

# DARWIN and FACIAL EXPRESSION

*A CENTURY OF RESEARCH IN REVIEW*

Edited by  
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## Preface to New Edition

It is gratifying that this book is back in print, for all the information in it is still relevant today. Although I intended for the first edition of this volume to celebrate the 100th anniversary of the publication of Darwin's book *The Expression of the Emotions in Man and Animals*, published in 1872, this volume did not appear until 1973, a year late for the centennial. The delay occurred because my friend Silvan Tomkins never wrote his chapter summarizing his theory of emotion, although he continued to promise to do so. When I finally gave up and submitted the other book chapters to the publisher, it was too late to make a 1972 publication date. Silvan did eventually write his chapter, which appeared in the second edition of *Emotion in the Human Face* (1982, 2013).

The chapter entitled "Facial Expressions in Nonhuman Primates" by Suzanne Chevalier-Skolnikoff should command new interest today because of all the new work on the brain and emotion. Chevalier-Skolnikoff explained how facial expressions become more complex in parallel with increased complexity of the brain as one moves up the phylogenetic ladder. She considered similarities in appearance of facial expressions in humans and other primates. That focus was extended in a chapter by William Redican in *Emotion in the Human Face* (2nd Ed.). Redican's and Chevalier-Skolnikoff's observations have been, for the most part, substantiated and extended in research over the last thirty years; only a few have been challenged. The best source for this update is a volume that I organized with the assistance of Joseph J. Campos, Richard J. Davidson, and Frans B.M. De Waal entitled *Emotions Inside Out: 130 Years After Darwin's The Expression of the Emotions in Man and Animals* (2003). It includes chapters by De Waal, by Seyfarth and Cheney, and another by Parr, as well as discussion of these chapters by other contributors.

Charlesworth's chapter on expressions in infants and children has also been extended but not contradicted in subsequent research. A report of some of the current findings can be found in *Emotions Inside Out* in chapters by Campos, Thein and Owen; and by Camras, Oster, Campos and

Bakeman. A new focus on how emotion and its expression changes in later life, described by Carstenson and Lockenhoff, is in that same volume.

My chapter on facial expression across cultures explains how the evidence does not fit the view that expressions are culture-specific espoused by La Barre, Klineberg, and Birdwhistell. My friend Erving Goffman, who until then had accepted the culture-specific view, told me that he was convinced by the logic of the argument in my chapter but not by the specifics of the experiments I had conducted a – typical Goffman compliment. In a chapter entitled “Facial Expressions” in *The Handbook of Cognition and Emotion* (1999), I discuss new challenges to the universality view, answering each of them with evidence and logic. Nevertheless, some still maintain that expression and emotion are culture-specific. They do acknowledge, however, that the expressions of at least some emotions are associated with the same social contexts across cultures, but not with the same emotion terms. From my vantage point, that is sufficient; emotion terms are only abstractions standing for the social contexts, signals, and physiological changes which comprise each emotion.

Margaret Mead was quite disturbed by my chapter in the first edition of *Darwin and Facial Expression* (1973). She wrote a review entitled “The Appalling State of the Human Sciences” (1975), singling out my chapter as the most dreadful. She conveniently ignored the findings reported in my chapter on the study of spontaneous expressions in Japan and the United States, claiming that I had only studied posed expressions. She was willing to concede that posed facial expressions are universal, but not spontaneous expressions. She also ignored the obvious logical error – what were poses constructed from, and why would people in every culture choose to pose the same expression if it was not what they were observing in spontaneous expression? Goffman told me that Mead was loyal to her protégés, and I had offended her by criticizing Birdwhistell.

New findings on facial expression are found in *Emotions Inside Out*. In this volume, I consider how expression is related to deception, a topic about which Darwin had written but two sentences. Keltner reports evidence of how expression is related to personality and psychopathology, and Bachorowski and Owren report on vocal signals of emotion.

I edited a new, third edition of Darwin’s expression book in 1998. In that edition, for the first time all the illustrations Darwin discussed are included and are correctly displayed in terms of left-right orientation, and I included more than one hundred commentaries in Darwin’s texts discussing how contemporary research supported, or challenged (rarely) his views. That edition also includes my introduction, which offers multiple explanations

of why this book, though a bestseller in its time, was largely ignored in much of the twentieth century. In a long afterword, I describe the struggle over Darwin's legacy among Bateson, Birdwhistell, Mead, Tomkins and myself. We all knew each other; and I am the only one still alive to tell the story.

Paul Ekman  
March 2006

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## Preface

A century ago Charles Darwin published his work on *The Expression of the Emotions in Man and Animals*, thirteen years after his revolutionary *The Origin of Species* and one year after the *Descent of Man*. The book was a bestseller in its time. "On the day of publication 5267 copies were sold – a remarkable tribute to Darwin's reputation, to his skill in amassing and marshalling relevant facts, and to the book's extraordinary interest as the first serious attempt to apply evolutionary principles to the subject [Huxley, 1965, p. 102]." Darwin claimed that we cannot understand human emotional expression without understanding the emotional expressions of animals, for, he argued, our emotional expressions are in large part determined by our evolution. Not only are there similarities between man and certain other animals in the appearance of some emotional expressions, but the principles which explain why a particular emotional expression occurs with a particular emotion apply across species. To explain and support his theory, Darwin described emotional expressions in infants and children, in adults from various cultures, in the mentally ill, and in animals.

*Darwin and Facial Expression* celebrates the centennial of the publication of Darwin's work on emotional expression. Darwin's central concepts and key sources of information are reconsidered in light of the work of the last hundred years. There is a chapter each on animals (the nonhuman primates), on infants and children, and on people in various cultures. Each of these chapters gives Darwin's ideas on the topic and then presents a critical integration of current knowledge about facial expressions of emotion. It is a tribute to Darwin that each of these chapters concludes that many of Darwin's observations, and a large part of his theoretical explanations and forecasts, are substantiated by current knowledge.

These chapters consider emotional expressions in the face only, and not body movements, because most of Darwin's discussion was of the face, not the body, and his theory seems most applicable to the face (cf. Chapter 4, pages 180-181). There is no chapter on facial expression in the mentally ill, although Darwin did consider this matter, because there has been no follow-up research.

A more general chapter describes Darwin's conceptual and methodological contributions, tracing his influence through the history of psychology. The

concluding chapter integrates and summarizes how Darwin's ideas have fared in light of current knowledge about facial expression.

Consistent with the nature of Darwin's contribution, this centennial volume is intended to be relevant across disciplines, for persons interested in emotional expressions in psychology, anthropology, zoology, and ethology. For the book to be useful to those from such separate disciplines, it has been necessary to avoid or explain technical terms known only within one discipline. And, because not only the scientist but the layman as well was interested in Darwin's book on emotional expression when it was first published, our intention in preparing this book was that it be interesting and understandable to the layman and the college undergraduate, as well as to the scientist.

Paul Ekman

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I am grateful to Wade Seaford, who first suggested the idea of celebrating the centennial of the publication of Darwin's *The Expression of the Emotions in Man and Animals*. I thank Silvan S. Tomkins for his encouragement in the planning of this book, and also for his encouragement and inspiration in my own research studies. I am grateful also to Patsy Garlan for her editorial help and criticisms, and to Nina Honbo for her help in compiling this book.

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# 1

## Introduction

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It is paradoxical that 100 years should have elapsed between the publication of Darwin's book and a book such as this. Serious attention has not been focused previously upon the value of Darwin's work, *The Expression of the Emotions in Man and Animals*.<sup>1</sup> Never before has current knowledge on facial expression been drawn together to reveal the importance of Darwin's contribution, the accuracy of his observations, the pertinence today of the questions he raised, and the durability of much of his theory about emotional expression. The failure of Darwin's work on emotional expression to have the influence it so well deserved is paradoxical – and not because the value of his work is just apparent now. (After all, the history of science is filled with examples of men whose work was ignored in their time, only to be rediscovered later.) The paradox lies in the fact that Darwin was a famous scientist at the time he published *The Expression of the Emotions*. His work on evolution, which revolutionized thinking for scientist and layman alike, had been published 13 years earlier. Far from being ignored when it was published, the book on expression was a best seller. Also, the topic of emotional expression was not obscure, but intrinsically popular. Yet this book

<sup>1</sup>Although the volume, *Expressions of the Emotions in Man*, edited by P. H. Knapp (1963) paid tribute to Darwin's book on emotional expression in its title, it actually had little to do with either Darwin or facial expression. Only 3 out of 18 chapters made reference to Darwin, and only two chapters dealt with facial expression.

had little influence on the scientific community over the following 90 years.

The lack of influence is easily shown. In his recent excellent appraisal of all of Darwin's work, Ghiselin (1969) commented:

That *The Expression of the Emotions* has not been well understood is clear from the fact that it was a historical dead end. Nobody took up the train of reasoning and developed it, although the work was widely read, and although it did become an element in various controversies . . . there is little evidence that the real merits of the work have come to be appreciated [pp. 187-188].

In this book, Charlesworth and Kreutzer point out in "Facial Expressions of Infants and Children" (Chapter 3) that less than a third of the studies they reviewed indicated that the author was directly or indirectly influenced by Darwin. Chevalier-Skolnikoff, in "Facial Expressions of Emotion in Nonhuman Primates" (Chapter 2), indicates that there was no progress in the study of facial expression of primates from Darwin's time until the 1960s. In the work I reviewed in "Cross-Cultural Studies of Facial Expression" (Chapter 4), the majority of the systematic studies of facial expression showed little influence from Darwin.

Five issues are relevant in explaining why *The Expression of the Emotions* had so little influence. Ghiselin (1969) suggested, "One reason why Darwin's psychology has not been understood is his tendency to express himself in anthropomorphic terms [p. 188]." Darwin did not hesitate to use terms based on man's experience in describing the behavior of animals. He said, for example,

Dogs also exhibit their *affection* by *desiring* to rub against their masters . . . I have also seen dogs licking cats with whom they were *friends*. This habit probably originated in the females carefully licking their puppies – the dearest object of their *love* – for the sake of cleansing them [1965, p. 118; Italics added].<sup>2</sup>

In discussing Darwin's anthropomorphism, Petrinovich (Chapter 5 of this book) agrees with Ghiselin's interpretation that this was partly a stylistic device that Darwin used to communicate more readily with his reader. Partly, also, Darwin's anthropomorphism may be interpreted as an outgrowth of his belief in the continuity of the species. If man has evolved from animals, many of the phenomena observable in man must exist in at least some animals as well – hence some justification for talking about emotion in animals. While Darwin's belief in the continuity of the species may have led to his anthropomorphism, for which he was condemned by some, his theory on the continuity of the species was responsible for the development of

<sup>2</sup> All of the page references for our quotations from Darwin's *The Expression of the Emotions in Man and Animals* are from the 1965 University of Chicago Press edition.

animal and comparative psychology.<sup>3</sup> It is only if the species are continuous and man not wholly different from other animals that it makes sense to have a *psychology* of animal behavior, for psychologists to compare species, and for such studies to be relevant to a psychology of man.

Chevalier-Skolnikoff (Chapter 2, p. 8) points out that contemporary scientists studying animal behavior object to characterizing animals as having emotions. The use of such terms is said to interfere with the real need for careful description of animal *behavior* itself. Such scientific work, conducted free of anthropomorphic terms by those who would or do condemn Darwin for anthropomorphism, has led to findings which in a sense vindicate Darwin. Rather than finding that nonhuman primates do not engage in behavior which can be characterized as emotional, the evidence now shows that Darwin's use of anthropomorphic terms may have been a correct forecast. In reviewing the evidence, Chevalier-Skolnikoff says

Through the examination of behavioral sequences and the interpretation of how the behavior functions, primatologists are fairly confident that the interpretation of the emotional nature of facial behavior in nonhuman primates is correct... [Chapter 2, p. 23].

The second reason for the lack of influence of Darwin's book was his reliance on anecdotal rather than systematic data. While the rationale and legitimacy of Darwin's anthropomorphism is subject to some dispute, at least in light of evidence now current, there is little question about the fallibility of anecdotal information. It is dubious data for various reasons: The amount of behavior observed is typically small; it is often reported without contextual information; the observer has no check against his own biases; and usually description and interpretation are mixed without distinction. Chevalier-Skolnikoff (pp. 15-20) contrasts Darwin's use of anecdotes with the systematically gathered information about behavior in current studies of nonhuman primates. Petrinovich (p. 236) explains how animal psychologists rejected the anecdotal method in favor of laboratory studies, where systematic observation and experimental manipulation was possible.

Darwin was aware of the problems inherent in anecdotal data (cf. my discussion of this in connection with his cross-cultural studies, Chapter 4 [pp. 172-173]). For example, he placed more confidence in a report if it described the full context in which the behavior occurred. But Darwin was limited primarily to information gathered by others, since he was confined by illness to his own home for most of the last 42 years of his life – the period during which he wrote all of his major works. It is interesting to note that the one

<sup>3</sup>Boring, 1950, and Petrinovich, Chapter 5 of this book, give Darwin credit for the development of these fields.

source of information which he was able to gather himself, observations on children by diaries he kept of his own children's behavior, has been almost completely substantiated in later work (Charlesworth & Kreutzer, Chapter 3).

While he often dealt with faulty data, Darwin's great strength was in using so many different sources of data, in testing his theory by its ability to explain widely divergent phenomena. Few scientists concerned with emotional expression since Darwin have similarly evaluated their theories by obtaining information about the behavior of children, animals, members of different cultures, the mentally ill, and the blind.

The third reason why Darwin's work on emotional expression had so little influence was his emphasis on the innate basis of at least some emotional expressions. As both Chevalier-Skolnikoff and Charlesworth and Kreutzer point out, while Darwin allowed that learning influences facial expression, his emphasis was on the innate basis, and it was mostly about this that he wrote. Darwin did not systematically explain the ways in which learning influences facial expression and the complex interplay between learning and innate factors.

Darwin's emphasis upon innate determinants is probably the most crucial reason for the rejection of his work, at least by psychologists. Petrinovich (p. 240) explains how in 1914 Watson, the founder of behaviorism, rejected the notion that inheritance played any part in variations in behavioral characteristics across individuals and attributed these solely to environmental effects. Watson claimed that to understand man, to understand why one man differs from another, we need only consider what is learned; and that this is the only proper focus for psychology. Behaviorism ruled the day; genetic and other biological determinants of behavior were not the subject of much experimentation or theory. Instead, learning, and then also perception and cognition, became central topics for research in psychology. The popularity of the behaviorist view was due in part to the power of the questions asked and the methodologies offered to generate replicable research. In part, the popularity of Watson's view may reflect the fact that it was harmonious with the democratic *Zeitgeist* – the hope that all men could be made equal if their environments were equally benevolent. On this point Ghiselin (1969) commented,

Watson flatly rejected the idea that inheritance plays any role in determining behavior patterns, evidently because of his cultural predisposition toward human equality. Although it is easy to sympathize with such democratic zeal, its concealment of the truth has not been without its deleterious effects... Rejecting inheritance for metaphysical reasons served only to hinder the progress of psychology. And it is sobering to observe that democratic societies are every bit as prone to the kind of dogmatism that caused the Soviet Union to reject

Mendelian inheritance and to embrace Lysenkoism because the latter, like the Watsonian notion, fitted in better with the prevailing creed [pp. 191-192].

Even a behavioristic view as orthodox as Watson's need not have required abandoning the notion that there is a genetic basis for facial expression, but only an emphasis on the influence of learning – that in various ways learning modifies built-in, genetically determined emotional expressions. But matters did not rest at that. Instead, the pendulum swung away from Darwin to the opposite pole. The popularity of cultural relativism, combined perhaps with the influence of behaviorism, led anthropologists concerned with emotional expression to claim that there was no innate contribution to facial expression, that there are no constants across cultures in any aspect of human facial expression. (See my discussion of LaBarre and Birdwhistell, Chapter 4, p. 179-187.)

An index of just how far the pendulum did swing is that much of the work of the last 10 years has taken as its aim the reestablishment of the proposition that there are some universal facial expressions, and that this is due to *some* innate or genetic contribution to facial expression. This is the conclusion of each of the authors who review a body of research evidence in this book: on animals (Chevalier-Skolnikoff, Chapter 2); on infants and children (Charlesworth & Kreutzer, Chapter 3); and on members of different cultures (Ekman, Chapter 4). Each author maintains that only certain aspects of facial expression are genetically determined and argues for the influence of non-genetic determinants as well. The authors agree that there is a major genetic contribution in the morphology of facial expression – the particular patterns of facial muscular movement associated with particular emotions.

The fourth reason why Darwin's book had little influence was his adoption of Lamarck's theory that learned characteristics could be inherited. Chevalier-Skolnikoff (Chapter 2) discusses this matter, explaining how Darwin also used his principle of natural selection to account for the evolution of emotional expressions. This principle, which has stood the test of time, was rejected in Darwin's day, while the alternative mechanism proposed by Lamarck and accepted in Darwin's day is now disproved. Darwin's placing greater emphasis on Lamarck's theory than on his own principle of natural selection is really not intrinsic to the theory he propounds. While he did claim that expressions learned by an animal later become inherited, the evolution of facial expressions does not require such Lamarckian reasoning. Darwin also provided natural selection as the basis for the evolution of emotional expression: "Animals who had a genetically based tendency to substitute facial displays (e.g., threats) for more dangerous actions (e.g., fighting) probably had a higher survival ratio, thus passing this propensity on

to their descendants (Chevalier-Skolnikoff, Chapter 2, page 32).” Ghiselin (1969) commented on this issue, “Those who criticize *The Expression of the Emotions* on the grounds that it presupposes inherited habit overlook the fact that Darwin invokes natural selection as a more effective mechanism [p. 209].”

The last reason we will consider for the book’s failure to achieve the influence it deserved is Darwin’s adherence to the deductive method, which lessened his impact on those who now work mostly in his tradition. Petrinovich (Chapter 5) points out that the “most direct line of Darwinian influence on the study of complex behavior has been through the branch of Zoology called ethology.” According to Petrinovich, ethologists believe it is necessary to observe carefully the behavior of the organism in its natural environment, and they emphasize the instinctive bases of behavior. “The approach of the ethologists is toward the molar, functional, and dynamic view which characterizes Darwinism . . .” (Petrinovich, Chapter 5). While most ethologists make reference to Darwin, they do not give his work on emotional expression very great emphasis. Ghiselin (1969) explains this as follows:

Turning to the ethologists, or zoologically oriented students of animal behavior, one has little difficulty in seeing why they have failed to give Darwin the credit he deserves. Instead of going back to fundamentals, as did the founder of the science, and constructing theoretical models to be tested by means of the hypotheticodeductive approach, they have largely relied on more primitive forms of induction. What theoretical systems they have elaborated contain little reference to evolutionary theory. In conformity with the European tradition, they have tended to employ the sort of typological comparison that still prevails among many morphologists. They have simply gathered facts, put similar behavior patterns together, and superimposed a historical rationalization. Thus Lorenz states: “It is an inviolable law of inductive natural science that it has to *begin* with pure observation, totally devoid of any preconceived theory and even working hypothesis.” A more pernicious fallacy could scarcely be enunciated. Darwin, in all of his work, including that on behavior, proceeded with a diametrically opposite methodological assumption. Small wonder that he has not received the recognition he deserves [p. 212].

Petrinovich, in his appraisal of Darwin, emphasizes his use of the deductive method as one of his most important contributions. He provides several telling quotes from Darwin on his manner of approaching phenomena, such as “No one could be a good observer unless he was an active theorizer.”

Let us now discuss the sources of information Darwin used to “ascertain, independently of common opinion, how far particular movements of the features and gestures are really expressive of certain states of the mind . . .” [1965, p. 13]. A major source was the “expression of the several passions in some of the commoner animals . . .” [1965, p. 17]. He said this was of para-

mount importance for determining the generality of his explanations of the origin of emotional expressions. Chevalier-Skolnikoff, in Chapter 2, summarizes Darwin's findings, then presents a comprehensive account of the current state of knowledge on facial expression in nonhuman primates. She reports research on the description of facial expression, on the function of facial expression, and on the various determinants of facial expression. Her chapter makes two crucially important additional contributions to our knowledge about facial expression. Chevalier-Skolnikoff discusses at some length, and in considerable detail, how the evolution of the nervous system is related to the variations in facial expressions across different species. She explains how differences in the brain may be responsible for human facial expressions being more subject to voluntary or habitual control than are those of other animals. She shows how similarities in other parts of the brain may be responsible for the similarities in facial expression across species as well as for the universality of facial expression in human beings. Chevalier-Skolnikoff also provides a thorough, detailed, discussion of the evolution of the facial musculature. She points out that among Darwin's major contributions to the study of facial expression were his emphasis on the facial musculature as a determinant of expression and his understanding of the intimate relationship between form and function. Her explanation of the evolution of the facial musculature and the differences across species is thus within Darwin's tradition, and expands our knowledge of how facial expression in different species is related to differences in musculature.

Darwin's second source was infants and children, whom he observed because he felt they showed emotions with extraordinary force. In Chapter 3, Charlesworth and Kreutzer recapitulate Darwin's findings on infants, then critically review research since Darwin on facial expressions in infants and children. They consider specific behaviors such as crying, smiling and laughing, and more global emotional states such as surprise, fear and anger. Charlesworth and Kreutzer also present an important survey of studies on wild or feral children, institutionalized children and blind children, which they interpret with regard to the issue of whether there is an innate contribution to facial expressions of emotion. Finally, their chapter provides a thorough discussion of the methodological problems encountered in studying facial expression in infants and children, and draws attention to many questions that have not yet been systematically addressed.

A third source of information for Darwin was the facial behavior of persons in differing cultures. He wished "to ascertain whether the same expressions and gestures prevail, as has often been asserted without much evidence, with all the races of mankind, especially with those who have associated but little with Europeans" [1965, p. 15]. Darwin considered this information important, because he held that if the same expressions signified

the same emotions across various cultures, we could infer that they were innate. In Chapter 4, I have reviewed Darwin's methods of studying facial expression across cultures and his reasoning about the innate basis for any universals that may be discovered. The views of the three major theorists who have contested Darwin's theory and findings – LaBarre, Klineberg, and Birdwhistell – are critically evaluated. In this part of the chapter, two theoretical issues are introduced that are crucial to interpreting the contradictory impressions obtained by observers of emotion expression. Distinctions between facial expressions of emotion, facial simulations of emotion, and facial gestures (or *emblems*), are elaborated. The concept of *display rules* is introduced to explain socially learned, culturally variable rules regarding the control and management of facial expressions. Critical analysis is made of all the systematic, quantitative experiments intended to prove that facial expressions are culture specific, and ways are discussed for avoiding methodological pitfalls. Finally, all of the evidence supporting universal facial expressions is reported and integrated, including new evidence not previously published.

Another source of information for Darwin was the mentally ill, whom he thought should be studied "as they are liable to the strongest passions, and give uncontrolled vent to them" [1965, p. 13]. There is no chapter on this topic, because, strangely, there has not been any systematic follow-up in this area of research. While there is little reason to doubt Darwin's view that the facial expressions of the mentally ill would be fruitful to study, almost no one has done so. How the mentally ill interpret facial expressions has been studied, but this is not relevant here. Our own laboratory is now studying facial expressions in depressed psychiatric patients, but unfortunately that information is not ready for publication.

Darwin mentions another source of information – painting and sculpture – which he was disappointed to find was not of much use to him. He thought this was because "in works of art, beauty is the chief object; and strongly contracted facial muscles destroy beauty" [1965, p. 14]. Gombrich (1972), who has been concerned with the study of action and expression in Western art, writes that no one has studied the history of facial expression in art. Certainly if Darwin were alive today, the very reasoning which suggested the possible utility of art and sculpture might cause him to look at photographs and motion picture film. To my knowledge there has been no thorough study of facial expressions of emotions shown in the cinema of different nations, or in commercial or amateur still photographs, or in family albums, although such a study might be interesting and relevant.

The last source Darwin discussed was a series of photographs supplied to him by the French anatomist Duchenne (1862), who electrically stimulated the facial muscles of a man whose skin was not sensitive. Darwin showed

these photographs to people and asked them what the man was feeling. Darwin used these data to verify some of his thinking about the emotional meaning of particular facial muscular contractions. While no one else, to my knowledge, has electrically stimulated the face to obtain pictures of facial expression, the use of observers' judgments of the emotion shown in facial photographs has been widely used and is discussed in Chapter 4.

While Darwin did not list studies of blind children as a separate source of information in his introduction, he did describe such studies later in his book and cited their importance, because the blind have no opportunity to learn facial expression visually. As mentioned earlier, Charlesworth and Kreutzer review this topic in their chapter, also considering feral and institutionalized children who may similarly lack all of the visual stimulation available to the normal sighted child.

In closing this introduction, I might mention that Darwin closed his introduction by presenting what was then known about the anatomy of human facial musculature. He continually referred to this description in later chapters when he proposed the muscular movements that depicted each of the emotions. Since Darwin, there has been little interest until recently in further description of facial musculature from the point of view of its relationship to expression. Huber's work (1931) and the recent work of the Swedish anatomist Hjortsjö (1970) are exceptions. In recent years there has been a bit more interest in describing in a systematic way the muscular movements that are associated with each of the emotions. Building largely on the work of Duchenne, one of Darwin's sources, and on the work of Darwin himself, Tomkins, Friesen, and I have developed a systematic procedure for measuring and classifying the movements of the facial musculature and determining which emotion is being shown on the face (Ekman, Friesen, & Tomkins, 1971; Ekman, 1972). A few other authors have developed somewhat similar methods for describing the movements of the face (Blurton Jones, 1972; Grant, 1969; Leventhal & Sharp, 1965), but they have not attempted to link their descriptions to emotions.<sup>4</sup>

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<sup>4</sup>See Ekman, Friesen, and Ellsworth (1972, Chap. 16) for a discussion of these various ways of measuring facial behavior.

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