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EXPRESSIONS AND EMOTION DETECTION

Emotion-Recognition Technology: Promise and Flaws

Along with facial recognition, one of the fields in which AI-driven facial technology is being most clearly deployed commercially is in the detection of emotional states. It is claimed that such technology, via the detection and interpretation of facial expressions, can, amongst other things, help companies recruit the perfect employee, assess the reaction of customers to products and promotions, develop TV programmes and films, measure the engagement of students in classrooms, and detect people with possible criminal intent.[1] Some researchers even propose that the ability of computers to recognise emotional states might lead to intelligent machines expressing and having emotions.[2] The emotion-recognition industry is undergoing a period of rapid growth, with some reports indicating that the market for emotion-detection was worth $12 billion in 2018. According to some estimates, the industry was projected to have grown to over $90 billion by 2024, although this is most certainly an understatement.[3]

Some of those involved in the development and sale of emotion-detection systems are significant IT players in their own right. Amazon, for example, claimed in 2020 that its Rekognition software allowed those who deploy it to 'get information about where faces are detected in an image or video, facial landmarks such as the position of eyes, and detected emotions (e.g., appearing happy or sad)'.[4] Similarly, Microsoft's Azure Face was said to enable its purchasers to:

> Embed facial recognition into your apps for a seamless and highly secured user experience. No machine learning expertise is required. Features include: face detection that perceives faces and attributes in an image; person identification that matches an individual in your private repository of up to 1

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> million people; perceived emotion recognition that detects a range of facial expressions such as happiness, contempt, neutrality and fear; and recognition and grouping of similar faces in images.[5]

There are numerous other firms in the field that are more niche players. For example, the company Affectiva claimed that, amongst other products, its:

> industry-leading Emotion AI … provides deep insight into unfiltered and unbiased consumer emotional responses to brand content. Based on this, brand owners can understand if their campaigns are working as intended, what makes them sing and how to create more effective edits.[6]

Affectiva was founded by Rana el Kaliouby and Rosalind Picard, spinning it out of the MIT Media Lab in 2009.[7] This stress on marketing applications reflects a recent turn in market research towards the close study and measurement of emotions, evident in the publication of a number of works in the field since the early years of the twenty-first century.[8] Similarly, a Danish company claimed in 2020, amongst other things, that 'With IMotions you can take a clear step towards objectively understanding what really drives the shopping experience and purchase decisions'. Its clients were said to include GSK, Deloitte, BMW, Procter and Gamble, Unilever, and Expedia.[9] In addition, affective technologies can be used to improve human/machine interactions, which are increasingly the basis of customer services.[10] It might be argued that such companies are merely discovering what potential clients actually want or seeking to encourage them to realise what their true desires are. However, this might also be seen as a variety of 'libertarian paternalism',[11] in which, to paraphrase the Enlightenment thinker Jean-Jacque Rousseau, people are persuaded to be free (to consume).

In a slightly different context, VCV, a company that sold digital recruitment tools, provided in 2019 a means of recording videos of potential company recruits answering a series of questions. It claimed that its 'facial and voice recognition [product] identifies a candidates' nervousness, mood, and behaviour patterns to help recruiters assess whether a person is a good cultural fit for the company'. So confident was one company, L'Oreal, in the power of these tools that a refusal on the part of a student applying for an internship to provide such a video recording was taken as evidence of a lack of motivation. The company was reported as saying, somewhat tersely, that 'The agreement to make video answers is the additional selection criteria for us'.[12] Clearwater, a Maltese start up, also used micro-expressions recorded in videos to help identify 'the most suitable person for the task in hand'. They had even claimed that their technology could be used in private life to 'find better ways to communicate in your relationship. Know how your

loved ones operate'.[13] Such examples could be multiplied, with new ventures being launched on an ongoing basis.[14]

In addition, the MIT Media Lab developed 'My Automatic Conversation Coach', a system in which potential interviewees could practice their interaction skills with an online avatar, which gave them guidance as to how to improve their expressions and gestures. According to Rosalind Picard from the MIT Media Lab, those who undertook the training were judged better candidates for jobs.[15] However, if expression AIs could be used to game expression AIs in this manner, this raises the question of whether expressions necessarily give access to emotions in the first place. The EU's rules on AIs, issued in 2024, defined AIs used in recruitment as 'high-risk' because of their potential impact on the career prospects and livelihoods of individuals, and they need regulation as a result.[16] Similarly, the UK Information Commissioner has warned companies not to use the technology since it is 'not backed by science'.[17] Companies launching such AI products have been accused of exaggerating what such technology can do.[18] It has also been difficult to interrogate the underlying workings of some of these systems because their algorithms, as proprietary software, are off limits.[19]

Once recruits actually start working for companies, their 'affective states' can also be monitored as part of 'algorithmic management' in order to ensure they are working at maximum efficiency. However, the opacity of this surveillance can result in increased anxiety amongst the workforce, although this appears to vary according to culture and region.[20] It has been suggested that the introduction of such technology is part of a broader 'neo-Taylorist' project to increase the extraction of value from the workforce.[21] This is perhaps an extension of what Arlie Russell Hochschild has described as the 'commercialization of human feeling' in her book *The Managed Heart*. Workers are expected to express certain forms of emotion to customers of companies, to be happy to serve them, for example, and this is part of the value of the service they sell.[22] The smile represents, therefore, a monetary value as well as an emotion, although both can come to be measured. A 2020 study of human resources professionals representing 500 mid-sized organisations from a range of industries in five different countries found that 24 per cent of businesses had already implemented AI for recruitment purposes, and 56 per cent of recruitment managers planned to adopt it in the following year.[23]

Such systems may potentially be deployed at international borders for immigration control. From 2007 to 2013, the US Transportation Security Administration (TSA) spent $900 million on a 'behaviour-detection programme' entitled Screening Passengers by Observation Technique (SPOT), which was deemed scientifically invalid by the Department of Homeland Security and the Government Accountability Office and was accused of racial bias.[24] Similarly, the EU funded a research project to create a 'smart

lie-detection system', as part of a wider electronic border control system imaginatively dubbed IBORDERCTRL. The intention was that:

> travellers will use an online application to upload pictures of their passport, visa and proof of funds, then use a webcam to answer questions from a computer-animated border guard, personalised to the traveller's gender, ethnicity and language. The unique approach to 'deception detection' analyses the micro-gestures of travellers to figure out if the interviewee is lying.[25]

However, the research project, the first phase of which was completed in 2019, was the subject of court proceedings in Europe in an attempt to make the project's evaluation documents public.[26] The system had caused controversy after it was tested in Greece, Latvia, and Hungary.[27]

These digital systems draw to a considerable extent upon the extensive work of the eminent US psychologist Paul Ekman, especially his Facial Action Coding System (FACS). This is an anatomically based system for describing the universe of observable facial movements said to be associated with emotions.[28] As will be described below, his work involved showing subjects photographs of facial expressions and then getting them to apply defined 'emotion labels' – 'happiness', 'fear', 'surprise', 'anger', 'disgust', 'contempt', and 'sadness' – to them. Given Ekman's centrality to the modern study of the relationship of expressions to emotions and his own work on the history of the subject, his ideas will be considered in more detail below. It should be noted, however, that himself launched a commercial venture, Paul Ekman Group Training. In 2020, for $299, one could purchase access to his All Face Advanced Training, an online guide to recognising expressions. This includes a Subtle Expressions Training Tool, covering:

> the very "mini" expressions that often appear in just one region of your face, such as the brows, eyelids, cheeks, nose, or lips. They can occur when a person is trying to conceal a strong emotion — subtle expression can leak, exposing the true emotion in a tiny change in expression.

His Micro Expressions Training Tool was said to be 'appropriate for those whose work requires them to evaluate truthfulness and detect deception, such as police and security personnel, as well as those in sales, education, and medical professions'. The purchasers of his various applications, said to be 'more than 50,000 users worldwide', included organisations such as iDisney, Apple, the Harvard Business School, the CIA, KPMG, and the Salk Institute.[29]

Some experimental researchers have moved beyond using systems such as Ekman's FACS for the detection of emotions to argue that the codification of expressions can be used to identify 'personality' as well as emotions. It has been argued by some psychologists that emotions are linked to other emotions

and that these help to structure images, thoughts, and ways of thinking. In very crude terms, someone who has experienced happiness will tend to build up a positive outlook and so continue to have positive emotions, which further reinforce their positive outlook.[30] Whether this goes much beyond having a 'half glass full' versus a 'half glass empty' personality is, of course, debatable. This model of personality has been linked to facial expressions, themselves seen as markers of emotions. Thus, US psychologists LeeAnne Harker and Dacher Keltner have argued that smiling reflects a positive personality, which is typified by people being enthusiastic, outgoing, energetic, assertive, adventurous, and humorous. This, in turn, leads to more positive life experiences. They sought to prove this by using the FACS system to code the photographs of a group of women in school yearbooks on an 'emotionality scale' from positive to negative. Women were then interviewed at ages 27, 43, and 52 to see if they were married or not and whether they experienced marital tension. Positive emotional expressions in the yearbook pictures were expected to predict future marital status, and they argued that:

> Consistent with this expectation, women displaying more positive emotion were more likely to be married by age 27 and were less likely to remain single into middle adulthood. We also expected individuals expressing more positive emotion to have more satisfying marriages. Consistent with this view, positive emotional expression correlated positively with marital satisfaction at age 52 and negatively with marital tensions at ages 27 and 52, although these latter correlations were not significant. Positive emotional expression was not significantly related to getting divorced or to marital satisfaction at age 43.[31]

These arguments, of course, equate marriage with personal fulfilment, which may, in turn, reflect a particular set of American values. The model also appears to bear some passing affinity with the Classical Greek concept of *kalokagathia* to be discussed in the next chapter, in which external beauty (defined by Harker and Keltner as a 'positive' expression) was seen as reflecting internal virtue. It is highly unlikely, however, that ancient Athenian philosophers would have spent much time asking their wives about their marital experiences.

Similarly, Mihai Gavrilescu and Nicholae Vizireanu, two Romanian scholars, writing in the *EURASIP Journal on Image and Video Processing* in 2017,[32] claimed that their video-based analysis of facial expressions using Ekman's FACS system enabled them to predict aspects of personality. They used the well-developed Sixteen Personality Factor (16PF) system based on questionnaires already mentioned[33] to identify facets of experimental subjects' personalities, such as warmth, emotional stability, liveliness, sensitivity, self-reliance, social boldness, vigilance, rule consciousness, tension, and so on. Using Ekman's FACS system to predict these personality traits from videos of the same

individuals, they claimed to have obtained over 80 per cent prediction accuracy for warmth, emotional stability, liveliness, social boldness, sensitivity, and vigilance, as well as over 75 per cent prediction accuracy for rule consciousness and tension. For the other 16PF traits, the prediction accuracy was said to be 60 per cent to 70 per cent. Why, they asked, does one need to undertake the lengthy 16PF questionnaire process when their digital system can produce such results in minutes from expressions shown in videos? As already noted, Chinese computer scientists have made similar claims with respect to correlating facial geometry and 16PF traits.[34]

Nevertheless, given all this scientific and commercial activity, much of it based on Paul Ekman's work over a career of 50 years (itself, as we shall see, based on research going back into the nineteenth century), it is odd how a diffident note crept into some claims being made for emotion-detection systems. For example, despite the apparent assertion on the Amazon Rekognition website that the system allowed one to detect sadness in faces, when one delved deeper into the product developer's guide, one could find a statement to the effect that the system:

> is only making a determination of the physical appearance of a person's face. It is not a determination of the person's internal emotional state and should not be used in such a way. For example, a person pretending to have a sad face might not be sad emotionally.[35]

Similarly, Microsoft noted on its Azure website that its Face system detected 'perceived' facial expressions denoting such things as anger, contempt, disgust, fear, happiness, neutrality, sadness, and surprise. However, it added that it 'is important to note that facial expressions alone do not represent the internal states of people'.[36] This may explain why Microsoft phased out general public access to Azure Face.[37] Interestingly, one of the leading video interviewing firms, HireVue, has abandoned the use of visual analysis in its assessment models.[38]

Contemporary Critiques of the Model Underlying Expression AIs

Despite the widespread use of the FACS system, there have been claims that there are fundamental problems with the model of emotions/expressions assumed in Ekman's work and the commercial applications already discussed. Indeed, Lisa Feldman Barrett has gone as far as to describe the notion of universal emotions as a 'myth'.[39] Given the complexities of the debates in the field, all that can be attempted here is to raise some issues that are relevant to the broader historical developments discussed below.

The recognition of expressions plainly has some physiological basis, as can be shown from the problems that people with some forms of brain damage have

in interpreting them.[40] However, one criticism of Ekman's specific work on emotion detection is that he constrained how his subjects could describe facial expressions by limiting their replies to his restricted number of 'expression labels' – 'happiness', 'fear', 'surprise', 'anger', 'disgust', 'contempt', and 'sadness'.[41] Rana el Kaliouby has pointed out that Ekman's six emotions are far too few for the effective development of affect technologies.[42] However, Ekman has pointed out the degree of uncertainty with which his fellow researchers agree with all the 'emotion labels' that have subsequently been identified. Thus, in a 2016 paper in *Perspectives on Psychological Science*, entitled 'What scientists who study emotion agree about', he revealed the results of a survey he had undertaken to establish which 'emotion labels' (out of a list of 18) should be considered to have been empirically established. There was relatively high agreement about only five emotions: anger (91 per cent), fear (90 per cent), disgust (86 per cent), sadness (80 per cent), and happiness (76 per cent), whilst shame, surprise, and embarrassment were endorsed by 40 per cent to 50 per cent. Other emotions, currently under study by various investigators, drew substantially less support: guilt (37 per cent), contempt (34 per cent), love (32 per cent), awe (31 per cent), pain (28 per cent), envy (28 per cent), compassion (20 per cent), pride (9 per cent), and gratitude (6 per cent).[43] Moreover, as we shall see below, the very process of labelling may be problematic.

Others have gone even further, however, and queried whether we can talk about specific emotions at all, arguing that there are no objective measurements that can identify an instance of one emotion category compared with an instance of another. Siegel *et al.*, for example, claim that there is currently no reliable relationship between an emotion category, such as 'anger', and a specific set of cardiovascular, respiratory, and perspiration changes that accompany the instances of that label.[44] This is an extreme position, and if simple emotions do not exist, then how can expressions communicate them? Similarly, if emotions are not physical at all, then what are they – linguistic constructions or the movements of the soul in Descartes or Aristotle's sense?

As will be described below, Ekman followed previous Western thinkers in proposing a universal understanding of emotions, although his own work showed problems in the case of the recognition of some emotions by his non-Western subjects. Moreover, other research has shown similar issues with regard to Chinese research participants. This can be seen, for example, in an experiment by David Chan, who presented 50 undergraduate medical students at the Chinese University of Hong Kong with photographs showing various paired emotions: interest-excitement, enjoyment-joy, surprise-startle, distress-anguish, anger-rage, disgust-revulsion, contempt-scorn, fear-terror, and shame/shyness-humiliation. He found quite high agreement with Western observers for most of the pairs, but that interest-excitement was predominantly misidentified by his Chinese students as surprise-startle and disgust-revulsion as distress-anguish.

To a lesser extent, fear-terror was identified as surprise-startle.[45] Given the extent to which Ekman's work underpins the burgeoning use of emotion detection in China in order to enforce public security, driving safety, and pupil attention in classrooms, these results are somewhat concerning.[46] Questions relating to the universal application of Ekman's categories have been raised more generally by scholars such as James A. Russell.[47] That expressive patterns depend on social and cultural contexts is also accepted by leading affect technologists such as Rosalind Picard and Rana el Kaliouby.[48]

Others go still further and argue that people who live in some non-Western cultures perceive facial movements not as expressions of emotions but as predicting future actions in certain situations – a wide-eyed, gasping face is simply described as 'looking'.[49] If these researchers are correct, then certain expressions are not universally understood as expressing simple emotion and may not be expressing emotions at all. Is this suggested misunderstanding a reflection of the assumptions embedded in Western ways of understanding the nature of the person over the course of millennia? Such issues have important practical significance because many of the people who are annotating images to teach AIs to identify expressions have differing cultural backgrounds from those who will be subjected to them.[50]

In addition, there may be problems with assuming that all people within even a single culture use and understand the emotions embedded in facial expressions in the same manner. This may be especially true of those persons with autism spectrum 'disorder' (ASD). Numerous studies have observed atypical recognition of others' emotions via expressions in this population.[51] In a recent paper, it was also reported that when those with ASD were asked to pose basic emotions (Ekman's happiness, sadness, fear, surprise, anger, and disgust), non-autistic, or 'neurotypical', observers were less able to identify the emotions posed than when the emotions were posed by 'neurountypical' individuals.[52] The authors of the paper suggested that this phenomenon might be due 'to atypical internal representations of the physical features of emotional expressions, limited understanding of the communicative value of emotional expressions, or poor proprioceptive or motor feedback when producing emotional expressions'.[53] All of which would tend to problematise the validity of the dominant model of emotion expression discussed above.[54] Interestingly, Affectiva is developing systems to interpret facial expressions for people on the autistic spectrum, although once more, this problematises the supposed universality of expressions.[55] Of course, this assumes that the 'neurotypical' always show certain expressions when they are experiencing certain emotions, but there is evidence that this is not the case. People who are angry, for example, may only scowl some of the time.[56]

There is also the whole question of the importance of the context in which expressions are said to reflect emotions.[57] Ekman and his successors have tended to argue that expressions are an unmediated expression of emotions.

However, if the same facial movements can have differing meanings in differing contexts, then these arguments would be undermined. In the 1980s, for example, Harald G. Wallbott showed research participants video clips from films and TV shows depicting an emotional situation, followed by an emotional facial expression of male and female actors in reaction to this situation. Three groups of participants each watched: (a) only the first takes of the clips depicting an emotion-arousing situation; (b) only the second takes of the clips presenting the emotional facial expression; or (c) combinations of both takes depicting the emotion-arousing situation, followed by the facial expression. Their task was to judge the emotion(s) expressed by the person in the given situation. Wallbot's results indicated that context information was more important than person information in determining emotion attributions. Furthermore, there were differences due to the gender of the actors – when watching female actors, personal information dominated judgements; when watching men, situational information was dominant.[58] More recently, Alexander Todorov in his *Face Value: The Irresistible Influence of First Impressions* has shown how a photograph of a man showing an apparent expression of anger can be turned into one showing disgust simply by putting a soiled nappy into the man's hand in the photograph.[59] The importance of context has also been noted by Rosalind Picard and Rana el Kaliouby when discussing smiling and other expressions.[60]

If expressions need to be understood in particular contexts, then AI systems which only measure facial movements may misconstrue the import of the emotions being expressed. There is some support, however, for the contention that to a significant extent, the same expressions are used in similar contexts across the world, as shown by the recent work of Cowen, Keltner, Schroff, *et al.*, who asked respondents in differing regions to label expressions in videos of particular events. However, there may still be labelling effects here, and in some 30 per cent of cases, the overlap was not complete despite the possible development of an international visual culture.[61] The question of context also creates problems for AI systems since they are not embodied entities that interact with what the German philosopher Edmund Husserl (1859–1938) described as the 'life-world' – the universe of what is self-evident or given that subjects may experience together.[62] An AI system could not understand the difference between the expressions in Todorov's example mentioned above if it did not understand what a nappy was, what it was used to capture, and what effect this might have on a middle-aged man.

The issue of coaching for interviews, mentioned above, raises the whole question of the faking of expressions by actors, fraudsters, or in general conversation. In her autobiography, Rana el Kaliouby seems to dismiss this by pointing to a waitress dealing with difficult customers whose smile does not reach her eyes.[63] Yet she also sees women smiling as part of her Muslim upbringing.[64] The implication is that one cannot easily fake emotions, although

people do this every day. Rosalind Picard attempts to get around this by positing different pathways for the production of fake and 'natural smiles':

> Neurological studies indicate that *true* emotions travel their own special path to the motor system. … In other words, an intentional smile travels a different path than a spontaneous one. The cognitively-generated command to smile does not express itself in the same way as a genuine feeling of happiness expresses itself. Not only does this imply that, physiologically, false and sincere smiles may be discriminated, but illustrates the existence of multiple paths, multiple causes, for emotional expression.[65]

However, this is merely a distinction between ways in which smiles are produced; it does not say anything about the smiles themselves. Despite such arguments, it is clear that actors and fraudsters can produce expressions that appear to reveal inner emotions, and the concept of faking facial expressions and character is, of course, an old one. Thus, in *The Divine Comedy*, when Dante (1265–1321) descends into the eighth circle of Hell, Malebolge, where those guilty of fraud are punished, it is on the back of the monster Geryon. Dante described Geryon, the personification of Fraud, as a beast with the paws of a bear or lion, the body of a wyvern, and a scorpion's poisonous sting at the tip of his tail, but with the face of a 'just man'.[66]

Where might these doubts about what emotions are shown by expressions, or whether expressions in fact show emotions at all, come from? One way into this question is by looking at the history of the development of the field of emotion detection from facial movements to understand the context within which claims are made and the disagreements that have arisen. This is, of course, a vast field of research (in his survey of his peers noted above, Ekman identified no fewer than 250 researchers working on emotions), and all that can be attempted here is to give a brief outline of some of the principal historical contributions to the debates. The nature of emotions is an extremely complex philosophical question[67] , but it will not concern us directly here when discussing their relationship to expressions, especially in digital applications.

Emotions, Expressions, and the Greek and Christian Soul

The contemporary model of expression implied by the commercial ventures already discussed is that there is a unitary person who has a series of simple emotions or feelings that lead directly to a set of universal facial expressions that are generally understood by all other human beings. There are a number of questions that could be raised about this formulation – is the 'person' in fact unitary, or is he or she a composite of conflicting drives as psychoanalysts such as Freud would have claimed; are there simple emotions, or can people experience conflicting emotions at the same time; how far are there universal expressions; are expressions understood by all people in the same way; and can

expressions be understood as unmediated one-to-one communication, or are there other factors than the expressions themselves that have to be taken into consideration? One of the latter is context, where the meaning of facial movements can mean different things in different situations. Nevertheless, this simple model of expressions and their relationship to emotions has a very long history in the West and certainly one that goes back much further than a supposed nineteenth-century physiognomic model, as some have implied.[68]

For the author of *Aristotle's Physiognomonica* of the early third century BC, expressions were seen as part of an individual's physiognomy, understood in the round:

> I will give a complete list of the sources from which physiognomic signs are drawn. They are these: movements, gestures of the body, colour, *characteristic facial expression*, the growth of the hair, the smoothness of the skin, the voice, condition of the flesh, the parts of the body, and the build of the body as a whole.[69] [my italics]

As already noted, the unitary person reflected in the body was the soul, and the soul was the immanent potential of the human body. Since for Aristotelians the nutritive soul was the form and organising principle of the human body, there was no conceptual or physical gap between the soul, the person, the emotion, and the facial expression.[70] What affected the soul would naturally affect the body and vice versa. The understanding of facial expressions was also universal amongst human beings since the human soul was also universal. Those who could not understand the emotions of other human beings were simply not human because it was the *telos*, or inherent purpose or end, of human beings to be sociable. Since, for Aristotle, the act of seeing involved the projection of the forms of bodies from objects into the eye through the aether, there was hardly any way in which humans could not see the souls of others directly.[71] Thus, there was no question that anything other than communication between souls was involved in the communication of emotions via expressions. Thus, context was irrelevant.

This formulation could become problematic in Christian thought, however, when the body and the soul were seen as distinct entities that could exist independently and could even be understood as in opposition. The body and the soul might be reunited at the Final Judgement, but in the meantime, the soul exists independently in either Heaven, Hell, or Purgatory. As we have already seen when considering physiognomy and character in Chapter 3, for much of the medieval and early modern periods, the prestige of Aristotelian thought and Neoplatonic ideas on signatures could continue to allow the form of the body to stand as a proxy for the soul. However, as Naomi Baker has shown, in the early-modern period, there was an endless tension between the body, especially the ugly body, as representing the soul and the body as a false representation of inner nature. Beauty, especially that of women, could be seen as a mask for evil, whilst ugliness, usually of men, could hide inner nobility.[72]

The body/spirit duality inherent in Christianity was taken to its ultimate conclusion by René Descartes, for whom the physical world and the human soul were radically distinct.[73] This implied that since animals had no human souls, they were simply machines or automata.[74] Then, how could human beings exist both as spiritual and material beings, and how could states of the soul be communicated? Descartes answered these questions by replacing the form of the body with the movements of the muscles of the face and body as signifying the hidden motions of the soul.[75] He believed that there were six 'primitive' emotions from which all others were derived: admiration, love, hate, desire, joy, and sadness.[76] Descartes and his followers posited that God had so designed Creation that external objects had 'dispositions' that made them set up various kinds of motions in the body's nerves, which set up sensations in the soul via the pineal gland in the brain. Similarly, the soul's act of willing set up motions in the pineal gland, which in turn moved 'animal spirits' to the nerves, which moved the limbs and facial muscles. Descartes hit upon the pineal gland as the site of this interchange between material and immaterial existence because it was a single, rather than a binary, organ in the brain and therefore indivisible like the Christian soul.[77]

So, although the soul was no longer the bodily form as in Aristotle, expressions were still universal because the human soul was universal. Expressions could be understood by other humans and were one-to-one communications because that is how God intended it. This way of understanding expressions also drove a wedge between physiognomy and expressions; the former became a means of reading the nature of the soul via the structure of the body rather than facial movements as direct communication. This contrast also underlay the distinction which Johann Lavater later drew between physiognomy, as the study of the face at rest, and 'pathognomy' as the study of the face in motion.[78] Such distinctions have been ignored by those who have tried to understand the theory of expressions in terms of the undoubtedly racist ideology of physiognomy.[79] Indeed, in some sense, the theory of expressions led to a belief in the universality of humanity, as we will consider shortly. For Lavater, since expressions were to some extent under human control, they could be deceitful, whilst the signs in physiognomy were a God-given language and so superior.[80] This might explain the primacy Lavater gave to the profile in his work, where expressions were obscured.[81]

Descartes' model influenced the arguments regarding expressions to be found in a key paper that Charles Le Brun, Louis XIV's court painter, gave to the French Royal Academy of Painting and Sculpture in 1668 entitled *Methode pour apprendre a dessiner les passions propose dans une conference sure l'expression generale et particuliere*.[82] For Le Brun, expressions, especially those associated with the eyes and eyebrows,[83] reflected the emotions in the soul working through human physiology[84] (Figure 4.1). He argued that:

> Passion is a movement of the soul, which resides in the sensitive member, that which is produced by an attraction to what the soul thinks is good, or a

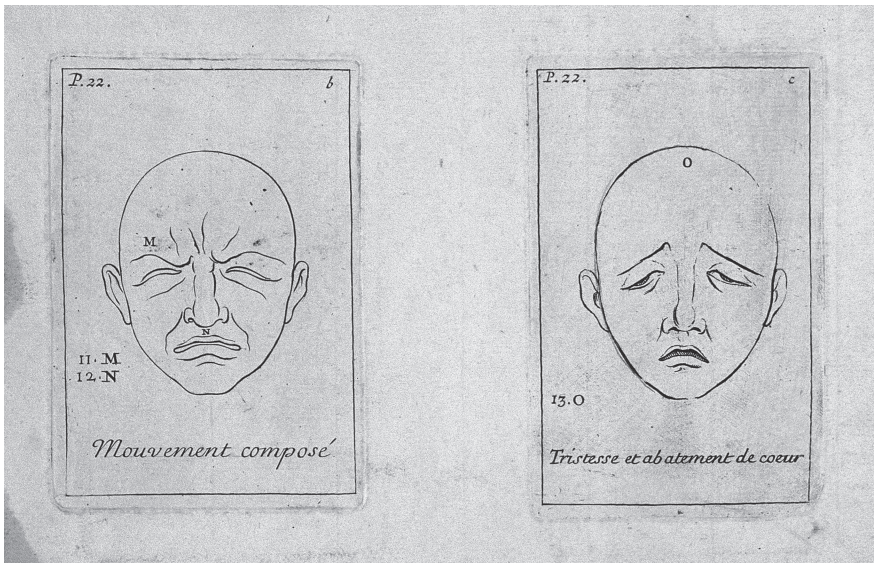

FIGURE 4.1 Outlines of faces making mixed and contrary muscular movements (left) and sadness and dejection (right). Etching by B. Picart, 1713, after C. Le Brun.

Source: Wellcome Collection, https://wellcomecollection.org/works/qdhayafr.

> reaction to what it perceives to be bad; and ordinarily that which causes passion in the soul, creates some movement in the body. … Action is nothing more than the movement of some part, and the movement is merely made by the change in muscles which have movement only because of the extremities of the nerves that pass through them, the nerves are only agitated by the spirits which are contained in the cavity of the brain…' [my translation][85]

This cavity was analogous to Descartes' pineal gland. According to Le Brun, such an understanding of the role of facial expressions would allow painters and sculptors to render emotions more accurately in their artistic productions. As will be shown later, a similar concern with artistic conventions in the portrayal of the face, especially with regard to the depiction of differing races, was to be found in the later work of Petrus Camper in the eighteenth century. Le Brun bridged the gap between physiognomy and pathognomy by positing a characteristic movement of the eyebrow or eye as reflecting a certain type of soul. Thus, an eye that sloped downwards, for example, indicated a 'base' kind of soul.[86] However, as in the case with physiognomy already discussed, Le Brun took no account of the long history of the use of makeup, plucking, and grooming to alter the shape of eyebrows.[87]

Despite the onset of the Scientific Revolution, such ideas, if not the emphasis on the pineal gland, could still be found in the early nineteenth-century

work of the Scottish surgeon and anatomist Sir Charles Bell (1774–1842). Whilst the likes of Descartes and Le Brun talked in general terms about the role of the nervous system, Bell had undertaken actual anatomical research into its configuration. In a privately circulated book of 1811, *An Idea of a New Anatomy of the Brain*, Bell described his findings that the different nervous tracts were connected with different parts of the brain and thus had different functions.[88] His discovery of the differences between the sensory and motor nerves is seen by many as the basis of modern clinical neurology, and his work is still reflected in the name of the disorder known as Bell's Palsy, which he first described in 1821.[89]

However, Bell was also a committed Christian, and like many early-nineteenth-century men of science, he was concerned to show that the new scientific discoveries of the age did not undermine the established Christian religion. In this, he and others were following the lead of William Paley, who, in his *Natural Theology or Evidences of the Existence and Attributes of the Deity Collected from the Appearances of Nature* of 1802, argued that the intricate and efficient workings of nature indicated the existence of a divine Creator.[90] It should come as no surprise, therefore, that Bell was a contributor to the influential series of *Bridgewater Treatises*. These were composed under the provisions of the will of Francis Henry, Earl of Bridgewater, who died in 1829, for the publication of works 'On the Power, Wisdom, and Goodness of God, as manifested in the Creation'.[91] Bell wrote the fourth treatise in the series, *The Hand: Its Mechanism and Vital Endowments, as Evincing Design*.[92] The hand of God has, of course, a unique role to play in the Judeo-Christian tradition and Western art[93] but Bell also saw the hand of man as showing the workings of God since 'there is Design in the mechanical construction, benevolence in the endowments of the living properties, and that good on the whole is the result'.[94] Bell's ideas, on the hand, as evidence of divine creation and human intelligence, continued to have influence well into the nineteenth century.[95]

Bell also understood expressions in the same manner as reflecting God's dispensation to Man.[96] He explained in his *Essays on the Anatomy and Philosophy of Expression* of 1824 that he saw the facial muscles of man as being peculiarly constituted for expression since:

> Attending merely to the evidence furnished by anatomical investigation, a remarkable difference is to be found between the anatomy and range of expression in man and in animals: In the former there seems to be a systematic provision for that mode of communication and that natural language, which is to be read in the changes of the countenance; there is no emotion in the mind of man which has not its appropriate signs; and there are even muscles in the human face, to which no other use can be assigned than to serve as the organs of this language.[97]

For Bell, these muscles supposedly peculiar to the human face allowed expressions which were a 'universal language which has been called instinctive, which at least produces something like the effect of innate sympathy and seems to be independent of experience or arbitrary custom'.[98] The nerves linked to these muscles formed part of a chain of relations between the mind and the material world, without which the 'immaterial principle', or mind/soul, could not act or be acted upon.[99] Unlike Descartes and Le Brun, Bell did not locate exactly where the interchange between soul and body took place, but he assumed that it did indeed take place and that the expressions produced in the process were universal, and peculiar to human beings because only human beings had a soul and thus were universally understood by all people as part of God's plan (Figure 4.2).

Bell's anatomical work influenced Guillaume-Benjamin-Amand Duchenne de Boulogne (1806–1875), the French neurologist, who sought to determine how the facial muscles produced expressions. In order to do so, he triggered muscular contractions in the faces of his hospital patients with electrical probes, photographing the resulting exaggerated expressions (Figure 4.3). Duchenne

FIGURE 4.2 Charles Bell, Essays on the anatomy of expression in painting, London: Longman, 1806. Page 142 – Wonder/Fear/Astonishment.

Source: Wellcome Collection, https://wellcomecollection.org/works/stg6p5sv.CC BY 4.0 [https://creativecommons.org/licenses/by/4.0/).

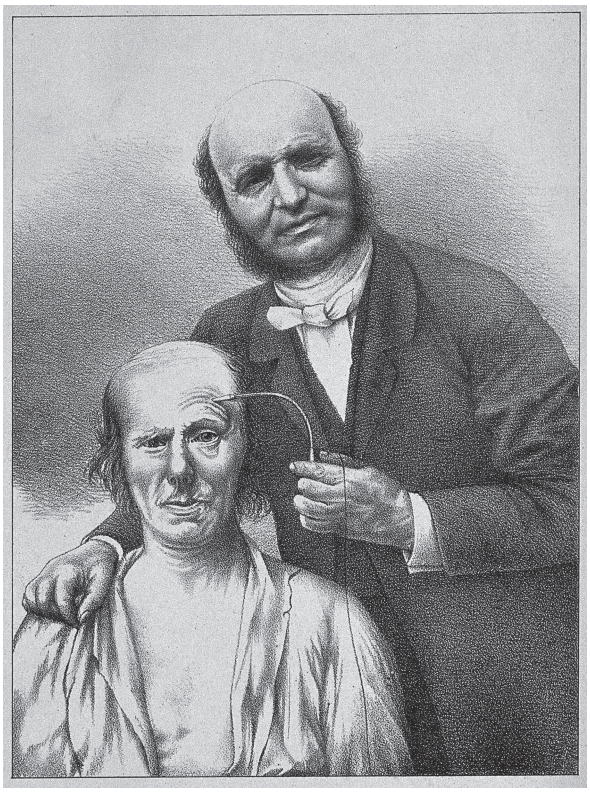

FIGURE 4.3 Guillaume Benjamin Amand Duchenne de Boulogne stimulating a patient's facial muscle with a faradic current. Lithograph, ca. 1865, after a photograph by G.B.A. Duchenne de Boulogne, ca. 1862.

Source: Wellcome Collection, https://wellcomecollection.org/works/rm3up8hs.

published his findings in 1862, together with photographs of the induced expressions, in his book *Mecanisme de la physionomie humaine*.[100] In this work, he constructed the anatomy of 32 facial muscles he thought were used in expressions, and compiled a table of distinct expressions which he distinguished according to the muscles involved and the intensity of their movements.[101] As we shall see shortly, this was a strategy to be followed 100 years later by Paul Ekman in his own work on expressions.

Duchenne, in agreement with Bell, saw this process as part of God's plan to enable human souls to communicate with each other via a universal language:

> In the face our creator was not concerned with mechanical necessity. He was able in his wisdom or – please pardon this manner of speaking – in pursuing a divine fantasy … to put any particular muscles into action, one alone or

> several muscles together, when He wished the characteristic signs of the emotions, even the most fleeting, to be written briefly on man's face. Once this language of facial expression was created, it sufficed for Him to give all human beings the instinctive faculty of always expressing their sentiments by contracting the same muscles. This rendered the language universal and immutable.[102]

Duchenne's project also drew upon the description of the human face as a 'tableau vivant' by the eighteenth-century French naturalist Georges-Louis Leclerc, Comte de Buffon (1707–1788). In turn, Buffon also saw facial 'traits' as the expression of the movement of the soul.[103]

One should note here that Duchenne uses the concept of 'passions' in the original French, rather than the more modern term 'emotions'. Later, English translations of his work used the latter term rather than earlier usages such as 'passions', 'affections', or 'sentiments'. This reflected the strategy initiated by moral philosophers such as Thomas Brown in the early nineteenth century of displacing the latter theoretical terms with the single psychological category, 'emotions', that we now predominantly use to describe love, hate, jealousy, anger, joy, sorrow, and so on.[104]

Nineteenth-Century Materialism: Charles Darwin and Expressions

Despite these examples of the continued influence of theological concepts, the belief in expressions as emanations of the soul began to be questioned by materialist thinkers in the early nineteenth century. The German naturalist Lorenz Oken (1779–1851), for example, argued in his *Naturgeschichte* that the bones and muscles of the head were transformed extremities, and so facial expressions were repetitions of the movements of the limbs. Thus, arms opened wide in friendship were accompanied by a wide mouth opening – a smile. His pupil, the anatomist Emil Huschke (1797–1858), adapted similar naturalistic reasoning in his 1821 doctoral dissertation. Huschke believed that the head was a metamorphosed torso and that the facial muscles each mapped onto a different limb or trunk muscle. Thus, humans who are threatened will crouch down and simultaneously furrow their brows and pull them down.[105]

However, in the late Victorian period, one of the greatest scientists of the age, Charles Darwin, mounted a more thoroughgoing assault on the belief in expressions as reflecting the motions of the soul. In *The Expression of the Emotions in Man and Animals*, published in 1872,[106] Darwin incorporated Bell's neurology and Duchenne's pictorial methods into a strictly materialist theory of expressions, whilst retaining their belief in expressions as universal. His *Expression* book was originally intended as a chapter of his *The Descent of Man* of the previous year,[107] but Darwin came to the conclusion that the amount of information he had collected required a separate exposition. The

work was unusual for a scientific treatise of the day for the range of sources used, including the results of questionnaires,[108] and extensive illustrations. The latter included not only Duchenne's portraits but also specially commissioned photographs produced by the Swedish photographer Oscar Rejlander (1813–1875). Many of the latter had to be posed, or turned into engravings, because of the difficulties nineteenth-century cameras had in catching fleeting expressions, especially amongst children (Figure 4.4), something that later photographic equipment and AI systems are claimed to have overcome.[109]

Darwin undermined Bell's belief in expression as reflecting the soul, and thus the workings of the Creator, by pointing out that Bell did not give a step-by-step description of how exactly the 'motions' in the soul led to facial expressions:

> Sir C. Bell did not attempt to follow out his views as far as they might have been carried. He does not try to explain why the different muscles are brought in to action under different emotions; why, for instance, the inner ends of the eyebrows are raised, and the corners of the mouth depressed, by a person suffering from grief or anxiety.'[110]

This seems like quite a mild criticism but was actually devastating because if Bell could not show how the 'immaterial principle' actually influenced individual expressions, then how could he prove that they were so influenced at all? Bell himself admitted that 'We must confess that they are so deeply implanted in our nature that we shall not be able to discover the ultimate connexion between the emotions of the soul and those signs of the body'.[111] Bell did not demonstrate expressions as the workings of the soul but assumed it at the outset, a failing which we will note in Chapter 5 when discussing the work of Francis Galton on the relationship between the configuration of the face and character.

Darwin tried to explain the process of expression formation in terms of three factors: 'serviceable associated habits', the principle of 'antithesis', and the constitution of the nervous system. The first factor reflected his belief that actions are of service under certain mental states in order to relieve certain sensations or desires, and then, when the same states of mind occur, the body habitually carries out the same actions. Thus, he reasoned that people blink and start away when they hear a loud noise to protect their eyes, and this becomes a habitual reaction to similar stimuli. Antithesis worked on the principle that if there are habitual movements that are serviceable under certain 'states of mind', then the opposite state of mind will result in the opposite movement. Darwin pointed out how cats crouched when threatened, but then arched their backs and rubbed themselves against objects to show pleasure. Similarly, a dog raises its tail when happy but drops it when dejected. In some cases, however, he reasoned that some states of mind were so overwhelming that they discharged nervous energy throughout the body, as when angry people trembled.[112]

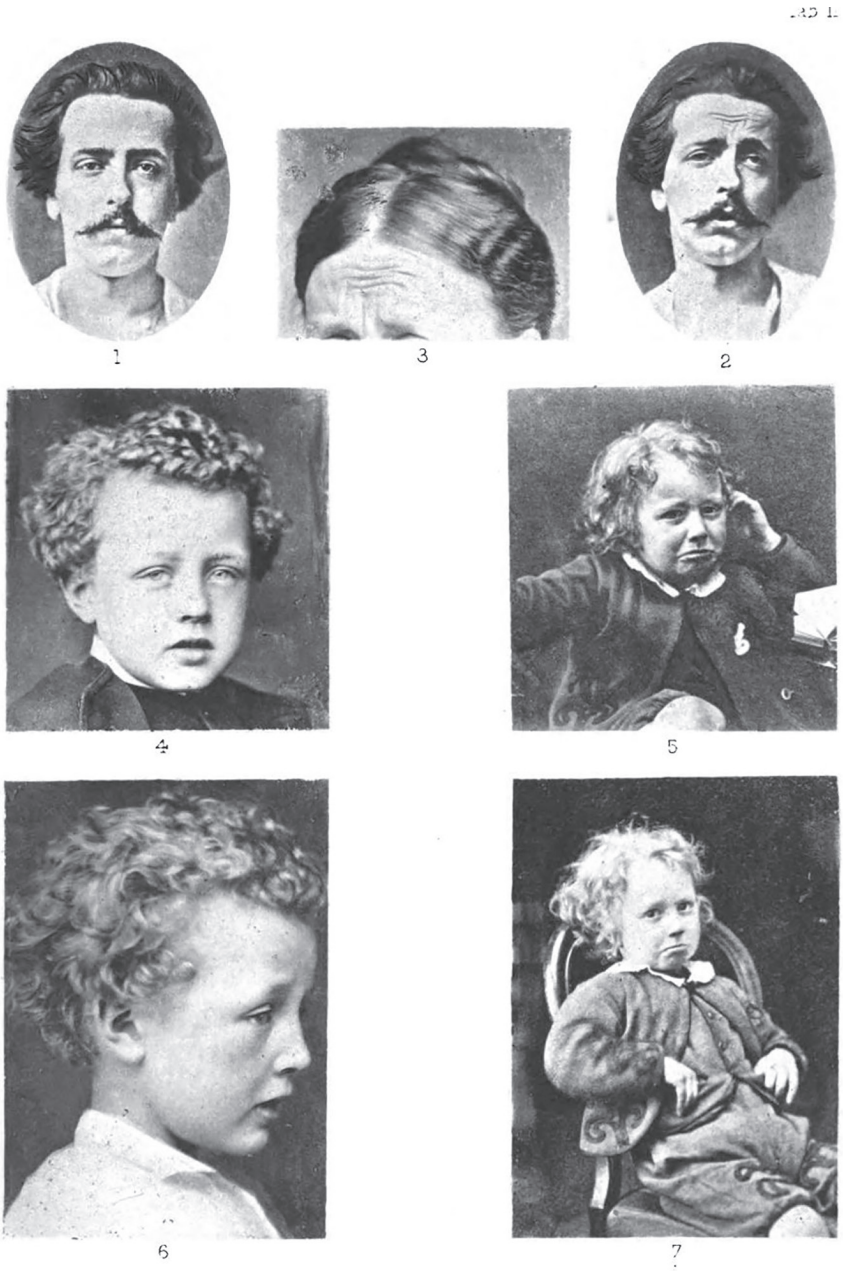

FIGURE 4.4 'Obliquity of the Eyebrows'. *The Expression of the Emotions in Man and Animals*, by Charles Darwin (New York: D. Appleton and Company, 1899), Plate II.

Perhaps Darwin's most striking departure from the previous two thousand years of theoretical discussions on the subject of human expressions was, as the title of his book indicated, the argument that these were derived from the facial and bodily movements and gestures made by animals. Contrary to Charles Bell's arguments, there was, he reasoned, nothing peculiar about the facial anatomy of human beings which set them apart from their animal ancestors. Thus, he was quite happy at the start of his book to draw examples from the physical movements of cats and dogs in certain contexts when describing his basic principles of how facial expressions took place. Then, before moving on to discuss human expressions, he devoted two chapters of his work to discussing facial movements in animals, including a consideration of the expressions of joy and affection in monkeys[113] (Figure 4.5). As already noted, both classical and Christian thinkers understood human expressions as being comprehensible to other human beings either because man's intellectual soul was the form of the human body or because God had given humans expressions so that their souls could communicate. Moreover, for many Christians, animals, strictly speaking, had no souls and, in Descartes' model, were mere machines. So if expressions were simply physical phenomena, how exactly could they act as meaningful signs to others?

According to Paul Ekman, writing in the 1970s, Darwin believed that expressions were universal, derived from animals, and therefore innate:

> There are two choices as Darwin saw it. If facial expressions vary from one culture to another, then they must be learned within each culture, and, like language, learned differently. Or, if facial expressions are universal, then they are not like language, where the vocabulary is culture specific, and cannot be acquired in a fashion that would vary with culture. For this reason, Darwin infers, they must be inherited.[114]

More recently, however, Ekman has qualified this by arguing that Darwin only claimed that the specific set of expressions he had studied were universal.[115] This is a somewhat unfortunate qualification because Darwin indeed expected all expressions to be universal because of his long-held belief in monogenesis.[116] As will be noted below in the chapter on faces and race, Darwin certainly believed in racial differences and even hierarchies, although he argued that rather than the races of Man being separate species, as claimed by the racist polygenists, all human beings were one species. The universality of expressions was one more argument for what Desmond and Moore have called Darwin's 'sacred cause' of common ancestry, which undermined justifications for slavery.[117] Or as Darwin put it himself:

> I have endeavoured to show in considerable detail that all the chief expressions exhibited by man are the same throughout the world. This fact is interesting, as it affords a new argument in favour of the several races being

FIG. 16.—*Cynopithecus niger*, in a placid condition.
Drawn from life by Mr. Wolf.

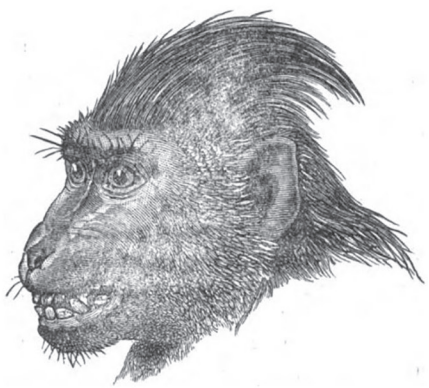

FIG. 17.—The same, when pleased by being caressed.

FIGURE 4.5 '*Cynopithecus niger*, in a placid condition. Drawn from life by Mr. Wolf' and 'The same, when pleased by being caressed'. *The Expression of the Emotions in Man and Animals*, by Charles Darwin (New York: D. Appleton and Company, 1899), Figures. 16–17.

> descended from a single parent-stock, which must have been almost completely human in structure, and to a large extent in mind, before the period at which the races diverged from each other.[118]

However, given the different understandings of facial expressions between races already noted, it is ironic, given Darwin's troubled relationship with the concept of 'race', that one of the key pieces of evidence which he put forward for the unity of the human species might not be quite as solid as he imagined.

As in all his work, Darwin had replaced God with evolutionary history, although he still retained the idea of the direct communication of emotions through human expressions. This is also a stark reminder of the conceptual difference between physiognomy and expression analysis in the nineteenth century. As we have seen in the previous chapter, physiognomy in the hands of the likes of Lavater could be put to profoundly racist ends, but the analysis of expressions by Bell, Duchenne, and certainly Darwin was based on the belief in a shared humanity. However, although the theory underlying the analysis of expressions might be based on universality, its application in AI systems can be profoundly racist, as shown by the work of Lauren Rhue, to be noted in Chapter 6, on the way these systems interpret emotions differently between races.[119]

Ekman tended to concentrate on Darwin's belief in the universality of facial expressions, rather than in a universal understanding of those expressions as signs of emotions. For Alan J. Fridlund, on the other hand, Darwin was not arguing that expressions were evolved for communication but rather that they were the mere vestiges of man's animal past or indeed accidents of anatomy. Darwin's anti-creationist argument was, according to Fridlund, that they really had no purpose. For Lucy Hartley, Darwin's neglect of the communicative aspects of expressions was a failure on his part.[120] Such facial movements, Fridlund argues, were only subsequently co-opted for communications because they were useful, as in the case of smiling:

> In an intention-movement view of the smile, instigation of smiling does not occur via an elemental state of 'happiness'. Rather, they are distinct social relations in which smiles are likely to be deployed, and the different experiences accompanying these diverse social relations are labelled 'happiness' merely out of convenience. Amusement, sensual pleasure, serenity, delight, pride, awe, contentment, and so on, depict social relations, are phenomenologically distinct, and all may engender smiles in the appropriate social context.[121]

Expressions are not genetic, or 'innate', but are facial displays used in certain situations for certain ends – like gestures, they are a 'paralanguage'. Some of Rana el Kaliouby's statements would appear to support this.[122] If the understanding of expressions is a cultural process, then that understanding can vary between cultures, although given physical and cultural migration, trade, and the mass media, it is difficult to discern such differences today.[123]

Both these approaches tend, perhaps, to caricature the complexity of what Darwin actually argued. Darwin certainly saw many expressions and other signifiers of emotion as innate, but that they might require practice to perfect:

> We may see children, only two or three years old, and even those born blind, blushing from shame; and the naked scalp of a very young infant reddens from passion. Infants scream from pain directly after birth, and all their

> features then assume the same form as during subsequent years. These facts alone suffice to show that many of our most important expressions have not been learnt; but it is remarkable that some, which are certainly innate, require practice in the individual, before they are performed in a full and perfect manner; for instance, weeping and laughing.[124]

Other expressive gestures, such as the raising of the eyes in prayer, 'apparently have been learnt like the words of a language'.[125] He fully understood that although expressive gestures might be innate, their use as signs might involve their cultivation:

> every true or inherited movement of expression seems to have had some natural and independent origin. But when once acquired, such movements may be voluntarily and consciously employed as a means of communication. Even infants, if carefully attended to, find out at a very early age that their screaming brings relief, and they soon voluntarily practise it. We may frequently see a person voluntarily raising his eyebrows to express surprise, or smiling to express pretended satisfaction and acquiescence.[126]

Thus, Darwin was setting up some of the debates that subsequently divided scholars of expression in the following century and a half.

The Science of Expression in the Post-Victorian Period

Darwin's belief in a generalised set of expressions linked to underlying emotions was not always substantiated by later research in the field. Thus, in 1924, American psychologist Carney Landis (1897–1962) undertook a grisly series of experiments to find out if all humans made the same facial expressions in response to the same emotions. He did this by taking photographs of his subjects after unpleasant experiences, such as being shocked with electricity or putting their hands inside a bucket full of frogs. Worst of all, he required his subjects to decapitate a live rat, and if they refused to cut off the rodent's head, Landis would do it himself and force the person to watch. Landis found that the expressions people made in response to pain, disgust, and horror showed great differences, and in some cases, where it was expected, no expressions of emotion were present at all.[127]

However, Darwin's ideas were resurrected by Paul Ekman in the post-war period. According to Ekman, Darwin's work on expressions was far less influential than his other publications, such as *The Origin of Species* and *The Descent of Man*. Ekman puts this down to several weaknesses in Darwin's mode of argument – his use of anecdotal evidence, anthropomorphic language, and Lamarkian concepts – as well as the later dominance of behaviourism in the human sciences during much of the twentieth century.[128] Ekman certainly

saw himself as carrying forward Darwin's work, having, in 1973, as already noted, edited *Darwin and Facial Expression: a Centenary of Research in Review* to mark the 100th anniversary of the publication of Darwin's *Expression* and providing an introduction and commentaries to an edition of that work in 1998.[129]

However, Ekman also placed himself in the tradition of the earlier twentieth-century research of the likes of Floyd Allport (1890–1979) and Silvan Tomkins (1911–1991), who agreed with Darwin in seeing expressions, and an understanding of them, as in some sense innate rather than simply culturally formed.[130] They were hard-wired into the human brain, via what Tomkins described as 'programs'.[131] This has some similarities to the concept of pain resulting in particular facial expressions in babies, who are indeed susceptible to automated facial analysis.[132] It should be noted that the concept here implies that expressions are merely physical phenomena divorced from cognition – sadness has nothing to do with loneliness or hunger. The external events or objects that elicit emotions, and then expressions, were merely triggers that sparked the 'affect programs' in the brain. This allowed Tomkins to save the concept of human consciousness from behaviourism and, above all, psychoanalysis, in which the individual consciousness was not necessarily 'master' in its own house. For Tomkins, the conscious mind was a unitary phenomenon, rather than the somewhat befuddled front end of a series of conflicting, unconscious drives as Freud had posited.[133] This was the basis of what became known as the Basic Emotion Theory (BET), which, as already noted, assumes a unitary person who has a series of simple emotions, or feelings, that lead automatically to a set of universal facial expressions that are generally understood by all others. The soul had been replaced by the brain and had many of the same attributes, although expressions were no longer a gift of God but natural feedback loops.

For Ekman, like Darwin, expressions had a physiological basis. They might represent facial movements associated with physical actions linked to the preservation of life. Regurgitating matter from the mouth to prevent choking, for example, necessitated certain facial movements which have become associated with the emotion of disgust. Alternatively, the pressing of the lips to force air back into the lungs might be a prelude to activity associated with attack and so with anger. Similarly, the raising of the eyebrows when surprised might be seen in terms of increasing the visual input to the retina as a prelude to action. He also put forward Darwin's concept of antithesis as a reason for the development of certain expressions. Ekman then saw 'generalised learning processes' as perfecting the use of such expressions and the learning of their meanings.[134] Babies certainly seem to be able to copy the expressions of adults, although whether they understand their meanings is a moot point.[135] He believed that those who argued that expressions and their understanding were merely a cultural phenomenon were confusing natural, innate expressions with certain

display rules and the like, which modify them in certain circumstances in certain cultures.[136] How this was distinguishable from 'generalised learning processes' was left somewhat obscure. Nevertheless, it should be noted that, somewhat confusingly, Tomkins considered an understanding of expressions to be a 'somewhat cultural-bound skill'.[137]

However, perhaps Ekman's most important contribution to the field of 'affect studies' was his actual empirical research and the development of research methodologies which allowed the 'datafication', or reduction to empirical data, of expressions.[138] Originally funded by the US Defense Department's Advanced Research Projects Agency (ARPA), Ekman with other researchers undertook psychometric tests in the 1960s and 1970s in which people from differing literate cultures (e.g., the United States, Brazil, Chile, Argentina, and Japan) were presented with photographs of individuals showing various expressions and asked which emotion 'labels' they would associate with them.[139] He argued that there was a high degree of agreement across the cultures as to what simple emotions were being expressed, including happiness, disgust, surprise, sadness, anger, and fear. These bear a degree of similarity to the typology of emotions posited by the likes of Descartes. It should be noted, however, that despite Ekman's assertions of universality, there were some anomalies in his results, such as Japanese subjects having rather lower scores for an understanding of sadness and fear than those in the West.[140]

One criticism of Ekman's specific work on emotion detection is that he constrained how his subjects could describe facial expressions by limiting their replies to a restricted number of 'expression labels' – 'happiness', 'fear', 'surprise', 'anger', 'disgust', 'contempt', and 'sadness'.[141] This, in turn, can be seen as linguistically reinforcing the model of simple emotions that have long dominated Western discussions regarding the role of expressions.[142] As will be discussed below, similar criticisms can be made of the labelling theory of phenomena to be found in the work of the likes of Francis Galton. According to Ruben Van De Ven, considering the AI systems that use Ekman's research:

> the promotion of emotion analysis technology *normalizes* concepts such as 'anger', 'sadness' and 'contempt'. Through that process of normalization, the position of the software as a tool that is able to measure these concepts is strengthened. Rather than giving new insights into how humans interact, these systems reinforce an existing preconception of what emotions are. For that reason, the technology ultimately provides a guideline for humans to express themselves.[143]

Ekman also saw the need to see if subjects from non-literate societies understood expressions in the same manner as those in literate ones, and he did this by showing his expression photographs to members of the Fore tribe in New Guinea. They had difficulty in applying expression labels to the photographs

until Ekman and his co-researchers associated the latter with a story or context. The happiness photograph, for example, was associated with the story, 'His friends have come and he is happy'. This elicited responses much more in line with the subjects in the literate societies already examined, although the New Guinea respondents still seem to have had rather low scores with regard to surprise and 'fear from surprise'. Ekman tried to explain the latter phenomenon by arguing that 'perhaps … in this culture fearful events are usually also surprising', although this seems a little weak as an argument.[144]

In addition, Ekman and his co-researchers developed tools to identify a taxonomy of distinct movements in facial muscles, which could be used to describe expressions. Ekman's first attempt in the early 1970s at compiling such a taxonomy, in co-operation with Wallace Friesen, was based on statements about expressive phenomena made by Charles Darwin, Duchenne de Boulogne, and others. Ekman and Friesen constructed a table that listed all the facial muscles and six emotions, entering into the table what their historic predecessors had written about which muscles were involved in what ways for each emotion. The authors realized that there were many gaps in this that they had to fill, where no one had said anything about the involvement of a particular muscle in a particular expression. Experiments were then undertaken to test the validity of the resulting taxonomy.[145] Ekman and Friesen subsequently improved on this work by spending what Ekman claimed was the better part of a year with a mirror, anatomy texts, and cameras, learning to fire separately, and then record, the muscles in their faces.[146] This enabled them to draw up a list of 'action units' describing the components of expressions, which was then published in 1978 as the Facial Action Coding System, or FACS.[147] As already noted, the FACS system has subsequently become the basic tool allowing AI systems to measure and interpret facial expressions, and the relationship to emotions is said to be linked to them.

These processes were subsequently automated in AI systems, and indeed, Ekman was advocating the use of FACS in computer image analysis as early as the late 1990s.[148] FACS was seen as well-suited to automation because operationalising it did not in itself depend on any possible meaning attached to facial behaviours.[149] Of course, at some point, the facial expressions so measured had to be translated back into meaningful interpretations of emotions. However, it was assumed that if the outputs of automated systems were consistent with the decisions of manual coders, then all was well, although this agreement might depend on the labelling that was the foundation of Ekman's work.[150]

Ekman also seems to have allowed for the role of context to some extent when undertaking his experiments with the tribespeople from New Guinea by linking expressions to stories eliciting emotional responses. Interestingly, Charles Darwin seems to have understood the role of context, even if he could only discuss it in the form of anecdotes, which, for Ekman, appeared to

undermine his scientific credentials. Thus, his chapter on 'Hatred and Anger' in *The Expression of the Emotions in Man and Animals*[151] is replete with anecdotal descriptions of the circumstances within which expressions and gestures were used, as for example:

> A Benglee employed in the Botanic Gardens was accused, in the presence of Mr Scott, by native overseers, of having stolen a valuable plant. He listened silently and scornfully to the accusation; his attitude erect, chest expanded, mouth closed, lip protruding, eyes firmly set and penetrating. He then defiantly maintained his innocence, with up raised and clenched hands, his head now being pushed forwards, with eyes widely open, and eyebrows raised.[152]

This interest in the context can also be found in Darwin's contribution on 'Physiognomy' in the *Notes and Queries on Anthropology for the Use of Travellers and Residents in Uncivilized Lands*, drawn up by a committee of the British Association for the Advancement of Science in 1874. Darwin called not only for a 'definite description of the countenance under any emotion or frame of mind' but also for 'a statement of the circumstances under which it occurred'.[153]

Might Ekman's work actually be a retrograde step in this respect compared to that of the Victorian naturalist he claimed to build upon? It could be argued that the return to seeing expressions as unmediated communications between individuals has more in common with the followers of Descartes than with Darwin. Indeed, Ekman's rejection of volition in the production of expressions might be seen as a return to Aristotle's concept of the automatic nature of the body's projection of emotion in the soul.

Conclusion: Emotion Recognition in Historical Perspective

It is clear that the study of the relationship between emotions and expressions is a complicated one that has had a long and fraught history. Whether all those developing digital systems to determine emotional states from facial movements, or those purchasing and using such systems, fully understand this is perhaps doubtful. However, some of the statements embedded in websites noted at the start of this chapter indicate that there is a sense of unease, or at least a concern about possible litigation, respecting the implementation of the simple model of the relationship between expressions and emotions underpinning the BET system. Such issues may have little immediate impact on shoppers whose expressions are being recorded to gauge the effectiveness of promotions or advertisements. However, they may materially affect the hiring opportunities of prospective employees who react with the 'wrong' facial movements when asked questions in interviews. There are implications here in terms of justice, equity, and human rights, as the EU has recognised.

The reasons given in the Introduction to this book as to why the history of the reading of the face is important for an understanding of the contemporary digital revolution are exemplified by the discussion in the present chapter. There are, for example, direct links in the development of facial AI applications to the work of past thinkers. Paul Ekman, for example, claims to be drawing on what he takes to be the arguments of Charles Darwin in the latter's *The Expression of the Emotions in Man and Animals*, and his FACS system had a forerunner in Duchenne's work. Both Darwin and Duchenne were similarly engaged in a dialogue with their intellectual predecessors, such as Sir Charles Bell and the Count de Buffon. Even more broadly, although there are physiological explanations for why people see external facial expressions as indicating something 'inside' others, the way this is understood in the West carries an intellectual baggage based on the concept of communicating souls, which ultimately goes back to ancient Greek thought. After all, it was Aristotle in his *Politics* who argued that a human being who did not need to commune with others was either a beast or a god.[154] Our understanding of these ideas as 'common sense' reflects this intellectual inheritance. However, is such communication always evidence of the Self, or can it merely be an external presentation of the Self that needs to be understood in particular cultural or social contexts?[155]

Notes

1 Andrew McStay, *Emotional AI: The Rise of Empathic Media* (London: Sage, 2018), p. 55; Article 19*, Emotional Entanglement: China's Emotion Recognition Market and its Implications for Human Rights* (London: Article 19, 2021).
2 Rosalind Picard, *Affective Computing* (Cambridge, Mass.: MIT Press, 1997), pp. x, 1–3.
3 Kate Crawford, Roel Dobbe, Theodora Dryer, Genevieve Fried, Ben Green, Elizabeth Kaziunas, Amba Kak, Varoon Mathur, Erin McElroy, Andrea Nill Sánchez, Deborah Raji, Joy Lisi Rankin, Rashida Richardson, Jason Schultz, Sarah Myers West, and Meredith Whittaker, *AI Now 2019 Report* (New York: AI Now Institute, 2019): https://ainowinstitute.org/AI_Now_2019_Report.html; Kate Crawford, *The Atlas of AI: Power, Politics, and the Planetary Costs of Artificial Intelligence* (Yale University Press, 2021), pp. 153–5; Sharon Richardson, 'Affective computing in the modern workplace', *Business Information Review*, 37(2) (2020), pp. 78–85: doi: 10.1177/0266382120930866.
4 Amazon Rekognition Website, 'Detecting and Analyzing Faces': https://docs.aws.amazon.com/rekognition/latest/dg/faces.html (accessed 13/08/2020).
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