PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

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Journal:	*Philosophical Transactions B*
Manuscript ID:	RSTB-2009-0189
Article Type:	Review
Date Submitted by the Author:	23-Jul-2009
Complete List of Authors:	Ekman, Paul; University of California
Issue Code: Click here to find the code for your issue.:	EMOTIONS
Subject:	Behaviour < BIOLOGY, Evolution < BIOLOGY, Neuroscience < BIOLOGY
Keywords:	Emotion, Expression, Face

Darwin's Contributions to Our Understanding of Emotional Expressions

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Abstract: Darwin charted the field of emotional expressions with five major contributions. Possible explanations of why he was able to make such important and lasting contributions are proposed. A few of the important questions that he did not consider are described. Two of those questions have been answered at least in part; one remains a major gap in our understanding of emotion.

Key Words: Emotion, Expression, Face

Introduction

The Expression of the Emotions in Man and Animals was published in 1872, a year after *The Descent of Man.* Originally intended as a chapter in Descent, it grew too long and required a book of its own. (I have adopted Darwin's practice of referring to his books by a single word from the title). Darwin started writing Expression two days after correcting the page proofs for Descent, finishing it in four months, just before he compiled the sixth and last edition of *On the Origin of Species*. Many of the central ideas, (although not the details) appear in his 1838-1839 notebooks.

Prior to Expression, the face was of interest primarily to those who claimed they could read personality or intelligence from the facial features. Darwin ignored the features, and focused on the visible but temporary changes in appearance.

It is without doubt a brilliant book, forecasting many of the fundamentals of not just facial expression but emotion itself. Expression is the first, pioneering study of emotion, and in my view should be considered the book that began the science of psychology.

Major Contributions

Darwin treated the emotions as separate discrete entities, or modules, such as anger, fear, disgust, etc. The German physician Wilhelm Wundt proposed an alternative view of emotion about a decade later. Wundt wrote about variations in dimensions or continua of pleasantness and activity or intensity. This very different conceptualization enjoyed popularity in 20th century psychology, with

Schlosberg (1941) the major proponent in mid century, then adopted by Russell at the end of the last century.

Many different kinds of research – neuroscience, perception, and cross cultural evidence – show that Darwin's conceptualization of emotions as separate discrete entities is correct. Of course, each emotion also varies on attributes such as intensity or acceptability, which can be considered as dimensions that describe differences within each discrete emotion. I regard Darwin's consideration of discrete emotions to be the first of his lasting major contributions.

Darwin described variations in related emotions; for example in chapter 10 he described rage, anger, indignation, defiance, and hatred. But he did not conceptualize each emotion as constituting a *family* of related experiences, varying in social context, physiology and expression, but sharing characteristics that distinguish one emotion family from another. I will return to this question when I describe unanswered questions at the end of this chapter. Before turning to Darwin's next great insight about emotion, let me note that I have argued that hatred is not an emotion, but best considered as a transformation of the emotion of anger into a quite different, enduring psychological state, which unlike the emotions is fundamentally destructive to the person who experiences it (see Chapter 1 in Ekman, 2003, and Chapter 1 in Dalai Lama & Ekman, 2008). For quite different reasons I have argued that love, which Darwin considered an emotion, is quite different from the emotions that Darwin described in the same chapter in which he described joy.

The second major contribution was his focus primarily on the face, although he did give some attention to vocalizations, tears, and posture. To date, facial expression has been found to be the richest source of information about the emotions. The voice has yet to be shown to be a source for as many discrete emotional states as the face, although it is harder to fabricate or regulate than facial expressions.

Darwin took for granted that it is the morphology of facial expression that conveys information about which emotion is occurring. No question that the timing of an expression carries information as well, but not about which emotion is occurring. Using photographs and engravings Darwin took for granted that these presented the needed information about what emotion was being displayed. My own research has found that facial expressions reach an apex of the maximum muscular contraction that is going to occur, which is held typically for a few seconds with little noticeable variation during the apex. Any time slice within that apex carries the information about which emotion is being signaled. For that reason I call these *snapshot* expressions, to distinguish them from aggregate signals, which incorporate a sequence of expressions. Of course the extent of muscular contraction varies from one instance to another, providing information not about which emotion, but the intensity of the emotion that is signaled.

Darwin's third major insight was that facial expressions of emotion are universal. In the last few decades the preponderance of evidence, from Western and Eastern, literate and preliterate, cultures strongly supports Darwin's claim (based on sparse evidence, but in all likelihood demonstrated to him by his experience traveling around the world on his five year journey on the Beagle). Universality did not support his evolutionary theory – for if we all descended from Adam and Eve, expressions would be universal. But it did support Darwin's challenge to the racists of his time – who claimed Europeans had descended from a more advanced progenitor than Africans – by showing common descent, allowing Darwin to proclaim the unity of mankind.

While Darwin proposed that facial expressions of emotion are universal he also proposed that gestures are culture specific conventions. This has proven to be correct. The same hand movement, for example the first finger touching the thumb to form a circle in the North American "A-OK" gesture, has a radically different meaning in other countries. Totally different gestures may be used to signal the same message, as in the example of "good luck" signaled by crossed fingers in North America, and thumbs inserted into the fist in Germany. And, there are messages for which there is a gesture in one country and no gesture in another country. (For discussion of symbolic gestures see Ekman (Ekman 1976 and Chapter 4 in Ekman 1985).

The fourth insight was that emotions are not unique to humans, but found in many other species. His examples in Expression range from bees to roosters, dogs, cats, horses, as well as other primates. For much of the last century that view was considered an example of bad science, of anthropomorphism. Underlying that belief was a reification of language and verbal self report. If we can't examine a species report of their experience how can we know if emotion is occurring? That stance would require that we regard infants as not having emotions prior to their acquiring speech! Words are used to describe or reflect upon our emotional experience, but the words are representations of emotion not the *sine qua non* of emotion.

A fifth contribution was Darwin's explanation of why particular movements signal a particular emotion. Why is the upper lip raised in one of the anger expressions, for example? Darwin described this as due to it having been a "serviceable habit", exposing the canine teeth threatening harm to come as well as preparing for the attack. Stripped of its Lamarckian baggage, this explanation is consistent with contemporary ethological accounts of how signals evolved from intention movements, providing the foundation for current formulations of how signals become ritualized or formalized. Darwin also proposed a principle of antithesis, whereby a signal has a certain form because it is the opposite of another signal. For example, the dog (and many other animals) puffs itself up to appear larger in a potentially antagonistic encounter, which Darwin explained as based on the principle of serviceable habits. But the antithesis of that movement is the submissive slinking and lowering of the body.

Why, we might ask, was Darwin right about so many aspects of emotion and expression? One answer is that it was the product of his evolutionary perspective; a perspective that would suggest much of what he proposed when it is focused on emotion. Another related answer is that Darwin turned to the biology of emotion, noting what he could about the physiology of emotion, and (where in his time much more was known), the anatomy of facial expression. He utilized the anatomical descriptions of Sir Charles Bell, from whom he took a class during his aborted medical student days. Darwin rejected Bell's theorizing that expressions were given by God only to man. In the margin of his copy of Bell's book Darwin wrote, "he never looked at a monkey". Darwin's other important source was the French neurologist Duchenne De Boulogne, many of whose photographs Darwin printed, with permission, in Expression. When Darwin wrote to Duchenne asking him what he should pay for the right to reproduce some of his photographs, Duchenne wrote back that between men of science there should be no financial transactions. Amazingly Darwin's publisher omitted three of Duchenne's photographs that Darwin discussed at length in Expression, presumably because it was too costly to print all the images Darwin analyzed. Those photographs never appeared in any subsequent edition of Expression, until the recent third edition.

Darwin said that he differed from other men in "… noticing things which easily escape attention, and in observing them carefully." His keen observational skills were applied to more different data sources than anyone before or since has included in an article or book about emotion: infants (his own), children (likewise), adults, animals in the zoo, the mentally ill, and reports he obtained from many people he wrote to or who wrote to him about what they had observed in other cultures.

Another methodological contribution was Darwin's focus not just on changes in appearance but the musculature that generated those changes. Although he made a few mistakes on the anatomy (see the third edition 1998), he was certainly on the right path by describing the anatomy of each expression. That path was not followed in most of the twentieth century when scientists instead described expressions in terms that mixed inference about underlying state with description (e.g., smile, frown) and were imprecise to boot. Another mistaken path was to describe changes in the appearance of the features or wrinkles without considering what muscular actions produced those changes. Building on Duchenne, Wally Friesen and I published a comprehensive, anatomically based tool for describing/measuring any facial movement – the Facial Action Coding System, FACS (1978).

Another of Darwin's methodological contributions was to show photographs of facial expressions to observers and note what emotions they attributed to each expression. This is still the most widely and easily used method for studying facial expression, referred to currently as a *judgment* study. It is a useful method, but there are many questions that it cannot answer, that must be addressed by measuring facial movement itself (see chapter 2 in

Ekman,1982 for a comparison of the different methods for studying facial expression).

Issues Not Considered by Darwin

Now let me turn to matters that Darwin did not consider. I have already mentioned two. He did not attempt to provide a method for measuring facial movement. And he did not consider how to define the boundaries of each emotion family. There is little doubt that there are many variations on the expression of any emotion. We do not yet know how many variations, nor do we know how many of those variations are linked to differences in social context or subjective experience. This is, in my judgment, the most serious gap remaining in our understanding of facial expressions, and it is a very large one. FACS provides the means for describing all the variations, but we are yet to map them completely for any emotion, nor do we have an empirical basis for knowing how many of the possible distinctions or variations merit consideration because they provide different information.

Another issue that Darwin did not consider but needs to be addressed with vigor is the distinction we described (Ekman & Friesen, 1969) between an *indicator* and a communicative *signal*. I didn't know then how to apply this distinction to facial expressions, but Duchenne's observations about the differences between a voluntary smile and an involuntary smile of enjoyment provide an excellent illustration of the value of this distinction between indicators and signals. The action of *zygomatic* major (AU 12 in FACS terms) provides a very strong signal, even when the action of that muscle is weak. But as Duchenne suggested the absence of *orbicularis oculi*, (AU 6, Duchenne failed to exclude AU7, the inner part of that muscle which we found is not relevant to distinguishing enjoyment) "unmasks the false friend". Neither Duchenne nor Darwin noted however, that the difference in appearance is very subtle, hard to recognize without precise measurement. The difference between a 6+12 and a 12 alone, between a spontaneous enjoyment signal and a voluntarily or habitually produced facsimile is an indicator, not a signal. It is rarely recognized by conspecifics.

Not coincidentally this leads to my last and concluding topic, which is Darwin's lack of interest in how to distinguish deceptive from genuine facial expressions of emotion. Neither the word *deception* nor *lie* (lies, or lying) appears in the index of Expression. (I quote now from my chapter "Darwin, Deception and Facial Expression" 2003). "In the 19 page conclusion there is only one sentence that refers to this: They [the movements of expression] reveal the thoughts and intentions of others more truly than do words, which may be falsified. A bit too simple; for surely we know and research has documented that some facial expressions can be very misleading. In brief comments elsewhere Darwin provides a more complex view, suggesting how true feelings may be shown despite efforts to conceal emotions, (although he gives no hint that concealed emotions may be revealed in the very brief expressions I have called *micro*

expressions, or very tiny movements I call s*ubtle* expressions [Ekman 2009, chapter 11]), and also how false expressions, which display emotions not felt, may be betrayed.

"Darwin suggested that muscles that are difficult to voluntarily activate might escape efforts to inhibit or mask expressions, revealing true feelings." A great deal of research, described in Ekman, 2003, has supported this suggestion. Darwin made one more hypothesis about deception: A man moderately angry, or even when enraged, may command the movements of his body, but … those muscles of the face which are least obedient to the will, will sometimes alone betray a slight and passing emotion. While correct about the leakage in the face, Darwin failed to note the existence of gestural slips (Ekman, 1985/2009), which leak concealed feelings and intentions, and other forms of body movement that can betray a lie. The conceptualization of the role of emotion in perpetrating and betraying a lie was clearly not of much interest Darwin, being one of the very few topics he left to others to chart.

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