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## Facial Expressions



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## Synonyms

Configurations; Displays; Facial behavior;  
Signals; Signs

## Definition

Psychologists' interest in facial expressions arose from the long-standing belief that, just as our dreams were Freud's royal road to the unconscious, our smiles, frowns, pouts, grimaces, and other faces are the royal road to our emotions. The phrase "facial expression" is a presupposition that some event inside, typically an emotion, is pushed outside for public consumption. To avoid any such presupposition, *facial behavior* is used here to describe the movements and positioning of the

facial muscles. Likewise, *emitter* and *observer* are used to avoid implying that any "content" is necessarily transferred by the face.

## Introduction

Human facial behavior results from a set of roughly 20 muscles. Except for the masseter, which clenches the jaw, these muscles originate on the bones of the face but insert in the skin, where they act as tractors, dilators, or sphincters that modify the orifices formed by the eyes, nose, and mouth. Although the nature of "facial expressions" was discussed for centuries, Darwin's noncommunicative formulation remains foundational.

## A Brief History

Historical accounts of research on facial behavior usually begin with Charles Darwin's (1872) *The Expression of the Emotions in Man and Animals*, but his work on *Expression* was a reaction to writings a half-century earlier by physician-artist Charles Bell. Bell had written and illustrated a volume on facial behavior in which he endorsed the prevailing natural theology and regarded the human facial musculature as divinely gifted solely to humans to express emotions.

Bell's depictions themselves drew upon prescientific theorists like Aristotle, who declared that certain faces expressed the "passions and their

contraries.” Descartes elaborated upon Aristotle’s system and listed six primary passions – wonder, love, hatred, desire, joy, and sadness. The Cartesian passions were adopted by Charles Le Brun, court painter to Louis XIV, who prescribed exactly how each should be “expressed” on the face in paintings, drawings, and sculptures. The French neurologist Duchenne, best known for his “faradism” (electrical stimulation of muscles and nerves), argued from faradic studies that 60 different emotions could appear on the face.

Darwin (1872), intent on discrediting special creation, sought to overturn Bell’s creationist account. As he confided in an 1867 letter to Alfred Russel Wallace, “I want, anyhow, to upset Sir C. Bell’s view . . . that certain muscles have been given to man solely that he may reveal to other men his feelings” (Fridlund 1992). In *Expression*, Darwin rebutted Bell’s twin claims of human uniqueness and special communicative function, first noting how human “expressive” behaviors resembled those of other species and then highlighting numerous noncommunicative features of those behaviors. To that end, Darwin explained most “expressions” using his *Principle of Serviceable Associated Habits*, by which he meant “habits associated with actions once serviceable ancestrally” but which survived only in degenerate form, like webbed feet on land birds, male breasts, and the human appendix. Darwin’s contention that much of our “expressive” behavior is similarly vestigial was decisive for biological evolution: functional movements or structures could be either God’s handiwork or evolution’s, but nonfunctional vestiges could not. Thus, our ancestors might have bared their teeth before kill-biting an interloper, but now we merely bare our teeth without progression to biting. This rudimentary habit no longer accomplishes anything; any signal value is incidental.

## Basic Emotion Theories

In the first half of the twentieth century, psychological research found no clear mapping of faces to emotions but instead suggested that (1) observers used contextual information (e.g., what led to making the face) to attribute emotion *to* the face,

(2) facial behavior was better interpreted in terms of broad dimensions (e.g., pleasantness and intensity) rather than discrete emotions, and (3) the interpretations of faces varied somewhat with culture.

Much of this information was eclipsed in the 1960s with the advent of *Basic Emotion Theories*, a set of related frameworks which began with the writings of personality theorist Silvan Tomkins (for history and critique, see Leys 2017). Tomkins took the received wisdom from Descartes and Le Brun that much of our facial behavior was eruptive and nonintentional, consistent with Darwin’s view, but he also argued *contra* Darwin that these movements arose via natural selection. Faces revealed precisely nine specific, biological “primary affects”: interest, enjoyment, surprise, distress, anger, fear, shame, disgust, and contempt. These affects were categorical, and the faces they produced were iconic. Tomkins’ theory gained traction with the 1960s–1970s research of two proteges, Carroll Izard and Paul Ekman.

Most prominent was Ekman’s *neurocultural theory* with its clear enunciation of the *universality thesis*, which contended that (1) certain “facial expressions of emotion” revealed a small number of categorical “basic emotions;” (2) each expression resulted from a modular emotion “program” in the brain which was triggered by a constrained set of elicitors; (3) these expressions were phylogenetic and, as such, would be produced uniformly, recognized by humans panculturally, and found early in child development and among nonhuman primates; and (4) deviations from uniformity were due to supervention by cultural *display rules* reflecting learned conventions or modes of dissimulation (Ekman, in Fernández-Dols and Russell 2017).

One clear accomplishment of the basic emotion approach was the late 1970s dissemination of an anatomically based system for scoring facial movements (updated by Ekman et al. 2002) developed originally by the Swedish anatomist Carl-Herman Hjortsjö (1969). The basic emotion approach continues to develop conceptually and methodologically and is the basis for much “emotion recognition” software (Keltner and Cordaro, in Fernández-Dols and Russell 2017).

## Contrary Evidence

Ekman's "neurocultural theory" achieved fame with a series of cross-cultural matching ("recognition") studies, some also conducted by Izard. In these studies, individuals in diverse cultures – including some small-scale societies in Papua New Guinea and Borneo reputed to have been minimally Westernized – were able to match photos of posed Caucasian faces to indigenous emotion terms at rates greater than chance. The simplicity of forced-choice matching procedures led to their widespread adoption (reviewed by Gendron and Crivelli, in Fernández-Dols and Russell 2017).

The cross-cultural studies were controversial from the beginning especially among field anthropologists who argued that the (1) posed photos were ecologically dubious caricatures, (2) designated categorical "emotion" terms did not capture the diversity of emotion concepts across cultures, (3) investigators underestimated the participants' degree of contact with the West, (4) matching procedure did not capture participants' spontaneous interpretations of the faces, and (5) translators may have helped the participants choose the expected responses in cultures that emphasized cooperation (Russell, in Fernández-Dols and Russell 2017).

Subsequent research ratified these doubts. Findings from the first half of the twentieth century on contextual influence, dimensionality, and cultural diversity were all replicated. Agnostic, bottom-up psychophysical methods showed that European and Chinese students differed in their mental representations of faces for specific emotions (Jack and Schyns 2017). Observers matched faces to predicted emotion labels better when the posers were from the same culture. Evidence from African and Melanesian societies, using more sophisticated and diverse research designs, did not replicate the Ekman studies (reviewed by Gendron and Crivelli, in Fernández-Dols and Russell 2017). Trobrianders in Papua New Guinea understood the putative "fear expression" as an agonistic display instead (Crivelli et al. 2016). When the Himba group in Namibia sorted into piles a series of posed faces, they did not recreate

the classic "expressions of basic emotions" when the sorting was unconstrained but did so only when emotion concept words anchored the piles at the outset (Gendron et al. 2014).

The matching studies were attempts to test how people understood facial "expressions," but not what produced them. Even if people everywhere see happiness in a smile, much as they hear it in birdsong, the question remains whether happiness actually produces the smile (or the song). Contrary to basic emotion predictions, smiling was found to depend more on the presence of an audience than on the emitter's emotions. In such studies of *audience effects*, people smiled (1) during films only when with friends or believed they were; (2) when bowling strikes, mainly after pivoting to see their fellow bowlers; and (3) after winning Olympic gold medals but only when looking at the audience. One study of the putative "surprise expression" had participants enter a laboratory by a corridor, then leave by the same door only to find a room with posters, bold green walls, and a red office chair. Participants reported great surprise and believed that their faces showed it, but only 3 of 60 made the "surprise expression" expected by basic emotion theorists (Schützwohl and Reisenzein 2012). Overall, production studies like these have shown weak relations between emotion and the predicted facial behavior (Duran et al., in Fernández-Dols and Russell 2017), with one exception: reports of feeling amused correlate strongly with smiling and laughing.

Theoretical critiques of basic emotion theory also emerged: (1) the claim that certain emotions were "basic" lacked foundation (Ortony and Turner 1990), partly because of difficulties with the emotion concept itself, and (2) greater knowledge of biology-culture interactions proved inconsistent with its dual presumptions that "universality" implied phylogenesis, whereas diversity signified cultural learning (Crivelli and Fridlund 2018). To the contrary, diversity may equally arise from phylogenesis (Darwin's *adaptive radiation*) and commonalities from cultural learning (*convergent cultural evolution*). Buss (2014) questioned using universality among humans and presence among nonhuman primates,

as criteria for determining the “basicness” of emotions, when (1) “jealousy” was not on any basic emotion list and (2) traits that were unquestionably phylogenetic often span very few species (e.g., ultrasonic echolocation, documented only among microchiropteran bats).

## Contemporary Research Agenda

The most important advance in psychology’s study of facial behavior may lie in the sophistication of its inquiry. Questions loaded with presuppositions (Does this society “recognize” the “basic emotions” from these posed faces?) are being replaced with more neutral questions, such as (1) What facial behavior occurs? (2) In what context does it occur? (3) How does that behavior influence an observer? (4) What about the observer and context leads him or her to react in that way? Of course, faces of emitters and observers quickly form a reciprocal interaction loop.

*Childhood development.* What facial behavior is seen in early development? One researcher made diaries and video records of her daughter’s facial behavior over 8 weeks and found notable departures from basic emotion theory’s predictions. For example, similar stimuli frequently elicited wholly different facial behaviors, and “distress-pain” faces occurred during bathing with no obvious distress (the body of research supporting this conclusion is summarized by Camras et al.; in Fernández-Dols and Russell 2017).

Studies of infants concluded that even neonates respond to facial behavior, and habituation studies showed that infants can even discriminate among different facial configurations. Still, two more specific issues remain unresolved. The first concerns whether neonates can imitate facial behavior, and one question hinges on whether certain neonatal facial behaviors that were considered frank imitation instead signify mere arousal produced by the model’s behavior (see Meltzoff et al. 2017; and Oostenbroke et al. 2016, for opposing views). The second issue concerns when children learn to apply their culture’s

emotion concepts to faces. It appears that young children begin by making valence-based (good vs. bad) attributions and use more differentiated emotion labels increasingly over the preteen years (Widen, in Fernández-Dols and Russell 2017).

The bivalent way that young children react to facial behavior is readily seen in infant social referencing, in which infants as early as 6 months who confront conflict or ambiguity (e.g., in traversing a visual cliff) use the facial behavior of a caretaker to guide how they respond. Caretaker smiles are cues to engage or proceed, while frowns promote disengagement or retreat (Feinman 1992). Maturation brings sharper discernment of others’ facial behavior. Joint attention, or following another’s gaze, may predict where the emitter goes or what he or she talks about next. Others’ facial actions may suggest people’s intentions, dispositions, or what they will say when asked, “How are you feeling?”

*Signaling.* Ethologists long stressed the signaling role of behavior in animal communication. Might our facial behaviors have evolved *as signals*, rather than having “devolved” (degenerated) to mere residues of once functional acts as Darwin proposed? That was the conclusion from early twentieth-century avian observations by Heinroth and Huxley, who suggested that behaviors used as signals evolved to be more conspicuous by prior selection for their predictive value. These *displays* tended to be ones that preceded overt acts (e.g., baring teeth before biting) and foreshadowed the acts themselves. Teeth baring, through natural selection, would become more dramatized and conspicuous and increasingly independent of its origins in biting. Such *intention movements* (Heinroth) were thus said to become displays by *ritualization* and *emancipation* (Huxley). An analogous process – *conventionalization* – results from cultural rather than natural selection (Smith 1977).

These ritualized actions are potentially beneficial for both emitter and observer: conspicuous tooth baring alerts an interloper that I may pounce and bite, so that the interloper flees and neither of us draws blood. Krebs and Dawkins (1984) characterized the coevolution of displays and vigilance as a signaling ecology which, like many

social strategies, is probabilistic; it will be leveraged by deceivers who may force the evolution of more “honest” (i.e., predictive) displays, but the signaling ecology nonetheless carries overall reproductive benefits.

Might human facial behavior be conceived similarly? Noting that ethology had jettisoned the earlier view that animal signals were stereotyped and “released” and now considered them contextual and strategic, Fridlund (1994) suggested that human facial displays might work identically. He proposed the *Behavioral Ecology View* of facial behaviors, reconceiving them as “social tools” which serve as cues of contingent action in social negotiation. This view suggested a functionalist, externalist approach to research in which constructs like “emotion” were unnecessary detours.

The approach has seen wide application. One contemporary effort is in artificial intelligence (AI), where the task is to understand everyday interactive facial behavior and then simulate it using embodied computerized agents. Although most software efforts have been benchmarked on “recognition” of iconic “expressions of emotion,” doubts about the usefulness of this approach have arisen, and AI alternatives based on the functionalist behavioral ecology view have been proposed (Crivelli and Fridlund 2018).

*Miming and deception.* Like stage actors, people in everyday impression management adjust their facial behavior with their social role transitions, e.g., from partner to parent to employee. As Goffman (1959) noted, it is often difficult to separate non-acting from this “miming” or frank pretense. Indeed, the facial muscles are sometimes termed the *mimetic* muscles.

One unexpected instance of miming may be “showing empathy.” Bavelas et al. (1986) analyzed dyadic conversations and found that listeners produced facial movements like those of speakers, not by reproducing the speakers’ sentiments but to convey understanding of those sentiments; thus, empathic facial behavior needs not be “feeling as you do” but “showing you how you feel.”

It’s a thin line between pretending and deceiving, and detecting deception via the face has been

a consistent theme in facial behavior research. Despite several claims, research has failed to substantiate any reliable facial signs of deception or inauthenticity (Vrij et al. 2011).

*Signs.* Much of our facial behavior (1) aids in regulating respiration, lacrimation, olfaction, vision and light adaptation, food ingestion or expulsion, and speech articulation; (2) is recruited in protective reflexes like coughing, sneezing, blinking, and nose wrinkling; and (3) is involved in homeostatic adjustments like yawning, burping, and vomiting. Some so-called “expressive” facial behavior may simply be “given off” in the process (e.g., widening the eyes takes in more light, and flaring the nostrils takes in more scent; Lee and Anderson, in Fernández-Dols and Russell 2017; Susskind et al. 2008). In this way, research is returning us to Darwin’s non-communicative view of facial behavior.

*Appraisals.* Some theories posit that facial behavior results from information processing beyond mere registration of the situation. Several *appraisal theories* assume the basic emotion theory’s “emotion program” but contend it is triggered by prior appraisal. Other such theories treat “emotion” as a folk concept rather than a scientific one, and for these theories, an “emotion episode” results from a series of appraisals of one’s situation which leads to reactions that include facial behavior. Such constituent appraisals may be (1) bottom-up (stimulus-driven) or top-down (based on preconceptions from one’s interaction history), and (2) fast and automatic or slow and integrated with other cognition.

Appraisals, these theories hold, are made along dimensions such as novelty, valence, goal relevance, goal congruence, certainty, coping potential, and agency. Each appraisal dimension has separate and independent effects on facial behavior: novelty results in eye widening, positive valence in smiling, and so on. The large number of possible appraisal patterns implies commensurately numerous patterns of facial behavior, from which observers may make inferences about the emitter (Scherer et al., in Fernández-Dols and Russell 2017).

## Conclusion

Scientific work on human facial behavior has advanced by the slow, painful abrogation of long-standing presuppositions, both explicit and implicit. This research has brought home the fact that approaches to facial behavior based on received wisdom, assumed subpersonal events, posed faces, and categorical emotions will be insufficient to understand how that behavior arises and functions in social interaction and how to simulate it in our future android interactants. These questions and others dovetail with new interdisciplinary efforts that combine psychologists with specialists in fields that include anthropology, biology, biomedical engineering, communications, computer science, the history of science, and the neurosciences. The result is the emergence of fundamentally different conceptions about human facial behavior and the ways to study it.

## Cross-References

- [Adaptation and Natural Selection](#)
- [Charles Darwin](#)
- [Cross-Cultural Studies](#)
- [Evolution of Communication](#)
- [Evolutionarily Stable Strategy](#)
- [Neonatal Imitation](#)
- [Social Development](#)
- [Universality](#)

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