



A taxonomy of positive emotions

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Within social functionalist theory (SFT), emotions structure attachment relations, cooperative alliances, hierarchies, and collectives. Within this line of thinking, a rich array of positive emotions enable the formation and negotiation of these relationships. Guided by these arguments, we synthesize how top-down confirmatory studies and data-driven, computational studies converge on evidence for 11 positive emotions with distinct experience, expression, and physiology. This taxonomy includes amusement, awe, compassion, contentment, desire, love, joy, interest, pride, relief, and triumph. We conclude by considering how recent taxonomic efforts will advance emotion science in mapping the distinct forms and functions of the positive emotions.

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A first 30 years of emotion science focused on the ‘Basic 6’ taxonomy: anger, disgust, fear, sadness, surprise, and one positive state, labeled happiness or joy. Robust literatures have mapped emotion-related antecedents, appraisals, peripheral physiology, facial and vocal display, and neural patterning of the ‘Basic 6’ taxonomy [1–4].

Clearly, there is more to positive emotions — experiences that feel more good than bad and that orient the individual to approaching rewards — than ‘joy.’ A next wave of emotion science, most notably the influential broaden and build account, offered arguments for broad distinctions between negative and positive emotions, and what emotions like ‘amusement’, ‘awe’, and ‘triumph’ have in common [5–8].

Social functional theory concerns itself with distinctions between positive emotions [8–10]. In this article we

review empirical efforts that converge upon a taxonomy of positive emotions.

Beyond fight or flight: a social functional approach to positive emotions

The scientific focus on the ‘Basic 6’ was grounded in a ‘fight or flight bias’ early in the field. Emotions enable humans to flee peril, fight rivals, and avoid toxins. Activation in the amygdala, the HPA axis, and the sympathetic autonomic nervous system supports fight-or-flight related actions. Emotions enable individuals to meet threats to individual survival.

Beginning in the 1980s, the theoretical landscape shifted to more social considerations. Humans are an ‘ultrasocial’ species who accomplish everything of significance—from the raising of vulnerable offspring to the procurement of food—in relationships. Analysis would shift from the individual as the unit of analysis to relationships, groups, and culture as dynamic forces in human evolution [11,12]. These developments raised questions. What is the role of emotions in caregiving relations, friendships, or social hierarchies? How do emotions enable cooperation? What collective emotions arise in religion, or music, or ritual?

Social functional theory, or SFT, emerged in response to these kinds of questions [9,13–15]. Grounded in broader functional arguments about the emotions (e.g. [16]), SFT posits that emotions shift behavior, thought, and feeling to enable attachments between parents and offspring, romantic bonds, friendships, status hierarchies, and social collectives. Emotional expression is not only a manifestation of subjective feeling; it coordinates dyadic and collective interactions [17,18]. Emotional experience frames social-moral judgments about harm, risk, trust, fairness, and status [19,20]. New branches of the autonomic nervous system gained attention, like the chills, blush, and vagal tone, alongside oxytocin, the opioids, and dopamine as neurophysiological substrates of social tendencies like affiliation and empathy [8,21–23].

The empirical literatures on positive emotions are significant but scattered. Two empirical approaches converge on a taxonomy of positive emotions that provide a framework for these findings.

A tale of two methods: converging evidence for a taxonomy of positive emotions

Often emotion science proceeds in top-down, confirmatory fashion, comparing emotion constructs derived from theory or intuition — for example, ‘anger’ or ‘awe’—with closely related emotions — for example, ‘disgust’ or

'interest.' Grounded in SFT and arguments that distinct emotions are differentiated by their experience, expression, and physiology [24,25], advances have been made in the top-down mapping of many positive emotions. Relevant studies have characterized the experience, expression, and physiology of attachment-related emotions, in particular love, sexual desire, and sympathy [26–29]. Studies have examined pride and triumph and their relationship to signaling status and group strength [30,31]. A turn to the collective emotions has led to explorations of ecstasy and awe in religion, ceremony, music, and dance [32,33].

Our review yields a preliminary taxonomy of 11 positive emotions: amusement, awe, compassion, contentment, desire, interest, joy, love, pride, relief, and triumph (on expressive behavior, see Refs. [34,35]); for summary of neurophysiology, see Refs. [8,36], for summary of autonomic patterning, see Ref. [2]; for summary of mammalian homologies, see Ref. [36]). This review converges significantly with Shiota *et al.* synthesis, which focused on phylogenetic evolution and neurotransmitter function [8], and a taxonomy offered by Weidman and Tracy from their study of the structure of experience [37].

Taxonomies point to new discoveries in the study of emotion-related experience, expression, and physiology. In studies of relived emotion, self-reports of emotional experience include at least nine distinct positive states [37]. In a fine-grained coding of the facial and postural movements of participants from 5 cultures expressing 22 emotions, distinct profiles were observed for amusement, awe, compassion, contentment, desire, interest, love, pride, relief, and triumph, and on average 50% overlap in the expressive movements of people from five cultures ([38]; see also Ref. [39]). More comprehensive studies of the neurophysiology of positive emotions will advance the field.

This more top-down, confirmatory approach is limited in important ways. It is guided by scientists' *a priori* assumptions about what are the emotions. Within any study the focus is typically on a subset of emotions, which introduces problems in estimating variance, thus undermining inferences to be drawn. The stimuli in recognition studies are often photographs of posed, prototypical facial expressions. Often studies focus on a narrow range of emotion elicitors, pure in the emotions they evoke.

Responsive to these concerns, a computational approach relies on participants' own interpretations of vast arrays of stimuli, be it emotion-eliciting films or music or interpretations of facial, vocal, or artistic expression [36]. Experiences are rated and stimuli are judged on a wide array of emotion terms and appraisal dimensions and components [40]. The stimuli within recognition studies

include spontaneous facial, vocal, and full bodied expressions captured in social interactions outside of the laboratory, for example at weddings or sporting events [41]. New variance partitioning and multidimensional reliability analysis techniques allow for the bottom-up emergence of how individuals parse the space of positive emotions.

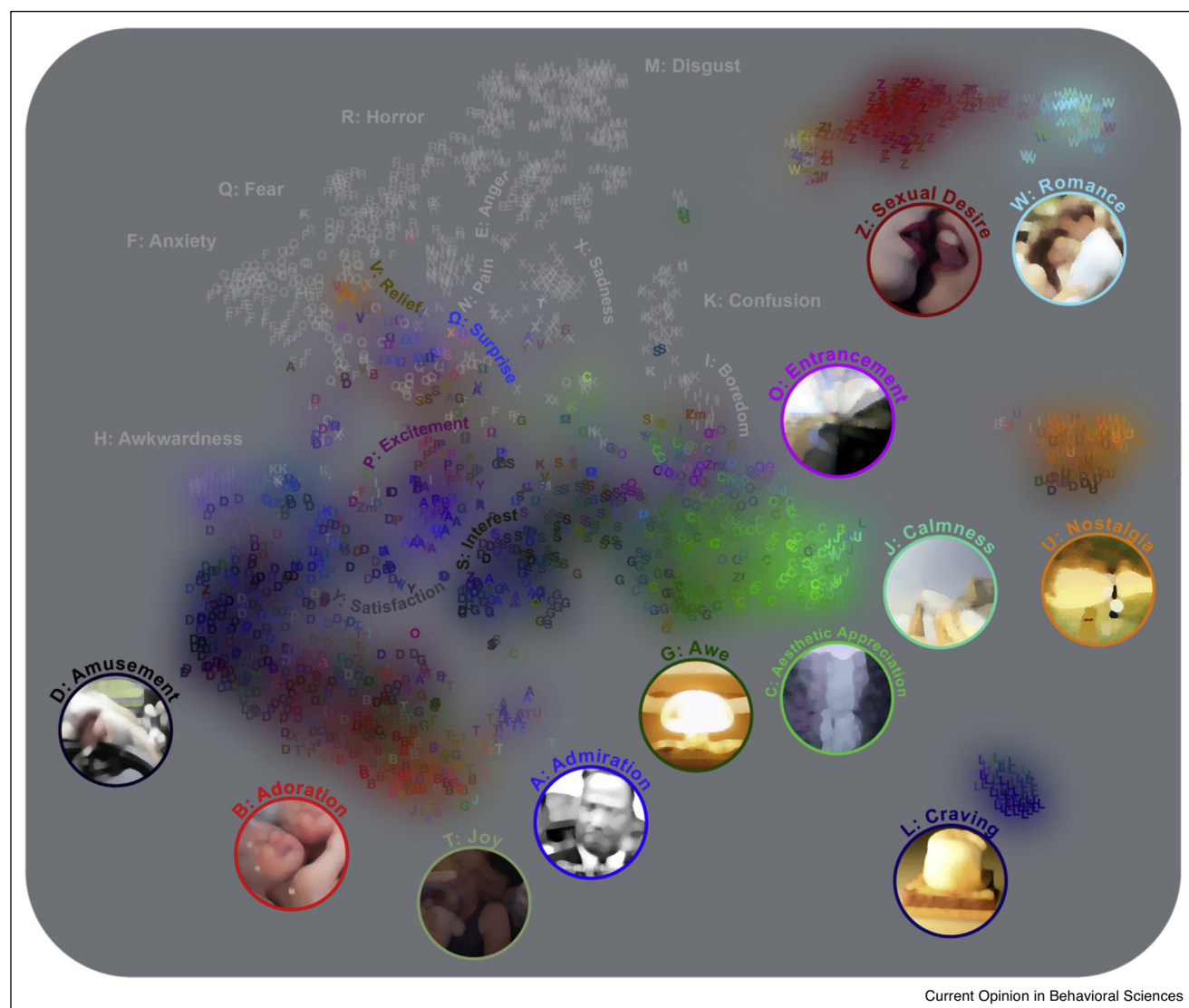
These methods enable scientists to map the *semantic space* of a domain of experience [36]. This approach yields insights into: (1) the number of kinds of emotion, or *dimensionality*; (2) the *distribution* of emotions, and whether there are discrete boundaries between emotions (the answer is no, see Ref. [36]); and (3), the *conceptualization* of emotion, or how distinct emotion concepts and valence and arousal capture how people construct emotion (discrete emotion concepts, more so than valence or arousal, drive the experience, expression, and physiology of emotion; see Ref. [36]).

With new computational approaches, we have carried out studies of the recognition of facial-bodily expression and vocalization [36], cortical and subcortical response patterning, and the feelings evoked by music [32] and video [40], within and across cultures [32]. In a first study of emotional experience, participants rated 2180 short, evocative videos in terms of 34 distinct emotions and appraisal dimensions. Figure 1 presents a visualization of these results; each individual letter refers to a video, and they are color-coded in terms of distinct emotions the video elicited. The semantic space of positive emotional experience is rich. As in other studies (e.g. Ref. [37]), people reliably distinguish experiences of closely related states, such as love ('romance') and desire or awe and joy.

Next consider a study of the recognition of 1500 naturalistic facial bodily expressions that arose in actual social interactions [41]. As evident in Figure 2, this study uncovers evidence of upwards of 14 positive emotions with distinct facial-bodily expressions, and blended expressions.

Across the face, voice, and film and music-elicited experience, criteria that have defined the study of emotion-specific response profiles (e.g. Refs. [24,25]), these bottom-up computational studies yield convergent evidence for the following distinct positive emotions: amusement, awe, compassion, contentment, desire, interest, joy, love, relief, and triumph. Again, we note the considerable overlap with recent taxonomies focusing on neurophysiology (e.g. Ref. [8]), and experience [37]. Other positive emotions seem to be modality-specific. For example, pride has a reliable signal in the face and body (but not necessarily voice) [41,31]. The space of positive emotion is high dimensional and complex.

Figure 1



Map of 16 varieties of positive emotional experience evoked by 2185 videos. Participants judged each video in terms of 34 emotion categories, free response, and 14 scales of affective appraisal including valence, arousal, dominance, certainty, and more. At least 27 dimensions, each associated with a different emotion category, were required to capture the systematic variation in participants' emotional experiences, including 16 dimensions of positive emotion (those videos that evoked stronger positive than negative feelings). We visualized the approximate distribution of videos along all 27 dimensions using a technique called t-distributed stochastic neighbor embedding (t-SNE). Here, we highlight the positive emotions (and surprise, which is often positive). The varieties of positive emotional experience are high-dimensional and bridged by continuous gradients, found to correspond to smooth transitions in meaning [40⁷]. In addition, a number of positive emotions can often be found blended with negative ones (e.g. excitement and anxiety, amusement and awkwardness, relief and fear), suggesting that the distinction between positive and negative emotion may be fuzzier than commonly assumed. See <https://s3-us-west-1.amazonaws.com/emogifs/map.html> for interactive map.

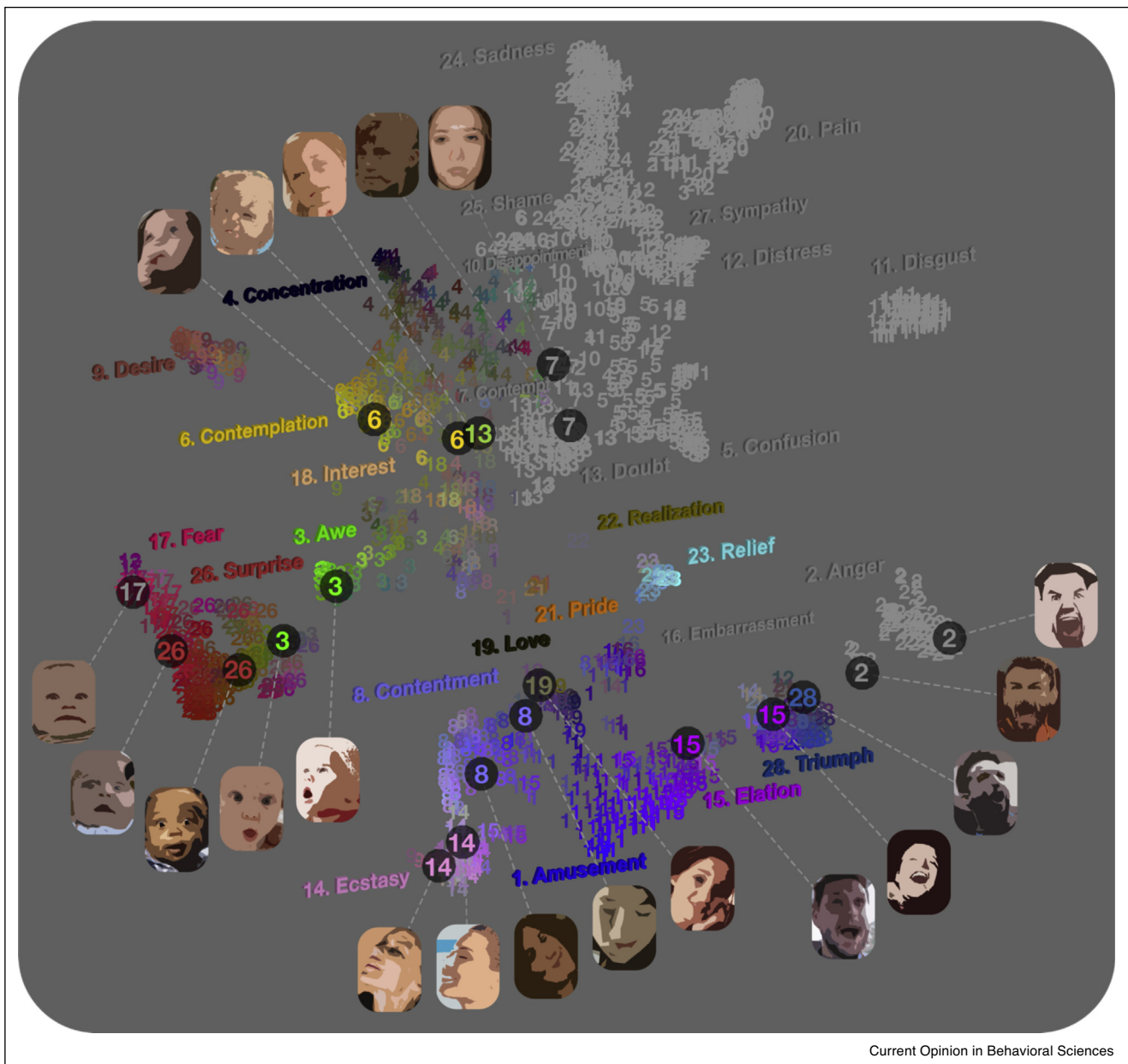
A taxonomy of positive emotions

Across both top down, theory-guided research, and more data driven, computational approaches, we find convergent evidence for a taxonomy of positive emotions (see also Refs. [8,37]). This includes three states involved in attachment — DESIRE, LOVE, AND COMPASSION — two states related to power and status — PRIDE AND TRIUMPH — and three states related to knowledge and social-cultural practice — AMUSEMENT, AWE, AND

INTEREST. CONTENTMENT, JOY and RELIEF reflect the individual's relation to goals and challenges. In Table 1, we summarize the convergent evidence for a taxonomy of positive emotions within a social functional framework.

We note that other positive emotions are likely to might meet the criteria of distinct experience, expression, and physiology, and be integrated into an evolving,

Figure 2



Map of 14 varieties of positive emotion recognized in 1500 facial-bodily expressions [41*]. Participants judged each expression in terms of 28 emotion categories, free response, and 13 scales of affective appraisal including valence, arousal, dominance, certainty, and more. All 28 categories were required to capture the systematic variation in participants' judgments. Here, we highlighted the 14 positive emotions, whose expressions were perceived to be more positive than negative (plus concentration and realization, which can be positive). The positive recognized in facial-bodily expression are again much more complex than a unitary state of happiness. As with the emotions evoked by video (Figure 1), these emotions were most accurately conceptualized in terms of the emotion categories, and we can see that emotion categories often treated as discrete are bridged by continuous gradients. Many of these gradients traversed both positive and negative emotions — triumph and anger, interest and doubt, awe, surprise, and fear — further suggesting that the distinction between positive and negative emotion may be fuzzier than commonly assumed. See <https://s3-us-west-1.amazonaws.com/face28/map.html> for interactive map.

consensual taxonomy of positive emotions. Likely candidates include admiration, gratitude, and hope. The studies that led to this taxonomy involved over a dozen cultures, but much of the work is from Western European

samples. The advances synthesized here raise intriguing questions about individual differences, and how, for example, emotion granularity or autism might influence semantic spaces of emotion. And in more general terms,

Table 1

A social functional approach to positive emotions

Relation	Recurring social context	Emotion
Attachment	Maintain contact with attachment figures	Love
	Reduce harm in vulnerable	Compassion
	Reproductive possibility	Desire
	Play	Amusement
Group	Signal elevated rank <i>vis-à-vis</i> others	Pride
	Prevail in competition over others	Triumph
	Collective action and identity	Awe
Individual navigating environment	Seeking, finding	Interest
	Goals fulfilled	Joy
	Distress reduced	Relief
	Needs satisfied	Contentment

the review offered here raises the question of whether or not one positive emotion — joy perhaps — is a superordinate state, from which the 11 states we consider here derive (e.g. Ref. [8])?

Scientific progress depends upon the precision and rigor of its taxonomies. Emotion science has recently turned to mapping the positive emotions, with considerable convergence. This work will prove vital to all manner of empirical study, from mapping of emotions in the brain and body to stringent hypothesis testing focusing on comparisons of closely related states. History suggests these advances will prove to be useful. When the study of the weather moved from a taxonomy of 4 kinds of clouds to 10, significant advances arose in understanding weather systems. Here we offer an empirically grounded taxonomy of 11 positive emotions, one convergent with other efforts, with the hope that this more precise mapping of positive states will enable answers to questions that began the science of emotion, and new ones on the horizon.

Author statement

In this letter I confirm that Dr Alan Cowen and Dr Dacher Keltner contributed equally to the design, conceptualization, and write up of this paper.

Conflict of interest statement

Nothing declared.

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We collected and Facial Action Coding System (FACS) coded over 2600 free-response facial and body displays of 22 emotions in China, India, Japan, Korea, and the United States to test 5 hypotheses concerning universals and cultural variants in emotional expression. New techniques enabled us to identify cross-cultural core patterns of expressive behaviors for each of the 22 emotions. We also documented systematic cultural variations of expressive behaviors within each culture that were shaped by the cultural resemblance in values, and identified a gradient of universality for the 22 emotions. Our discussion focused on the science of new expressions and how the evidence from this investigation identifies the extent to which emotional displays vary across cultures.
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Using statistical methods to analyze reports of emotional states elicited by 2185 emotionally evocative short videos with richly varying situational content, we uncovered 27 varieties of reported emotional experience. Reported experience is better captured by categories such as 'amusement' than by ratings of widely measured affective dimensions such as valence and arousal. Although categories are found to organize dimensional appraisals in a coherent and powerful fashion, many categories are linked by smooth gradients, contrary to discrete theories. Our results comprise an approximation of a geometric structure of reported emotional experience.
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Guided by new conceptual and quantitative approaches (Cowen et al. [42]; Cowen and Keltner [40,41]), we explore the taxonomy of emotion recognized in facial-bodily expression. Participants (N = 1794; 940 female, ages 18–76 years) judged the emotions captured in 1500 photographs of facial-bodily expression in terms of emotion categories, appraisals, free response, and ecological validity. We find that facial-bodily expressions can reliably signal at least 28 distinct categories of emotion that occur in everyday life. Emotion categories, more so than appraisals such as valence and arousal, organize emotion recognition. However, categories of emotion recognized in naturalistic facial and bodily behavior are not discrete but bridged by smooth gradients that correspond to continuous variations in meaning. Our results support a novel view that emotions occupy a high-dimensional space of categories bridged by smooth gradients of meaning.
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Guided by a new theoretical approach to emotion taxonomies, we apply large-scale data collection and analysis techniques to judgments of 2032 emotional vocal bursts produced in laboratory settings (Study 1) and 48 found in the real world (Study 2) by U.S. English speakers (N = 1105). We find that vocal bursts convey at least 24 distinct kinds of emotion. Emotion categories (sympathy, awe), more so than affective appraisals (including valence and arousal), organize emotion recognition. In contrast to discrete emotion theories, the emotion categories conveyed by vocal bursts are bridged by smooth gradients with continuously varying meaning. We visualize the complex, high dimensional space of emotion conveyed by brief human vocalization within an online interactive map.