
Imaging Race

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Researchers have recently begun to use the tools of neuroscience to examine the social psychological responses associated with race. This article serves as a review of the developing literature in this area. It advances the argument that neuroscience studies of race have the potential to shape fundamental assumptions about race, and the interplay between social and biological processes more generally.

Advances in the neurosciences have produced new and powerful tools for examining neural activity. Functional magnetic resonance imaging (fMRI) techniques in particular offer a noninvasive means of examining the functioning of healthy brains. These techniques provide unique opportunities for researchers from a wide variety of disciplines to explore the neural correlates of social psychological phenomena. As a result, research and interest in social neuroscience has experienced a recent upsurge (e.g., see Adolphs, 1999; Cacioppo & Berntson, 1992; Cacioppo et al., 2003; Ochsner & Lieberman, 2001; Willingham & Dunn, 2003). In the past few years, neuroimaging studies have been used to examine a broad range of social psychological issues, including self-perception (e.g., Kelly et al., 2002), social attribution (A. Martin & Weisberg, 2003), extraversion (Canli, Sivers, Whitfield, Gotlib, & Gabrieli, 2002), love and attraction (Bartels & Zeki, 2000), social exclusion (Eisenberger, Lieberman, & Williams, 2003), emotion regulation (Ochsner, Bunge, Gross, & Gabrieli, 2002), deception (Langleben et al., 2002), cooperation (McCabe, Houser, Ryan, Smith, & Trouard, 2001), and moral reasoning (Greene, Sommerville, Nystrom, Darley, & Cohen, 2001), as well as racial perception (Golby, Gabrieli, Chiao, & Eberhardt, 2001) and racial bias (Cunningham et al., 2004; Hart et al., 2000; Phelps et al., 2000; Richeson et al., 2003; Wheeler & Fiske, 2005).

This article focuses exclusively on neuroscience studies related to race. These recent neural investigations examine questions of abiding interest to social psychologists and have already deepened researchers' understanding of how race comes to influence thought and action. Conversely, the findings of social neuroscience may also *actively shape* how race comes to influence thought and action. In other words, neuroscience findings may both document and, in part, determine the role of race in social psychological phenomena. Just as 19th-century neuroscientists dramatically altered the public's understanding of race by attempting to chart neurobiological differences

across racial groups in order to explain Black inferiority and justify massive racial inequities, so too may current neuroscience studies shape societal understandings of race. The differences between neuroscientists then and now, however, are stark. Whereas 19th-century neuroscientists sought and saw permanent racial group differences rooted in biology, contemporary neuroscientists seek to uncover social influences of neural responses understood to be transient and malleable. Contemporary research efforts thus rest on and promote an alternative understanding of the interplay of race and neurobiology.

This article unfolds in three steps. First, I review a limited number of social neuroscience studies of race, highlighting neuroimaging studies in particular. Second, I contrast current research to the efforts of 19th-century neuroscientists to identify differences in skull size among racial groups. Finally, I discuss how current neurobiological approaches to race may refashion societal notions of race as well as our understanding of the relationship between social and biological phenomena more generally. Such approaches may ultimately help to sever the lingering cultural association between studies of race and the brain, on the one hand, and racist efforts to legitimize severe racial inequities, on the other.

Recent Neuroscience Findings on Race

Two issues dominate recent neuroscience studies related to race: (a) evaluative processing and (b) face processing.

Race and Evaluative Processing

Numerous studies have aimed to understand the relative contributions of automatic (i.e., unconscious or unintentional) and controlled (i.e., conscious or deliberate) processing to racial bias (e.g., Dasgupta & Greenwald, 2001; Devine, 1989; Devine, Plant, Amodio, Harmon-Jones, & Vance, 2002; Dovidio & Gaertner, 1998; Lepore & Brown, 1997; Lowery, Hardin, & Sinclair, 2001; Payne, 2001; or for a review, see Fiske, 1998). Determining the extent to

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which racial bias can be automatically triggered versus deliberately controlled is a fundamental issue in social psychology. Better understanding this tension may improve not only theories of social cognition but also interventions designed to reduce bias and minimize racial inequities.

The desire to examine automatic racial bias, in particular, has led researchers to adopt indirect measures of bias. Social pressures and cultural expectations may prompt Americans to publicly embrace racially egalitarian values that they neither strongly nor personally endorse (Devine et al., 2002; Dovidio & Gaertner, 1998). To measure pure automatic racial bias, unaltered by participants' social desirability concerns, some researchers place participants in situations where they have less control over their responses and/or less knowledge about what their responses imply. To achieve this aim, researchers use measures and techniques that are not only more indirect (e.g., subliminal priming, lexical decision tasks, implicit association measures), but also more physiologically focused (e.g., event-related potentials, facial electromyography [EMG], startle eyeblinks, fMRI).

The benefit of physiological measures of racial bias is considerable. Because many of these measures are more continuous than traditional behavioral measures, they offer a wealth of information on the time course of responses. Some measures allow researchers to physically locate the phenomena of interest, such that precise predictions can be made regarding when and where race effects will emerge. Moreover, physiological tools often allow measurement of mental states without eliciting overt behavioral responses or decisions from participants.

Armed with these technologies, researchers have found that exposing Whites to Black targets, for example, can affect Whites' physiological responses in myriad ways:

how their skin sweats (Rankin & Campbell, 1955), how their hearts pump (Blascovich, Mendes, Hunter, Lickel, & Kowai-Bell, 2001), how their cortical voltages shift (Chiu, Ambady, & Deldin, in press), how their facial muscles twitch (Vanman, Paul, Ito, & Miller, 1997), and how their eyes blink (Amodio, Harmon-Jones, & Devine, 2003; Phelps et al., 2000). These physiological indices consistently reveal significant response differences as a function of race even when traditional, more direct, measures of racial attitudes do not.

Simply imagining an interaction with a Black partner can have physiological consequences for Whites. For example, Vanman et al. (1997) used measures of facial EMG to examine Whites' responses to Blacks in an imagined cooperative-learning encounter. On self-report measures, Whites rated Black partners more favorably than White partners when they imagined working with them. On EMG measures, however, Whites exhibited more responses known to indicate negative affect (i.e., increased brow activity and decreased cheek activity) when they imagined working with a Black partner rather than a White one. Vanman and colleagues considered involuntary affective responses (such as EMG measures) to be more valid indicators of affect toward out-group members than self-report measures. Because involuntary affective responses are less controllable, they are thought to be less subject to self-presentational concerns.

Neuroimaging studies related to race are part of a broader trend examining the physiological correlates of well-known social psychological phenomena. Hart et al. (2000) published the first neuroimaging study examining the effects of race on the amygdala, an area of the brain that has been implicated in learned emotional responses. They exposed self-identified Black and White participants to the faces of Black and White people (with neutral facial expressions) while recording neural activity in the amygdala. During early presentations of faces, there was no significant difference in amygdala activation between in-group and out-group faces. During later presentations, amygdala activation declined more for in-group faces than for out-group faces, indicating a heightened habituation toward in-group faces. Hart and colleagues highlighted two possible explanations for these findings. Greater familiarity might lead to faster amygdala habituation. Because people tend to have greater experience with in-group members, the faces of in-group members may seem more familiar. Alternatively, differential amygdala responses could be tied to racial bias directed against racial out-group members.

Phelps et al. (2000) focused squarely on the second possibility in a study examining the link between indirect race bias and neural functioning. They exposed White participants to Black and White faces while recording neural activity in their amygdala with fMRI. After the fMRI scan, participants completed a direct measure of racial attitudes (the Modern Racism Scale; McConahay, 1986) as well as indirect measures of racial attitudes (including the Implicit Association Test [IAT]; Greenwald, McGhee, & Schwartz, 1998). Although Phelps and colleagues found no overall difference in amygdala activation

as a function of stimulus race, differences in amygdala activation to Black faces were significantly correlated with the IAT (but not with the Modern Racism Scale). The White participants with the most negative implicit attitudes toward Blacks exhibited the greatest amygdala activation responses to Black faces compared with White faces. Phelps and colleagues viewed these findings as reflecting a cultural context that prompts the negative evaluation of unfamiliar Black faces. A second study exposing White participants to famous, well-liked Blacks found no significant correlation between IAT responses and amygdala activation.

Phelps et al. (2000) understood their findings to bear on the role of the amygdala in unconscious race evaluation; however, as Hart et al. (2000) suggested, an alternative possibility is that racial differences in familiarity produce these effects. Nevertheless, in either case the findings suggest that social experience plays a significant role in the alteration of neural responses in the amygdala.

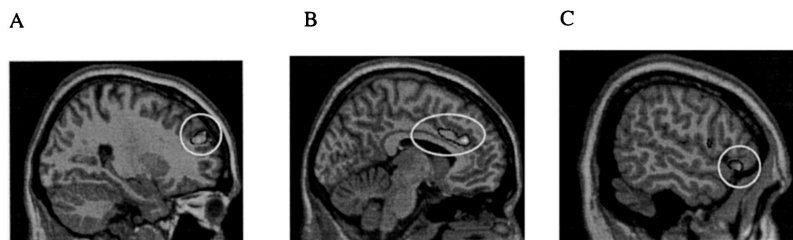
A recent study by Wheeler and Fiske (2005) has also demonstrated that increased amygdala activation to Black faces compared with White faces can be modulated. Wheeler and Fiske exposed White participants to Black and White faces under three different encoding conditions as they measured amygdala activity. As the faces were displayed, participants were asked to determine whether a dot appeared on each face (a visual search task), whether the person pictured liked a certain vegetable (an individuation task), or whether the person was older or younger than 21 years of age (a social categorization task). Black faces elicited greater amygdala activation than White faces only when the participants' processing goal was to socially categorize the faces. Wheeler and Fiske (2005) interpreted these findings as demonstrating "that such goals influence even low-level, fast emotional responses to out-group race members" (p. 60). Changes in the social context brought about by manipulating the participants' immediate processing goals thus produced substantial changes in brain activity.

Race-based emotional responses also can be modulated by more stable individual differences in motivations

or goals. For example, using a startle eyeblink response paradigm, Amodio et al. (2003) have demonstrated that Whites motivated by internal, personal reasons rather than by external, norm-based reasons to respond to Blacks without bias exhibit less negative affect in response to Blacks. In a typical startle eyeblink study, participants are presented with a startle probe (i.e., a burst of white noise that causes the eye to blink) as they are exposed to stimuli of different types. When participants experience negative affect, startle (i.e., eyeblink) responses are magnified. The magnitude of the startle response is then taken as a measure of negative affect. Amodio and colleagues measured negative affect by examining the magnitude of the startle response as participants were exposed to Black faces as compared with White faces. Individuals who were more internally motivated but less externally motivated to control prejudice exhibited less affective race bias than others. Furthermore, these differences were not due to decreased familiarity of other-race Black faces compared with same-race White faces; blink responses to Asian faces (which were as unfamiliar to White participants as Black faces) were not significantly modulated by motivation to control bias. Amodio and colleagues viewed these results as evidence of a significant relationship between affective race bias and neural mechanisms of learned emotional responding.

Cunningham et al. (2004) examined the extent to which conscious attempts to control bias toward Blacks (compared with Whites) might lead to increased activation in the frontal cortex and decreased activation in the amygdala. They presented participants with Black and White faces for a short duration (30 milliseconds) that prevented conscious detection and for a longer duration (525 milliseconds) that permitted conscious detection. Overall, Black faces triggered greater amygdala activation than did White faces only when the faces were presented subconsciously. When presented consciously, Black faces triggered greater activation than White faces in the prefrontal and cingulate areas that have been associated with control and regulatory responses (see Figure 1). Moreover, the increased frontal activity in response to Black faces predicted decreased

Figure 1
Black-White Contrast of Prefrontal Activations for Faces Displayed at the Long Duration (525 Milliseconds)



Note. Areas of the brain showing more activation in response to Black than to White faces included the (A) dorsolateral prefrontal cortex, (B) anterior cingulate, and (C) ventrolateral prefrontal cortex. From "Separable Neural Components in the Processing of Black and White Faces," by W. A. Cunningham et al., 2004, *Psychological Science*, 15, p. 810. Copyright 2004 by Blackwell Publishers. Reprinted with permission.

amygdala activity in response to Black faces relative to White faces.

Offering these findings as evidence of the modulating role of controlled processes on automatic racial bias, Cunningham et al. (2004) argued that their findings explain why researchers have not been able to consistently document greater amygdala responses to Black faces than to White faces, irrespective of individual differences in implicit attitudes or motivation to control bias. They reasoned that overall differences in amygdala responses have not emerged because researchers have exposed participants to Black and White faces for relatively long durations, which has allowed participants to respond to Black faces using a mixture of automatic negative processing and controlled positive processing.

Richeson et al. (2003) extended this line of reasoning by examining not only the relationship between prefrontal activity and automatic racial bias but also the consequences of increased prefrontal activity for interracial interactions. Specifically, Richeson and colleagues were interested in the extent to which White individuals who exhibit anti-Black evaluative bias (as measured by the IAT) experience cognitive resource depletion when interacting with Blacks but not with Whites. Consistent with this logic, their findings revealed that racially biased Whites were more impaired on a cognitive task (i.e., a Stroop color-naming task) after a brief interaction with a Black person than with a White person. Moreover, in a separate neuroimaging study, they found not only that greater racial bias was associated with greater prefrontal activation to Black (as compared with White) faces, but also that prefrontal activation mediated the relationship between racial bias and cognitive task performance. The greater the racial bias, the greater the prefrontal activation and, hence, the more the performance on the cognitive task was impaired. The authors offered their findings as evidence for a resource depletion model, which predicts that racially biased Whites will engage more executive function processes in their interactions with Blacks and will, as a result, experience temporary cognitive dysfunction.

More broadly, the findings of Richeson et al. (2003) seem to undermine the view that indirect measures of bias are completely unfettered by people's self-presentational concerns and attempts to control their responses. Quite the contrary, their findings, along with those of Cunningham et al. (2004), suggest that efforts to control race-based responding are critical components of such responding and can be reliably tracked using indirect measures. Efforts to control race-based responding appear to have a specific neural consequence.

In general, the recent neuroscience studies reviewed here use an assortment of methods and theoretical frameworks to examine race and evaluative processing, yet they report findings that are highly compatible. The studies associate racial bias with specific neural responses that may be modulated by both situational and motivational factors.

Despite the compatibility of the findings, however, it is not obvious that the neurobiological responses these researchers have identified warrant the designation "bias."

In fact, some researchers argue that social knowledge, rather than racial bias, may explain these findings. Just as IAT responses, for example, may simply reflect the social knowledge that Blacks are often associated with negative affect (e.g., Karpinski & Hilton, 2001; Olson & Fazio, 2004), so too may neurobiological responses reflect this social knowledge rather than personalized, evaluative processing. Stated simply, knowledge of the cultural association of Blacks and negative affect could elevate both IAT scores and amygdala activation. Likewise, the effort to control race-based responding across many of these studies might reflect an effort to control the activation of cultural knowledge that Blacks are associated with negative attitudes and beliefs, rather than an effort to control personal attitudes and beliefs.

Attempts to document the distinction between social knowledge and individual bias reflect the scientific impulse to categorize and label social psychological phenomena precisely; however, one may legitimately question whether the label is of great significance, especially in cases where the negative consequences of either form of race-based responding are identical. Perhaps distinguishing bias from social knowledge implies a moral distinction as well: "Bias" calls forth a sense of moral condemnation in a manner that "social knowledge" does not. Claiming that someone's responses reflect social knowledge simply does not have the same sting as claiming that those same responses reflect racial bias. Furthermore, people may feel less urgently the need to remedy responses thought to reflect social knowledge as opposed to bias. Ironically, as researchers highlight the often unconscious and unintentional character of bias, they undermine the moral foundation of the dichotomy between bias and knowledge.

Race and Face Processing

Although the research reviewed in the previous section presupposes that people can and do use images of faces to immediately categorize others as Black or White, other studies ask the following questions: What neural circuitry is involved in this initial categorization? Can the race of a face influence neural activation at early stages of face perception? Is racial categorization a necessary component of face processing?

Golby et al. (2001) conducted a neuroimaging study to examine whether a target's race correlates with activation differences in a part of the brain, the fusiform face area, implicated in early face processing. Self-identified Black and White participants were exposed to Black and White faces under intentional encoding conditions as whole brain data were acquired. Immediately following the fMRI scan, participants were given a face recognition test. They were shown a second set of faces (half were faces they had just seen, and half were new) and asked to indicate with a button push which faces they had seen previously and which were new. Consistent with decades of research on this topic, their findings revealed that participants were better able to recognize same-race faces than other-race faces. Most important, they found greater activation in the fusiform face area for same-race faces than for other-race

faces. Moreover, differences in face recognition performance correlated with activation in the left fusiform cortex. Those Black participants who best recognized Black faces compared with White faces showed the greatest activation to Black faces compared with White faces. Similarly, those White participants who best recognized White faces compared with Black faces showed the greatest activation to White faces compared with Black faces. These race differences were present even though participants were not required to categorize the faces by race. Attention to race occurred spontaneously, in very early stages of face processing.

These results pose an interpretive dilemma similar to the social knowledge/racial bias distinction discussed in connection with the evaluative processing studies. The results Golby et al. (2001) obtained could be due to implicit racial categorization processes or merely to differences in perceptual expertise. Superior perceptual expertise for same-race faces may reflect greater exposure to those types of faces and greater practice at identifying them. As a result of substantial residential racial segregation, Whites especially are likely to have much more contact with members of their own race than with members of a different race (Massey & Denton, 1993). Moreover, even in mixed-race settings such as colleges and universities, individuals have substantially more same-race friendships than interracial friendships (Williams & Eberhardt, 2005).

Finally, Gauthier, Skudlarski, Gore, and Anderson (2000) have documented experience-dependent changes in the fusiform face area. Specifically, they have shown that expertise with certain classes of nonface objects (cars for car experts or birds for bird experts) can trigger fusiform face activation upon exposure to these objects of expertise. Gauthier, Tarr, Anderson, Skudlarski, and Gore (1999) have also demonstrated that training at identifying novel nonface objects is linked to changes in the fusiform face area. The development of perceptual expertise with novel stimuli may increase activation in the fusiform face area. Just as the influence of race on affective processing systems could be due to social knowledge rather than to racial bias, the influence of race on face processing could therefore be due to perceptual expertise rather than to racial categorization.

There are numerous studies, however, that cast doubt on the perceptual expertise account of race effects in face processing. Contrary to what the perceptual expertise explanation would predict, interracial contact does not seem to be reliably related to the same-race recognition advantage in face processing. The effects of contact, in fact, are weak and inconsistent (e.g., see Anthony, Cooper, & Mullen, 1992; Bothwell, Brigham, & Malpass, 1989; Ng & Lindsay, 1994; but see Meissner & Brigham, 2001). The data of Golby et al. (2001) cast additional doubt on the expertise explanation. The expertise explanation suggests that the race effect should be a function of individual participants' degree of other-race contact. For example, because Blacks generally have more interracial contact (and hence more expertise with other-race faces) than Whites, one would expect Black participants to be less

likely than White participants to exhibit a race effect. The race effect, however, is arguably more robust for Black participants than for White participants. Every Black participant exhibited greater activation in the fusiform face area to same-race faces as compared with other-race faces, whereas only three quarters of the White participants exhibited this effect.

A study by Golarai, Ghahremani, Eberhardt, Grill-Spector, and Gabrieli (2004) replicated and extended the basic race effect demonstrated by Golby et al. (2001). Golarai et al. exposed White participants both to faces whose features were intact and to faces whose features were moved to random locations on the face (i.e., scrambled). Golarai and colleagues found no difference in fusiform face activation triggered by same-race intact and scrambled faces. In contrast, fusiform face activation was significantly reduced for Black intact faces—not only when compared with White intact faces but, amazingly, when compared with White scrambled faces as well. Because it is implausible that participants had more previous exposure to scrambled White faces than to intact Black faces, these results suggest that the fusiform face area may be (a) more sensitive to racial category membership than to the familiarity of the face and (b) more sensitive to racial category membership than to fundamental changes in the structural integrity of the face.

Ito and Urland (2003) have reported data consistent with these effects. They used event-related potentials to determine the precise timing of participants' attention to the race of faces. They found that attention to race occurs within the first 120 milliseconds of the onset of the face stimulus, well before the structural analysis of the face is thought to occur.

Although racial categorization occurs at early stages of perceptual encoding and can significantly influence face processing, race encoding is not inevitable. For example, Kurzban, Tooby, and Cosmides (2001) have maintained that people sort and categorize others in terms of coalitional alliances for which race is but one proxy. When people have a more meaningful proxy for coalitional alliances, they are much less likely to attend to race. Notably, the Phelps et al. (2000) findings, reviewed earlier, regarding reduced amygdala activation to famous, well-liked Black faces may also reflect the possibility that racial categorization processes are quite flexible. In that study, reduced amygdala activation may have occurred because participants were simply less inclined to encode well-liked Black faces in terms of their racial category. Findings by Richeson and Trawalter (2005) are consistent with this possibility. These researchers asked study participants to racially categorize famous Blacks who are well liked (e.g., Michael Jordan) as well as those who are disliked (e.g., OJ Simpson). They found that participants racially categorized well-liked Blacks more slowly than they categorized disliked Blacks.

Even when people actively attend to race, race encoding may not be a simple matter of registering the physical traits of others. For example, changes in the racial label of a stimulus can produce substantial changes in how other-

wise identical face stimuli are processed. To demonstrate this, Eberhardt, Dasgupta, and Banaszynski (2003) presented participants with racially ambiguous faces that were labeled either *Black* or *White*. They found that these racial labels interacted with participants' implicit beliefs about human traits to influence how the faces were perceived and remembered. Those who understood human traits to be fixed and diagnostic perceived and remembered racially ambiguous faces in a manner consistent with the racial label provided. Those who understood human traits to be malleable and provisional perceived and remembered racially ambiguous faces in a manner inconsistent with the racial label provided. Not only might racial categorization processes modulate basic face-processing mechanisms, but it is possible that situational variables, in turn, might modulate racial categorization processes.

Past Neuroscience Findings on Race

Contemporary research approaches stand in stark contrast to those of the 19th century. Nineteenth-century researchers examined physical differences among racial groups in a direct effort to document Black inferiority and thus justify gross racial inequities. Such earlier approaches are quite significant, as they were inextricably bound to the development of neuroscience as a field (Finger, 1994) and consequently produced dramatic changes in how 19th-century Americans came to reason about race. As the pioneers of neuroscience sought to understand the relationship between intelligence and frontal lobe functioning, for instance, they were well aware of the implications for race. In fact, racial considerations frequently were not an unintended consequence of research on the brain but rather the guiding motivation.

Samuel George Morton played a key role in the initial neuroscience studies of race. Morton, a famous 19th-century physician and scientist, assembled the largest collection of skulls ever (more than 1,000), which he used to identify the distinct characteristics of various racial groups

(Gould, 1996). Initially, Morton calculated skull size by filling skulls with mustard seed and, later, with lead shot (a more precise method of measurement). Whatever the index of measurement, Morton consistently found White skulls to be significantly larger than Black skulls, a finding that was taken to legitimize the then-commonplace views that Whites and Blacks were different and that Whites were superior. Although these findings now have been thoroughly discredited (see Gould, 1996), Morton's work was applauded by his scientific contemporaries, who sought scientific explanations for the racial problems of that day.

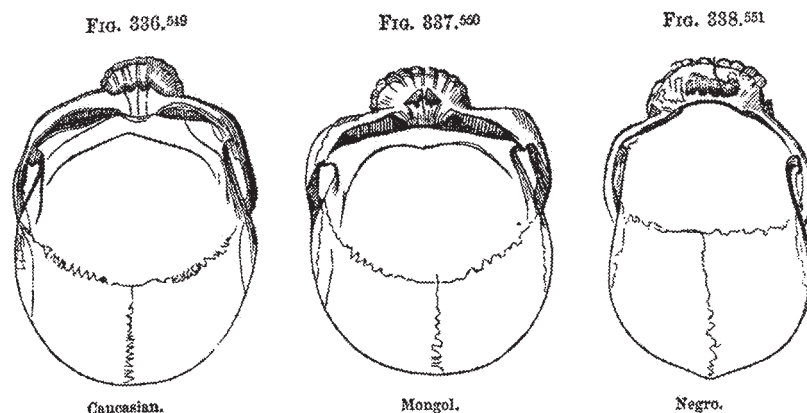
Josiah Nott and Samuel Gliddon popularized scientific findings of racial difference in *Types of Mankind* (Nott & Gliddon, 1854), which became the dominant book on race in American society during the 19th century. On page after page, Nott and Gliddon displayed, in graphic form, scientific evidence of racial differences (see Figure 2). Images of skulls were produced alongside directions on how to comprehend racial differences:

The "Caucasian," Mongol, and Negro, constitute three of the most prominent groups of mankind; and the vertical views of the following crania (Figs. 336–338) display, at a glance, how widely separated they are in conformation. . . . Such types speak for themselves; and the anatomist has no more need of protracted comparisons to seize their diversities, than the school-boy to distinguish turkeys from peacocks, or pecarries from Guinea-pigs. (p. 456)

It was commonly assumed that these obvious differences in skull measurements indexed major differences in brain functioning. As Nott and Gliddon (1854) stated directly, "The physical difference of human races is as obvious in their internal brains as in their external features" (p. 465).

These 19th-century scholars believed that physical differences accounted for mental differences, so intellectual differences between Whites and Blacks, in particular, could be studied simply by documenting anatomical differences. Notably, Paul Broca, one of the most powerful scientists to advocate this approach, applied his much cel-

Figure 2
Sample Skulls From Caucasian, Mongol, and Negro Individuals Presented in Nott and Gliddon (1854)



ebated cortical localization of function theory to the problem of racial differences in intellectual performance. He argued that relative to Whites, Blacks had grossly underdeveloped frontal lobes (implicated in higher reasoning) but occipital lobes (implicated in basic sensory processing) that were substantially overdeveloped (see Gould, 1996). Broca strongly believed that anatomical differences between Blacks and Whites well explained intellectual differences between Blacks and Whites. In fact, Nott and Gliddon's (1854) assertion that "the intellectual man is inseparable from the physical man" (p. 50) was strongly supported by most scholars of that era.

Physical measurements of the brain were used to rank racial groups along a continuum of worth (Gould, 1996). Any brain differences were taken as indicative of the innate inferiority of the Black race and the superiority of the White race. Brain differences were not only linked to intellectual differences but to cultural and moral differences as well. Rather than simply underscoring the relation between perceivers' physical and mental states as contemporary researchers have done, 19th-century researchers attempted to pinpoint the physical traits that would explain the differences in the mental capabilities that they believed to exist. Ultimately, the skull images that were produced to exhibit racial difference became the means through which Blacks were dehumanized (see Figure 3). Employing the tools of neuroscience, scientists from a variety of disciplines aimed to document the inhumanity of the Black race. Blacks came to be seen as occupying an anatomical position between humans and apes.

Anatomical and physiological differences among racial groups were frequently used to explain the different social positions these groups occupied:

A prognathous [forward-jutting] face, more or less black color of the skin, woolly hair and intellectual and social inferiority, are often associated, while more or less white skin, straight hair and an orthognathous [straight] face are the ordinary equipment of the highest groups in the human series. . . . A group with black skin, woolly hair and a prognathous face has never been able to raise itself spontaneously to civilization. (Broca, as cited in Gould, 1996, pp. 115–116)

Although Black inferiority was considered to be beyond debate even before the 19th century, the permanence of that inferiority was not. Many scholars in the 18th century, for example, believed that Black inferiority was subject to change, under the right conditions (Eze, 1997). During the 19th century, however, a new perspective began to emerge. Aided by new scientific data, scholars were beginning to seriously consider the possibility that racial groups would be forever estranged from one another (Fredrickson, 1971).

New evidence, made possible through the advanced neuroscience techniques of the 19th century, seemed to point definitively to permanent, physical differences among racial groups that explained differences in the social positions these groups occupied. As the late Stephen Jay Gould (1996) contended:

What argument against social change could be more chillingly effective than the claim that established orders, with some groups

on top and others at the bottom, exist as an accurate reflection of the innate and unchangeable intellectual capacities of people so ranked? (p. 28)

Broader Social Significance

Current research revises the understandings of race on which 19th-century researchers relied. Researchers now treat race as a concept that can trigger a set of physical states within the self rather than as a concept that simply describes the physical traits of others. Rather than highlighting observable, stable differences across racial groups, researchers highlight the ideas people have about race and the material consequences of those ideas. Neuroimaging techniques allow researchers to view the process by which those ideas become material—the process by which ideas produce physical changes in individuals and thus come to shape who those individuals are.

Such a framework has broad implications. To some extent, this view of race might lead people to refashion their notion of the relationship between social and biological phenomena more generally. Many Americans understand biological processes as fundamental, determinative, and unchangeable (Hoffman & Hurst, 1990; C. L. Martin & Parker, 1995; Rothbart & Taylor, 1992). By way of contrast, the emerging framework discussed here forcefully raises the possibility that social variables can influence biological processes. Such a framework, in fact, is quite compatible with emerging evidence that brain systems can be modulated quite substantially by experience (e.g., Draganski et al., 2004; Maguire et al., 2000).

Consider the research demonstrating the influence of cultural systems of thought on visual attention to objects in scenes (Masuda & Nisbett, 2001; Nisbett, 2003). In one such study, Masuda and Nisbett (2001) found that East Asians, who are more holistic thinkers than Westerners, were more likely than American participants to visually attend to scenes holistically as well. Indeed, they found large differences between Japanese and American participants in how an object's setting affected their ability to recognize the object itself. Not only were Japanese participants more likely to visually attend to the contextual background in scenes, they were more likely than American participants to spontaneously discuss this context. Recently, Gutchess, Welsh, Boduroglu, and Park (2005) found that such differences in cultural systems are reflected in differences in brain systems. In particular, the left-middle-temporal cortex, implicated in the processing of isolated objects, was activated more in Westerners when exposed to pictures of objects with background scenes than in East Asians who were exposed to the identical pictures.

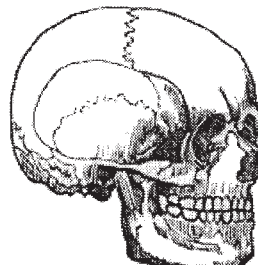
Although contemporary researchers have not chosen to emphasize racial differences between participant groups, discoveries of racial differences are inevitable outcomes of contemporary neuroscience research aimed at examining race-relevant phenomena. To the extent that Blacks and Whites have different social experiences, Blacks and Whites are bound to exhibit differences in neural functioning. Notably, this possibility is quite evident (although not highlighted) in the race and neuroimaging studies to date.

Figure 3
A Greek, a Negro, and a Young Chimpanzee Presented in Nott and Gliddon (1854)

FIG. 339. — Apollo Belvidere.⁵³³



FIG. 340.⁵³⁶

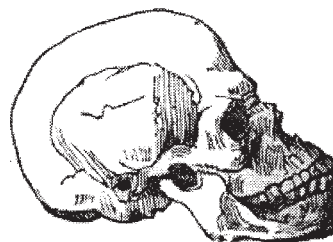


Greek.

FIG. 341. — Negro.⁵³⁴



FIG. 342.⁵³⁷

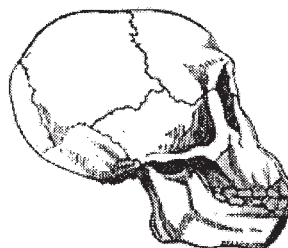


Creole Negro.

FIG. 343. — Young Chimpanzee.⁵³⁵



FIG. 344.⁵³⁸



Young Chimpanzee.

(458)

Note. The Negro skull has been exaggerated by Nott and Gliddon to emphasize its greater similarity to the chimpanzee than to the Greek god Apollo.

For example, Golby et al.'s (2001) finding that both Black and White participants exhibited greater brain activation in face-processing regions in response to same-race faces as compared with other-race faces indicates that Black and White participants responded in opposite ways to identical stimuli. Whereas Black participants exhibited greater activation to Black faces than to White faces, White participants exhibited greater activation to White faces than to Black faces.

Hart et al. (2000) stated directly that their research was not aimed at uncovering any race differences but was "explicitly designed to assess fMRI responses to outgroup versus ingroup faces across subjects of both races" (p. 2352). As with the Golby et al. (2001) study, however, the results seem to indicate that Black and White participants responded in opposite ways to identical stimuli. Blacks exhibited greater amygdala response habituation to Black faces than to White faces, whereas Whites exhibited greater amygdala response habituation to White faces than to Black faces. Although Phelps et al. (2000) did not test Black participants, they too made it clear that they would not expect Blacks to respond identically to Whites. Specifically, because Blacks exhibit a more positive evaluation bias to Blacks than Whites do, Phelps et al. (2000) anticipated that Black participants would exhibit less amygdala activation to Black faces than would White participants.

Despite the fact that racial differences have not played a dominant role in contemporary research, researchers have either found or anticipated racial differences in brain functioning. Moreover, to the extent that brain function influences brain structure (Draganski et al., 2004; Maguire et al., 2000), one might anticipate future research findings that highlight anatomical differences between racial groups that are understood, at least in part, to be socially or culturally produced.

Contemporary research may thus undo the historical association between neuroscience (as a field) and scientific racism. It offers an alternative model for thinking about race and neuroscience. Surely, it was at the site of the brain that supposedly fundamental and inescapable differences between Whites and Blacks were mapped out initially. In spite of (or precisely because of) this problematic legacy, the brain sciences may currently hold considerable power in undoing these old maps. In examining changes in blood flow within the brain as people are exposed to race-relevant stimuli under various conditions, researchers can literally see the ways in which social knowledge about race can dictate neurobiological responses. Researchers are tracing the neurobiological effects of people's racial beliefs, attitudes, and knowledge in a manner that appears to highlight (both to scientists and to laypeople) the socially constructed nature of race.

Advanced neuroscience technologies, then, have the power to aid our understanding of the social brain. These technologies have the power to loosen the grip that old skull images still have on American society, such that viewing contemporary pictures of the brain would no longer evoke fear that these images could eventually suggest natural and permanent racial differences between

groups, after all. Instead, seeing pictures of the brain may lead people to understand that their own race-based *perceptions* have the capacity to change and shape who they themselves are, in ways never before thought possible.

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