

From Sanctity to Invulnerability: Disgust as a Function for Avoiding the Cognition of Limits

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Introducing My Project

For as far back as I can remember, I have had a deep fascination with the macabre. At aged five, I wrote a “screenplay” about a giant insect that wreaked havoc on humanity. At aged eight, I wrote a story about an animate piece of candy at the bottom of a sample jar who lived his days watching all of his friends be taken from him one by one. At aged sixteen, I took an intensive summer course in acting and performance at UCLA and wrote two short plays. The first was about a snowman that comes to life and attempts to murder the children who birthed him his “miserable existence”. The second was a dark comedy about the assassination of John F. Kennedy. Suffice to say, I have always felt an allure to narrative content that induced antipathy or gave the audience a chance to indulge in emotions that they spend most of their lives avoiding. It is not shocking then that the topic of disgust eventually piqued my interest. This all started when I fell upon an interview on Youtube about Jonathon Haidt.

In the interview, Haidt mentions a 2008 paper where he and colleagues uncover disgust’s origins and symbolic functions. Naturally I was curious, so I gave it a read. On the RHM model – Rozin, Haidt, and McCauley – our disgust response is a phylogenetically ancient response to toxins; it originated from distaste and its evolutionary function predisposed people to avoid potentially harmful stimuli (758). With the inception of early human societies and the symbolic markers that they cultivated, our “core” disgust response was preadapted to address various social concerns – reminders of our animal nature, our interpersonal relationships, and our moral judgements (Rozin 761-63). That was my first exposure to academic thinking about disgust. It made reference to our fear of death, disgust’s relationship to humour, and the role of religious thinking in the evolution of morality. I was struck by the fact that, despite its focus on symbolic functions, it did not ignore the role of genes and immunology from its conclusions. I was

instantly hooked – how could something as seemingly superficial as being disgusted be so rich and perplexing? This was when I realized that there was something worth exploring here beyond my temptation to utilize disgust in story-telling. What I did not realize at the time was that what would distinguish my thesis from a reiteration of Haidt’s worldview was a return to where I started.

Around the same time, my supervisor recommended a book to me on the origins of morality, by Dennis Krebs. In a nutshell, the book argued for a functionalist view of morality, which posits that evaluating morality should be a matter of evaluating the functions that morality originated to serve (Krebs 27). He demonstrates that our moral sense is really a suite of adapted functions – physiological, cognitive, and social – dedicated to various problems that our ancestors tended to encounter. Reading his account, I realized that this could be a hint of an answer to a problem that researchers have scratched their head about since Darwin, namely, disgust. At this time, I did not realize that the contemporary research was well ahead of me. That is when I fell upon Haidt and colleagues’ seminal work on moral foundations which, in my view, took the functionalist approach to a new level.

In *Moral Foundations Theory*, Haidt et al. propose that humans have a suite of innate dispositions that are associated with certain fundamental moral values, which they categorize as follows: care vs. harm, fairness vs. cheating, loyalty vs. betrayal, authority vs. subversion, and sanctity vs. degradation (Haidt 60). These moral categories are foundational to human societies because they are common in our normative judgments of each other, they manifest themselves in automatic affective evaluations, they are culturally widespread, they show evidence of innate preparedness, and they were suited for their ancestral environments (Haidt 108). The premise is that the human mind is organized in advance of experience so that it is prepared to learn values,

norms, and behaviours related to a diverse set of recurrent adaptive problems which each culture articulates and molds in specific ways (Haidt 63). “Innateness” is not equivalent to “hardwired” or responses that are insensitive to environmental influence. Our genes write no more than a first draft into neural tissue, beginning in utero but continuing throughout childhood, and experience or cultural learning revises the draft during childhood (Haidt 61). Thus, morality is both innate and highly dependent on environmental influence. According to Haidt, the emotion of disgust played a pivotal role when societies began to concern themselves with bodily and spiritual purity in religious communities (89). Moral concerns related to issues on the sanctity/degradation spectrum are considered the most recently evolved of these foundational values.

Disgust has a rich history. To understand what it does turns out to be a lot harder than it sounds. The timeline of our disgust response, in Haidt’s account, begins with distaste, then broadens to bodily pathogenic avoidance, and eventually reaches its most prominent prosocial adaptation – bodily and spiritual purity. Krebs and Haidt paint a fairly similar picture of our evolutionary and cultural history. Where they differ is on what they believe to be the origin of morality. Haidt suggests that the origin of morality was the inception of shared intentionality while Krebs suggests morality began with attributions of intention (109; 203). Haidt also suggests that the most recent stage of the evolution of morality was the development of religious communities and the sanctions that they placed on individuals perceived to be in violation of human sanctity (1001). This was the first time in human history when people created an “ethic of divinity”, a belief that humans are somewhere hierarchically between God and non-human animals, a spiritual entity (Rozin 763). From this vantage point, our disgust response is fine-tuned to avoid the reminder that we are mere animals and leading us to avoid people we deem

strange, diseased, unfortunate, or morally tainted, as well as to protect the self from “degrading” or “polluting” acts (Rozin 761-63).

My thesis addresses some of the critiques that others have levied on animal-reminder disgust. Some of the terminology in this paragraph will make more sense as we move along, but it serves to give an impression of what I hope is creative or “interesting” about my thesis. My view suggests that one development in the moral matrices of modern environments is an unconscious narrative lens. This psychodynamic structure is the unconscious belief that the world and our lives are structured like a story; all the settings, events, people, and conflicts that we experience are perceived to have a purpose that draws upon dramatic actions. This does not mean that we necessarily believe that our lives are governed by fate. It means that we are purpose-driven creatures who live our lives as a series of conflict-based events or “climaxes” that we must overcome. In modern environments, disgust can be elicited from the emergence of events that reveal the limitations in the narrative of human invulnerability, which is our unconscious desire to be invulnerable to the vagaries of life. Unfortunately for the narrative, there are aspects of life that are simply out of our control. As such, one of disgust’s symbolic functions is to avoid the despair that comes from too close a look at the limits of our desire to be invulnerable to life’s vagaries. It is a function for overcoming our limitations in controlling the outcome of certain events during the course of our lives. This could explain why disgust is also alluring (as opposed to merely non-threatening) in humour and stories: it gives us the opportunity to evaluate disgust elicitors from a distant perspective, and it reveals events which elicit core-disgust features *and* the satisfaction that comes from conflict resolution, a tenant of narrative. To sum it up, my thesis suggests that narrative structures our moral matrices and that the RHM model should replace

animal-reminder disgust with limitation disgust, the function of which is to avoid despair arising from the limitations of our unconscious desire to be invulnerable to the vagaries of life.

To begin, let me briefly summarize the history of scientific thinking about disgust from the 19th to the 21st century.

- (i) Disgust as a subject of academic interest was popularized by Charles Darwin in *The Expressions of the Emotions in Man and Animals*, where he defined disgust primarily as a sensation stimulated by the oral incorporation of offensive objects, and secondarily as anything which induces a similar feeling (258-259). Since disgust primarily arises from taste, according to Darwin, it is not surprising that it is associated with movements around the mouth. The contemporary literature refers to these movements as Darwin's gape face or sick face, facial movements which are identical with those preparatory to the act of vomiting (259). Disgust was once an acquired habit of our progenitors to reject food that disagreed with them, which eventually became what we now understand as the involuntary movements of disgust (Darwin 259). Disgust can also be co-opted for a use other than the one that natural selection built for it. For example, Darwin describes the revulsion he felt when a native man in Tierra Del Fuego touched his pre-cooked meat with his hands, despite their being relatively clean (257). Disgust for Darwin is an instinct that provokes a negative sensation, a feeling of revulsion that induces movements around the mouth.
- (ii) In his 1905 *Three Essays on the Theory of Sexuality*, Sigmund Freud described the dichotomous conventionalities of disgust. People who are willing to kiss their partner on the lips are far less willing to use the other's toothbrush, despite both actions requiring contact with the mucous membranes of the oral cavity (Freud 248). Consistent with his psychodynamics, Freud suggested that disgust's function is the repression of desire, taught to children at a young age to keep their animal *id* in check by learning to be disgusted (Curtis 748). The *id* is a function of human psychology that serves the unconscious part of our mind, which includes our instinctive and primitive behaviours. Teaching children at a young age to be disgusted at bodily waste and other elicitors teaches them to not embrace every lustful desire that they have in adulthood.
- (iii) In the 1940's, Andras Angyal published his seminal work *Disgust and Related Aversions*. He believed that disgust carried the symbolic association of being

- “debasement, degrading rather than harmful”, and that its function was to avoid the incorporation of objects deemed “inferior” (Angyal 397). Disgust is elicited by objects that represent the nexus of life and death: organic objects that are not quite alive (e.g. body products or severed parts) or nonliving objects that are tied to animate beings (e.g. corpses or decaying organisms) (Hanna 84). Disgust is a combination of three aspects: the symbolic, the neuro-vegetative, and the muscular (Angyal 402). This was the first model of disgust that focused primarily on its symbolic mechanisms; that is, how disgust emerged from, and interacted with, representations of abstract concepts (Hanna 84).
- (iv) In 1966, Mary Douglas published *Purity and Danger*, where she proposed that our avoidance of dirt is rooted in the need to seek unity in our environment, which is a ubiquitous practice among different cultures (Douglas 2). Classification is inherent to the organization of social life; objects which do not fit the “local cosmology” are considered dirty or impure (Curtis 748). Dirt is handled by cultures in ways that assume its lack of organizational structure. For example, among the Havyaka Brahmin, tasks which involve dirt are often the first to be handled – like taking manure to the garden – before the daily bath that precedes the meal (Douglas 4). This is what Douglas refers to as “pollution behaviour”, which is a reaction that condemns any object or idea likely to confuse or contradict cherished classifications (4) This behaviour is commonly found in primitive religions and traditional European ideas of defilement (Douglas 5).
- (v) Eventually, philosophers and scientists began to appreciate disgust’s allure, and theory after theory about its implications, functions, and origins started to make way. After “symbolic mechanism” theories, a “cultural evolution” model entered the stage, which categorized disgust into three symbolic functions rooted in core disgust: animal-reminder disgust, interpersonal disgust, and moral disgust (Rozin 761-763). Recall that Rozin et al.’s premise was that disgust had a distaste origin that broadened to bodily pathogenic avoidance and finally to a suite of symbolic functions. This expanded the cultural domains in which the emotion functions to avoid the reminder that we are mere animals, to avoid impurity or protect the “spiritual self”, and to avoid the threat of people deemed tainted, unfortunate, or unfamiliar (Rozin 762-763). These symbolic functions aim to “push away, or otherwise draw a protective line between the self and threat” (Haidt 127).
- (vi) Finally, in 2013, Tyber et al. put forth a tripartite model of pathogen, sexual, and moral disgust (2). They argue that disgust is best categorized in terms of the problems

that it adapted to solve, rather than the symbolic functions that it performs. Each domain of disgust has its own selective pressures that help shape their various functions. Disgust provides inputs to systems that detect properties associated with pathogen avoidance (pathogen disgust), genetic compatibility and mate value (sexual disgust), and the strategic value of endorsing a rule (moral disgust) (9). This research is referred to as an adaptationist or individual-level framework on disgust.

The popularity of these theories does not mean that they are the only game in town. There is plenty of research that rejects or reformulates the ideas promoted in my summary. Some have argued for *social* functionalism over *moral* functionalism, that disgust's origin is social, that it did not arise from distaste, and even that the term "moral disgust" is a metaphor or a lay-meaning for unrelated emotions. Finally, there is large philosophical literature that attempts to solve normative, meta-ethical, and epistemic problems related to disgust. My project aims solely to be a descriptive analysis of the functions of disgust. I sympathize with the RHM model, but I am not convinced that animal-reminder disgust is a notable symbolic function, and I suggest as a substitute something more reflective of one of disgust's prominent roles in modern environments, namely, limitation disgust. But in order to get there, I cannot ignore the broader worldview that the RHM model is based on: moral foundationism. Thus, I dedicate Part 1 in explaining and justifying moral foundationism. My argument on moral foundations accomplishes the grunt work of systematizing the theory, which includes self-report scales, implicit measures, psychophysiological and neuroscience methods, and even text analysis. I will make mention of them, but they are still in their infancy, so the bulk of Part 1 will be a timeline of the original triggers that helped us adapt prosocial behaviours to address problems related to resource scarcity, dominance and status hierarchies, familial relationships, and group conflict. This should be a sufficient justification for the existence of moral foundations.

Once I have laid out the evolution of the domain-specific functions from which our moral sense evolved, I move to a discussion about the origins and evolution specifically of disgust. I explain and justify the RHM model which posits that from distaste, disgust evolved to broader pathogenic avoidance, and eventually to core disgust. Disgust became one of the primitive mechanisms that early human societies refined to uphold the social order of their group (Krebs, 165). These primitive mechanisms, located in the inner recesses of the brain, are one of the bedrocks of the development of prosocial behaviour (Krebs 143). When hunter-gatherer bands began to form larger, more complex tribal coalitions, a new set of adaptations were needed. Our disgust response was preadapted to address issues related to bodily and spiritual purity, which conferred on this feeling a suite of new symbolic functions. In this context, I suggest that one of disgust's symbolic functions is to avoid the limitations inherent in our unconscious desire to be invulnerable to life's vagaries. Animal-reminder disgust is a possibility under the broader picture that I defend, but it does not meet the standard of a symbolic function. I name this function "limitation disgust" or "limitation-reminder disgust", which is an affective response that functions to avoid reminders that the unconscious lens that promotes human invulnerability is limited. This framework, I argue, can also provide a reason for why disgust elicitors are an enduring feature of humour and storytelling.

PART 1

On Morality

A great many people think they are thinking when they are merely rearranging their prejudices. – William James

Disgust's original function was to avoid potentially harmful stimuli. On its own, that statement is the least controversial claim in the contemporary disgust literature. What is controversial is the precise nature of the claim: did disgust originate from distaste? Is it a catch-all term for an immunological response? Was it a dual-response to orally-transmitted toxins and bodily pathogens? That debate, however, is not nearly as controversial as the debate on the relationship between disgust and morality. The primary reason for that is that whilst most scholars acknowledge that disgust's original function was to avoid harmful stimuli, they fundamentally disagree about how we should evaluate morality or what constitutes a moral sense.

In this section, I give an account of the evolution of the primitive mechanisms that gave rise to prosocial dispositions, the cognitive mechanisms that gave rise to uniquely-human prosocial behaviours, and the symbolic markers that gave rise to our unique sense of morality. Our contingent evolutionary and cultural development was conducive to fostering the adaptations that gave rise to a moral sense. We developed the cognitive mechanisms to evaluate the moral status of forms of conduct, such as altruism, self-control, and fairness, in order to solve problems unique to our species.

In *Origins of Morality*, Krebs maps out a timeline of the most prominent events that gave rise to prosocial dispositions. In *Moral Foundations*, Haidt justifies five moral foundations with reference to psychological literature. These scholars present a great deal of evidence for the view

that the majority of our moral judgements begin with “moral intuitions” and that “moral reasoning” is often initiated by social requirements to explain, defend, and justify those intuitions (Haidt 66). The modules present at birth are “learning modules”, that is, they are innate templates or “learning instincts” whose function is to generate a host of more specific tendencies as the child develops (Haidt 64). Moral foundations constrain the kinds of moral order than can be built; this does not mean that they are finished moralities or that they are limited to the ones that Haidt mentions. What I attempt to demonstrate in this section is that the problems posed by ancestral and modern environments imply a few significant features of human morality: that monist conceptions of morality – attributing one overarching feature to morality – does not reflect our evolutionary or cultural development; that moral intuitions occur rapidly and moral reasoning often occurs after the fact; that individual-level and gene-cultural evolution have both played a role in shaping morality; and that the evolution of moral judgements have a rich history of the cultivation of domain-specific functions that generate innate dispositions for prosocial behaviour, always tempered by local culture. In other words, morality is pluralistic, modular, organized in advance of experience, and responsive to cultural environments. I will rely on Krebs for the timeline of the most prominent ancestral events that cultivated our moral sense and will then make brief mention of some of the psychological studies that support this model.

Genes, Pro-sociality, and Mental Mechanisms

According to Krebs, there were three great discoveries about evolution after Darwin: (a) the recognition that genes constitute the primary unit of inheritance, (b) that when people band together to foster their interests, they inevitably experience both confluences and conflicts of interest, and (c) that mental mechanisms play a large role in the rise of moral judgements, behaviours, and emotions (57).

In the center of cells are chromosomes composed of genes. In every human, there are twenty-three pairs of chromosomes in each cell, and each chromosome holds thousands of genes. The discovery of the role of genes revolutionized evolutionary theory. We are very similar genetically to other animals, especially chimpanzees, and the genes that constitute the difference in species is a small subset of the total number of genes which make up the genome of living organisms. Theoretically, then, it would take only one gene from our genome to produce animals as different as mice and elephants, because one gene could control the expression of the other genes in the animals' genome (Krebs 14). Genes produce replicas of themselves, and they oversee the construction of the body by directing the synthesis of proteins. It would be in our ancestors' interest to pass on genetic information that dispose their offspring to be better suited to their environment. This provides an explanation of how a trait like altruism, which disposes individuals to sacrifice their survival and reproductive success for the sake of other individuals (offspring or near kin), could evolve (Krebs 59).

It is not difficult to see how social traits in animals may contribute to their ability to survive and reproduce. As Linnda Corporael suggests in *The Evolution of Truly Social Cognition*: "to the extent that exploiting a habitat may be more efficient as a collective rather than an individual process, not only would more successful groups prevail, but so also would individuals that were better adapted to group living" (282). Those are the dual benefits of social selection, when two or more individuals select traits in each other: not only does it affect the survival and reproductive success of recipients, it also affects the survival and reproductive success of the actors.

The selective pressures which gives rise to both adaptations – the pursuit of self-interest and social cooperation – inevitably produce conflicts of interest (Krebs 61). Conflicts of interests were both good and bad for our ancestors. On one hand, if there were not conflicts of interest

among people and societies, it is difficult to see how concepts of right and wrong could have arisen (Krebs 61). On the other hand, conflicts of interest have the potential to disintegrate groups that contain enough individuals who have decided that the pursuit of their self-interest comes at a lesser cost to them than cooperation. In order to mitigate the possibility of collapse, we needed to evolve social strategies (Krebs 61).

The need for our ancestors to evolve prosocial behaviours led to the development of appropriate mental mechanisms. However, before I get into mechanisms, I should provide a cursory glance at the evolution of prosocial behavior.

The Evolution of Prosocial Behaviour

Deference

In our evolutionary history, and in the evolutionary history of many species, there are prototypic adaptive problems that are conducive to developing certain social dispositions. One of these is the problem of resources (Krebs 77). Every species needs resources to help it survive, relative to its biology and circumstances. Krebs asks us to imagine a typical scenario where two animals want the same resource. In such an event, each animal has three basic choices: (a) to try to take the resources for itself, (b) to permit the other animal to take the resource for itself, or (c) to share it (Krebs 77). The frequency of such events disposes animals to develop social strategies necessary to cognize the relative power, agility, and cunning of their opponent. It is not enough for animals to merely fight to their potential death every time a resource that they want could be taken; the cost of fighting an opponent may outweigh the cost of leaving it be (Krebs 78).

A similar social strategy can be employed in dominance or status hierarchies. Evolutionary history is rife with examples of social groups whose members set up systems of affairs that dispose certain members to have more power, status, or resources than others (Krebs

78). Although size and physical power are significant sources of dominance in primate species, so is their status among their group. Members of a group that “possess specialized knowledge, that have leadership abilities, that are socially skilled, that uphold the implicit norms of their groups, and that display a willingness to foster the cooperative interests of a group” are held in high regard by their peers (Krebs 79).

This is where deference comes in. According to Krebs, our prosocial behaviour of deferring to an authority originated as a way to combat the issues of resource scarcity and hierarchal disputes. Deference stems from primitive hormonal processes; there are positive correlations between status and levels of androgen and serotonin in primates, which engender positive emotional states that induce animals to hold their position or to try to elevate it (Krebs 79). But deference is also beneficial to low-ranking members, who typically benefit from protection, leadership, and intervention in disputes. More importantly, in groups, everyone’s survival depends on everyone else, so there is a necessity for social strategies to emerge for members to maintain and hone those relationships (Krebs 79). Whilst deferential dispositions are good strategies in some cases, when perceived costs of deference outweigh benefits, tension occurs. This tension disposes low-ranking members to violate norms more readily than high-ranking members in order to change their circumstances (Krebs 79). This evolutionary pattern – an arms race between deferential dispositions and biological selfishness – predicts some of the arrangement of hierarchies today in human societies; for example, our complex web of egalitarian and dominance hierarchies. Deference is relevant to the development of our moral sense because it involves the suppression of selfishness to maximize one’s overall gains.

Self Control

As humans, we are prone to both over-indulgence and to self-control. The reason for this is because in our evolutionary history, we needed to adopt both strategies for particular circumstances. Gluttony and lust had the adaptive property of optimizing caloric intake in resource-scarce environments (Krebs 92). Consuming as much food as possible in one sitting is a good strategy for animals for whom food is an undependable resource. But as the kinds of social strategies necessary to maintain cooperation in groups increased, so did the necessity to put aside certain selfish dispositions. People who indulge themselves in stable environments jeopardize their own welfare, which reduces their ability to help others. In order for low-ranking members to maintain the security that comes with group living, they needed to develop certain social dispositions, like cowardice. Cowardice stems from fear. Members of species low on the food chain that were cautious, fearful, and quick to take flight fared better than more confrontational low-ranking members (Krebs 93).

Altruism

According to Krebs, altruism can be divided into three types: sexual selected-, kin selected-, and group-selected altruism (98).

Since animals have an interest in producing copies of their genes, sexual selection plays an important role in our evolutionary history. Some of those selective pressures were conducive to altruistic tendencies. It is in each individual's genetic interest to mate with partners who possess the most viable complement of genes to accompany his or her own complement in the journey to the next generation (Krebs 98). Animals do not just randomly mate with anything they can; they look for individuals with traits best suited to pass on their genes, and with that comes the pressure to demonstrate to other individuals that they possess traits that make them a viable

candidate. Sexual selection was an important part of human evolution because we produce less offspring relative to other species and our children require a great deal of parental investment (Krebs 99). The willingness and ability to improve the welfare of others signals the traits necessary to survive and reproduce in various social structures (Krebs 100). Heroic animals that risk their lives to save members of their groups display their ability to survive in the face of threats that others are either unwilling or unable to endure. In addition to this, heroism is often rewarded, and even if animals die performing such acts, their mates or offspring may benefit (Krebs 102). Humans possess altruistic dispositions, but they equally possess the capacity to behave in selfish ways. Krebs suspects that early human groups were a mixture between forming nuclear families and polygamous relationships (Krebs 103). Flexibility in mating strategies implies flexibility in altruistic dispositions.

Kin selection is the social strategy of favouring the reproductive success of one's relative versus one's nonrelative (Krebs 111). The prolonged dependency of human infants played a role in developing caring dispositions. It increased the value of mates who possessed caring dispositions and dispositions to nurture offspring (Krebs 107). Although kin selection may lead us to expect animals to distribute their altruism in proportion to the degree of relatedness to recipients, it does not quite work that way. It is not that the degree of relatedness is proportionate to the degree of help, rather, that when all else is equal, people are more likely to help a brother over, say, a cousin (Krebs 110). This is a well-documented aspect of human behaviour, with multiple studies showing that people are strongly disposed to help their kin and tend to favour close over distant kin (Krebs 114).

The idea that altruism has evolved through group selection is popular because it is plausible that groups that contain individuals who are disposed to cooperate with each other and

sacrifice their individual interests would prevail over groups of selfish individuals in intergroup competitions (Krebs 117). Social strategies, such as the ability to manipulate others for one's own gain, could provoke others to behave in ways that increase their overall fitness. "Humans manipulate others into behaving in biologically altruistic ways by acting as though they are their kind, by exaggerating the value of the assistance they have proffered to them, by misrepresenting their values as mates, by praising altruistic martyrs, by persuading others that altruism pays off, and so on" (Krebs 122). In other words, the adaptive qualities procured by altruism within groups is, partly, the capacity to present oneself as committed to the interests of the group as to one's own kin, which is beneficial to maintaining one's status. But due to this, people also developed complex reasoning procedures to detect deleterious manipulative tactics, which is what Krebs refers to as the "imperfect design" of altruism (122). In this regard, the evolutionary process that enabled people to detect others' attempts to manipulate them through persuasive messages is incidentally the same ability that gave people the capacity to answer abstract questions about what they really want out of an exchange. Thus, altruism in humans could also be an incidental by-product or spandrel of reasoning abilities that evolved to serve other adaptive functions (Krebs 122).

Cooperation

Some of the functions that underlie cooperation have already been mentioned. The first is mutualism, which is when animals work together to obtain a resource and share it (Krebs 126). The adaptive logic is that sometimes animals end up with more they would have if they tried to obtain the resource on their own (Krebs 126). Sharing and turn-taking is adaptive when the benefit from settling for part of a resource is greater than the benefit of competing for the entire thing. The second relevant function is reciprocity, which has altruistic and selfish tendencies.

Under the conditions that produce an arms race between group stability and biological selfishness, humans need to develop the tact to be conditionally cooperative (Krebs 131). A cost of being unconditionally cooperative is that it is easy to be taken advantage of, while a cost of being unconditionally selfish is that you are likely to be excluded from the protection of your group (Krebs 13). So, conditionally cooperative behaviour that avoids exploitation was an adaptation to the ever-increasing demands of exchange among various social groups. Conditional cooperation involves a tit-for-that strategy, which is to “invite mutually beneficial cooperative exchanges by making low-cost giving overtures to others, then copying their response” (Krebs 131). This is a form of reciprocity that not only holds individuals accountable for their behaviour, but also rewards cooperating with people who have a reputation for being cooperative. Again, however, the dichotomies of our adaptations are also apparent in the development of cooperative dispositions. Mechanisms designed to deceive others and mechanisms designed to catch and punish cheaters have evolved side by side in an arms-race manner.

Very few species seem to have the cognitive capacity to maintain conditionally cooperative relationships. One of the features of conditional cooperation is delayed reciprocity over long periods of time, which has a high cognitive cost. Krebs suggest that this form of reciprocity is specific to animals that live in stable groups, have large brains, and strong memory (134).

The Psychological and Neurological Sources of Primitive Prosocial Behaviours

Primitive mechanisms evolved in our early ancestors to induce people to behave in ways that helped them solve various quandaries. Primitive mechanisms are located in the inner recesses of the brain, directly below the newer brain circuitry that regulates our cognitive

capacities (Krebs 143). Physiological and mental processes that induce people to experience emotions influence their behaviour. Emotional experiences are by-products of these procedures.

Deference is a prosocial behaviour that evolved to meet the demands associated with resource management and dominance/status hierarchies. It was beneficial for our ancestors to be disposed to deferential treatment. The two types of emotions that dispose people to behave in deferential ways are (a) feelings of fear and insecurity, and (b) feelings of admiration and awe (Krebs 147). Fear disposes to people to show deference to powerful and intimidating authorities in order to avoid punishment. Alternatively, awe and admiration induce support for those whom they look up to and seek approval, both of which contribute to psychologically altruistic tendencies (Krebs 148).

Altruism is a prosocial behaviour that evolved to meet the demands associated with sexual selection, kin selection, and group selection. Additionally, it seems altruistic tendencies are also potentially maladaptive by-products of the development of our reasoning capacities. This gave rise to a number of complex emotions. People often rightly associate altruism with sympathy and empathy, which work in subtly different ways (Krebs 148). Sympathy is evoked by others' suffering and involves an emotional state that is negative in nature. In contrast, empathy may involve positive or negative emotions, depending on whether it is evoked by others' pleasures or their pains. It involves experiencing others' affective states vicariously and sharing their emotions (Krebs 148). Sympathy involves trying to understand another's suffering. This is a complex motivational state with the goal of increasing another's welfare (Krebs 149). Empathy functions more like personal distress; a primitive mechanism that motivates palliative behaviours. Someone can reduce their personal distress by helping another in need or by looking away (Krebs 150). Other altruistic emotions include love and feelings of solidarity (151-152).

Love disposes individuals to behave in caring and devoted ways. Feelings of solidarity elicit commitments which uphold the norms of their groups, even at some expense to those who feel them.

Cooperation is a prosocial behaviour that evolved to meet the demands of reciprocity under conditions of complex social dynamics. Emotions like anger and indignation motivate those who have been cheated to punish those who cheated them, even when it is costly to do so in the short term (Krebs 155). Guilt motivates cheaters to regret exploiting others and to make amends (Krebs 157). Feelings of forgiveness induce people to re-establish cooperative relationships with those who have cheated them (Krebs 157). Pride reinforces behaviours that elevate people's status. Gratitude promotes the reciprocation of favours.

Krebs refers to these primitive tendencies as moral emotions. All of these emotions foster inclusive fitness by inducing people to resist temptation to promote their short-term personal interests at the expense of their long-term biological and genetic welfare (Krebs 158). The reason that people are adapted to be both selfish and altruistic is because the contingent adaptive pressures of our evolutionary history promoted the use of both traits depending on the problems that they were trying to solve. The adaptive qualities of prosocial behaviour and the primitive dispositions that induce people to promote the welfare of others at the expense of their short-term gains take us closer to answering the question of how humans developed their moral sense.

So far, Krebs has provided an account of the evolutionary development of deferential, altruistic, and cooperative dispositions. There were a number of problems that were posed by the environments that our ancestors faced. We evolved pro-social behaviours to reap the benefits associated with group-living, and we evolved emotions to behave in ways that increased our ability to reproduce copies of our genes. The question for morality, however, is why some people

behave in ways that have no direct or even indirect benefit to themselves. Why are some people predisposed to give without the expectation of return? The answer lies in the development of our cognitive capacities and the transition from foraging societies to hunter-gatherer bands. It is when our environments demanded that we think abstractly and learn how to manage the complex balance of egalitarian and status-driven societies that we developed a moral sense. We evolved the capacity to appreciate abstract ideas, like formal law, control our aggressive urges, plan for the future, and make philanthropic contributions; all uniquely human prosocial behaviours (Krebs 163).

Uniquely Human Prosocial Behaviours

The cultural development of modern communities is highlighted by four stages: (a) small foraging groups, (b) hunter-gather bands, (c) tribal coalitions, and finally (d) modern communities (Krebs 163).

Early Foraging Societies

In early human societies, approximately 45-100,000 years ago in the Pleistocene era, we had already developed deeply-imbedded prosocial dispositions that adapted us both to deferential and dominant behaviours (Krebs 164). We lived in small mobile groups of a few extended families and acquired most of our food from foraging. We were organized hierarchically, with opportunities for lower-ranking members to climb the social ladder (Krebs 164). We did not have formal law at this point; we maintained order by intervening in conflicts and inflicting punishment where necessary.

Hunter-Gatherer Bands

Krebs describes four major transformations that eventually lead early human societies to form hunter-gatherer bands: (a) mobile groups increased in size, (b) social orders became increasingly egalitarian, (c) systems of direct reciprocity became systems of indirect reciprocity, and (d) groups as a whole assumed responsibility for enforcing norms (Krebs 165). Around this time, we developed social norms aimed at upholding long-term objectives, became sensitive to the violation of those norms, and learned how to suppress cheating and prevent high-ranking members from going too far (Krebs 165). This marks the change from hierarchically-organized groups to an admixture of egalitarian and status-driven norms, an essential feature of modern societies.

Tribal Coalitions

Not too long after the advent of hunter-gather bands, we noticed the social utility in forming tribal coalitions, particularly to protect ourselves from other bands. We evolved our capacity to protect ourselves from and to collaborate with increasingly diverse populations (Krebs 165). The bigger our societies got, the more we needed to set up common languages and norms.

Modern Societies

Modern societies are attributed to the advent of agriculture some 11,000-12,000 years ago (Krebs 165). With the progress made through divisions of labour and the ease with which larger societies could conquer smaller societies, the size, productivity, and military success of societies grew to unprecedented levels (Krebs 166). The inception of the city-state began approximately

5000 years ago, which in turn expanded the exchange of goods and services, divisions of labour, and the development of political and class structure (Krebs 166).

How did humans evolve the prosocial behaviour and cognitive capacities to solve the problems associated with complex modern societies? So far, we have discussed what those behaviours were, but there is debate about the precise nature of their evolution.

The Evolution of Uniquely Human Prosocial Behaviour

The evolutionary development of the prosocial behaviours that underlie the fabric of modern environments is debated to this day. The most prominent theories are individual-level theory and gene-cultural theory.

Individual-Level Theory

Individual-level theories base the development of uniquely human prosocial behaviour on individual-level adaptations. One of the unique arrangements of human societies is the admixture of egalitarian and hierarchical structures. Primatologist, Christopher Boehm, suggests three adaptive benefits of egalitarianism: (a) it enables members of groups to maximize gains from cooperative activities, (b) it suppresses dominance in certain instances to promote group harmony and (c) it provides a way to avoid being dominated by others (Krebs 174).

Another uniquely human prosocial behaviour is indirect reciprocity (Krebs 176). It is uncommon in the animal kingdom to find reciprocal exchanges that are not instantaneous. It requires certain high level of brain capacity to remember and establish norms that appreciate delayed responses in reward. Individual-level theorists believe that our cultivation of indirect reciprocity was due to the increasing returns implied by it: “as people invested more and more time and effort in systems of indirect reciprocity, it generated increasingly large returns” (Krebs

176). This is not to suggest that prosocial behaviour is always favoured, as it can also be beneficial to behave exploitatively when such an opportunity is more beneficial than costly to the actor (Krebs 177). One example of this is when people manipulate others into thinking that the long-term benefit to an exchange is better than it actually is, e.g. the sub-prime mortgage crisis. This is why it is expected, from an evolutionary point of view, that people are predisposed to both types of behaviour, which is what we see today.

Gene-Cultural Theory

According to critics of individual-level theory, a problem with it is that ancient social instincts that evolved through kin selection and reciprocity pose unanswered questions when applied to larger groups. For example, it does not make sense to suggest that the reason people join thousands of other protestors to challenge a law is merely to reap the adaptive benefit of group conformity (Krebs 178). There are plenty of examples where humans make sacrifices to uphold their groups that do not necessarily increase their inclusive fitness. Whilst gene-culture theorists appreciate the power of the adaptationist framework to account for primitive group selection, they suggest that it was culture's impact on our genetic makeup that paved the way for the formation of larger groups, the transmission of certain cultural patterns from one generation to another supplying the basis for a shared identity (Krebs 179). Groups that promoted cooperation with neighbouring groups were best suited for conditions that included "symbolic markers" (Krebs 179). These enabled human populations to increase in size and for individuals to distinguish themselves from out-groups without recognizing them personally (Krebs 179). These symbolic markers include, but are not limited to, similar languages or dialects, forms of dress, and a set of rituals. One of the prosocial dispositions that arose from culture is what Richerson and Boyd call tribal instincts, which dispose people to identify with in-groups that are

distinguished by symbolic markers, and to abide by culturally created rules and norms that uphold their groups (181).

Individual-level theorists believe that “tribal instincts” can be explained through traditional individual-level processes such as kin selection, direct and indirect reciprocity, and costly signaling (Krebs 182). First, abiding by certain norms produce net genetic gains relative to other forms of conduct, and whilst certain kinds of behaviour may be costly now, they were likely to have been adaptive in the ancestral environments in which they evolved (Krebs 182). So, it is expected that people may do things which do not necessarily increase their inclusive fitness. These behaviours can be accounted for in terms of the automatic and subconscious activation of mental mechanisms that evolved through individual selection in small groups (Krebs 184).

Which theory holds up?

What Krebs suggests is that the two theories are not mutually exclusive, a view that I support (186). Evolution and culture play an integrative role in the development of our moral sense. Our history is built from a foundation of primitive inclusive-fitness-increasing forms of prosocial behaviour, which may unexpectedly induce people to behave in fitness-reducing ways in modern environments. But culture and symbolic markers also play a significant role in the evolution of moral dispositions. The ability to engage in symbolic communication, along with the cognitive mechanisms that endow us with unique intellectual abilities, were all necessary for the development of morality. I will return to this discussion in my chapter on the evolution of disgust.

Psychological and Neurological Sources of Uniquely Human Forms of Prosocial Conduct

It is debated which events promoted the expansion of the human brain. Krebs suggests that it was likely variations in climate and other sources of ecological uncertainty that elevated the adaptive value of cooperative food gathering and hunting, which in turn elevated the adaptive value of behaviours necessary to coordinate those efforts. Certain prosocial dispositions, such as social learning and language abilities, would have facilitated coordinating cooperative social relations and passing them on to the next generation, while certain intellectual abilities such as expanded memory, reason, and language were instrumental in the expansion of social instincts (Krebs 192). Krebs suggests that these intellectual abilities enabled ancestors to construct symbolic representations of the world in their minds, to manipulate them with imagination, and to communicate the results to other people (192). The ability to consult, manipulate, and retain our thoughts required the development of new brain circuitry over top of older brain circuits that coded for more automatic and predictable responses. This new brain circuitry gave rise to more complex prosocial dispositions, such as social learning, enhanced memory, predictive tools, cognitive representations, and language.

Social Learning

Humans are capable of creatively modifying their conduct to copy others in ways that increase their effectiveness and to pass on those insights to future generations. They can store cognitive representations of abstract concepts and imitate conduct in appropriate contexts after long periods of retention (Krebs 192).

Memory

People create worlds in their minds that they can return to and consult on how they should behave in the future (Krebs 193). In order to reap the benefits of indirect reciprocity, individuals needed to be able to remember who they have helped and who has helped them.

Complex Cognitive Representations

One of the reasons that we can cultivate self-control is because we can abstract pictures in our minds of the potential rewards for delaying our gratification. Enhanced neural capacity allows us to put automatic responses aside for more abstract cognitive representations. In a study by Michael et al., children were more likely to delay gratification from delicious foods when they thought about the stimulus in “cold” ways, such as comparing the food in their minds to something inedible, as opposed to “hot” ways, such as imagining its delicious taste (Krebs 194).

Predictions and Planning

Humans are able to coordinate an enormous array of information, weigh the various pros and cons, and anticipate long-term consequences (Krebs 194). The ability to do this enables us to sacrifice short-term interests for long-term benefits, such as investing in long-term relationships, and doing our share for the community,

Reason

Reason enables us to draw inferences from given information, formulate mental representations, and test the logical consistency of our ideas (Krebs 194). Despite what most people and even Darwin himself assumed, the function of reason seems to be less that of deriving the truth than it is about solving certain adaptive problems (Krebs 195). We have also

discussed how creative inference may give rise to prescriptions about appropriate courses of action that are not necessarily adaptive, such as protesting a law perceived to be unjust.

Mind Reading

Humans are able to take the perspectives of others and to construe mental images of their outlook in their minds (Krebs 195). It is psychologically beneficial for one to help another correct an emotional problem which the former has also incorporated into themselves. When we internalize images of other people's situation, we may experience them as a sort of audience, making us feel accountable (Krebs 195). Mental mechanisms that enabled humans to understand what others were thinking, feeling, and planning would have enabled those who possess them to fare better in strategic social interactions than those who did not.

Language

Language is the most explicit way that people communicate their ideas, cultural norms, and refine their thoughts and behaviours (Krebs 196). People also use it to induce others to obey rules, defer to authorities, and to behave cooperatively. It enables people to coordinate on matters in an organized way and to resolve conflicts through dialogue and negotiation. I will justify an unconscious narrative lens with reference to the evolution of language in Part 2.

Old Brain and New Brain Mechanisms

The cognitive capacities associated with the prefrontal cortex build upon older mechanisms in the inner recesses of the brain. This is what underpins cognitively-advanced forms of empathy and sympathy (Krebs 198). We began with simple forms of empathy, consisting of emotional reactions that generate the motivation to relieve one's personal distress, evoked by the distress of others (Krebs 198). Then we developed the capacity to assess people's

situation and to try to understand what caused it, which is known as cognitive empathy. This gave rise to sympathetic behaviours, such as consoling people who have been harmed. Finally, we acquired the cognitive tools to understand how other people are thinking and feeling, which in turn allowed us to refine our empathetic reactions (Krebs 198). The neurological data confirms that there are subregions of the prefrontal cortex that mediate the interaction between primitive types of emotional contagion and more complex cognitive processes (Krebs 199).

The Moral Foundations of Primitive Mechanisms and Prosocial Behaviour

Using Krebs' insights, I have provided a summary of the origins of uniquely human prosocial behaviour building on the foundations of emotional and behavioural distinctions between care/harm, fairness/cheating, loyalty/betrayal, and authority/subversion.

The care/harm foundation has its roots in the cultivation of prosocial behaviours that evolved to meet the demands associated with sexual selection, kin selection, and group selection. Feelings like empathy and sympathy motivate people to help others in need or to see things as others see them. Love disposes individuals to behave in caring and devoted ways, and feelings of solidarity elicit commitments which uphold the norms or security of their groups. Another relevant model for caring vs. harming impulses is Bowlby's attachment theory. He suggests that children come into the world biologically programmed to form attachments to others because this helped them survive in evolutionary conditions (Bowlby 51). The function of attachment behaviour is protection from predators, which affords the opportunity for the infant to learn from the mother's behaviour necessary for survival. Animals that stay bunched together with others of their kind are more likely to survive, so attachment behaviour may have been prevalent in ancestral conditions. Animals that are vulnerable to predators are more likely than others to develop attachment behaviour, e.g. young children or the sick. And human parents have to take

care of their offspring for unusually long periods of time before they can do things on their own accord (Bowlby 190). These are some of the justifications for a predisposition in humans to formulate and justify issues related to care and harm in modern communities.

The fairness/cheating and loyalty/betrayal foundation has its roots in cooperation, a prosocial behaviour that evolved to meet the demands of reciprocity and complex social dynamics. Emotions like anger and indignation motivate those who have been cheated to punish those who cheated them. Guilt motivates cheaters to regret exploiting others and to make amends. Feelings of forgiveness induce people to re-establish cooperative relationships with those who have cheated them. Pride reinforces behaviours that elevate people's status, while gratitude promotes the reciprocation of favours. Prosocial behaviours like mutualism and reciprocity dispose members of a community to make short-term sacrifices for long-term advantage and to use social strategies to gain part of a resource that they would otherwise not have. With the evolutionary arms race between biological selfishness and prosociality, it was necessary for our ancestors to develop the tact to be conditionally cooperative. The desire for fairness, thus, has its roots in reciprocal exchanges that hold others accountable. This lays the foundation for what Trivers calls "reciprocal altruism", which is the idea that a giver incurs a small cost to produce a great benefit for a taker (45). The hope is that as a result, the taker will be a reliable and productive member of the group. Some forms of reciprocal altruism include sharing food, sharing ideas, and helping the sick or wounded. Most notably associated with loyalty vs. betrayal is the advent of tribal instincts, which disposes people to identify with in-groups that are distinguished by symbolic markers.

Finally, the authority/subversion foundation has its roots in deference. In times of resource scarcity, it is costly to fight an opponent every time a resource that one wants could be taken.

The same principle is true of hierarchies. Evolutionary history is rife with examples of social groups in which certain members have more power, status, or resources than others. Although size and physical power are significant sources of dominance in primate species, so is their status or prestige among their group. Deference stems from more primitive hormonal processes; there are positive correlations between status and androgen and serotonin levels in primates, which engender positive emotional states that induce animals to hold their position or try to elevate it. Deference is also beneficial to low-ranking members, who typically benefit from protection, leadership, and intervention in disputes. This arms race between deferential and selfish dispositions predicts modern conditions we see today that are built on authority and subversion.

The Origin of Morality

In Krebs' view, a sense of morality is a feeling or thought that someone – whether it be oneself or another – is obliged or ought to feel, think, or do something. Many animals, especially our closest relatives, have the capacity to feel guilt about their actions, to conform to the dictates of their group, and to place sanctions on members who violate their rudimentary norms. But a sense of morality is a set of ideas concerned with *how* people who live in groups should behave in order to meet their needs and advance their interests in cooperative ways. We are deeply invested with the intention to feel, think, say, or do something for the right reasons, e.g. a sense of duty, justice, or righteousness (Krebs 203). We are not inclined to call someone a moral person who is forced to do a good deed; how we achieve our goals is just as important to us as the benefits in achieving them. In order to get to that advanced stage, we needed to develop a conscience, a sense of obligation, sentiments about others, and abstract ideas about morality. The function of moral sense is to achieve the same goals that prosocial behaviours evolved to achieve, which is disposing oneself and inducing others to esteem their long-term interests over

their short-term gains to promote the social order and welfare of their groups. Whilst the function is relatively the same, the demands of modern society requires more complex evaluations than those of primitive social strategies.

In Haidt's view, the origin of morality is associated with the inception of shared intentionality, which is "the ability of multiple people to hold a shared mental representation of what they are trying to do together" (109). Some animals, like chimpanzees, have a sense of norms and expect certain kinds of behaviour, but their concern is with objects or events that have direct implications for self-interest (Haidt 109). Human shared intentionality, on the other hand, is interested in the violation of third-party normative judgements and in building communities that concentrate their attention on the prosocial thoughts and behaviours of their members. Gossip about fairness, for example, is ubiquitous in ancestral and modern environments.

My view is that these two conceptions of morality are complementary. The evolutionary development of a sense of rights, righteousness, and justice within an ancestral history of individual-level adaptations and gene-cultural evolution would have produced a dual interest in the moral judgements of individuals and groups as a whole. We care that people do things for the right reasons, but we also care about the interests of the community at large.

Self-Surveys, Implicit Measures, and Neuroscience Methods

In a study by Graham et al. in 2011, researchers provided participants with a set of normative statements, e.g. "It can never be right to kill a human being", and asked them to evaluate these on a scale of 0 to 5 depending on how relevant they are to their decisions about right and wrong (369). For example, if the statement included the qualification "whether or not someone suffers emotionally", a participant would have to rate how relevant this statement would be in their decision about whether something is right or wrong. They did a second study to

assess levels of agreement with more specific and contextualized moral-judgement statements (Graham 369). Their data comprised 34,476 adults, 37% of which were women (Graham 371). The results demonstrated that concerns about harm and fairness are so widespread that they might be said to be universally used foundations of morality (Graham 380). However, the data also confirmed that people are concerned about the proper relationships of individuals to groups, authorities, institutions, roles, and how we treat our own bodies. In a separate study about the relationship between affect and moral foundation, Young et al. hypothesized that accidental harm would be judged less morally wrong than accidental incest, and that people would judge purity violations as more disgusting than harm violations (203-208). The results of the study supported the researchers' hypotheses (Young 203-308). This provides some evidence that the involvement of disgust elicitors influences our moral judgements, that certain moral values can be attributed to characteristic emotions, and that perceptions of bodily and spiritual purity have a distinctive role to play in moral judgements.

Payne et al. presented participants with a "prime picture" and a "target photo", and then asked them to judge the target photo as pleasant or unpleasant (280). The researchers hypothesized that if the participants were flashed an unpleasant prime picture before a target photo, they would be more likely to judge the target photo as unpleasant, with the same logic applied to pleasant primes (Young 277). The researchers were interested in how easily we can be manipulated to misattribute our judgements, i.e. mistaking an effect of one source for the effect of another (Young 278). To test this, they did a series of four separate experiments. They asked participants to sit in front of a computer and informed them that the study was examining "how people make simple but quick judgements" (Young 280). They were told that they would see pairs of pictures that flashed one after the other, the first one being a real-life image and the

second being a Chinese character (Young 280). The first image is called a “prime” picture because it is priming an affective response from the participant, while the second image is the “target” picture because it is the picture that participants are asked to evaluate. The participants in each experiment were instructed to press separate keys labeled ‘pleasant’ or ‘unpleasant’ depending on how they felt about each Chinese character (Young 280). All four experiments worked much the same way, but with subtle differences. The first experiment gave no warning to the participants about the nature of the study, while the second experiment warned the subjects that sometimes the photographs presented prior to the Chinese characters could bias their responses (Young 280). The results of the first two experiments were similar: participants were most likely to judge the target photo as pleasant following a pleasant prime and least likely to do so following an unpleasant prime (Young 280). The researchers were curious whether the short amount of time that they gave participants between seeing the photos and pressing the keys had any effect. So, they conducted two more experiments. The first added more time for the participants to witness the prime picture, and the second added more time for the participants to evaluate the target photo (Young 282-83). Nothing changed with the third experiment, but longer target presentations demonstrated a significant decrease in priming (283). However, priming remained the most significant factor in projections about the target photos. These studies lend support to the idea that our affective responses have a great deal of influence on our judgements.

In a psychophysiological study by Cannon et al., electrodes placed on participants’ heads measured frontal brain activity while they listened to recorded statements about other people (326) The experiment was divided into two blocks with a break in between. In the first block, facial muscle activity was recorded while participants considered certain moral behaviours, and in the second block, the same behaviours were repeated in a different order. After hearing each

statement, the participants were asked, “how negative or positive was this behaviour?”, which they were to evaluate on a 7-point scale (Cannon 327). The statements in question covered the five moral foundations, for example, a statement associated with fairness might say “someone cheated in a game of cards”. The researchers studied the electromyographic data from four recording sites: the inside brow (corrugator supercilia), the cheek (zygomaticus major), nose (levator labii), and forehead (medial frontalis). As predicted, purity violations resulted in the greatest increase in levator activity, which is the part of the face responsible for raising the top lip during a facial disgust expression. When thinking about issues related to harm, there was a significant increase in the corrugator muscle, which is responsible for knitting the brow when frowning. This study lends support to the idea that different moral behaviours are associated with different characteristic emotions.

In a neuroscientific study, Van Berkum et al. asked two groups to complete a realistic attitude survey on societal matters while researchers used an EEG to track and record electrical activity in the brain. The first group consisted of members of a strict Christian political party while the second group consisted of non-Christians who voted for political parties that took diametrically opposed stances on the same issues (Van Berkum 1092). The researchers were interested in the event-related potential response or ERP to the first word that indicated a statement that clashed with the subject’s value system (1093). An ERP is the measured brain response that is the result of a specific sensory, cognitive, or motor event. For both groups, the researchers compared ERP responses to value-inconsistent words with ERP responses to value-consistent words, e.g. comparing “euthanasia is acceptable” to “euthanasia is unacceptable”. A certain kind of ERP is called late positive potential or LPP, which is an ERP component over visual cortical areas that is modulated by the emotional intensity of a stimulus. Negatively

valenced stimuli tend to generate stronger LPP responses than positive ones, which makes evolutionary sense, as it is generally more important to pay attention to potentially aversive stimuli. The researchers constructed 150 statements that they expected each group to disagree over and studied their ERP responses (1094). The study demonstrated that the first word in a sentence dictating that a statement clashes with the reader's value system elicits a very rapid and characteristic neural response (1095). The control words, the neutral words in the sentence such as "I think it is acceptable..." elicited no differential ERP response. This research suggests that strongly disagreeable words and statements recruit additional processing resources, taking strongly value-inconsistent words and statements as potentially aversive stimuli that warrants extra attention (1097). This study lends support to the idea that we have innate, domain-specific triggers in the brain, especially when the stimuli is perceived to be aversive.

In another neurological study, the participants had sustained brain injuries in the ventromedial area of the brain, which is associated with emotion processing (Krebs 208). The study found that the participants' judgments in real-life moral decision-making was radically impaired, and that they were more inclined to behave in selfish and uncaring ways. They understood the difference between right and wrong, as shown when they were tested on what they would do in hypothetical moral scenarios, but they did not feel the difference because they did not experience emotions such as shame, guilt, or gratitude (208). The same study also showed that the participants failed to take intention into account in hypothetical scenarios. In one scenario, they judged someone who accidentally killed another person more harshly than someone who attempted to kill another person but failed. These findings seem to indicate that moral judgement for the average person requires both a logical assessment of intention and an emotional reaction to the assessment. This model supports the view that human conscience stems

from “a blending of...emotional experiences, which are ubiquitous in mammals, with emotional and cognitive mechanisms that are typically human” (209). This helps illustrate the mediated nature of moral judgement, which mobilize a complicated ensemble of strategic social interactions, primitive and cognitive information processing, and social conditioning.

Finally, in a famous study conducted in 2001, Joshua Greene and colleagues used functional magnetic resonance imaging (fMRI) to demonstrate how the brain uses different regions to assess the moral status of the hypothetical scenario of the now infamous trolley problem (Krebs 229). The researchers introduced two different scenarios to their participants. In the first scenario, the participant is a bystander to a moving train that will most certainly kill five people unless they pull a lever to divert the train onto adjacent tracks (Krebs 215). The problem is that if the lever is pulled, the train will most certainly kill one person who is walking along the adjacent track. Should the participant throw the switch or not? In this no-win situation, most people believe that it is right to pull the lever to reduce the number of deaths. The second scenario is similar to the trolley problem, but this time there is a footbridge that spans the train tracks, on which stands a very heavy person (Krebs 215). If the participant pushes the person onto the tracks, they will save the five people. This time, however, most people do not believe that it is right to sacrifice one life to save the other five. When assessing the first scenario, people use more recent parts of the brain in the prefrontal cortex, which is associated with controlled, rational decision-making processes. When people assess the second scenario, their amygdala and medial prefrontal cortex light up, which are the areas associated with the processing of emotions (Krebs 229). This lends support for the idea that people have domain-specific functions to address different moral problems.

In this section, I provided insight from evolutionary theory and a variety of psychophysiological and neuroscientific studies to justify the view that morality is pluralistic, nativist, intuitionist, and cultural-developmental. Morality is pluralistic because domain-specific functions have evolved to address qualitatively different moral problems. This also means that morality is nativist, which suggests that the human mind is to a great extent organized in advance of experience with hundreds or thousands of functional modules (Haidt 99). Those innate dispositions manifest themselves in different ways, the most prominent being automatic responses, which were presumably cultivated in ancestral environments to address problems associated with resource scarcity and group dynamics. Finally, cultural development shapes the specific content of our feelings, thoughts, and behaviours, and in some cases changes the genetic makeup of our prosocial dispositions.

Part 2

On Disgust

It isn't about being or not being dead, it's about what you leave behind. – Martin McDonagh

Disgust's Origins and Symbolic Functions

The origins of disgust have been conjectured since Darwin, who believed that disgust was intimately related to taste. This is why disgust is associated with oral cues, e.g. nausea and facial expressions around the mouth. Andryas Angyal described the odors of certain objects as “offensive because they appear experientially as something which materially penetrates the nostrils and mouth, zones which are extremely sensitive to disgust-stimulating objects” (395). Rozin, Haidt, and McCauley believe that humans have a core disgust response that originally functioned to avoid the risks associated with food intake (758). Some scholars beg to differ. Daniel Kelly, for example, believes that disgust originated as a dual avoidance system to orally transmitted toxins and parasite contact (Rozin 758). And Valerie Curtis at the London School of Hygiene and Tropical Medicine believes that disgust is a catch-all term for a system in animal brains that serves to avoid infection (702). I sympathize with the RHM model that suggests that disgust originated from distaste, broadened to bodily pathogenic avoidance, and then cultivated a suite of symbolic functions in newly-cultural environments.

According to Rozin et al., the biological roots of disgust are still apparent in its facial expressions, characteristic behaviour, and physiological correlates (65). Those features are a common mammalian mechanism for rejecting distasteful and noxious foods, the function of which is to protect the body from harmful toxins. The evidence suggests that the behavioural and physiological components of distaste in animals is nearly identical to the expressive components

of disgust. There is plenty of evidence for an oral rejection system among non-human animals. In a notable example, Grill et al. of Rockefeller University did taste reactivity tests on mice to determine the acceptance or rejection of tastes in animals other than humans (263). They injected fifty microliters of taste stimulus into the mouth, specifically sapid sucrose, sodium chloride, hydrochloric acid, and quinine. When quinine – a bitter tasting compound from the bark of the cinchona tree – was injected in concentrations slightly above the minimal detectable, it elicited behaviour that the researchers associated with an oral rejection system. Using frame by frame video analysis, they discovered similar reactions among the rats: the mandible, or jawbone, rapidly opens to its maximal extent, the tongue protrudes rhythmically, the corners of the mouth retract, the head shakes from side to side, a face-forelimb grooming strategy occurs, consisting of contact between forelimbs, mouth, and face while the rat rears on its hindlimbs, and paw-pushing occurs, where the rat simultaneously extends one forelimb forward and retracts the other back, actively rubbing the forepaws on the floor (267-272). Quinine fits the criteria for an aversive stimulus, and the sequence of motions comprising the response to this substance appeared to facilitate removal of the fluid from the oral cavity (277). The head shake scatters oral fluid, the face-forelimb strategy rids the perioral region of accumulated fluids, the paw pushing wipes the fluid on the floor, and the gaping collects the fluid anteriorly in the oral cavity (277). Expulsion of the quinine solution was repeatedly observed, with fluid dribbling from the mouth and soaking the fur of the mandible (277). This was not the same reaction from the control solutions when quinine was excluded. These tests demonstrate that there are discriminative responses to taste in non-human animals. Research such as this suggests that it is likely in our evolutionary history that threats of disease and infection shaped our disgust response, especially as humans increased their intake of foods of animal origin and as group densities increased. The argument for a food

origin is convincing, as the behavioural, physiological, and expressive components of distaste are nearly identical to the prototypical disgust response seen in humans. In a discussion about Silvan Tomkin's affect theory, Steven Shmuraq describes disgust as a basic emotion characterized by behavioural responses such as head forward, lower lip pushed down, and tongue protruding (7). Chapman et al. in 2009 studied the facial motor activity of distaste, basic disgust, and moral disgust, and found that all of them evoked activation of the levator labii muscle region of the face, characteristic of an oral-nasal rejection response (1222). Husted et al. in 2006 demonstrated that the brain region most often activated in responses of disgust is the anterior insula which, among its other functions, is the gustatory cortex in primates (Rozin 758) Scholars are not in complete agreement about the prototypical disgust response, but the three main components of disgust seem to be the gape face, a retraction of the upper lip, and a nose wrinkle, which are movements around the mouth and nose that tend either to encourage discharge or to discourage entry. (Rozin 759).

Pathogenic microorganisms, though small in scale, pose large selection pressures on all long-lived, multicellular organisms (Tybur 67). In our evolutionary history, our distaste response was adapted to address a broad range of potentially infectious items, especially when environmental factors forced our ancestors to transition from a tree- to land-dwelling lifestyle. Animals and animal by-products are among the most prominent sources of infection, so it is not surprising that salient examples of disgust elicitors include food, body products, sexual behaviours, contact with corpses, violations of the exterior envelope of the body, and poor hygiene (Haidt 757). Humans have elaborate defensive physiological, cognitive, and behavioural adaptations that evolved because of the selection pressures posed by pathogens (Tybur 68). Maximal pathogenic avoidance is impossible, as many adaptive behaviours involve some risk of

exposure to infectious disease, such as sexual intercourse (Tybur 46). One piece of evidence for the link between disgust and pathogenic avoidance is disgust's association with reproductive immunomodulation. One of the results of pregnancy is that the body has to readjust its functions of detecting and attacking foreign entities to tolerate the presence of paternal genetic material (Fleischman 271). A cost associated with this is that females are more prone to infection during this phase. Fleishman et al. hypothesized that prophylactic behaviour should be enhanced during periods of increased susceptibility to infection. Fessler et al. confirmed this when they found elevated disgust sensitivity, primarily in the food domain, in the first relative to the second and third trimesters of pregnancy, a period of heightened vulnerability to infection (272). It has also been shown that meat, a principle source of foodborne illness, is frequently avoided during pregnancy.

The second property of disgust, offensiveness, was investigated by Andryas Angyal, who proposed that our disgust response depended on the intimacy of contact and the association made between sensory quality and the disgusting object (395). We are often disgusted by things that we associate with having left the body. For example, as soon as it is mentioned that eggs and milk come from the body, we are more likely to find their consumption disgusting (Angyal 396). Our disgust response is intimately tied to our capacity to associate a particular meaning with the waste products that induce revulsion. His main points are:

- (i) Frequent objects of disgust are the waste products of the human and animal body (401).
- (ii) We associate a meaning to those objects, which for waste products is that of something inferior or useless after it is expelled from the body (402).

- (iii) Our degree of disgust to the object will depend on its relevance to us, e.g. if it comes in contact with the mouth region or, worse, we ingest the object deemed disgusting, it can induce nausea or vomiting.
- (iv) Our disgust reactions show three aspects, highlighting symbolic, neuro-muscular, and neuro-vegetative features. Symbolic features are the experiential and mental aspects of the experience; neuro-muscular features are movements of the mouth that prevent penetration or eject the object(s); and neuro-vegetative features include the tendency to salivate and vomit (402).
- (v) A holistic interpretation of the phenomenon suggests that disgust is a manifestation of oral rejection, or defence against oral penetration. It is a protest against the incorporation of substances deemed inferior or base.

“Offensiveness” is not qualitatively different from behaviours that many animals produce to avoid objects deemed threatening or infectious. Val Curtis demonstrates that pathogen/parasite avoidance behaviour has been found in the animal kingdom wherever it has been studied (704). Social primate species will generally only accept a new member into the troop after a long period of quarantine, which includes stressful attacks to expose the state of health of the candidate. Candidates showing signs of sickness remain excluded (Curtis 704). Even the Caribbean spiny lobster *Panulirus argus*, refuses to share a den with other lobsters that are infected with the lethal PaV1 virus, which is transmitted by physical contact (Curtis 704). Although associations of offensiveness on their own do not seem to *require* advanced cognitive capacities, the range and degree of things that elicit a sense of offensiveness is greater in humans than in non-human animals.

Contamination, however, confers disgust’s uniquely human properties. Contamination is the belief that when two entities make physical contact, essential properties of each pass permanently between them, i.e. ‘once in contact, always in contact’ (Rozin 69). If a cockroach, for example, touches your dinner – even briefly with no visible residue – you are inclined to

associate your dinner as contaminated with cockroach properties (Rozin 69). If a person that we deem inferior cooks our food, for example, we might feel “contaminated” by touching or consuming it. There is experimental evidence that demonstrates that disgust is a more long-lasting emotion than other negative emotions like contempt or anger. Hutcherson et al. in 2013 hypothesized that disgust results in a lasting reluctance to come into contact with objects themselves contaminated by contact with something else (721). It was predicted that disgust applied to moral situations would lead to more stable, longer lasting attributions concerning a person’s character. Their study presented evidence that, as compared to anger and contempt, moral disgust may be associated with a long-lasting judgment of the inherent moral worth of a person that is difficult to undo, and avoidance or ostracism and a loss of regard may result from a person being labeled morally disgusting (728). In Cannon’s study on affective facial muscle activity, he found that transgressions in hypothetical scenarios that involved the risk of contamination of the body or spirit resulted in a strong facial expression of disgust, involving the levator muscle (329). The intuition here is that one of disgust’s functions is to avoid objects or events that we have deemed to be contaminated, even if they do not have such qualities. This is a uniquely human feature because it requires the capacity to attribute qualities to objects that the objects themselves do not make obvious.

Those are the basic features of core disgust: expressive, behavioural, and physiological components similar to distaste, and a sense of offensiveness and contamination. The hypothetical evolutionary sequence begins with distaste, whose elicitors are bad taste and whose function protects the body from poison, to core disgust, whose elicitors are food, body products, and animals, and whose function protects the body from disease/infections (Rozin 764). The next proposed pathway of the expansion of disgust and disgust elicitors are its symbolic functions,

which aim to push away, or otherwise draw a protective line between the self and threat. Haidt attributes this phase to the inception of symbolic structures that promoted human sanctity and deference to abstract entities. However, I garnered some insight from Rottman et al. about the power of the disgust expression to be used as a function for honest signals of group membership (36). Their paper suggests that disgust's primary origin is social, although, their evidence for this is perhaps shoddy. They point to the fact that many species have evaded the threat of pathogens and parasites without the emotion of disgust. But different species can have different avoidance mechanisms, so this is hardly an argument against a pathogen-avoidance origin. They also point to the fact that our disgust response is underdeveloped during early childhood, for example, children do not avoid playing with individuals who appear to be sick until aged six. However, Val Curtis has pointed out that infants are prepared to eat a wide variety of food until at around aged two, where they develop an extreme reluctance to new foods (706). The development of disgust sensitivity in children seems to be ubiquitous at around age six or seven, when it becomes pronounced (Haidt 113). This development fits the evolutionary model that places distaste phylogenetically earlier than our disgust response, which requires certain cognitive capacities, e.g. an awareness of contaminant properties, that are absent at a young age. The insight I garnered from Rottman et al. is the fact that we have been using facial expressions and bodily signals to report events as far back as *Homo erectus*. So, it would not be surprising that our forebears may have utilized the prototypical disgust expression to stigmatize ingroup members who violated certain norms or to expunge people from group membership.

With that in mind, I believe that our disgust response was preadapted to address moral issues related to bodily and spiritual purity. The first signs of human burial, which is a prototypic example of human sanctity, can be traced back as far as 100,000 years ago. Paul Pettit notes that

at least two dozen examples of Neanderthal burial are known, dating from after about 70,000 years ago. Many of the burials in the early Pleistocene era are of infants when infant mortality would have been high (Pettit). Special attention was paid, as in the Dederiyeh Cave in Syria, to bury their loved ones in correct anatomical order and only after the joints had been disarticulated (Pettit). One of the first signs of human cremation can be found at Lake Mungo, western New South Wales, which is dated as far back as 32,000 years ago (Bowler 58). And the earliest site of worship is traced to 12,000 years ago, at the Neolithic site of Göbekli Tepe in Turkey (Scham). From late antiquity to the Renaissance, and extended through European colonialism, Christianity became a world-wide religion. The tenants of Christianity are some of the most well-known examples of purity concerns in history. As Haidt explains in *The New Synthesis in Moral Psychology*, ideas about divinity played a crucial role in the formation of modern moral communities: “nearly all religions have culturally evolved complexes of stories, practices, and norms that work together to suppress the self and connect people to something beyond the self” (1001). This broadened the scope of human morality to address purity violations – an ethic of divinity – which cultivated a fifth moral foundation in response to sanctity versus degradation. Its characteristic emotion, disgust, was preadapted to address social issues associated with bodily and spiritual purity, which helped us avoid reminders of our animal nature, evade contact with strangers or undesirables, and keep the social order from disintegration.

The first symbolic function, disgust directed at residual animality, is the view that anything that reminds us that we are animals elicits disgust (Rozin 761). Humans must eat, excrete, and have sex, just like other animals. Some cultures prohibit the consumption of animals, hygienic rules govern the proper use and maintenance of the human body, and the failure to meet these culturally defined standards places a person below the level of humanity

(Rozin 762). Animals are seen as inattentive to hygiene and humans that behave like animals are seen as debased. Rozin suggests that one of the prominent reasons for this is due to the centrality of mortality in human psychology (761). This is an appeal to a psychodynamics that suggests that mortality represents the fundamental human dilemma. One of the functions of animal-reminder disgust is to avoid thoughts that remind us of our mortality. Rozin acknowledges that avoidance is not the only way that we deal with disgust. Toy stores sell imitation mucus and humour seems to encourage disgusting imagery. He thinks that sharing and comparing disgust reactions can be a source of social bond that distinguishes ingroups from outgroups. In this case, the ingroup is human beings and the outgroup is animals, and disgust functions as a barrier to keep out thoughts of our animal origins (Rozin 762). It also helps, according to him, that disgust to these events is generally non-threatening (Rozin 769).

Finally, we reach interpersonal and moral disgust. It is not merely contact with nonhuman animals or their by-products that elicits disgust, it is also contact with other people. Angyal noted that other persons, as containers of waste products, are potentially disgusting; we are averse to “possessions, utensils, clothing, cars, and rooms used by unknown or undesirable persons” (Rozin 762). These instances seem to elicit a sense of offensiveness and contamination. Often, our negativity towards other people increases if they had a misfortune, a disease, or moral taint, which may function to avoid infection and maintain social distinctiveness (Rozin 762). Moral disgust tends to be elicited by social concerns that do not involve the body at all, e.g. betrayal, hypocrisy, and racism (Rozin 762). Research in neuroscience has demonstrated that brain areas linked to disgust light up in neuroimaging studies when people observe certain social behaviours unrelated to animals or animal-by products. For example, an fMRI study had people play an ultimatum game, and those who were given a very low take-it-or-leave-it division of a pool of

money usually left it. Their decision was well predicted by a surge of activity in the anterior insula, which is a crucial site for “somatic marking”, the process by which interoceptive information (gut feelings) meets up with higher level social cognition (Rozin 763). Finally, in a response to a video about American neo-Nazis, participants displayed a proto-typical disgust response: they self-reported as being disgusted, their heart rates went down, and they experienced tightness or clenching in their throats (Rozin 763). Rozin et al. describes interpersonal and moral disgust as pre-adaptations to a disease avoidance mechanism; “an opportunistic accretion of new domains of elicitors to a rejection system that is already in place” (764).

Tybur et al. in 2013 argued that the function of moral disgust is to make a cost/benefit analysis of the strategic interactions of endorsing a rule. Their premise was that disgust, an evolutionary function, should be investigated from an adaptationist perspective (Tybur 11). Pathogen disgust was presumably adapted to reduce exposure to harmful pathogens, sexual disgust was adapted to motivate the avoidance of sexual behaviours with partners imposing potentially high fitness costs, and moral disgust was adapted to avoid sanctions from group members and assess the risks of endorsing a rule (Tybur 66-75). My concern with this perspective is that it turns a blind eye to the influence that symbolic markers have had in the development of morality, suggesting that human beings are merely information-processing creatures who make computational assessments about how to adapt to environmental cues. They are not wrong: we are creatures with domain-specific functions adapted to solve recurring problems in ancestral environments. Pathogenic-avoidance mechanisms were adapted to address harmful pathogen transmission, sexual-avoidance mechanisms were adapted to minimize deleterious recessive alleles, and group conformity was adapted in response to dominance and

status hierarchies, resource scarcity, and external threat. However, such functionality does not come to an end at individual-level analysis. People beat themselves up when they do not achieve goals that they set out for themselves, they create Gods and an afterlife to give their lives purpose, they form loyalties with people who are ostracized due to sickness or criminality, and they ask that they remain anonymous when they give exorbitant amounts of money. It is descriptively false to reduce morality to a chess game. The choices we make about our relationships to other people is multi-faceted. Human experience is a mosaic of domain-specific functions evolved from ancestral environments, individual-level analysis of modern environments, gene-cultural evolution, the way we were raised by our parents and local environments, and more. The relative power of Rozin et al.'s theory is that it attempts to take all of these ubiquitous features of human experience into account.

Casting a wider net, however, does not automatically enhance the quality of the analysis. We can appreciate some of the evidence that disgust had a phylogenetic origin in the adaptive advantage of avoiding harmful toxins, and this response may have evolved to avoid a broader range of pathogenic threats. Where Rozin et al.'s theory of disgust is most susceptible to criticism is in the explanatory power of its symbolic functions. The most hard-hitting critique that I have found is from Tybur, who argues that animal-reminder disgust equates mere possibility with behavioural consequence. It is a mere possibility that people would be disgusted by something because it reminds them that they are animals. But what about all of the other situations that induce positive feelings when we are reminded that we are animals? Tybur provides examples: "nonhuman animals can be readily observed running and jumping like humans, breathing like humans, sleeping like humans, and caring for their offspring like humans, yet none of these behaviours elicit disgust" (66). In other words, it is untenable to suggest that

humans are *always* disgusted when we are reminded that we are animals. Yet Rozin explicitly maintains the contrary: “anything that reminds us that we are animals elicits disgust” (761). Tybur’s solution is to reduce the functions of core, interpersonal, and most of animal-reminder disgust to pathogen disgust, the function of which is to avoid physical contact with sources of infectious disease-causing organisms (67). In other words, the reason that we avoid animals or their by-products is because in our evolutionary history, it was adaptive to avoid various common sources of infection. This is a strong argument and I incorporate it in my discussion of limitation disgust; however, it is too reductive. It leaves more questions unanswered, as it ignores both the cultural evolution of disgust’s domains, and how animal-reminder disgust applies to scenarios where pathogen transmission is irrelevant, e.g. the disgust that some people report feeling about morbid obesity. The biggest pitfall for animal-reminder disgust is that, rather than suggest that animal-reminder is a *common* way that disgust is induced, it argues the more radical assumption that *any* reminder that we are mere animals induces disgust. Symbolic functions, like evolutionary functions, are not inflexible. Functions merely develop traits in response to the conditions that we face. Since cultural development is extremely unpredictable, symbolic functions should be studied as the most salient ways that we respond to various challenges in our environments. My alternative, limitation disgust, does not suggest that every situation that reminds us of our limitations induces disgust. It suggests that one of the most notable symbolic functions of disgust in modern environments is to avoid the reminder that human beings are inherently limited in their unconscious desire to be invulnerable to life’s vagaries.

Limitation Disgust

The problem with the proposition “anything that reminds us that we are animals is disgusting” is that it is descriptively false. Let us imagine, rather, that Rozin et al. argued that the

one of the notable symbolic functions of disgust in modern environments is to avoid the reminder that we are animals. This premise is far more intuitive. Most of us have probably heard someone say “don’t treat them like animals” or received lectures from parents that we should use utensils lest we wish to be mere animals. Animal-reminder has intuitive force, but it still does not get to the heart of what makes certain reminders of our animal nature induce disgust. The reminder that we are animals is deeper than the mere comparison of human as non-human. It is a reminder of the limitations of our unconscious desire to be invulnerable to life’s vagaries. Life is full of reminders that we are less than what we think we are. The unconscious belief that we are invulnerable is a symbolic function to avoid the inherent fact that we are limited in overcoming the ubiquitous hurdles of human life, e.g. illness and death. If we always concentrated on life’s potential dangers, we would be paralyzed. In order to live free from constant despair, we employ an unconscious lens that we are invulnerable to life’s vagaries. Animal-reminder disgust is only one of many ways that humans avoid the limitations inherent in that psychodynamic structure.

Consider the infection potential of many core-disgust elicitors. Contact with food, body products, other animals, and corpses, if handled improperly, could have disastrous outcomes for our forebears. We take all kinds of precautions in modern environments to reduce the transmission of pathogens: wearing gloves to handle food for customers, washing our hands multiple times a day, using mouthwash to kill bacteria, closing containers and refrigerating food to reduce the risk of bacterial transmission, and so forth. It is not surprising, then, that societies have introduced norms that prohibit the consumption of animals, enforced etiquette standards that take hygiene seriously, or sanctioned the misuse of animals or their by-products. None of these examples require that the individual believe that they are spiritual entities or that they are hierarchically above animals. Animal-reminder disgust may be more salient in religious or

spiritual communities that preach the inferiority of non-human animals. However, animal-reminder disgust does not meet the standard of being a symbolic function. What distinguishes limitation disgust from animal-reminder disgust is its capacity to provide an explicit theoretical framework for distinguishing varying degrees of disgust, and justify a wider variety of instances of disgust where pathogen transmission or core-disgust elicitors are not operative.

Imagine two scenarios that induce disgust. In the first scenario, you are walking on the sidewalk and notice feces on a patch of grass, likely from a pet whose owner did not dispose of it. This could induce a prototypical disgust response. In the second scenario, you are watching your friend play a sport from the stands when suddenly he falls and breaks his leg, revealing an open wound with a bone sticking out. You recoil and feel queasy. Part of the reason that these examples induce disgust is because in ancestral environments, contact with excreta and open wounds would have increased our chances of infection. So, it is not surprising that in modern environments, we would have primitive affective responses that aim to avoid contact with excreta and open wounds. If asked, however, I suspect that most people would say that the second scenario is a far more traumatizing or unsettling example of disgust than the first. Rozin's animal-reminder disgust fails to explain why one example of animal-reminder is more disgusting than others. Why is an open wound a more intense reminder of our animality than excreta? Introducing limitation disgust, the function of which is to avoid the limitations of human invulnerability, provides a solution. Seeing excreta on a patch of grass is at most a trivial reminder of our limitations. Seeing an open wound, however, is a less trivial example, as it is an explicit reminder of the fragility of the human-body envelope. Limitation disgust, thus, offers a framework for distinguishing scenarios whose events express different degrees of human susceptibility. My view provides an explicit theoretical framework, though admittedly Rozin

could introduce the evolutionary functions of empathy and sympathy to explain why some events are more intensely disgusting than others. The relative power of my framework is that it need not introduce a separate function to explain how these scenarios are distinguished; limitation disgust does the work.

Limitation disgust can explain why we feel disgust in scenarios that have no infection potential or even lack association with core-disgust elicitors, other than that they contaminate our thoughts. The unconscious lens of human invulnerability is a predisposition to perceive ourselves as invulnerable to life's vagaries. Unfortunately for the narrative, there are certain aspects of life that are or are perceived to be out of our control. Certain examples are ubiquitous to human experience, e.g. the fragility of the human-body envelope. But there are also examples that have no obvious relationship to infection or core-disgust elicitors, for example, the possibility of being ostracized by members of your community. From this perspective, the reason that some people experience an unsettling gustatory response before being called on by a teacher is because it is a reminder that we cannot please everybody or that we are not cut out for public speaking. The reason that some people feel nauseous after hearing about a school shooting is because it is a reminder that evil does not discriminate, that the same could happen to our children, or that our officials will do nothing about it. The mere mention of a death in the family may induce nausea, let alone seeing or handling the corpse, partly because we are reminded that there is nothing that we can do about the fate of the people we cherish most. In a personal example, a few years back, my father was driving my mother and I to Toronto for a family trip. On the way, a severe car accident occurred directly in front of us and we had to swerve out of the way to avoid it. My father and I were in shock and my mother began to sob. After about fifteen minutes of driving, my mother asked my father to pull over because she was feeling sick. As we reached the road's

edge, she proceeded to vomit on the shoulder of the highway. She did not see bloodshed and she was not introduced to items with infection potential. All she needed in order to produce a primitive response that encouraged discharge was to experience a direct example of the sheer fragility of human experience. In all of these examples, disgust serves as an affective response that attempts to avoid the reminder that we are limited in our capacity to be invulnerable to life's vagaries.

Let us return to some of Tybur's examples of animal reminders that induce positive feelings: "Nonhuman animals can be readily observed running and jumping like humans, breathing like humans, sleeping like humans, and caring for their offspring like humans, yet none of these behaviours elicit disgust" (66). This is a good criticism of the theory that places priority on animal-reminder disgust, but it is not an argument against limitation disgust. The ability to run and jump is not an example of a limitation of human invulnerability. Moments in life that prevent running or jumping, say, can induce disgust, e.g. when someone breaks a bone or when an animal is missing a leg. We cannot control the fact that we breathe to survive, but its role in most people's lives is hardly a chore. When acts associated with breathing remind of us our limitations, however, it can induce disgust, e.g. seeing a stoma on someone's throat or suffocating from choking on their food. We cannot control the fact that we need to sleep, but sleep is generally perceived as a way that people can better equip themselves to tackle life's hurdles while they are awake, not a significant damper on our invulnerability. Finally, caring for offspring is not usually an obstacle to living a meaningful life; many of us choose to have children *in order* to give our life purpose. A lot of animals do this, and witnessing such behaviour tends to elicit no disgust. Thus, we may conclude that animal-reminder disgust is inadequate to explain all of the phenomenon of disgust.

I do not claim that every example of an event that reminds us of our limitation induces disgust. A natural question therefore arises: why is a disgust-response triggered by certain reminders of limitation and not others? Sometimes, when someone behaves unfairly towards us, we feel angry rather than disgusted. Other times, when we are no longer friends with someone whom we once admired, we feel sad rather than disgusted. My answer is that the human mind produces different emotions for different purposes. Disgust is primarily an avoidance response, anger a confrontational response, and sadness a coping response. In scenarios where we are inclined to avoid a problem, we are more disposed to emotions that encourage us to eject the thought from our minds, e.g. disgust. In scenarios where we are inclined to confront the source of the problem, we are more disposed to emotions that motivate us to be adversarial, e.g. anger. And in scenarios where we are inclined to reflect on the state of a problem, we are more disposed to feel emotions that provoke grief, e.g. sadness. We have a suite of domain-specific responses that evolved in ancestral environments to solve various quandaries. When a problem arises similar to one that such responses evolved to solve, it will trigger the associated affective response. How these dispositions are conditioned and the lessons we are taught from social learning varies from person to person, and depend on a number of factors: neural triggers in our brains, the state of our limbic system, the kind of upbringing we had, and so on. In short, the reason that we are disgusted in certain scenarios and not others depend on how largely unconscious neurological systems evaluate the scenario, and *that* depends on a whole host of factors – our dispositions, our upbringing, our values, and so on – that vary from individual to individual.

But why the need to invoke narrative? Is the symbolic function of avoiding reminders of human limitation not sufficient to elicit disgust? The reason for introducing an unconscious

narrative lens is because I have concluded that it is an important aspect of the evolutionary and cultural development of the moral matrices of modern environments, and it provides a theoretical framework for justifying disgust's allure in storytelling and humour. Naturally, I will begin with my reasoning for the first point.

The Evolution of Unconscious Invulnerability and Limitation Disgust

Brian Boyd, in *The Evolution of Stories*, is interested in the evolution of fiction. He suggests that narrative is as old as the transmission of information itself: organisms as remote from us as bacteria and plants extract information from their environment and communicate it to others (Boyd 2). Animals, similarly, need cognitive maps of their territories, and to understand the changes that other animals make to their context of action. According to Boyd, there is broad consensus that *Homo erectus* in our ancestral genus moved into a 'cognitive niche', exemplified by four behavioural novelties: cooperative breeding, fire-making, refined stone tools, and the cooperative hunting of large animals (Boyd 3). All of these skills arose from and accelerated reinforcing several trends in hominin evolution: the expansion of the brain, increased sociality and cooperation, and improved communication (Boyd 3). Cooperative breeding – when the young are provisioned by other individuals besides the biological parents – selected for greater social responsiveness, trust, and empathy between infants and their care-givers (Boyd 3). Stone tools, made as far back 2.5 million years ago, enabled cutting of meat from animal carcasses, and enabled *Homo erectus* to expand beyond Africa and survive in a wide variety of climactic conditions (Boyd 4). Fire making, which is believed to have been mastered some 1.5 million years ago, allowed the more efficient extraction of nourishment from food sources, e.g. drastically shrinking the time needed for chewing raw food (Boyd 4). This eventually led to the emergence of complex cooperative hunting, with efficient hunting spears that date back as far as

400,000 years ago (Boyd 4). The move into this new ‘cognitive niche’ must have been accelerated by the capacity of our forebears to absorb socially accumulated information. In order to display the new skills of artisanship and coordination, we would have required the capacity to engage in extended instruction and to understand varying ecological environments, including presumably the capacity to point to things and to draw features of the environment to others’ attention (Boyd 4).

The best current fossil and genetic evidence suggests that the evolution of spoken language developed about half a million years ago, in *Homo heidelbergensis*, the common ancestor of *Homo sapiens* and *Homo neanderthalensis* (Boyd 4). Language did not develop until anatomically modern *Homo sapiens*, about 100,000 years ago. Boyd attributes this to the development of what he calls “the mimetic mind”, which is a suite of capacities that control representation and communication. Mimesis, the earliest stage of social communication in hominin evolution, uses a range of modes of expression short of language: pointing, gesture, posture, movement, facial expression, and vocalization (Boyd 4). This would have transformed the way that ancestral groups communicate with each other, supplying the basis for ritual, monitoring the enforcement of social norms, and producing imitation games. The development of narrative was likely prominent when we evolved the capacity to mime or re-enact events (Boyd 5). The purpose of narrative in its inception was to report information about events that actually happened. This capacity would eventually allow for the passing-on of norms from generation to generation.

Boyd suggests that the development of language was primarily due to phenotypic plasticity (6). Phenotypic plasticity is the idea that “creatures confronted with new problems may try out new solutions, some of which may succeed, be repeated, copied, improved, and

stabilized, be learned early in life by new generations, and thereby create new niches where new selection pressures come into play.” (Boyd 6). In other words, animals can pick up new ways of doing things which then create new selective pressures that encourage them to either add to or refine older ways of doing things. The invention of language placed new selection pressures on our hominin forebears to modify cognition, emotion, and social behaviour for more efficient language use (Boyd 6). The revolutionary thing about language is that it allows speakers to instruct the imagination of the receiver to share something even if it cannot be pointed to, e.g. something past, private, or invented (Boyd 6). Language gives us the capacity to share things with others that direct experience cannot communicate.

Narrative is a natural product of language that allows us to explore beyond the limits of our lives (Boyd 6). Those in ancestral environments with more facility with narrative would have been advantaged, since reporting events in a way that others can readily comprehend has social utility. Narrative is not interested in the routines that we already know without it; it is a function that extends what can be expected (Boyd 7). It extends our appreciation of what it means to be human, the risks we may face, and the options that we have, so that we can better cooperate with each other. It can model and motivate personal and social values like courage, resourcefulness, generosity, and sympathy, and enables reflection on and modification of norms. Some of the reasons favouring the construction and communication of narrative in ancestral environments are to display our ability to appraise human behaviour and discern norms, to supply information that has come our way while it still has value, and to earn attention and status for our alertness to persistent social information (Boyd 7).

Haidt said it best when he said that whatever the origins of religiosity, nearly all religions have “culturally evolved complexes of practices, stories, and norms that work together to

suppress the self and connect people to something beyond the self” (1001). It is unusual to me that he would have the insight to say that the stories that constituted religious communities had the capacity to suppress the self and connect people to something beyond the self, but then not incorporate the power of story into his larger picture of emotional evolution, limiting disgust to a response to toxins that was preadapted to perform certain symbolic functions in newly-developed cultural environments. Symbolic functions, however, are more than just how we perceive our relationship to nonhuman animals or other people, they are also how we perceive our relationship to life itself. The transition to religious communities and worship was our most explicit attempt as a species to invent narratives that answered such questions as what created us and why we are here. Such narratives contribute to the evolving structure of social and political power. Their adherents believed that the narratives were sent to them by the highest authorities. They were promoted explicit rules and norms that, they were promised, would put them on track to achieve something greater than themselves. My view suggests that modern environments have inherited the remnants of a time when the power of story in religious communities was deeply influential. Human sanctity, the idea that every human being is of ultimate importance, functioned politically to keep people conforming to the dictates of the relevant authorities. Despite their continued practice worldwide, faithful deference to authority and norms of spiritual purity in Western nations have declined. However, in my view, secular communities in modern environments have co-opted the remnants of norms on human sanctity into an unconscious lens of human invulnerability. They have taken something that was once explicit, codified, and sanctified, and made it plastic and unconscious, to provide a framework that provides the opportunity for anyone to live a ‘meaningful’ life. Such a narrative need no reference to spirits or authorities, nor does it need a preordained answer. It certainly *can*, given that modern societies

encourage people to find a partner, have children, raise them to give back to the community, and teach them be hard-working, reliable people. This is the story that modern societies have manufactured to dispose people to behave in prosocial ways. But some people desire the freedom to reject the narrative that society has provided. The narrative of human invulnerability – as opposed to human sanctity – provides all of us, whatever our choices, with a framework to meet aspects of life that are out of our control. Disgust, an affective response which was preadapted for sanctity-related concerns, functions in modern environments as an avoidance mechanism for issues of similar concern, relating to the ubiquitous problem of how to make sense of life. It is an affective response that aims to avoid the limitations inherent in the narrative of human vulnerability. The adaptive logic is that avoiding the cognition of limits allows for stronger resolve and the avoidance of a wider array of harmful stimuli. The unsettling gustatory response before a theatrical performance, for example, aims to avoid too deep a focus on the possibility of being ostracized or failing to perform adequately. Our unconscious desire to be invulnerable gives us the strength to go through with our decision, despite the negative valence. The satisfaction that comes from a successful performance after such turbulence makes for richer feelings of resolve. Disgust suppresses fear or doubt in the face of difficult decisions, which minimizes the constant despair of the limitations inherent in human life.

Gene-cultural evolution is a well-established theory, suggesting that certain cultural environments can significantly affect our genetic makeup, which can in turn influence culture. In *The 10,000 Year Explosion*, anthropologist Gregory Cochran demonstrates that since the rise of agriculture, human evolution has rapidly increased by nearly 100 times from that of typical recurring environments (16). Recent studies have demonstrated hundreds of ongoing sweeps, which are reductions or eliminations among the nucleotides near a mutation in DNA (Cochran

90). This results from a beneficial allele having recently reached fixation due to strong positive selection; a single copy of an advantageous gene has a fair chance of succeeding (90). Many of these alleles are recent, with their rate of origination peaking at about 5,000 to 8,000 years ago. There are different ways to understand a gene's function, including observing the tissues that it is highly expressed in or what goes wrong when it is inactivated. Many of these recent changes include changes in metabolism and digestion, defences against infectious disease, and in DNA repair (90). The controversy among theorists is not whether gene-cultural theory is sound, but whether its relationship to morality is significant. There are modified genes for adult lactose tolerance that evolved in tandem with the cultural practice of raising dairy cows, but it is less obvious to some theorists that genetic modification can account for things like tribal instincts (Haidt 1001).

I suggest that limitation disgust's development is due to the plasticity of disgust's gene-cultural evolution. We can attribute some of disgust's earlier evolution to individual-level adaptations: our phylogenetic disgust response evolved because our forebears had to deal with the recurrent threat of infection and disease, especially when they transitioned from tree- to land-dwelling. However, with the advent of symbolic markers in newly-cultural environments, group-level selection pressures started to play a larger role. Gene-cultural evolution has a significant role in the development of morality, and therefore in disgust more specifically. With the protracted timeline that norms associated with human sanctity have had, it is not radical to suggest that our genetic makeup has been modified to address similar environments. According to D.S. Wilson, the coevolution of religions and religious minds created conditions in which multilevel group selection operated, transforming the older morality of smaller groups into a more tribal form that could unite larger populations (Haidt 1001). In his book called the *God*

Gene, Dean H. Hamer suggests that human beings have an instinct for spiritual thinking (21). It is not that spiritual thinking is automatic in the same the way that blinking is automatic, rather, it is a “complex amalgamation in which certain genetically hardwired, biological patterns of response and states of consciousness are interwoven with social, cultural, and historical threads” (Hamer 21). In other words, humans have a genetic predisposition for spiritual belief that is expressed in response to, and shaped by, personal experience and cultural environment (22). There are several ways that Hamer justifies this, including appealing to heritability and identifying a specific gene. One of the ways to justify the heritability of a trait is to compare fraternal and identical twins (54). Fraternal twins share half their genes because they develop two different eggs fertilized from two different sperms (dizygotic), and identical twins have nearly identical genetic codes because they develop from the same fertilized egg (monozygotic). This variation allows researchers to distinguish genetic influence from environmental influence in explaining differences in personality. In a notable study, 25,000 pairs of twins of either zygosity were examined (59). They were asked questions about self-transcendence, which are spiritual feelings that are independent of traditional religiousness (32). Some examples of self-transcendence include (a) self-forgetfulness, which is when you are so absorbed in something that you forget yourself, e.g. the “flow state” of a musician who gets lost in music, (b) transpersonal identification, when you feel a sense of unity with all things around you, and (c) mysticism, when you experience something that you do not believe can be explained by science (37-42). The study took into account three sources of variation: genetic influence, shared environmental influence, and unique environmental influence. The analysis indicated that genes are responsible for 48 percent of the variation in self-transcendence in twins, with the remaining 52 percent being environment (60). Hamer also discovered a gene called VMAT2, which

packages the monoamines that transmit dopamine, noradrenaline, and serotonin to the brain (87). This particular gene is said to be polymorphic because within its locus – a fixed position on a chromosome where a particular gene is located – it possesses more than one allele, which can lead to the abnormal expression of the gene. One of the polymorphisms or genetic variations of VMAT2 is called A33050C, a base that could be either adenine or cytosine, which are a couple of the building blocks or nucleobases used to form the nucleotides of DNA. These bases attach themselves to sequences in orders of three called amino acids, and these determine the structure of proteins that transmit and transcribe information for physiological, expressive, and behavioural components in living organisms (71). Hormones that code for differences in sex and height are proteins, and so are the neurotransmitters that tell the brain what to do. Research has shown an association between the VMAT2's polymorphism and self-transcendence, with individuals with the cytosine base scoring significantly higher for self-transcendence in surveys than those with adenine (87). The researchers controlled for age and gender, and found that the results were the same: both the cytosine/cytosine and cytosine/adenine genotypes increased self-transcendence scores compared to the adenine/adenine genotype (88).

This study gives reason to believe that some people may be more predisposed to spiritual thinking than others. My thesis suggests that individuals in modern environments make use of an unconscious lens that promotes their invulnerability to the vagaries of life. I speculate that the transition from norms on human sanctity to unconscious structures of invulnerability is due to the plasticity of our predisposition for spiritual thinking. Automatic responses are influenced by cues that are similar to the ones that it adapted for in recurring environments. Since the sanctity/degradation's spectrum's characteristic emotion is disgust, I suggest that the group-level selection pressures that modified our genetic makeup for spiritual thinking also modified

automatic responses that are characteristic of such thinking. The contingent evolution of spiritual thinking shaped our cultural environments to be concerned (or more concerned than we might otherwise) with norms associated with human sanctity, and those stable environments modified our genetic makeup to be better suited for them. Thus, we can view the transition from sanctity to invulnerability as the gene-cultural evolution of a set of instincts that predisposes us to spiritual/self-transcendent thinking. I have proposed that one of these instincts function to avoid cognizing the limitations inherent in such thinking, namely, limitation disgust. The psychodynamic structure of invulnerability is an instinct that individuals who might otherwise express a lack of religious thinking still possess. Feeling nauseous before a theatrical performance, for example, is not a mere accident of the culture that one is born into, it is an instinct that every human is capable of possessing to a greater or lesser degree. This feeling is a response to the fear of the possibilities inherent in partaking in such a performance; when cues in our environment make explicit the limitations inherent in our predisposition to feel invulnerable, we have automatic responses to avoid too deep a focus on them. These responses, I argue, were intimately shaped by enduring norms that promoted bodily and spiritual purity, whose characteristic emotion functioned to avoid reminders of similar concern, e.g. residual animality.

I would like to clarify something. My motivation in this section is to provide a descriptive analysis of the evolution of narrative structure as it relates to the emotion of disgust. I am not suggesting that our evolutionary and cultural history is necessarily progressive; what works in one generation does not necessarily work in the next. Human history has been an arms race between selfishness and prosociality from its inception, biologically and psychologically. The more prosocial strategies we pass on, the more opportunities we create for exploitative behaviour. Religious history is rife with colonial violence, the genocide of indigenous people,

civil war among sects, and the torture of nonbelievers. When I suggest that religious communities endeavour to use the social and political power of story to their advantage, what I am saying is that communities in our recent past contrived to establish environments that were conducive to fostering group conformity and deference to authority. In return, adherents were promised spiritual purity and a part in something bigger than themselves. My argument is that modern communities have picked up the remnants of the moral matrices from the past, modified into unconscious narratives, based on a set of values that continue to govern the social and political life of the majority of the world.

Disgust's Allure in Art

When scholars evaluate disgust's role in society, it is often painted in a negative light. Laura Niemi provided evidence that women who were sexually assaulted perceive themselves and their bodies as contaminated and tainted (113). This motivates them to devalue their body, to blame themselves, and ultimately to acts of self-harm. This also seems to be encouraged by other members of society, who in a separate study demonstrated that they perceived hypothetical victims of sexual crimes as more contaminated than victims of nonsexual crimes (Niemi 112). Patrick et al. suggest that disgust should play no role in legal systems because relying on disgust as a reason to prohibit a behaviour only serves to mobilize exploitation, for example by placing unreasonable sanctions on individuals who are marginalized or impoverished (134). How we address legal cases related to food choice, personal contact, and mate choice should be made with arguments that appeal to more than somebody's response of disgust (Patrick 135). Carol Hay suggests that when people use disgust to mobilize their political enemies to their side, they are not changing anybody's mind, only increasing one's allegiance to ideas that they already adhered to (144). Finally, Alexandra Plakias suggests that people need to suppress their disgust

sensitivities to certain foods for the betterment of the planet (197). Animal agriculture is a major contributor to the emissions that cause global warming (Plakias 198). If we switched our diets from animal flesh to insects, we could significantly reduce our impact on the environment, but we first need to suppress an unreasonable aversion to them.

All of the studies above make excellent points about disgust. Disgust can motivate self-harm; it is not a reason for a negative evaluation of the incitement; it should not be relied on to evaluate hypothetical moral scenarios, or be used as a gimmick to convince people of one's side; nor should it hinder our responsibility to make the planet a better place for future generations. With all of that said, disgust's role in society is not always to reject and repel. Carolyn Korsmeyer says it best when she states that in art, disgust can be cultivated to alert us to the additional complexes of the emotion and its effects on judgement (218). Disgust has what Korsmeyer calls a "macabre allure", which is the idea that there is a space between disgust's initial avoidance and turning away from the object where we permit a pause (219). In this pause, there is a superimposed "attractedness" of the subject to the object, which is what leads Kolnai to say that "disgust is an eminently aesthetic emotion" (Korsmeyer 220). She also notes that disgust keeps us from drowning in pleasure; we may love sweet things but we also understand that they tempt us to overindulge to the point of nausea, at which point what began as attractive becomes aversive (Korsmeyer 220). Horror movies are a great example of the way that difficult facts are put on display for audiences to see things from a different perspective and understand their own physical vulnerabilities (Korsmeyer 223). As Korsmeyer puts it, "the cognitive significance that disgust achieves differs depending on circumstances and other accompanying emotions" (224).

Korsmeyer hits the nail on the head. I suggest that, seen through the lens of narrative, the reason that disgust is explored so readily in humour and storytelling is because it manufactures a

conceptual space where an avoidance mechanism and the satisfaction of conflict resolution come into close proximity. Haidt suggested that disgust plays a role in art because sharing and comparing disgust reactions can be a source of social bond that distinguishes ingroups from outgroups; in this case, the ingroup is human beings and the outgroup is animals. He argues that disgust functions as a barrier to keep out thoughts of our animal origins. I do not know what sort of comedy Haidt watches, but my experience has been that the most prominent examples of disgust in comedy draw attention to human fragility and error. Ali Wong, a famous stand-up comedian, makes jokes about her genitalia, pregnancy, HPV, micropenises, and more. Bill Burr, another famous comedian, makes jokes about genitalia, past sexual partners, emotional insecurity, and food taboos, while Amy Schumer, another comic, makes jokes involving graphic imagery about her genitalia, pregnancy, and sexual promiscuity. If that is supposed to keep out thoughts off our animal origins, American comedians are doing a poor job. Haidt makes a good point when he claims that situations where disgust elicitors are non-threatening offer a chance for us to explore situation that we normally avoid. But that only gets us half of the way there because rendering something non-threatening does not explain why it is alluring. We do not just incorporate disgust in humour and storytelling, we put its elicitors in the limelight, from comedy specials about bodily functions to horror movies about human centipedes. In my view, narrative and our unconscious lens of invulnerability affords the framework to make sense of this.

Narrative's evolutionary function was to extend what to expect in human behaviour. It makes existence more comprehensible, including the risks we face, and the options we have, giving us a platform to observe, spread, deepen, and even question norms. Information about our behaviour and environment could be transmitted through imagined characters, plots, climaxes, and resolutions. In our daily lives, disgust elicitors and symbolic functions are often a source of

distress, uneasiness, ambiguity, and even tragedy. Other than in art, we do not find many instances in life where disgust elicitors are a source of joy. Disgust in humour and storytelling offer instances where the possibility of conflict resolution enters the same conceptual space as something we typically avoid. The reason that this is alluring is because humour and storytelling give us an opportunity to take back control of something that we normally have no control over. The stories and punchlines in humour make light of difficult topics, and conflicts in horror movies utilize narrative functions such as exposition, rising action, climax, falling action, and resolution. Humour enables us to make light of the ubiquitous aspects of human life, to stop torturing ourselves over things that we cannot change. And storytelling reminds us that we can bend the rules of life as long as we can tell a good story about what we are doing. All of these art forms build a conceptual space that minimises our perception of vulnerability. The evolutionary development of such narrative opened the door for disgust elicitors to be explored and utilized in settings that confer a sense of humility and resoluteness which would otherwise be sorely missed.

Disgust is an evaluative response that demarcates patterns of salience within narrative and normative structures related to extreme forms of proscription and avoidance. Its origin was distaste, which broadened to include bodily pathogenic avoidance. With the symbolic markers that culture cultivated, disgust broadened to address a range of symbolic functions. In my view, modern environments have inherited from our religious predecessors the remnants of values that enforce bodily and spiritual purity to construct an unconscious narrative lens of human invulnerability. This psychodynamic structure represses the inherent fact that human beings are limited in their capacity to be invulnerable to life's vagaries. One of the ways that we repress this

fact is through a characteristic emotion associated with bodily and spiritual purity, namely, disgust. I have described this response as limitation disgust, the function of which is to avoid the limitations inherent in our desire to be invulnerable to the vagaries of life. Integrating the disgust response in such narratives also helps to explain why disgust can be alluring in humour and storytelling, which view the lack of control that we experience in life through the prism of geniality and conflict resolution. As the character of Edward Blake aptly states in Alan Moore's *Watchmen*, "once you realize what a joke everything is, being the Comedian is the only thing that makes sense."

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