Emotion Researcher

The Official Newsletter of the International Society for Research on Emotion

Editor's Column

There is much to enjoy in this issue! Click on the post title to get a quick overview of what's inside.

ISRE Matters

Check out Arvid Kappas' latest column. ISRE's President has an important reminder for all members, and needs your help.

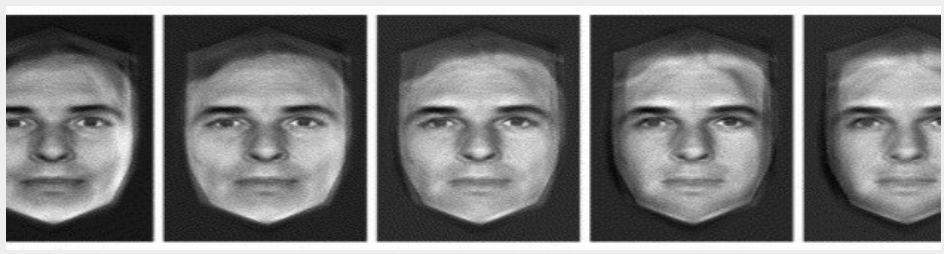
Young Researcher Spotlight

Come inside to discover who is this issue's featured young researcher!

UNDERSTANDING DISGUST – March 2014

How did disgust evolve and why does it have so many different elicitors? Should we take seriously our disgust reactions to moral issues, or dismiss them as brutal enforcers of a reactionary morality? This issue of Emotion Researcher is devoted to these two central puzzles about disgust.

An Audio Interview With Paul Ekman



Listen to an audio interview with Paul Ekman, one of the world's leading affective scientists. Paul reminisces about his beginnings, and presents his latest views on expressions, basic emotions, regulation, lies, and the future of affective science.

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Editor's Column

Andrea Scarantino, Department of Philosophy and Neuroscience Institute, Georgia State University

Jeopardy question: Which emotion has seen the greatest increase of academic in terest over the past 20 years? Tybur and Lieberman have crunched the numbers, and one emotion comes out clearly on top: disgust. Distant second is sadness, fol lowed by fear and shame. Does emotion theory need a shrink? Possibly. But it is hard to resist the fascination of disgust. Perhaps more than any other emotion, dis gust has a way of combining the base and the elevated, revealing both our animal side and our aspiration to part ways with it. The base is familiar: we are disgusted by feces, corpses, rotten food, maggots, gory wounds and the like.

At the same time, politicians, betrayal, hypocrisy, and incest disgust us. And all of a sudden we are far removed from the toilet and the trashcan, with all the ingredients of a Hollywood blockbuster waiting to happen. The sheer range of disgust elicitors raises a basic puzzle: How did disgust evolve and why does it have so many dif ferent elicitors? A second puzzle concerns the expansion of disgust to the moral domain: Should we take seriously our disgust reactions to moral issues, or dismiss them as brutal enforcers of a reactionary morality?

These are the two central puzzles this issue of *Emotion Researcher* focuses on. We begin with Paul Rozin's provocative skeptical argument about disgust's biological origins. Rozin argues that, although disgust currently protects us from pathogens, it does not necessarily follow that it evolved *biologically* as a pathogen-avoidance mechanism, contrary to what many are now taking for granted. He suggests as an alternative worth consider ing that disgust evolved *culturally*, just like fire and penicillin, which also help us avoid pathogens but clearly lack a biological origin.

The next two articles present two of the best worked out theories on how disgust expanded beyond its evol ved origin. On one side, Rozin and Haidt defend their influential view that disgust started out as a distaste mechanism and later acquired the functions of protecting us from reminders of our animal origin and from inter personal and moral pollutants that symbolically contaminate our "sacred" self.

Tybur and Lieberman, on the other hand, argue that disgust started out as a pathogen-avoidance mechanism (inclusive of, but not restricted to, food-borne pathogens) and later acquired the functions of protecting us from sexual contact with reproductively unsuitable individuals and expressing condemnation for certain classes of moral violations.

These first three articles give us a nice overview of the main live options in the debate on the origins and ex pansion of disgust. We will then switch gears, and focus on disgust's normative side. Giner-Sorolla and Harris present several reasons for discounting disgust in the moral domain, mentioning for instance its trigger-happy eliciting mechanism, its relative impenetrability to contextual factors and its tendency to lead to "dehumanizing" and "cleansing" reactions.

Clark and Powell, on the other hand, invite us to take a second look at disgust, calling into question some of the empirical evidence for its alleged inflexibility, and pointing out various analogies between disgust and anger, a negative emotion whose role in morality is much less frowned upon.

If disgust leaves you cold, rest assured that there is more to enjoy in this issue of Emotion Researcher. We have a real treat: an audio interview with Paul Ekman, the father of modern day basic emotion theory. I emailed

Ekman fifteen questions, and I received an audio file with his responses, which I broke down into bite-sized chunks.

In his interview, Ekman walks us through his storied career, from his beginnings as a student of Tomkins to his most recent collaboration with the Dalai Lama. The interview has some surprising moments, and it will give you a sense of what drives the research agenda of what is arguably the most influential emotion theorist alive.

Our President, Arvid Kappas, reminds us in his ISRE Matters column of a very important date: ISRE's 30th birthday! It will take place this April, since ISRE was founded in Paris on April 25th-26th of 1984. Arvid's column contains a link to our founding document (check out the list of founders!) and a call for help documenting the photographic history of ISRE's conferences.

Last but not least, Giovanna Colombetti, a philosopher from Exeter University, introduces us to her interdisciplinary work on emotions, which applies insights from both philosophical phenomenology and neuroscience to the understanding of the nature of emotions, appraisals and feelings.

A sad final note is that on January 15 of this year psychologist Michael Owren passed away. He was at the time adjunct Professor of Psychology at Emory University. Michael served on the editorial board of *Emotion Review* since 2009 and his important publications over almost three decades have greatly advanced our understanding of the role of affect in non-linguistic communication. Drew Rendall, a long-time friend and collaborator, has contributed a note to remember Michael's life and scientific achievements. He will be sorely missed.

Enjoy this issue, and, as always, be in touch with comments, ideas, feedback on the website, information about future conferences, and anything else that strikes your fancy.

Previous Editor's Columns

Editor's Column – Emotional Brain Issue

ISRE Matters – Disgust Issue

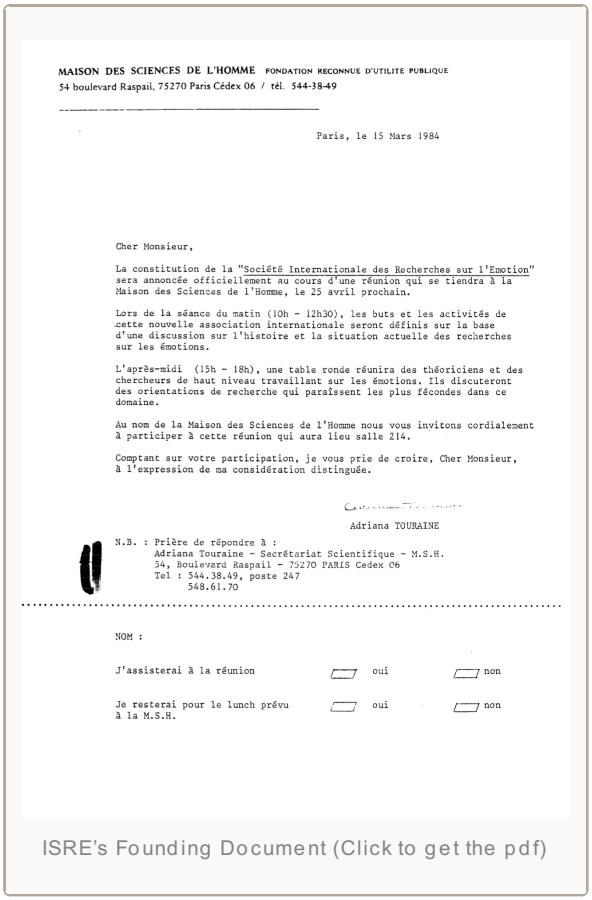
Arvid Kappas, Psychology, University of Bremen, ISRE's President

Dear ISRE members, dear friends of ISRE,

This year we will celebrate the 30th anniversary of the International Society for Research on Emotion. The founding meeting of our society took place on the 25th and 26th of April 1984 in Paris, France, at the Maison des Sciences de l'Homme. This year we want to organize a few activities to mark this important milestone and one of the things that is dear to my heart is to better document our past.

If you click on the program of the founding meeting (below) and check out the list of participants, you will see that ISRE has been since the very be ginning the occasion/place/society where things came together. As reported in our founding document, "progress requires that information and tech niques be shared and that research become multidisciplinary and multination al".

As we move to a stronger online presence and better access to information for all, I feel that we should present our past better, so that our future shall benefit from that. I see this not only as something related to telling a curi ous history of a small society, but as an important part of documenting what would help to shape affective science in the decades fol lowing the founding of ISRE.



MAISON DES SCIENCES DE L'HOMME FONDATION RECONNUE D'UTILITE PUBLIQUE
54 boulevard Raspail, 75270 Paris Cédex 06 / tél. 544-38-49

Paris, le 15 Mars 1984

Cher Monsieur,

La constitution de la "Société Internationale des Recherches sur l'Emotion" sera annoncée officiellement au cours d'une réunion qui se tiendra à la Maison des Sciences de l'Homme, le 25 avril prochain.

Lors de la séance du matin (10h - 12h30), les buts et les activités de cette nouvelle association internationale seront définis sur la base d'une discussion sur l'histoire et la situation actuelle des recherches sur les émotions.

L'après-midi (15h - 18h), une table ronde réunira des théoriciens et des chercheurs de haut niveau travaillant sur les émotions. Ils discuteront des orientations de recherche qui paraissent les plus fécondes dans ce domaine.

Au nom de la Maison des Sciences de l'Homme nous vous invitons cordialement à participer à cette réunion qui aura lieu salle 214.

Comptant sur votre participation, je vous prie de croire, Cher Monsieur, à l'expression de ma considération distinguée.

Adriana TOURAINE

N.B. : Prière de répondre à :
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NOM :

J'assisterai à la réunion ☐ oui ☐ non

Je resterai pour le lunch prévu à la M.S.H. ☐ oui ☐ non

ISRE's Founding Document (Click to get the pdf)

Just to be clear – we are not a society that lives in the past – we are working on our future. I have the firm belief that 30 years from now we will look at our meetings from now and see all the relevant action unfolding right there and then. It is one of the peculiar aspects of emotion research that it is a truly transdisciplinary enterprise. EMOTION does not belong to any single discipline, instead it requires multidisciplinary approac hes that can help bridge the different levels of analysis and

Do you have photos of ISRE meetings? If you do, please send them to us, ideally di gitally. Please indicate the occasion, e.g., place and time as well as who is being shown. I am sure these materials will also have significant potential use for educational purposes and we will make them available to the public at large. Please send all photos to Jan Stets (jan.stets@ucr.edu), who agreed to serve as a nexus to collect relevant materials.

help us get a better grasp of our object of investigation.

The terminology to describe our field changes across disciplines and individual researchers. I like to talk about emotion science. Others talk about affective sciences. Then we have the philosophy of emotions, the sociology of emotions, the history of ideas about emotions, and so on. But do not be fooled: in the end any fruitful investigation that goes to the heart of things will boil down to an interaction of a broad array of discip lines from philosophy to the neuro sciences, from psychology to sociology, from biology to history. Further more, current emotion research projects have practical applications in many fields, from business to engineer ing, from robotics to law enforcement. ISRE has been for 30 years, and will continue to be, the place where ideas come to meet, a true melting pot of creative forces!

Previous ISRE Matters Columns

ISRE Matters – Emotional Brain Issue

Roll the Credits (by Jerry Parrott)

On The Origin of Disgust

Paul Rozin, Department of Psychology, University of Pennsylvania

There has been a major increase in interest in the emotion of disgust over the last decade, especially in neuroscience and evolutionary psychology, and this has substantially enriched our understanding. I focus here on the evolutionary psychology of disgust, which involves determining its adaptive value in our ancestral environment, and on the construction of the history of disgust over evolutionary time (Rozin & Schull, 1988). Generally speaking, the creation of a convincing origin story for a trait, which is usually a consequence of the adaptive value, is exceedingly difficult. We just do not have good detailed records of human behaviors or mental events during the long course of human evolution. We almost always have to infer an origin, rather than demonstrate it.

The critical inference, for biological evolution, is that there is a genetic basis for the feature in question, such that natural selection could operate upon it. The four primary types of evidence that may be available to assign a genetic origin to a human feature are: (1) It is present at birth or very soon thereafter; (2) It is present in non-human primates; (3) We can establish genetic origins by mapping a path from genes to the feature in question; (4) We can establish a possible role for genes by showing some heritability for the trait in question. This is commonly done with twin studies, which generally indicate modest to substantial heritability for the traits usual ly measured by psychologists. But accounting for variance (heritability) does not demonstrate that the basic core feature is itself inherited. It simply shows that genes can work to moderate expression. Thus, reading ab ilities are to some degree heritable, but writing, the critical base for reading, is acquired and not inherited.

Tybur and his colleagues (2012) and Curtis (2013) have made forceful arguments that disgust evolved bi ologically, originally to protect humans from pathogens. The evidence is clear that disgust does serve such a function in contemporary humans, and presumably in whatever ancestors had disgust reactions (Oaten, Steven son & Case, 2009, Tybur et al, 2012, Curtis, 2013). The two most convincing pieces of adaptive evidence are (1) the avoidance by humans of entities which have a higher probability of microbial contamination (Curtis, 2013; Tybur et al., 2013) and (2) the apparently universal contamination response in humans over about 4 years of age (Rozin & Nemeroff, 2002). That is, all normal humans (above 4 years of age) tested avoid ob jects that have touched something disgusting. This is exactly what one would expect for a system designed to avoid microbial contamination, although Tybur et al (2012) and Curtis (2013) do not cite contamination as a crit ical feature in support of their pathogen-avoidance view of disgust. I do not understand why they do not cite contamination, which we consider a defining feature of disgust, although this may be because it does not ap pear until 4-5 years of age. The most systematic case for disgust as a disease avoidance mechanism, whatev er its origin, comes from Oaten et al. (2009), who do recognize the importance of contamination for their argu ment.

The adaptive value of what we call *core disgust* – the avoidance of foods of animal origin, and spoiled meat – fits nicely with a pathogen account, since animal foods are the source of almost all pathogens (as opposed to toxins). But evidence for its origin in biological evolution, while quite plausible, has not yet been demonstrated. Disgust is not present at birth, it is not present in any non-humans if we include the focus on spoilage and con tamination, and research has not mapped a path from genes to disgust. Although individual differences in dis

gust are in part heritable, we do not know that the basic circuitry for disgust is itself inherited.

Our model of the origins of disgust assumes that it is built upon the preadapted bitter (toxin) avoidance sys tem. That system is clearly biologically evolved. The question is when the preadaptive step from toxin avoidan ce to pathogen avoidance occurred. We (Rozin & Fallon, 1987; Rozin, Haidt & McCauley, 2008) never positively assigned this transfer of function to biological or cultural evolution, though it is clearly one or the other.

Disgust appeared somewhere in the long history of human evolution. We don't know when and where. The abs ence of the best sources of evidence leaves the assignment of disgust origins to genetic selection in biolog ical evolution uncertain. Neither contamination sensitivity nor avoidance of decayed substances are present at or shortly after birth in humans, and neither is documented to be present in other primates. The fact that dis gust functions to protect humans from microbial contamination is a start for an evolutionary account, but it is far from conclusive. Both fire and antibiotics are parts of the human antimicrobial repertoire, but neither evol ved biologically. So just establishing an adaptive value for a trait does not make a strong case for its biological evolution.

There are other problems with the evolutionary view. Its strong points are the power of evolutionary theory it engages, and its link to survival value, but there are observations that are hard to explain on the evolutionary view. For example, why is it so hard to get people to wash hands to avoid microbial contamination? Why do in fants consume feces (a practice terminated by the universal cultural institution of toilet training)? And why isn't there disgust to coughing or breathing, major sources of airborne infection? None of these questions negates the possibility of a biological evolution of disgust, but they surely question its certainty.

The case is very different for the facial expression of disgust, which is clearly borrowed (I would say by pre adaptation) from the bitter rejection face, a feature biologically adaptive for the avoidance of toxins. The "bitt er face" is present at birth and in non-human primates, and even in rats. We consider the poison avoidance sys tem to be the preadaptive origin of disgust, but we do not consider it to be disgust *per se*. It is neither elicited by spoilage, nor are bitter foods contaminating. Kelly (2011), as well as myself and colleagues (Rozin and Fal lon, 1987), recognize that there is a major difference between a biologically evolved poison rejection system and a microbe avoidance system. This big jump in any account of the biological or cultural evolution of disgust does not seem to bother evolutionary psychologists. I am inclined to think that the pathogen avoidance part of disgust is biologically evolved, but I cannot create a convincing case with the evidence at hand, in such marked contrast to the clear evolutionary basis for the bitter/toxin avoidance system. Possible origin stories, compatib le with either biological or cultural evolution, include the increased risk of pathogens when humans began to eat more animal foods, when humans domesticated animals (leading to much more intimate contact with anim als), or when humans began to live in very dense concentrations. But these are just possibilities.

To reiterate my central point, if something would be adaptive in our ancestral environment (fire and antibiotics would certainly have been), and currently serves the same function, it does not follow that it evolved biological ly. It could have evolved culturally. For reasons that escape me (Rozin, 2010), evolutionary psychologists don't like to consider cultural evolution, although (1) cultural evolution, for the most part, works under the same prin ciples as biological evolution, and (2) we can actually accumulate definitive evidence for cultural evolutionary origins, because they are more recent, and often leave records (for example, for some thousands of years, in writing). Indeed we know a lot about the cultural evolution of writing itself (Gleitman and Rozin, 1977)! So, I think we are treading on less than solid ground if we try to build a model of the earliest, pathogen-related forms of disgust, as a clearly biologically evolved system. And later expansions of disgust to animal reminders, interpersonal contacts, and sexual and some other moral violations are much less persuasive cases of biolog ical evolution. One can well imagine, as Tybur et al do, and consistent with our prior formulations, that disgust expands from an initial pathogen focus, without assuming that the original pathogen focus was biologically evolved.

The comparison between evolutionary and developmental psychology may be illuminating. Evolutionary psyc

hology is based on one great, well-documented theory about origins, but faces difficult problems in directly de monstrating the evolutionary origins of most features of behavior that psychologists care about. Development al psychology has a much weaker theoretical basis, but has a significantly easier empirical task in demonstrat ing origins. Thus we might suppose that disgust originates in the process of toilet training (Rozin & Fallon, 1987). And if we were really motivated to do so, and no one has been so motivated yet, we could probably de termine the extent to which this is true. In sum, I suggest that developmental, cultural and evolutionary perspec tives have enlightened our understanding of disgust, but the story of the origin of disgust is still uncertain.

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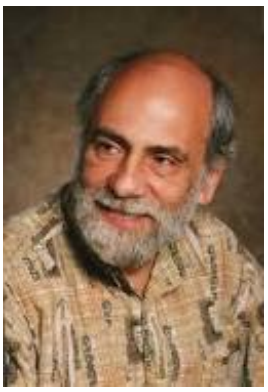
On The Expansion Of Disgust

Paul Rozin, Department of Psychology, University of Pennsylvania & Jonathan Haidt, Business and Society Program, NYU-Stern



Tybur et al (2012) offer an evolutionary theory of disgust's origins, nature, and expansion. Their theory has much in common with our older theory of disgust (Rozin & Fallon, 1987; Rozin, Haidt & McCauley, 1993; 2008). Both theories presume a food-related origin, although Tybur et al., by invoking a pathogen origin, are open to non-oral (e.g. airborne) original disgusts. Both invoke the process of preadaptation to explain the expansion of disgust (although Tybur et al. use the term "co-opted"). Preadaptation (related to the later idea of exaptation) (Mayr, 1960) refers to the fact that in biological (and cultural) evolution, something already present–usually something that evolved for another purpose–can be recruited to a new function. Both theories recognize a role for disgust in response to certain other humans and certain types of moral violations. That is a lot of similarity.

Our main differences arise in two areas: 1) what are the domains into which disgust expanded? and 2) is biological evolution for pathogen avoidance sufficient for explaining disgust and its expansion, or does cultural evolution play a crucial role? Tybur et al (2012) subsume what we call "animal reminder" disgust into their central category of pathogen disgust. Animal reminder disgust as we use the term refers to the disgust response to corpses, blood, gore, amputations, piercings, and other violations of the normal, culturally-agreed-upon outer "envelope" of the human body. Tybur et al. note that many of these elicitors – such as blood and corpses – are vectors for pathogens, and that is certainly true (and more important than we acknowledged in our early papers).

But many of these "creepy" items have little to do with pathogens, e.g., seeing a man with a glass eye remove the eye from its socket, or seeing someone who is morbidly obese. Items such as these repeatedly factored together in our early work. That is, when we examined hundreds of candidate items for our Disgust Scale, animal reminder items were rather highly correlated with one another, and less highly correlated with what we called core disgust items, like rotting food (Haidt, McCauley & Rozin, 1994).

In trying to make sense of this cluster, we drew on anthropological work, and on the writings of Ernest Becker (1973). We suggested that many cultures have come to use disgust to reinforce their own norms about the ideal human body (an ideal that varies across cultures). Part of the motivation for guarding this ideal was the motivation to believe that human beings and human bodies are special; we are not like other animals, and things that remind us that we are in fact animals tend to recruit disgust. In particular, one animal property–death–is particularly threatening to the only species that consciously appreciates its own mortality. A significant motivating force in human history and cultural evolution, at least over the last 10,000 years, has been coping with death. And a major function of many religions is to relieve death anxiety. Tybur et al. (2012) have raised some good objections to our explanation of the animal reminder items (e.g., animals breathe, yet breathing is not disgusting). But they include only one item of the animal-reminder type on their Three Domains of Disgust (3DD) scale (Tybur et al., 2009). The single item is touching a person's bloody cut – but because the item includes touching blood, it is clearly a pathogen threat. We think they may have ignored these disgust elicitors, and hence an important component of disgust, because it didn't fit their theory.

Our biggest area of disagreement with Tybur et al. is over the nature of moral disgust. We carved out a well-defined subset of moral violations and showed that they were linked more closely to disgust than to anger (Rozin et al., 1999). These were violations of what Shweder et al. (1997) called the “ethics of divinity.” Many cultures create sacred objects and values; many treat the body as a temple; many have notions of purity, pollution, desecration and degradation. These cultural values and practices are heavily moralized, and they involve elements of contagion, yet they cannot be interpreted as efforts to guard against actual pathogens. We did not include such items on our disgust scale because we found, early on, that they did not seem to correlate well with the other disgust subscales—just as the moral component of Tybur et al’s 3DD scale correlates rather weakly with their sexual and pathogen components. We think that part of the problem with moral disgust is that, in English, the word disgust is used in the specific sense we and Tybur et al. propose, but also to generally mean “bad”, either morally or otherwise (Nabi, 2002). It is a fact of interest that people will say that a wide range of moral violations are “disgusting” and show the disgust face. Perhaps in the most recent stage of its history, “disgust” began to be loosely used to signal general moral rejection.

The 3DD has a subscale for moral disgust, but it consists exclusively of questions about violations of fairness, for which we know that the dominant emotion is anger, not disgust. For example, the 3DD asks subjects to rate how disgusting is the concept of “shoplifting a candy bar,” or the concept of “a student cheating to get good grades.” People do indeed vary in their willingness to use disgust to describe these acts, but we don’t believe this variation tells us anything about disgust sensitivity, or about moral disgust. Olatunji et al. (2012) have reported evidence that the moral items on the Tybur et al. disgust scale are more associated with anger than disgust, and we have unpublished evidence showing the same.

Clearly there is much more work to be done on disgust, particularly on moral disgust. Tybur et al., in our view, have oversimplified the moral domain in their quest for parsimony. Human beings are cultural creatures who have woven disgust into their religious, political, and moral practices. We think that the expansion of disgust beyond its probable original role as an “oral defense” system is more complex. Preadaptation in biological and cultural evolution may be the processes through which this has occurred, but how and when the expansions happened, the changes in function that occurred, and the interactions between biology and culture are yet to be described. Unlike Tybur et al., we think that cultural psychology, as well as evolutionary psychology, is necessary to tell the whole story.

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Animal reminders, pathogens, and sex: Evaluating distinct evolutionary theories of disgust

Joshua Tybur, Dept of Social and Organizational Psychology, VU University Amsterdam & Debra Lieberman, Dept of Psychology, University of Miami

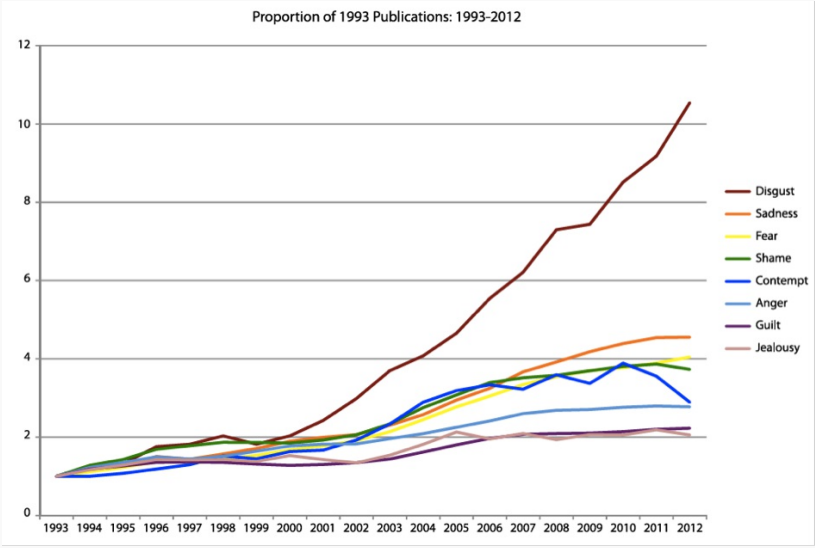
While disgust as a subject of inquiry has skyrocketed in popularity over the past 20 years (see Figure 1), there has yet to be a consensus among psychologists regard ing disgust's function(s). We believe this is partially due to the variation in objects, concepts, and behaviors that elicit disgust—things as varied as lawyers, vomit, in cest, diapers, politicians, and sex during menstruation (e.g., Curtis & Biran, 2001; Haidt et al., 1997; Nabi, 2002).

Although some have suggested that disgust is best described as having the generic function of "protecting the self" (e.g., Miller, 2004), others have proposed that the heterogeneity of disgust elicitors reflects multiple disgust adaptations, each of which evolved in response to distinct selection pressures. For example, Rozin, Haidt, McCauley and colleagues (RHM; 2008, 2009) suggest disgust evolved from distaste —a food-rejection adaptation for neutralizing toxins—in response to new selection pressures imposed by pathogens in the varied, omnivorous human diet.

Inspired by cultural anthropologist Ernest Becker (1973), RHM further argue that this pathogen-avoidance emotion was exapted for a new function: to "protect the soul" (Rozin et al., 2008, p. 764) by neutralizing purported existential threats posed by re minders that humans are animals and, hence, mortal. Rozin et al. (2008) argue that this perspective is supported by their observation that "anything that reminds us that we are animals elicits disgust." (p. 761).

Prototypical animal reminders, under this framework, include dead bodies, deformity

(e.g., burn wounds, port wine birthmarks), bad hygiene (e.g., body odor), and sex. RHM also posit domains of “interpersonal” disgust, which they argue functions to maintain social distinctiveness, and moral disgust, which they argue functions to pro tect the social order. We do not further address moral disgust here (though see Tybur, Lieberman, Kurzban, and DeScioli, 2013, pages 73-77, for our account of morality and “purity” and “divinity” viola tions, as well as disgust toward unfair and harmful acts). Briefly, then, RHM posit four functions for disgust: 1) to neutralize pat hogens; 2) to neutralize the purported threats posed by reminders that humans are animals; 3) to maintain social dis tinctiveness, and 4) to protect the social order.



Data were collected using PsychInfo searches for each year from 1993 to 2012. Searches specified that the emotion (e.g., disgust) appeared in the ab stract of the paper. Data are the proportion of 1993 search hits for each year through 2012. Baseline (1993) hits for the emotions were as follows: disgust (22), sadness (78), fear (667), shame (111), contempt (9), anger (362), guilt (204), jealousy (36).

In contrast to the type of evolutionary trajectory proposed by RHM, we, along with other researchers in the area, (e.g., Curtis et al., 2011; Fessler & Navarrete, 2003) have suggested that disgust evolved to perform a different set of functions. Specifically, we have argued that disgust functions in the realms of pathogen avoidance, sexual choice, and moral judgment (see Tybur, Lieberman, & Griskevicius, 2009; Tybur et al., 2013). Here, we will refer to this as the three domain disgust (3DD) model. The 3DD and RHM models are similar in that they both posit evolved functions for dis gust, and both posit that disgust serves some pathogen-avoidance function. They differ in a number of ways as well. For example, the 3DD model does not argue that disgust evolved from distaste to neutralize food borne pathogens, but that it evolved from pathogen avoidance adaptations that are ubiquitous across species. Further, the 3DD model includes functions relevant to sexual choice, whereas the RHM model does not; similar ly, the RHM model includes functions relevant to symbolically protecting the soul, whereas the 3DD model does not. These differences are fleshed out to make different predictions below. First, we provide further details re garding the 3DD model.

Conspecifics and animals are potential sources of pathogens. All else equal, psychological mechanisms that de tected pathogens and motivated physical avoidance of them would have conferred reproductive advantages. Note that these do not need to be food borne pathogens. Indeed, touching vomit, feces, and other sources of pathogens with the hands can cause infection even if the pathogen sources are not directly ingested. For ex ample, pathogens on the hands can enter the body via cuts and scrapes, and they can be transmitted to ot herwise noninfectious foods, which can then be consumed. In contrast to the animal-reminder function pro posed by RHM, we suggest that disgust toward corpses, deformity, and bad hygiene functions to reduce phys ical contact based on the pathogen-relevant information associated with these objects. We further suggest that disgust toward sex, rather than functioning to neutralize reminders that humans are animals, evolved to motivate avoidance of specifically sexual (rather than generally physical) contact with individuals who impose net reproductive costs as sexual partners. Mating with close genetic relatives, for instance, imposes significant reproductive costs, and evolution should have engineered psychological mechanisms to prevent and deter sexual, but not physical, contact. Sexual disgust, we argue, was exapted from pathogen disgust and modified (e.g., to motivate avoidance of sexual contact rather than purely physical contact) to perform this function.

These two evolutionary models propose different functional explanations for disgust toward items that RHM state fall into an “animal-reminder” category. On the one hand, RHM suggest disgust toward dead bodies, bad

hygiene, body products, and sex functions to neutralize the existential threats posed by reminders that we are animals and thus mortal. On the other hand, the 3DD model suggests two different adaptations underlie disgust toward corpses and sex: one for avoiding physical contact with pathogens and another for avoiding sexual contact with reproductively costly mates. We feel that the best way to evaluate these models is to use them to generate competing, testable predictions and compare the extent to which each model is supported by observations. Here we consider predictions regarding contact with corpses and disgust toward sex.

Let's first consider disgust toward corpses and the predictions each model makes regarding (a) the consequences of *failing to avoid* physical contact with corpses (i.e., what happens if disgust were somehow removed, but physical contact, direct or indirect, remains), and (b) whether non-human animals avoid corpses. With respect to (a), the 3DD model predicts that failing to avoid physical contact with corpses increases infectious disease costs, whereas the animal-reminder perspective does not make this prediction (recall, the RHM model posits that the key threats posed by corpses are symbolic and existential, not infectious). With respect to (b), the animal-reminder perspective predicts that only humans – so not non-human animals – should avoid corpses, since (purportedly) only humans can forecast their own mortality. In contrast, the 3DD model predicts that many species should avoid corpses, since the threats posed by decaying conspecifics (e.g., infectious disease) are not unique to humans.

In both cases, the pathogen-avoidance perspective as outlined by the 3DD model fits observations better. As Ignaz Semmelweis discovered, removing the cues associated with putrefying bodies—and, hence, removing the disgust that motivates physical avoidance—can lead to inadvertent pathogen transmission and lethal infections. And, as multiple animal-behavior researchers have shown, non-human animals avoid dead conspecifics, partially to avoid infection from pathogens that might have killed the animal or that are rapidly colonizing the corpse (indeed, "reminding" non-human animal pests of dead conspecifics via olfactory cues is used to manage pests; see Wagner et al., 2011).

Using sex as another example, we can also consider the competing predictions each model makes regarding (a) how imagining sex with different partners changes disgust toward sexual acts, and (b) differences between men and women in disgust toward sex. Regarding (a), the animal-reminder perspective suggests that the *act* of sexual intercourse should elicit disgust, because non-human animals also have intercourse–there is no distinction based on sexual partner implied by this model. In contrast, the 3DD model suggests that a sexual act should elicit disgust if the partner is perceived to be reproductively costly, but not if the partner is perceived to be reproductively beneficial. In our view, the animal-reminder perspective, again, does not fare well. For example, a 25 year-old man would likely find sexual intercourse with his 22 year-old sister disgusting, even if the sister possesses physical and mental traits he otherwise finds attractive (see, e.g., De Smet, Speybroeck, & Verplaetse, in press; Lieberman, Tooby, and Cosmides, 2007). But the same "animalistic" act of intercourse with an unrelated, but equally attractive 22 year-old woman elicits *lust* rather than disgust.

With respect to (b), the RHM model would predict that men and women should be roughly equally disgusted by sex. In contra st, based on Parental Investment Theory, (Trivers, 1972), which states that the sex that invests more in reproduction (e.g., via time and metabolic resources) should be sexually choosier, the 3DD model predicts that women should be more avoidant of – and hence more disgusted by – sex than men (Tybur et al., 2013). Data support the 3DD model, with multiple studies finding that women are much more sensitive to sexual disgust than men. That is, when asked to self-report how disgusted they are by a variety of disgust elicitors, women report far greater disgust toward sexual items than men do. Indeed, the magnitude of these sex difference dwarfs the magnitude of sex dif ference in disgust toward other elicitors grouped within the "animal-reminder" domain by RHM and disgust toward moral violations (see Figure 2).

This – along with other data (see Tybur et al., 2009, Study 4) suggests that disgust toward sex and disgust toward corpses should not be categorized into the same "domain," and that the threats that sexual disgust functions to neutralize vary across men and women.

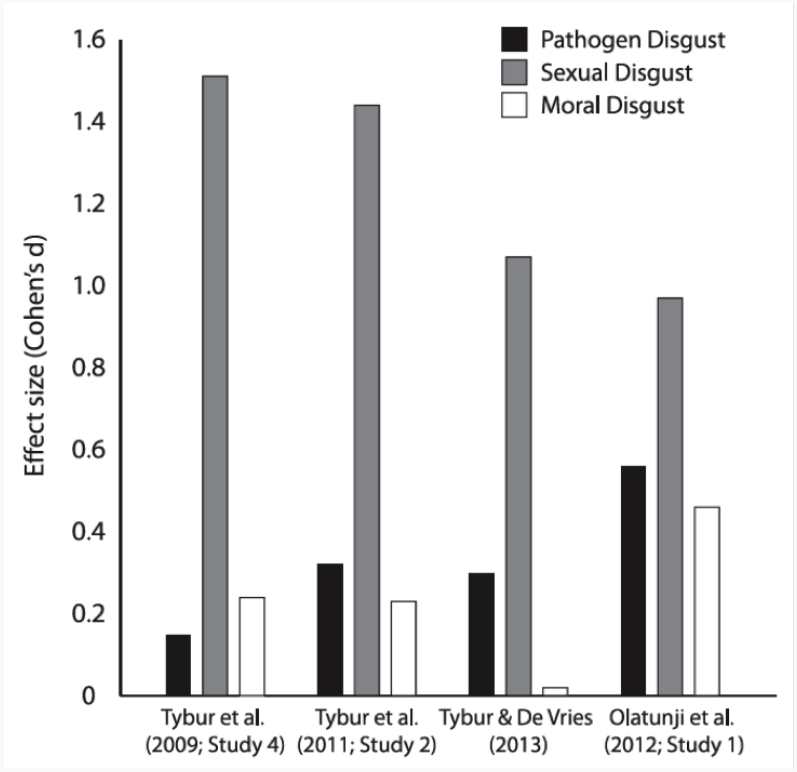


Figure 2
Data describe standardized mean sex differences (the difference between women's scale scores and men's scale scores in standard deviation units, or Cohen's d) in Three Domain Disgust Scale (TDDS) factor means across four data sets. The TDDS is a 21-item measure in which participants self-report, on a 0 = not at all disgusting to 6 = extremely disgusting scale, how disgusting they find statements. Some statements concern pathogen cues (e.g., "Stepping on dog poop"), some concern sexual situations (e.g., "Find ing out that someone you don't like has sexual fantasies about you"), and some concern moral violations (e.g., "A student cheating to get good grades"). Factor means are averages across the seven items per factor. Women's mean scores are higher across every data set and every TDDS factor.

We believe that the recent surge in disgust research can have maximum impact if guided and interpreted using a robust theoretical framework. Given the current theoretical and empirical arguments against the existence of an "animal–reminder" function of disgust as outlined by RHM (see Al-Shawaf and Lewis, 2013; Royzman and Sabini, 2001, Tybur et al., 2009, 2013), we believe that it is time to retire this candidate functional explanation.

Moving forward, we suggest that researchers continue to explore topics such as the proximate (i.e., informa tion processing) mechanisms underlying plausible evolved functions, discussing the degree to which disgust functions to promote group versus individual fitness (see Pinker, 2012, for a discussion), and discussing the role of cultural evolution in the structure and function of disgust (see Tybur, 2013; contrast with Rozin and Haidt, 2013). For example, this type of approach might be useful in unraveling some of the mysteries of moral disgust, which we have suggested reflects two phenomena: 1) the tendency for people to morally condemn oth ers who engage in disgusting behaviors; and 2) the tendency for people to communicate moral condemnation with verbal and facial expressions of disgust. Ultimately, we believe that a systematic evolutionary approach can help integrate the impressive and growing body of research on disgust.

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The Negative Side of Disgust

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Psychologists are often asked to provide prescriptive as well as descriptive views on emotions: whether, say, shame is generally destructive and unfair, or potentially useful and justifiable (e.g., Tangney & Dearing, 2002; Teroni & Deonna, 2008). Disgust is another such controversial emotion. We will review here evidence that, while negative feelings are useful means for tracking objectionable behaviors, disgust may be less appropriate than other alternatives such as moral anger.

Undesirable elicitors and consequences of disgust

In the debate between Martha Nussbaum and Dan Kahan over the admissibility of disgust as a part of liberal jurisprudence (e.g. Nussbaum, 1999; Kahan, 1999; Nussbaum, 2004), Nussbaum disqualifies disgust on a number of grounds. There is psychological evidence supporting each of these. First of all, it is well established that while anger's action tendency is one of hostile approach, disgust leads to avoidance and cleansing behaviors (e.g., Roseman, Spindel & Jose, 1996; van Overveld, de Jong & Peters, 2010; Fontaine, Scherer & Soriano, 2013). These do not seem to facilitate respect for human dignity and rights. Rather, they call to mind shunning punishments, and in a more sinister turn of phrase, "cleansing" society of undesirables. The hostility in anger at least is compatible with reproach and reform, while disgust seems to lead either to avoidance of the problem, or to inhumane punishment.

Disgust has also been seen as an emotion that is relatively insensitive to rational assessments of context; for example, Rozin, Millman & Nemeroff (1986) reported people's reluctance to ingest chocolate merely shaped like dog droppings. In the moral domain, however, this characteristic of disgust can lead people to ignore morally relevant aspects of the action being judged, such as whether it was harmful or whether it was performed intentionally. Studies in moral judgment (Gutierrez & Giner-Sorolla, 2007; Giner-Sorolla, Caswell, Bosson & Hettinger, 2012; Russell & Giner-Sorolla, 2011a) show that anger, versus disgust, responds more strongly to experimental manipulations of the intentional nature of a wrong act and whether it harmed anyone.

For example, Russell and Giner-Sorolla (2011a) manipulated whether potentially immoral acts involving cloning (e.g. eating one's own cloned flesh, serving cloned meat to guests without telling them what it is) were presented as intentional, or accidental due to another person's error. In that study, when statistically controlling for anger, disgust did not discriminate between intentional and accidental wrongs, while anger controlling for disgust did.

Additionally, disgust appears to be especially hard to justify with supporting reasons and to change when mitigating circumstances emerge. Russell and Giner-Sorolla (2011b) demonstrated that people had a harder time coming up with reasons for why they felt disgust, as opposed to anger, toward sexually stigmatized groups, beyond simple evaluative restatements (e.g., "because they're evil"; see also the "moral dumbfounding" in Björklund, Haidt, & Murphy, 2000, which was mainly shown for disgusting moral violations involving sex or the body).

Furthermore, other research (Russell & Giner-Sorolla, 2011c) has shown that when people were asked to re-evaluate a stated moral violation (such as kicking a dog, or eating a dog that had been killed by a car) in the presence of various mitigating circumstances they changed their anger reactions toward the violation, but not their disgust reactions. It is unlikely that decisions relying on disgust are easily changed by new evidence, further showing that disgust is estranged from rational moral judgment.

Disgust, dehumanization, and social status

When disgust is directed at humans, it can motivate a dehumanized perception-the inability to see the person as still human, that is, as having a human mind (Harris & Fiske, 2009). Social psychological and social neuroscience data document these psychological and neural findings (Harris & Fiske, 2006), which resonate with philosophical theory (Descartes, 1637). Descartes postulated 'Cogito ergo sum' (I think therefore I am), suggesting the mind and body are separable entities. Though a lot of what Descartes postulated about the brain was incorrect, this Cartesian Dualist perspective seems to have an intuitive appeal among lay people, who can attribute greater and lesser degrees of "mind" to other humans.

One example is found within person perception research. People reduce their mental state inferences—ideas about the content of a person's thoughts, feelings, and disposition—when seeing members of a dehumanized group (Harris & Fiske, 2011). Mental state inferences occur spontaneously when viewing other people (Fiske, 2013), for instance, "that guy is well-dressed, so he must be meticulous". When seeing "disgusting" individuals, however, these inferences are not made. As a result, the way we think about "disgusting" people appears to be similar to the way we think about objects, animals, and other things that do not have minds like ours. Currently, the causal relationship between disgust and dehumanized perception remains unknown, and recent evidence is now beginning to test the impact of this psychological phenomenon on actual, real world behavior (Capestany & Harris, 2014). For instance, people may engage dehumanized perceptions to reduce feelings of helplessness, despair, compassion, and empathy in themselves (Cameron & Payne, 2011), or simply to ensure their economic well-being in contexts where people's physical, not mental abilities are more predictive of winning money (Harris, Lee, Capestany, & Cohen, 2014). Specifically, people behave in a more rational, profit-maximizing manner when they first dehumanize other people in an economic context.

Therefore, the psychological impact of disgust through dehumanized perception is not simply limited to sanctioning extreme acts of violence and cruelty (cf. Castano & Giner-Sorolla, 2006). This presents an additional challenge to disgust in the light of modern values of justice, which insist on recognizing the humanity of social offenders. Though other emotions are certainly involved in such instances of human cruelty as genocide, torture, slavery, murder, rape, child abuse, human warfare, poverty, and neglect, disgust has one feature that explains why it may fit these contexts so readily: the role of hierarchy and status. Disgust may allow people to quickly and easily distinguish features of hierarchy, including whether someone is of low social status, and thus undeserving of social interaction.

People report disgust and contempt (though less so) to homeless people and drug addicts, social groups at the bottom of the American social hierarchy. They rate them as low on warmth and competence related traits, the two primary dimensions of person perception. All other people receive high ratings on at least one trait (Fiske, Cuddy, Glick, & Xu, 2002). These results replicate across cultures (Cuddy et al., 2009). Indeed, it has been argued that disgust is an inherently hierarchical emotion (Brandt & Reyna, 2011), felt by higher status people toward lower status people. Commentators in the humanities have often noted that beliefs about smell, animality, and other disgusting metaphors are used to reinforce the social stigma of oppressed classes and groups (Orwell, 1937/1986; Smith, 2006).

In sum, like any emotion, disgust motivates behavior (Darwin, 1872). Specifically, disgust motivates avoidance of potentially harmful objects and agents to help satisfy a basic need for survival (Rozin & Fallon, 1987; Oaten, Case & Stevenson, 2009). But this very same functional quality of disgust also causes problems for our egalitarian values when it is applied to groups and persons. Not only is the physiological-phenomenological

experience of disgust powerfully unpleasant, it also leads people to make inflexible moral judgments, to shun other people as less than human on a very basic level, and supports social hierarchies with prejudices as seemingly self-evident as the prejudice humans hold against rats, lice and dung. While it may be adaptive to hold strong, inflexible, avoidant attitudes towards things that can make us sick, these attitudes, directed at other people, conflict with the values of social justice.

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Defending Disgust: Why Disgust Is Morally Beneficial

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Many argue that moral disgust developed as a regulator of social behavior, and that it still dutifully serves that purpose (Tybur et al. 2013). However, a growing number have criticised disgust as a morally objectionable emotion in modern society, emphasizing features that, while adaptive in response to pathogens, render disgust unsuitable for policing morality (Nussbaum 2009; Kelly 2011; Bloom 2013). These include: cognitive and behavioral inflexibility, the generation of "dumbfounded" moral judgments lacking reasons, insensitivity to contextual factors and reappraisal, dehumanization, and a focus on the whole person, rather than their actions (Schnall et al. 2008; Russell & Giner-Sorolla 2011).

Critics of disgust compare it unfavorably with other moral emotions (especially anger), which they hold to be more flexible and reasoned, and lump it together with related emotions such as shame, which are often viewed negatively for similar reasons. Specifically *moral* critiques of disgust have been largely qualitative, based on historical case studies and anecdotal examples. Arguments condemning disgust as a moral emotion emphasise disgust's negative role in instances of stigmatization, such as homophobia, racism, and genocide. Disgust is involved in such scenarios, but we doubt that it is always and uniquely involved. Building on a series of papers arguing that disgust can be a morally beneficial emotion (Clark forthcoming; Clark & Fessler, forthcoming) we maintain that disgust can play a positive role in morality, and that the evidence for condemning moral disgust is often either lacking, or misinterpreted. More specifically:

(1) ***Causal relations between disgust and moral judgement are not well established.*** Evidence suggests that disgust can amplify the severity of moral judgements, but there is insufficient evidence to conclude that it has the power to causally engender an unreasoned, "dumbfounded" moral verdict, or that it is a "moralising emotion" *per se* (Pizzarro et al. 2011), i.e., that acts or agents that elicit disgust are automatically seen as immoral in some sense. Some research suggests an alternative temporal and causal ordering. Testing participants' reactions to moral violations that involved inherently disgusting elements, Yang and colleagues (2013) used a Go/No-Go paradigm and measured lateralized readiness potentials to determine the temporal order of physical disgust and moral information processing, in which participants were asked to respond with "yes" or "no" concerning the physical disgust and moral wrongness of a social act. They found that the moral wrongness of an action was processed before any physical disgust, and suggest that (a) moral disgust does not require the presence of physical disgust elicitors, and (b) moral reactions may be equally (or more) important to humans than physical disgust.

Fessler et al. (2003) surveyed participants concerning meat consumption, reasons for meat avoidance, and disgust sensitivity, and found that (a) meat consumption was positively correlated with disgust sensitivity, and (b) individuals who avoided meat on moral grounds were not more sensitive to disgust than those who avoided meat for other reasons, such as health. This suggest that moral vegetarians' disgust reactions to meat are more a consequence, than an antecedent, of moral beliefs. Hence, moral disgust may function as an affective modulator of moral judgements (preparing the agent to act in appropriate ways) but not the causal impetus,. Furthermore, other emotions (including anger) are guilty of modulating moral judgements, so condemning disgust on this basis alone is tantamount to censuring all (moral) emotions.

(2) *Disgust is more flexible in its sensitivity to context and reappraisal than commonly ackowledged.* Even simple forms of disgust are highly sensitive to the context in which stimuli are presented. Context alone can determine whether an animal will consume food, and the extinction of disgust responses are dependent on learned context (Viar-Paxton & Olatunji 2012); e.g., an animal may develop an aversion to a particular food in one context where it is paired with nausea, but be willing to consume the same food in another context (Reilly & Schachtman 2008). For instance, people's reactions to the (similar) odors of dirty socks and parmesan cheese may vary when given contextual information about the source. Also, disgust is sensitive to our motivational states (e.g., hunger or sexual arousal), and moral disgust continually interacts with opposing moral emotions like compassion and empathy. Further, moral disgust appears sensitive to cognitive reappraisal. This is dramatically illustrated by the cognitive reframing displayed by survivors of the Andes 1972 flight disaster, many of whom elevated the acts of cannibalisms in which they engaged to the ritual of Holy Communion and interpreted it as a spiritual experience, thereby reducing their physical and moral disgust (Reed 1974). Imaging experiments have shown moral disgust to be mitigated by perceptions of blame, controllability, or deliberate efforts to empathize with stigmatized individuals (Harris & Fiske 2007; Krendl et al. 2013). Moreover, Feinberg et al. (2013) suggest that differences in the role of disgust in conservative vs. liberal morality may lie in liberals' ability to regulate and reappraise disgust, rather than simply experiencing less moral disgust than conservatives.

(3) *The focus on extremely negative effects of disgust obscures its role in more ordinary and/or morally commendable values*. Critics of disgust focus almost exclusively on disgust's role in moral behaviors that most readers will condemn (e.g., homophobia). However, moral disgust has also been shown to occur in responses to violations such as others' hypocrisy, lying, cheating, racism, sycophancy, exploitation of the weak, unfairness, betrayal, and theft. Critics would argue that disgust is not suited as a response to *any* moral violations, but the case is harder to make when confronted with the potential positive contribution of disgust to values with which we identify.

(4) *To the extent that disgust is more inflexible than other emotions, this can be beneficial in moral judgment.* Emerging evidence suggests that disgust is directed primarily towards more stable features of individuals' character or identity, rather than towards specific acts (Giner-Sorolla & Chambers in prep; Clark forthcoming). This is often presented as a vice, but in some cases we are better off relying on information about the individual's social category. The ability to negatively assess individuals' character and respond appropriately is an important capacity (Ciaramelli et al. 2013), whose loss can lead people into negative relationships, as is illustrated by those with damage to the medial prefrontal cortex, which is thought to mediate such responses.

(5) *Empirical evidence that disgust dehumanizes is limited, and more lauded emotions like anger are also likely to produce dehumanization.* Despite much qualitative research linking disgust to dehumanization, this causal link has only recently been tested. Using arbitrarily created outgroups (over- and under-estimators in a guessing task) Buckels and Trapnell (2013) demonstrated that induced disgust increased implicit associations of the outgroup with animals. Interestingly, however, they found that, while disgusted particpants showed the greatest shift in this respect, *all* participants showed this implicit dehumanizing bias, whether or not they underwent a disgust induction This suggests that dehumanization may be a more general and fundamental part of our group psychology, rather being disgust-specific. There is also little evidence concerning whether other emotions also engender dehumanization. Anger has been shown to cause implicit negativity toward outgroups (De Steno et al. 2004), and Russell and Giner-Sorolla have preliminary evidence that anger can also produce dehumaization (Giner-Sorolla & Russell, in prep.).

In sum, we encourage readers not to dismiss disgust as a problematic moral emotion, but to take a closer look at the empirical evidence on which such a critique is based. We have argued above that there are significant gaps in such evidence, and maintain that disgust can have a positive/adaptive role in morality under certain circumstances.

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Get To Know Giovanna Colombetti!

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What is most distinctive about my work on emotions is that it is grounded in an account of the mind that emphasizes its embodied and affective character. My current project, funded by the European Research Council, is titled "Emoting the Embodied Mind" and it aims to reconceptualize a variety of affective phenomena from the "embodied" perspective in the philosophy of mind. The project is primarily philosophical, in the sense that it develops an abstract theoretical framework and explores its implications; in doing so, however, I draw on the empirical results unveiled by the affective sciences.

My starting point is the so-called "enactive" approach to the mind, which is a synthesis of several interrelated and mutually supportive ideas from different disciplines, in particular phenomenological philosophy, psychology, biology, and neuroscience (the key texts developing this approach are Varela, Thompson, & Rosch 1991 and Thompson 2007; for succinct introductions to enactivism see Torrance 2005; Colombetti & Thompson 2008; Di Paolo, Rohde, & De Jaegher 2010; Thompson 2011).

Enactivism rejects the assumptions, widespread in cognitive science, that the body does not itself underpin cognitive capacities and that cognition is instantiated "centrally" by the brain only. Rather, according to enactivism cognition is realized ("enacted") by the whole living organism embedded in the world. A central theme of enactivism is the autonomous (i.e., self-determining) nature of living systems, and the idea that cognition, as enacted by living systems, ought to be understood in terms of *self-organization*. In a self-organizing system (e.g., a flock of birds), there is no component that instructs or controls how the other components of the system behave; instead, the structure and the behaviour of the system result from the reciprocal influences of its various constituents.

Another central theme of enactivism is the importance of examining in detail the nature of *lived experience* to develop an appropriate account of the mind. Much cognitive science is explicitly about the structure of the "cognitive unconscious", i.e., it aims to explain how a certain system of non-conscious representations implements some cognitive function. Enactivism takes its lead from the idea, developed especially in the phenomenological philosophical tradition, that our body is not just a physical entity but also an *experienced* or *lived* structure (Husserl [1952] 1989; Merleau-Ponty [1945] 1962). Understanding the mind thus requires an exploration of our embodied nature at *both* physical and experiential levels. Moreover, the two levels need to inform one another; rigorous descriptions of experience are necessary to make sense of brain and bodily activity, and data about the latter can be used to refine experiential reports (for the idea of "circulation" between neuroscience and experience, see Varela 1996; for an application of this idea to the study of emotion, see Colombetti 2013).

These two themes have interesting implications for our understanding of affectivity (see Colombetti 2014):

Emotional episodes are self-organizing patterns of the organism

From the enactive perspective, emotional episodes such as fear, anger, happiness, shame etc., are best conceptualized as self-organizing patterns of the entire organism that recruit various processes (neural, muscular, autonomic, etc.) into highly integrated configurations (Colombetti 2009a, 2014). Related suggestions can be found in psychological and neuroscientific works, together with supporting empirical evidence (e.g., Fogel & Thelen 1987; Fogel et al. 1992; Freeman 2000; Lewis 2005). Importantly, this proposal provides a middle way

between some of the most influential theories of emotion in psychology. Self-organizing emotional episodes can be highly variable, because the processes constituting them can organize themselves in different ways, de pending on the context. Yet at the same time, the range of their possible variations depends on the state of the organism, and is evolutionarily and developmentally constrained.

This perspective entails that there is no need to posit "internal causes" of emotion—such as affect programs (Tomkins 1962; Ekman 1980) or sequences of cognitive appraisals (as in the "component process model"; Scherer 2009). Additionally, there is no need to posit the existence of "basic" emotions, in the sense of emo tions that are building blocks of more complex or non-basic ones. Rather, *all* emotional episodes can be seen as complex, flexible and variable self-organizing patterns—with some patterns occurring across different cul tures, and other patterns emerging only in specific contexts or even in specific individuals.

This perspective also differs from the "conceptual act theory" proposed by Barrett and others (Barrett 2006; Wilson-Mendenhall et al. 2011), according to which conceptualization, usually driven by language, is needed for the construction of emotional episodes in oneself and others. From the perspective of self-organization, lan guage and language-based concepts are not required for the organism to adopt, or better enact, specific em otional patterns (indeed even very simple organisms can be said to have emotions); at the same time, however, enculturation, including language, can influence how the organism self-organizes, including the way in which its various processes (muscular, physiological, etc.) integrate into specific emotional episodes (Colombetti 2009b, 2009c, 2014).

Appraisal is embodied

The enactivist idea that the mind needs to be understood by developing and integrating detailed accounts at the physical and experiential level has important implications for the notion of appraisal. This notion standardly refers to a cognitive-evaluative process that elicits emotion—either as an external cause of emotion, or as a causal mechanism internal to emotion itself. In either case, the process of appraisal is typically conceptualized as an entirely "brainy" process, clearly distinct from emotion, or at least from its bodily aspects (its visceral, musculoskeletal, expressive and behavioural components).

The enactive perspective entails that appraisal is not entirely in the head, but is constituted by the activity of the whole situated organism (for more details see Colombetti 2007, 2010, 2014). This view follows from the en active conception of cognition as thoroughly embodied, but is also in line with experiential considerations as well as some recent neuroscientific accounts. Experientially, it does not seem possible to clearly distinguish appraisal from emotion, and it seems misleading to suggest that a separate appraisal can produce or elicit an emotion in a linear way—for example, to suggest that one *first* evaluates something as being a loss, and *then* feels sadness. When one appraises something as being a loss and experiences sadness accordingly, the appraisal is already, I maintain, imbued with sadness. Moreover, I think that it is also inaccurate to separate the experience of appraisal from the bodily feelings that often occur in emotion experience in the form of either vis ceral sensations or action tendencies. When these bodily feelings occur, they are not experienced as mere re sponses to the appraisal, lacking evaluative character; rather, they are part of the experience of assessing a certain event as unfair, scary, enjoyable, etc.

These experiential considerations converge with neuroscientific accounts emphasizing that the brain areas traditionally associated with cognitive and emotional functions are so deeply integrated via processes of con tinuous reciprocal influences (also called "circular causation") that it is inappropriate to posit linear causal sequ ences from cognition to emotion (and vice versa; see, e.g., Freeman 2000; Lewis 2005). In fact, some even claim that it is impossible to identify brain areas uniquely dedicated to emotion (including bodily arousal) and cognition (including appraisal) respectively. In their extensive reviews, both Lewis (2005) and Pessoa (2008) for instance show that brain regions traditionally viewed as emotional, such as the amygdala, are also involved in cognition; and vice versa, brain regions traditionally viewed as cognitive, such as the prefrontal cortex, are also involved in emotion (see also Pessoa 2012). They conclude that emotion and cognition (and appraisal more

specifically) are broad psychological categories that do not map neatly onto the brain. If we then add to this neural complexity the further consideration that the brain is itself deeply integrated with the rest of the organism (e.g., Thompson & Cosmelli 2012), it becomes even harder to hold on to the view that appraisal is a distinct cognitive and entirely "heady" process that does not overlap with other aspects of emotion.

Affectivity pervades the mind

Via its phenomenological connections, the enactive approach also helps to reclaim a "broader" and "deeper" notion of affectivity than the one usually assumed in the affective sciences. Affective scientists typically focus on relatively narrow and bounded phenomena such as emotional episodes and moods. The phenomenological notion of affectivity refers instead to our basic capacity to be "affected", in the sense of influenced by something that matters to us (for an accessible introduction to this and other phenomenological ideas about consciousness, see Thompson & Zahavi 2007). In this sense, one need not be in an emotion or mood to be in an affective state; affectivity is a very broad phenomenon that refers to our basic, indeed inescapable, condition of caring about our existence and activities. This broad notion is also "deeper" than ordinary emotions and moods, in the sense that it is a condition of possibility for those (it enables them): if we were non-affective, i.e., indifferent beings, we would not be moved by anything, and accordingly we would not have emotions and moods. Importantly this notion of affectivity is intimately related to the one of embodiment. In a nutshell, it is because we are living bodily organisms that we can be affected and that things matter to us. Non-living beings do not strive to maintain themselves, and there is no reason why they should care about anything.

These three themes are elaborated in more detail in my book, *The Feeling Body: Affective Science Meets the Enactive Mind* (2014, just published by MIT Press). The book elaborates other enactivist themes and their relevance for affective science as well. For example, it proposes new phenomenological categories to describe in detail the many ways in which we experience our body in emotion experience. Drawing on the "neurophenomenological" approach (Varela 1996; Thompson 2007), the book also advances what I call a "neuro-physio-phenomenology" for the scientific study of emotion experience. This term refers to a method for integrating first-person data about emotional feelings (generated via rigorous first- and second-person methods, such as trained self-observation and intersubjective validation) and third-person data about brain and bodily activity (generated via measures of brain as well as autonomic and musculoskeletal activity). The idea is that first-person data should be used to make sense of brain and bodily activity, whereas third-person data should in turn be used to refine reports about feelings (see also Colombetti 2013). The book also addresses the place of affectivity in intersubjectivity. I distinguish different ways in which we feel others in concrete, face-to-face (or better body-to-body) encounters—e.g., phenomena of basic empathy, feelings of closeness and intimacy, sympathy—and relate these distinctions to existing empirical evidence of how our brain and bodies respond to the bodily presence of others, supporting the interpretation that our widespread tendency to mimic others has primarily an affective role.

In sum, I think that the enactive approach to the mind offers a host of resources for thinking about affectivity in novel and fruitful ways. Affectivity is a complex biological as well as experiential phenomenon, and as such it needs to be addressed from a complex multidisciplinary and integrative perspective. Enactivism, with its synthesis of ideas from biology, neuroscience, psychology, philosophy of mind, and phenomenology, provides just such a perspective. Importantly, rather than inviting us to explain one aspect of affectivity (e.g., feelings) in terms of another (e.g., neural activity), it calls for detailed descriptions and analyses of each aspect, with the aim of showing that they can enrich and illuminate one another. This kind of pluralistic and integrative approach is, I think, precisely what we need to do justice to the richness of our embodied and affective lives.

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In Memoriam: Michael Owren (1955-2014)

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Michael J. Owren, a teacher and scientist who analyzed the biological foundations of animal and human communication, died on January 15 2014 at his home in Atlanta, Georgia. Michael was born July 19, 1955 in Oslo, Norway, the third child of Leif and Ingrid Owren. He was raised in College, Alaska; Hanover, New Hampshire; and Bergen, Norway. He received his B.A. in Psychology from Reed College and his Ph.D. in Experimental Psychology from Indiana University.

Michael taught psychology and neuroscience for over 25 years, first while doing post-doctoral work at the University of California, Davis, and later at the University of Colorado at Denver; the University of Otago (New Zealand); Reed College; Cornell University; and Georgia State University. At the time of his death, he was an Adjunct Professor at Emory University.

Michael had a vigorous scientific career focused on understanding the nature, scope and mechanisms of non-linguistic communication. He thought closely and carefully about focal phenomena in systems of vocal production and perception and his empirical studies are widely recognized for their unparalleled rigor and attention to detail.

He was also a skilled developer of novel research technologies and a sophisticated theoretician. On the methods side, he pioneered the application of spectral analysis techniques developed in speech science to the study of animal communication (see for instance his "Some analysis methods that may be useful to acoustic primatologists"). Based on the example of his own research, and on his detailed tutorials for their appropriate use and application, such techniques were widely embraced and became a standard part of the analytic toolkit of animal bioacousticians.

In his theorizing efforts, Michael was particularly invested in delineating and clarifying core constructs that underdgird the theoretical foundations of the field of animal communication, and in this, as in everything else, he brought exceptional clarity of thought, expression and vision. Michael and I jointly developed a heterodox theory of the origins and evolution of signaling systems in animals and humans (See for instance our collaborative papers "Sound on the rebound" and "An affect-conditioning model of non-human primate vocal signaling").

The theory, dubbed the "affect-induction model", emphasizes that many animal vocalizations, and some forms of nonlinguistic vocal communication in humans such as laughter, "work" by influencing relatively low-level processes of attention, arousal, emotion, and motivation in the listener rather than the kind of high-level intentional and representational processes that support complex language in humans.

We distinguished two mechanisms of such influence, in particular. In some cases, the signal itself has acoustic properties that have a direct impact on the affective states of the recipient. Young vocalizers, for instance, can generate aversive sounds like crying, shrieking, or other kinds of loud and extravagant sounds, which directly motivate caregivers to pay attention and take action to turn off the source of the noxious stimulus.

In other cases, the signal is not high-impact by virtue of its acoustic properties alone, but it influences the affective state of the recipient by virtue of its association with social experiences that have positive or negative consequences, thereby leading to conditioned affective responses.

Dominant monkeys can, for instance, exploit social conditioning processes by pairing distinctive threat calls with subsequent physical attack on subordinate rivals, using the threat call alone in future encounters to in timidate those individuals.

Michael applied these insights to the understanding of human laughter, working closely with Jo-Anne Bac horowski in this enterprise (See for instance two of their papers "The acoustic features of human laughter" and "Not all laughs are alike").

They proposed that laughter "works" by being associated with positive events – e.g. a joke, a happy meal with friends – and becoming a conditioned stimulus for those events. Since laughter breeds more laughter, laugh production creates positive and reciprocally sustaining affective states that can be used for fostering coopera tion and diffusing conflicts.

The affect-induction model was creatively applied by Michael to a large domain of experimental settings, rang ing from alarm calling and food calling in nonhuman primates, domestic cat meowing, infant babbling and human laughter (Notable publications here include "The acoustic features of vowel-like grunt calls in chacma baboons," "Salience of caller identity in rhesus monkey (*Macaca mulatta*) coos and screams: Perceptual experi ments with human listeners" and "Asymmetries in the individual distinctiveness and maternal recognition of in fant contact calls and distress screams in baboons").

The model challenges the standard interpretation of non-linguistic signals as providing veridical information to recipients, suggesting that they can have a much more direct impact on recipients' responses and in ways that are not always aligned with receiver interests (See "What do animal signals mean?" and "Communication with out meaning or information" for an exploration of some of the tensions with the received view). But it also shows how low-level processes of influence can pave the way for more complex representational communica tion like that epitomized by the semantic qualities of human language.

In addition to its academic recognition, Michael's work generated interest in the popular media, as in a 2003 Chicago Tribune article that described his feline communication research as the "how of the meow," and a 2009 NPR interview on his work with Marina Davila Ross investigating the evolutionary roots of laughter: http://www.npr.org/templates/story/story.php?storyId=104952197.

Michael loved teaching, and was a mentor to many undergraduate and graduate students. Outside the classroom, he was a life-long runner. For a while, he also sang professionally, performing during his time in De nver with an a cappella group known as Cool Shooz. To his friends and family, Michael was known for his intel ligence, dry wit, and knowledge of everything. From beer to basketball to politics and world geography, Michael was the guy everyone wanted on their Trivial Pursuit team.

Michael is survived by his three siblings, Turid Owren of Portland, Oregon; Henry Owren, also of Portland; and Thomas Owren, of Bergen, Norway; as well as thirteen nieces and nephews who loved spending time with their Uncle Michael. They, along with his many students, colleagues, and friends, will miss him greatly. I will too…