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Monsters on the Brain: An Evolutionary Epistemology of Horror

"SUDDENLY HE HEARD A GROAN—HIS TEETH CHATTERED," WRITES WASHINGTON Irving about the frightened teacher Ichabod Crane in *The Legend of Sleepy Hollow*. Crane finds himself in headless-horseman territory, tentatively riding his stubborn horse along a dark road. In what many regard as the first American horror story, Irving (2006) describes Crane's charged emotional state:

> In the dark shadow of the grove, on the margin of the brook, he beheld something huge, misshapen and towering. It stirred not, but seemed gathered up in the gloom, like some gigantic monster ready to spring upon the traveler. The hair of the affrighted pedagogue rose upon his head with terror. What was to be done? (342)

A PHYSIOLOGY OF FEAR

Not only does one's hair stand up with terror, but many other common physiological changes overtake a frightened person. The sympathetic nervous system is stimulated in cases of fight, freeze, or flight. Sometimes the rage and attack system will activate and initiate intense aggression. Neurologist Melvin Konner explains that

> the nerve net, balanced by the braking power of the parasympathetic system, spurs the increase of heart rate, rise

> in blood pressure, increased flow of blood to the muscles, and decreased circulation to the viscera that accompany fear and flight in many animals. The shifting balance also causes the reflexive emptying of bladder and bowel that helps to prepare an animal for fight or flight and may humiliate a man on the verge of a battle he cannot flee (Konner 2002, 209).

We also know that fear has a significant hormonal component. Corticotropin releasing hormone (CRH), cortisol, and adrenaline are some of the hormonal triggers and gates associated with fear. We have been able to manipulate these in the laboratory and thereby produce more and less fearful behavior in mammals. Experiments with mice have shown that if scientists insert a gene that makes CRH, they will produce a more fearful mouse. But removing the gene that builds the CRH receptor, thereby gating the entry of the hormone, will result in an extremely fearless mouse.

All mammals are equipped with adaptive instincts like fight or flight, but these are old-brain systems, housed primarily in the brain stem. Built on top of these midbrain systems are the limbic emotional circuits. Emotional neuroscience (Panksepp 1998) has located seven major emotional systems that mammals share: fear, care, lust, rage, panic, seeking, and play.[1] Each of these circuits has unique pathways through the brain, enlists specific neurotransmitters and hormones, and results in specific mammal behaviors. Fear, for example, has a neurocircuitry that passes from the amygdala through the hypothalamus to the periaqueductal gray (PAG), down to the brain stem, and out through the spinal cord. Natural selection built this operating system in most vertebrates; it helped them survive in a hostile world.

Human and other mammal fear is regulated largely in the amygdala, and neuroscientist Joseph E. LeDoux has mapped the pathway by which fear and memory (in the hippocampus) work in tandem to create conditioned learning (LeDoux 1996, 2002). When a person associates dogs with aggression (and biting), for example, and then

crosses the street when dogs approach, her brain is cycling through a similar circuit that governs rodent lab learning (foot shocks and associated images/smells). Fear is homologous across the mammal clade.

DARWINIAN ROOTS OF HORROR

Like any other biological trait, fear is subject to evolution. We have evidence that mammals have heritable dispositional levels of fear or timidity. And these levels of shyness can be artificially selected by breeders, resulting in more fearful populations. Rats, for example, have been analyzed in new threatening environments, and those animals that displayed fearful behaviors (for example, immediate defecation and reluctance to explore) were bred together. In only ten generations of breeding, scientists were able to measure 10 times more fear in the population, and 30 generations produced 30 times more fear (Konner 2002, 216).

Thinking about fear from a Darwinian perspective is revealing. Darwin himself repeatedly brought snakes (real and fake) down to the London Zoo primate house. He discovered that chimps had an extreme fear of snakes, and concluded that some rudimentary taxonomic recognition system seemed hardwired into the animals—some classification system (probably morphological) carried emotional responses with it and helped give the chimps a useful instinctual dread of threatening species. Is it possible, then, that some of our own deep-seated monster fears may be rooted in real predators or environmental threats from our prehistory?

MODULAR OR CONDITIONED PHOBIAS?

Evolutionary psychology, typified by the work of Steven Pinker, John Tooby, and Leda Cosmides, posits the existence of human cognitive modules that were shaped during the Pleistocene era. These modules are genetically engraved archetypes that all humans inherit from our savanna ancestors, and they help us to instinctively classify snakes and spiders as bad (dangerous).[2] But this nativist view of phobias is problematic. Not least of the trouble is that we know of no *biological* mechanism

by which cognitive content can be replicated in the next generation of brains. Of course, *cultural* mechanisms allow for transmission of content horizontally (across a contemporary tribe) and vertically (down to offspring), but nativists expect the modules to be innate. The universality of spider and snake phobia is proffered as a kind of proof that such modules precede human cultures. But there is no direct evidence that genes build brains with preset fear of creepy-crawly creatures. Instead, I want to articulate—especially in light of growing data about early childhood neuroplasticity—a more flexible notion of phobias. The deeply primitive and automatic aspect of fear and horror leads many to search for innate switches, but an alternative model can account for both the automatic/instinctual aspects of horror response and the modifiable/learnable aspects.

In the 1940s, psychologist Donald Hebb continued Darwin's experiments, and showed that infant chimpanzees, who had no earlier exposure to snakes, were nonetheless terrified of them when first presented. But Hebb continued to introduce novel objects and animals to the chimps and discovered something more subtle than just snake phobia. Hebb concluded that chimps had alarmed and frightful responses to any extremely varied morphologies they encountered. When something in their perceptual field "jumped out" as radically different, then it could not be processed by the cognitive categories already in place. As Konner (2002) describes it,

> Against the background of knowledge already accumulated by the infant chimps, the new objects were different; they aroused many perceptual schemas or patterns stored in the brain but fitted into none, causing arousal and then fear. The brain was somehow designed to generate fear as the result of such a cognitive mismatch (219).

Subsequent experiments by ethnologist Wolfgang Schleidt discovered similar emotional/cognitive responses in birds (Schleidt 2011; see also his website at http://www.schleidt.org/wolfgang/, which lists

relevant publications on hawks and turkeys, and an autobiographical sketch of his work with Niko Tinbergen [1907–1988] and Konrad Lorentz [1903–1989]). Chicks were exposed to a hawk-like cut-out shape, which was passed over their nest. As one might expect from the Darwin and Hebb findings, the hawk shape struck fear in the chicks, while a goose-shaped cut out garnered no such fearful behavior and physiology. One might conclude from this that some rather species-specific instinctual fears were embedded in animal instincts. But Schleidt showed that when new chicks were *first* exposed to repeated hawk-like shapes, and then afterward presented with the goose shape, they were frightened by the goose and not the hawk—corroborating Hebb's idea that some discrepancy between a new perception and previous background stored experiences causes the fearful response. Theoretically, one could condition an animal to be unresponsive to snakes and hawks, but utterly terrified of fluffy bunnies. The template of taxonomic fear gets built upon the earliest experiences and categorial formations of the animal. Manipulation of the original perceptual environment of the animal will alter its later default anxieties.

This may explain the snake-fearing chimps differently than Darwin, because now we have a *generic* pattern recognition system at work rather than a *specific* preset snake phobia. But these new findings make even better sense under Darwin's theory of natural selection, because a general mechanism for "fearful reaction to categorial mismatch" could be serviceable for any animal born into its native habitat, where friends will be ubiquitous and foes will be atypical. So such a general mechanism would be highly favored by selection. Turkey chicks in the wild will develop default fears for hawks, and chimps will develop default fears about snakes. The local environment will condition the infant animal and then the cognitive development will lock in the categories, creating a software program that recognizes some animals and mismatch novelties. This theory also avoids the troublesome implication that some very specific cognitive content (like the idea of a snake) could be genetically heritable. Instead of the improbable idea that a phobia module could be a specific cognitive/

perceptual "representation" that is inherited over generations (a perception to gene to perception process), this model suggests a *content-free* recognition system only.

One objection to the theory that novel creatures cause fearful responses is to ask, Why doesn't every new experience scare the infant? After all, absolutely everything is "new" once. Why isn't the animal in a constant state of terror, as new experiences meet old stored experiences? The answer is located in the findings of developmental psychologist Mary Ainsworth's "strange situation" experiments. Ainsworth (1913–1999) tested for infant fear by devising an experiment in which a baby and mother are introduced to an unfamiliar woman. The two women talk for a while and then the mother leaves the room, returning after a three-minute interval. Over many trials with different subjects from diverse racial, cultural, and class backgrounds, the results showed that infant fear in the "strange situation" spiked dramatically *after* six months old (Ainsworth and Bell 1970). What this appears to demonstrate, and brain science seems to confirm, is that there is a window of opportunity for template formation. It's a window that closes after six months, but prior to that allows all manner of new experiences to be stored as normal. In those first six months everything is recorded and the categories are laid down, whereas after the six months have passed, novelties are read against the now congealed defaults. Fear from category mismatches cannot occur until the normal categories are laid down, and that foundation is laid down in the first six months—a time when infants can peacefully absorb almost any stimuli.

PHOBIAS AND PHYLOGENETIC MEMORY?

Many of the creatures of the horror genre—like the "face-hugger" creature in *Alien*—are composites of real-life natural history enemies. Snakes and spiders horrify most humans, so mixing them together into one creature may well amplify the terror. Arachnophobia, or fear of spiders, is a universal human dread—especially in children. Biologist Tim Flannery asks, "Why do so many of us react so strongly, and with such

primal fear, to spiders? The world is full of far more dangerous creatures such as stinging jellyfish, stonefish, and blue ringed octopi that —by comparison—appear to barely worry most people" (Flannery 2008). Flannery speculates a Darwinian story that connects human arachnophobia to our African prehistory. Since *Homo sapiens* emerged in Africa, he wonders whether a species or genus of spider could have been present as an environmental pressure. If humans evolved in an environment with venomous spiders, then a phobia could have been advantageous for human survival and such a trait could be expected to gain greater frequency in the larger human populations. The six-eyed sand spider of western and southern Africa actually fits that prediction very well. It is a crab-like spider that hides in the sand and leaps out to capture prey. Its venom is extremely dangerous to children, and one can see how a fear of spiders, in this African context, would have been highly advantageous. So our contemporary arachnophobia may be a leftover from our prehistory on the savanna.

Is the phylogenetic "memory" of ancient danger somehow rewritten in our contemporary ontogeny as Flannery seems to be suggesting here, or is the categorial mismatch system enough to make spiders and snakes horrible? The modular nativists expect to find a morphological archetype of "scary spider" somewhere in the inherited mental landscape, but developmental mismatch theory suggests a different mechanism to explain the same universal phobia. If early *Homo sapiens* babies spent most of their first year strapped to their mothers or otherwise protected (and off the ground) by parents and alloparents, then creepy-crawlies of every variety would, once encountered, radically disturb the default categorial systems laid down in the child's first six months. The same argument can be enlisted to explain other cases of predator-based phobias, like fear of big cats, crocodiles and murky water, and other ecological threats. It also explains similar phobias in our primate cousins. And if we add the emerging imagery and stories of early human culture (cave paintings and gestural reenactments), we can see how "adaptive horror "can be strengthened, reinforced, and transmitted beyond the automatic process of categorial mismatch.

THE HORRORS OF CATEGORY JAMMING

Research in the development of cognition and emotions demonstrates that the effects of stimuli on the organisms are delicate matters of degree. Moderate perceptual variations (for example, meeting subtly different creatures) from previously known schema only produce arousal and *attention* in the perceiver, not fear. When Ichabod Crane, or anybody in this genre, encounters a menacing headless person, their fear might be broken down and analyzed in terms of cognitive mismatch. Perhaps the sight of a combined normal (human) and abnormal (headless) creature bearing down on one is a mental confusion between what should be the case (having a head) and what is the case (no head). And perhaps this confusion produces fear as an automatic secretion from the cognitive tangle.

Of course, in this kind of rational reconstruction, one feels a little like a dullard trying to give a scientific explanation of a successful joke. In the order of felt experience, the fear is primary and doesn't seem to need an intellectual/cognitive glitch to kick-start it. In some important sense, Ichabod is not afraid because he's undergoing a categorial mismatch—he's afraid because a headless monster is bearing down on him. Isn't that good enough to cause fear in the protagonist and fear in the audience—do we really need a cognitive theory to explain it? But then we are forced back, given the experimental research of Hebb and Schleidt, to asking why fears are associated with certain experiences and not others. There seems to be some undeniable cognitive component to monster fear.[3] Is the headless man particularly scary (when compared with the moustache less man or the hatless man) because we've never experienced such an anomaly, or because we have some deep conceptual understanding that heads are essential for human life? And therefore, is the headless monster a multiple piece of "category jamming"—both morphologically incoherent and also transgressing the categories of animate and inanimate?

The philosopher of horror Noel Carroll invented this term "category jamming" and makes an argument that fits quite nicely with Hebb's and Schleidt's mismatch theory. Carroll (1990) arrives at his

own mismatch theory by noticing that most horror monsters are *disgusting* as well as threatening. Carroll follows the argument of British anthropologist Dame Mary Douglas (1921–2007), who posited that human beings appear especially disgusted by "impurity." Things that we find impure, and consider as abominations, are usually interstitial entities—in between normal categories of being. For example, blood, feces, spit, snot, and vomit all blur the usual categories of *me* and *not me*, or *human* and *not human*. Pushing this idea of transgressing categories further, Carroll extends the unsettling aspect of interstitial awareness to the experience of all monsters in horror genres. The argument is made more compelling by the fact that so many monsters are depicted as truly disgusting. One thinks of the mucus-like slime oozing off most aliens, or the gelatinous blob monsters, or the undulating goopy transformations of shape-shifters, or the viscous twisting of monster reproduction.

Carroll thinks that it is this cognitive slippage, invoked by monsters, that explains why we are both repelled and drawn to horror films and novels. The fascination or arousal produced by categorial mismatch is the solution to the paradox of why we seek out an experience that is at least partly unpleasant. This argument has compelling features, but also seems slightly too cognitive and intellectual (that is, pertaining to the conscious mind) and not sensitive enough to the unconscious noncognitive aspects of monster fascination.

THE WOMAN WITH HORROR BLINDNESS

Recent neuropsychology experiments present a way to synthesize many of these philosophical and phenomenological insights. A woman, referred to as SM in neuroscience literature, suffers from focal bilateral amygdala lesions (Feinstein et al. 2011). Her compromised amygdala means that she lacks the usual fear affect that normal mammals experience. She is fearless. And researchers have studied her while they exposed her to fear-inducing experiences (real snakes and tarantulas, haunted houses, and horror films).

Experiments repeatedly showed that the frightening stimuli elicited high degrees of attention arousal in SM but no fear per se. She would approach many of the threats with great curiosity and cognitive excitement, but she did not have normal physiological or psychological fear responses. "The hidden monsters attempted to scare SM numerous times, but to no avail," researchers reported. "She reacted to the monsters by smiling, laughing, or trying to talk to them. In contrast, their scare tactics typically elicited loud screams of fright from the other members of the group. More than showing a lack of fear, SM exhibited an unusual inclination to approach and touch the monsters" (Feinstein et al. 2011, 36). In some cases she had to be prevented by the researchers from putting herself in actual danger because she seemed to lack the instinctual wherewithal.

Cultural theorist Mathias Clasen takes the SM case as evidence that "horror monsters are not only terrifying; they are captivating" (Clasen 2012, 224). He recognizes, in the pathology case of SM, a failure or breakdown of a universal affective system that explains (when healthy) some of the cross-cultural features of horror. "Why," he asks, "do horror stories generally travel well across cultural borders, if all they do is encode salient culturally contingent anxieties?" Cases like SM suggest that horror has a finite set of triggers/responses that were built during our hominid past. And we can glimpse how it works when the system goes wrong, as in cases like SM.

One way to interpret the fearless woman is to see her as experiencing category jamming, in Noel Carroll's sense, but failing to experience the affective feelings (avoidance, retreat, dread, etc.) that usually spark the appropriate adaptive response. The SM case also seems consistent with the developmental story of fear acquisition that we saw in Schleidt's bird experiments. The default cognitive categories, laid down in SM's early childhood, are violated by horror images—producing arousal—but the affective system of fear (based in the lateral amygdala) is never appropriately triggered.

While the SM case seems to corroborate a correlation between category jamming and arousal, it seems neutral regarding the theory

that such categorial mismatch is the *cause* of affective fear. It is possible that normal amygdalae are programed to respond with fear to the kind of mismatches that occur in the prefrontal cortex, and SM simply has a broken link in this causal chain. But alternatively, it is also possible that fear precedes all this cognitive machinery and triggers more directly from perceptual data. Fear, in this view, is not a result of cognitive confusion, but runs on a different physiological pathway altogether. Placing fear before cognition (rather than as a consequence) is more consistent with our understanding of evolution. Mammal emotional adaptations (like fear) were under construction for hundreds of millions of years before symbolic cognition arose in *Homo*.

The emotion/cognition complex in horror is a Janus-faced experience, partly *imperative* (I should run away) and partly *indicative* (that creature is part-man and part-snake). According to some philosophers of mind, like Ruth Millikan (2004), this Janus-faced representation is strongly coupled together in lower animals—mice, for example, simultaneously recognize cats as a kind of thing (in a category) *and* as dangerous (fear affect). Humans, on the other hand, can decouple these two pathways (indicative and imperative) and fear can be reattached to alternative kinds of creatures/perceptions. We may need to distill the horror experience, and other emotionally charged judgments, into a parallel process of affect and cognition, a process usually so interwoven that it appears as one unified experience (and in animals always remains so).

EMBODIED COGNITION AND EMOTIONAL LEARNING

The growing field of embodied cognition is trying to undo the mistakes of earlier artificial intelligence and cognitive science by reintroducing feelings and affect into judgment itself. Judgments of fear and horror may be excellent case studies in a more mature view of human cognition generally. While there are still psychologists and cognitive scientists who think of the mind as a computer—one that is occasionally "contaminated" by our emotions—there is an alternative view. This alternative guard, people like George Lakoff, Mark Johnson, Antonio Damasio, Louise

Barrett, and Jaak Panksepp, recognize that the mind is hopelessly (albeit beautifully) entangled in the body. Reason is embedded in emotions and cannot be separated. So, ethical emotions like empathy (care), which we find in primates, are matters of the heart or at least matters of the limbic system. Not only do primate studies reveal high degrees of empathy and sharing in social animals (that is, rudimentary ethics), but we now have neurological evidence that emotional decision-making helps us resolve complex ethical quandaries in fast real-time scenarios. And in the same way that prosocial emotions, such as empathy, can aid us in our ethical lives, other emotions, such as fear, disgust, and horror, can be double-edged swords when wielded in the social arena. They might protect us from enemies, but they might also make "enemies" out of xenotypical individuals and groups.

Neurologist Antonio Damasio (1991) suggests that there are emotional settings or pathways, called "somatic markers," that help us make all kinds of decisions and especially automatic judgments. Remember that the amygdala controls emotion and the adjacent hippocampus handles memory, but these are in direct communication with the ventromedial prefrontal cortex—the new brain area of decision-making and executive control. Damasio suggests that somatic markers (created in the communication between the amygdala and the ventromedial prefrontal cortex) create weighted behavioral options for us. Should I run when I see the shadow approaching? Should I protect my brother? Should I throw myself on a hand-grenade that's landed in an orphanage? What about a hand-grenade that's landed in a corporate lawyers' convention? From the trivial to the sublime, fast decisions (including both survival and ethical decisions) are heavily biased by the emotional pathways that have been laid down by reward/punishment associations in our previous experiences. This is different from other forms of information learning. A positivist epistemology about sense data, recall, and syntactical manipulation is not enough to account for the uniquely "instinctual" and imperative aspects of emotional judgments like horror and fear.[4]

As we grow up, we meet our environment with associated physiological affective states. These affective responses to stimuli become default emotional settings—for example, snakes give me the creeps. But on the positive side, family and friends give me feelings of love and affective bonds of loyalty (cemented by oxytocin and opioid production). These somatic markers are processed in the pathway between the ventromedial prefrontal cortex and the limbic brain. When we encounter new decision-making situations (for example, the police are after my father) the somatic marker associations are triggered and these physiological feelings quickly bias or influence our cognitive processing. Positive feelings might well lead me to shelter my father from the police in the scenario I've described. Or if my father had been abusive I might show the cops exactly where he is hiding. These are complex associations, but they are not different in kind from the affective natural taxonomies that Schleidt discovered in birds and Ainsworth discovered in babies. Attraction (love) and repulsion (fear) color our world in an early encoded configuration, but these shift and modify according to later experiential patterns.

The point is that these emotional responses are not *instincts* in the sense of prewired or genetically engraved responses. The affective systems are ancient in the sense that they have many homologies with nonhuman animals, but in our individual lives they are idiosyncratically assigned and have significant plasticity. Emotional tendencies and values can help us make fast appropriate responses to environmental challenges, but they can also be retrained or reeducated.

ART AND THE ADAPTIVE IMAGINATION

Emotionally charged aesthetic experiences, such as Greek tragedy or horror films, can shape somatic markers in the viewer. You cannot know for sure how you will face the kind of horrors portrayed by Euripides and Sophocles. And you probably can't predict your responses to a headless zombie, an alien face-hugger, an approaching sea monster, or a chainsaw-wielding psycho. Hopefully, you are never going to be put to the test. But you might face similarly terrifying trials. You might be

assaulted, be put on the frontlines of some war, or be robbed, raped, or otherwise harassed and assailed. We may be fortunate enough to avoid such horrors, but we have all nonetheless played them out in our mind's eye. And though we can't know for sure how we will face an enemy soldier or a rapist, it doesn't stop us from imaginatively formulating responses. We use the imagination in order to establish and guide our own *agency* in chaotic and uncontrollable situations. The horror story is probably a permanent player in the moral imagination because human vulnerability is permanent. The monster is a beneficial foe, helping us to virtually represent the obstacles that real life will surely send our way. As long as there are real enemies in the world, there will be useful dramatic versions of them in our heads. And these rehearsals are voluntary sketches that both compose and employ our somatic markers.

People frequently underestimate the role of art and imagery in their own value convictions. Through artwork, such as Shelley's *Frankenstein*, Hitchcock's *Psycho,* King's and Kubrick's *The Shining*, artists convey moral visions and audiences can reflect on them, reject or embrace them, take inspiration from them, and otherwise be enriched beyond entertainment and catharsis. Good monster stories can transmit values to us by showing us examples of dignity and depravity without preaching or proselytizing. The horror we feel while watching or reading *The Walking Dead* is matched only by the inspirational awe we feel at the heroic family members in the bleak drama.

Following Leo Tolstoy's (1996) theory, powerful art should "infect" the audience with specific emotional content. But while Tolstoy thought the infection should be "Christian love," contemporary scholars recognize a plurality of legitimate emotional themes and cognitive strategies. We can see now that these virtual rehearsals and strategies can be interpreted in terms of evolutionary fitness. Our big neocortical brains don't need to actually fall off a cliff to understand what such an accident will do to us—our survival fitness is increased by simply playing out such scenarios in our imaginations. If I, living on the ancient Serengeti, see a conspecific attacked by a crocodile or lion, then my brain quickly assigns a negative somatic marker (terror) to crocodile

or lion morphologies. I don't need to reason much about it the next time I encounter these creatures. Like other mammals, I need a fast response to such threats—so, fear instincts (that are soft-wired rather than hard-wired) do the trick.

Horror genres, along with the more ethical genres, have unique powers to sculpt our somatic markers. Why does art communicate, explore, and even reprogram values better than science? Because art is a secret language that speaks directly to the limbic system. Art doesn't just tell us about emotional conflicts or clashes of values, it actually speaks directly to our affective system—bypassing the discursive (syllogistic) rationality. Art triggers the emotions in us directly, it doesn't represent them to us. The story of a novel or a film may be a representation of another place and time, but the emotional content is a direct infection in Tolstoy's sense. It is not a representation of a feeling of horror, but a contagion of horror.

NEOCORTICAL HORROR AND THE EXISTENTIAL COMPONENT

Of course, horror is more than just fear. Horror, unlike fear, seems to have existential significance embedded within it. Edgar Allan Poe describes a species of horror in *The Tell-Tale Heart:* "Presently I heard a slight groan, and I knew it was the groan of mortal terror. It was not a groan of pain or of grief —oh, no!—it was the low stifled sound that arises from the bottom of the soul when overcharged with awe" (Poe 2009, 200).

Horror master H. P. Lovecraft (1890–1937) tried to articulate a difference between real horror and just common fear. Lovecraft argues, in his 1927 *Supernatural Horror in Literature*, that good horror evokes a unique subjective emotion, which he refers to as "cosmic fear." There is something in the horror experience, Lovecraft claims, that resonates a deep instinctual awe of the unknown. "The one test," Lovecraft explains,

> of the really weird is simply this—whether or not there be excited in the reader a profound sense of dread, and of con-

> tact with unknown spheres and powers; a subtle attitude of awed listening, as if for the beating of black wings or the scratching of outside shapes on the known universe's utmost rim (1973, 7).

Lovecraft suggests that all humans have an instinctual awareness (some more refined than others) of the paltry state of human understanding—especially when compared with the almost limitless domain of the strange and unfamiliar. That sense of fragility and vulnerability is a major aspect of the "cosmic fear" that horror triggers in us.

The same year that Lovecraft published his *Supernatural Horror in Literature*, German philosopher Martin Heidegger published his magnum opus *Sein und Zeit* (*Being and Time)*. From quite a different starting place, Heidegger, and other existential writers including Jean Paul Sartre, argued that there is a radical kind of human experience, which is like fear but in a way deeper. Heidegger calls this radical dread "angst," a now famous German word for anxiety. Fear, he argued, is different from angst, because fear is a response to a definite, identifiable threat. One will have a fearful response to an assailant in a dark alley, an approaching aggressive animal, a felt earthquake or other natural disaster, and so on. But angst is an indefinite threat—the danger is nowhere in particular and yet everywhere. Like Lovecraft's "cosmic fear," Heidegger's angst is an ineffable mood of metaphysical proportion. Angst doesn't make me aware of a particular threat, but instead draws me out of my ordinary utilitarian ways of operating in the day-to-day world and makes me aware of my existential quandary—who and what am I? "Being-anxious," Heidegger says, "discloses, primordially and directly, the world as world" (Blackwell 1978, part I, chapter VI), and it brings human beings into a face-to-face crisis with their own finitude. Angst is that unsettling philosophical sense that you, and every other thing in the world, is just "*pulvis et umbra*."

These philosophical demarcations of horror may now be correlated with insights from brain science and evolution theory. Animals, as we have already noted, are more constrained by their emotional op-

erating system. Fear in most mammals is dedicated to specific enemies and comes charged with specific behavioral responses, but in human beings the dedicated circuit can be broken. The relatively massive human neocortex (which expanded between 800,000 and 200,000 years ago) allows for remarkable degrees of reflection. Unlike most other animals, we can take our memories, ideas, goals, and emotions offline, so to speak, and entertain them in a parallel universe of mental space. The frightening monsters of the savanna can be decoupled from real-time and represented on cave walls and in stories, and we can embellish them without constraint inside this unique mental space. In the mind, teeth and claws become sharper, predators become faster, tentacles reach longer, and so on. Reflection can turn finite threats into infinitely recurring vulnerabilities, and add totalizing or cosmic dimension to our affective anxieties—principal among these apprehensions being death itself. Neocortical expansion creates space for reflective symbolic counterfactual thinking, and along with that great privilege comes relentless horror. The nihilist is a brain with a negative somatic marker attached not to this or that but to the concept of the whole cosmos.

POLITICAL HORROR AND XENOPHOBIA

Arguably, one of the central functions of culture itself is to guide somatic marker associations into prosocial pathways (using ritual, art, and politics). In this sense, the somatic marker hypothesis modernizes Freud's repression thesis (in *Civilization and Its Discontents*) that prosocial harmony comes at the cost of a difficult retraining of individual affects.[5] Assigning the experience of horror to antisocial feelings and behaviors (aggression, incest, murder) is part of culture's job. Somatic markers are socially engineered (mostly unconsciously, but sometimes consciously, as in propaganda) by dedicating the flexible affective systems of fear and aggression to specific "enemies" (of the tribe or state). The epistemology of flexible horror is not merely an academic question. It may seem trivial to track the way ancient biological fears become reassigned to creatures in monster movies (default snake phobias, for example, are

heightened by Hollywood horror), but the triviality fades when we realize that racism and xenophobia are subspecies of the same epistemic processing.

Horror and monsters have always been politically useful. If imaginative monsters (extrapolated from nature) can help train us for survival in a hostile world, they can also easily corrupt our view of the Other. The history of monsters, from the ancients to the present, is rife with political demonization and dangerous propaganda (Asma 2009). In-group tribal affiliation seems to thrive when it can oppose an outgroup, and one of the best ways to distance one's own from another group is to characterize the other as uncivilized, monstrous, inhuman, horrifying.

A brief historical example will illustrate the way individuals and groups can be transformed into monsters. In 1484 Pope Innocent VIII gave Dominican inquisitor Heinrich Institoris wide-ranging legal powers to pursue and eradicate witches (Papal Bull *Summis desiderantes affectibus*). The Bull was used as a justification preface for Institoris's famous demon-hunting guide, *Malleus Maleficarum*. The *Malleus* foments many primordial fears and apprehensions—and no greater wellspring of irrational fear and worry exists than the emotions surrounding the subject of one's children. When you first become a parent, charged with the greatest responsibility possible, you discover subterranean emotional deposits of vulnerability in yourself that you didn't know existed. Parents of the medieval era had the *Malleus* to help nourish their worst hysterical fears, because witches were apparently very interested in stealing and eating babies. As Institoris describes it, "Midwives who work harmful magic kill fetuses in the womb in different ways, procure a miscarriage, and, when they do not do this, offer newly born children to evil spirits" (Institoris 2007, Question 11).

There are three ways that witches go after the sacred purpose of procreation. The first is to render the man's penis flaccid. The second is to produce a miscarriage or prevent conception altogether. And the third is to steal the infant shortly after birth, in order to eat the baby or offer it to an evil spirit. "Those who are indisputably witches are ac-

customed, against the inclination of human nature—indeed contrary to the temperament of every animal (at least, with the exception of the wolf)—to devour and feast on young children."

Institoris relates a story from his colleague, the Inquisitor of Como, that "a man had lost his child from its cradle and, while he was searching for it, he saw some women who had gathered together during the nighttime, and he came to the conclusion that they were slaughtering a child, drinking its fluid, and then devouring." In response to that event, the Inquisitor of Como came down very hard on the local witches, burning over 41 of them in a single year. One might well ask how all this baby stealing and torturing was possible, and the answer is simple: midwives. The *Malleus* takes a very dim view of midwifery—associating midwives with witches, and witches with baby eating (Heinsohn and Steiger 2004).[6]

It is hard to imagine a more horrific charge than baby eating, which is precisely why some inquisitors made the same charge against the Jews. And this legend can be added to the others, like the Gates of Alexander, that sought to demonize Jews as monsters.[7] For Institoris, Jews were like witches in another important way. Unlike other heathen, Jews and witches had been exposed to the Christian faith (had understood the teachings of the Gospel) but had then decided to reject it or turn away from it. This was considered worse than those people who were oblivious to the Gospel. It was an old anti-Semitic charge, further heightened by Institoris's theological attempt to link demonic witches and Jews directly.

This crude association of midwives and Jews with fear and aggression is cultural work (for example, myth, imagery, stories), but cultural work upon the underlying mechanism of fear conditioning—the amygdala. Unconscious bias against different races, genders, ethnic groups, and economic groups is a growing research area in social psychology. Repeatedly associating a *token* of an out-group *type* with negative affect will tag all members of the type with a negative somatic marker. The amygdala system does this nefarious work.

THE END OF HORROR?

David Amodio (2013) at the New York University Social Neuroscience Lab has been researching our bigoted brains. His experiments find that many whites (around 75 percent) have split-second negative responses to blacks, and these are subconscious and unavailable to conscious introspection. Our brains evolved to do fast pattern recognition and make unreflective judgments, often equating "difference" with negative affect.

Our amygdala is highly activated when we assess strangers. Our brain is helping us make predictions about what and who will be threatening, and our whole body is then tilted toward an appropriate action potential. If our cultural milieu is filled with negative racial stereotypes, then we have unconsciously generated many negative affect somatic markers for those people who are different. Even below this cultural level of subconscious taxonomy or classification, we should also incorporate the developmental xenophobia that Schleidt's birds and Ainsworth's babies demonstrate. If you're white and you never encounter a black person when you're a baby, then you may have categorial mismatch issues (and negative affect) later when you do.[8]

As Amodio (2014) points out, however, we are not prisoners of our fear-conditioned patterns. We have the complex frontal cortex that helps us inhibit knee-jerk negative impulses, but also gives us the reflective powers to reimagine and retrain our antisocial somatic markers. "The human mind is extremely adept at control and regulation," Amodio says, "and the fact that we have these biases should really be seen as an opportunity for us to be aware and do something about them."

But what exactly can we do about them? We know, cognitively speaking, that this or that racial member is not a baby eater, a monster, a horror, but such knowledge is relatively effete when compared with subconscious amygdala motivation—which is so robust that it appears instinctual.

If the epistemology that I have been sketching is correct, then the solution to xenophobia and the demonization of the Other is *affect*

replacement, not information enrichment. Just as Tolstoy thought his novels could infect readers with love, Charles Dickens also saw his novels as a way of inspiring prosocial affect and thereby improving social policies. In the 1840s, Dickens was mortified by a government report about the child labor abuses of factories and mines. He knew firsthand about the social injustices in the underclass and he tried composing pamphlets with stilted titles like "An Appeal to the People of England on Behalf of the Poor Man's Child." Dickens' philosophical and political screeds fell to the ground unread, so he vowed to strike a "sledge-hammer blow . . . on behalf of the poor man's child" (Schlicke 2011, 102). This eventual sledge-hammer blow, which showed the dignity of poor Victorians and revealed their hidden struggles, was called *A Christmas Carol* (1843).

In Somerset Maugham's book *The Summing Up* (1938), he reflects on his own ethical novels, including *Of Human Bondage* and the *Razor's Edge*, and echoes Tolstoy's earlier call for socially conscious art. Art, Maugham argued, should not succumb to elite, aesthete tendencies. It should not turn in on itself in an art-for-art's-sake narcissism, but should instead look outward. "For art, if it is to be reckoned as one of the great values of life, must teach men humility, tolerance, wisdom and magnanimity. The value of art is not beauty, but right action" (673). Art, like religion and political rhetoric, has the ability to cultivate moral sentiments and inspire moral action. As "affect management," culture has the potential to paint the Other as horrifying (Islamophobia, homophobia, for example) or paint the Other as brethren.

Reconfiguring the antisocial somatic markers created by political horror is fundamentally a cultural therapy project, but some recent neuroscience pulls back the curtain on how such reconfiguring happens. Kateri McRea et al. (2008) conducted a series of fMRI studies on emotional regulation. The study measured brain activity first while male and female subjects were exposed to disturbing negatively valenced images, and then while the subjects engaged in calming methods (emotional regulation strategies). In addition to cognitive reappraisal strategies (for example, subjects reminding themselves that the

horrible image is only a movie), many subjects—especially women—appeared to diminish negative feelings by enlisting positive feelings (for example, happy memories) to supersede the adverse emotions. In men, the amygdala down-regulates more rapidly upon cognitive reappraisal, but in women the amygdala stays more active and appears to be processing positive affect from the ventral striatum (a reward/pleasure processor). The gender issue aside for our purposes here, the interesting issue is that neuroscience reveals a brain system that helps us replace fear, horror, and disgust with positive affects. The brain has a therapeutic architecture.

Recent social psychology suggests that human tribalism (underwritten by amygdala-based fears about out-groups) might be inevitable, but also highly susceptible to revision. So promiscuous and flexible is in-group favoritism that it can be weaned off the usual nefarious criteria of blood ties, race, sex, and class, to be reassigned to more benign affiliations. Psychological experiments (Tajfel 2010) reveal a whole range of criteria for in-group bias. For example, test subjects have been shown to award higher payoffs to arbitrary in-groups, such as people who just happen to share the same birthday as the test subject. And in-group bias can be demonstrably strong when subjects share allegiance to the same sports teams, and so on.

A fickleness of tribalism is potentially good news for reeducating bigots, giving new hope to liberalism generally. But of course, such promiscuity or flexibility of affective bonds also reduces positive solidarity mechanisms too, including loyalty (Asma 2012). Liberalism often forgets that strong tribal forms of socioeconomic organization—families, for example—still do most of the day-to-day living, dying, cooperating, and conflicting well below the radar (and the ideals) of abstract state-level egalitarianism (Earle and Johnson 2000). Many small subsistence groups, such as families, tribes, and chiefdoms, continue to struggle for resources inside the larger political frameworks of nation-states, and this means that the psychology of vulnerability is a daily experience. These smaller us-them dynamics continue to draw on the ancient epistemology of xeno-processing. Therefore, horror,

like other emotions, may continue to have adaptive utility in our contemporary biological and political environments.

NOTES

1. In addition to Jaak Panksepp, Paul Ekman and Richard J. Davidson are crucial researchers into the affective springs of human and animal emotions. And while they may quibble about Panksepp's master list of emotions, all three share an empirically grounded commitment to the importance of bio-social adaptive affect and expression.
2. See the many articles by evolutionary psychologists Leda Cosmides and John Tooby, particularly "The Lords of Many Domains," *The Times Higher Education Supplement*, June 25, 1993. Philosopher Jerry Fodor surveys the general thesis, in his book *The Modularity of Mind* (1983) and elsewhere, that the mind may be more "modular" than we previously thought, and strong phobias (and language acquisition) may be evidence of these modules—each module being like a hard-wired preset that evolved for guiding human thinking and behaving.
3. In 1962 S. Shachter and J. Singer demonstrated, in their paper "Cognitive, Social, and Physiological Determinants of Emotional State" (*Psychological Review,* 69), that an emotion requires both a physiological arousal and a correlate cognition. For example, if a subject is injected with adrenalin, she does not automatically have an emotional response to the chemical. If however, the subject is first questioned about a painful event, then the injection will trigger an upsetting emotional response. The cognitive interpretation of, or even just correlation with, physiological arousal, is crucial to defining the subsequent felt emotion.
4. Neuroscience has begun to correct the computational model by showing how our rational, linguistic mind depends on the ancient limbic brain, where emotions hold sway and social skills dominate. In fact, the cognitive mind works only when emotions preferentially tilt our deliberations. Damasio et al. (1991) worked with patients who had damage in the communication system between the cognitive and emotional brain. The subjects could compute all the informational

aspects of a decision in detail, but they couldn't actually commit to anything. Without clear limbic values (that is, valenced feelings), Damasio's patients couldn't decide their own social calendars, prioritize jobs at work, or even make decisions in their own best interest. Our rational mind is embodied, and without this emotional embodiment we have no preferences. In order for our minds to go beyond syntax to semantics, we need feelings. And our ancestral minds were rich in feelings before they were adept in computations.

5. Retraining our "pleasure principle" to accommodate other egos and conform to the "reality principle" is accomplished by affective associational reeducation, not merely cognitive reassessment. One must, according to Freud, learn to loath one's selfish desires, not merely calculate their social liability.
6. No particular compelling reason is given in the text for this hostility. Institoris claimed, however, that penitent witch-midwives had confessed to him (doubtlessly under duress) that, "No one does more harm to the Catholic faith than midwives. When they don't kill the children, they take the babies out of the room, as though they are going to do something out of doors, lift them up in the air, and offer them to evil spirits" (Institoris, 2007, Part I, Question XI). While the *Malleus* itself offers little clue to the antimidwife campaign, some recent social scientists in Germany have suggested that midwives represented a threat to procreation because they knew the herbal arts of contraception and abortion. In a time when European populations had been decimated by plagues, the Church sought to rebuild its people. Disease, schism, Muslims, and infidels of all stripe seemed to be at the door of Catholicism. Midwives, with their contraceptive "magic," seemed to the Inquisition to exacerbate the problems, and this may be why they became prime suspects in the witch trials.
7. "Alexander's Gates," the story of a barrier against barbarian enemies, seems to have first appeared in sixth-century accounts of the *Alexander Romance*, but the legend is probably much older. Alexander supposedly chased his foreign enemies through a mountain pass in the Caucasus region and then closed them all behind unbreachable iron gates. The

details and the symbolic significance of the story changed slightly in every medieval retelling, but it was very often retold—especially in the age of exploration. According legend, the monsters' incarceration behind Alexander's Gates is only temporary. They await their imminent release, the medievals believed, and would be upon us shortly. The famous *Travels of Sir John Mandeville* (published between 1357 and 1371) reveals precisely how this unleashing will finally occur. The fictitious Mandeville (2011) retells the story of a monster zone (full of dragons, serpents, and venomous beasts) in the Caspian Mountains, but he adds another ethnic group—indeed, what he considers the main ethnic group—to the famous confinement. In Chapter 29, he states that "between those mountains the Jews of ten lineages be enclosed, that men call Gog and Magog and they may not go out on any side" (157). Here he is referring to the legendary 10 lost tribes that disappeared from history after the Assyrian conquest in the eighth century BCE. These Jews, according to Mandeville, will escape during the time of the Antichrist and "make great slaughter of Christian men. And therefore all the Jews that dwell in all lands learn always to speak Hebrew, in hope, that when the other Jews shall go out, that they may understand their speech, and to lead them into Christendom for to destroy the Christian people."

8. Eventually *Homo sapiens* evolved representational ways to communicate and improve the norms of our social contract. But before rules, morals, and laws we had prosocial affective systems—kin loyalty, empathy and so on—which served to bond small groups together. Even our basic folk-taxonomy of the world into friends and foes requires that perceptions and memories be emotionally coded with feelings of approach or avoid. The cognitive psychologist Elizabeth Spelke, who runs Harvard's famous "baby lab," has interpreted the problem-solving skills of prelinguistic human babies as evidence for inborn core knowledge—innate modules of cognition. And the psychologists Karen Wynne and Paul Bloom at Yale have interpreted babies' early social preference for cooperative companions as cognitively smart—the product of early conceptual thought. I have been suggesting an

alternative, emotions-based model for things like social preferences. Affection, not cost-benefit computation, is the true spring of primate social life.

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