Afterword: *How are emotions embodied in the social world?*

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All of the contributors agree that emotions are profoundly social. At home and at work, social cues, interactions, and relationships dominate the landscape of our emotional lives. The association between the social and the emotional is bidirectional: emotional signals influence the social environment and shared feelings are critical for understanding and constructively interacting with others. Here, the authors describe socio-emotional interactions from multiple perspectives, ranging from emotional expressions to emotional contagion, from guilt to compassion, and from strategic cooperation to friendship.

Many contributors highlighted evidence that social contexts play an important role in regulating the expression and experience of emotion. Eisenberg & Hernández underscore the importance of emotion display rules—culture-specific norms for when, where, and how emotions can be expressed (cf. Blanchard & Pearson's response to Question 7; e.g., Ekman, 1972; Safdar et al., 2009). Lemay reminds us that individuals often attempt to deliberately regulate outward signs of emotion, such as anger, in order to preserve or cultivate desired social relationships. He joins with Eisenberg & Hernández in emphasizing that emotions such as guilt, shame, and pride are inherently social, and these "self-conscious" emotions are shaped by our social environment. Lemay goes as far as to provide a general model by which social contexts can influence our emotional state by motivating or interrupting emotional goals. Several authors note that reflexive social appraisals (e.g., perceived closeness, trustworthiness, or group identity) can govern the intensity of emotional experience (Engen & Singer, Fareri & Delgado, Fox, and Parkinson). For example, Parkinson highlights evidence that mothers experience lower levels of disgust in response to diapers soiled by their own baby compared to unrelated babies and Engen & Singer tell us that sports fans experience lower levels of empathy and show reduced altruism in response to the physical suffering of fans of a rival team. Finally, adopting a developmental perspective, Eisenberg & Hernández remind us that social contexts (e.g., familial and cultural norms, social isolation) can also have profound

consequences for emotional development (e.g., McLaughlin, Sheridan, & Lambert, 2014; McLaughlin et al., 2015).

Just as the social environment can influence emotions, emotions can alter social interactions (Eisenberg & Hernández, Fareri & Delgado, Lemay, and Parkinson; see also Shackman et al., 2016). The expression of anger, for example, tends to promote avoidance and conflict. In contrast, positive expressions (e.g., a smiling baby, laughter) encourage social approach, engagement, and bonding. As Fox and Fareri & Delgado note, such stimuli are highly motivating to observers and engage the same neural circuits recruited by other rewards, including food and money. Engen & Singer, Fareri & Delgado, and Parkinson all highlight evidence that this reward-relevant circuitry is also sensitive to reward delivered to others. For example, seeing another person receive a reward can activate one's own reward circuitry, and, potentially, impart positive affect. Fareri & Delgado argue that this vicarious reward information provides the information that is required to develop predictions about how people will act (i.e., social priors), which explains unique variance in reward-related neural activity (i.e. ventral striatal BOLD response). Fareri & Delgado go on to suggest this social-value signal contributes to the development and maintenance of social relationships. Parkinson picks up this argument by emphasizing how humans develop uniquely intense affiliative bonds with people who are neither kin or mates— our friends.

Several contributors emphasize the importance of feelings for motivating social behavior. Parkinson argues that feelings of loneliness motivate individuals to seek out new social connections and to evaluate potential partners more favorably. Engen & Singer, Fareri & Delgado, and Parkinson tell us that feelings of empathy and, even more so, compassion can motivate prosocial behavior, facilitate social understanding, and strengthen social cohesion. Eisenberg & Hernández, Fox, and Parkinson point out that the reverse is also true and emphasize the importance of social forms of emotion regulation, noting that the presence of friends, family members, and other forms of social support reduces distress

(Shackman et al., *in press*). Fox and Engen & Singer go on to suggest that deliberate mental training, such as cultivating feels of compassion, can motivate feelings of kindness and pro-social actions.

As Engen & Singer, Fareri & Delgado, and Fox note, the deep connection between the social and the emotional is evident in the high degree of overlap between the social and emotional brain. In addition to the role for social-valuation signals outlined above, Fareri & Delgado and Fox emphasize the amygdala's role in basic social processes, such as perception, trust, and proximity aversion. Engen & Singer highlight evidence that perception and action often engage overlapping substrates, and that some of the same neural systems that underlie emotion processing seem to enable emotion perception and empathy for others. In fact, many of these same systems are those that are thought to change with explicit prosocial training.

Finally, many of the contributors agree that, once elicited, moods and emotions can leapfrog from person-to-person via empathic distress and facial mimicry and spread across larger groups via emotional contagion (Eisenberg & Hernández, Engen & Singer, Fox, and Parkinson; see also Hatfield, Cacioppo, & Rapson, 1993). Fox takes this argument the furthest, arguing that implicit social communication of emotion (see Question 14) can form the basis for unconscious emotional transmission and group-affect. As Parkinson suggests, "better understanding how our emotional responses to the world around us are shaped by details of our social relationships, as well as by our relative positions in the social networks in which we are each embedded, comprises an important direction for future research."

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