

Books of faces: Cultural techniques of basic emotions

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Introduction

In 2015, Facebook filed a patent that proposes the passive use of digital cameras on computers and smartphones, taking pictures of users, matching, among other things, photographed facial expressions with those in a database.[1] This would permit, the patent suggests, evaluation of subjective feelings about whatever appears on one's social media feeds, manipulating what 'content' is seen and how one will potentially feel in response. Facebook's patent application neither defines what an emotion is, nor which facial expressions are assumed to be 'emotional'. It merely suggests their system would rely on 'one of many well-known techniques'.[2]

Facebook's proposal is representative of tech companies investing in the identification of facial expressions of emotion. Reasons for this include the refinement of user experience following principles of 'affective computing',[3] attempts to create realistic characters for digital animation,[4] a cybernetic reinvention of prediction and control,[5] and even a broader, more fundamental transformation of sensibility that rests on the technological manipulation of embodied affection prior to conscious awareness.[6] Each of these, however, have some relation to determining internal emotional states from images of facial expression.

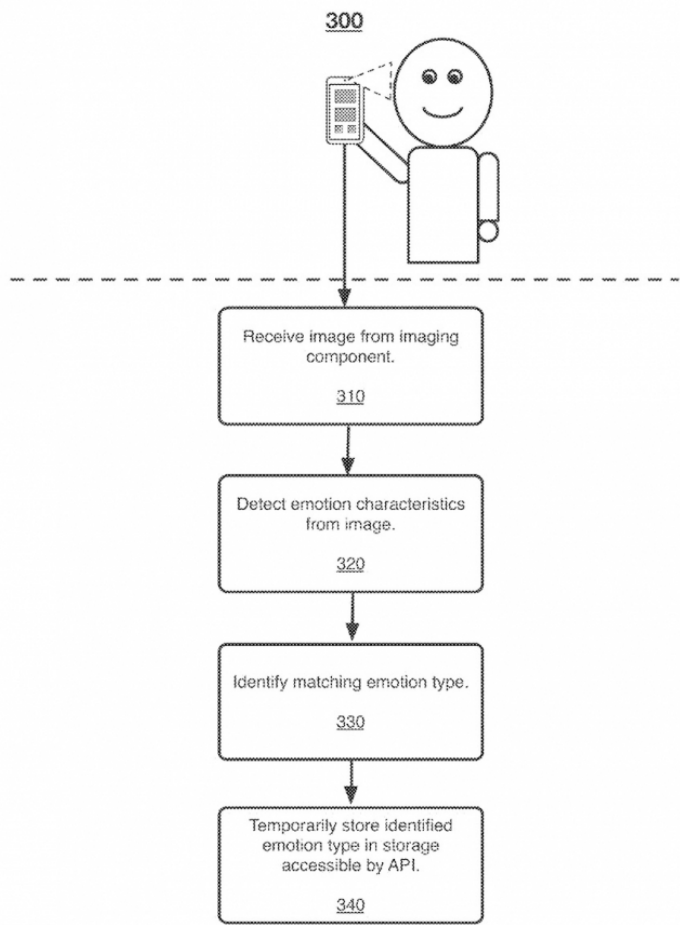


FIG. 3

Fig. 1: A diagram of the technological 'logic flow' of emotion detection from Facebook's patent application. Source: US Patent Application No. US 2015/0242679 A1.

The assumption that facial expression can be isolated from motion has long characterised psychological and neurological research.[7] Still images are linked with the claims of 'affect program theory', which argues for six to nine 'basic emotions' neurologically given in the brain that can be seen, assuming proper conditions, universally expressed on the face.[8] My claim here is that the identification of 'affect programs', as employed in technologies of emotion detection, should be linked with a particular media history, one of *books of faces* used in psychological research from the late 1800s to the

1960s. Algorithms for visual emotion detection are, in many ways, a recursion of a particular technological form: the publication of serial images of the same human face, either bound in book form, printed in the pages of academic journals, or organised in unbound photographic folios.[9]

What I trace in this article is ultimately a history of ideas in psychology, but I follow a range of historians of media, art, and science who demonstrate how scientific ideas emerge from the intersection of media and the capacities of the human body.[10] This is particularly the case in the history of emotions in psychology. As Sigrid Weigel has argued, the evidence for physical and neuronal ‘arousal’, such as pulse, blood pressure, and muscle contraction, inevitably require one to ‘rely on interpretation’, a fact that includes the interpretation of facial expression.[11] These interpretations, however, only occur through the use of a particular technology, providing the grounds of what is seen in conjunction with what can be said about it.

In other words, books of faces provide the material foundations for emotion as, to follow Bernhard Siegert, a product of particular, material ‘cultural techniques’, and thus of ‘a more or less complex actor network that comprises technological objects as well as the operative chains they are part of and that configure or constitute them’.[12] The emotions, I suggest, cannot be divorced from cultural techniques that serve to differentiate and identify particular materialities of feeling.[13] To be clear: I am not suggesting that emotions have no relation with the material grounding of human physiology. I am arguing that the descriptive categorisation and ordering of the emotions as ‘things’ that can be scientifically evaluated (and operationalised in systems of emotion detection) depends on the media employed in emotions research. The media used in laboratory research changes, and therefore the definition of an emotion changes as well, because of how a body is visualised and inscribed by an apparatus.

Affect program theory’s primary claim is that each of the ‘basic emotions’, which include emotions such as fear or anger, has a specific, unique neural ‘circuit’ or ‘signature’ (or ‘program’) that is triggered based on a response to a particular stimulus.[14] These programs are innate to human, and often animal, neurophysiology, and their existence is assumed to have some evolutionary benefit. Affect program theory is most commonly associated with psychologists Paul Ekman and Wallace Friesen, whose influential ‘Facial Action Coding System’, or FACS, provides theoretical and practical grounding for many technological systems of emotion detection.[15]

Affect program theory has influenced a wide range of other disciplines. Ekman and Friesen, along with other affect program theorists, like Silvan Tomkins, Carroll Izard, and Jaak Panksepp,[16] are regularly cited in a broad range of research arguing for the existence of biological, emotional universals.[17]

The broad deployment of affect program theory is a problem – both for reasons I will elaborate below, and because Ekman's work has been challenged by numerous psychologists. Alan Fridlund, a former student and co-author with Ekman, has criticised the affect program paradigm for a foundational misreading of Darwin and a reliance on techniques of forced choice in laboratory experiments. Fridlund also found, in reviewing laboratory notes from some of their most widely cited experiments, evidence that Ekman and Friesen manipulated the published reports of their most influential findings to make claims not supported by their experiments, calling into question the empirical validity of some of their studies.[18] Similar critiques have been made in the work of psychologist James A. Russell and the neuropsychologist Lisa Feldman Barrett, who have engaged in experimentally based research to undermine the claims of Ekman and other affect program theorists, using technologies like facial electromyography.[19]

I do not believe that a rejection of Ekman and affect program theory necessitates a 'constructionist' paradigm of affect and emotion. Numerous scholars in the humanities and cognitive philosophy acknowledge the materiality of the brain and body without deferring to the more determinist or universalist understandings of the neurological implied by affect program theory.[20] What I offer here suggests that the materiality of the brain and emotions must be positioned in relation to the materiality of media. Given the continued use of affect program theory in technologies of emotion detection, historicising this perspective is necessary.

The rest of this essay looks at the books and images of faces circulated by psychologists during the first half of the 20th century. Authors like Ruth Leys[21] have provided detailed histories that follow the research of Silvan Tomkins and those who trailed in his wake, like Ekman and Izard. Historians of photography, like Georges Didi-Huberman,[22] have traced the impact of photography on psychology in its infancy. Rather than repeat these arguments, I focus on the constellation surrounding psychologists Robert S. Woodworth and Harold Schlosberg, whose textbook *Experimental Psychology* is the source for the processes later taken up by Ekman and other affect program theorists. This book, called the 'Columbia Bible', circulated at Columbia

University initially in 1909, in mimeograph form. It is one of the most important texts in the formation of experimental psychology in the United States, providing a central route through which techniques of German psychophysics entered into – and were revised by – American psychology.

The first published version, the 1938 edition solely authored by Woodworth, and the 1954 revision, jointly authored by Woodworth and Schlosberg, together sold over 67,000 copies, making it an academic bestseller that influenced the experimental practices of several generations of psychologists. A third edition was published in 1971, revised and rewritten mostly by Schlosberg's former colleagues at Brown University. The book's first edition was warmly reviewed by luminaries in psychophysical research, such as Edwin Boring, and it has been argued that this book was *the* central text in defining what a psychological experiment even was.[23]

I have never seen Woodworth and Schlosberg given a prominent place in histories of emotions research, and any memory of their work seems to have been obliterated in spite of the centrality of their book in defining American psychology. Their methods were foundational for almost all affect program research, and, in examining Woodworth and Schlosberg, I demonstrate how research on facial emotions depended on the material capacities of books of faces, and primarily revolved around the physical aspects of bodies recorded in drawings and photographs.

Woodworth and Schlosberg's optical unconscious

In his 1931 essay 'Little History of Photography', Walter Benjamin identifies one promise of photography as visualising 'the optical unconscious':

[w]hereas it is a commonplace that, for example, we have some idea of what is involved in the act of walking (if only in general terms), we have no idea at all what happens during the fraction of a second when a person actually takes a step. Photography, with its devices of slow motion and enlargement, reveals the secret. It is through photography that we first discover the existence of this optical unconscious, just as we discover the instinctual unconscious through psychoanalysis. [24]

There is a relation between Benjamin's optical unconscious – that 'secret' exposed by the still image – and the claims of physiognomy, the 'science' of determining character from facial features referenced often by Benjamin. The secret details revealed in the halting of time matter not because of their revelation of empirical truth alone. Benjamin tells us, in his essay 'Doctrine

of the Similar', '[t]he similarities perceived consciously – for instance, in faces – are, compared to the countless similarities perceived unconsciously or not at all, like the enormous underwater mass of an iceberg in comparison to the small tip one sees rising out of the water.' [25] Benjamin sees in physiognomy the idea that similarity and likeness, be it perceived or exposed only in the halting of time, are foundational for a cosmic intertwining of human lives.

While these likenesses are seen in faces readily – hence, the obsession physiognomy has with reading character from the face – photography makes previously unseen similarities visible. Yet photography also disenchantments – the reproducibility of the photograph is, of course, central for Benjamin's claims about the destruction of aura, and is one element why, whenever Benjamin speaks of the 'mimetic faculty' that sees and produces similarity, he suggests that the role of mimesis in modern life is eroding or coming to an end. This dialectic between visualising similarities from still imagery, and the disenchantment that comes from the visualised stillness of a reproducible image, foregrounds many of the problems of motion and its capture in photographic imagery, and leads us to the limits of experiments that use photography to empirically determine the visual universality of facial expression.

Woodworth and Schlosberg's experiments do not emerge *sui generis*. There are three intertwining, if relatively distinct, historical traditions that produced the range of published books of faces used in their research, which move from drawings and etchings of faces to photography. One tradition, the one Benjamin was interested in, is physiognomic – books of faces were circulated to 'teach' one how to interpret character from images of faces. The second is artistic – books of facial expressions were created to help artists and actors accurately represent 'the passions'. The third is a Darwinian tradition that follows his 1872 book, *The Expression of the Emotions in Man and Animals*. Each of these traditions works to visualise and produce particular kinds of similarities, between human bodies, between human faces, between human and animal. But, through their combination in Woodworth and Schlosberg's experiments, they rationalise and limit the possibilities for similarity, constrained to a set of categories determined by negative differentiation. Or, in combining these traditions and introducing forced choice into experiments on emotion, what Woodworth and Schlosberg discovered is not that observers agree about particular, posed photographs of emotion representing specific emotional states. Rather, observers agree on what specific facial expressions *do not* represent.

Three traditions: Physiognomy, the passions, evolutionary descent

While part of a long history that descends from Ancient Greece, physiognomy achieved widespread popularity throughout 19th century Europe through the work of Zürich pastor Johann Caspar Lavater. While many editions of Lavater's work were large, ornate, and expensive, his writings were circulated – often in pirated form – in inexpensive pamphlets and paperback editions, disseminating his belief in ‘a way to access the invisible internal through the external’ that he saw as evidence of the agency of a divine creator.[26]



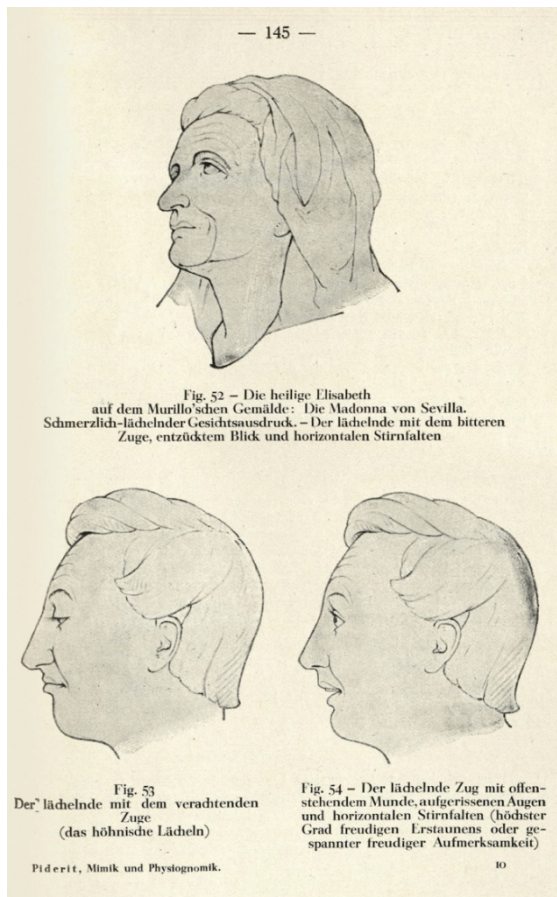
Fig. 2: A plate from Lavater's *Essays on Physiognomy*. Lavater nd. [1800?]. Public domain.

Lavater distinguished between physiognomy and pathognomy. Physiognomy studies the immobile, neutral face, while pathognomy examines the muscular motions of the face that provide evidence for the passions.[27] Facial expression, according to Lavater, distorts the face and makes it difficult, if not impossible to judge character.

Physiognomy is inherently visual, and embodied in artistic practice. ‘The art of drawing is indispensable’, claims Lavater, and the ‘physiognomist who cannot draw readily, accurately, and characteristically, will be unable to make, much less to retain, or communicate, innumerable observations.’[28]

Physiognomy is therefore intertwined with questions about the training of artists, but is somewhat distinct. The physiognomic tradition works to remove the presence of facial emotion to approach the ‘truth’ of character in the stillness of the face. The artistic tradition, instead, seeks to improve artistic representation and, ideally, induce in the viewer or spectator particular emotions from a mimetic relation with an artwork.[29]

This perspective predates Lavater, and can be seen in the work of Charles Le Brun and a range of 18th and 19th century artists and scientists who followed him, the most notable of which were Sir Charles Bell and Duchenne de Boulogne. This also included the Germans Theodor Piderit and Heinrich Rudolph, both of whom published illustrated books or pamphlets with the goal of helping artists accurately represent facial emotions, often synthesising physiognomy with the arts.[30]



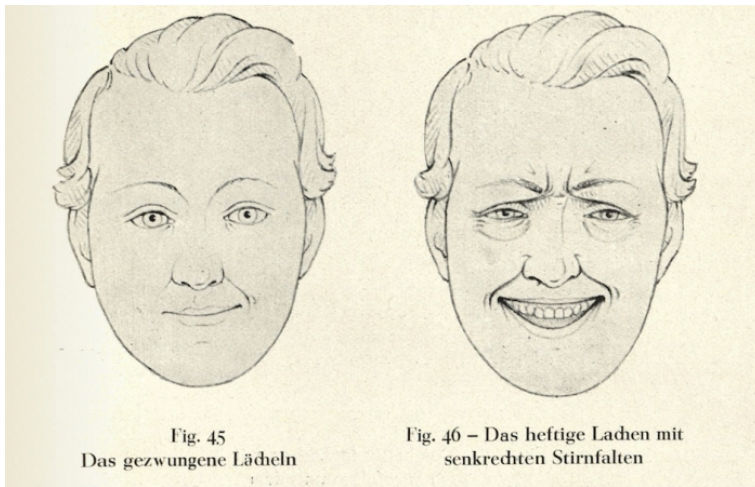


Fig. 3a, b: Illustrations from Theodor Piderit's *Mimik und Physiognomik* (1886).
Public domain

Bell, Le Brun, and Piderit all relied on drawings and paintings. Duchenne's 1862 *Mécanisme de la physionomie humaine*, however, was one of the first works to rely extensively on photography. Employing a set of electrodes, Duchenne would stimulate the faces of several subjects and photograph them. Duchenne's apparatus enabled him to induce and hold the action of particular facial emotions for the length of time demanded by 19th century photography.[31] Duchenne's book was divided up into two parts: a 'scientific' section that isolated particular facial muscles, and an 'aesthetic' section that reproduced works of art and other 'artistic' scenarios to demonstrate how 'beauty' could be achieved with scientifically accurate facial expressions.[32]

Darwin's *The Expression of the Emotions in Man and Animals*[33] operates within the space opened by Lavater, Bell, Piderit, and Duchenne, relying on evidence from their writings and the illustrations from their books. But he was also offering a critique or reinvention of many of their assumptions. This instability means that Darwin's work on facial expression is the most misread of all of those I have mentioned. Darwin is often invoked by affect program theorists to argue facial expressions have an evolutionary purpose. This is a misreading; Darwin suggests that the facial expression of emotion demonstrates not an evolutionary function in contemporary human life but, instead, humanity's descent from animals.[34]

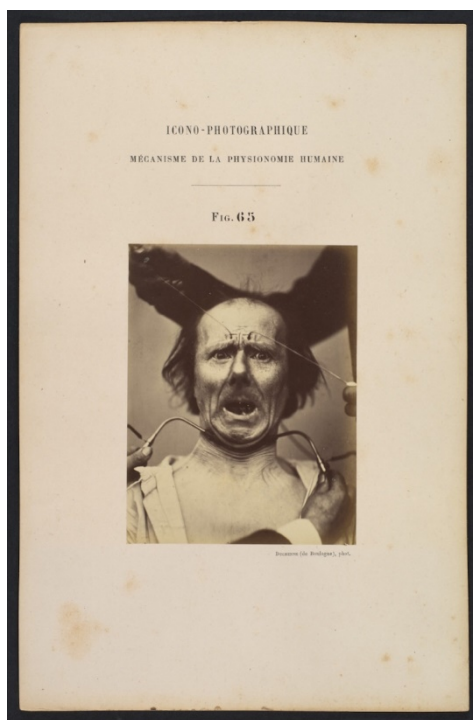


Fig. 4: From Duchenne's *Mécanisme de la physionomie humaine*. Photograph by Adrien Tournachon (1854-56, printed 1862). Albumen silver print from glass negative, 12.0 x 9.2 cm. Metropolitan Museum of Art, New York. Public domain.

Darwin was offering a particular critique of the artistic tradition, especially as represented by Theodor Piderit and Charles Bell.[35] Bell saw facial expression as an endowment from God, differentiating humans from animals. Through his critique of Bell, Darwin was attempting to dismiss the artistic tradition's suggestion that the aesthetic experience produced through facial expression was a uniquely human means for producing sympathetic relations. Darwin was also attempting to reject the assumptions of Lavater because of the 'unscientific' reputation of physiognomy and his employment of similar illustration strategies as Lavater.[36] In fact, the limitations of photography were something Darwin was working against. The theorisation of emotion Darwin offers undermines the idea of discrete emotional categories, instead conceptualising emotions as blurry states that cannot be defined discretely. In spite of his use of photographic illustrations, Darwin was deeply sceptical about the use of photography to document scientific truth.[37]

Emotions in *Experimental Psychology*

In American psychology, a misreading of Darwin provides the motivation for research on facial expression, the artistic tradition provides physical materials used in laboratory experiments, and physiognomy looms in the background as a disavowed, yet determining ancestor. Representing emotion through drawings and photographs – highlighting the ‘optical unconscious’ of emotion – contributes to the belief that there are a limited number of discrete ‘basic emotions’. The ability to organise photographs into groups – which comes from both the discreteness of the image and the ability to arrange photographs in serial form, published in books, repeated across pages – creates an experimental method in which different images are conjoined to generate particular ‘classes’ of emotion through the differentiation of facial expressions from each other.

In the first edition of *Experimental Psychology*, Woodworth begins by suggesting Darwin claimed that emotions were ‘serviceable’, or ‘remnants ... of practical movements’ that were ‘directed to the securing of practical results’. But instead of interpreting this as a ‘remnant’ from broader evolutionary descent alone, Woodworth assumes that the emotions are also vestiges from human development, and that, say, the ‘expression of grief in the adult is toned down from the frank crying of the infant. The vocal part of crying is a practical call for help, and the facial part was originally an adjunct to the vocal. The wide open mouth involved the muscles which depress the corners of the mouth, and this little movement remains as a sign of grief after vocal crying has been eliminated’.[38] Woodworth begins by assuming emotions to be both a derivation of evolution and a necessary aspect of human development – one that may be inconsequential in adult life, but helps ensure the survival of the child.

In this, Woodworth is conflating the claims of Darwin with those of Piderit, who claimed that expression has ‘a present utility which can be discovered without going back into individual and racial history’.[39] This conflation persists today in the psychology of the emotions. Piderit, the vast majority of whose work was never translated into English, is where we get the idea that facial expressions must have some *current* social and evolutionary value, rather than the Darwinian claim that facial expressions are remnants of evolutionary descent.

Piderit is also the first source of images of faces used in psychological experiments. His 1886 book *Mimik und Physiognomik* [*Facial Expression and Physiognomy*], included numerous line drawings of facial expressions, bridging the tradition of Lavater with questions of artistic representation. Many of Piderit's drawings were similar to Lavater's, though Piderit diverged from Lavater by including numerous images of the human face expressing particular emotions, with parts of the face broken up to isolate the eyes, forehead, or mouth. In their 1923 article 'A Model for the Demonstration of Facial Expression', Edwin Boring and Edward Titchener, two of the most important scientists in the history of American psychology, used Piderit's drawings to create a model of the human face, comprised of wood, ink, and cardboard, in which fungible, physical pieces for brows, eyes, nose, and mouth would generate a range of different facial expressions.[40] The combination of a technological model with a series of drawings provides the material techniques that separated eyes from brows, nose from mouth, breaking the face into a series of discrete elements that can be disassembled and recombined.

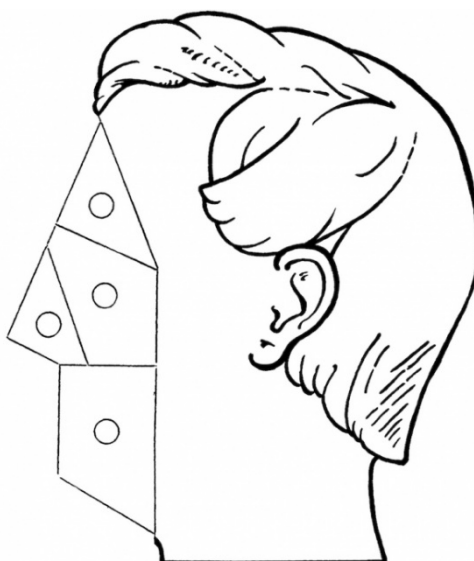


FIG. I

Fig. 5: A sketch of Boring and Titchener's (1923) cardboard, ink, and wood experimental model with interchangeable expressions, derived from Piderit. Public domain.

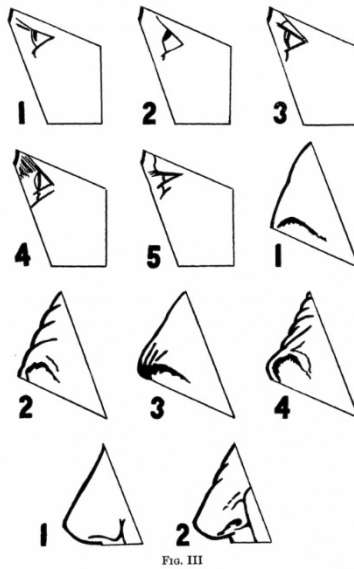
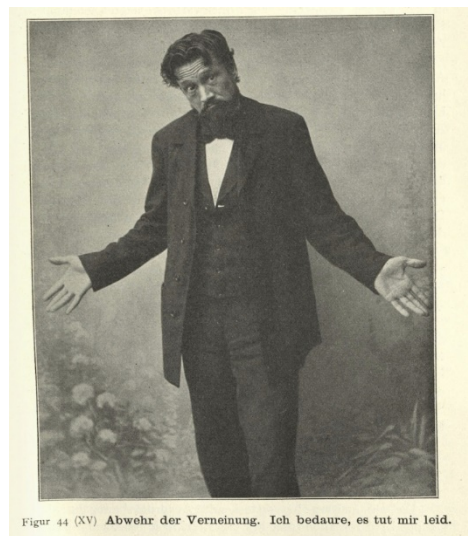
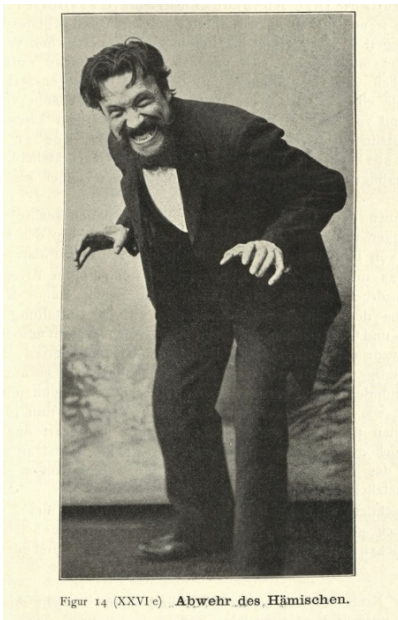
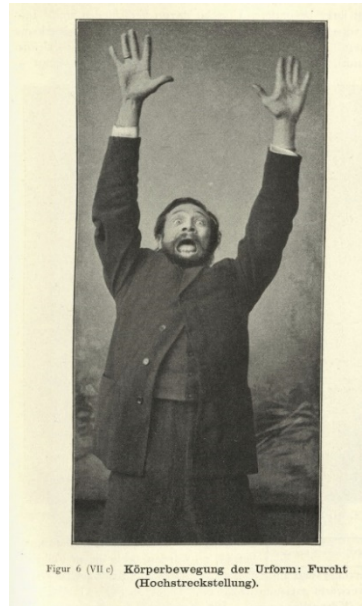
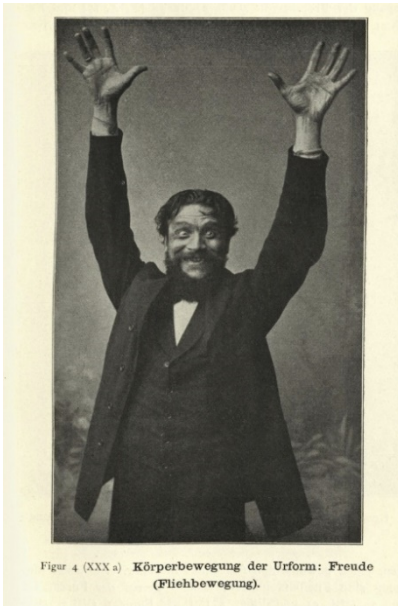


Fig. 6: Boring and Titchener's (1923) groupings of the Piderit drawings. Public domain.

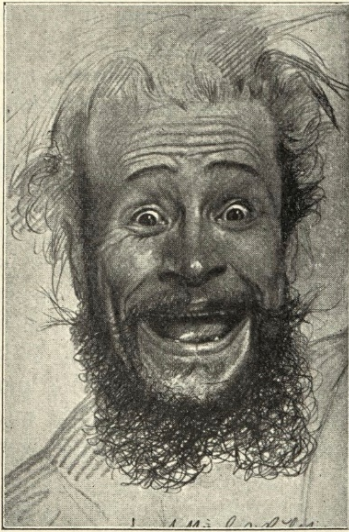
In one study performed using Boring and Titchener's model, psychologists intended to represent dismay, horror, disdain, disgust, and bewilderment – and, in a second study, suggested dismay could also be a 'quizzical' expression, horror also attention, disdain also displeasure, disgust also contempt, and bewilderment also reverence. Without prompting from the scientists, students would identify intended expressions at very low rates. Woodworth suggests that the failure of this experiment means "Reading the emotion from the face" amounts in large part to reading the emotion into the face', though, he also suggests, it is probable that Piderit's line drawings were the main problem.[41]

This second suggestion was deemed more likely by experimental psychologists, though the idea that emotion was read into the face, rather than from the face, was not dismissed. Psychologists admitted that their studies were about posed facial expressions rather than any universal 'natural' facial expressions, and seemed to be interested in understanding if observers could identify the intent of an actor in a particular performance. The interest in art and performance had clear precedent – psychophysics in Germany was developed alongside 'psychological aesthetics', which saw aesthetic response as indicative of broader psychological states.[42] Yet, the legitimating function

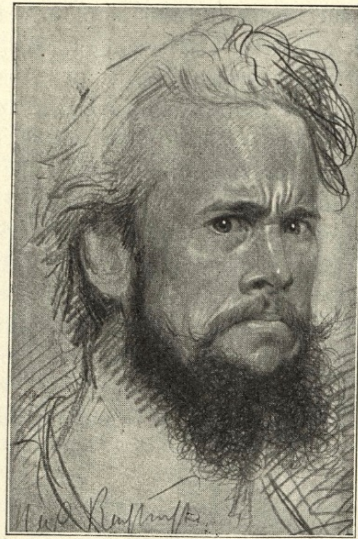
of Darwin (and Piderit) served to suggest that something more fundamental was at stake in the judgment of facial expression.



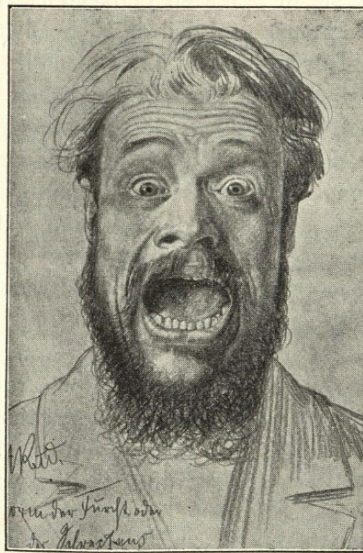
Figs 7a-d: Photographs from Rudolph's *Der Ausdruck der Gemütsbewegungen des Menschen* (1903). Public domain.



Figur 32 (XXX, 17)
Urform Freude.



Figur 33 (XXVI, 2)
Urform böse Erregung.



Figur 27 (VII, 5)
Urform Furcht.

Figs 8a-c: Rudolph's drawings of his model's face from *Der Ausdruck der Gemütsbewegungen des Menschen* (1903). Public domain.

To solve the problem of Piderit's drawings, experiments were conducted using images from another German book of facial expressions intended for the training of artists, Heinrich Rudolph's *Der Ausdruck der Gemütsbewegungen des Menschen* [*The Expression of the Emotions of Man*], which included hundreds of photographic reproductions of a bearded actor simulating a range of expressions along with drawings of faces derived from these images.[43] As was the case with Boring and Titchener's model, there was very low agreement on just what emotions these images were supposed to represent.[44] As psychologist Christian A. Ruckmick argued, this was because of the images themselves: '[t]he collections of facial expressions so far published and available for general use are made up of line drawings of a heavily bearded face that was obviously "touched up" by some artist.' Ruckmick, who is here referring to Rudolph's drawings, not his photographs, thus created his own set of images – of a female student with acting experience – in order 'to see what range of expression we could obtain without such accentuating accessories as a moustache and beard'.[45] At Columbia, the psychologist Antoinette M. Fel-eky produced a similar archive of faces to Ruckmick. Using herself (referred to as A.F.) as her subject in 86 photographs, she asked 100 observers to label her images as expressing a particular emotion from a list of 110 possibilities.[46]



Fig. 9: Christian A. Ruckmick's photographs from 'A Preliminary Study of the Emotions' (1921). Public domain.

PLATE II.



Fig. 10: Antoinette M. Feleký's photographs of herself from 'The Expression of the Emotions' (1914). Public domain.

In the first edition of *Experimental Psychology*, Woodworth tells a story of gradual refinement in empirical studies of facial emotion, both in terms of the material used in experiments and in terms of the general boundaries of empirical study. In the revised edition, Woodworth and Schlosberg claim that, in the first edition, Woodworth, using data from Feleký's study, was able to limit emotions to six categories and would then account for a range of 'near misses' or inconsistencies in naming. This is a slight distortion. In the first edition, Woodworth's six categories were presented as a hypothetical grouping in a table. His categories, while derived from gradually simplifying Feleký's 110 emotions to six, worked consistently with data from a range of prior studies, such as Ruckmick's.[47] In the revised edition, this tentative hypothesis became the following:

After some trial and error, [Woodworth] found the following scale to be satisfactory:

Love, Happiness, Mirth

Surprise

Fear, Suffering

Anger, Determination

Disgust

Contempt

The scale was satisfactory in that a pose which most [observers] judged to be Fear might seem to others to represent a neighboring step, as Surprise or Anger, but was rarely called anything as remote as Love or Disgust.[48]

The Woodworth scale – which, for anyone acquainted with the ‘basic emotions’ of the affect program theorists, should appear familiar – is not a measure of homology or association.[49] It is intended ‘to say how far apart two different expressions are’.[50] In *Experimental Psychology*, this identifies similarity through negation – the posed images of love, happiness, or mirth are grouped together because those images were *not* interpreted as belonging to one of the other general categories, not because people identified ‘happy’ faces as being happy. These categories are less about which images belong in a particular category, but which images *do not* belong.

In 1930, a French doctoral student in psychology at Princeton, Jean Frois-Wittmann, published an article derived from his PhD research, ‘The Judgment of Facial Expression’, for which he created a series of photographs of himself. ‘The face is fairly neutral; there is no indication of clothes, the hair is without parting and unobtrusive; the face is clean-shaven and its muscles are thus plainly visible; the head has been kept in a uniform three-quarter position, and only that mount of tilting necessary for certain expressions is present.’[51] The problems of past studies are presented as about bodies appearing in photos. No longer are we dealing with the bearded actor of Rudolph, clothed, gesticulating wildly, but with a ‘neutral’, seemingly nude male body. The seriality of the photos is enforced, and the lack of continuity in the Rudolph photos is presented as a primary problem. The question of gender is overt. Woodworth’s scale was developed with Feleky’s photos of herself. As Frois-Wittmann put it in a footnote, clearly referring to Feleky’s photos, if not by name:

[o]f course a woman would copy a woman's expressions more readily than would a man. But this does not mean that a man cannot assume them. On the contrary, this is made possible by the plasticity of the facial musculature and the imitative capacity of the subject, which depends for a great part on the ease with which he can identify himself with a woman and assume the feminine attitude (as exemplified by impersonators). As a matter of fact, a feminine expression like Coyness was frequently judged. This attempt at imitating expressions had an interesting bearing on the question of the *learning of a new voluntary movement* ...[52]

The questions of gender and the performance of facial expression implied here are more complex than I can go into,[53] though Frois-Wittmann positions himself as a universal, mutable subject, able to reinvent his face through the control of his facial muscles. In his photographs, specific facial expressions are linked with particular groups of muscular contractions. As Frois-Wittmann notes, his study demonstrates that, unlike Piderit, expressions do not have fixed patterns, and unlike Duchenne, they are not linked with *specific, individual* muscles. Instead, expressions come from particular groups of muscles in the face, which themselves exhibit some level of variability.[54] Frois-Wittmann gets under the skin for the first time in these studies, using his images to suggest that facial expression is not only about a visual relation, but about the biological, embodied aspects of a mutable face – a face that, given sufficient muscular training, could substitute for all others.

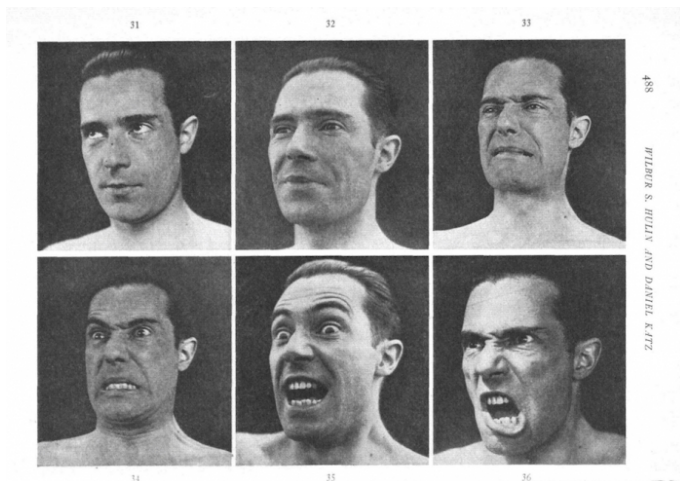


Fig. 11: Examples of the Frois-Wittmann images, from Hulin & Katz (1935). Reproduced according to fair use.

While Frois-Wittmann was the subject in front of the camera, Harold Schlosberg was the photographer behind it. The Frois-Wittmann images were published as a set in the *Journal of Experimental Psychology* in 1935.[55] Over the next twenty years, Schlosberg would perform a range of studies using these images, plotting them through a range of measures to refine the Woodworth scale. Clearly, the posed nature of these images began to bother Schlosberg, especially since the concerns of psychology had, by the 1950s, moved away from the aesthetic judgments that characterised it at the turn of the century. As well, in the years between the publication of the Frois-Wittmann images and the 1950s, the original photographs and negatives were seemingly lost; the only copies available were the published versions. In 1957, with some of his colleagues, Schlosberg published 'A New Series of Facial Expressions', images of Marjorie Lightfoot, a 'leader in college dramatic activities' at Brown. Instead of having Lightfoot pose for particular expressions, the psychologists had her dramatically recreate a scenario narrated by one of Schlosberg's colleagues, with a newspaper photographer taking pictures of her face at his own discretion.[56]

A third edition of *Experimental Psychology* was published in 1971, written not by Woodworth and Schlosberg, but by twenty authors, most of whom were Schlosberg's former colleagues and students.[57] The third edition completely removes the chapters on emotion. In 1965, however, early in his career, Ekman delivered a co-authored paper at the annual convention of the Western Psychological Association, titled 'A Replication of Schlosberg's Evaluation of Woodworth's Scale of Emotion'.[58] Ekman's research until then was focused on hand gestures, not the face, and it was only in 1964 and 1965 that he began his research into facial expression. Ironically, considering Ekman's eventual embrace of a model that identified almost the exact same set of basic emotions as Woodworth, arguing for their universality, this paper claimed that Woodworth and Schlosberg assume too much order in their categories of emotion.[59]

Conclusion: Metadata and the organisation of emotion

The American artist Trevor Paglen's print *Machine Readable Hito* (2017) contains hundreds of images of fellow artist Hito Steyerl's face. In each, Steyerl is making a different facial expression, and each is captioned with the output

of an algorithm designed to detect gender, age, or emotion from facial expression. These captions are similar to those generated through software developed by Microsoft – algorithms that are part of what was once called ‘Project Oxford’, which are now part of a machine-learning platform called ‘Microsoft Azure’. There is a level of continuity between Paglen’s print and what I have described above. We see both the general technique provided by books of faces – the same face, in serial, in a broad range of different poses. We see nearly the same set of emotions identified through computer vision that once comprised the Woodworth scale. The differences are subtle, but perhaps more striking. No longer are the categories discrete. Rather, the algorithm judges the *probability* that a face is making a particular expression, which does not require a forced choice between them. The discreteness of a photograph has been transformed into a range of data points that do not judge precise categories, but emergent possibilities that blur the boundaries of emotional distinctions, distinctions that were initially negative, not associative.

Machine Readable Hito, along with Project Oxford’s emotion detection algorithms, demonstrate that discrete categories of ‘basic’ emotion are, most likely, residual, and exist today as a general heuristic that helps translate what humans see (and judge) with algorithmic processes of generating metadata about an image.[60] As various artificial intelligence-based methods emerge to sort and correlate facial expressions with particular behaviours, I imagine we will see a reinvention of discrete emotional categories. The probabilities judged by algorithms may lead to a sense of facial affect that cannot be linked with particular ‘affect programs’ – that is, unless these categories can be associated with observable, controllable behaviour, often in the service of directing attention and consumption. Rather, we will begin to see the emergence of another way of modulating affect, one derived from books of faces comprised of digital images and metadata, discrete, as they are, at a scale that exceeds the photography of the early 20th century.

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Notes

- [1] The patent acknowledges 'any type of imaging device capable of producing electronic signals representing light'. This speaks of the incommensurability of human vision with what a computer 'sees' as emotion, which does not differentiate between still and moving images in a way that correlates to human sensation. Naveh 2015, p. 3.
- [2] Ibid., p. 4.
- [3] Picard 1996.
- [4] Feng & Rosenberg & Shapiro 2017; Laine et al. 2017.
- [5] Andrejevic 2013.
- [6] Clough 2018; Hansen 2015.
- [7] Leys 2017, p. 66. Film and video have been used as well, often to elicit emotion. Yet, in experimentally identifying emotion (or other signifier of behaviour), film tends to be slowed down to individual frames to 'scrutinise' recorded interaction, with motion emerging from sequences of individual, still frames. See Watter 2017; also see Malin 2014, pp. 157-195; Gross & Levenson 1995.
- [8] Moors 2009, pp. 645-646.
- [9] My use of 'recursion' here refers to the model of media history outlined in Krajewski 2018, pp. 155-159.
- [10] I am thinking of, among others, Karan Barad, Jonathan Crary, Lorraine Daston, Peter Galison, Friedrich Kittler, and Timothy Lenoir.
- [11] Weigel 2012, p. 33.
- [12] Siegert 2015, p. 11.
- [13] I am following the claims of Karen Barad that – following an analysis of quantum mechanics – laboratory techniques and scientific claims about reality are material and 'intra-active', refusing a distinction between 'natural' and 'cultural'. See Barad 2007, and see Bollmer 2019 for my elaboration of this perspective. For more on my interpretation of Siegert, see Bollmer 2018, pp. 37-57.
- [14] Moors 2009, p. 645.
- [15] For an outline of FACS in research, see Ekman & Friesen 1978. For an overview of FACS in the history of emotion detection technology, see Gates 2011, pp. 151-190.
- [16] Izard 1971; Panksepp 1998.
- [17] For instance, see Turner & Stets 2005, p. 3; Richardson 2010, p. 66; Grodal 2009, p. 18.

- [18] Fridlund 1994; Leys 2017, p. 252.
- [19] Barrett 2017. Russell and Barrett's theories are highly contested from a range of perspectives. Ruth Leys critiques both Russell and Barrett, and goes so far to claim there 'is no intellectually viable alternative to Fridlund's position'. Leys 2017, p. 368.
- [20] For instance, Hayles 2017, Malabou 2012, Noë 2015, Sampson 2017. Bollmer 2019 summarises some of these positions.
- [21] Leys 2017.
- [22] Didi-Huberman 2003.
- [23] Winston 1990.
- [24] Benjamin 1999, pp. 510-512.
- [25] Ibid., p. 695.
- [26] Pearl 2010, p. 11.
- [27] Lavater nd. [1800?], p. 11.
- [28] Ibid., p. 66.
- [29] This is central to the history of 'empathy'. See Mallgrave & Ikonomidou 1994.
- [30] For publishing details about the books of these authors – aside from Piderit and Rudolph – see Smith 2006, pp. 179-213.
- [31] Cf. Didi-Huberman 2003.
- [32] Smith 2006, pp. 216-218.
- [33] Darwin 1965.
- [34] There is wide agreement that Darwin's emotions book must be historically contextualised, but there is significant disagreement as to why. Jonathan Smith suggests that Darwin be situated in relation to the authors he is drawing on and differentiating himself from. Eric Korn and Paul Ekman argue that Darwin censored himself to avoid offending Victorian Christians. I think Korn and Ekman's requires a retrojective projection of Ekman's arguments into the original text when there is scant evidence for these claims in the text itself. As well – as I argue below – this ignores Darwin's criticism of Piderit, who *does* make the argument Ekman attributes to Darwin. Smith 2006, pp. 179-180; Korn 1998.
- [35] See Piderit 1886. Darwin's references to Piderit are rarely discussed in Anglophone scholarship.
- [36] Smith 2006, p. 202.
- [37] Ibid., p. 208, p. 221.
- [38] Woodworth 1938, p. 243.
- [39] Ibid., p. 244.
- [40] Boring & Titchener 1923.
- [41] Woodworth 1938, p. 247.
- [42] Cf. Jarzombek 2000.
- [43] Rudolph 1903.
- [44] Woodworth 1938, p. 248.
- [45] Ruckmick 1921, p. 31. For more on Ruckmick, see Malin 2014, pp. 157-195.
- [46] Feleky 1914.

- [47] Woodworth 1938, p. 251. This practice also tells us something about lists as cultural techniques. See Young 2017.
- [48] Woodworth & Schlosberg 1954, p. 118.
- [49] Today's 'basic emotions' model includes sadness and does not always include contempt.
- [50] Woodworth & Schlosberg 1954, p. 124.
- [51] Frois-Wittmann 1930, pp. 116-117.
- [52] Emphasis in original. Ibid., p. 117.
- [53] For more on this, see Taussig 1999.
- [54] Frois-Wittmann 1930, pp. 134-135.
- [55] Hulin & Katz 1935. Frois-Wittmann returned to France after his Ph.D. and would reject empirical psychology for psychoanalysis. He was one of the first French psychoanalysts to engage directly with surrealism. He died in 1937 at the age of 45. See Roudinesco 1990, p. 9.
- [56] Engen & Levy & Schlosberg 1958, p. 264. The experiments performed with the Frois-Wittmann images were repeated with the Lightfoot images in Levy & Schlosberg 1960.
- [57] Kling & Riggs 1971.
- [58] Boucher & Ekman 1965.
- [59] See Frijda 1969, p. 188.
- [60] Hui 2016, p. 1.