrates, the open questions remaining in the field are not just manifold, but substantial. Many of disgust's most pressing lack a satisfying (in some cases, even a perfunctory) answer. These lacunae promise to keep scholars busy with important work in the years ahead.

### *Short Biography*

Nina Strohminger specializes in emotions, moral psychology, and evaluative judgment. She holds a BA in Cognitive Science from Brown University and a PhD in Psychology from the University of Michigan, Ann Arbor. She works as a postdoctoral associate at Duke University's Kenan Institute for Ethics. She is 20% philosopher, 70% psychologist, and 10% miscellaneous.

### *Notes*

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<sup>1</sup> The original title of this manuscript was "Disgust, Discussed". After discovering that at least five articles since 1999 have been published under this heading, I canvassed colleagues for an alternative. I sifted through many strong contenders, including "Disgust: An Engrossing Emotion: Revulsion Revisited" (Azim Shariff), "Gross Encounters of the Turd Kind" (David Pizarro), and "Aversion: A Version" (Matthew Hutson), but in the end chose Jesse Graham's submission. For helpful suggestions on the manuscript itself, thanks are due to Daniel Kelly, Walter Sinnott-Armstrong, Alexandra Plakias, Jana Schaich Borg, Mark Alfano, and Vlad Chituc. Irene Lee helped collect the data for Figure 1, and M.R. Trower provided advice on the design of Figure 2. Bryan J. Parkhurst, Joshua Carp, and Alison Niedbalski provided fodder for the list appearing in footnote 9.

<sup>2</sup> The relationship between moral and non-moral disgust is a matter of some debate, but it bears noting that moral transgressions can spread in a way analogous to disease transmission (Gino, Ayal, & Ariely, 2009; Plakias, 2013).

<sup>3</sup> A somewhat bizarre mythology has built up around tears. Tears are said to be the only bodily fluid that does not elicit disgust, because they are a uniquely human ejection (Ortner, 1973; Haidt, Rozin, McCauley, & Imada, 1997; W. Miller, 1997). Other animals do produce tears, of course – they just don't use them to cry. And some cultures identify tears as a physical impurity (Curtis, 2007). Perhaps their lower disgust potency is due to their sensory attributes: clear, odorless, and fluid, tears are the only effluvium that could be mistaken for water.

<sup>4</sup> Here again, disgust may be contrasted with distaste. Children who refuse to eat their vegetables do so on the grounds of palatability, whereas adults who reject a delicious fried roach will do so because the thought of consuming a bug is repugnant. Knowing that roaches are crisp and mild, like toasted almonds, does little to change one's stance (viz. Goodyear: 2011).

<sup>5</sup> Since backwards causation is a feature of magical thinking (Rozin & Nemeroff, 1990), disgust at a clean fly swatter could be due to beliefs about future intended use of the swatter. Alternately, this aversion may trace to its similarity to used fly swatters.

<sup>6</sup> Many anxiety disorders are as much a function of disgust as they are fear. Blood-injection-injury phobia, snake phobia, spider phobia, the washing (but not checking) subtype of obsessive-compulsive disorder, eating disorders, and scrupulosity are all independently predicted by disgust sensitivity, beyond generalized fear to external threats (Phillips, Senior, Fahy, & David, 1998; Davey, Buckland, Tantow, & Dallos, 1998; Cisler, Olatunji, & Lohr, 2009; Olatunji, Tolin, Huppert, & Lohr, 2005; Olatunji & McKay, 2009).

<sup>7</sup> This is likely not the strong evidence for the disgust-morality connection it is often treated as. All emotions can impact moral behavior. At bare minimum, these disgust priming studies show that physical and moral disgust are not completely encapsulated from one another.

<sup>8</sup> There is surely some appeal lent to objects simply by virtue of their being off-limits. This is a separate phenomenon, though one that could also be at play in sexual contexts.

<sup>9</sup> Consider the following list: flatulence, corpulence, pustules, poo-poo, pee-pee, booger, toe cheese, diarrhea, butt, adult diaper, felching, discharge, smegma, spunk, seminal, chunky, girthy, moist, panties, manhood, gaseous emissions, titmouse, the Woodcock-Johnson Test, wiener, turd. High humor it ain't, but it is surprisingly easy to elicit giggles simply by invoking disgust-related words.

<sup>10</sup> Some have argued that violations must be perceived as benign in order to be funny (Veatch, 1998; McGraw & Warren, 2010). Given that nervous laughter can be elicited by intensely negative situations (Milgram, 1963), perhaps all that is required is that the situation seem momentarily less awful.

<sup>11</sup> Sensation, here, should not be mistaken for high physiological arousal; disgust and sadness are both low arousal emotions. Rather, their appeal would derive from novel stimulation, an antidote to boredom.

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