Danger, Disease, and the Nature of Prejudice(s)

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Abstract: An evolutionary perspective on human cognition provides a foundation for research programs that identify unique linkages between specific threats and specific prejudices directed against specific categories of people. It also provides a set of logical tools that help identify conditions under which these prejudices are exaggerated or inhibited. We focus here on two kinds of threats: The threat of interpersonal violence and the threat of infectious disease. The inferred threat of interpersonal violence leads to a fear-prejudice against members of coalitional outgroups. This prejudice (along with a set of cognitive consequences) emerges especially under conditions that connote vulnerability to interpersonal harm. The inferred threat of infectious disease leads to a disgust-prejudice against individuals whose morphological appearance or behavior deviates from normative standards. This prejudice emerges especially under conditions that connote vulnerability to infection. Together, these lines of research yield insights about the origins of prejudices directed against many different categories of people (many of whom pose no real threat whatsoever), and also have useful implications for prejudice-reducing interventions. The results also indicate that the psychology of prejudice is best conceptualized as the psychology of prejudices (plural).

Keywords: prejudice, stereotyping, threat, person perception, social cognition, evolution, infectious disease, intergroup relations, fear, disgust

> "We humans have to grant the presence of some past adaptations, even in their unforgivable extremes, if only to admit they are permanent rocks in the stream we're obliged to navigate." (Kingsolver, 1995, p. 8)

1. Introduction

The title of this chapter adopts, and adapts, the title of Gordon Allport's (1954) classic book, *The Nature of Prejudice*. By coincidence, in the same year that Allport's book first appeared, the biologist Frank Brown published a fascinating study on the diurnal rhythms of intertidal oysters. Here is how Barbara Kingsolver—in her smart and lovely essay *High Tide in Tucson*—describes Brown's (1954) study:

> He scooped his subjects from the clammy coast of Connecticut and moved them into the basement of a laboratory in landlocked Illinois. For the first fifteen days in their new aquariums, the oysters kept right up with their normal intertidal behavior: they spent time shut away in their shells, and time with their mouths wide open, siphoning their briny bath for the plankton that sustained them, as the tides ebbed and flowed on the distant Connecticut shore. In the next two weeks, they made a mystifying shift. They still carried out their cycles in unison, and were regular as the tides, but their high-tide behavior didn't coincide with high tide in Connecticut, or for that matter California, or any other tidal charts known to science. It dawned on the researchers after some calculations that the oysters were responding to high tide in Chicago. Never mind that the gentle mollusks lived in glass boxes in the basement of a steel and cement building. Nor that Chicago has no ocean. In the circumstances, the oysters were doing their best. (Kingsolver, 1995, pp. 5-6)

Like all animals, oysters are characterized by a nervous system that evolved in a manner allowing them to effectively manage their behavior within their natural ecology—in this case, an ecology characterized by the ebb and flow of tides. One element of this adaptive physiology is sensitivity to perceptual information that tells them when the tide is high. Given the nature of their perceptual organs and their ecological circumstances, it is implausible that oysters might have evolved the means to judge tidal changes in the same way that we might do it (e.g., by glancing at the shoreline and visually assessing the extent to which the intertidal zone is submerged). Instead, what appears to have evolved is sensitivity to a cue that, within their natural ecology, was diagnostic of the tidal flow: The gravitational pull of the moon. When the magnitude of the moon's gravitational pull reaches some perceptual threshold, it triggers a cascade of neurochemical events within

their nervous system, which in turn stimulates their musculature to respond in ways that facilitate their feeding, their survival, and ultimately their reproductive fitness.

Or, at least, it did. It did so under the ecological circumstances within which oysters' ancestors lived, and reproduced, for millions of years. Take them out of that ancestral ecology and plop them into an artificial tideless box and, sure, their ancient adaptations seem senseless. As Kingsolver observes, you could say pretty much the same thing about humans, too:

> On most important occasions, I cannot think how to respond, I simply do. What does it mean, anyway, to be an animal in human clothing? We carry around these big brains of ours like the crown jewels, but mostly I find that millions of years of evolution have prepared me for one thing only: to follow internal rhythms. To walk upright, to protect my loved ones, to cooperate with my family group—however broadly I care to define it—to do whatever will help us thrive. (Kingsolver, 1995, p. 8)

In the tradition of psychological research on heuristics and biases (Gilovich, Griffin, & Kahneman, 2002; Kahneman, Slovic, & Tversky, 1982), Kingsolver reminds us that seemingly senseless responses provide invaluable insight into highly automatized psychological mechanisms that also characterize the many more straightforwardly sensible things people do. In the tradition of ethologists and evolutionary biologists (Alcock, 2005; Darwin, 1859), she reminds us that the mysteries of animal behavior can be most completely solved if we reflect deeply upon the evolutionary selection pressures imposed by the enduring ecologies into which animals' ancestors were born and produced offspring of their own, for millions of years. And in the tradition of evolutionary psychology (Barkow, Cosmides, & Tooby, 1992; Buss, 2005; Crawford & Krebs, 2008; Gigerenzer, Todd, & the ABC Research Group, 1999), Kingsolver reminds us that this last point applies not just to oysters but to humans, too. If we are to understand the heuristics and biases that guide human behavior, we would be wise to study them in the light of what we know about human evolution.

1.1 The Nature of Prejudice

That brings us back to Allport and the nature of prejudice. In this chapter, we describe a broad multi-pronged program of research that applies the logical principles of evolutionary psychology to the study of human prejudice(s).

This body of research focuses on linkages between the psychology of threat perception and the psychology of prejudice. Taken as a whole, this work reveals a set of qualitatively distinct prejudices rooted in distinct sets of psychological processes, each of which can be understood as an adaptive consequence to a distinct kind of threat that imposed evolutionary selection pressures on ancestral populations. Within this broad framework, individual lines of research have focused on two specific kinds of threat—the threat of interpersonal violence and the threat of infection disease—and their separate implications for different kinds of prejudices pertaining to different categories of people. Each line of research has produced novel empirical insights that help us understand the prejudices that influence social cognition and social behavior, and help us predict the specific circumstances under which those specific prejudices wax and wane.

Beyond the specific conceptual insights and empirical discoveries, we hope readers take away four broader lessons as well:

(1) If we are to truly understand the psychology of prejudice(s), it can be useful to adopt the logical principles of evolutionary psychology as a point of departure.

(2) Many specific prejudices can be understood as responses to specific kinds of threats that had enduring implications for human welfare over the course of human evolutionary history. Because these threats differed in important ways—in terms of the people who posed them and the manner in which those threats would have been successfully mitigated—psychological processes that evolved in response to these threats would also have differed in important ways and produced qualitatively different prejudices. These prejudices differ in terms of their connotative contents and associated affect, in terms of the categories of people toward whom they are directed, and in terms of the contextual variables that amplify and inhibit them.

(3) The novel insights that have emerged from this research are not only conceptually illuminating but also have useful practical implications. Different threat-based prejudices will often require different interventions to mitigate. By more fully articulating the distinct processes and conditions that produce different prejudices, it should be possible to design interventions that target those processes more specifically and, thus, will be more effective.

(4) These preceding lessons all converge on the broader lesson: To understand the nature of prejudice (singular), we must study the different natures of different prejudices (plural).

2. An Evolutionary Perspective on Threats and Prejudice(s)

There is a long history of social psychological research linking the perception of threat to the expression of prejudice (e.g., Sherif & Sherif, 1953; Stangor & Crandall, 2000). For instance, Hovland and Sears (1940) published an article documenting a relation between threats to Americans' economic resources and lynchings of African Americans. There are many additional, more rigorously experimental studies documenting the impact of perceived economic threat on prejudice against immigrants and ethnic minority groups (Butz & Yogeeswaran, 2011; Esses, Dovidio, Jackson, & Armstrong, 2002). Another illustrative line of research reveals that prejudice emerges, in part, from ego threat. To the extent that individuals' self-appraisals are influenced by their appraisals of the social categories to which they belong, the positivity of their self-appraisals is indirectly influenced by their evaluations of those self-relevant ingroups, especially in comparison to outgroups (Tajfel & Turner, 1986). Ingroup favoritism (prejudicial attitudes and actions favoring an ingroup over an outgroup) therefore provides a functional means of self-enhancement. This form of prejudice is exaggerated under circumstances in which people experience some form of ego threat, and can be attenuated under conditions in which a positive self-concept has been affirmed through other means (Brown, Collins, & Schmidt, 1988; Fein & Spencer, 1997).

These are just two examples of different threats that have been linked to prejudice. Our purpose here is not to provide a complete—or even cursory—review of these different kinds of threat. Rather, we want to highlight an important point illustrated by these two paradigmatic lines of research on economic threat and ego threat: These different kinds of threat are fundamentally different. Aside from the fact that they share the word "threat," and the fact that they both have been implicated as contributors to prejudice, economic threat and ego threat have almost nothing in common. Even the various forms of threat sometimes lumped together as "realistic" threats (as opposed to intrapsychic threats such as ego threat; see, for example, Stephan & Stephan, 2000) are conceptually distinct. The economic consequence that may follow from job loss is very different than the lasting injury that may follow from actual intergroup violence. Even corporeal threats differ. Injury differs from illness, and the peoples who pose some threat of intentional injury comprise a different set of social categories from the peoples who pose some threat of transmitting infectious diseases. In short, different threats are truly different threats; and because of this, they produce different prejudices.

There are a variety of ways through which one might arrive at the observation that different threats produce different prejudices. For us, that arrival has been facilitated by an evolutionary analysis of human social cognition (Neuberg, Kenrick, & Schaller, 2010, 2011; Neuberg, Smith, & Asher, 2000; Schaller, Kenrick, & Park, 2007).

2.1. Prospects and Perils in Ancestral Ecologies

An evolutionary analysis of human psychology follows from the basic biological principle that if (a) some psychological tendency has some genetic basis, and (b) this psychological tendency was associated with increased reproductive fitness (relative to plausible alternative psychological tendencies) within an ancestral population, then (c) this psychological tendency (along with its genetic bases) would have become increasingly widespread over time within the population. Within this framework, hypotheses about contemporary psychological phenomena can be derived through a deductive process requiring at least two steps.

The first step is to identify an enduring reproductive challenge—some enduring feature in the physical and/or social ecology of ancestral human populations that provided some opportunity for enhanced reproductive fitness or imposed some obstacle to reproductive fitness. Some reproductive challenges arise in the context of fitness-relevant prospects to be attained. For example, to survive and reproduce, one must discriminate between potential foodstuffs that do, or do not, provide nutrients. Other reproductive problems arise in the context of fitness-relevant perils to be avoided. To survive and reproduce, one must avoid ingesting substances containing deadly toxins.

The second step is to identify psychological tendencies that might plausibly have helped to address that challenge (and to address it more reliably than alternative psychological tendencies), and thus to have exerted a positive effect on reproductive fitness within ancestral populations. Barring any countervailing selection pressures, these adaptive psychological tendencies would have become widespread within those ancestral populations.

Times change, of course, and so do ecological circumstances. Human beings have proven themselves adept at reshaping physical and social environments to the point that, in many parts of the world, contemporary human ecologies bear little resemblance to those inhabited by ancestral populations. Environmental destruction, technological innovation, and cultural change all happen quickly, but evolutionary change is relatively slow and lags far behind. The upshot is that psychological tendencies that evolved in response to the enduring prospects and perils of ancient ecologies continue to influence

human affect, cognition, and behavior in contemporary environments—even if they no longer confer any reproductive benefits. The appetitive attraction to sugar and fatty foods offers one example of a preference that conferred obvious reproductive benefits in ancestral ecologies (in which such foods were highly valuable yet scarce), but is counterproductive in many contemporary human societies (in which such foods are inexpensive and abundant). Many prejudices fit this same profile. They were adaptive under ancestral circumstances but have problematic consequences in contemporary human societies.

2.2. Prejudices as Threat Management Mechanisms

Humans are an ultrasocial species and, for a very long stretch of evolutionary history, our ancestors were as well. Reproductive fitness in ancestral populations depended not just upon the solution of reproductive challenges pertaining to the physical environment but also upon the solution of reproductive challenges pertaining to the social environment. Specific kinds of interactions, with specific kinds of conspecifics (each of whom might have specific traits and behavioral intentions) had specific kinds of consequences for reproductive fitness. Some of these interactions would have had positive consequences (e.g., sexual intercourse with a mate of high genetic quality), but some would have had negative consequences. Among those negative consequences were a variety of threats to perceivers' immediate or long-term welfare—the threat of interpersonal hostility, the threat of contracting an infectious disease, the threat of being cheated out of valuable resources, and so forth. Reproductive fitness in ancestral environments depended crucially on (a) individuals' capacity to identify conspecifics who posed some sort of fitness-relevant threat, and (b) their capacity to respond behaviorally in a manner to minimize that threat. Psychological mechanisms that facilitated accurate diagnosis of threats would have been evolutionarily adaptive, as would psychological mechanisms that facilitated threat-minimizing behavioral responses (Neuberg et al, 2011).

How could an individual know whether another individual posed a potential threat? It's safe to assume that our ancestors weren't mind readers. They had no ESP-like access to others' behavioral intentions or to the contents of their character. Nor would they have benefited by deferring judgment, because effective management of many threats (especially those with immediate implications for personal welfare) often would have required immediate evasive action. Inevitably, there must have evolved psychological mechanisms that promoted inferences about traits and intentions on the basis of mere appearances—perceptually salient aspects of an individuals' morphology or movement that, ideally, had some non-zero correlation with their actual traits or intentions.

Facial expressions comprise one category of superficial cues that can be useful when inferring another's intentions. It is partly for this reason that there evolved brain systems that are functionally specific to face perception (Kanwisher, McDermott, & Chun, 1997) and that our attentional systems are hypersensitive to specific kinds of functionally relevant facial expressions, such those connoting anger and friendliness (e.g., Becker, Anderson, Mortensen, Neufeld, & Neel, in press). But facial expressions are fleeting and can be readily disguised (even someone with the most murderous intentions may fake a smile). Moreover, some interpersonal threats—such as the threat of disease transmission—may be entirely unrelated to intentions and so cannot be inferred from facial expressions at all.

Therefore, there were likely adaptive benefits associated with the capacity to draw threat-relevant inferences from additional appearance cues as well—cues that were relatively invariant and difficult to disguise. As we discuss more fully below, many of the threats that inspire prejudices are inferred from exactly these kinds of difficult-to-conceal aspects of physical appearance—including features of morphology that convey information about sex, age, health status, and membership in a coalitional outgroup.

To protect oneself from a threat posed by another individual, one must not only recognize that the potential threat exists but also respond to that threat in a manner that minimizes one's own vulnerability to it. Different kinds of threats tend be effectively minimized by different kinds of behavioral responses. A behavioral response that reduces one's vulnerability to being unscrupulously cheated (e.g., monitoring another's actions from nearby) may not necessarily reduce one's vulnerability to infection—and may even increase it. It is likely, therefore, that there evolved stimulus-response mechanisms through which qualitatively different threats stimulated different behavioral responses. Behaviors—actual muscle movements—don't just happen. They result from a complex cascade of neurochemical reactions that manifest also in specific kinds of functionally interrelated cognitive and emotional responses: The activation into working memory of specific kinds of connotative associations with target individuals (i.e., stereotypes), along with specific kinds of feelings toward them (i.e., prejudices).

Thus, to have offered reproductive benefits in ancestral environments, these emotion-cognition-

behavior syndromes are likely to have been threat-specific, designed to increase the likelihood that an individual experiencing them would perform actions to mitigate that specific inferred threat.

3. Functional Specificity: Different Threats Elicit Different Prejudices

Emotions are fundamental to the psychology of threat-management. Many emotions (e.g., fear, disgust, anger) act as alarms, responding quickly to perceptual cues connoting the presence of a threat and interrupting ongoing activities to re-orient attention toward it. If you perceive the sinuous shape of a snake slithering along a woodland path, the immediate fear response directs your attention away from the forest landscape and toward the snake itself. Emotions also facilitate functionally appropriate motor responses. The physiological symptoms of fear—the rush of adrenaline, release of body sugars, and flow of blood toward our larger muscles—prepare the body to flee or fight, either of which (depending on the context) may be an effective means of managing the danger posed by a predatory threat.

Different emotional alarms sound in response to different kinds of threats, and these distinct emotional experiences are associated with distinct cognitions, distinct motivations, and distinct action tendencies (Izard, 1991; Plutchik, 1980; Roseman, Wiest, & Swartz, 1994; Tooby & Cosmides, 1990). When unexpectedly encountering a slithering snake, we experience fear (not sadness, anger, disgust, or guilt), which compels the characteristic fight-or-flight response functionally specific to predatory threats. When smelling the stench of a rotting carcass, we experience disgust (not fear, sadness, anger, or guilt), which compels avoidance of contact with the bacteria-infested object.

Just as functionally integrated sets of emotions, beliefs, and behavioral tendencies are engaged when we encounter slithering snakes and festering flesh, functionally integrated sets of emotions, attributions, and discriminatory propensities are engaged when we perceive potentially threatening members of our own species. Consider a few examples of common prejudices experienced by many White Americans. Based on implicit concerns with physical safety, the perception of a dark-skinned Muslim fundamentalist may elicit fear, expectations of untrustworthiness, and behavioral guardedness. Based on concerns with the threat of contagion, the perception of someone's facial disfigurement may elicit disgust, implicit activation of disease-connoting cognitions, and behaviors designed to minimize proximity and contact. Based on resource-related concerns with non-reciprocation, the perception of a welfare recipient may elicit resentment, a stereotypic attribution of laziness, and civic actions designed to limit governments' collection of tax dollars. And based on perceptions of threats to closely-held values and desired social norms, the perception of anyone who holds beliefs that deviate from the status quo may elicit anger and contempt, attributions of moral wrongness, and behaviors designed to deny them public positions from which they might exercise influence over others. These different sets of emotions, cognitions, and behavioral inclinations can be considered to comprise qualitatively distinct "syndromes" of prejudice.

This concept of threat-based prejudice syndromes contributes depth and texture to our understanding of prejudice. Prejudice has typically been defined simply as a general undifferentiated attitude—positive or negative, favorable or unfavorable—directed toward groups and their members. This traditional approach to prejudice captures the affective valence of prejudice, which may often be sufficient to predict gross acts of behavioral discrimination. It is becoming increasingly apparent, however, that this view of prejudice ignores the diversity of actual psychological reactions people have to others (e.g., Brewer & Alexander, 2002; Mackie, Devos, & Smith, 2000; Esses, Haddock, & Zanna, 1993; Fiske, Cuddy, Glick, & Xu, 2002). The evolutionary approach makes salient the possibility that different groups elicit qualitatively different emotions from others, and that they do so because they are viewed as posing qualitatively different threats (Cottrell & Neuberg, 2005).

Many empirical findings support hypothesized links between specific threats and specific prejudice syndromes. Results from one illustrative study focused on perceptions of threat and their prejudicial consequences among college students in the southwestern United States (Cottrell & Neuberg, 2005). African-Americans and Mexican-Americans were especially likely to be perceived as posing a threat to physical safety; consequently they elicited relatively high levels of fear. Gay men were especially likely to be perceived as posing a health threat (presumably because of the heuristic association between homosexuality and HIV), and so elicited relatively high levels of disgust. Fundamentalist Christians and feminist activists (two social categories that are perceived to be different in most other ways) were both judged to pose moral threats to values and personal freedoms, and so they elicited nearly identical emotion profiles characterized not only by disgust but also by high levels of anger as well.

The fundamental distinctions between these different prejudice profiles are masked by more traditional, valence-based measures of prejudice.

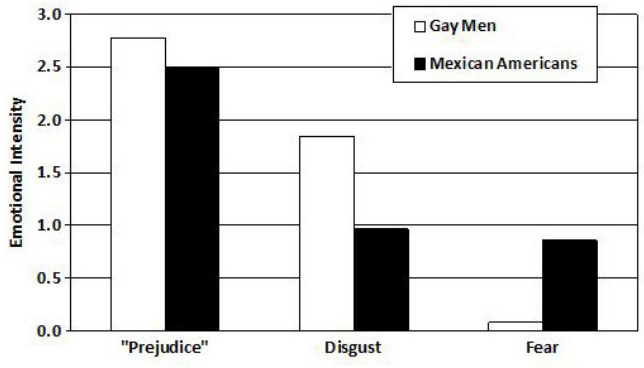

Figure 1. Measures of general prejudice can mask qualitatively distinct prejudices. A survey of European American undergraduates revealed that they held equally negative evaluative attitudes toward Mexican Americans and gay men. These findings obscured important qualitative differences in the underlying prejudices: Whereas Mexican Americans elicited much more fear than did gay men, gay men elicited much more disgust than did Mexican Americans. Other findings showed that these differences resulted from differences in the threats these two groups were perceived to pose: Mexican Americans were viewed as posing threats to physical safety whereas gay men were viewed as posing threats to health. (Results originally reported by Cottrell & Neuberg, 2005).

Although it may appear that people feel equally prejudiced against two groups based on conventional measures of prejudice, closer examination reveals that people actually feel quite differently towards these groups (e.g., especially disgusted by gay men, but especially fearful of Mexican Americans; Cottrell & Neuberg, 2005; see Figure 1). Similar findings characterize people's perceptions of the general versus specific threats that groups may pose: Groups seen as posing similar levels of "threat" (in general) are often viewed as posing quite different specific kinds of threats.

Other studies (e.g., Cottrell & Neuberg, 2004) reveal that these different threats are also accompanied by functionally different behavioral inclinations. People who are viewed as a threat to physical safety (e.g., African Americans) not only elicit fear but also inclinations to learn new self-defense strategies and to increase police patrols. People viewed as health threats (e.g., gay men) not only elicit physical disgust but also inclinations to get more frequent medical checkups and to avoid drinking out of the same water fountain. People viewed as threats to values and personal freedoms (e.g., fundamentalist Christians) not only elicit moral disgust and anger but also inclinations to reduce the exposure (physical and media) that children have to them and to reduce the ability for such individuals to make public policy. Because different threats and different emotions are functionally linked to qualitatively different behavioral inclinations, to ignore these distinctions is to conceptually blind oneself to the different forms of behavioral discrimination that different groups are likely to confront.

These distinct threat-based prejudice syndromes also have important implications for predicting perceivers' attitudes toward social and political policy. People who view gay men and lesbians as threatening values are less favorable towards gay rights, and this is mediated by disgust; people who believe that Mexican immigrants threaten reciprocity norms are more enthusiastic about limiting immigration, and this is mediated by anger (Cottrell, Richards, & Nichols, 2010).

These links among perceived threats, emotional reactions, and behavioral inclinations have been demonstrated not only with college students but also with individuals selected from a nationally stratified sample, and with perceivers from a variety of different ethnic minority backgrounds (i.e., Hispanic-, African-, and Asian-Americans; Cottrell, Richards, & Neuberg, 2011). Moreover, several studies reveal that threat perceptions strongly mediate the effects of target group on emotional reactions and behavioral inclinations. Indeed, after controlling for threat, very little variance in emotional reactions and behavioral inclinations is actually accounted for by target groups themselves. Prejudiced people appear to be reacting primarily against the threats ostensibly posed by the characteristics of particular people, rather than against the groups and their members, *per se* (Cottrell & Neuberg, 2005).

This threat-based approach seems to do a much better job than broader, sociocultural approaches in predicting prejudices and discriminatory inclinations across the societal "interethnic matrix." Cottrell and her colleagues (2011) assessed the particular prejudices that European Americans, African Americans, and Hispanic Americans have of one another (and of Asian Americans), as well as the specific threats that each group perceives each of the other groups to pose. A straightforward ingroup-outgroup approach to intergroup relations predicts that each group would view their own group more favorably than the others and would not qualitatively differentiate among outgroups. A majority-minority approach to understanding intergroup relations predicts that the majority group (European Americans) would view each of the three minority groups as similar to one another (and feel similarly towards them), and that these minority groups would respond similarly toward the majority group. A status-focused perspective predicts that the groups would differentiate among groups on the basis of their status—that, for instance, the lower status groups (i.e., African- and Hispanic-Americans) would share

common views of and feelings toward the high status groups (i.e., European- and Asian-Americans) and not differentiate between them. None of these predictions are borne out by the empirical results. Instead, the results support the implications of threat-based prejudice syndromes. Prejudicial beliefs were uniquely predicted by the specific threats that each group was believed to pose to each other group.

Why exactly are different threats implicated in different inter-group contexts? Part of the answer may result from the tendency for different societal contexts to elicit different kinds of vulnerabilities (pertaining to interpersonal violence, infectious disease, social exchange relations, group status, etc.), each of which implies a different threat—two of which we discuss in much greater detail below. Additionally, perceptions of threat may be influenced by idiosyncratic historical relations between different groups. A deeper discussion of these sociological subtleties is beyond the scope of this article. We elaborate instead upon the more fundamental implication: Different groups are perceived to pose qualitatively different threats to perceivers and, as a consequence, they elicit qualitatively distinct prejudices.

4. Further Implications: Adaptive Error Management and Context Contingency

An evolutionary perspective on threats and prejudices has additional implications as well. Two of these implications are particularly important in predicting the manner in which different prejudices are expressed in contemporary contexts. One implication results from a signal detection problem inherent in the detection of threats. The other results from a cost/benefit problem inherent in behavioral responses to threats.

4.1. Signal Detection and the Smoke Detector Principle

To respond to a threat in an adaptive fashion, one must first infer that the potential threat exists. Because these inferences are often based on superficial physical cues (which typically are imperfectly diagnostic of actual threat) perceivers confront a signal-detection problem. Inference errors are inevitable. Two kinds of errors can occur: (a) false positive errors (in which truly benign individuals are erroneously perceived to pose a threat), or (b) false negative errors (in which individuals who truly do pose a threat are erroneously perceived to be benign). Any error can be costly, but some errors are more costly than others. This has had important implications for the evolution of adaptive biases in person perception and social inference.

An analogy is useful here. A smoke detector (the kind that that you install in the ceiling of your home) is a threat-detection device designed to use superficial cues (particulates in the air) to infer the presence of a specific kind of threat (a house fire). It has the potential to make false positive errors (sounding its alarm even when there is no fire) as well as false negative errors (failing to sound its alarm when the house actually is on fire). False positive errors are irritating; false negative errors can be deadly. Because of this cost asymmetry, smoke detectors are deliberately calibrated to minimize the frequency of (potentially fatal) false negative errors, with the inevitable consequence that they make many (merely irritating) false positive errors.

The "smoke detector principle" (Nesse, 2005) applies not just to mechanical devices designed intentionally by intelligent engineers but also to neural mechanisms shaped blindly by millions of years of genetic evolution. Natural selection has led to the evolution of perceptual, cognitive, and emotional systems that minimize the likelihood of making whichever form of inference error is most costly to reproductive fitness; consequently, psychological systems are characterized by predictable biases that lead them to often make the alternative, less costly, form of error (Haselton & Nettle, 2006). Therefore, like other evolved biases in person perception (e.g., Zebrowitz & Montepare, 2006), the psychology of threat detection is characterized by a tendency toward overgeneralization: Many people who pose no threat whatsoever are implicitly assumed (on the basis of superficial features alone) to pose some sort of potential threat. Although threat-based prejudice processes evolved as a means of minimizing the reproductive costs posed by actual threats in ancestral ecologies, they evolved in such a way that the resulting prejudices are very often expressed against individuals (and groups of individuals) who pose no actual threat of any sort at all.

This principle has been usefully applied to predict categories of people who (despite posing no threat) are likely to be victimized by threat-based prejudices in contemporary human societies. We discuss some of these applications in greater detail below.

4.2. Costs, Benefits, and the Functional Flexibility Principle

Threat-management mechanisms evolved because there were reproductive benefits associated with the capacity to deploy those mechanisms. But the actual deployment of those mechanisms can be associated with costs as well. Consider humans' highly automatized alarm response to sudden loud

noises (which manifests in the acoustic startle reflex). It was surely adaptive to have the capacity for this reflexive response, because sudden loud noises (e.g., the roar or lion, or the scream of a child) often are symptomatic of immediate threats to reproductive fitness. But the actual startle response is metabolically costly, as are its behavioral consequences; and these behavioral consequences (even if they do minimize the immediate threat) often interfere with other fitness-enhancing activities. In short, any behavioral response poses a cost/benefit problem.

Importantly, the ratio of benefits (which are specific to threat-reduction) to costs tends to be variable across different ecological contexts. The benefits (but not the costs) are greater under conditions in which individuals actually *are* more vulnerable to the specific form of threat. Therefore, the cost/benefit problem is likely to have been adaptively solved by the evolution of psychological mechanisms that (1) are sensitive to individuals' apparent vulnerability to specific threats and (2) modulate threat-minimizing responses accordingly. When individuals encounter information suggesting they are highly vulnerable to a threat (implying that the benefits of threat-mitigating action may outweigh the costs), they are more likely to engage relevant threat-management mechanisms, and to do so more strongly. However, when individuals perceive they are relatively invulnerable to the threat (implying that the costs of a defensive response may outweigh the benefits), they are less likely to engage defensive responses, or are likely to engage them less strongly.

This kind of "functional flexibility" manifests across various different kinds of threat-minimizing psychological phenomena—including our example of the acoustic startle reflex. The magnitude of this startle response is exaggerated when people feel more vulnerable to danger. Because humans are a highly visual species, people feel more vulnerable to danger when denied visual access to their surrounding environment—when they are blindfolded, for instance, or when there is no ambient light at all. In fact, when people are in the dark, they show an especially strong acoustic startle reflex (Grillon, Pellowski, Merikangas, & Davis, 1997).

The functional flexibility principle has obvious implications for the activation and expression of threat-based prejudices. Although there may be some default inclination to perceive specific kinds of people as posing specific kinds of threats, this inclination is likely to vary depending on the extent to which perceivers feel vulnerable to that specific kind of threat. If perceivers are (or merely perceive themselves to be) especially vulnerable to a specific threat, the threat-specific prejudice (but not other prejudices) is likely to be exaggerated. On the other hand, if perceivers are (or merely perceive themselves to be) relatively invulnerable to that threat, the threat-specific prejudice is likely to be more muted.

Like the smoke detector principle, this functional flexibility principle has been used productively to deduce novel hypotheses specifying the circumstances under which specific prejudices are either more, or less, likely to emerge. In our own work, we have focused especially on two particular kinds of threat-based prejudices. One line of research focuses on the perceived threat of violent interpersonal harm and its implications for prejudices against members of coalitional outgroups. The other line of research focuses on the perceived threat of disease transmission and its implications for prejudices against various categories of people characterized by subjectively atypical appearances and behavioral tendencies. The following two sections of this chapter provide overviews of each line of research. The results reveal unique implications for specific ways in which specific peoples are pre-judged, and for the conditions under which these prejudices are either exaggerated or inhibited.

5. Violence, Vulnerability, and Implications for Intergroup Prejudices

Not all prejudices can be sensibly characterized as *intergroup* prejudices, but many are: They truly fit the ingroup/outgroup template, in which we respond to "us" more favorably than we respond to "them." Intergroup prejudices are pervasive—not just in human populations but also in other primate species (e.g., Mahajan, Martinez, Gutierrez, Diesendruck, Banaji, & Santos, 2011; Wilson & Wrangham, 2003). Cross-species evidence indicates that intergroup prejudice is evolutionarily ancient and substantially predates the more recent evolution of uniquely human processes—pertaining to self-concept, self-esteem, and social identity—that lie at the core of many of the most widely cited social psychological theories of prejudice. There is no doubt that these uniquely human processes do contribute, in part, to ingroup favoritism (Hewstone, Rubin, & Willis, 2002). But they form only part of the full story of intergroup prejudice. To tell the story more completely, we must identify additional, more evolutionarily ancient psychological processes. To do so, we must consider the nature of ancient social ecologies and the selection pressures they imposed upon ancestral populations.

5.1. The Enduring Threat of Intergroup Violence within Ancestral Populations

For a long stretch of human evolutionary history our ancestors lived in small coalitional groups. Group life was adaptive. It afforded efficient means for finding mates and raising offspring; it enabled individuals to more effectively exploit natural resources; it provided a buffer against predators. The many benefits of group living provided a selective context within which there evolved many psychological processes—and associated cultural norms—promoting within-group cooperation, coalitional behavior, and ethnocentric attitudes (Brewer, 1998; Campbell, 1982; Kurzban & Neuberg, 2005).

Although the majority of social interactions were likely to have occurred within the boundaries of these coalitional groups, there existed the potential for interactions with members of other groups as well. These intergroup interactions were characterized by nontrivial potential for hostility and violence.

We hasten to note that this last statement is speculative. Ideally, we could buckle ourselves into a time machine and roar off into the past to see if this speculative statement stands up to observational evidence. But we can't. In the absence of a time machine, it is impossible to draw completely confident conclusions about the nature of intergroup interactions during the distant past. Nor do social interactions leave any clear fossil record. For this reason, biologists, anthropologists, and other human evolutionary scientists often look for indirect evidence in contemporary populations that live under ecological circumstances that are as similar as possible to those of our ancestors. These populations include other primate species, as well as human hunter-gatherers living in technologically primitive small-scale societies.

First the primate evidence: Among most primate species, intergroup interactions are more violent than within-group interactions (e.g., Southwick, Siddiqi, Farooqui, & Pal, 1974; for a brief review, see Schaller & Neuberg, 2008). As our closest non-human relatives, chimpanzees provide an especially compelling example (Wilson & Wrangham, 2003). Dugatkin (1997, p. 132) characterized intergroup interactions among chimpanzees like this: "Such encounters on occasion can be friendly, and even solicited... but most often they are not." And, based on her observations of chimpanzees, Goodall (1986, p. 331) concluded that chimpanzee aggression against outgroup members is "prompted by what appears to be an inherent dislike or 'hatred' of strangers."

Similar conclusions emerge from ethnographic analyses of human hunter-gatherer societies. Human hunter-gatherer societies tend to be territorial, with the consequence that trespasses onto outgroup territory can be dangerous (Eibl-Eibesfeldt, 1974; Kelly, 1995; Robarchek, 1990; for a brief review, see Schaller & Neuberg, 2008). The anthropological literature on warfare reveals many contexts in which intergroup relations among hunter-gatherers are characterized by chronic violence and hostility (Ferguson, 1984; Haas, 1990). Even when actual acts of intergroup violence are rare, there appears to be considerable awareness of the potential for such violence. For example, based on his study of tribal groups in the Upper Xingu basin in Brazil, Gregor (1990, p. 114) concluded that, "The Xingu peace relies heavily on institutions that separate the tribes and preoccupy villagers with thoughts of death and violence."

All things considered, it seems reasonable to assume that, throughout a substantial chunk of human evolutionary history, interactions within one's own coalitional group were generally more cordial than interactions with outgroup members. Unplanned, unsolicited interactions with outgroup members were likely to have been dangerous.

5.2. Implications for the Psychology of Prejudice

If our ancestors' ecological circumstances were characterized by the enduring threat of intergroup violence, this would have imposed nontrivial selection pressures on ancestral populations. The evolutionary consequence would have been the emergence, and refinement, of psychological mechanisms that helped to protect individuals from this threat—for instance, mechanisms that promoted behavioral avoidance of unplanned intergroup encounters and caution within the context of any ongoing intergroup interaction.

Exactly what psychological mechanisms would facilitate this adaptive behavioral strategy? First, individuals must be able to quickly and efficiently distinguish between ingroup and outgroup members. This requires not just the capacity to distinguish between members of different coalitional groups (which people are very adept at doing; Brewer, 1988; Kurzban, Tooby, & Cosmides, 2001), but also the capacity to efficiently acquire and retain associative knowledge structures that link outgroup members to threat-connoting affective and cognitive information. As Cottrell and Neuberg (2005) show, groups perceived as posing threats to physical safety elicit fear—the specific emotion designed by natural selection to facilitate escape from or defense against predatory threats. Research on associative learning reveals that although people are quick to learn fearful responses to both ingroup and outgroup members, there is an important asymmetry in their tendency to *unlearn* those fearful responses (Olsson, Ebert, Banaji, & Phelps, 2005): Fearful responses to ingroup members are easily extinguished whereas fearful

responses to outgroup members resist extinction and are more persistent over time.

Once learned, fearful responses are likely to be activated whenever one perceives the presence of an outgroup member. Interactions with unfamiliar outgroup members are associated with a set of physiological reactions that connote threat (Blascovich, Mendes, Hunter, Lickel, & Kowai-Bell, 2001). The mere visual perception of outgroup member stimulates greater levels of amygdala activity, an indicator of a fearful response, and occurs especially strongly among individuals who have acquired especially negative semantic associations with the outgroup (Phelps, O'Conner, Cunningham, Funayama, Gatenby, Gore, & Banaji, 2000).

These fear-based prejudices aren't invariant; they are functionally flexible. The activation and expression of these specific prejudices (and perhaps *only* these specific prejudices, but not prejudicial beliefs more generally) are likely to be exaggerated under conditions in which perceivers feel especially vulnerable to interpersonal harm. Conversely, to the extent that perceivers feel less vulnerable to harm, the prejudice may be reduced.

5.3. Intergroup Biases in the Dark

If someone actually does have malevolent intentions toward you, it would be useful for you to judge that person accordingly. More intriguing (and troubling) is the possibility that individuals may prejudicially perceive entirely innocent others as harboring malevolent intentions, simply because those other people happen to members of coalitional outgroups. More intriguing yet (and perhaps even more troubling) is the possibility that this prejudice may emerge especially strongly whenever perceivers feel especially vulnerable to harm, even if that feeling is logically unrelated to intergroup relations and even if it is the obvious consequence of an entirely artificial intervention—such as when someone turns off the lights in a windowless room.

For humans, mere ambient darkness signals increased vulnerability to physical threat; consequently, it can influence intergroup prejudice in a predictably specific way. In an initial study on this effect (Schaller, Park, & Faulkner, 2003), Canadian high school students were seated in a windowless room and given blank sheets of paper on which they were instructed to write down answers to a set of questions that were asked aloud by an experimenter. In one condition, the room was well lit by electric lights. In the other, the lights were extinguished immediately prior to the recitation of questions, plunging the room into darkness so complete that participants were unable to see anything or anyone. Participants listened to the questions and recorded their responses to each question. (They did so by writing down a number from 1 to 10 on their sheet of paper—which was something participants could easily do even when they couldn't see the piece of paper.) In both the Light and Dark conditions, the experimenter recited an identical set of questions, asking participants to rate "people from Iraq" and also "people from Canada" on four trait dimensions: hostile, trustworthy, ignorant, and open-minded. Two of these traits (hostile, ignorant) were pre-tested as equally negative in valence, but differed in the extent to which they connoted potential malevolent intent. The two other traits (trustworthy, open-minded) were equally positive in valence but also differed in the extent to which they connoted malevolent intent.

Consistent with hundreds of studies documenting ingroup favoritism of various kinds, there was a general tendency for participants to rate their ingroup more positively than the outgroup, and to do so on all four trait dimensions. The interesting question is whether this ingroup favoritism was influenced by the artificial manipulation of ambient darkness. It was, and in a very specific way: Ambient darkness led to an exaggerated tendency to view the ingroup as relatively more trustworthy and less hostile, but had no such exaggerating effect on the tendency to view the ingroup as more open-minded and less ignorant (see Figure 2). In short, the vulnerability-connoting circumstance of ambient darkness triggered an exaggerated prejudice of a very specific, threat-relevant kind.

Schaller et al. (2003) also reported results from a more rigorous study testing the effects of ambient darkness on Canadians' impressions of Canadians and Iraqis. The procedures were similar to those described above, except that participants recorded their answers in response to questions that had been pre-recorded on audiotape. Also, participants completed a questionnaire assessing chronic belief in a dangerous world (Altemeyer, 1988; sample item: "There are many dangerous people in our society who will attack someone out of pure meanness, for no reason at all.") After doing so, participants rated Canadians and Iraqis on the same four traits described above (hostile, trustworthy, ignorant, open-minded), and did so in a room that was either well lit or completely dark.

Results revealed that chronic beliefs about danger interacted with ambient darkness to predict ingroup favoritism on perceptions of trustworthiness and hostility. Among people who were chronically concerned with interpersonal danger, ambient darkness led to exaggerated beliefs that the ingroup was more trustworthy, and less hostile, than the outgroup. No effect of ambient darkness emerged

among people who didn't worry about interpersonal danger. This interaction emerged only on perceptions of trustworthiness and hostility; no effects emerged on perceptions of open-mindedness and ignorance.

Thus, we see again that intergroup prejudice can be exaggerated under the vulnerability-connoting circumstance of ambient darkness, but this occurs primarily among people who are dispositionally prone toward feeling vulnerable to interpersonal harm. This finding helps to drive home the point that the effect of ambient darkness cannot be attributed to the mere physical properties of darkness; it is attributable to the subjective state that people (some more than others) experience in the dark: an increased vulnerability to interpersonal harm.

We see again also that the prejudice precipitated by this subjective sense of vulnerability is specific to a particular set of perceptions functionally relevant to the subjective sense of vulnerability. Vulnerability to interpersonal harm does *not* lead people to perceive ingroups more positively, and outgroups more negatively, in general. It leads them to perceive ingroups more positively on specific traits that connote safety and trust, and to perceive outgroups more negatively on specific traits that specifically connote malevolence. Other prejudices, which are functionally irrelevant, are unmoved.

This specific effect emerges not only on overt expressions of prejudice against ostensibly aggressive nations; it also emerges on the implicit activation of racial stereotypes. Schaller, Park and Mueller (2003) reported results from two studies in which ambient darkness and belief in a dangerous world (BDW) interacted to predict the implicit activation of stereotypic knowledge structures linking African-Americans to danger. In one study, non-Black participants watched a slide show portraying young African-American men, and did so under conditions of either dim lighting or near-total darkness. After the slide show, participants completed a measure on which they rated the extent to which various traits were part of the popular stereotype of African-Americans. (This method cannot reveal participants' own prejudicial attitudes, but it does reveal the extent to which stereotypical knowledge structures are activated into working memory.) A subset of the traits connoted danger (e.g., criminal, untrustworthy); other traits were similarly derogatory and stereotypical but less relevant to danger (e.g., lazy, ignorant). In the other study, participants were induced to think about Blacks under either well-lit conditions or under conditions of near-total darkness. Stereotype activation was assessed with two computer-based reaction-time measures—one that assessed the implicit cognitive association between

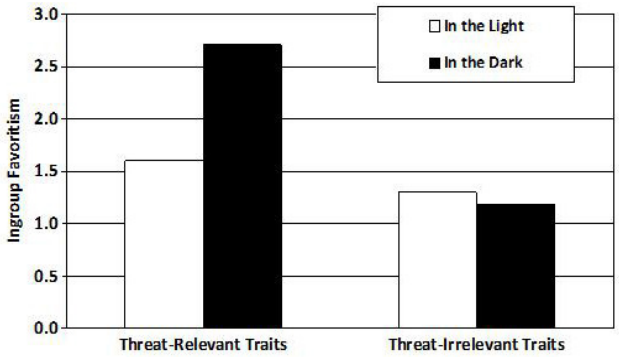

Figure 2. When Canadian participants were in the dark, they showed exaggerated ingroup favoritism when rating ingroup members (Canadians) and outgroup members (Iraqis) on highly evaluative traits, but this effect emerged only on traits relevant to threat (hostile, trustworthy); no such effect emerged on equally evaluative traits that were comparatively threat-irrelevant (ignorant, open-minded). Additional results revealed that this effect emerges especially strongly among perceivers who feel more chronically vulnerable to interpersonal harm. (Results originally reported by Schaller, Park, & Faulkner, 2003.)

"African" and the semantic category "danger," and another that assessed the implicit association between "African" and "unpleasant." The two studies revealed identical results: Implicit negative stereotypes were especially strongly activated among high-BDW individuals in the dark, and this effect occurred most strongly on the implicit activation of danger-connoting stereotypical knowledge structures. Any effects on other (equally-negative but functionally irrelevant) stereotypes were much weaker, and emerged only as indirect side effects of the primary impact on stereotypes connoting danger.

5.4. Vulnerability to Harm and the Misperception of Outgroup Emotions

If specific (danger-connoting) stereotypes of racial and ethnic outgroups are more likely to be activated under conditions that make people feel vulnerable to harm, these same kinds of conditions are likely to lead to predictable biases in perceptions of, and inferences about, specific members of those outgroups. Results from two studies document one interesting way in which these biases may manifest: Misperception of others' emotions (Maner, Kenrick, Becker, Robertson, Hofer, Neuberg, Delton, Butner, & Schaller, 2005).

Participants in both studies were presented with photographs of individuals (both ingroup members and outgroup members) with objectively neutral facial expressions, and were asked to judge the extent to which each individual was experiencing various different emotions (happiness, fear, anger, etc.).

Before engaging in this task, participants watched a short excerpt from a movie, which differed across experimental conditions. In one condition, the excerpt was from *The Silence of the Lambs*, and depicted the movie's protagonist being scarily pursued, in a pitch-black cellar, by a serial killer. It's worth noting that both the protagonist and the pursuer were White; thus, if anything, the movie highlighted the potential for intragroup rather than intergroup violence. Nonetheless, it was highly effective at inducing a state of perceived vulnerability to harm (it is commonly used as an experimental procedure for inducing fear; Gross & Levenson, 1995), and so it had predictable—and highly specific—effects on the misperception of others' emotions. Compared to control conditions, individuals who had watched the scary movie were especially likely to erroneously perceive anger in outgroup faces. Importantly, this emotion misperception was functionally specific: The bias was specific to perceptions of outgroup members; no such bias emerged in perceptions in ingroup members. And the bias was specific to the misperception of anger (which uniquely connotes the threat of interpersonal violence); no such exaggerated misperception bias emerged in the perception of other emotions.

These results have some superficial similarity to the concept of projection—in which people perceive others to be experiencing the same state that they themselves are experiencing. But in this case, fearful people don't perceive that others are fearful. Instead, fearful people perceive that a specific subset of other people (members of coalitional outgroups) are experiencing a very different kind of emotion altogether. The misperception of anger facilitates cautious avoidance of outgroup members. In contemporary environments, that outcome may have little or no functional benefits, and may even be costly. But in ancestral environments, cautious avoidance of outgroup members was likely to have minimized the likelihood of falling prey to interpersonal violence, and thus would have been functional indeed. For this reason, this phenomenon can be considered a form of "functional projection" (Maner et al., 2005).

5.5. The Consequences of Feeling Outnumbered in an Ongoing Ethnopolitical Conflict

As the effects of ambient darkness and frightening movies indicate, there are many specific kinds of variables that influence whether or not people feel vulnerable to interpersonal harm. Within the context of actual intergroup conflict, one of the most important such variables might be relative group size: Do "we" outnumber "them," or do "they" outnumber "us"? Like other social animals, humans experience safety in numbers (e.g., Roberts, 1996; Wirtz & Wawra, 1986). In intergroup contexts, the perception of being outnumbered arouses feelings of vulnerability to danger. Thus, when people perceive they are in a minority group, they are likely to have unrealistically exaggerated beliefs about the untrustworthiness and potential hostility of the more numerous outgroup.

In many intergroup contexts, the perception of being outnumbered depends on one's frame of reference. Within Israel, Jews outnumber Arabs; but within the Middle East more broadly, Arabs outnumber Jews. Therefore, Israeli Jews can justifiably perceive their ingroup to be either a majority or a minority, depending on their geographic frame of reference. Similarly, within Sri Lanka, Sinhalese greatly outnumber Tamils; but within southern Asia more broadly, Tamils greatly outnumber Sinhalese. Depending on their geographic frame of reference, Sinhalese may either perceive safety in numbers or perceive their ingroup to be a threatened minority. Schaller and Abeysinghe (2006) conducted an experiment on Sinhalese participants, which revealed that shifts in geographic frame of reference have predictable consequences for prejudicial perceptions of Tamils.

Sinhalese participants worked on a geography task that temporarily made salient either the nation of Sri Lanka (within which Sinhalese outnumber Tamils) or a broader region of south Asia (within which Sinhalese are outnumbered by Tamils). Following the manipulation, stereotypic perceptions of Tamils were assessed. Consistent with the hypothesis, when participants adopted the broader geographical frame of reference (the context in which their ingroup was outnumbered by Tamils, and was therefore vulnerable) they stereotyped Tamils as especially hostile, aggressive, and supportive of terrorism. They also stereotyped them as especially intelligent and capable. The juxtaposition of negative hostile intent with enhanced intelligence and ability is notable for two reasons. First, it fits perfectly with the hypothesis that feelings of vulnerability exaggerate the tendency to perceive outgroups as threatening: A foolish and bumbling enemy poses less of a threat than a cunning and capable one. Second, it highlights the importance of conceptualizing stereotypes and prejudices not merely in terms of their evaluative valence (positive versus negative) but in terms of their actual meaningful contents. Feeling outnumbered did not lead Sinhalese to perceive Tamils more negatively *per se*, but it did lead them to perceive Tamils as posing a more substantial threat to their welfare.

Fearful perceptions of this sort are often used to justify acts of aggression between groups (Chagnon,

1992; Robarchek, 1990), and can inhibit attempts to arrive at peaceful resolutions to intergroup conflicts. Schaller and Abeysinghe's study was conducted during a ceasefire in an ongoing civil war between the Sri Lankan government and a Tamil rebellion army. The Sinhalese participants were asked about their attitudes toward various possible resolutions to the war, as well as their attitude toward the ongoing peace process. Soberingly, when these participants adopted a geographical frame of reference that cast their ingroup as the outnumbered minority group, they were less supportive of peaceful resolutions.

Of course, one can look at these results in a more encouraging way as well: When participants were inclined to adopt a frame of reference that cast their ingroup as the majority group (and thus connoted safety in numbers), they were *less* likely to demonize the outgroup and were *more* supportive of a peaceful resolution to the ongoing ethnopolitical conflict.

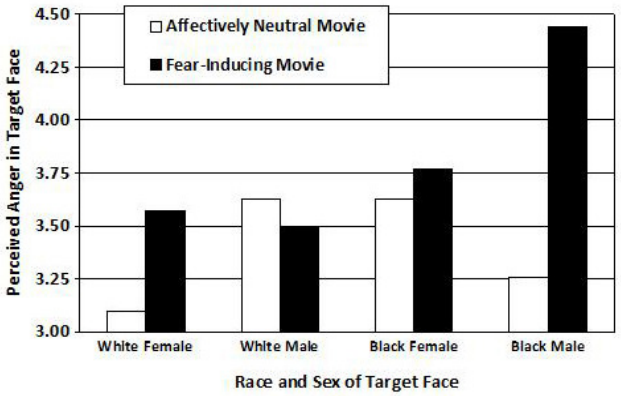

Figure 3. After non-Black participants had seen a fear-inducing movie (temporarily enhancing feelings of vulnerability to interpersonal harm), they showed an exaggerated tendency to erroneously "see" anger (but not other emotions) in the faces of African American men. This effect was specific to the perception of African American men, and not to Whites or African American women. (Results originally reported by Maner et al., 2005.)

5.6. Sex Differences

If greater vulnerability to harm disposes people to distrust members of outgroups, then you might expect there to be sex differences in the baseline level of prejudicial distrust, and in the extent to which threat-connoting cues (such as ambient darkness) trigger prejudicial responses. Exactly how one thinks about vulnerability, however, leads to two diverging predictions.

One could argue that women are more vulnerable to men. On average, women are smaller and weaker than men, and are less able to physically ward off a violent attack. Compared to men, women in modern societies are socialized to perceive themselves as vulnerable (e.g., they are more likely to be explicitly advised to avoid walking home alone in the dark). Thus, if prejudicial beliefs are responsive simply to modern perceptions of vulnerability, one might predict that women will hold stronger intergroup prejudices than men and respond more strongly to danger-connoting contextual cues.

However, if one applies the logic of evolutionary psychology to the concept of vulnerability, a rather different prediction emerges. This logical perspective demands that we lift our gaze from the modern world and consider instead the structure of ancestral ecologies. Specifically: To what extent were males and females differentially vulnerable to intergroup violence within the ecological circumstances that characterized human evolutionary history? Much circumstantial evidence suggests that ancestral males were more vulnerable than females to violence from outgroup members. Observations of our closest non-human primate relatives reveal that unexpected intergroup contact is more likely for males than for females. Male chimpanzees range more widely than females, increasing their chances of unexpectedly encountering members of rival chimpanzee communities (Goodall, 1986; Hasegawa, 1990). Moreover, across most primate species, acts of intergroup violence typically involve males more than females (Carpenter, 1974; Cheney, 1986; Wilson & Wrangham, 2003). A similar conclusion emerges from observations of contemporary human societies that most closely resemble ancestral populations. Men are more likely than women to intrude upon the territories of rival groups, and men are more likely than women to be involved in intergroup hostilities (Chagnon, 1988). The implication is that, historically, males were more likely than females to benefit from distrustful perceptions of coalitional outgroups. Consequently, one might predict that men will express stronger intergroup prejudices than women, and also that men will respond more strongly to danger-connoting contextual cues.

Consistent with the latter line of reasoning, empirical evidences reveals that, compared to women, men perceive greater threat within intergroup contexts (Pemberton, Insko, & Schopler, 1996) and also express higher levels of intergroup prejudice (e.g., Sidanius, Cling, & Pratto, 1991). In addition, the intergroup prejudices of men tend to be especially responsive to contextual cues connoting vulnerability (e.g., Yuki & Yokota, 2009). Recall the interactive effect of chronic vulnerability and ambient darkness on the activation of danger-connoting stereotypes (Schaller et al., 2003). Although this effect occurs for

both male and female perceivers, the effect is stronger among men (Schaller & Neuberg, 2008).

The evolutionary perspective implies another kind of sex difference as well, pertaining not to the sex of the perceiver but to the sex of the person perceived. Given that unexpected and violent contact between groups was more likely to involve men than women, and that men tend to be stronger and more aggressive than women, it would have been more functionally beneficial to distrust outgroup men than to distrust outgroup women. It would also have been especially adaptive to acquire and maintain fearful responses to outgroup men, and to draw inferences about them accordingly. Empirical evidence supports these predictions. The finding that people are especially slow to unlearn fearful responses to coalitional outgroups is specific to perceptions of male, but not female, outgroup members (Navarrete et al., 2009). And although feelings of vulnerability lead White people to erroneously "see" anger in the faces of neutrally-expressive Black people, this effect is specific to the perception of Black men, but not of Black women (Maner et al., 2005; see Figure 3).

5.7. Attention to and Memory for Outgroup Faces

In the preceding sections, we showed how evolutionary psychological reasoning yields a set of novel hypotheses linking perceived vulnerability to specific kinds of stereotypes about and prejudices toward coalitional outgroups. The same reasoning also implies an additional set of hypotheses about attention to and memory for specific members of those outgroups.

Stereotyping involves not merely the tendency to over-estimate differences between groups but also to under-estimate differences between individuals within groups (Tajfel & Wilkes, 1963). The latter tendency shows up especially strongly in the perception of outgroup members: People judge outgroups to be relatively homogeneous (Ostrom & Sedikides, 1992). They fail to observe the individual personality traits and dispositions of outgroup members, and fail to take those individuating traits and dispositions into account when predicting their behavior (Fiske & Neuberg, 1990). They also fail to visually attend to the individuating physical features of outgroup members, leading to poorer recognition accuracy for outgroup members compared to ingroup members (the "they all look the same to me" effect; Chance & Goldstein, 1996). These effects vary depending on circumstances, and the tendency to view outgroups in a stereotypically undifferentiated way can be exaggerated under conditions of arousal and anxiety (Wilder, 1993). You might therefore expect that contexts connoting the threat of interpersonal violence might lead perceivers to be especially unlikely to attend to the individuating features of outgroup members, and to be especially unable to perceptually distinguish them from one another.

But that's not what happens. To predict and make sense of what happens instead, it's useful to consider person memory processes within the functional framework outlined earlier.

Cognitive resources are limited. Consequently, when faced with a wide variety of perceptual information that might (or might not) be encoded into memory, humans selectively allocate their cognitive resources to encode information that is likely to have functional implications for reproductive fitness. In the context of person perception, this means that perceivers are especially likely to encode the individuating features of people who appear to offer especially useful benefits for, or especially potent threats against, reproductive fitness. Historically, our ancestors were more likely to have recurrent interpersonal interactions with ingroup members than with outgroup members, and these recurrent within-group interactions had substantial implications for fitness-relevant outcomes. Therefore, it would have been functionally sensible to allocate cognitive resources to encode ingroup members' individuating features, so that one might accurately recognize, and respond appropriately to, those individuals when one encounters them again. In contrast, the functional benefits of encoding the individuating features of outgroup members are likely to have been smaller, given the reduced likelihood of repeated, subsequent interactions—at least under most circumstances. However, there are some circumstances when the opposite may have been true, such as when outgroup members appeared to have hostile intentions.

Any overtly hostile person poses a potential threat to one's well-being and reproductive fitness. To avoid a catastrophic future interpersonal interaction with such a person, it is beneficial to be able to recognize that person—to be able to perceptually distinguish that person from others. Doing so requires that one attend to and encode individuating features. Historically, this would have been functionally beneficial even if that individual belonged to a coalitional outgroup. In fact, it's likely that it would have been functionally beneficial *especially* if that person was an outgroup member. Moral codes and other social norms limit the extent to which within-group hostilities result in fatality or serious injury, but these same codes are rarely extended to inter-group hostilities. The logical implication is that when presented with a set of people who appear hostile (e.g., individuals with angry facial expressions), the usual "they all look the same to me" effect may disappear, and perhaps even

be reversed.

We conducted a set of studies that tested this hypothesis (Ackerman, Shapiro, Neuberg, Kenrick, Becker, Griskevicius, Maner, & Schaller, 2006). Non-Black participants were presented with photographs depicting the faces of men who were either White or Black, and who displayed either affectively neutral or obviously angry facial expressions. Later, following a distraction task, participants were given a surprise memory test, and we assessed recognition accuracy for these same faces. Employing a standard signal detection methodology, participants were presented with previously-seen faces interspersed with previously-unseen faces that also differed in race and facial expression. Participants indicated whether they had seen the face previously or not. Recognition accuracy for neutral faces revealed the usual effect: White faces were recognized more accurately than Black faces. But this effect disappeared entirely for angry faces: Angry Black faces and angry White faces were both recognized with a high degree of accuracy (see Figure 4).

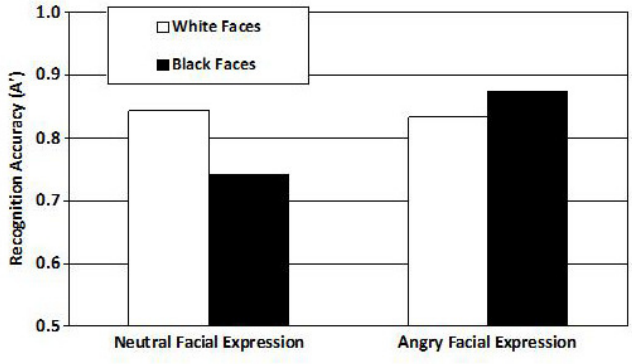

Figure 4. Non-Black participants showed higher levels of recognition accuracy for White faces compared to Black faces, but only when the target faces displaying neutral facial expressions. When target faces had angry facial expressions, recognition accuracy for Black faces was elevated to a level that equally that for White faces. Additional results revealed that angry Black faces were recognized even more accurately than angry White faces under conditions that imposed constraints on cognitive processing resources. (Results originally reported by Ackerman et al., 2006.)

Additional evidence revealed that recognition accuracy for angry outgroup faces was highest (and significantly higher than for angry ingroup faces) under conditions in which there were the greatest constraints on cognitive processing resources—when exposure times to the faces were short and distractor stimuli were presented at the same time (Ackerman et al., 2006). This is intriguing. It suggests that the elimination (and reversal) of the usual bias was not the result of additional effortful processing on behalf of perceivers, but instead was the result of a highly automatized reallocation of cognitive processing resources—the kind of reflexive cognitive process that typically indicates either extensive practice (e.g., overlearning) or ancient evolutionary origins.

More recently we tested the related hypothesis that the perception of threat leads perceivers to engage in especially *efficient* processing of outgroup faces. By "efficient" we mean the successful encoding of individuating facial features into memory (as indicated by later recognition accuracy) with a minimal investment of attentional resources (e.g., relatively short duration of visual attention). Such efficient encoding would enhance later recognition for outgroup faces while simultaneously minimizing the amount of time spent staring at that those faces (a behavior that can be interpreted as a form of aggression; Ellsworth, 1975). From an evolutionary perspective, it would have been most functionally adaptive to efficiently encode the facial features of individuals who posed the greatest potential threat of interpersonal harm: outgroup males. And it would have been especially adaptive to do so under conditions that connoted an especially high level of vulnerability to this threat. To test this hypothesis, we manipulated the temporary perception of threat (by having some participants, but not others, watch the scary excerpt from *The Silence of the Lambs*), measured the duration of visual gaze toward ingroup and outgroup faces, and also measured later recognition accuracy for those faces (Becker, Anderson, Neuberg, Maner, Shapiro, Ackerman, Schaller, & Kenrick, 2010). Encoding efficiency was assessed with a measure of recognition accuracy that controlled for gaze duration. Consistent with the hypothesis, under threat-connoting conditions White participants exhibited greater encoding efficiency for the faces of African American men and for Arabic men, but not for the faces of females or ingroup males.

5.8. Summary

The ancient context of intergroup violence provides the basis for deducing many hypotheses pertaining to contemporary intergroup prejudice. When people feel (for any reason) more vulnerable to physical harm, they exhibit a stronger prejudice against outgroup members. This prejudice—and the stereotype that accompanies it—is characterized by particular kinds of affective (i.e., fear) and cognitive (i.e., dangerousness) contents, and is directed especially strongly against outgroup men (compared to outgroup women). Male perceivers (compared to female perceivers) also appear to be especially responsive to the threat-connoting cues that trigger these exaggerated prejudices. The same conceptual foundation that yields these highly specific implications for intergroup prejudice also yields

additional implications for person memory (including a specific context under which the usual "they all look the same to me" effect not only disappears but actually reverses). Considered individually, each of these empirical discoveries is conceptually useful and interesting. Considered collectively, they provide a richer and more nuanced perspective on prejudice, and on intergroup cognition in general.

6. Infectious Disease and Its Implications for Prejudices

We've seen that superficial physical features indicating coalitional outgroup membership trigger specific kinds of prejudicial responses. Other superficial physical features can trigger other prejudice syndromes, even towards ingroup members. Among the many individuals who suffer from these prejudices are people with physical disabilities, people who are fat, and those who are facially disfigured, physically unattractive, or just plain old (e.g., Bugental & Hehman, 2007; Crandall, 1994; Hamermesh & Biddle, 1994; Houston & Bull, 1994; Snyder, Kleck, Strenta, & Mentzer, 1979). These categories of individuals do not fit the psychological template of an outgroup—at least not in the "us-versus-them" sense that traditionally characterizes the psychology of intergroup prejudice. Indeed, in contrast to intergroup prejudices, these other prejudices are exhibited regularly even by people who belong to the target category. For example, anti-fat prejudice is expressed just as strongly by fat people as by thin people (Crandall, 1994). Nonetheless, individuals who fit these categories are associated with specific kinds of negative attributes and elicit specific kinds of aversive emotional responses. This is consistent with the operation of underlying threat-management mechanisms. But just what might be the threat implied by the perception of someone who is disabled, or fat, or unattractive, or old? Recent research suggests one answer: The threat of infectious disease.

6.1. The Enduring Threat of Infectious Disease within Ancestral Populations

Although there are many reproductive benefits associated with densely populated societies that ultrasocial species (like humans) create, these same social arrangements introduce or exacerbate specific reproductive problems too (Kurzban & Leary, 2001; Kurzban & Neuberg, 2005). One such problem lies in the potential for contracting infectious diseases.

Humans have a long history of co-evolving with many different kinds of parasites (e.g., bacteria, viruses, helminths) that cause many different kinds of infectious diseases. Proximity to other people enhances the likelihood of contracting many of these diseases—either directly, through interpersonal transmission, or indirectly (e.g., by drinking water contaminated by another person's feces). This state of affairs imposed selection pressures on ancestral populations. The evolutionary consequence was the emergence, and refinement, of mechanisms designed to protect individuals from the threat posed by pathogens. One set of mechanisms is obvious: The immune system, which is designed to detect the presence of pathogens within the body and to mobilize physiological defenses against those parasitic intruders. These immunological defenses are adaptive, but their use comes at a cost: They consume substantial metabolic resources and can be temporarily debilitating (because of fever, fatigue, and other physiological correlates of immunological defense). Moreover, these defenses are merely reactive—triggered only *after* the intruders have invaded the body. The immune system is therefore like medical insurance: It's great to have, but it's even better if you never actually have to use it. For these reasons, it appears that there also evolved a complementary form of defense: A "behavioral immune system" that provides proactive defense against disease-causing pathogens (Neuberg et al., 2011; Schaller, 2011; Schaller & Duncan, 2007; Schaller & Park, 2011). The behavioral immune system comprises psychological mechanisms that detect the presence of disease-causing pathogens in the immediate perceptual environment (including the presence of pathogens in our fellow human beings) and then facilitate the avoidance of contact with those pathogens (and the people who appear already to be infected).

Behavioral avoidance of infection risk has received considerable attention from evolutionary biologists, behavioral ecologists, and behavioral neuroscientists (e.g., Hart, 1990; 2011; Kavaliers & Choleris, 2011; Kiesecker, Skelly, Beard, & Preisser, 1999). There is now also a burgeoning body of literature documenting specific ways in which the perceived threat of disease influences human personality, emotion, sexual behavior, social influence, as well as attitudes, values, and ideologies of various kinds (e.g., Curtis, de Barra, & Aunger, 2011; Fincher, Thornhill, Murray, & Schaller, 2008; Mortensen, Becker, Ackerman, Neuberg, & Kenrick, 2010; Murray & Schaller, in press; Murray, Trudeau, & Schaller, 2011; Oaten, Stevenson, & Case, 2009; Schaller & Murray, 2008; Tybur, Bryan, Magnan, & Hooper, 2011; for reviews see Schaller, 2011, and Schaller & Murray, 2011). Much recent work also documents novel implications for stereotypes and prejudices.

6.2. Implications for the Psychology of Prejudice

Many disease-causing pathogens are transmitted through interpersonal interaction. Social contact with an already-infected individual enhances the likelihood of transmission. Therefore, one way to minimize one's own risk of infection is to selectively avoid contact with people who appear already to be infected. This requires that individuals learn what kinds of perceptible cues (e.g., morphological features, behavioral tendencies) indicate the possible presence of pathogens in other people. Once learned, individuals must be vigilant for these cues. And, once detected, these perceptual cues must trigger a cascade of functionally relevant affective and cognitive responses that facilitate behavioral avoidance.

What cues connote infection? There are a great many species of pathogenic organisms and many different species produce different symptoms. These species also tend to evolve very rapidly, which means that their symptomatic manifestations can be highly variable over time. Moreover, different people may show different symptoms even if infected with the same pathogen. It would be virtually impossible for a psychological system to acquire a definitive catalog of all symptoms of all infectious diseases. However, because so many pathogens reveal themselves by altering prototypical human morphology and motor behavior (e.g., pox, rashes, coughing spasms), and this was especially the case for the bulk of evolutionary history prior to the miracles of modern medicine, there has been an adaptive solution to this signal detection problem: The evolution of a psychological system designed to detect *any* deviations from typical morphology and normal movement. Thus, any subjectively deviant appearance might implicitly connote, in the minds of perceivers, the presence of infectious disease (Kurzban & Leary, 2001; Oaten, Stevenson, & Case, 2011). This logical analysis has an obvious implication: Just as people may exhibit a predictable pattern of prejudice (characterized by disgust, disease-connoting cognitions, and behavioral avoidance) against individuals who truly do pose an infection risk, they may exhibit the same pattern of prejudice against many additional categories of people who pose no infection risk at all, but merely appear morphologically or behaviorally anomalous in some superficial way.

The magnitude of disease-based prejudice is likely to be predictably variable, of course. Perceptual cues connoting the potential presence of infectious disease are especially likely to trigger prejudicial responses under conditions in which perceivers are (or merely perceive themselves to be) highly vulnerable to infection.

6.3. Wariness of People with Unhealthy-Looking Faces

People are perhaps especially sensitive—and respond especially aversively—to anomalous facial features. This is not only because facial features play such a profound role in communicating functionally important information (e.g., emotional expressions), but also because many infectious diseases produce symptoms that manifest in specific kinds of facial anomalies (e.g., rashes and other forms of facial discoloration). Therefore, even if they aren't explicitly known by perceivers to be symptoms of disease—and even when they are explicitly known via medical research *not* to be a symptom of disease—obvious anomalies are likely to inspire wariness, especially among perceivers who feel vulnerable to infection. Research on visual attention to faces supports this hypothesis. Compared to unblemished faces, faces that are blemished receive a disproportionately high level of attention from perceivers, and this occurs especially under conditions in which perceivers feel especially vulnerable to infection (Ackerman, Becker, Mortensen, Sasaki, Neuberg, & Kenrick, 2009). This predictable wariness manifests in attitudinal measures, too. The usual preference for healthy-looking (versus unhealthy-looking) faces emerges more strongly among people who chronically worry about their own vulnerability to infection (Welling, Conway, DeBruine, & Jones, 2007). An analogous effect pertains to preferences for faces that are simply symmetrical (a morphological feature that underlies subjective judgments of physical attractiveness): People generally show a preference for symmetrical faces, and this preference is exaggerated when the threat of pathogen transmission is salient (Little, DeBruine, & Jones, 2011; Young, Sacco, & Hugenberg, 2011).

A recent set of studies reveals that such effects emerge not only among people who subjectively feel vulnerable to disease but also among people who actually have recently been sick. Because illnesses can leave individuals more susceptible to subsequent infection, it may be especially beneficial for recently ill individuals to be wary of anyone whose facial appearance heuristically implies the presence of pathogens. Consistent with this logic, Miller and Maner (in press) found that people who reported recent bouts of illness showed exaggerated visual attention, and stronger avoidant motor responses, to disfigured faces.

6.4. Prejudicial Cognitions about People Who Are Elderly, Physically Disabled, or Obese

The same disease-avoidant mechanisms that inspire wariness of unhealthy-looking faces may also contribute to prejudices against elderly people ("ageism"). Ageism is a curious form of prejudice. People typically hold many positive attitudes toward the elderly (stereotypes of old people typically connote nurturance and wisdom) and in many cultures there exist norms of filial piety that endow the elderly with exalted status. But these positive attitudes exist alongside negative ones as well. Elderly people are often targets of abuse, neglect, and social exclusion. (Some evidence suggests that negative attitudes and behaviors directed against the elderly may occur especially strongly in cultures that promote filial piety; McCann, Ota, Giles, & Caraker, 2003. These findings underscore the multi-dimensional nature of attitudes toward the elderly, and also imply that psychological roots of respect for the elderly are conceptually distinct from the underlying causes of the prejudices against them.) A variety of different processes have been suggested as contributing to ageism, and there is some support for several of them (Bugental & Hehman, 2007). There are at least two reasons to speculate that ageism also results in part from the perceived threat of disease. First, aging is associated with many physical changes (e.g., wrinkles, cartilaginous growth, liver spots and other skin discolorations) that, when judged against the subjective prototype of human morphology, are anomalous. Second, as people become elderly, their immune systems tend to function less well. This means that, compared to younger adults, older adults actually are at greater risk for harboring (and potentially transmitting) infections. Thus, whether perceivers are engaging in a logical analysis of immunocompetence or simply responding automatically to superficial appearance, older adults may be implicitly perceived as posing an infection risk. If so, ageism may be exaggerated when perceivers feel especially vulnerable to infection.

Duncan and Schaller (2009) employed a computer-based reaction-time task to assess the implicit association between older adults and negative semantic concepts (including semantic concepts explicitly connoting disease). With one culture-specific exception (participants of East Asian background showed generally high levels of implicit ageism, regardless of the perceived threat of infection), the results revealed that when participants were inclined to feel vulnerable to infection—either because of chronically high feelings of vulnerability or because the threat of infection was made temporarily salient—they showed higher levels of implicit ageism.

Similar results emerged in a study assessing implicit cognitive associations between physical disability and negative semantic concepts, including concepts connoting disease. These prejudicial cognitive associations were activated more strongly

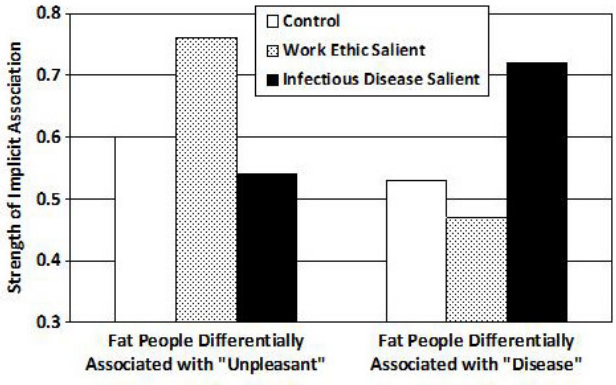

Figure 5. When the threat of infectious disease was temporarily salient, it led participants to exhibit a stronger implicit cognitive association differentially linking fat people (compared to thin people) to the semantic concept "disease" (but it had no impact on implicit cognitive associations linking fat people to the concept "unpleasant"). In contrast, when the value of hard work was temporarily salient, it led to stronger implicit associations linking fat people to "unpleasant" (but had no impact on implicit associations linking fat people to "disease"). The results suggest that perceived vulnerability to infectious disease contributes in a unique and specific way to anti-fat prejudice. (Results originally reported by Park et al., 2007).

when participants were especially likely to experience disgust (the emotion most closely linked to the threat of infection; Oaten et al., 2009), or when the threat of pathogen infection was made temporarily salient (Park, Faulkner, & Schaller, 2003). It is well-known, of course, that people respond aversely to the sight of other people's disabilities, and strategically avoid interacting with them—affective and behavioral reactions that mimic the prejudice directed against people who actually are diseased (e.g., Snyder et al, 1979; for a review see Park et al., 2003). The results of our research suggest that this similarity in prejudicial responses is no coincidence; rather, it is due in part to the same underlying disease avoidance mechanism.

This mechanism also appears to contribute to anti-fat prejudice. As with many other prejudices, prejudice against fat people is rooted in multiple processes, some of which are psychological independent of the behavioral immune system (e.g., processes pertaining to ideologies emphasizing the value of hard work; Crandall, 1994). Still, results from several empirical studies reveal that the behavioral immune system also contributes uniquely to anti-fat prejudice. People who feel chronically vulnerable to infection exhibit stronger antipathy in response to the sight of fat people, and this relation persists even after controlling for other prejudice-relevant individual

differences (Park, Schaller, & Crandall, 2007). Such effects aren't limited to reactions to strangers: Parents who feel chronically vulnerable to disease report more negativity about their own fat (but not normal weight) elementary-aged children (Kenrick, Shapiro, & Neuberg, 2011). More persuasive still is evidence from an experiment that targeted two distinct processes and documented their separate effects on two distinct measures of anti-fat prejudice (Park et al., 2007; see Figure 5): When the value of hard work was made temporarily salient, it produced an exaggerated tendency to implicitly associate fat people with generally negative semantic concepts, but had no impact on implicit associations linking fat people with the more specific concept of disease; in contrast, when the threat of infection was made temporarily salient, it produced an exaggerated tendency to differentially associate fat people with the specific concept of disease but had no impact on the implicit association linking fat people with generally negative (but disease-irrelevant) concepts. These findings demonstrate that the perceived threat of disease contributes to anti-fat prejudice in a conceptually unique and psychologically specific way.

These findings also buttress the conclusion that appearance-based prejudices result from a signal-detection system sensitive not just to symptoms that might logically result from infection but also to a much broader range of morphological anomalies. Obesity was almost certainly rare in ancestral ecologies. And even though it is common in contemporary human societies, it is rarely diagnostic of pathogen infection. (If anything, infectious diseases are more likely to lead to weight loss than weight gain.) But obesity does represent a perceptually obvious deviation from species-typical morphology and, as a consequence, it—like facial disfigurement, physical disability, and other anomalous physical features—triggers the specific kind prejudice that, in ancestral populations, probably served a pathogen-avoidant function. Alas, in contemporary societies this same prejudice arises in many contexts in which it serves no useful function whatsoever.

6.5. Xenophobia and Ethnocentrism

The perceived threat of disease also has implications for xenophobia and ethnocentrism. There are many examples of a general tendency to link subjectively foreign peoples with disease. This link is evident in xenophobic propaganda, in which ethnic outgroups are explicitly likened to pathogenic species or to non-human vectors of disease, such as rats, flies, and lice (Goldhagen, 1996; Suedfeld & Schaller, 2002). The associative link between foreign peoples and disease is also a recurring theme in the social science literature on immigration (Markel, 1999). In ancient Rome, outsiders were likened to detritus and scum (Noy, 2000). And in the United States, "foreigners were consistently associated with germs and contagion" (Markel & Stern, 2002, p. 757).

There are at least two reasons why a subjective sense of "foreign-ness" may implicitly connote an increased risk for infection. First, historically, contact with exotic peoples increased exposure to exotic pathogens, which tend to be especially virulent when introduced to the local population. Second, outsiders are often ignorant of local behavioral norms that serve as barriers to pathogen transmission (e.g., norms pertaining to hygiene, food-preparation, etc.); as a consequence, they may be more likely to violate these norms, thereby increasing the risk of pathogen transmission within the local population. Thus, in addition to other threats connoted by outgroup status, people perceived to be subjectively foreign are likely to be implicitly judged to pose the threat of infection.

If so, prejudice against subjectively foreign peoples is likely to emerge most strongly when people are, or merely perceive themselves to be, especially vulnerable to infection. Many studies support this hypothesis. One study examined changes in xenophobia and ethnocentrism over the course of pregnancy. A woman's body is naturally immunosuppressed during the first trimester of pregnancy. This temporary vulnerability to infection results in a variety of functionally adaptive psychological responses, including "morning sickness" and a greater sensitivity to disgust in general (Fessler, Eng, & Navarrete, 2005; Flaxman & Sherman, 2000). It also results in an exaggerated intergroup prejudice: Compared to women in later stages of pregnancy, women in their first trimester exhibit higher levels of xenophobia and ethnocentrism (Navarrete, Fessler, & Eng, 2007).

Additional studies reveal that increased xenophobia also occurs among people who merely perceive themselves to be vulnerable to infection (Faulkner, Schaller, Park, & Duncan, 2004). In one experiment, Canadian students completed a task that assessed their attitudes toward immigrants from countries that were either subjectively familiar (e.g., Poland, Taiwan) or subjectively foreign (e.g., Mongolia, Peru). Immediately prior to this task, participants watched one of two slide shows, designed to make two different kinds of threats salient. One slide show depicted the threat posed by disease-irrelevant mishaps (e.g., electrocution); the other slide show depicted the threat posed by infectious diseases and the pathogens that cause them. This manipulation influenced responses on the immigrant attitudes task: Compared to the accidents-salient control condition, when the threat of infectious

disease had been made salient, people exhibited an exaggerated preference for immigrants from familiar

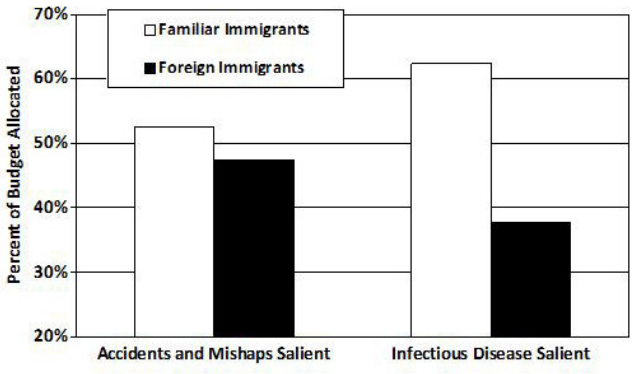

Figure 6. On a budget allocation task that assessed interest in recruiting immigrants from various countries, Canadian participants discriminated in favor of subjectively familiar immigrant groups compared to subjectively foreign immigrant groups. This xenophobic prejudice against foreign immigrants was exaggerated under conditions in which the threat of infectious disease was temporarily salient (compared to a control condition in which life-threatening but disease-irrelevant accidents and mishaps were salient). (Results originally reported by Faulkner et al., 2004.)

places, to the exclusion of immigrants from more subjectively foreign locales (see Figure 6).

6.6. Summary

People typically prefer to stay healthy, so it isn't surprising that they prefer to avoid interactions with those known to be physically ill (Crandall & Moriarty, 1995). People also express prejudices against entire social categories that, in contemporary societal contexts, have been explicitly linked to specific forms of infectious disease. Anti-gay prejudice provides an example of the latter phenomenon. There are multiple, conceptually distinct causes of anti-gay prejudice (Herek, 1991; Neuberg et al., 2000) and, although the potency of some of those causal processes may be waning, anti-gay prejudice continues to be sustained by the popular linkage between male homosexuality and HIV infection (Herek & Capitaniato, 1999). But the impact of disease-avoidance processes on prejudice is not limited just to target groups that are explicitly believed to pose some increased risk of infection. The psychology of disease-avoidance is evolutionarily ancient and pre-dates the uniquely human capacity to construct and express explicit knowledge structures pertaining to abstract concepts such as infection. Because of its ancient evolutionary roots, the psychology of disease-avoidance is responsive to superficial perceptual cues. This has important consequences. The evolved psychology of disease-avoidance contributes to a particular kind of prejudice directed against a wide range of people, many of whom may not be explicitly believed to pose any increased risk of pathogen transmission whatsoever. But they are targets of prejudice anyway—especially under conditions in which the threat of pathogen transmission is psychological salient.

7. Implications for a "Prejudiced Personality"

The idea of a "prejudiced personality"—that some people have a chronic dispositional inclination to be prejudiced against a wide range of others—has a long history in the psychological study of prejudice (Allport, 1954). *The Authoritarian Personality* (Adorno, Frenkel-Brunswick, Levinson, & Sanford, 1950) is one classic example, implicating child-rearing practices in the development of a multi-faceted personality structure that predicts a wide range of negative stereotypes, prejudices, and desires to discriminate. More recent examples include work on right-wing authoritarianism (Altemeyer, 1998) and social dominance orientation (Pratto, Sidanius, Stallworth, & Malle, 1994; Sidanius & Pratto, 1999), both of which are conceptualized as personality characteristics that lead to general prejudice against and oppression of many different kinds of groups. Other research has taken a different tack, focusing not on the idea of a "prejudiced personality," per se, but instead on a variety of other traits (e.g., self-esteem, need for structure) that have wide-ranging psychological consequences, including consequences for prejudice and stereotyping (e.g., Crocker & Luhtanen, 1990; Neuberg & Newsom, 1993). These individual differences have been hypothesized to predict prejudice against many different target groups (e.g., evaluative negativity toward any outgroup could potentially have implications for self-esteem). One weakness of all these approaches, however, is their inability to explain the nuanced emotional character and specific content of prejudices—why, for example, do people feel disgust towards some groups, fear towards another, and anger towards yet another?

This is where the evolutionary threat-based approach makes a unique contribution to the study of the prejudiced personality. As we have discussed above, individual differences in perceived vulnerabilities to disease and to interpersonal violence predict specific kinds of responses to specific features of different groups of people. Individuals who are dispositionally worried about interpersonal violence show stronger fear-based prejudices against male members of coalitional outgroups, but are not more prejudiced against fat people (Maner et al., 2005; Park et al., 2007). In contrast, individuals who feel chronically vulnerable to disease show greater

disgust-based prejudice against fat people and subjectively foreign immigrants, but not against subjectively familiar coalitional outgroups (Faulkner et al., 2004; Park et al., 2007).

This threat-based approach may also help to explain why right-wing authoritarianism and social dominance orientation predict negative prejudices, and do so in a broad, undifferentiating way. Both of these constructs tap into traditionalism—the desire to maintain existing norms and institutions and other aspects of the societal status quo. Historically, many societal norms emerged, and were sustained, because they provided effective buffers against human and non-human predators (e.g., traditions on how to employ nighttime fires), against cheating and theft (e.g., systems of monitoring and punishment), against famine (e.g., rules of food sharing), and against other threats as well. In fact, Fabrega (1997) observed that in contemporary foraging societies (which may serve as a model of ancestral human societies), a substantial proportion of behavioral norms serve to mitigate the threat of pathogen transmission. Moreover, hierarchical power structures within traditional societies provide a means to ensure that those rituals and rules are observed. To the extent that individuals feel vulnerable to threats of any kind, they may take comfort in the status quo. This has implications for a variety of attitudes and actions that are conceptually distinct from prejudice (e.g., under conditions connoting various kinds of threats, people endorse more conservative attitudes, engage in more conformist behavior, and respond with greater moral indignation toward norm-violators; e.g., Griskevicius, Goldstein, Mortensen, Cialdini, & Kenrick, 2006; Helzer & Pizarro, 2011; Murray & Schaller, in press). It also has implications for individual differences in prejudice. Individuals who endorse the status quo more strongly are likely to be prejudiced against anyone who threatens that status quo, and are also more likely to be prejudiced against anybody who implicitly embodies threat against any aspect of the status quo that historically provided some buffer. Thus, personality measures assessing traditionalism in general (e.g., right-wing authoritarianism) or especially important forms of traditionalism (like social dominance orientation, which emphasizes the maintenance of traditional status hierarchies) are more likely to predict negative attitudes toward a wide array of groups, but without precision as to the specific emotional and cognitive contents of those prejudices. In contrast, threat-specific traits (such as perceived vulnerability to disease) predict prejudices against particular sets of groups, and predict the actual content of those prejudices in a more nuanced and specific manner.

8. Implications for Interventions

Many novel discoveries and conceptual insights have emerged from the lines of research summarized above. These results contribute to a growing body of research implicating the ancient evolutionary roots of contemporary prejudices (Mahajan et al., 2011; Schaller & Neuberg, 2008; Wilson & Wrangham, 2003). Many scholars presume that a psychology of prejudice rooted in ancient evolutionary processes must be a psychology of prejudice that is static and unchangeable. In fact, the opposite is true. Evolved threat-based prejudices emerge strongly under some predictable circumstance and, under other (equally predictable) circumstances, they don't. This functional flexibility has important practical implications for the design of interventions to reduce these prejudices and the problems they cause.

Generally speaking, any threat-based prejudice should be muted under conditions in which people feel (for any reason) less personally vulnerable to the relevant threat. Sometimes that sense of safety is simply a matter of perspective. Schaller and Abeysinghe (2006) found that a simple shift in geographical frame of reference was sufficient to change Sinhalese Sri Lankans' perception of being outnumbered into a more comforting sense of safety in numbers. The latter perspective led to a reduction in prejudice and an increased inclination toward peaceful resolution of intergroup conflict. There are many additional methods of making people feel safe from interpersonal violence, and these methods too are likely to have beneficial consequences for intergroup perceptions and intergroup relations.

The same principle can be applied toward the reduction of prejudices rooted in the implicit threat of disease. Several recent studies reveal specific ways in which this might be done, and the specific effects that might reasonably be expected (Huang, Sedlovskaya, Ackerman, & Bargh, in press). One study showed that when chronically germ-averse people were given the opportunity to clean their hands with an anti-bacterial wipe, they subsequently indicated lower levels of prejudice against various categories of implicitly threatening people (e.g., immigrants, fat people, people with physical disabilities, etc.). Additional studies showed that the typical relation between disease threat and prejudice was reduced among individuals who had recently been inoculated against seasonal influenza, and that this occurred only when those individuals perceived that the inoculation reduced their vulnerability to infection.

These results (Huang et al., in press) are instructive in at least two ways. First, they reveal that these interventions don't reduce prejudice across the board; rather, they reduce a specific kind of prejudice

(a prejudice rooted in the implicit threat of infectious disease) among a specific subset of people most prone to experience and express that prejudice (people who feel most vulnerable to infectious disease). The specificity of this effect fits neatly within the threat-based approach we have articulated here. Second, these findings reveal that the success of the interventions depends crucially on subjective experiences.

This last point is essential. In designing any intervention to reduce a threat-based prejudice, it will be important to consider the distinction between objective invulnerability and the subjective salience of the threat. Some forms of intervention may make people objectively less vulnerable but do so while simultaneously making the relevant threat more psychologically salient. In a violent society, people may actually be more fully protected from violence if they live behind locked gates and have armed guards patrolling the perimeter of their property. But those gates and guns also serve as a perceptual reminder of threat, and so may lead to an increase rather than decrease in prejudicial perceptions of coalitional outgroups. Similarly, although hand-washing may actually reduce an individual's risk of infection, the perceptual presence of overtly anti-bacterial products has the potential to make the lurking threat of invisible pathogens more psychologically salient. Helzer and Pizarro (2011) found that the mere perceptual salience of anti-bacterial cleansers led people to express more conservative political attitudes. For the same reasons, it might lead to exaggerated disease-based prejudices. The trick to reducing a threat-based prejudice, apparently, is to design interventions that reduce individuals' sense of vulnerability to the relevant threat, *without* making the threat itself more psychologically salient.

8.1. Insights into the Successes and Failures of Other Interventions

Just as this conceptual analysis has useful implications for the implementation of interventions designed specifically to reduce threat-based prejudices, it also has implications for understanding the successes and failures of other intervention strategies. The psychological study of prejudice has led to many different strategies for combating prejudice. Most of these intervention strategies have been designed to target psychological processes conceptually distinct from those discussed here. Nevertheless, some of these strategies may influence the extent to which people feel vulnerable to specific threats. A threat-based analysis can help us better understand why these interventions sometimes work, and sometimes don't.

For example, consider research on the prejudice-reducing benefits of attachment security. Mikulincer and Shaver (2001) found that when a sense of secure interpersonal attachment was made temporarily salient (e.g., by the presentation of words such as "love" and "support"), people consequently reported less prejudicial attitudes toward foreign immigrants and other outgroups. Among the many real benefits of secure interpersonal attachment is, presumably, a reduced vulnerability to violence. We don't want to suggest that all the psychological benefits associated with attachment security (and there are many; Mikulincer & Shaver, 2007) can be reduced simply to invulnerability to threat. But it's hardly far-fetched to suppose that the specific benefits pertaining to intergroup prejudice may result, at least in part, from the implications that a feeling of secure interpersonal attachment has for a sense of actual safety.

Recategorization—in which a single superordinate group category is imposed upon both ingroup and outgroup—is another ostensibly unrelated intervention strategy that may actually tap into the psychology of threat. Successful recategorization effects are typically attributed to the creation of a common social identity (Gaertner & Dovidio, 2000). But why does a common social identity mitigate prejudice? We suspect it has a lot to do with the implicit reduction of perceived threat: A person viewed as one of "us" is assumed to pose less of a threat than a person viewed as one of "them." Real-world assessments of "us" and "them" are based not merely on category labels but on the perception of features that designate others as similar or different. Consequently, recategorization interventions may be most likely to succeed when the tactics used to create the common superordinate identity also reduces the salience of those features that typically identify others as "them" (e.g., language, clothing, cultural practices). In contrast, when differentiating features remain salient, recategorization strategies are more likely to fail. In many real-world recategorization "experiments," different ethnic groups are recategorized as belonging to the same superordinate political entity (e.g., Rwanda, Sri Lanka, Yugoslavia). Alas, in many of these cases, the superordinate categorization—even when in place for decades—fails to substantially reduce intergroup prejudices (e.g., Rwanda, Sri Lanka, Yugoslavia). One reason for these failures may lie in the fact that different ethnic groups have continued to retain distinctive cultural markers.

The threat-based evolutionary perspective also sheds explanatory light on the effects of intergroup contact. Mere contact between groups typically does not reduce prejudice, and can sometimes exacerbate it (Stephan, 1999). From a threat-based approach, this is no surprise. If people are perceived to pose a

threat, then any increased likelihood of interpersonal contact is likely to lead perceivers to feel even more vulnerable to that threat. And, as we have seen, increased vulnerability leads to increased expressions of prejudice.

Intergroup contact can sometimes undermine prejudice under specific conditions that successfully transform perceptions of vulnerability into perceptions of trust. The success of the "jigsaw classroom" intervention (Aronson, Blaney, Stephan, Sikes, & Snapp, 1978) is not merely the result of contact, nor is it simply a product of pragmatic interdependence in which intergroup cooperation is required for the successful completion of class projects. Rather, it may be due in part to the production of trust (and associated reduction of threat) that emerges following positive interdependent interactions. Other research reveals that intergroup contact most reliably reduces prejudice when individuals form friendships that transcend group boundaries (Pettigrew, 1997). Next to kinship, perhaps, nothing heuristically connotes the presence of trust and absence of threat more strongly than the intimate bonds of friendship.

Intergroup contact is likely to be an effective intervention primarily when the perceived threat is illusory, with little basis in reality. But when the perception of threat is based on some nontrivial kernel of truth (e.g., actual intergroup conflict; actual affliction of individuals with highly infectious diseases), contact-based interventions are likely to backfire. Instead, interventions designed to truly reduce the threat (or, at least, the perception of threat) may be required to reduce prejudices.

8.2. Prejudice May Be Most Effectively Reduced By Focusing on Its Precursors Instead

It is tempting to assume that the most effective interventions will be those that focus specifically on the prejudice itself. This is a limiting assumption. Many prejudices are highly automatic, emotion-laden responses to the inferred presence of threats that are cued by the perception of superficial features. Rather than merely focusing on the outcome (prejudice), interventions might focus on disrupting the chain of causal events that produces that outcome.

Interventions may be especially successful when they eliminate the perception of threat-connoting features in the first place. Medications that mask visible symptoms have reduced the stigmatization of lepers in Thailand (Navon, 1996). Other morphological anomalies that might implicitly connote the threat of disease (e.g., facial birthmarks, cleft palate) can also be made less visible through medical interventions. Of course, not all threat-connoting features are easily rendered imperceptible. Even if it were possible to make them imperceptible, there are many additional issues to be considered. For instance, ostensibly stigmatizing features sometimes have psychological benefits as well as costs (Crocker & Major, 1989). Any attempt to systematically change the superficial appearances or behaviors of human beings requires careful consideration of the many complex personal, societal, legal, and ethical issues involved in doing so.

Additional intervention strategies may effectively reduce prejudice if they weaken the associative links between perceptual cues and assumed threats. In cases where there exists no substantial kernel of truth underlying an assumed threat, it may be tempting to use educational interventions that expose perceivers to facts that reveal the actual (unthreatening) truth. For two reasons, however, this sort of intervention may be relatively ineffective. First, relevant research on learned fear associations (Navarrete et al., 2009; Olsson et al., 2005) suggests that the threat-based associations that have especially important implications for prejudice are especially difficult to unlearn. Second, because the associative links between cues and threats are typically acquired implicitly and then activated implicitly as well, they may be relatively unaffected by interventions that focus on explicit knowledge. Instead, it may be more effective to design interventions to reduce the psychological salience of the threat. Public policies and social services that reduce the prevalence of violent crime may have the additional benefit of reducing prejudices toward outgroup members. Policies and services that reduce the prevalence of disease may also inhibit prejudices against peoples whose appearances or actions deviate from local norms. These threat-based prejudices might also be reduced by interventions that focus on the mere perception of threat. People commonly overestimate the prevalence of violence and infectious disease. Intervention strategies that effectively reduce these estimates to more realistic levels may also have the collateral benefit of reducing prejudices of various kinds.

8.3. Different Interventions Are Required to Fight Different Prejudices

Prejudice is not a monolithic phenomenon. Yes, human beings are implicit organizers; we like to lump people into categories. And, yes, social categorization has some psychological implications that generalize across virtually all kinds of social categories. But neither of these facts implies that social categories are conceptually interchangeable. Specific kinds of social categories (e.g., the categorical distinctions between male and female, between coalitional ingroup and

outgroup, between people who look subjectively normal and those who do not) were associated with specific kinds of adaptive problems in ancestral environments and, as a consequence, elicit specific kinds of prejudices in the here and now. These different prejudices are triggered by different perceptual cues and are defined by different emotional, cognitive, and behavioral responses. Their activation and expressions are moderated by different sets of variables. This functional specificity of prejudices necessarily limits the realistic range of impact that any single prejudice-reduction intervention strategy is likely to have.

To effectively combat any specific threat-based prejudice, an intervention must target a specific form of threat, the specific cues that connote it, and the specific dispositional and situational factors that inhibit or enhance it. But we cannot expect that intervention to effectively inhibit other, functionally independent prejudices. An intervention designed to overcome sexism cannot be expected to have much impact on ageism. An intervention that mitigates fearful reactions to someone who looks like one of "them" (rather than one of "us") may be entirely ineffective in reducing aversion to someone else's facial disfigurement or reducing resentment toward someone else's status as a welfare recipient. To combat those other prejudices, additional, functionally focused interventions are required.

And when a target group is characterized by features that connote multiple kinds of threat, no single intervention strategy—no matter how thoughtfully designed—is likely to be completely effective. Immigrants are a good example. Many immigrant groups are perceived to be coalitional outgroups, and also are characterized by appearances and behaviors that deviate from local normative standards. These immigrants may therefore be implicitly associated with the threat of interpersonal harm as well as the threat of disease (and possibly other threats as well), and so be the simultaneous targets of multiple kinds of prejudice. A single, highly focused intervention strategy may curb one of those prejudices, but leave the others untouched. To effectively reduce behavioral discrimination against this single target group, a multi-pronged set of interventions—each of which must be carefully calibrated to a specific threat-based prejudice—may be necessary.

A realistic psychological approach to prejudice reduction may need to operate on a principle that guides the medical approach to disease reduction. There is no panacea that reduces an individual's susceptibility to all possible forms of infectious disease. There isn't even a single vaccination that inoculates against all strains of influenza. Because different infectious diseases have distinct pathogenic causes, different vaccinations are required to inoculate against them. The same is true of prejudice. Because different prejudices have distinct evolutionary roots as well as distinct psychological causes, different interventions are required to fight them.

9. The Nature of Prejudice(s)

The word *food* is singular, not plural, and is typically defined in a singular way as well (e.g., "a nutritious substance…"). Nevertheless, we know that *food* refers not to any single kind of nutritious substance but instead to an entire broad category of them. Within this abstract category of food, there are many different foods (plural) that come in many different forms and flavors. Oysters, mangoes, and shiitake mushrooms may all qualify as food, but along almost every dimension that scientists and laypeople actually care about (molecular structure, evolutionary history, the ecological circumstances in which they are found, the way that they taste) they are completely different. Any scientific understanding of food requires acknowledgement of these differences. Whatever you might know about oysters—their origin, their structure, the taste on your tongue when you bite into one—tells you very little about mangoes or mushrooms, or about sirloin steaks, potato chips, or Junior Mints. To fully understand food (singular), it's necessary to know the nature of foods (plural).

The same principle applies to prejudice. Like food, the word *prejudice* is singular, not plural, and is typically defined in a singular way (e.g., "a negative evaluation of a social group or a negative evaluation of an individual that is significantly based on the individual's group membership"; Crandall & Eshleman, 2003, p. 414). Nevertheless, like food, *prejudice* refers not to any single kind of evaluation but instead to an entire broad category of them. Like food, prejudice comes in many different forms and flavors. Sexism, racism, and nepotism all qualify as prejudices (in the sense that some individuals are treated less favorably than others, simply on the basis of their categorical characteristics), but along almost every dimension that scientists and laypeople actually care about (the affective and connotative contents of those prejudices, the psychological processes that produce them, the variables that moderate them, their implications for real life) they are completely different. Any scientific understanding of prejudice requires acknowledgement of these differences. Whatever you might know about the psychological bases of one particular kind of prejudice may tell you very little about the psychological bases of other prejudices. To

fully understand the nature of prejudice (singular), it's necessary to know the nature of prejudices (plural).

9.1 Envoi

Allport's book on *The Nature of Prejudice* was eclectic, identifying many different kinds of psychological processes that contribute to the problem of prejudice. This eclectic approach is intellectually generous and open-minded. It acknowledges that no single process is likely to have any sort of privileged status in our understanding of prejudice. "There is no master key," wrote Allport (1954, p. 208). "Rather, what we have at our disposal is a ring of keys, each of which opens one gate of understanding."

The evolutionary perspective on threats and prejudices adds additional keys to this conceptual key ring. This evolutionary approach is not everyone's cup of tea. There are a variety of reasons that contribute to wariness about evolutionary approaches to human behavior, and these reasons have been discussed extensively elsewhere (e.g., Buss, 1990; Conway & Schaller, 2002; Pinker, 2003). Among these reasons, perhaps, is our distinctly human fondness for the distinctively human wonders of cognitive rationality, which may lead people to reflexively recoil from the ugliness of our bestial past. But most prejudices aren't cognitively rational products of our newfangled neocortex. Prejudices are, and always have been, products of the more ancient and beastly parts of our brains. If we ignore our evolutionary past, we are likely to ignorantly fall prey to the prejudices that have resulted from it. If we confront our evolutionary past (and its psychological consequences) with scholarly rigor, we can more truly know the nature of these prejudices, and do something about them.

> "A thousand anachronisms dance down the strands of our DNA from a hidebound tribal past, guiding us toward the glories of survival, and some vainglories as well. If we resent being bound by these ropes, the best hope is to seize them out like snakes, by the throat, look them in the eye and own up to their venom." (Kingsolver, 1995, p. 9)

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