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CHAPTER 27

Expression of Emotion

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The study of emotional expression has long been the provenance of scientific discovery and heated controversy. It has spurred advances in studies of emotion-related physiology (Matsumoto, Keltner, Shiota, O'Sullivan, & Frank, 2008), mammalian social behavior (Snowdon, 2003), cultural variation in emotion (Matsumoto, Olide, Schug, Willingham, & Callan, 2009), and evolutionary treatments of emotion (Shariff & Tracy, 2011). Alongside these discoveries are controversies that have propelled the science of expression forward. Questions persist about what kind of information expressions signal—feeling states, intentions, or both (Fridlund, 1991); the inferences to be drawn from emotion recognition data (Barrett, 2011; Russell, 1994); and the extent to which subjective feeling necessarily accompanies expressive behavior (Mauss, Levenson, McCarter, Wilhelm, & Gross, 2005). More recently, attention has turned to how contextual factors shape the interpretation of emotional expression (Barrett, Lindquist, & Gendron, 2007; Barrett, Mesquita, & Gendron, 2011).

In the last edition of this volume, this review centered on what has been learned about expression from a basic emotions perspective (Matsumoto et al., 2008). That review summarized discoveries related to the display of emotional behavior in other species; the covariations among expressive behavior, subjective experience, and physiology for a limited set of emotions; and the universality and cultural variations in labeling expressive behavior. Advances continue in those areas of inquiry, but in many ways the past 10 years has seen the study of expression broaden in consequential ways.

In the present review, we bring into focus these new directions in the study of emotional expression, concentrating on four emergent themes. A first is that signalling behavior is associated with a broader array of emotions than initially considered in early studies of emotional expression (e.g., Ekman, 1992). A second is the interest in new modalities of expression: studies of facial muscle movement and emotional speech prosody are increasingly complemented by an attention to vocal bursts, bodily movement, tactile contact, autonomic responses, and artistic forms of expression, including dance, music, and drawing. Our third focus is on how expressions of emotion shape social interactions. This idea traces back to ethologists' observations of how emotional expressions structure ritualized social interactions in remote peoples in the naturalistic contexts of their daily living, and is being actively pursued in laboratory research. And finally, we explore new advances in studies of the inferences that people draw in judging emotional displays. New theoretical developments have sought to capture how the perception of expressive behavior is shaped by contextual, cultural, and individual difference factors, a theme we bring into focus in the last section of this review (Barrett et al., 2011).

New Expressions of Emotion: A Widening Landscape of Emotional Expression

In 1872, Charles Darwin published *The Expression of the Emotions in Man and Animals*, which influenced profoundly the scientific search for the characteristic patterns of behavior that signal different emotions, their universality, and their origins in display behaviors of mammalian species (Ekman, 1998; Barrett, 2011; Shariff & Tracy, 2011). In Table 27.1, we represent the specific behaviors Darwin observed to be associated with positive emotional states (see Keltner, 2009).

One sees that Darwin (1872/1998) concerned himself with a wide array of states; in fact, over 40 in all (those in Table 27.1 are just the positive ones he referred to in his analysis). These states may cluster in emotion families, and represent variations or subtypes of one emotion (e.g., Ekman, 1992; Sauter, Gangi, McDonald, & Messinger, 2014). But clearly, Darwin cast his net much more

TABLE 27.1. Darwin's Descriptions of Expressive Behaviors Associated with Positive States

Admiration	Eyes opened, eyebrows raised, eyes bright, smile
Affirmation	Nod head, open eyes widely
Astonishment	Eyes open, mouth open, eyebrows raised, hands placed over mouth
Contemplation	Frown; wrinkle skin under lower eyelids; eyes divergent; head droops; hands to forehead, mouth, or chin; thumb/index finger to lip
Determination	Firmly closed mouth, arms folded across breast, shoulders raised
Devotion (reverence)	Face upward, eyelids upturned, fainting, pupils upward and inward, humbling kneeling posture, hands upturned
Happiness	Eyes sparkle, skin under eyes wrinkled, mouth drawn back at corners
High spirits, cheerfulness	Smile, body erect, head upright, eyes open, eyebrows raised, eyelids raised, nostrils raised, eating gestures (rubbing belly), air suck, lip smacks
Joy	Muscle tremble, purposeless movements, laughter, clapping hands, jumping, dancing about, stamping, chuckle/giggle, smile, muscle around eyes contracted, upper lip raised
Laughter	Tears, deep inspiration, contraction of chest, shaking of body, head nods to and fro, lower jaw quivers up/down, lip corners drawn backward, head thrown backward, shakes, head/face red, muscle around eyes contracted, lip press/bite
Love	Beaming eyes, smiling cheeks (when seeing old friend), touch, gentle smile, protruding lips (in chimps), kissing, nose rubs
Maternal love	Touch, gentle smile, tender eyes
Pride	Head, body erect, look down on others
Romantic love	Breathing hurried, faces flush
Surprise	Eyebrows raised, mouth open, eyes open, lips protruded, expiration, blowing/hissing, open hands high above head, palms toward person with straightened fingers, arms backward
Tender (sympathy)	Tears

broadly than the six or seven states that were of intensive focus in the early literature on facial expression.

In the past 10 years, scientific progress has been made in charting expressive behaviors of a wider array of emotions. Some studies have documented the expressive behaviors that covary with the experience of a specific emotion (see Matsumoto et al., 2008, for a review). Other studies have examined the patterns of behavior individuals emit when given different emotion concepts (e.g., "awe" or "love") and asked to express the emotion using their face, voice, or body. And emotion recognition studies have ascertained whether naïve observers can reliably identify emotions from patterns of expressive behavior.

From evidence generated by these methods, a case can be made for several "new" displays beyond the six traditionally studied. Here we profile a few more specific studies (see Table 27.2, for a synthesis of the literature). To establish whether self-conscious emotions would elicit unique nonverbal displays, Keltner (1995) coded muscle-by-muscle actions of participants who became embarrassed after making a silly face on camera. Careful frame-by-frame analysis uncovered a fleeting but highly

TABLE 27.2. Evidence Related to the Expression of Emotion in Different Modalities

Emotion	Face	Voice	Touch	Music	Dance
Amused	Yes[a,b,d,i]	Yes[y,z,bb]	n/a	n/a	Yes[gg]
Anger	Yes[d,w,x]	Yes[y,aa,bb]	Yes[dd,ee]	Yes[ff]	Yes[gg]
Awe	Yes[a,c,d]	Yes[y]	No	n/a	Yes[gg]
Boredom	Yes[n]	Yes[aa]	n/a	n/a	n/a
Confused	Yes[n,u]	n/a	n/a	n/a	n/a
Contempt	Yes[v,w]	Yes[y,aa]	n/a	n/a	n/a
Content	Yes[d]	Yes[z]	n/a	n/a	Yes[gg]
Coy	Yes[e,f,g]	n/a	n/a	n/a	n/a
Desire	Yes[h,i]	No[y]	n/a	n/a	n/a
Disgust	Yes[d,w,x]	Yes[y,aa,bb]	Yes[dd,ee]	n/a	Yes[gg]
Embarrassed	Yes[d,i,j,k,l]	Yes[y]	No[ee]	n/a	Yes[gg]
Fear	Yes[d,w,x]	Yes[y,aa,bb]	Yes[dd,ee]	Yes[ff]	Yes[gg]
Gratitude	n/a	No[y]	Yes[dd,ee]	n/a	n/a
Happiness	Yes[i,w,x]	Yes[aa]	Yes[dd]	Yes[ff]	n/a
Interested	Yes[i,m,n]	Yes[y]	n/a	n/a	n/a
Love	Yes[d,i]	No[y]	Yes[dd,ee]	Yes[ff]	Yes[gg]
Pain	Yes[o,p,q,r]	Yes[cc]	n/a	n/a	n/a
Pride	Yes[a,i]	No[y]	No[ee]	n/a	n/a
Relief	n/a	Yes[y,z,aa,bb]	n/a	n/a	n/a
Sadness	Yes[d,w,x]	Yes[y,bb]	Yes[dd,ee]	Yes[ff]	Yes[gg]
Shame	Yes[d,i,t]	No[y]	n/a	n/a	Yes[gg]
Surprise	Yes[w,x]	Yes[y,bb,ee]	No[ee]	n/a	n/a
Sympathy	Yes[i]	Yes[y]	Yes[dd,ee]	n/a	n/a
Triumph	n/a	Yes[y]	n/a	n/a	n/a

[a]Shiota, Campos, & Keltner (2003); [b]Keltner & Bonanno (1997); [c]Shiota, Keltner, & Mossman (2007); [d]Hejmadi, Davidson, & Rozin (2000); [e]Reddy (2000); [f]Reddy (2005); [g]Bretherton & Ainsworth (1974); [h]Gonzaga et al. (2006); [i]Keltner & Shiota (2003); [j]Keltner & Buswell (1997); [k]Keltner (1996); [l]Ekman & Rosenberg (1997); [m]Silvia (2008); [n]Reeve (1993); [o]Prkachin (1992); [p]Williams (2002); [q]Grunau & Craig (1987); [r]Botvinick et al. (2005); [s]Tracy & Robins (2004); [t]Tracy & Matsumoto (2008); [u]Rozin & Cohen (2003); [v]Ekman & Friesen (1986); [w]Ekman (1992); [x]Levenson, Ekman, & Friesen (1990); [y]Simon-Thomas et al. (2009); [z]Sauter & Scott (2007); [aa]Schröder (2003); [bb]Sauter, Eisner, Ekman, et al. (2010); [cc]Dubois, Bringuier, Capdevilla, et al. (2008); [dd]Hertenstein et al. (2009); [ee]Hertenstein et al. (2006); [ff]Juslin & Laukka (2003); [gg]Hejmadi et al. (2000); [hh]Piff et al., (2012).

coordinated 2- to 3-second display, which involved gaze aversion, controlled smiles, and partial face covering with one hand (Edelmann & Hampson 1979; Harris, 2001).

Other experiments sought to analyze self-conscious displays that accompany gaining or losing status (Tracy & Robins, 2004, 2007; Tracy & Matsumoto, 2008). Tracy and Robins (2004, 2007) documented expansive postures coincident with the emotion of pride, as well as head movements up and back, and expansive arm thrusts upward, or outward in an akimbo position with hands on hips. This expansive display, reliably recognized as pride by children and adults (Tracy, Robins, & Lagattuta, 2005), is the direct opposite of the shame display, which involves head tilt downward, eye gaze downward, and posture turned inward (Keltner, 1995; Haidt & Keltner, 1999; Izard, 1971; Tracy & Matsumoto, 2008). Images of both pride and shame displays were reliably recognized in both industrialized cultures and remote small-scale societies in Burkina Faso and Fiji (Tracy & Robins, 2008; Tracy, Shariff, Zhao, & Henrich, 2013). These expressions of pride and shame are also reliably displayed in response to success and failure, respectively, by children and adults (Lewis, Alessandri, & Sullivan, 1992).

Conceptual analyses of attachment processes emphasize distinctions among love, desire, and compassion or sympathy that enable specific attachments to reproductive partners and offspring (Bowlby, 1969). Guided by these claims, studies have found that when feeling romantic love, individuals show coordinated sequences of genuine smiling, mutual gaze, affiliative hand gestures, open posture, and leaning forward (Gonzaga, Keltner, Londahl, & Smith, 2001), a pattern of behavior found to covary with oxytocin release (Gonzaga, Turner, Keltner, Campos, & Altemus, 2006), and to occur when people are given the term "love" and asked to express or embody it in nonverbal behavior (e.g., Campos, Shiota, Keltner, Gonzaga, & Geotz, 2013). By contrast, individuals' reports of desire correlate with a different pattern of behavior that includes lip licks, bites, and puckering. Reactions to the suffering of others and experiences of sympathy are correlated with oblique eyebrows, concerned gaze, and approach behaviors such as forward leans (Eisenberg et al., 1989; Goetz, Keltner, & Simon-Thomas, 2010).

Still other studies have identified facial displays of awe (Campos et al., 2013), coyness (Reddy, 2000), pain (Prkachin, 1992; Grunau & Craig, 1987; Botvinick et al., 2005), and amusement (Ruch & Ekman, 2001). Different smiles accompany different positive states (Sauter et al., 2014). For example, in one recent study participants were given descriptions of eight different positive emotions—amusement, awe, interest, joy, love, pride, gratitude, and contentment—and asked to express these emotions nonverbally (Campos et al., 2013). Coding of these patterns of behaviors with Ekman and Friesen's (1978) Facial Action Coding System (FACS) found distinctions in the displays of all these emotions except gratitude, and several of the expressive behaviors observed in this paradigm replicated those observed in other investigations (see also Mortillaro, Mehu, & Scherer, 2011; Sauter, 2010).

Building upon studies of emotional prosody (Nelson & Russell, 2011a; Banse & Scherer, 1996), a similar broadening of the range of states shown to have signals has emerged in the study of emotion-related vocalization (Sauter & Scott, 2007; Sauter, Eisner, Calder & Scott 2010; Simon-Thomas, Keltner, Sauter, Sinicropi-Yao, & Abramson, 2009). In one illustrative study, participants read descriptions of 22 different emotions, and then produced "vocal bursts"—sighs, growls, grunts, and laughs—to convey each emotion (Simon-Thomas et al., 2009). Naïve observers could reliably identify several understudied emotional states, including awe, interest, relief, sensory pleasure, enthusiasm, sympathy, triumph, and contempt, from these vocal bursts. Other studies have documented similarly high rates of identification of emotion vocal bursts conveying triumph, amusement, contentment, sensory pleasure, and relief (Sauter & Scott, 2007).

Sauter, Eisner, Ekman, and Scott (2010) performed a two-way cross-cultural vocalization experiment with U.K. participants and members of the Himba, a culturally isolated group in Namibia. The vocal bursts collected from both cultures were decoded bidirectionally with above-chance accuracy ratings for anger, disgust, fear, sadness, and surprise. In addition, vocalizations of amusement were recognized across cultures, and relief expressions were similar, although not bidirectionally recognized. These findings have recently been replicated and extended by Laukka and colleagues (2013), who recorded emotional vocalizations of 18 emotions from actors in India, Kenya, Singapore, and the United States. Swedish participants performed well in identifying emotions that had been well recognized in Sauter, Eisner, Ekman, et al.'s (2010) study, and also could identify interest, lust, relief, and serenity from brief vocal bursts (but see Gendron, Roberson, van der Vyver, & Barrett, 2014; Gendron, Roberson, & Barrett, 2015).

Synthesizing these new studies, in Table 27.2 we present the states that can be signaled with reliable patterns of behavior, at least in one modality. It is clear the field is moving beyond the original six or seven emotions so sharply in focus in early studies of expression to a much broader landscape of emotion, one that likely includes over 10 signals each of positive and negative emotion.

Beyond the Face and Voice: Toward a Science of Multiple Modalities of Emotional Expression

Emotional expression is a multimodal phenomenon. Darwin (1872/1998) himself referred to facial muscle movements and vocalizations, but also autonomic responses (the blush, pupil activity), movements of the arms and hands (clapping), shifts in posture, head movements, gestures, respiration, and full-body actions like jumping and dancing about. Darwin's emphasis on dynamic behavior is also of note. With a few notable exceptions (see Krumhuber, Kappas, & Manstead, 2013; Nelson & Russell, 2011a, 2011b, for a review) though, the literature on facial expression has focused on static photos. Yet a great deal of information is likely contained in dynamic movement.

For the most part, however, the empirical literature on expression has removed the body from systematic inquiry (but see Atkinson, Dittrich, Gemmell, & Young, 2004; Kret, Pichon, Grèzes, & De Gelder, 2011, for exceptions) and focused narrowly on facial muscle movements or vocalizations. Attention to emotions like pride and embarrassment has necessitated the study of head, gaze, and bodily movements (Keltner, 1995; Tracy & Robins, 2004, 2007). There are select studies of other channels of nonverbal behavior, such as how emotions are communicated in patterns of posture (Dael, Mortillaro, & Scherer, 2012; Gross, Crane, & Fredrickson, 2010) and gaze (Graham & LaBar, 2007; Lobmaier, Tiddeman, & Perret, 2008; Sander, Grandjean, Kaiser, Wehrle, & Scherer, 2007). Clearly, Darwin's (1872/1998) more comprehensive analysis suggests that there should be signal value in how emotions are communicated in a vast array of communicative behaviors, from simple movements of the hands to shifts in body posture to head movements. Relatively little is known about these intriguing possibilities.

Several recent studies have begun to capture how people convey emotion in tactile contact (Hertenstein & Weiss, 2011). Studying touch poses methodological challenges. Touch is dyadic, involves multiple regions of the body, and has many dimensions, including pressure, duration, location, and intensity. Touch does not lend itself to portrayals in classes of stimuli that can be used in typical emotion recognition paradigms. Notwithstanding these methodological issues, progress is being made in understanding which emotions have tactile signals.

Hertenstein and colleagues (Hertenstein, Keltner, App, Bulleit, & Jaskolka, 2006; Hertenstein, Holmes, McCullough, & Keltner, 2009) have begun to ascertain which emotions can be conveyed by touch. In a first study, an encoder (the person charged with touching another person to convey emotion) and decoder (the person being touched) sat at a table, separated by an opaque black curtain, which prevented communication other than touch. The encoder was given a list of emotions and asked to make contact with the decoder on the arm to communicate each emotion, using any form of touch. The decoder could not see any part of the touch because his or her arm was positioned on the encoder's side of the curtain. After each touch, the decoder selected from 13 response options the term that best described what the person was communicating. In this study, participants could reliably communicate anger, disgust, and fear with a brief 1- or 2-second touch of another's forearm, as well as love, gratitude, and sympathy (see also Piff, Purcell, Gruber, Hertenstein, & Keltner, 2012, for replication). Emotions like embarrassment, awe, and sadness were not reliably communicated via touch. In other research, people prove to be better able to communicate emotion through touch when allowed to touch other regions of the body than the arm (Hertenstein et al., 2009), and there is cross-cultural similarity in which emotions can be conveyed in tactile contact (see Hertenstein et al., 2009).

There are also emerging literatures on potential autonomic signals of emotion. The blush arises during experiences of embarrassment (Shearn, Bergman, Hill, Abel, & Hinds, 1992) and has clear social signal value. The chills, or goosebumps, refer to the sympathetically mediated contraction of the muscle surrounding the hair follicles, and arise during the appreciation of music and art (e.g., Grewe, Kopiez, & Altenmüller, 2009). In nonhuman species, this action, piloerection, is thought to signal threat behavior toward conspecifics. Recent work by Maruskin and colleagues (Maruskin, Thrash, & Elliot, 2012) has mapped the emotional correlates of two kinds of chills, which they posit have different evolutionary origins in mammalian behavior. One variant of chills, goosebumps, co-

varies with experiences of awe (see also Campos et al., 2013). Another kind of chills response, shivers, involves more pervasive muscle contractions like those observed during experiences of cold, and covaries with social disgust and fear.

Alongside the blush and the chills, another autonomic response with almost certain signal value is a tearing response. Studies of tears—a chemosignal response—have recently examined the chemical content of tears and their effects, when displayed by women, upon males' sexual response (Gelstein et al., 2011). It will be interesting to determine whether the addition of tears to different facial expressions (e.g., to facial muscle configurations of sadness or laughter or pain) changes the inferences drawn from the expression (e.g., Provine, Krosnowski, & Brocato, 2009).

As scientists have begun to understand more richly how bodily responses express emotion, they also have turned with more focus to the artistic expression of emotion. The voice and music share many emotionally expressive properties (i.e., tempo, loudness, and timbre) that account, in part, for how instruments can resemble the human voice (Gabrielsson & Juslin, 2003; Juslin & Laukka, 2003). In an analysis of the cues that people use to infer emotion from speech prosody and music, Juslin and Laukka (2003) found that people vary their tempo, loudness, and pitch in similar ways to communicate emotion (see also Zentner, Grandjean, & Scherer, 2008). And scientific studies find that listeners can reliably discern distinct emotions from different musical performances. In music–emotion recognition studies, performers sing a brief melody with no words and attempt to communicate anger, fear, happiness, sadness, joy, and on occasion, tenderness or love. The listener is then asked to choose the word from a list of words that best matches the emotion conveyed in the musical performance. Across over a dozen studies of this kind, listeners on average achieved accuracy rates of about 70% (Gabrielsson & Juslin, 2003; Juslin & Laukka, 2003). Recent evidence suggests that at least a few basic emotions may be universal to the perception of music in radically different cultures (Fritz et al., 2009).

What about emotional expression in other art forms? One recent study ascertained whether Western observers could reliably identify the emotion conveyed in traditional Hindu dance (Hejmadi, Davidson, & Rozin, 2000). In the Hindu Indian *Natya Shastra*, from around the second-century B.C.E. (Bharata Muni, 200 B.C.E.), specific writings detail how actors and dancers are to express emotions in movements in the face, body, and with hand gestures. Hejmadi and colleagues presented participants in India and the United States with videotapes of Hejmadi's own renditions of anger, disgust, fear, heroism, humor, love, peace, sadness, embarrassment/shyness/modesty, and wonder (Hejmadi performed as a dancer in India for 20 years). Based on video clips only lasting between 4 and 10 seconds, observers achieved accuracy rates between 61 and 69% in judging the 10 emotions communicated through dance and gesture.

These growing literatures on emotional expression in art bring into focus an important theme: that emotional expression is not limited to how humans signal internal states with the communicative systems shaped by evolution and culture. Emotional expression is part of all forms of art and other creative acts. And emotions are likely to be expressed in other sensory modalities, including through scent (Delplanque et al., 2012), color (Palmer, Schloss, Xu, & Prado-León, 2013), and natural scenes (e.g., Zhang, Piff, Iyer, Koleva, & Keltner, 2014). These new areas of inquiry raise the deeper question of how emotions are expressed in cultural artifacts like painting, sculpture, dance, music, poems, and architectural design—a question we believe is ready for synthetic theorizing.

Table 27.2 represents the current state of knowledge with respect to which emotions can be signaled in the five modalities of expression with substantive literatures: face/body, voice, touch, music, and dance. "Yes" in the columns signify that either in production or perception evidence, the emotion was found to have a distinct display.

The study of emotional expression has broadened in the past 10 years. Signals for at least 24 states have been identified. New modalities and the temporal dynamics of expression are increasingly considered. The promise of new areas of inquiry that are likely to yield new empirical insights is great. For example, there is good evidence for the association between subjective experience and emotion-related behaviors for "basic" emotions like anger, fear, disgust, or happiness (see Lench, Flores, & Bench, 2011, for a meta-analysis). This sort of evidence is needed for more recently investigated emotion displays.

A continued focus on the mammalian parallels of these "new" expressions will yield intriguing insights into the functional origins of these displays (Shariff & Tracy, 2011). As one example, shivering and piloerection are common responses in mammals; their study is germane to understanding the

origins of human goosebumps and emotions like awe.

As the study of these new signals progresses, we foresee several important issues on the horizon. A first is to study emotional expression across multiple modalities (e.g., Aviezer, Trope, & Todorov, 2012; Campos, Campos, & Barrett, 1989). That science will likely reveal the relative contribution of different modalities to the experience and signal value of distinct emotional displays (e.g., see App, McIntosh, Reed, & Hertenstein, 2011; Flack, 2006; Scherer & Ellgring, 2007). Table 27.2 hints at the possibility that certain emotions may be robustly signaled across modalities (e.g., anger), whereas others may privilege select modalities of expression (e.g., embarrassment, awe). For example, sympathy, or compassion, is reliably signaled in touch and the voice, but less so, in the face (Goetz et al., 2010). Studies of multimodal expressions will bear upon debates about the degree to which emotions are expressed in patterns of behavior (Barrett, 2011; Russell, 1994). Cross-modal integration of expressive stimuli has a long history of producing additive effects in emotion recognition accuracy (Vroomen, Driver, & de Gelder, 2001; Paulmann & Pell, 2011). The distinct possibility is that as studies examine multimodal expressions of emotion—involving face, voice, body, tactile contact, and gesture—those signals may prove to be more recognizable than static photographs of facial expressions or snippets of vocalizations.

It will be important to explore universals and cultural variations in these expressions (e.g., Russell, 1994; Nelson & Russell, 2013). There is already evidence suggesting that the Japanese privilege the voice in inferring intention and emotion (Tanaka et al., 2010). This raises the question that some cultures may privilege the face in inferring emotion, some the voice, some touch, and some bodily responses—all intriguing possibilities awaiting empirical inquiry.

It will also be important to continue the study of remote peoples. In work attempting to differentiate beyond the basic six emotions, there is a dearth of research on culturally isolated groups. Basing our knowledge on findings from participants from a culturally narrow range of groups limits the inferences that can be drawn from such findings (Henrich, Heine, & Norenzayan, 2010). The influence of cultural input emerges early: Recent work has documented the impact of cross-cultural differences in parenting behaviors on the development of emotional expression beyond the commonly studied emotional states (Wormann, Holodyski, Kartner, & Keller, 2014). The limited available evidence suggests that the role of culture-specific social learning is likely highly variable across emotions (Sauter, Einser, Ekman, et al., 2010).

Critically, it will be important to extend this research further to special samples of individuals with reduced cultural input, such as people who lack vision. In one example of this approach, Tracy and Matsumoto (2008) coded the pride and shame displays of sighted and blind—including congenitally blind—athletes from 37 different countries at the 2004 Olympic Games judo competition. Both sighted and blind winners showed expansive posture, smiles, head up, and arms in the air; sighted and blind losers showed slouched posture, shoulders slumped, and chest caved in. Interestingly, the tendency to display pride in response to success was found in all cultural groups examined. Shame displays, by contrast, were reliably shown in response to failure by individuals from all cultural groups except those that were particularly high in individualism and self-expression values—that is, North American and Western European cultures.

Finally, the work we have reviewed points to several states that do not figure in the classification schemes of theorists influential in the development of the science of emotion (see Keltner & Lerner, 2010, for synthesis). As the list of emotional displays expands, it will be important to consider how some states and their accompanying displays may fall within the same overarching emotion category (see Scarantino, 2012, for a discussion). For example, recent evidence points to distinct displays for fear and anxiety (Perkins, Inchley-Mort, Pickering, Corr, & Burgess, 2012). Other research, however, suggests that two variants of pride—labeled "authentic" and "hubristic"—share the same nonverbal display, and thus must be distinguished from contextual information (Tracy & Robins, 2007; Tracy & Prehn, 2012). However, as research on other modalities continues, perhaps these distinct forms of pride will be linked to distinct vocal, or even musical, displays.

Emotional Expression and the Coordination of Social Interaction

Based on his years of intensive observation of preindustrial people, Irenäus Eibl-Eibesfeldt (1989) posited that emotional expressions are like a grammar of social interaction. Facial expressions,

vocalizations, patterns of bodily movement, gaze, gestures, and touch bind people into dyadic and group-based interactions—the soothing of a distressed child, the flirtation between potential suitors, sexual interaction, the play of young siblings, the aggressive encounters of rivals, or status conflicts in groups.

A corollary to this analysis is that emotional expressions trigger systematic inferences and behavioral responses in others. This thinking requires that we shift a level of analysis, and look at individuals' expressions of emotion at the dyadic or even group level (Tiedens & Leach, 2004), as has been done in the study of emotional mimicry (Hess & Fischer, 2013).

Consider the recent theorizing of Paula Niedenthal, Ursula Hess, and their colleagues concerning how different smiles evoke different inferences and responses in others (Niedenthal, Mermillod, Maringer, & Hess, 2010). Within 500 milliseconds, this theorizing posits, a warm smile of enjoyment triggers neural processes that lead the perceiver to seek more information about the smiler through eye contact, which in turn evokes feelings of pleasure, mimetic behavior, and the experience of positive emotion and approach behavior. A proud, dominant smile, by contrast, triggers the same automatic search for information about the smiler, along with neural activation that leads to a sense of threat and avoidant behavior.

Or consider a recent study of touch among members of professional basketball teams (Kraus, Huang, & Keltner, 2010). Drawing upon the new science of emotional touch, these researchers coded all observed touches in an entire game of each team in the National Basketball Association at the start of the 2008 season. Over 25 kinds of celebratory and encouraging touch were coded: high-fives, fist bumps, chest bumps, arm embraces, bear hugs, and the like. On average, each player touched his teammates for about 2 seconds during each game. The more a team's players touched each other at the beginning of the season, the better the team played at the end of the season, according to sophisticated basketball statistics, even when controlling for whether or not the team was winning, their preseason expectations, and how much money they were making.

So how do emotional expressions coordinate social interactions? Three ideas have emerged (Keltner & Kring, 1998; van Kleef, 2009). A first is that emotional expressions rapidly provide important information relevant to perceivers, useful in guiding subsequent behavior. For example, emotional expressions signal more trait-like tendencies of individuals, including the tendency to be dominant (Knutson, 1996), to be of upstanding character (Feinberg, Willer, & Keltner, 2012), and the degree of strength within a negotiation (van Kleef, De Dreu, Pietroni, & Manstead, 2006). Pride displays promote automatic, cross-cultural judgments of high status in the displayer—judgments that are strong enough to counter contextual information indicating that the displayer in fact merits low status (Shariff & Tracy, 2009; Tracy et al., 2013).

Emotional expressions also signal the trustworthiness of the sender. For example, Krumhuber and colleagues (2013) have found that people trust interaction partners more, and will give more resources to those partners who display authentic smiles (which have longer onset and offset times) than fake smiles, which have shorter onset and offset (Krumhuber et al., 2013). Social perceivers infer trustworthy intentions from people who spontaneously display intense embarrassment, and are more likely to cooperate with individuals who express embarrassment than other emotions (Feinberg et al., 2012). Pride displays direct social learning by providing information to others; individuals motivated to attain the correct answer to a difficult trivia question were found to selectively copy the answer provided by others showing pride, suggesting that pride displays communicate expertise or knowledge (Martens & Tracy, 2013).

Emotional expressions convey information about the environment, allowing individuals to coordinate their responses to outside opportunities or threats (e.g., Klinnert, Emde, Butterfield, & Campos, 1986). For example, parents use touch and voice to signal to their young children whether other people and objects in the environment are safe or dangerous (Hertenstein & Campos, 2004), using vocal cues that are consistent across cultures (Bryant & Barrett, 2007).

Emotional displays coordinate social interactions in a second way, by evoking specific responses in social perceivers. Early studies in this tradition found that some emotional expressions trigger complementary emotions in social perceivers: facial displays of anger enhance fear conditioning in observers, even when the facial displays are not consciously perceived (Ohman & Dimberg, 1978); expressions of distress can evoke sympathy in observers (e.g., Eisenberg et al., 1989); and displays of dominance trigger more submissive expressive behavior (Tiedens & Fragale, 2003). More recently, van Dijk and colleagues (van Dijk, de Jong, & Pe-

ters, 2009) have documented that social observers respond with more positive emotion to individuals who blushed after they made mistakes than if they showed other display behavior.

Finally, emotional expressions structure social interactions by serving as incentives for others' actions, by rewarding specific patterns of behavior in perceivers. Early studies on this notion focused on how parents use warm smiles and touches to increase the likelihood of certain behaviors in their children (e.g., Tronick, 1989) and the incentive value of laughter, and how it triggers cooperative interactions between friends (Owren & Bachorowski, 2001).

This analysis of the rewarding properties of emotional expression likewise sheds light on some of the direct effects of emotional touch upon recipients of touch. Gentle, pleasing touch triggers activation in the orbitofrontal cortex, a brain region involved in the representation of secondary rewards (Rolls, 2000). Given the rewarding quality of being touched, it has been claimed that touch motivates sharing behavior in others' altruism (De Waal, 1996). This may help explain why a warm touch increases compliance to requests (Willis & Hamm, 1980) and cooperation toward strangers in economic games (Kurzban, 2001).

Clearly, these studies on how expressions coordinate social interactions are in their infancy. Many of these studies have focused on the face; it will be important to extend this line of reasoning to studies of the voice, touch, body movement, gaze, and other modalities. This work has focused on a more limited set of emotional displays: smiles, anger displays, disgust expressions, and fear expressions. It will be important to examine how less-studied expressions of emotion—for example, of interest (in the voice), gratitude (in touch), sympathy (in the voice or touch), or awe (in the voice)—coordinate social interactions.

Studies of the social functions of emotional expressions have set the stage for new theorizing. One recent line of argument has outlined how emotional expressions evolved to serve these informative, evocative, and incentive-signaling functions, perhaps in the "second stage" of their evolution (see Shariff & Tracy, 2011). This account dates back to Darwin (1872/1998), and argues that internal physiological regulation was likely the original adaptive function of emotion expressions, which later evolved to serve communicative functions (e.g., Chapman, Kim, Susskind, & Anderson, 2009; Eibl-Eibsfeldt, 1989; Ekman, 1992; Shariff & Tracy, 2011).

To take the classic example of fear, the facial muscle movements that constitute a fear expression likely originally emerged as part of a functional response to threatening stimuli; widened eyes increase the scope of one's visual field and the speed of eye movements, allowing expressers to better identify (potentially threatening) objects in their periphery (Susskind et al., 2008). In contrast, the "scrunched" nose and mouth of the disgust expression results in constriction of these orifices, thereby reducing air intake (Susskind et al., 2008; Chapman et al., 2009). Given that disgust functions to alert expressers of the potentially noxious nature of the eliciting stimulus, and thereby disincline them from ingesting it (Rozin, Lowery, & Ebert, 1994), the reduced inhalation of airborne chemicals can well be considered part of the same adaptive response. In more recent work, these authors have shown that the opposing eye movements involved in fear and disgust expressions (i.e., widening vs. narrowing) function to increase visual sensitivity (localizing an object) and acuity (determining what the object is), respectively—further supporting the argument that these two expressions initially evolved to serve opposing yet equally important functions for the expresser.

However, these original physiological benefits experienced by the expressers eventually became transformed into communicative signals, which benefit both expressers and observers in terms of the more efficient and coordinated interactions. Over time, the facial and bodily behavioral components of certain emotions came to signal those emotional states to observers, through processes of ritualization, wherein mammalian nonverbal displays become exaggerated, more visible, distinctive and/or prototypic, and ultimately, more recognizable.

Beyond these theoretical implications, this new emphasis on how expressions coordinate social interactions has inspired studies of how the abilities to express and detect emotions predict positive social outcomes. For example, the ability to read emotions effectively predicts positive negotiation outcomes (Elfenbein, Der Foo, White, Tan, & Aik, 2007). The extent to which a person's felt positive emotion is expressed in positive social behaviors predicts better social connections and reduced symptoms of depression (Mauss et al., 2011). These two skills—to express emotions clearly and read others' emotions effectively—are correlated (see Elfenbein & Eisenkraft, 2010, for a meta-analysis) and central to conceptualizations of emotional intelligence, which consistently pre-

dicts increased social adjustment (see Brackett et al., 2013; Mayer, Salovey, Caruso, & Sitarenios, 2003, for a review).

Beyond Single-Word Emotion Recognition Paradigms: Context and Inference in Emotion Perception

The first wave of science on emotional expression—in particular, that on the face—involved emotion recognition studies that most typically entailed that participants match an emotion term from a list of options to a specific expression (see Elfenbein & Ambady, 2002). A meta-analysis of 182 independent samples examining judgments of emotion in the face and other nonverbal stimuli yielded an average accuracy rate of 58.0% (a notably large effect size), after correction for chance guessing (Elfenbein & Ambady, 2002). With respect to vocal expressions of emotion, in a review of over 60 studies largely using single-word emotion recognition paradigms, Juslin and Laukka (2003) concluded that listeners can judge five different emotions in the voice—anger, fear, happiness, sadness, and tenderness—with accuracy rates that approach 70% (see also Scherer, Johnstone, & Klasmeyer, 2003). There is continued debate about the meaning of these levels of accuracy, and the degree of universality they imply (Barrett, 2011; Russell, 1994).

Of course, emotion perception involves more than labeling expressive behaviors with single words, and the study of emotion perception has advanced in two new directions. A first is to begin to systematically examine the inferential processes by which individuals interpret expressive behavior. When people encounter expressive behavior in another person, or target, the inferential processes they likely engage in involve more than the ascription of single-word labels; they almost certainly make inferences about the target's desires and intentions, trait-like tendencies, strategic motivations, and surrounding context. This common-sense analysis begs two questions: What other sorts of inferences do people make in interpreting expressive behavior? and How do perceivers arrive at attributions of emotions to targets?

In work on this latter question, Scherer and colleagues propose that perceivers first infer specific appraisals upon observing expressive behavior (Scherer & Grandjean, 2008)—that is, if a person sees another person express anger in the face, or interest in the voice, or sympathy in a pattern of postural movement and tactile contact, the social perceiver first infers a pattern of appraisals that would lead the individual to express emotion as he or she has done. And from these inferred appraisals, the social perceiver would then infer the experience of specific emotions. Seeing someone express anger might lead to initial inferences that the person has been treated in an unpleasant, unfair, intentional, and immoral fashion, which in turn would increase the likelihood of attributing anger to the target. It may be that the first inferences perceivers draw on seeing others' expressive behavior is a pattern of appraisals, rather than distinct emotions, a notion in need of systematic study, and one that could shed light on cultural variations in attributions of emotion to individuals' expressive behavior (Fontaine, Scherer, & Soriano, 2013).

Another area of growth in the study of emotion perception is in the understanding of how the context influences how people perceive emotional expression (Barrett et al., 2011). How do emotional expressions vary in their meaning from one context to another? A pattern of touch will vary in the inferences it evokes depending on whether the people are friends or strangers, at work, or on a date. A laugh can be perceived as an expression of affection or sarcastic critique depending on the context. A blush could be read as a sign of self-conscious inhibition or flirtatious interest, again depending on the context.

In their constructivist account of emotion perception, Barrett and colleagues (2011) offer a theoretical synthesis for how to approach contextual variations in the meaning social perceivers derive in perceiving emotional expressions, highlighting three kinds of context. A first is called stimulus context, which refers to the surrounding stimulus features that accompany the expressive behavior. Most of the work on emotional expression has isolated specific display behaviors in the face or voice, largely for purposes of experimental control. But expressions of emotion in the real world most typically occur in multimodal patterns of behavior: A facial expression, or vocalization, is accompanied by other behaviors (gestures, bodily movements, intentional actions unrelated to emotion, gaze—static features of appearance—physical size, beauty, and even patterns of dress). These behaviors that accompany an expression of emotion are likely to shape the interpretation of the focal expression in interesting ways; something for which the field is turning its attention to.

In one line of work inspired by this analysis, studies are finding that the accuracy in labeling

facial expressions of emotion varies according to other physical actions of the individual expressing emotion (see Barrett et al., 2011, for a review). When observers are given more than a decontextualized static facial expression to judge, they tend to take into account the surrounding contextual information in making their judgment. For example, Aviezer and colleagues (2008) presented a classic facial expression of disgust in one of four stimulus contexts, in which the person expressing disgust was engaged in different actions. Participants labeled the expression as disgust 91% of the time when the individual was holding a soiled article of clothing, 59% of the time when the person displayed fearful hand and arm movements, 33% of the time when the same person was clasping his or her hands sadly to the chest, and 11% of the time when the person was poised with fist clenched to punch.

A second kind of context highlighted is perceptual context. Perceptual context refers to the mental states within the perceiver's mind that shape his or her inferences upon observing expressive behavior. A person's current goals, intentions, values, emotions, physical state, and the like give rise to context-specific interpretations of social stimuli, and one would imagine, expressive behavior. Little is known about how a person's goals, current state, or values and ideals shape the perception of expressive behavior, although that is starting to change thanks to Barrett et al.'s (2011) constructivist theorizing. For example, recent studies find that the likelihood that participants will label a disgust expression (nose scrunch) rises when an anger expression precedes the presentation of the disgust expression, but drops when no anger expression precedes the target disgust expression (Pochedly, Widen, & Russell, 2012). The clear implication is that the perceiver's judgments of emotional expressions will be shaped by his or her encounters with stimuli that precede his or her judgments of the expressive behavior.

In another series of studies on perceptual context, Lindquist and colleagues induced participants into a state of what is known as semantic satiation by having them repeat an emotion word (e.g., "sadness") 30 times (Lindquist, Barrett, Bliss-Moreau, & Russell, 2006). This repetitive process makes specific emotion words less accessible, and less likely to be used in interpreting emotionally expressive behavior. Indeed, this semantic satiation slowed participants' identification of anger, disgust, sadness, surprise, and happiness, but did not influence their levels of accuracy.

A third kind of context is culture. In early studies in this tradition, researchers documented cultural differences in the accuracy of emotion perception (e.g., Russell, 1994) and cultural variations in attributed intensity to emotional displays (Biehl et al., 1997). More recently, studies have begun to explore cultural variations in the more complex inferences that perceivers make in perceiving expressions of emotion. For example, when compared with members of East Asian cultures, Americans indicate that the external display of emotion is more intense than the inner experience, consistent with the emphasis in the United States on expressing one's feelings (see also Matsumoto, Olide, & Willingham, 2009).

Still other findings suggest that cultures vary in their attention to the surrounding context of an expression. In one paradigmatic experiment, Masuda and colleagues showed Japanese and American participants cartoon figures with various expressions on their faces (Masuda, Ellsworth, Mesquita, Leu, & van de Veerdonk, 2004). The central, target face was always surrounded by smaller, less salient faces, with expressions that were dissimilar to those of the target. Japanese participants' judgments about the central target's facial expression were more influenced by the surrounding faces than were judgments made by Americans. In a similar vein, Kraus and colleagues (Kraus, Côté, & Keltner, 2010) have found that lower-class individuals—more oriented to the social context than upper-class individuals—also incorporate contextual information into their judgments of expressive behavior.

This new focus on the complex interpretations placed upon emotional expression represents one of the exciting areas for further inquiry. The general promise is to begin to understand the meaning attributed to expressive behavior beyond labels or relatively scripted stories, and to understanding systematically how interpretations of expressive behavior are similar across individuals, cultures, and contexts, and how they vary in their meaning.

Conclusions

Our review has focused on four emergent themes in the study of emotional expression. We have seen impressive advances in the study of new states that had only received scant attention in the past. The field is moving beyond the face and voice, to study other signaling modalities. We are learning how a pattern of emotionally expressive behavior

might change from one context to the next. And the field is revealing how emotional expressions shape social interactions of all kinds. Throughout the review, we have highlighted promising lines of future inquiry represented by these four new developments and how they interact.

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