Tracing the Expressive Lines of the Face: The Art and Science of Emotional Expression in Duchenne's *Mécanisme de la Physionomie Humaine* (1862) and Darwin's *The Expression of the Emotions in Man and Animals* (1872)

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Abstract

During the second half of the nineteenth century, there was a surge of interest in the study of human and animal facial expression. To visualize their theories and promote them globally, leading men in science and medicine collaborated with artists. Together, they created hundreds of images that circulated in scientific and popular publications worldwide. This dissertation investigates how photographs and prints were used to study expression by focusing on a set of images reproduced in the renowned French neurologist Dr. Guillaume Duchenne de Boulogne's *Mécanisme de la Physionomie Humaine* (1862) and in the English naturalist Charles Darwin's *The Expression of the Emotions in Man and Animals* (1872). Duchenne's pictures, taken at the Salpêtrière Hospital in Paris in the late 1850s, mark one of the first systematic applications of photography to the study of emotional expression and facial muscles. The photographs show the neurologist applying electrical probes to his patient's face to elicit muscular contractions. Ten years later, these photographs were reproduced in Darwin's widely-read book.

This dissertation conducts a comparative analysis of these two texts and their images to explore how the presentation of photographs and prints determined the ways in which nineteenth-century viewers interpreted them. I argue that viewers are active participants in meaning-making because they interpret visual information in historically and culturally specific ways: they are not passive observers but are constituents of the broader visual cultures that establish how images communicate meaning. By exploring the role that presentational and media decisions played in determining the communicative potential of Duchenne's photographs, I argue that the display strategies deployed in *Mécanisme* and *Expression* were linked to their authors' research methodologies. Further, I examine how Duchenne and Darwin invited their readers to activate the epistemological potential of images through participatory viewing practices that were already established in scientific and lay circles, such as those tied to handling daguerreotypes, studying anatomical models, organizing *cartes-de-visite* albums, and perusing Victorian natural history books. Ultimately, I argue that the didactic functions of the photographs and prints used by Duchenne and Darwin were facilitated by their viewers' interaction with them. These images required participants to bring them to life.

Résumé

Pendant la deuxième moitié du XIXe siècle, il y avait une vague d'intérêt pour l'étude des expressions de visages humains et animaux. Pour visualiser et promouvoir leurs théories à l'échelle mondiale, les scientifiques et les médecins ont collaboré avec les artistes. Ensemble, ils ont créé des centaines d'images qui ont été reproduites dans des publications savantes et populaires à travers le monde. Cette thèse enquête sur la façon dont la photographie et les estampes ont été utilisées pour étudier l'expression en se concentrant sur les images reproduites dans le livre *Mécanisme de la Physionomie Humaine* (1862) du réputé neurologue français, Dr Guillaume Duchenne de Boulogne, et dans *The Expression of the Emotions in Man and Animals* (1872) du naturaliste anglais Charles Darwin. Les photos de Duchenne, prises à L'Hôpital universitaire de la Pitié-Salpêtrière à Paris dans les années 1850, marquent une des premières applications systématiques de la photographie pour étudier les expressions et les muscles du visage. Les images montrent le neurologue fixant des sondes électriques sur le visage de son patient pour susciter des réactions musculaires. Dix ans plus tard, Darwin présente ces photos dans son célèbre ouvrage.

Cette thèse effectue une analyse comparative de ces deux textes et de leurs images afin d'étudier la façon dont la présentation des photographies et des estampes à déterminé la manière dont les spectateurs du XIXe siècle les ont interprétés. Je soutiens que les spectateurs participent activement à l'élaboration du sens puisqu'ils interprètent les informations visuelles selon des modalités spécifiques à la culture et à l'histoire: ils ne sont pas des observateurs passifs d'images photographiques mais des constituants de cultures visuelles plus larges qui établissent comment les photographies communiquent du sens. En explorant le rôle que jouent les décisions quant à la présentation et la médialité des images dans la détermination du potentiel de communication des photographies de Duchenne, j'affirme que les stratégies déployées dans *Mécanisme* et *Expression* étaient liées aux méthodologies de recherche utilisées par les auteurs. En outre, j'examine la manière dont Duchenne et Darwin ont invité leurs lecteurs à découvrir le potentiel épistémologique des images par le biais de pratiques de visualisation participatives déjà établies dans les milieux scientifiques et laïques, comme la manipulation de daguerréotypes, l'étude de modèles anatomiques, l'organisation d'albums de *cartes-de-visite,* et la consultation de livres d'histoire naturelle de l'époque victorienne. En bref, je soutiens que les fonctions didactiques des photographies utilisées par Duchenne et Darwin ont été facilitées par l'interaction des spectateurs. Ces photographies requièrent un participant pour leur donner vie.

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INTRODUCTION

On 12 December 1872, a review of the English naturalist Charles Darwin's recently published book, *The Expression of the Emotions in Man and Animals*, was printed in *The Times*, one of London's leading daily newspapers. In his review, the author warned readers about the alarming pictures contained in the penultimate chapter of Darwin's book:

> There are some woodcuts … at the end, descriptive of the feelings of pain, horror, and agony, which will mar the pleasure of the book to sensitive readers … But if these could be kept out of sight, we should recommend to mothers a series of photographs of sulky, screaming, and smiling children, which might enable them, in the midst of some of their less agreeable experiences, to find relief in scientific observation.[1]

The images in question, meant to depict some of the most severe emotional expressions worn on the faces of humankind, show an old toothless man in various states of visible distress (Figs. 1, 2). With his eyes open wide and mouth agape, the man's face is contorted into violent expressions emblematic of terror, horror, and agony. These controversial photographs, part of Darwin's extensive collection of pictures of human expression, were produced by the renowned French neurologist Dr. Guillaume Duchenne de Boulogne at the Salpêtrière Hospital in Paris before they were reproduced in Darwin's book. Originally published in Duchenne's 1862 treatise on the anatomy of expressive facial muscles, *Mécanisme de la Physionomie Humaine*, the pictures of the old man mark one of the first systematic applications of photography to the study of emotional expression.

Duchenne and Darwin shared similar research interests and oriented their studies on expression toward a few common goals. For example, both men denounced pseudo-scientific theories of physiognomy which proposed that the fixed external features of an individual's face could be read as signs of inner character. Instead, Duchenne and Darwin alike posited that an individual's character is revealed by the expressive face in motion. Further, they both argued that emotionally expressive behaviours were constituents of a universal language performed and recognized with uniformity across the globe. With this in mind, the fact that Darwin chose to repurpose Duchenne's provocative and cutting-edge pictures for his own work on expression makes good sense.

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[1] "The Expression of the Emotions," *The Times*, 12 December 1872: 4a–e. Cambridge University Library: DAR 226.2 142-44.

That said, the two men also held opposing views on the origins and functions of emotional expression. For Duchenne, the language of expression was granted to humans by an intelligent creator for the purpose of communicating felt experiences to one another: "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."[2] For Darwin, the ostensible universality of expression was further evidence in support of his argument that all of humankind shares a common ancestor: "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 descended from a single parent-stock."[3] Despite some points of agreement, *Mécanisme* and *Expression* unmistakably advance two different arguments about the basis for and purpose of emotional expression.

Duchenne, often referred to as the father of neurology, was a leading figure in science and medicine in mid nineteenth-century France. Born in 1806 in Boulogne-sur-Mer, he moved to Paris to train in the city's hospitals after completing his degree at the University of Douai in 1825. In the 1830s, Duchenne returned to Boulogne and began experiments with faradic currents that would ultimately lead to the production of *Mécanisme*. In 1842, he continued pursuing this research in Paris. Though Duchenne did not hold an appointment at a specific institution, he visited many hospitals throughout the city to conduct his research. At the Salpêtrière, Duchenne oversaw the neurological division and paved the way for his successor, the infamous neurologist Dr. Jean-Martin Charcot. Today, Duchenne is best known for his contributions to myopathy and his work on what is now termed Duchenne Muscular Dystrophy, a genetic disorder which causes muscle weakness and rapid muscle loss in children. However, it was his research on the anatomy of facial muscles and the physiology of emotional expression that caught the attention of Darwin in the mid nineteenth century.

Darwin, born in 1809 in Shrewsbury, is widely recognized as a pioneer in evolutionary theory. When he read Duchenne's *Mécanisme* in the early 1860s, the naturalist was already well-known throughout Europe. He was celebrated in scientific circles for his contributions to

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[2] Dr. Guillaume Duchenne de Boulogne, *Mécanisme de la Physiognomie Humaine*, trans. R. Andrew Cuthbertson (Cambridge: Cambridge University Press, 1990 [1862]), 19.
[3] Charles Darwin, *The Expression of the Emotions in Man and Animals* (Oxford: Oxford University Press, 1998 [1872]), 355.

biology and geology and, in 1859, published a treatise on evolution aimed at the general public. In *On the Origin of Species*, Darwin outlined the basis of his theory of natural selection. He explained how and why beings evolve in relation to their environments and argued that diverse species progressively diverged from common ancestors. Darwin's ideas were radical at the time as they contested long-held beliefs in creationism and challenged the dominant ideologies of the Christian Church. While Darwin was not the only nineteenth-century scientist who was exploring evolutionary theories, his text was the first publication on the subject to reach a broad, nonspecialist audience. The arguments Darwin made in *Origin*, and continued to present in subsequent publications such as *The Descent of Man, and Selection in Relation to Sex* (1871), were a significant matter of interest and debate. By the time his highly anticipated treatise on expression was published in 1872, evolutionary theory was consistently praised, argued, and ridiculed in both scientific literature and the popular press.

Evidence of Darwin and Duchenne's relationship is limited to three letters exchanged between the two men in spring of 1871. In early March, Darwin wrote Duchenne asking for permission to reproduce a number of the photographs included in *Mécanisme* for *Expression*:

> I am going next autumn or winter to publish an essay on expression in mankind & animals. I procured some years ago your great album, & the same work in Octavo, & I shall have continually occasion to quote those works. I write now to ask whether you would permit me the great favour to have copied & engraved on wood-blocks some 4 or 5 of your photographs, printing beneath them that they are copied from your work …[4]

Duchenne responded later that month, permitting Darwin to copy as many images as he pleased. "I feel very honoured by your proposal to mention some extracts from my work," wrote Duchenne, adding that "between men of science there is no question of money … choose, in my album, all the figures that suit you."[5] Although the two men held two seemingly opposing views on the origins and functions of emotional expression, Duchenne allowed Darwin, whom he deemed a fellow "man of science," to reproduce his images for free.

This dissertation investigates how and why these two men deployed a series of the same images in service of two distinct, separate arguments. Through a close reading of *Mécanisme*'s and *Expression*'s texts, photographs, and prints, I examine the visual strategies Duchenne and

[4] Darwin Correspondence Project, "Letter no. 7566," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-7566.xml
[5] Darwin Correspondence Project, "Letter no. 7623," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-7623.xml

Darwin used to illustrate their theories and support their claims. By way of comparative analysis, this dissertation is the first to study the shifting meanings articulated by these innovative pictures, many of which nineteenth-century viewers deemed frightening as well as scientific. Ultimately, I argue that the epistemological potential of these images was activated by Duchenne and Darwin through techniques of display, as the photographs were deliberately altered through the processes of adaptation and calculated recontextualization.

By exploring the relationship between the visual strategies deployed in *Mécanisme* and *Expression*, this dissertation contributes to well-known interdisciplinary debates in the history of art, science, medicine, and photography about the significance of images, particularly photographs and prints, in producing, communicating, and publicizing scientific ideas. It also examines how these two books and their illustrations were embedded in broader nineteenth-century European debates about photography, epistemology, and scientific truth. This dissertation expands from previous scholarship by providing original research and detailed analyses concerning the surge of interest in the study of emotional expression, and its associated visualizations, in the second half of the nineteenth century.

To visualize their theories and promote them globally, Darwin and Duchenne, like other men of science and medicine, collaborated with artists and learned how to take photographs. Together, they produced hundreds of pictures that were shared amongst colleagues and reproduced in medical and popular publications worldwide. As this dissertation shows, Darwin and Duchenne's collaboration is historically significant because it reveals that presentation, arrangement, and viewer participation were crucial to determining the communicative potential of images in later nineteenth-century scientific publications.

"AS TRUE AS A MIRROR": DUCHENNE'S AND DARWIN'S SCIENTIFIC PHOTOGRAPHY

Throughout the second half of the nineteenth century, novel photographic technologies and processes generated new tools and objects for scientific inquiry. For example, the development of "wet-plate" photography in the 1850s enabled advances in numerous areas of medical study, such as fetal development and reconstructive plastic surgery.[6] Anatomical,

[6] Stanley B. Burns, *Early Medical Photography in America (1839–1883)* (New York: Burns Archive, 1983), 1267.

botanical, and geological specimens could be suspended in time, reproduced, and transported in the form of a photograph. Many early supporters of photography's scientific applications expressed unwavering confidence in the photograph's ability to reproduce the visible world with fidelity. *Mécanisme*'s introduction communicates such a belief: "Photography, *as true as a mirror*, can illustrate my electrophysiological experiments and help to judge the value of the deductions that I have made from them."[7]

Darwin, too, believed that photography was instrumental to articulating his ideas. Although they were a costly option, he was adamant about including photographs of human expressions in his book. A few months prior to *Expression*'s publication, Robert Francis Cooke, a partner at the firm that published Darwin's work in England, commented on the financial impact of Darwin's decision to illustrate his book with photographs: "I suppose you were convinced the expressions could not be portrayed on wood, or it would have been much cheaper."[8] Darwin was also concerned with the quality of the photographs printed for *Expression*. In late November of 1872, he wrote Cooke voicing anxiety about the condition of the images: "… it is obvious that the company must be almost as anxious as we are … it will be necessary to have a look at the Plates, to see that they do not palm off poor copies owing to the employment of incompetent workmen."[9] A few weeks later, he contacted Cooke again regarding the quality of the plates: "One of my sons saw a copy of *Expression* the other day with very poor Heliotypes. Would it not be well to caution the company that they will lose credit if they distribute poor copies?"[10] As Darwin's letters to his publisher demonstrate, he believed that photography's capacity to faithfully reproduce visual phenomena was crucial to its didactic function.

Despite the confidence many early advocates of photography expressed in the medium's ability to reproduce appearances, photography's truth value has been regularly contested since the medium's invention. The contentious relationship between the assumed objective mechanical recording processes of photographic technologies and the aesthetic conventions

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[7] Duchenne, *Mécanisme*, 39.
[8] Darwin Correspondence Project, "Letter no. 8473," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-8473.xml
[9] Darwin Correspondence Project, "Letter no. 8638," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-8638.xml
[10] Darwin Correspondence Project, "Letter no. 8663," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-8663.xml

deployed by photographers has since been explored by numerous scholars. Over the past forty years, medical photography in particular has been a fruitful avenue for the investigation of this interplay between technological and human processes. The much-quoted historians of science Lorraine Daston and Peter Galison argue that from the Renaissance until the mid-nineteenth century, scientists and artists collaborated to generate idealized images of a species or other natural specimen.[11] They claim that such images did not record the appearance of an actual individual specimen but, rather, synthesized knowledge accumulated from numerous acts of observation. Scientists aimed to ensure that the so-called "reasoned image" bore visual fidelity to what it depicted. To ensure this, they intervened in the image-making process to "perfect" atypical specimens.

By about 1860, numerous efforts to extract human intervention from the image-making process altogether had crystallized into the widespread drive toward "mechanical objectivity" in the medical sciences.[12] Daston and Galison broadly define "mechanical objectivity" as the desire "to repress the wilful intervention of the artist-author, and to put in its stead a set of procedures that would … move nature to the page through a strict protocol, if not automatically."[13] For many later nineteenth-century scientists, the belief in photographic neutrality validated the quest for mechanical objectivity. Duchenne, for example, likened photography to a "mirror" throughout *Mécanisme*. For him, photographs were direct, unmediated reflections of the visual information they captured. Darwin, too, sought to remove human intervention from the image-making process. This is most evident in his description of the "photographic engraving" process that the master engraver James Davis Cooper used to transform photographs of animals into woodcuts for *Expression*: "Some of the photographs … were first reproduced by Mr. Cooper on wood by means of photography, and then engraved: by this means almost complete fidelity is ensured."[14]

Debates about photographic objectivity flourished as photography was increasingly employed in the medical sciences during the mid-to-late nineteenth century.[15] Duchenne's book

[11] Lorraine Daston and Peter Galison, *Objectivity* (New York: Zone Books, 2007), 40.
[12] Daston and Galison, *Objectivity*, 27.
[13] Daston and Galison, *Objectivity,* 121.
[14] Darwin, *Expression*, 26.
[15] Martin Kemp, "A Perfect and Faithful Record: Mind and Body in Medical Photography Before 1900," in *Beauty of Another Order: Photography in Science*, eds. Ann Thomas and Marta Braun (New Haven, CT.: Yale University Press in Association with the National Gallery of Canada, Ottawa, 1997), 120.

is one such example. *Mécanisme*'s introduction assures readers that the photographs had not been edited: "I photographed most of the 73 plates that make up the Scientific Section of this Album myself, or presided over their execution, and so that none shall doubt the facts presented here, I have made sure that not one of the photographs has been retouched."[16] As various art historians, including Martin Kemp and Susan Sidlauskas, have shown, many early proponents of medical photography believed that mechanical technologies would replace artistic mediation, eliminate the subjective errors that arose as a consequence of artists' fallible perception, and provide more reliable representations of bodily structures, functions, and pathologies.[17] However, mediation merely shifted to other aspects of the representational process, such as the staging, exposure, and printing of photographs. As a result, the promise of mechanical objectivity propounded by many early supporters of medical photography was thwarted by photographers' widespread reliance on pre-established artistic conventions.[18]

Many historians and art historians have examined photography's reliance on these conventions, particularly with regards to portraiture. Cultural historian Sander Gilman, one of the first to investigate this relationship, argued that British psychiatrist Hugh W. Diamond's mid nineteenth-century photographic portraits of psychiatric patients at the Surrey County Lunatic Asylum (c. 1848–1858) marked the first systematic use of photography in a clinical setting.[19] Diamond's photographs reflected the belief that the camera operated as a "diagnostic tool" that could capture the visible world with absolute fidelity.[20] Yet as Gilman has noted, these photographs replicated the portrait models and posing conventions of early nineteenth-century physiognomic illustrations, and so cannot be read as objective scientific records.[21] Such visual

[16] Duchenne, *Mécanisme*, 39.
[17] Kemp "A Perfect and Faithful Record," 121; Susan Sidlauskas, "Inventing the Medical Portrait: Photography at the 'Benevolent Asylum' of Holloway, C. 1885–1889." *Medical Humanities* 39, no. 1 (2013): 29–37.
[18] For example, portraits of psychiatric patients produced throughout the second half of the nineteenth century were frequently staged according to the contemporary conventions of studio portrait photography. As Kemp has maintained, the staging of psychiatric portraits according to such conventions was precisely what enabled their subjects to be "read" as aberrant: "It was the accepted nature of the conventions that permitted the attentive viewer to determine where postures and expressions departed from the decorous norm." See Kemp, "A Perfect and Faithful Record," 139.
[19] Sander Gilman, Hugh W. Diamond, John Conolly, and Eric T. Carlson, *The Face of Madness: Hugh W. Diamond and the Origin of Psychiatric Photography* (New York: Brunner/Mazel, 1976), 5. As Eric T. Carlson has explicated, the tradition of psychiatric photography was grounded in the notion that portraits of patients could aid in the study of psychiatry due to a perceived causal relationship between psychopathology and outward appearance; specific bodily features and facial expressions were believed to hold clues for understanding the depicted patient's mental state. See *The Face of Madness*, xi–xiv.
[20] Gilman, *The Face of Madness*, 5.
[21] Gilman, *The Face of Madness*, 12.

tropes are also evident in Duchenne's and Darwin's work. For example, in *Expression*, Darwin reproduced several studio portraits that he purchased from prominent London photographers. These images, which show middle-class Victorian children posing in photography studios, embody genre-specific conventions that were familiar to Darwin's readers.

Historian of science Chris Amirault has also explored the relationship between mechanical objectivity and aesthetic convention in mid nineteenth-century medical photographs. He has argued that medicine and photography reinforced one another as both sets of practices were rooted in analogous "constructions of vision, the body, and representations of the real" aimed at fixing seemingly objective records of reality: "photography was constructed as the perfect technology at a moment in which medicine was staking its claim as a discourse of scientific, objective truth through visual knowledge."[22] Although early medical photographs were generally accepted as documentary evidence of the pictured individual's injury, the poses assumed by photographed subjects embodied the aesthetic traditions of studio portraiture.[23] For example, clinical photographs of patients often disclosed clues about their subjects' social class by showing them in everyday dress surrounded by domestic objects.

By the 1890s, discipline-specific conventions designed for diagnostic purposes were established to differentiate clinical photographs of patients from studio portraits. Patients, sometimes made anonymous by blacking out the area around the eyes, were increasingly shown naked against blank backgrounds, and parts of the body that were not diseased were cropped out of the print. As a result, early medical photographs, including those by Duchenne, exemplify a paradoxical tension between scientific and aesthetic demands. As this dissertation argues, while mechanical recording processes were thought to reveal objective and impartial accounts of scientific research objects, sitters' poses, along with the use of various other artistic conventions, implicated photographers in the production of photographic documents.[24]

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[22] Chris Amirault, "Posing the Subject of Early Medical Photography," *Discourse* 16, no. 2 (1993), 51, 60.
[23] Amirault, "Posing the Subject of Early Medical Photography," 53. Daniel M. Fox and Christopher Lawrence have likewise argued that many of the conventions which characterize mid nineteenth-century patient photographs were adopted from studio portraiture. See Daniel M. Fox and Christopher Lawrence, *Photographing Medicine: Images and Power in Britain and America Since 1840* (New York: Greenwood Press, 1988), 9; 25–26.
[24] Fox and Lawrence, *Photographing Medicine*, 55.

The argument for photographic objectivity has perhaps most famously been articulated by the French philosopher Roland Barthes. In his 1964 essay "Rhetoric of the Image," Barthes described the still photograph as a "message without a code."[25] He argued that the photograph, unlike the painting or drawing, embodies an unmediated and impartial relationship between reality and its representation: "the relationship of signifieds to signifiers is not one of 'transformation' but of 'recording' … the scene is *there*, captured mechanically, not humanly (*the mechanical is here a guarantee of objectivity*)."[26] For Barthes, the mechanical recording processes of photography effectively liberate representation from the layer(s) of human intervention necessitated by drawing and painting; artists' hands subjectively interpret while photographers' instruments objectively document. Although Barthes maintained that the processes of photographic production are "absolutely analogical" and, as such, objective, he asserted that the resulting images can never be *read* in an entirely neutral manner. Instead, Barthes contended that the viewer's *reading* of the photograph is largely guided by socio-historically contingent associations between visual symbols and their corresponding meanings.[27] The ostensible objectivity of the photograph, he reasoned, works to "naturalize" such symbolic associations, and so conceals the image's *constructed* meanings behind the appearance of seemingly *literal* ones.[28] According to Barthes, viewers of photographs, like artists, subjectively interpret a presumed objective reality, albeit in the form of infallible reproductions captured by mechanical processes.

Reading Duchenne through Barthes can help us understand how *Mécanisme*'s photographs, and scientific photographs more generally, operated in the later nineteenth century. Duchenne believed his photographs were faithful, impartial records of his experiments, and presented them to his readers as such. He required his audience to understand his photographs in this way for them to function as instructional tools and evidence of his research findings. *Mécanisme*'s images could only be pedagogically useful if they were considered accurate representations of the neurologist's experiments and the conclusions he drew from them.

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[25] Roland Barthes, "Rhetoric of the Image," in *Image/Music/Text*, trans. Stephen Heath (New York: Hill and Wang, 1977), 38.
[26] Barthes, "Rhetoric of the Image," 38. My emphasis.
[27] Barthes, "Rhetoric of the Image," 40.
[28] Barthes, "Rhetoric of the Image," 39.

Numerous scholars have challenged photography's claims to objectivity. For example, American philosopher Susan Sontag, like Barthes, considered how photographs relate to what they depict. However, her meditations on the subject denounced the faith in photographic objectivity that formed the basis of Barthes's analysis. Sontag altogether rejected the notion that the photograph renders visible an unmediated relationship between the subject or object and its representation. Instead, she argued that the production of a photograph always involves human interference: "Photographs are as much an interpretation of the world as paintings and drawings are."[29] As Sontag pointed out, photographers often deploy specific aesthetic strategies that inform viewers' readings of photographs. For example, Sontag noted that German photographer August Sander's catalogue of urban character types (c. 1910) adopted the conventions of nineteenth-century phrenological illustrations.[30] While Sander's photographs replicated the appearances of his subjects with sufficient fidelity, the aesthetic conventions that he deployed likely shaped how contemporary viewers derived meaning from such appearances.

Fifty years before Sander, Duchenne and Darwin in *Mécanisme* and *Expression* also interfered in image-making processes. Duchenne, for instance, used lighting techniques to achieve a chiaroscuro effect that helped bring the subject's expressions into three-dimensional relief in some of his photographs:

> In photography, as in painting or sculpture, you can only transmit well what you perceive well. Art does not rely only on technical skills. For my research, it was necessary to know how to put each expressive line into relief by a skillful play of light. This skill was beyond the most dextrous artist; he did not understand the physiological facts I was trying to demonstrate. Thus I needed to initiate myself into the art of photography.[31]

For Duchenne, the "skillful play of light" was essential to articulating his research subject. The communicative potential of his photographs was reliant upon the calculated technical choices that brought "each expressive line" into clear view.

Over the past decade, scholars have expanded from Daston and Galison to provide more specialized histories of the relationships between art, photography, and science. For example, art historian Tanya Sheehan has demonstrated that retouching photographs was common amongst

[29] Susan Sontag, *On Photography* (New York: Farrar, Straus, and Giroux, 1977), 4.
[30] Sontag, *On Photography,* 46–47.
[31] Duchenne, *Mécanisme*, 39.

studio photographers throughout the mid-to-late nineteenth century.[32] Undoubtedly, the photographer's deployment of aesthetic strategies, such as staging, posing, and retouching, problematize the promise of photographic objectivity proposed by early supporters of medical photography and, later, by Barthes. Yet as scholars such as Kemp, Gilman, and Amirault have argued, photography was frequently used as a mode of impartial documentation, especially within the fields of science and medicine. Although photographs were not and could never be neutral, objective records, it was the promise of objectivity that encouraged photography's early proponents to operationalize photographic processes and their resulting images toward specific ends. This promise led Duchenne and Darwin to embrace photography as a reliable way to visually communicate their arguments to readers.

ACTIVATING PHOTOGRAPHIC MEANING: HOW DUCHENNE AND DARWIN GUIDED READERS' VISUAL INTERPRETATIONS

This dissertation argues that photographic display practices, including how a photograph is cropped or positioned in a book, shape viewers' readings of images. As historian of science Julie K. Brown argues in her seminal work on the exhibition of photographs at later nineteenth-century American fairs and expositions, display practices play a determining role in how photographs are interpreted and understood.[33] For example, when displayed at fairs, photographs were integrated into the larger market of commercial items available for purchase within the fields of art and science. Art historians Elizabeth Siegel and Martha Langford have similarly shown that the presentation of photographs affects how they are interpreted and shapes their social meanings.[34] Siegel and Langford, both focusing on photographic albums, contend that the collection and organization of photographs was key to the formation of individual and group identities. Building on their work, this dissertation examines how a photograph's presentation

[32] Tanya Sheehan, *Doctored: The Medicine of Photography in 19th-Century America* (University Park, PA.: Pennsylvania State University Press, 2011), 37.
[33] Julie K. Brown, *Making Culture Visible: The Public Display of Photography at Fairs, Expositions, and Exhibitions in the United States, 1847 – 1900* (Amsterdam: Harwood Academic Publishers, 2001). See also Julie K. Brown, *Health and Medicine on Display: International Expositions in the United States, 1876 – 1904* (Cambridge: MIT Press, 2009).
[34] Elizabeth Siegel, *Galleries of Friendship and Fame: A History of Nineteenth-Century American Photograph Albums* (New Haven Conn.: Yale University Press, 2010); Martha Langford, *Suspended Conversations: The Afterlife of Memory in Photographic Albums* (Montreal and Kingston: McGill-Queen's University Press, 2021).

invites the viewer to interpret it in a particular way. I argue that viewers are active participants in meaning-making because they interpret visual information in historically and culturally specific ways: they are not passive observers but are constituents of the broader visual cultures that establish how images communicate meaning.

Duchenne's *Mécanisme* and Darwin's *Expression* demonstrate how presentation and arrangement guide readers' interpretations of photographs. With this in mind, it is crucial to note that *Mécanisme* and *Expression* had two distinct goals. While Duchenne outlined the anatomical structures of expressive facial muscles, Darwin established a relationship between expressive behaviours in humans and animals. Both authors used photography to illustrate and support their claims – Duchenne used photographs to make explicit the face's underlying muscular structures, and Darwin used them to draw similarities and differences between human and animal expressions.

In carrying out my analysis, I consider not only what these photographs show, but, perhaps more importantly, how Duchenne's and Darwin's readerships were invited to experience them. As this dissertation argues, their presentational choices helped determine the communicative potential of their images and grew out of their respective research methodologies. While Duchenne relied on a combination of vision and touch to locate and delimit facial muscles, Darwin compared sets of visual data to identify differences between and synthesize generalities out of individual specimens. Such choices embraced viewing practices that were already established in scientific circles and broader nineteenth-century visual culture – practices familiar both men's desired audiences.

Central to my analysis is the relationship between phenomenology (how an image is experienced) and epistemology (how knowledge is realized through that experience). At the heart of this intersection is the materiality of the photograph and its surrounding environment. As anthropologist Elizabeth Edwards and historian of photography Janice Hart have convincingly argued, the sensible features of a photograph and the manner in which it is presented shape how the image communicates meaning: "material and presentational forms and the uses to which they are put are central to the function of a photograph as a socially salient object."[35] Moreover, they maintain that a photograph's physical characteristics directly inform

[35] Elizabeth Edwards and Janice Hart, "Introduction," in *Photographs, Objects, Histories: On the Materiality of Images*, eds. Elizabeth Edwards and Janice Hart (Material Cultures. London: Routledge, 2004), 2.

how the visual information it captures is "read," as "different material forms both signal and determine different expectations and use patterns."[36] For this reason, physical and technical decisions concerning a photograph's presentation are rarely accidental. Instead, these choices are engendered by the larger socio-material contexts in which photography's presentational forms, such as daguerreotypes, *cartes-de-visite*, stereographs, and albums, make meaning. As Edwards and Hart contend, such presentational devices generate and retain meaning by way of our "habitual reiterations of engagement with them."[37]

My dissertation expands from this work to examine the socially and historically specific viewing practices and modes of display that informed how Duchenne's and Darwin's readerships experienced the images contained in *Mécanisme* and *Expression*. More specifically, it explores how Duchenne and Darwin invited (and, at times, required) their readers to activate the epistemological potential of photographs and prints through interactive, participatory viewing processes that were already established in nineteenth-century scientific and lay circles. For example, it considers how the display strategies at work in *Mécanisme* and *Expression* incorporated handling daguerreotypes, studying three-dimensional anatomical models, organizing albums of *cartes-de-visite*, and perusing natural history books in the Victorian parlour.

WHO READ *MÉCANISME* AND *EXPRESSION*?

Mécanisme and *Expression* had two distinct readerships. While Duchenne's book was predominantly aimed at scientists and fine art students, Darwin's book reached a wide, nonspecialist audience. Darwin's readership was geographically broad – *Expression* was quickly translated into French, German, and Dutch, and reached scientists and lay audiences alike across Europe. *Mécanisme*, however, was not well-known internationally outside of scientific circles. Darwin noted the limited reach of Duchenne's research in *Expression*'s introduction: "[his] works have been spoken lightly of, or quite passed over, by some of his countrymen."[38] In France, Duchenne's text was read by a number of leading scholars, including physiologist

[36] Edwards and Hart, "Introduction," 3.
[37] Edwards and Hart, "Introduction," 6.
[38] Darwin, *Expression*, 5.

Claude Bernard, anatomist Louis Pierre Gratiolet, philosopher Albert Lemoine, and physicians Edouard Brissaud and Amédée Latour. *Mécanisme* also reached a specialist audience in England. A few years after its publication, Duchenne's book was a point of discussion amongst Darwin and his peers.

In June of 1869, Darwin sent his copy of *Mécanisme* to Dr. James Crichton-Browne, a Scottish psychiatrist and prominent supporter of eugenics. Darwin consulted Browne, who oversaw the West Riding Lunatic Asylum in Wakefield, at length while preparing *Expression*. In a 1869 letter to Browne, Darwin requested the psychiatrist's opinion on Duchenne's photographs: "If you have the inclination and time, I should be delighted if you would write any remarks on the plates or separately, – such as whether you thought any decidedly good or bad etc."[39] Over the next few months, the two men mailed Duchenne's book back and forth, exchanging notes on its pictures and arguments. In January of 1870, Darwin asked that Browne return the book and thanked him for his valuable insights: "I am very sorry to trouble you but I should be very much obliged if you could soon return to me Duchenne, with, I hope, some notes, as your former notes were of such extreme interest to me."[40] Unfortunately, it would be two months until Darwin heard back from his trusted colleague, who assured him he would return the book promptly. As letters between the two men suggest, *Mécanisme* was an invaluable resource for Darwin. Having not received the book back from Browne by April, Darwin sent another letter:

> As Duchenne's book is of value to me for the marks and your notes of great value, will you have the great kindness to send me literally one line by post to tell me when it is despatched. You thought that you should send it off yesterday fortnight, and in case of loss per rail, it would of course be advisable to make early enquiries. I beg you to forgive me for being so troublesome …[41]

Duchenne's book was eventually returned. Both Darwin's copies of *Mécanisme* can now be found in the Darwin Papers Collection at Cambridge University Library. Sadly, most of the annotations are illegible due to Darwin's handwriting.

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[39] Darwin Correspondence Project, "Letter no. 6779," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-6779.xml
[40] Darwin Correspondence Project, "Letter no. 7089," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-7089.xml
[41] Darwin Correspondence Project, "Letter no. 7160," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-7160.xml

While Duchenne's *Mécanisme* reached a specialist audience largely composed of white, middle-class, educated men, Darwin's *Expression* was read by professionals and the general public, including men, women, and children. The diversity of Darwin's readership is evidenced by numerous reviews published in journals and newspapers, as well as correspondence between Darwin and his peers. A review of *Expression* published in the *Daily News* just days after the book's release, for example, stated that it was suitable for two classes of readers: "those who seek only enlightenment, and those who seek only amusement."[42] Two days later, a review published in *The Globe* suggested that, though women may be interested in reading *Expression*, the book's contents may be incomprehensible to them: "We dare not say what ladies ought to read or ought not to read now-a-days, but we may venture to hint that they should not be seen floundering beyond their depth."[43]

Despite such sexist attitudes, letters between Darwin and his colleagues show that *Expression* was read by their wives and enjoyed by their children. As Darwin's collaborator Alfred Russel Wallace remarked in a letter from November 1872, "the cuts & photos. are admirable and my little boy & girl seized it at once to look at the naughty babies."[44] The English botanist Joseph Dalton Hooker also informed Darwin that his daughter was enamoured: "I have not yet thanked you for your book, nor I regret to say have I opened it – Harriette is deep in it."[45] Darwin's daughter Emma received a similar letter from A.J. Cupples, whose copy was being read by an interested family member: "I have not been able to do more than look at the plates because Mr Cupples walked it off, and a minister here has got the promise of it after him, all without my leave in the matter."[46] The Irish writer Frances Power Cobbe and her partner Mary Lloyd similarly took turns reading Darwin's exciting new book: "Miss Lloyd & I are deep in it already – She is *meanly* rejoicing that I am going out to dinner that she may read it all the evening!"[47]

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[42] "Mr. Darwin's New Book," *Daily News*, Nov. 5, 1872. Cambridge University Library: DAR 226.2 122.
[43] "Darwin in the Drawing Room," *The Globe*, 7 November 1872. Cambridge University Library: DAR 226.2 129.
[44] Alfred Russel Wallace, letter to Charles Darwin, 15 November 1872. Darwin and Burkhardt, *Correspondence Vol. 20*, 506.
[45] Joseph Dalton Hooker, letter to Charles Darwin, 8 November 1872. Darwin and Burkhardt, *Correspondence Vol. 20*, 490.
[46] A.J. Cupples, letter to Emma Darwin, 8 November 1872. Darwin and Burkhardt, *Correspondence Vol. 20*, 488.
[47] Frances Power Cobbe, letter to Charles Darwin, 26 November 1872. Darwin and Burkhardt, *Correspondence Vol. 20*, 525.

Compared to *Mécanisme*, *Expression* had a much broader audience in terms of age, gender, professional status, and geographic location. There are several reasons for this discrepancy. Firstly, Darwin's book was more readily available than Duchenne's. As Darwin was already a well-known and controversial figure, there was a high demand for his work. *Expression*, priced at an affordable twelve shillings, sold over 5,000 copies on the day of its release .[48] In a letter from 9 November 1872, Darwin's publisher, John Murray, noted that the demand for *Expression* was quickly necessitating the production of more copies:

> I write under pressure of much business to let you know that the reception of your Expression by the Booksellers yesterday even exceeded my expectation – not less than 6,000 have been taken. I have not yet had time to ascertain the precise numbers. – The Printers are hard at work but I fear we cannot publish till the week after next.[49]

Two days later, Darwin wrote back expressing his appreciation for his new book's instant success: "I am quite delighted & more astonished than you can be at the sale of the Expression book."[50] Moreover, translations of *Expression* were swiftly made available to readers in metropolitan cities throughout Western Europe.

Secondly, Darwin's book appealed to the general public because of its subject matter. Darwin discussed not only the anatomical and physiological mechanisms of expression, but also the social functions of expressive behaviours in humans and animals. The behaviours Darwin analyzed were familiar, everyday spectacles witnessed by his middle-class Victorian audience – he wrote about blushing young women, doting family pets, and the so-called "exotic" animals admired by the public in zoos. Though Darwin does engage with scientific literature throughout *Expression*, his language is generally straightforward and conversational in tone. The conversational quality of Darwin's writing is further solidified by the fact that much of the evidence he cites in support of his claims is anecdotal.

Thirdly, *Expression* was published at a time when new printing technologies had made large print runs of photographically illustrated books possible. Although *Mécanisme* and *Expression* were published only ten years apart, significant advances in photography and its

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[48] Darwin Correspondence Project, "Letter no. 8622," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-8622.xml

[49] Darwin Correspondence Project, "Letter no. 8616," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-8616.xml

[50] Darwin Correspondence Project, "Letter no. 8620," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-8620.xml

systems of reproduction occurred in the years leading up to the release of Darwin's book. The heliotype process used to illustrate *Expression*, for example, permitted photographs and text to be printed alongside one another on a single page. It was by way of this new technology that Darwin's book became the first photographically illustrated scientific publication to reach a wide audience. Developments in photographic and printing technologies had made photography much more accessible by the later 1860s, and Darwin's readership was part of a culture of making, sitting for, purchasing, exchanging, and collecting photographs.

PORTRAITURE AND LIKENESS: THE CURRENCY, CIRCULATION, AND COLLECTING OF PHOTOGRAPHS OF PATIENTS AND SCIENTIFIC HEROES

Photography was central to the production of an individual's professional identity and status in later nineteenth-century Europe. By the early 1860s, Darwin and his peers were in the practice of sending photographs of themselves to each other by mail. Many of these photographic portraits were accompanied by letters that included observations about the sitter's likeness. A letter from Darwin to J.D. Hooker from 13 June 1864 documents such an exchange: "Many thanks for your photograph ... It is an excellent one & to my mind gives your character better than any one I have seen. I enclose 2 more of mine for Oliver & Thwaites. Funnily enough the boys declared it was like Moses."[51] The very next day, Darwin received a letter from Dr. Daniel Oliver, Hooker's colleague, requesting a copy: "Have you – *to spare* – a copy of the photog. of wh. one reached Dr. Hooker a few days ago, – reminding him of Moses … I shd. much value one."[52] The Darwin Correspondence Project contains hundreds of similar letters that accompanied the exchange of photographs between Darwin and his colleagues and friends, who added portraits of their peers to their prized photograph collections.

These letters, rife with flattery and humour, communicate the desire these men had to possess photographic likenesses of each other. A letter to Darwin from the German zoologist

[51] Darwin Correspondence Project, "Letter no. 4531," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-4531.xml

[52] Darwin Correspondence Project, "Letter no. 4534," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-4534.xml. A few days later, on 18 June 1864, Dr. Oliver wrote Darwin thanking him for the photograph. See Darwin Correspondence Project, "Letter no. 4539," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-4539.xml.

Ernst Haeckel, dated to 11 January 1866, illustrates the demand for photographs within scientific communities:

> I now have one more request, my dear sir, which I have wanted to present to you for a long time. One of my keenest desires is to have a larger portrait of you. It is true that I have the larger photograph (without a full beard) hanging over my desk … and below that I have the *excellent* smaller photograph which you were kind enough to send me two years ago. But the first is certainly bad, and the second too *small* to please me. I have already asked in all the bookshops in Berlin and other larger places whether there are any larger lithographs or photographs of yours, but I have not been able to get any. Perhaps there is one in England, and you would make me extremely happy if you would send me one. I am very often visited by many students and friends who want to see your picture, and I am always sad that your small photograph (with a full beard) cannot be enlarged four or six times. I have often been asked for the small photograph (in business card format) … I would send you back as many photographs of German admirers of Darwin and followers of his teachings.

Haeckel, having exhausted all options in Berlin, comes off quite desperate for photographs of Darwin. His letter not only reflects his personal interest in acquiring these images, but also communicates the wishes of his students and peers, who "want to see [Darwin's] picture." As was the norm, Haeckel offered to provide Darwin with photographs from his collection in exchange for the pictures he desired. As art historian Mary Hunter has shown, images of famous individuals and their admirers alike were valuable commodities and integral to the construction of both individual and collective identities.[53]

Though many of the photographs that circulated between Darwin and his circle were portraits, pictures of scientific specimens were also regularly exchanged by mail. Browne, for instance, sent Darwin many photographs of his patients at the West Riding Lunatic Asylum. Darwin also received photographs from scientists in America. For example, Otto Kratz, a physician in New Orleans, sent Darwin photographs of a Burmese family he believed to be the "very hairy people we want as one of the connecting links" between humans and their primordial ancestors.[54] Countless other photographic specimens, including images of prehistoric human jaw bones, ox skulls, and donkeys, were mailed to Darwin throughout the second half of the nineteenth century.

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[53] Mary Hunter, *The Face of Medicine: Visualising Medical Masculinities in Late Nineteenth-Century Paris* (Rethinking Art's Histories. Manchester: Manchester University Press, 2016), 10–15.
[54] Darwin Correspondence Project, "Letter no. 7862," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-7862.xml

As Darwin's correspondence demonstrates, photography was vital to the formation of professional identities and the construction of knowledge. Photographs were at the heart of professional and social interactions between him and his peers, friends, and admirers. The central role photographs played in these exchanges reflected photography's currency more generally. As the production of photographs increased significantly throughout the second half of the nineteenth century, the Victorian world was flooded with images.

THE STUDY OF EXPRESSION AND ITS INFLUENCE ON ART AND PSYCHOLOGY

The subject of emotional expression bridged a gap between scientific communities and the general public. Though it was a major focus of scientific inquiry throughout the nineteenth century, emotional expression was (and still is) an everyday phenomenon that most people witness when they interact with others – you do not need privileged scientific access to see a smile like you do a kidney. Photographs of emotional expression, however, were novel research objects at the time Duchenne and Darwin published their studies. Due to the long exposure times necessitated by early photographic technologies, photographs of human faces typically showed them in repose or holding still. If someone moved to make an expression, the image would be blurred. People who sat for portraits in early photography studios often had to remain still for several seconds, rendering photographs of the face in expressive motion impossible to make. When Duchenne presented his photographic research on expression in 1862, then, photographs of the expressive face were new to visual culture. By arresting emotional expressions in time, these images presented their viewers with an everyday phenomenon in a novel format.

The study of expression more generally was opened up by Duchenne's method of localized electrization, which allowed him to excite contractions in individual facial muscles without piercing the skin. Before the development of this technique, the study of facial muscles presented a host of challenges for scientists. The muscles of the face do not easily reveal their locations or borders in living subjects and quickly deteriorate after death. As a result of these epistemological limitations, scientists who were interested in the face's expressive movements largely turned toward physiognomy and studied facial structure. Localized electrization, by making the facial muscles beneath the skin legible in living subjects, ushered in new possibilities

for research on emotional expression. As historian of photography and medicine Beatriz Pichel has persuasively argued, Duchenne's study was made possible by the temporal synchronization of photographic exposure times and the localized electrization method he used to hold his sitters' expressions in place.[55]

Mécanisme and *Expression* were seminal texts that marked the transition from physiognomy to *pathognomy* – the study of facial muscles and expressions – in the sciences. Duchenne's photographs also provided artists with new ways of understanding facial anatomy. This was, indeed, one of Duchenne's goals: "The anatomical and electrophysiological analysis of the mechanism of human facial expression, which explains the lines, wrinkles, projections, and hollows of the face, is of great use in the practice of painting and sculpture."[56] In 1871, Duchenne's photographs were brought into the anatomy class of Professor Mathias Duval at the École des Beaux-Arts Paris, where they were studied by fine art students.

Although Duchenne's research launched a new era in the study of expressive anatomy, *Mécanisme*'s contributions to the psychology of emotion were less revolutionary. Much of the criticism Duchenne's research received centred around the fact that the photographed expressions were produced artificially and did not show how the subject *felt* when being photographed. However, such critiques demonstrate how Duchenne's project was misunderstood. Duchenne sought to uncover the locations and boundaries of the expressive muscles of the face. His primary concern was functional anatomy, not the relationship between the expression as it is performed and the emotion as it is felt.

When it came to the psychology of emotion, Darwin's *Expression* had a much greater impact. In 1855, Herbert Spencer, an English philosopher-psychologist and peer of Darwin, outlined what is now termed the "psychological constructionist approach" to the emotions.[57] His *Principles of Psychology* argued that emotion and cognition are analogous states that arise from the same mental processes.[58] Darwin's *Expression*, published seventeen years later, presented a more physiological approach. For Darwin, emotional expressions are complex, automatic actions that were once performed to relieve certain desires and sensations. This physiological

[55] Beatriz Pichel, "From Facial Expressions to Bodily Gestures: Passions, Photography and Movement in French 19th-Century Sciences," *Hist Human Sci* (2016 Feb, 29): 27–48.
[56] Duchenne, *Mécanisme*, 32.
[57] M Gendron and LF Barrett, "Reconstructing the Past: A Century of Ideas About Emotion in Psychology," *Emot Rev.* 2009 Oct 1;1(4): 316-339.
[58] Herbert Spencer, *The Principles of Psychology* (Abingdon: Routledge, 2019 [1855]).

approach toward understanding emotion was elaborated upon by the American philosopher William James, a critical figure in the science of emotion, in 1884. In *What is an Emotion?*, James argues that our perception of bodily changes which occur in response to external stimuli is itself emotion.[59]

While *Expression*'s lasting influence on the study of emotion is irrefutable, Darwin's reliance on Duchenne's research should not be underestimated. This dissertation argues that the interplay of image and text in Duchenne's *Mécanisme* paved the way for Darwin's *Expression* and the arguments it articulated. As the first photographic study of facial expression, *Mécanisme* presented its readers with an entirely novel research object. It also set a precedent for how these types of images could be displayed and interpreted.

READING DARWIN'S *EXPRESSION* THROUGH DUCHENNE: CHAPTER OUTLINES

Reading *Expression* through *Mécanisme* allows us to look at Darwin's groundbreaking publication in a new way. Namely, it sheds light on the importance of participatory viewing practices in the production of knowledge throughout the later nineteenth century. Duchenne provided Darwin with photographs that were central to the argument he presented in *Expression*. He also gave Darwin a model for how to involve the reader in the process of looking at photographs. *Mécanisme* and *Expression* deploy distinct strategies of display that invoke different use patterns and mobilize the same photographs in service of their authors' unique claims. By manner of their display, the photographs of the old toothless man were translated to mean something different for Darwin than they did for Duchenne.

Chapter one focuses on Duchenne's photographs of the old man and their presentation in *Mécanisme*. It argues that the photographs' capacity to support Duchenne's arguments is dependent on the interactive viewing process advanced by textual instructions that were printed alongside them in the book. Throughout *Mécanisme*, Duchenne urges his reader to interact with the photographic plates by masking specific areas of the images with a hand or piece of card. Though scholars such as François Delaporte, Andrew Cuthbertson, John Hueston, and Jean-François Debord have examined the lasting effects these images had on the study of expression,

[59] William James, "What Is an Emotion?" *Mind* 9, no. 34 (1884): 188–205.

an investigation of why Duchenne encouraged the tactile manipulation of his photographs has yet to be undertaken.[60] In this chapter, I argue that for Duchenne, the physical handling of the photographs reproduced in his book activated their didactic potential; knowledge about emotional expression gleaned through his experimental study was revealed through the tactile exploration of his photographs. Further, I explore how this tactile approach to looking at images embraced viewing practices that were already established in photography and medicine. Ultimately, I demonstrate that this interactive viewing process advanced Duchenne's argument that expressive facial muscles which were once believed to be connected to each other are, in fact, anatomically and functionally independent.

In chapter two, I examine how Duchenne's photographs were repurposed in Darwin's *Expression* ten years later. More specifically, I explore how Darwin arranged three photographs of the old man by Duchenne alongside three photographs of young English girls on a composite plate. I contend that the organization of these photographs was deliberate and served Darwin's argument that human expression is a language that is universally performed and recognizable across age and gender. In carrying out this analysis, I consider popular modes of photographic display that were familiar to Darwin's Victorian audiences. In particular, I examine how *Expression*'s composite plate embraced broader trends in Victorian visual culture, such as the rise of *cartes-de-visite* family photo albums, enabled by innovations in photographic and printing technologies. I argue that such formats required the active participation of viewers, who were encouraged to synthesize visual similarities amongst disparate pictured identities.

Chapter three is centered on the woodcuts of the old man at the end of Darwin's book – those *The Times* warned would "mar the pleasure of the book to sensitive readers." Here, I examine Darwin's decision to transform two of Duchenne's photographs into woodcuts. Through a comparative analysis of the various woodcuts and photographs included in *Expression*, I chart the visual strategies that Darwin deployed to establish connections and distinctions between two groups of beings – humans and animals. I propose that Darwin's decision to transform Duchenne's photographs in this manner mobilized these images to support

[60] François Delaporte, *Anatomy of the Passions* (Stanford, CA: Stanford University Press, 2008); Andrew Cuthbertson, "The Highly Original Dr. Duchenne," in *The Mechanism of Human Facial Expression* (Cambridge: Cambridge University Press, 1990), 225–241; John T. Hueston, "Duchenne Today: Facial Expression and Facial Surgery," in *The Mechanism of Human Facial Expression* (Cambridge: Cambridge University Press, 1990), 257–283; Jean-François Debord, "Une Leçon de Duchenne," in *Duchenne de Boulogne: 1806–1875* (École Nationale Supérieure des Beaux-Arts, 1999).

one of his key claims: the origins of human expression can be found in the expressions of animals. This rhetorical strategy operates within the internal logic of Darwin's book, which is divided into three main sections. The first, illustrated exclusively by woodcuts, analyzes the expressive behaviours of animals. The second, containing only photographs of humans, examines ordinary, everyday expressions, such as smiling and frowning. As historian of science Julia Voss has persuasively argued, these two distinct forms of visual media differentiate one group of beings from the other.[61] Significantly, the third and final section of *Expression*, which considers acute human expressions of terror, horror, and agony, is illustrated by woodcuts *and* photographs. By arguing that the woodcuts were linked to animality and the photographs to humanity, I explore how the sequential experience of reading Darwin's *Expression* and its images positions the woodcuts of the old man in the book's final section as visual evidence that the most severe human expressions demonstrate our connection to a primordial ancestor shared with animals.

Fundamentally, this dissertation argues that the didactic functions of the images used by Duchenne and Darwin were facilitated by their viewers' interaction with them. In both *Mécanisme* and *Expression*, photographs and prints were deployed strategically in support of their authors' chief arguments. Both the content captured by the images and how they were displayed were central to their didactic roles. By inviting their readers to experience the images that illustrated their books in specific ways, both Duchenne and Darwin operationalized the viewing process by encouraging use patterns already familiar to their audiences. These use patterns, encouraged by specific modes of display, mimicked Duchenne's and Darwin's research methods. Armed with effective display methods for their chosen photographs and prints, these two men brought their readers along for the journey of scientific discovery and verification.

[61] Julia Voss, *Darwin's Pictures: Views of Evolutionary Theory, 1837–1874* (New Haven: Yale University Press, 2010), 181–256.

CHAPTER 1

FARADIZING FACES, FEELING PHOTOGRAPHS: THE VIVIFYING POWER OF TOUCH IN DUCHENNE'S *MÉCANISME DE LA PHYSIONOMIE HUMAINE*

In 1862, Dr. Guillaume Duchenne de Boulogne's *Mécanisme de la Physionomie Humaine*, a study on the human face's expressive muscles, was published in Paris.[62] Illustrated by 82 original photographic plates, *Mécanisme* documents Duchenne's experimental research on facial expression carried out on seven models, some of whom were patients at the Salpêtrière Hospital in Paris.[63] Duchenne's revolutionary study used a novel technique of localized electrization that permitted the technician to induce muscular contractions without piercing the skin. The book's black and white photographs, which show the doctor stimulating his models' faces with electrical probes to trigger muscular contractions, are accompanied by explanatory notes and viewing instructions that guide the reader's interpretation of the extraordinary and, at times, grotesque images. Throughout *Mécanisme*, Duchenne implored his readers to interact with the photographs in a tactile way. Following his instructions, they are asked to conceal certain areas of photographs by masking them with their hands or a piece of card, thus revealing the boundaries of each muscle or group of muscles made to contract under localized electrization.

In this chapter, I argue that Duchenne's viewing instructions are best understood as the doctor's efforts to train his audience to view photographs in a participatory, multi-sensory way. I contend that this interactive viewing practice reflected a broader reconceptualization of vision that took place throughout the early nineteenth century. As art historian Jonathan Crary has argued, the viewer, previously conceived as a neutral, disembodied, and interiorized witness of external phenomena, was reimagined as the site upon which internal sense organs and the external objects that they apprehend meet.[64] Such an account of vision signaled a shift toward

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[62] Much of the content published in the 1862 edition of *Mécanisme de la Physionomie Humaine* was included in Duchenne's submission for the 1857 Volta Prize.

[63] Constructed in 1656 under Louis IX, the Salpêtrière was initially established as a general hospital for the underprivileged people of Paris and held almost 20,000 patients. Duchenne did not hold an appointment at a specific hospital while working in Paris, and so was able to examine cases at any of the city's hospitals.

[64] Jonathan Crary, *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century* (Cambridge, MA.: MIT Press, 1990), 73.

more recent phenomenological understandings of vision as learned, embodied, and localized. For Duchenne, I argue, the skilled and tactile manipulation of photographs according to his directives activated their epistemological potential; knowledge about his photographs and the experiments they documented were gleaned through the mutually-constitutive relationship between vision and touch presumed in his directions. Put simply, *Mécanisme*'s photographs required a participant to bring them to life.

Plate 64 (Fig. 3) shows Duchenne and his assistant applying four electrical probes to an older male subject's skin. This image is perhaps the most unsettling to modern viewers, and is now the most well-known photograph from the book. The old man's face, exhibiting a distorted, worrying expression, rests just above the centre of the black and white photograph. A cloud of diffuse light emanates from the perimeter of his face, generating a vignette-like effect that frames the expression under analysis. The subject's exposed chest, pale and luminous, nearly blends into the ill-fitting white shirt strewn haphazardly across his torso. To his left is the renowned Duchenne, dressed in a black suit and crisp white cotton dress-shirt. The doctor, carefully holding his induction instrument, stares at the points where the rheophores meet the subject's skin. Opposite Duchenne is his assistant, whose right arm presses into the old man's chest – as if performing an act of gentle restraint – while he applies two electrical probes just under his chin. Staring out at the viewer with his toothless mouth agape, the subject takes on an expression provoked by two expertly-trained pairs of hands. One pair is responsible for stimulating the contraction of the *m. corrugator supercilii* (named "the muscle of pain" by Duchenne), located above the inner corner of the eyebrow. The second pair applies two probes to the *m. platysma* ("the muscle of fright"), found just below the jaw on the side of the neck. Like a marionette attached to electrical wires, the subject takes on an expression described by Duchenne as "terror mixed with pain, torture."[65]

Most of the photographs included *Mécanisme* feature the old man, a Salpêtrière patient who suffered from a neurological condition. Though his name is unknown, Duchenne wrote that he was a former shoemaker who had a form of palsy which caused decreased sensation in his face. It was common for physicians at the Salpêtrière to use their patients in studies, particularly those of the lower classes who stayed at the hospital and had little agency. Throughout the album, the old man's face is shown contorted into a number of startling and painful expressions:

[65] Duchenne, *Mécanisme*, 89.

Plate 33 (Fig. 4), meant to demonstrate the expression of "agreeable surprise," depicts the contraction of "the muscle of attention" and "the muscle of surprise" while Plate 45 (Fig. 5), which shows "pain and despair," depicts the contraction of "the muscle of sadness" and "the muscle of pain." Connected to the expert hands of skilled technicians by electrical probes and cables, the old man's facial muscles effortlessly bend to the will of the induction machine's operators.

Visual recording was essential to the production of scientific knowledge in the later nineteenth century. With these photographs, Duchenne mapped the face's individual muscles and demarcated the boundaries between them, thus challenging facial musculature theories that were widely accepted at the time. French anatomists and physicians who carried out research on facial expression during the early nineteenth century, such as Jacques-Louis Moreau de la Sarthe, Jean-Baptiste Sarlandiére, and Jean Cruveilhier, believed that facial muscles operate as an "assemblage" much like a mask.[66] Duchenne instead attempted to prove that facial muscles are anatomically and functionally independent: "I can say that I have discovered the limits of some muscles that were considered to continue one into the other … the existence in the face of muscles that are neither classified nor named."[67] The doctor credited such discoveries to his novel technique, conceding that the boundaries between individual muscles were only made legible "by using the true *living anatomy* of electromuscular exploration."[68] While localized electrization isolated individual muscle contractions, photography permitted the doctor to fix the expressions he generated on patients' faces. Although exposure times were still too long to capture fleeting expressions, Duchenne's electrical induction process held the provoked expressions in place. Together, localized electrization and photography suspended the transitory object of research in time.

In mapping out the facial muscles' expressive movements, Duchenne educated his readers, which consisted primarily of middle-class men in scientific and artistic circles. Duchenne divided *Mécanisme* into three sections. In the first, he outlined his method, critiqued the works of his predecessors, and summarized his study's findings. The second, titled the "Scientific Section," charts the doctor's experiments through a series of comprehensive notes

[66] Delaporte, *Anatomy of the Passions*, 12.
[67] Duchenne, *Mécanisme*, 23.
[68] Duchenne, *Mécanisme*, 23.

that accompany each of the photographic plates. The final "Aesthetic Section," geared toward artists, features ten plates that show Duchenne stimulating the facial muscles of a young blind woman, who performs theatrical poses in costume to situate the expressions within the context of a dramatic scene. The doctor anticipated that his photographic project would not only enable men of science and medicine to more accurately identify muscular structures and functions, but would also help fine art students better represent facial expressions. In this way, Duchenne's work served as a more modern and technological *tête d'expression*.

In 1873, the original photographs produced for *Mécanisme* were donated to the École des Beaux-Arts Paris. This attests to how these images were deemed essential to artistic learning. The large-scale photographs (30 x 21.8 cm), which had entered the curriculum of Professor Mathias Duval's anatomy class two years earlier, were cropped to eliminate the bodies of Duchenne and his assistant, then stretched onto a canvas and varnished to achieve a "painterly effect."[69] Altered for the purpose of fine art instruction, some of the photographs at the École des Beaux-Arts feature small panels made of black card that can be moved across the image to mask specific portions of the model's face (Fig. 6). This tool assisted students in identifying the location of particular muscular contractions that altered the model's expression in cases where the doctor had only stimulated one side of the face. Importantly, this act also and mimicked the tactile viewing that Duchenne instructed *Mécanisme*'s readers to perform.

This chapter is the first study to analyze Duchenne's efforts to operationalize viewing processes by exploring the rhetorical strategies of his photographs and their accompanying text. More specifically, it considers how the doctor constructed, captured, and directed his audience's reading of a novel object of study: the dormant human body waiting to be expressively activated by expert hands. First, I examine how Duchenne's localized electrization method enabled a new "living anatomy" – the anatomical study of living subjects – that made possible a more accurate analysis of the face's muscular structures and functions. By discussing the ways in which photography's status and conventions informed Duchenne's images, I analyze how the participatory modes of observation he encouraged repeated looking practices already established in mid nineteenth-century culture. Further, I argue that such practices embraced a

[69] Alisa Luxenberg, "'The Art of Correctly Painting the Expressive Lines of the Human Face': Duchenne De Boulogne's Photographs of Human Expression and the École des Beaux-Arts," *History of Photography* 25, No. 2 (2001): 207.

phenomenologically-grounded conception of vision as an embodied, multi-sensory skill to be taught and learned. Duchenne, in instructing readers to view photographs with their eyes and hands, facilitated their participation in – or, perhaps more accurately, the illusion of their participation in – the construction of photographic and scientific truth.

BEYOND PHYSIOGNOMY, BEYOND THE EXPRESSIVE CORPSE: A HISTORY OF LOCALIZED ELECTRIZATION AND THE "LIVING ANATOMY" OF FACIAL MUSCLES

In *Mécanisme*'s introduction, Duchenne compared the animating force of his rheophores to that of nature and celebrated the research opportunities made possible by his new technology: "Armed with electrodes, one would be able, like nature herself, to paint the expressive lines of the emotions of the soul on the face of man. What a source of new observations!"[70] Indeed, Duchenne's localized electrization technique granted scientists newfound access to the facial muscles and their functions in living subjects. His novel approach to studying emotional expression is enmeshed in a long history of facial anatomy research. Prior to Duchenne's innovations, the study of facial muscles posed several problems for anatomists, physiologists, and myologists. Unlike most limb and torso muscles, which reveal their positions and boundaries by shortening upon contraction, the facial muscles do not effortlessly disclose their precise locations nor their borders.[71] Further, the facial muscles' forms and dimensions are easily distorted by the process of dissecting cadavers. After death, the facial muscles decay much quicker than those of the limbs and the torso; facial tissue rapidly loses the volume and colour it possesses when the body is alive. As a result of these limitations, facial muscles were chiefly studied by observing and identifying the wrinkles and folds that muscular contractions produce upon the skin's surface. Seeing as *pathognomy* – the study of the facial muscles and the expressions they impart – presented a host of epistemological obstacles, many nineteenth-century scholars interested in the expressive characteristics of the face turned instead to the study of facial structure.

Duchenne positioned his study in opposition to pseudo-scientific theories of physiognomy, which purported that the permanent features of an individual's face are indicative

[70] Duchenne, *Mécanisme*, 9.
[71] Delaporte, *Anatomy of the Passions*, 9.

of inner character. These theories were supported by anthropologists, criminologists, and artists throughout the nineteenth century.[72] As art historian Patrizia Magli has shown, the proposed union between external appearance and inward character that underlies such theories can be traced back to the sixteenth-century work of polymath Giambattista della Porta, who grounded his approach in the notion of a fundamental solidarity between the body and the soul.[73] Given that the facial expressions thought to articulate emotions are fleeting (and therefore difficult to pin down), physiognomists aimed to apprehend an individual's "univocal essence" by determining the norms that stood behind the transience of countenance. Magli argues that such efforts to interpret the body were predicated on *arbitrary equivalences* – semiotic relationships established by way of convention – between particular bodily parts and specific faculties or dispositions. According to physiognomic equivalences, the human face was translated into a "symbolic form" with "unchangeable elements" that could be isolated, abstracted, compared, and categorized.[74] For Delaporte, the physiognomist is best described as a semiotician who decodes the face as if it were script: "When he sees a face, the physiognomist reads it like a text, or hears it as a language … Physiognomy is nothing other than a semiology coupled with a hermeneutics."[75] Along these lines, physiognomy figures as a method of translation whereby discrete, particular facial features are interpreted according to a fixed classificatory framework. Under the scrutiny of the physiognomist, the distinctive features of the individual subject's face dissolve under the authority of a generalized taxonomy.

In France, physiognomic theory was chiefly advanced by seventeenth-century painter and art theorist Charles Le Brun. In 1668, the artist delivered his *Lecture on General and Particular Expressions* at the Royal Academy of Painting and Sculpture.[76] Le Brun relied on the

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[72] See Anthea Callen, *The Spectacular Body: Science, Method, and Meaning in the Work of Degas* (New Haven: Yale University Press, 1995), 1–35; Martin Kemp and Marina Wallace, "The House of the Soul," in *Spectacular Bodies: The Art and Science of the Human Body from Leonardo to Now* (London: Hayward Gallery, 2000), 94–149; Elspeth Brown, "The Physiognomy of American Labour: Photography and Employee Rationalization," in *The Corporate Eye: Photography and the Rationalization of American Commercial Culture, 1884–1929* (Baltimore: Johns Hopkins University Press, 2005), 23–64; Allan Sekula, "The Body and the Archive," *October* 39 (1986): 3–64.

[73] This central tenet grew out of the Aristotelian belief that the soul determines the form of the material body and, as it follows, that the passions are "immersed in matter." See Patrizia Magli, "The Face and the Soul," in *Fragments for a History of the Human Body v. 2*, eds. Michel Feher, Ramona Naddaff, and Nadia Tazi (New York, NY.: Zone Books, 1989), 87–88.

[74] Magli, "The Face and the Soul," 89–90.

[75] Delaporte, *Anatomy of the Passions*, 39.

[76] Delaporte, *Anatomy of the Passions*., 105.

conventions by which facial expressions were represented in painting in order to organize a visual vocabulary of human character traits and emotions.[77] In *The Expressions* (Fig. 7), a late seventeenth-century etching executed by the French artist Henri Testelin after Le Brun, twelve vignettes show the facial expressions of people in well-known artworks. These images, much like Duchenne's, were used by artists to accurately represent human emotions. Le Brun's figures do not look out the viewer; they react to something outside the picture plane that provokes an expressive response. The vignettes, accompanied by text that defines the represented emotion, are methodically arranged into a four by three grid so the expressions can be compared to one another.

A comparison of the pictured expressions, however, is not the only assessment enabled by Testelin's etching. Each vignette features a different subject, his or her individuality made clear by the artist's attention to the figure's facial features and accoutrements. Many of the figures, for example, are shown from a three-quarter or profile view, emphasizing the differences between the shapes of the browbones, noses, and jawlines. Testelin's etching, then, welcomes both pathognomic and physiognomic comparisons. However, pathognomy appears subordinate to physiognomy, as the structure of the individual's face determines the expressions produced by their facial movements. The strong brows and prominent cheekbones of the *fright* figure (Fig. 8), for example, produce a severe expression. While the figure's furrowed brows protrude over his wide eyes, the deep recess under his cheek – emphasized by crosshatching – creates the appearance of a hollowed-out face struck by fear. To compare, the soft features of the *contemplation* figure (Fig. 9) engender a gentler expression. Her faint brows and rounded face generate a subtle, delicate expression as she gazes up past the top edge of the picture plane. While the male figures tend to exhibit stronger, sharper features, the female ones are more rounded and smooth. By inviting comparisons between figures with strikingly different facial structures, Le Brun's study of pathognomy was wrapped up in the physiognomic project for which he is most well-known.

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[77] Le Brun's lecture at the Academy was accompanied by a series of illustrations that related the features and expressions of human faces to those of animals. Jennifer Montagu has argued that Le Brun's approach to physiognomy embraced René Descartes's notion that facial expressions serve as signs of the passions which, in turn, reveal the state of the given individual's soul. To compare, Delaporte has contended that Le Brun was following the French physican Marin Cureau de la Chambre who, unlike Descartes, did not believe that expressions could be feigned. For Le Brun, Delaporte claims, the expressive sign "is the effect of a physiological determinism that has its source in the soul." See Jennifer Montagu, *The Expression of the Passions* (New Haven and London: Yale University Press, 1994), 17; Delaporte, *Anatomy of the Passions*, 107–08.

During the eighteenth century, much of physiognomic theory was elaborated and popularized by philosophers and physicians throughout Western Europe, such as Johann Kaspar Lavater and Petrus Camper, and served as instructive and diagnostic tools in both scientific and artistic circles. As art historian Barbara Stafford has aptly demonstrated, the problem of visualizing that which remains "out of sight" – trapped within the confines of the human body – became essential to the natural sciences and fine arts of the Enlightenment.[78] As the central aim of visualization practices was to identify the relationship between interior states and their exterior manifestations, physiognomy gradually became a "universal science."[79] Imagery associated with physiognomy, such as Testelin's etching, was immensely popular and circulated widely throughout Europe through books, artist's manuals, lectures, and journals.

During the first half of the nineteenth century, numerous scientists began to investigate the anatomical and physiological underpinnings of physiognomic theories by studying the facial muscles. Yet physiognomy began to dwindle as the century progressed.[80] In 1806, Scottish anatomist Sir Charles Bell published the *Anatomy and Philosophy of Expressions as Connected with the Fine Arts*, which established a connection between Le Brun's physiognomic catalogue and the face's anatomical structure.[81] Bell's treatise, printed in seven editions during the nineteenth century, was widely disseminated throughout Western Europe and well-known to art and science students alike. As with Duchenne's *Mécanisme*, Bell's *Anatomy and Philosophy of Expressions* is illustrated by prints produced in part by its author: the treatise features numerous engravings based on Bell's drawings. Unlike LeBrun's catalogue, which codified the face's external characteristics, Bell's illustrations peeled back its fleshy surface to reveal how features and expressions are governed by the arrangement of facial muscles and the structure of the nervous system. The print *Facial Muscles used in Expression* (Fig. 10), for example, depicts the outlines, volumes, and configuration of the muscles responsible for expressive movements. Here, an anonymous face stripped of its superficial features (apart from the lashes that adorn a pair of closed eyelids) floats upon a bare, inarticulate surface. While thin, precise lines indicate the direction of the muscle fibres, areas of light and shadow elucidate where the muscles sit in

[78] Barbara Maria Stafford, *Body Criticism: Imagining the Unseen in Enlightenment Art and Medicine* (Cambridge, MA.: MIT Press, 1991), 2.
[79] Stafford, *Body Criticism*, 48.
[80] François Delaporte, "Duchenne, Darwin, and the Mimique," in *Duchenne de Boulogne: 1806–1875* (École Nationale Supérieure des Beaux-Arts, 1999), 80.
[81] Debord, "Une Leçon de Duchenne," 31.

relation to one another. The careful attention paid to each muscle's shape and topography, as well as its arrangement within the face's musculature as a whole, evince the anatomist's proficiency as both scientist and artist; the discerning eye of Bell the scientist shrewdly observed the object of study while the dexterous hand of Bell the artist precisely documented his observations. For Bell, an understanding of facial anatomy required both scientific and artistic education. As historian Frederick Cummings has argued, Bell believed that credible scientific images should be "an accurate reflection of natural structure and process based on and checked by the artist's experience."[82] Further, he held that scientific training was essential for art education. For him, both artist and scientist should be educated to accurately observe, interpret, and represent anatomical subjects. In Bell's *Facial Muscles used in Expression*, the precise markings that delineate the muscle fibres document the expert hand of the artist/scientist skillfully recording and interpreting his observations.

Following Bell, numerous nineteenth-century scientists aimed to unveil the anatomical and physiological foundations of facial expression. In the early nineteenth century, French anatomist Jacques-Louis Moreau de la Sarthe proposed a physiological basis for Lavater's theory of physiognomy.[83] Moreau conceived a link between physiology and physiognomy by arguing that the repeated contraction of certain facial muscles leaves a permanent impression on the face, and so determines the appearance of the face at rest. In the 1830s, French anatomists Jean-Baptiste Sarlandière and Jean Cruveilhier animated the faces of dissected cadavers through electrical stimulation to explore the relationship between facial muscles and nerves.[84] Their research demonstrated the continuity of fibres across the intersections of the face and, as such, seemingly revealed the "mutual dependence" of facial muscles. Overall, Moreau, Sarlandière, and Cruveilhier similarly asserted that facial muscles were best understood as an assemblage of mutually dependent parts.

However, as Jean-François Debord (1999), former professor of morphology at the École des Beaux-Arts Paris, and Delaporte (2008) have explained, the dissection of cadavers severed the mobile attachments between the facial muscles and the inside of the skin.[85] Though the

[82] Frederick Cummings, "Charles Bell and the Anatomy of Expression," *The Art Bulletin* 46, no. 2 (1964): 191.
[83] Delaporte, *Anatomy of the Passions*, 11.
[84] Cruveilhier chose to examine the cadavers of healthy individuals who had died unexpectedly because facial muscles tend to lose their volume and colour over time. Delaporte, *Anatomy of the Passions*, 12.
[85] Delaporte, *Anatomy of the Passion,* 1; Debord, "Une Leçon de Duchenne," 28.

scalpel was an intermediary between the visible and invisible, it also reconstituted what rested beyond the body's palpable surface. In unearthing the facial musculature beneath the skin, the instrument transformed the anatomist's object of study. To circumvent this problem, Duchenne excited his living subjects' facial nerves using a non-invasive technique of electrical stimulation. This localized electrization method caused individual facial muscles to contract, thus illustrating that the muscles are, in fact, structurally and functionally independent. In particular, Duchenne's research described the boundaries between the pyramidal and frontal muscles, and verified the independence of the superciliary portion of the superior palpebral orbicular (the muscle beneath the eyebrow) and the lower facial muscles.[86]

As historian Andrew Cuthbertson has noted, much of the success of *Mécanisme* is the result of Duchenne's non-invasive technique.[87] Duchenne used alternating induction currents and applied wet rheophores onto moistened skin to provoke isolated muscular contractions. Indeed, the doctor advertised the originality of his method and the anatomical knowledge it disclosed throughout *Mécanisme*'s introduction: "Localized electrization … permitted me to see the tiny radiations of the muscles occurring under the influence of the instrument. The muscular contractions revealed their direction and their anatomical situation more clearly than the scalpel of the anatomist."[88] The muscular anatomy beneath the skin could now be traced topographically across the visible surface of the body's exterior. Duchenne was also sure to note that his study marked the first research application of this method: "I take the liberty of affirming that this electromuscular method had not been used before my experiments."[89]

In addition to celebrating the contributions made by localized electrization, Duchenne criticized the works of Le Brun, Camper, Lavater, Moreau, Bell, Sarlandière, and Cruveilhier in *Mécanisme*'s introduction. For Duchenne, Le Brun "represented the diverse aspects of facial expression produced by the emotions but without worrying about their laws of motion."[90] Perhaps more importantly, Cruveilhier severed facial tissue from its underlying skeletal

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[86] Delaporte, *Anatomy of the Passions*, 26.
[87] Although Sarlandière had used galvanic (direct current) stimulation in some of his later research, the method he employed required that the subject's skin be pierced with a sharp electrode. See Andrew Cuthbertson, "The Highly Original Dr. Duchenne," 231. See also Sarlandière, J.-B. *Mémoires sur l'électropuncture considerée comme moyen nouveau, de traiter efficacement la quote, les rhumatismes et les affections nerveuses, et sur l'emploi du 'Moxa japonaia' en France* (Paris: Mlle Delaunay, 1825), 150.
[88] Duchenne, *Mécanisme*, 10.
[89] Duchenne, *Mécanisme,* 10.
[90] Duchenne, *Mécanisme*, 3.

structure, thus rendering inaccurate his claim that "all the muscular fibers seem to merge."[91] Duchenne positioned his study in direct opposition to Cruveilhier's research, noting that "it was only by using the true *living anatomy* of electromuscular exploration that we were able to demonstrate that this fibrillary continuity was an illusion."[92] As Duchenne made plain, the tools and techniques employed by the practitioner determine which features of the object of study he may identify. It was through a combination of electricity and photography that Duchenne revealed anatomical information that had previously remained enigmatic to scientists.

While the use of electricity for diagnostic and therapeutic purposes can be traced back to the seventeenth century, when static electricity was first utilized to treat paralysis, substantial developments in electricity's medical applications occurred at the end of the eighteenth century.[93] In the 1770s, Italian scientist Luigi Galvani observed that the leg of a lifeless frog convulsed when an electric generator unloaded nearby.[94] Galvani's discovery brought about a great deal of excitement. Scientists across Western Europe quickly began using direct currents to stimulate the limbs of deceased animals and humans. Among the men who performed these early experiments was Galvani's nephew, physician Giovanni Aldini, who conducted studies on horses, oxen, calves, and human cadavers.[95] As Aldini related, the electric stimulation of the human cadaver caused the body to move "as if the person were to get up, walk … The breathing movements were even restored; a candle placed in front of the mouth went out."[96] Similar experiments were carried out in France. In 1773, the military surgeon Dominique Jean Larrey reanimated an amputated human leg. Twenty-five years later, the renowned anatomist Xavier Bichat applied direct current stimulation to the bodies of beheaded criminals.

Italian physicist Alessandro Volta, who invented the electric battery, significantly advanced electricity's therapeutic applications at the turn of the nineteenth century. Volta's use of the electric battery to treat hearing diseases marked the beginning of direct current therapy.[97]

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[91] Duchenne, *Mécanisme*, 22.
[92] Duchenne, *Mécanisme*, 23. My emphasis.
[93] Therapeutic applications of static electricity were advanced during the late seventeenth and early eighteenth centuries. In 1748, Swiss physician Jean Jallabert successfully treated a patient suffering from paralysis of the right arm by way of static electricity therapy. See Monique Sicard, "When the Face, Photography, Medicine, and Electricity Meet," in *Duchenne de Boulogne: 1806 – 1875* (École Nationale Supérieure des Beaux-Arts, 1999), 68–69.
[94] Sicard, "When the Face, Photography, Medicine, and Electricity Meet," 69.
[95] Sicard, "When the Face, Photography, Medicine, and Electricity Meet," 70.
[96] Quoted in Sicard, "When the Face, Photography, Medicine, and Electricity Meet," 70.
[97] Sicard, "When the Face, Photography, Medicine, and Electricity Meet," 70.

However, the practice was painful and seldom produced successful results. In 1832, English scientist Michael Faraday discovered induction currents generated by the introduction of a magnet into a metal coil. Faraday's discovery further motivated efforts to harness electricity for medical therapy. With the development of novel tools and techniques, electric currents could now be utilized for the study and treatment of living patients.

Duchenne's localized electrization method drew on the work of Galvani, Volta, and Faraday, and his work on expression is embedded in this rich history of electricity's scientific uses. The doctor began experimenting with electricity's therapeutic applications in 1842 while still in his hometown of Boulogne-sur-Mer. Though the doctor first practiced electroacupuncture, a form of therapy in which electric currents are administered via needles inserted into the body, he developed a technique that did not require the practitioner to pierce the patient's skin.[98] Duchenne established his non-invasive technique by 1847, when he presented a paper on a new method of localized electrization using faradic induction currents.[99] Five years later, he began testing this technique's application to anatomical research while in Paris, where he conducted his first study on the structure and function of facial muscles.[100]

In *Mécanisme*'s introduction, Duchenne described how he applied this technique to identify and delimit the facial muscles and determine how certain muscle groupings produce expressions when contracted in unison:

> First I put each of the muscles into isolated contraction … then, progressing from the simple to the composite, I combined these isolated muscle contractions in all the variations possible, by making the different named muscles contract, two by two and three by three.[101]

As the doctor's account demonstrates, this non-invasive method permitted the repeated electrical stimulation of a given muscle. Indeed, repetition was instrumental to Duchenne's discovery that,

[98] Sicard, "When the Face, Photography, Medicine, and Electricity Meet," 70.
[99] Cuthbertson, "The Highly Original Dr. Duchenne," 227. See also Duchenne, "De l'art de limiter l'excitation électrique dans les organs sans piquer ni inciser la peau, nouvelle méthode de l'électrisation appellée electrisation localise," *Compte Rende de l'Acad des Sciences* (Paris, 1847).
[100] "The first application of the method of electrisation that I invented was in the study of the face." Duchenne, *Mécanisme*, 10. See also Sicard, "When the Face, Photography, Medicine, and Electricity Meet," 73.
[101] Duchenne, *Mécanisme*, 12.

though facial muscles contract in groups to generate specific expressions, they are anatomically and functionally independent.[102]

While working in Paris, Duchenne – like his peers – was motivated by numerous competitions organized by scientific institutions, academies, and the state. As historians Sandrine Bula and Michel Quétin recount, much nineteenth-century scientific research was supported and sanctioned by these competitions, several of which encouraged men of science and medicine to develop novel applications of electricity.[103] In fact, Duchenne submitted his initial findings, which were later published in *Mécanisme*, to the Volta Prize in 1857. This competition, launched under Napoleon III's authority in 1852, awarded 50,000 francs to applicants who developed practical and economically promising tools and/or techniques that utilized the Volta battery.[104] Though Duchenne's submission was ultimately unsuccessful, his work was recognized by the Volta Prize Commissions, which presented him with a medal of encouragement and the Knight's Cross of the Legion of Honour in 1858.[105]

Four years later, when *Mécanisme* was published, the general response to Duchenne's work was one of praise. However, the study was not received without criticism. Most critics were concerned with the proposed application of Duchenne's research to the psychological study of emotions.[106] Anatomist Louis Pierre Gratiolet questioned whether the expressions photographed by the doctor accurately reflected the corresponding emotions as they were experienced: "How can movements communicated to my muscles by a foreign will recount my own sentiments and desires? They could only express the experimenter's idea, fashioning me as a sculptor fashions clay."[107] Physicians Amédée Dechambre and Pierre Brissaud expressed similar doubts. Dechambre, like Gratiolet, was not convinced that the photographed expressions corresponded to specific emotions:

> In granting that each of the passions mentioned by M. Duchenne has its principal sign in the contraction of one or another muscle, I still cannot accept that the isolated contraction

[102] Given its clear anatomical and physiological applications, notes Delaporte, localized electrization quickly became an "instrument of exploration" that, with its capacity to isolate the superficial muscles of the face, uncovered "a new distribution of discrete elements under the skin." Delaporte, *Anatomy of the Passions*, 3; 6.
[103] Sandrine Bula and Michel Quétin, "Duchenne de Boulogne and the Volta Prize," in *Duchenne de Boulogne: 1806–1875* (École Nationale Supérieure des Beaux-Arts, 1999), 51.
[104] Bula and Quétin, "Duchenne de Boulogne and the Volta Prize," 53.
[105] Bula and Quétin, "Duchenne de Boulogne and the Volta Prize," 62. See also Catherine Mathon, "Duchenne de Boulogne, Photographe Malgré Lui?," in *Duchenne de Boulogne: 1806–1875* (École Nationale Supérieure des Beaux-Arts, 1999), 12.
[106] Delaporte, *Anatomy of the Passions*, 7–11.
[107] P. Gratiolet, *De la Physionomie et des Mouvements d'Expression* (Paris: J. Hetzel, 1865), 8–9.

> of this muscle – to no matter what degree – necessarily expresses a determined passion, and that one only.[108]

For Brissaud, who revived such critiques at the turn of the twentieth century, the models' passive gazes rendered their expressions lifeless: "How could Duchenne have not remembered that almost all the true physiognomy is in the gaze … Duchenne's personage, on the contrary, has fixed eyes, invariably fastened on the lens, and in truth these eyes are without expression."[109] While the use of Duchenne's study within the emerging discipline of psychology was questionable, its value within the fields of anatomy, physiology, and myology was largely undisputed.[110]

Though Duchenne's work was celebrated by many institutions, it is imperative to acknowledge that the majority of his experiments were conducted on the disadvantaged, oppressed, and incapacitated.[111] As mentioned above, amongst the doctor's experimental subjects were the patients of the Salpêtrière Hospital who lacked agency. As Cuthbertson relates, the hospital was well-known for holding a large number of patients with "incurable" cases of unidentified paralysis and atrophy.[112] At the time of Duchenne's experiments, he notes, the Salpêtrière had become a "fertile ground" for the doctor's proficiency in identifying previously undiscovered neurological conditions: "It was by studying, sorting, and classifying these rejected people – the mad, the epileptic, spastic, and paralytic – using physical examination aided by electrical stimulation, that Duchenne began to catalogue neurological disorders."[113] As scholars such as Ludmilla Jordanova and George Weisz have noted, the rise of specialization played a significant role in the development of nineteenth-century medicine.[114] Like many of his

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[108] A. Dechambre, "Anatomie des Beaux-Arts," *Dictionnaire Encyclopédique des Sciences Médicales* (1867), 247–49.
[109] E. Brissaud, "L'Oeuvre Scientifique de Duchenne de Boulogne," *Revue Internationale d'Électrothéraphie et de Radiologie 3* (1899), 81.
[110] Duchenne's research on the facial muscles and their expressive functions is still used by facial surgeons and scholars of emotional expression today. See John T. Hueston, "Duchenne Today: Facial Expression and Facial Surgery" and Paul Ekman "Duchenne and Facial Expression of Emotion" in Dr. Guillaume Duchenne de Boulogne, *Mécanisme de la Physionomie Humaine*, trans. Andrew Cuthbertson (Cambridge: Cambridge University Press, 1990 [1862]), 257–269; 270–284.
[111] Duchenne received many accolades for his work, including the Montyon Prize for Medicine and Surgery (Academy of Sciences) in 1851, the Itard Prize (Academy of Medicine), awarded the same year, and the Ghent Medical Society's 1852 competition. See Bula and Quétin, "Duchenne de Boulogne and the Volta Prize," 54.
[112] Cuthbertson, "The Highly Original Dr. Duchenne," 227.
[113] Cuthbertson, "The Highly Original Dr. Duchenne," 227.
[114] Ludmilla Jordanova, *Defining Features: Scientific and Medical Portraits, 1660–2000* (London: Reaktion, 2000), 54-78; George Weisz, *Divide and Conquer: A Comparative History of Medical Specialization* (Oxford: Oxford University Press, 2006).

peers, Duchenne chose to specialize in a particular area. He conducted several important studies in anatomy and physiology that would eventually be recognized as the beginnings of neuroscience.

The doctor's work at the Salpêtrière was not limited to the institution's living patients; Duchenne freely performed localized electrization on cadavers: "For several years, no subject died at the Charity Hospital while I was visiting, on which I did not study the individual actions of the facial muscles."[115] While his electrical stimulation technique produced an "anatomy of the living," the doctor justified his use of an unattractive, aged male patient throughout *Mécanisme* by repeatedly likening him to a cadaver. The subject, described by Duchenne as an "old toothless man with a thin face," suffered from a neurological condition that resulted in reduced facial sensation.[116] Unlike other patients, in which electrization could produce involuntary reflex movements, the toothless man was insensitive, permitting the doctor to stimulate an individual muscle without causing spontaneous contractions in other muscles. Duchenne, in defending his use of this particular patient, boldly claimed that he was able to stimulate the subject's facial muscles "with as much precisions and accuracy as if working with a still irritable cadaver."[117] He further argued that the subject's condition allowed him to conduct experiments with "as much effectiveness as on a corpse."[118]

If the study of the facial muscles assisted by localized electrization were more effective when carried out on cadavers, what was gained by conducting research on a living body? Duchenne's explanation for such a choice was aesthetic:

> It is true that instead of this man I could have used a corpse, which I often did in our hospitals, in front of numerous witnesses. I could animate the face by localized electrical stimulation to each one of the muscles, and the emotions rendered on the corpse were as genuine as those of the living person. But there is no more hideous or revolting spectacle![119]

Though the stimulation of muscular contractions on cadavers' faces was efficacious, Duchenne continually promoted his technique on living patients. In his *Physiologie des Mouvements*

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[115] Dr. Guillaume Duchenne de Boulogne, *De l'Élictrisation Localisée et de son Application à la Physiologie, à la Pathologie et à1 la Thérapeutique* (Paris: J.-B. Baillière, 1855), 375.
[116] Duchenne, *Mécanisme*, 42–43.
[117] Duchenne, *Mécanisme*, 43.
[118] Duchenne, *Mécanisme*, 101.
[119] Duchenne, *Mécanisme*, 102.

Démontrés à l'Aide de l'Expérimentation Électrique, published in 1867, the doctor described his method as "the *living anatomy* practiced on animals by the ancients, and realized for the first time on a living person, without a bloody operation, with inoffensive procedures, due to the advances in my method of localized faradization."[120] As Mary Hunter has recently explained, electrotherapy continued to be used on Salpêtrière patients following Duchenne's research.[121] By 1885, she notes, the use of electrotherapy at the hospital was well-known, and therapy rooms, like laboratory and operating rooms, were treated as "modern scientific spaces."[122] Throughout the later nineteenth century, the forced direction of bodies via electrotherapy played an important role in illustrating the assumed manifestations of specific illnesses.

Electrotherapy was tied up in the visuality of pathology; it provoked and captured the visual signs of particular conditions. Electrotherapy practitioners at the Salpêtrière, such as Duchenne and his successor Charcot, treated the rheophore as an "electric paintbrush" – a demonstrative tool that could rouse visible marks of illness that laid dormant. As Hunter argues, electrotherapy was generally considered "objective" due to its mechanical nature. However, the subjectivity of the technician could not be erased entirely: "Electricity was modern and non-human, and therefore appeared void of subjectivity. Yet, behind the technical façade of such procedures, touch remains."[123] The patient, when touched by the rheophore directed by the doctor's hand, was transformed into a "medium of electrical performance," made to gesture, express, and contort according to the physician's will. It was through localized electrization that Duchenne constructed a new object of anatomical and physiological study: the inert living body waiting to be animated by the doctor's vivifying touch. By touching his patients' faces with his animating rheophores, Duchenne forced his subjects to perform expressions that remained hidden until activated by his expert hands.

Undoubtedly, Duchenne's research was made possible and shaped by his unique localized electrization technique. Yet electricity alone would not disclose the doctor's discoveries to his contemporaries. In order to prove and communicate the results of his study, Duchenne needed to capture the transient expressions he provoked in his subjects. Visual

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[120] Dr. Guillaume Duchenne de Boulogne, *Physiologie des Mouvements Démontrés à l'Aide de l'Expérimentation Électrique et de l'Observation Clinique et Applicable à l'étude des Paralysies et des Deformations* (Paris: J.-B. Baillière, 1867), v–vi.
[121] Hunter, *The Face of Medicine,* 223.
[122] Hunter, *The Face of Medicine*, 226.
[123] Hunter, *The Face of Medicine,* 226.

imaging was essential to his research, and photography was a promising medium through which he could record his experiments and produce new objects of scientific study.

FIXING THE FLEETING EXPRESSION: SCIENTIFIC PHOTOGRAPHY AT THE TIME OF DUCHENNE

Duchenne became interested in using photography to document his research in the early 1850s. At this time, photography was only about twenty-five years old and was primarily being used for portraiture. Duchenne was the first to use it to study facial anatomy. However, his application of photography grew out of a long tradition of visualizing facial muscles. As Debord has recounted, visual representations of facial muscles and their expressive functions slowly began to appear in anatomical treatises from the mid sixteenth century onward. For example, an illustration depicting facial muscles can be found in the Flemish anatomist Andreas Vesalius's celebrated 1543 treatise *De Humani Corporis Fabrica*. In 1627, a plate detailing the deep, superficial layers of a dissected visage was published in the Italian anatomist Giulio Cesare Casseri's *Tabulae Anatomicae*, an influential treatise that included over 90 copper engraved plates by the printmaker Francesco Valegio. While anatomical iconography had become relatively detailed by the eighteenth century, early nineteenth-century advances in lithography permitted printmakers to render objects with greater clarity.[124]

While Duchenne called for "talented artists" to record his studies in 1852, he did not begin photographing his experiments until 1856.[125] Although he eventually took up photography and executed many of *Mécanisme*'s photographs himself, he sought out the assistance of experienced professionals to develop his skills.[126] Though many of the names of the assistants are unknown, in the foreword to *Mécanisme*'s "Scientific Section", the doctor extends his thanks

[124] See Debord, "Une Leçon de Duchenne," 31.
[125] Though no specific names are cited by Duchenne, Mathon has convincingly argued that he was likely in touch with several photographers. For instance, a note found after Duchenne's death stated that the doctor owed portrait photographer Pierre-Louis Pierson 68 francs and 30 cents. See Mathon, "Duchenne de Boulogne," 13. See also Delaporte, *Anatomy of the Passions*, 55.
[126] "I photographed most of the 73 plates that make up the Scientific Section of this Album myself, or presided over their execution …" Duchenne, *Mécanisme*, 39.

to Adrien Tournachon, younger brother of the celebrated French photographer Nadar, for his assistance with a number of the photographs.[127]

A clue to the extent of Tournachon's involvement in Duchenne's project can be found in the National Archives of Paris, where the photographs submitted alongside the doctor's paper for the 1857 Volta Prize Competition were recently found. Catherine Mathon has recalled that Tournachon's signature appears on 11 of the 32 images held at the National Archives. However, as Bula and Quétin have shown, the doctor removed Tournachon's signature from a number of photographs: "On some plates, Duchenne takes care to cross out the printed initials and pseudonym of Adrien Tournachon and replace them with his handwritten name."[128] Indeed, the photographer's signature has been substituted by Duchenne's in all of the plates included in *Mécanisme*'s 1862 publication.[129] Mathon argues that, in addition to replacing Tournachon's signature with his own, Duchenne positioned himself as the author of the photographs by organizing the compositions and posing his models.[130] Further, as she has observed, the dark traces of silver nitrate visible on Duchenne's nails in a few of the photographs demonstrate his engagement with the materials used to prepare the plates. Duchenne's decision to sign these images also transformed them into artworks of sorts. In this way, Duchenne's photographs complicate the boundaries between art, specimen, and scientific object.

Duchenne's efforts to establish his authorial position speaks to the status of photography in the later nineteenth-century. As art historian Phillip Prodger has noted, photography was "expensive, time-consuming, and fraught with error" when the doctor carried out his research for *Mécanisme*.[131] Consequently, the production of photographs required both financial investment and specialist education. As Sheehan has shown, early proposals for photography schools in the United States looked to the institutional and pedagogical models of medical training. Central to their proposed curricula were courses in anatomy, which played a crucial role in establishing the

[127] "M. Adrien Tournachon, a photographer whose ability is known to everyone, has been kind enough to lend me the sum of his talent to execute some of the negatives for this scientific section." Duchenne, *Mécanisme*, 39.
[128] Bula and Quétin, "Duchenne and the Volta Prize," 55–56.
[129] Any comment by Tournachon on this topic is yet to be discovered. See Mathon, "Duchenne de Boulogne," 14; Bula and Quétin, "Duchenne and the Volta Prize," 51.
[130] Mathon, "Duchenne de Boulogne," 15.
[131] Phillip Prodger, *Darwin's Camera: Art and Photography in the Theory of Evolution* (Oxford: Oxford University Press, 2009), xxi.

cultural authority of medicine.[132] Associations between photography and anatomy, then, served as a defense against criticisms that questioned the legitimacy of photography as a profession.

While the subject matter of Duchenne's photographs, along with his status as a medical professional, undoubtedly helped legitimize his photographic project, the silver nitrate visible on the doctor's fingers testified to his hands-on experience as a photographer. At the time Duchenne made his groundbreaking photographs, touch symbolized individual subjectivity, and therefore complicated objectivity in the sciences. That said, touch was central to Duchenne's practice and his advice for how to interact with his photographs. Educated in both anatomy and photography, Duchenne possessed the necessary medical knowledge and practical training that would permit his photographs to be read as legitimate records of his experiments. Like the accomplished artist/scientist Charles Bell, the skilled photographer/neurologist Duchenne was trained to accurately observe, interpret, and represent anatomical objects.

For Duchenne, photography was a precise tool that could fix fleeting facial expressions. Yet at the time the doctor conducted his experiments, instantaneous photography had not yet been developed; exposure times were still several seconds long. As Prodger has explained, localized electrization allowed the doctor to circumvent this crucial obstacle:

> Instead of accelerating the photographic process to produce instantaneous images, as others had tried to do, Duchenne devised a system for freezing the activity of his subjects long enough to accommodate the lengthy exposure times necessitated by photographic technology at the time.[133]

It was through the combination of localized electrization and photography that Duchenne's experiments were made possible. While electrical stimulation permitted isolated muscular contractions to be held on the face for several seconds, photography captured and analyzed the resulting expressions. The rheophore provoked and sustained movement while the photograph immobilized it.

Duchenne valued photography not only for its capacity to capture the transient moment but also for its ability to produce seemingly impartial visual records: "Only photography, *as a truthful mirror*, could attain such desirable perfection. Photography allowed me to compose an album of figures that illustrate my lectures on the electrophysiological experiments I have

[132] Sheehan, *Doctored*, 44.
[133] Prodger, *Darwin's Camera*, 82.

performed on the face of man."[134] Duchenne's account of photography as a "*truthful mirror*" reflects the widely-held nineteenth-century belief in photographic objectivity. Le Brun's physiognomic catalogue, which used artworks as source material, and Bell's anatomical illustrations, which relied upon artistic interpretation to transform observations into representations, were both associated with subjectivity. In comparison, Duchenne's photographs were seemingly removed from authorial subjectivity due to the mechanical character of photographic processes. However, as scholars such as Sheehan, Gilman, Amirault, Kemp, and Sidlauskas have convincingly argued, the production of a photograph necessarily involves human interference.[135] For example, posing, lighting, and compositional choices can all reflect the photographer's aesthetic and rhetorical goals.

While Duchenne expressed the utmost confidence in photographic objectivity, he also confessed to drawing upon the aesthetic conventions of portrait painting. This was not problematic for his audience. He admittedly imitated the chiaroscuro technique popularized by Rembrandt such that the "distribution of light" would be "in harmony with the emotions that the expressive lines represent."[136] In plates representing "somber" and "sinister" passions, such as *aggression, wickedness, fright,* and *torture*, the doctor lit his subject using harsh chiaroscuro to produce a stark contrast between areas of bright light and deep shadow on the patient's face. In Plate 18 (Fig. 11), which shows Duchenne stimulating *m. procerus* on both sides of the face to achieve an expression of *aggression* and *wickedness*, the subject is lit from the upper left-hand corner. As a result, his forehead and the right side of his face appear bright and reflective while the left side of his face is largely consumed by a dark shadow, save for a small patch of well-lit skin visible just under the patient's left eye. The play of light and shadow across the subject's face in Plate 18 mimics the technique employed by Rembrandt in his 1632 *Portrait of a Man* (Fig. 12) with nearly complete accuracy. Rembrandt's subject, like Duchenne's, is illuminated by a light source located beyond the picture plane's upper left-hand corner; bright, clarifying light falls upon his forehead, the right side of his face, and the skin under his left eye, while a shadow obscures much of the left side of his face. For Duchenne, this harsh chiaroscuro

[134] Duchenne, *Mécanisme*, 36.
[135] Sheehan, *Doctored*, 37; Gilman, *The Face of Madness*, 20; Amirault, "Posing the Subject of Early Medical Photography," 51–76; Kemp, "A Perfect and Faithful Record," 139; Sidlauskas, "Inventing the Medical Portrait, 29–37.
[136] Duchenne, *Mécanisme*, 40.

imparted a "singularity in energy" amongst the plates that portray the "somber" and "sinister" passions.[137]

The Boulogne doctor and Dutch painter also shared an interest in medicine and anatomy. Rembrandt's *The Anatomy Lesson of Dr. Nicolaes Tulp* (Fig. 13), dated to 1632, shows the surgeon conducting a dissection before a group of six men. More specifically, Tulp is pictured using a metal implement to animate a cadaver's hand by pulling on a tendon in his forearm.[138] Much like Duchenne's manipulation of his subjects' faces, Tulp's manipulation of the cadaver's muscular interior transforms the body into both a medical specimen and medium; the body becomes both an object through which anatomical knowledge may be gleaned and a vehicle whereby such knowledge may be demonstrated. Tulp, like Duchenne, uses an instrument to manipulate the body to show anatomical function. Such an instrument served as a barrier between the object of study and the doctor's touch (as well as the subjectivity it implies) while also ensuring precision as he carries out his work. In *Anatomy Lesson*, two of the pictured spectators look down in earnest at the doctor's tool – the meeting point between Tulp's controlling hand and the cadaver's inert musculature. Furthermore, the artist's use of chiaroscuro highlights the spectator's' features and expressions. This painting, which was well-known and celebrated in nineteenth-century France, undoubtedly served a source of inspiration for Duchenne's photographs.

Duchenne's decision to replicate Rembrandt's aesthetic techniques speaks to the influence of seventeenth-century Dutch art on nineteenth-century French and art culture. As Hunter has shown, reproductions of Dutch group portraits were immensely popular in nineteenth-century France and influenced how French artists made portraits of famous men in science and medicine.[139] Between 1830 and 1890, she notes, over 150 reproductions of Rembrandt's paintings circulated and were shown regularly at the Salon. Rembrandt's work was praised by contemporary critics for its realism and naturalistic rendering of human forms. For Duchenne, like other men of science and medicine, Rembrandt's work signified the seventeenth-century Dutch values that nineteenth-century French painters aimed to embody; they sought to

[137] Duchenne, *Mécanisme*, 40.
[138] The corpse has been identified as Aris Kindt, a criminal executed by hanging on 31 January 1632 after being convicted of armed robbery. See C. Jill O'Bryan, *Carnal Art: Orlan's Refacing* (Minneapolis: University of Minnesota Press, 2005), 64–7.
[139] Hunter, *The Face of Medicine*, 117–123.

produce faithful illustrations of the natural world. Duchenne's use of chiaroscuro, evocative of Rembrandt's paintings, intimates the neurologist's role in the image-making process, and thus demonstrates how subjectivity functions in photographic production.

By the time Duchenne began photographing subjects, developing processes had evolved considerably. In 1847, the French inventor and photographer Louis Désiré Blanquart-Evrard established a method by which photographic negatives could be fixed on paper.[140] Blanquart-Evrard worked primarily with calotypes, introduced in the early 1840s by English scientist William Fox Talbot, and was the first to separate the photographic process into two distinct operations: capturing the image and developing the negative. Exposure times were also dramatically reduced by mid-century. While earlier forms of photography necessitated that the subject pose for several minutes, exposure times improved in the early 1850s. In 1852, the French photographer Auguste Adolphe Berstch developed a procedure that permitted portraits to be made in 2 to 4 seconds in good diffuse light or 5 to 20 seconds in weak diffuse light.[141]

As Pichel has compellingly argued, the photographic technologies and techniques employed by Duchenne shaped the expressions that illustrate *Mécanisme*. In particular, she explains that the scope and quality of capturable expressions were determined by the camera's exposure time and the plate's emulsion. Exposure time, she relates, "coincided with the seconds during which the electrodes could hold the expression."[142] While the exposure time was long enough to fix the effects of localized electrization, it was too short to capture other gestures, as evinced by the blurred faces of Duchenne and his assistant that are sometimes visible in the photographs. In other words, the camera could not capture facial expressions that were not held artificially. As Pichel aptly observes, it is the temporal synchronization of the photographic apparatus and the electricization device that permitted Duchenne to document his subject's expressions:

> This synchronization, even if not exact, between the camera and the electrical device became the key element in the photographic production of facial expressions. The electrically stimulated expressions could look natural, but they were expressions held in time.[143]

[140] Duchenne, *Mécanisme*, 40.
[141] Delaporte, *Anatomy of the Passions*, 48.
[142] Pichel, "From Facial Expressions to Bodily Gestures," 33.
[143] Pichel, "From Facial Expressions to Bodily Gestures," 33.

Further, she maintains that the temporal suspension of the fleeting expression modified the object under scientific investigation: "While movement was the condition for the study of expressions, it was removed from the final evidence of that study."[144] Indeed, the photographic evidence Duchenne presented was necessarily constructed according to the affordances and limitations of the tools and techniques he used.[145]

Though Duchenne abandoned the anatomist's scalpel and replaced it with the rheophore, the technologies he deployed to provoke and capture expressions similarly reconstituted his object of study. The doctor's rheophores and camera unavoidably transformed the very expressions he aimed to examine and document. Together, they temporally extended what is normally experienced as a transient phenomenon. An appreciation for the transformative power of interpretive technologies is embodied in Delaporte's assertion that, in the case of Duchenne's *Mécanisme*, the photographs are "themselves the objects of study."[146] The capacity for photographs to act as surrogates for what they represent has been discussed at length by philosopher and anthropologist Bruno Latour, who has labelled images given the status of scientific specimens "immutable mobiles."[147] Latour proposed that these surrogate objects attain their immutable status by displaying "optical consistency" with their prototypes.[148]

Duchenne's unwavering belief in the documentary and didactic functions of his photographs intimates his confidence in their capacity to stand in for the subject and experiment they picture: "Photographic figures that represent, as in nature, the expressive traits assigned to the muscles that interpret the emotions, teach a thousand times more than extensive written descriptions."[149] *Mécanisme*'s photographs, then, are presented as surrogates by which readers may test and (hopefully) confirm Duchenne's conclusions. These images stand in for the body, made reproducible, portable, and examinable through photography. Medical books have long looked to photographs as proxies for bodies to make visual information sensible when direct, hands-on study was not available. Before photography, illustrations were used for the same

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[144] Pichel, "From Facial Expressions to Bodily Gestures," 33.
[145] For more on how the practice of photography generated new objects of study, see Josh Ellenbogen, *Reasoned and Unreasoned Images: The Photography of Bertillon, Galton, and Marey* (University Park, PA.: Pennsylvania State University Press, 2012).
[146] Delaporte, *Anatomy of the Passions*, 65.
[147] Bruno Latour, "Visualization and Cognition: Thinking with Eyes and Hands," in *Knowledge and Society: Studies in the Sociology of Culture Past and Present*, ed. Henrika Kuklick (London & Greenwich, CT: JAI, 1986), 8.
[148]Latour, "Visualization and Cognition," 8.
[149] Duchenne, *Mécanisme*, 37.

purposes. For Duchenne, the photographs he made for *Mécanisme* were deemed suitable for scientific instruction because they accurately depicted his experiments and made his findings legible and understandable to his audience.

ANIMATING PHOTOGRAPHS: OPERATIONALIZING MULTI-SENSORY OBSERVATION

While Duchenne expressed steadfast faith in photography's ability to capture objects with fidelity to visual appearance, he was aware that photography alone was not a sufficient vehicle to communicate his discoveries. Throughout *Mécanisme,* Duchenne repeatedly called on his readers to manipulate the photographic plates included in the volume. More specifically, he instructed them to mask or hide certain parts of the image, either with a hand or flat object. By concealing particular areas of the photograph, the boundaries of each muscle or muscle group made to contract under Duchenne's rheophore are revealed. What is more, the ways in which the pictured muscular contractions inform the appearance of the facial expression as a whole is made comprehensible.

Duchenne outlined specific instructions for engaging with his photographs in the commentary section accompanying the first series of plates in the book. This series demonstrates the electrical stimulation of *m. frontalis*, termed "the muscle of attention" by Duchenne. As the doctor's photographs illustrate, the contraction of *m. frontalis*, located just above the outer edge of the brow bone, causes the elevation and curvature of the eyebrow and produces lateral wrinkles across the forehead. Plates 7 through 9, like most of *Mécanisme*'s plates, show Duchenne stimulating one side of the subject's face while the other side remains in a neutral, relaxed state. In Plate 7 (Fig. 14) and Plate 9 (Fig. 15), a head-and-shoulders and close to half-length shot respectively, the old man is pictured looking out at the viewer. The doctor's hand, visible just above the subject's right shoulder, carefully places the rheophore upon his skin. A light source positioned beyond the upper left-hand corner of the image illuminates the right side of the old man's face. The left side of his face, in contrast, is engulfed in a dark shadow. Plate 7 shows the old man with pursed lips, lowered toward his chin by their downturned corners, and deep wrinkles reverberating from the site where the rheophore meets his skin just above the left eyebrow. Plate 9 shows him with a similar expression that is more exaggerated

due to his protruding jaw and the shadow below his left cheekbone. By stimulating and lighting only one side of the subject's face, Duchenne staged a visual dichotomy between the expressive face and the face in repose. The dichotomy orchestrated by such photographs can also be conceptualized in terms of living/dead. The doctor's hand, wielding the rheophore as if it were a magician's wand, appears to revive the old man's lifeless face. In Plate 7, the left side of the patient's face appears limp and passive, much like that of a cadaver, while the right side of his face is brought to life by localized electrization. While this rhetorical technique highlights the precision made possible by Duchenne's method as well as his technical expertise, it also facilitates a comparative analysis between the two sides of the face.

In his notes on this first series of plates, Duchenne insisted that the photographs prove that the contraction of *m. frontalis* affects the appearance of the cheek without provoking any physical changes in the mid-face. Yet for him, these photographs could not entirely speak for themselves. To make the range of *m. frontalis*'s expressive force visually explicit, the doctor directed readers to alternate covering each half of the photograph:

> If you mask the right side of Plate 7or Plate 9 with a piece of card, so as to leave only the left side of the face visible, you will notice the profound darkness that envelopes the eye and the orbit of this side, darkness that spreads over the entire cheek. Rapidly slide the card from right to left so that the forehead and the right cheek stay exposed … is the contrast not surprising between these two sides on the face![150]

As Duchenne professed, the reader's physical interaction with the plate would support his interpretation of the image, and so verify the discovery it captures.

A similar illusion is revealed when following comparable instructions printed alongside photographs that picture the doctor stimulating *m. corrugator supercilii*, or "the muscle of pain," found just above the inner edge of the eyebrow. Plate 19 (Fig. 16) shows the doctor's three fingers applying his animating rheophore to the right side of the subject's face. The features and expressive movements of the old man's face, here lit from the front, are captured in detail: deep lines form an arch across the right side of his forehead, his raised eyebrow generates a dark, triangular cavern just above his right eye socket, and two folds extend down from the sides of his nose toward the corners of his mouth. To compare, the doctor's hand, found to the subject's right and out of focus, is nearly reduced to a silhouette.

[150] Duchenne, *Mécanisme,* 50.

As Duchenne explained, the isolated contraction of *m. corrugator supercilii* produces the illusion of a grimace that spreads across the lower half of the face. This illusion is so convincing, he claimed, that spectators of his live experiments did not believe that the lower half of the face remained at rest: "Every time I have publicly repeated this experiment on this subject, the illusion has been such that I could not convince the spectators that a general movement was not operating in the rest of the face at the same time as the eyebrow."[151] The photograph, in comparison, had the potential to make the illusion plain: "[W]ith this photograph doubt is dispelled, for it would be absurd to say that the features can be thus changed on paper."[152]

However, as with the photographs depicting the contraction of *m. frontalis*, the photographic disclosure of the illusion requires the viewer's tactile exploration of the plate:

> If we cover the forehead in Plate 19 to just below the eyebrow, we see that the expression is neutral and that the two sides of the face are equal. If we can cover, say, the left half of this same figure, it seems that all the features of the other half (the mouth, the nasolabial fold) are painfully contracted, putting themselves in harmony with the eyebrow and the forehead.[153]

In masking specific areas of the still photograph, viewers may comprehend how "the movement of the eyebrow alone had disturbed the general tranquility of the facial features" and, as such, may come to recognize that they have been "deceived by an error of the senses."[154] Indeed, the process of concealing portions of the plate was essential to verifying Duchenne's discovery; the doctor's claims are not substantiated by the photograph alone. "By masking the stimulated area," note Cutherbertson and Hueston, Duchenne "proved that no reflex activity occurs elsewhere in the face – an illusion hitherto accepted almost universally."[155]

When considering Duchenne's directives for viewing photographs, it is imperative to reflect on why the doctor called for a participatory mode of observation. Why did he not, in the case of Plate 7, produce two photographs from the same negative – one with the right half of the image covered and another with the left? Surely, concealing portions of the image would have presented viewers with the same visible results regardless of their participation in the masking process. The doctor did, in fact, include nine synoptic plates – each containing sixteen

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[151] Duchenne, *Mécanisme*, 67.
[152] Duchenne, *Mécanisme,* 67.
[153] Duchenne, *Mécanisme*, 66.
[154] Duchenne, *Mécanisme*, 66.
[155] Andrew Cuthbertson and J. T Hueston, "Background: Duchenne De Boulogne and Clinical Photography," *Annals of Plastic Surgery* 2, no. 4 (1979), 332.

photographs arranged in a grid – at the end of the album. Many sections within the synoptic plates feature three versions of an image developed from the same photographic negative: the original image, the image with the left side covered, and the image with the right side covered. In Synoptic Plate 1 (Fig. 17), for example, Duchenne employs this strategy for Plates 7, 9, and 12, which show him stimulating "the muscle of attention" and "the muscle of reflection" in the old toothless man.

If the doctor had the means to reproduce several copies of one photograph, mask distinct portions of each copy, and arrange the copies to facilitate a comparative analysis, why did he adamantly urge his reader to interact with the larger-scale photographic plates that make up the majority of the album? While Duchenne did not disclose why he encouraged this particular interactive mode of viewing, I argue that viewers' tactile engagement with the photographs facilitated their participation in (or, alternatively, their perception of their participation in) the construction of photographic and scientific truth. More specifically, I propose that the viewing instructions outlined by Duchenne can best be understood as the doctor's attempt to operationalize a multi-sensory process of observation in a manner that appealed to historically-specific ideas about vision, photography, visible "truth," and their corresponding practices of looking. Here, the viewer takes on the role of a doctor, scientist, or medical student.

For Duchenne, the photographic plates, like the subjects they picture, were to be treated as passive forms waiting to be "activated" through manipulation carried out by dexterous human hands (and the tools that extend their capabilities). Much like Duchenne, who enlivened the patient's passive face with his rheophore, or Tulp, who revived the cadaver's lifeless arm with his metal implement, active viewers were trained to animate the object of study by pressing their agency firmly atop its surface, tactually traversing its landscape, and evaluating its features with discerning gazes. By interacting with the plates according to Duchenne's instructions, the viewer imitates the techniques employed by the doctor as he carried out his experiments and, in so doing, engages with his epistemological method to arrive at his conclusions.

Duchenne recognized that even his own photographs could be deceiving. For example, he acknowledged that the plates showing the stimulation of the "muscle of pain" must be manipulated to dispel the myth of reflex activity in the lower face; the visual influence the contraction of *m. corrugator supercilii* on the facial expression as a whole can only be disrupted

by physically fragmenting the image. For him, the trained, dexterous viewer could spot such illusions.

The doctor's operationalization the viewing process reflects larger debates about the evidential value of photographs and the visual agency of viewing publics that flourished in France and Britain since photography's inception. As historian of photography Jennifer Tucker and art historian Jordan Bear have demonstrated, many nineteenth-century viewers were not persuaded by advocates for photography's "mechanical objectivity."[156] Tucker argues that, while confidence in photography's capacity to faithfully reproduce appearances was seemingly widespread, "the idea that people over a hundred years ago accepted photographs at face value is exaggerated and misleading."[157] Moreover, she notes that the evaluation of scientific photographs in particular required the careful interpretation of visual details "recognized by people *trained to see them*."[158] Along the same lines, Bear contends that "a primary feature of the development of modern society was the dramatic expansion of an audience empowered to judge the reliability of its own visual experience."[159] With respect to photography, he maintains that "the very quality that is imagined to have made it unique – its objectivity – is instead understood as a deeply contested feature."[160] While primary source evidence, such as book reviews and correspondence between *Mécanisme'*s readership, suggests that Duchenne's photographs were generally accepted as faithful visual records, tactile interaction with the plates helped solidify his argument's validity to doubtful readers by allowing them to confirm his findings for themselves.

Along these lines, I would argue that mid nineteenth-century skepticism regarding the evidential value of photographs embodied a broader reconceptualization of vision that took place following philosophical and scientific studies concerning sensation and perception carried out during the 1820s and 1830s. As Crary has claimed, the observer is not simply an individual engaged in the act of looking but, instead, "one who sees within a prescribed set of possibilities,

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[156] Jennifer Tucker, *Nature Exposed: Photography as Eyewitness in Victorian Science* (Baltimore: Johns Hopkins University Press, 2014), 4–6; Jordan Bear, *Disillusioned: Victorian Photography and the Discerning Subject* (University Park: Penn State University Press, 2017), 39–42.
[157] Tucker, *Nature Exposed*, 4.
[158] Tucker, *Nature Exposed*, 19. My emphasis.
[159] Bear asserts that the growing attention paid to visual agency was tied to the development of liberal subjectivity; John Stewart Mill and Marx argued that the liberation of the senses (and of visual capacities in particular) empowered the working class, who had been rendered morally and politically passive due to the diminution of bodily agency under capitalist regimes. Bear, *Disillusioned*, 39.
[160] Bear, *Disillusioned*, 42.

one who is embedded in a system of conventions and limitations."[161] The nineteenth-century observer, he explains, was established alongside – and in compatibility with – arrangements of power that grew out of contemporary scientific knowledge about the human body, its functions, and the methods by which behaviour could be modified, manipulated, and managed.[162] Crary recounts that the camera obscura served as the dominant model through which human vision was conceptualized during the seventeenth and eighteenth centuries. This optical device, he elucidates, interiorized and disembodied the observer's position in relation to his outer world. Accepted as a neutral device of pure optical transmission, the camera obscura presented seventeenth- and eighteenth-century observers with a seemingly unified field of ordered forms through which the external world's contents could be studied by the mind. This model operated according to the Cartesian theory of mind/body dualism, which presumed that a separate, objective, and rational "self" governed by the mind could be extrapolated from its embodied position in the world. Crary argues that a nineteenth-century turn toward a Kantian subject-centered epistemology involved the "repositioning" of the observer beyond the supposed fixed relations between interior and exterior worlds assumed by the camera obscura and Cartesian logic. The observer was thus reconceptualized as the site upon which internal sense organs and the external objects that they apprehend converge: "the viewing body and its objects begin to constitute a single field on which inside and outside are confounded."[163]

As Crary's argument illustrates, the nineteenth-century body was not simply a vehicle through which the sensible world may be experienced. Liberated from the confines of the interiorized mind, the observer participated in both the creation and apprehension of the visible world. The body, then, was not only an access point to reality but also an essential constituent in its unfolding. Rethinking Crary's argument in light of the interactive viewing experience encouraged in Duchenne's *Mécanisme* emphasizes the participatory role of the body in the perception of visual media. At the same time, it highlights that the embodied observer was also susceptible to manipulation and control. If vision is not a trans-historical constant and, as Crary

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[161] Crary, *Techniques of the Observer*, 6. For the evolution of optical theories, see also *Modernity and the Hegemony of Vision*, ed. David Michael Kleinberg-Levin (Berkeley: University of California Press, 1993); *Vision and Visuality*, ed. Hal Foster (Seattle: Bay Press, 1988).

[162] Seminal works published on the subjective aspects of visual perception include Goethe's *Theory of Colours* (1810), Chevrul's *De la loi du contraste simultané des couleurs* (1839), Hermann von Helmholtz's *Treatise on Physiological Optics* (1867).

[163] Crary, *Techniques of the Observer*, 73. See also Jonathan Crary, "Modernizing Vision," in *Vision and Visuality*, ed. Hal Foster. Discussions in Contemporary Culture, No. 2 (Seattle: Bay Press, 1988).

persuasively suggests, the embodied observer may be instructed to see in a particular way, control over the body may equate to control over what is visible and how it is interpreted. By directing viewers' bodies as they interact with *Mécanisme*'s images, Duchenne was simultaneously striving to direct viewers' vision and, thus, interpretation of the photographs.

While nineteenth-century theories of vision largely denounced Cartesian rationality and, instead, grounded vision in embodied experience, photography appealed to the ideal of "mechanical objectivity" sought by the scientific disciplines. The pursuit of "mechanical objectivity" is exemplified by the approach to photography taken at the Salpêtrière during and after Duchenne's work. For example, Charcot had many photographs taken of female patients under his care, most of whom he had diagnosed with so-called "hysteria." The photographs were made by the French physician and photographer Paul Regnard. About a decade after Duchenne's research, the images were published in *Iconographie Photographique de la Salpêtrière (1876 – 1880)*. For Charcot, visual fidelity was necessary for these photographs to function as diagnostic and educational tools. This sentiment is evidenced in the publication's introduction: "To achieve the goal we were pursuing, what we needed to have on hand … was a man who knew photography and was dedicated enough to be ready, whenever circumstances required, to respond to our call."[164] Charcot and his team photographed "hysteric" attacks as they occurred in real-time, documenting their visual features and movements. Further, they assured readers of the veracity of the photographs in *Iconographie*'s case descriptions. For instance, text printed alongside pictures made of an 18-year-old florist referred to as "Th. L" states that "Plates 2, 3, and 4 give an *exact* idea of the main attitudes of the head" during an attack.[165]

As cultural historian Andrea Goulet explicates, many nineteenth-century visual practices manifest a tension between two competing models of vision: "mechanical objectivity" and embodied experience.[166] This tension is, in fact, reflected in the process of viewing daguerreotypes, images produced by the first widely available photographic technology. Developed upon silvered copper plates' mirror-like surfaces, daguerreotypes required handling to reveal the "true" pictures captured by photographic technologies. The daguerreotype, notes

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[164] Paul Regnard, Bourneville, and Royal College of Physicians of Edinburgh. *Iconographie Photographique de la Salpêtrière (1876 – 1880): Service de M. Charcot.* (Paris: Progrès Médical, 1877), iv.
[165] *Iconographie Photographique de la Salpêtrière,* 13.
[166] Andrea Goulet, *Optiques: The Science of the Eye and the Birth of Modern French Fiction* (Philadelphia: University of Pennsylvania Press, 2006), 11.

visual and historical anthropologist Elizabeth Edwards, only becomes visible "if manipulated in the hand, moved to reveal the image, not the mirror quality of the polished pate."[167] Likewise, she recounts that ambrotypes, negatives printed upon dark backgrounds, "demanded physical engagement, a manipulation of the material object to reveal the creamy tones of the image as a lifelike positive rather than a negative." As such, Edwards argues, the nineteenth-century photograph figured "not merely as an image but in relation to the human body, tactile in experienced time."[168] Duchenne's use of photography was rooted in this tactile history of the medium. His images demanded physical engagement for the visual information they carried to be fully comprehensible.

Due to the interactive viewing processes necessitated by early photographic technologies, mid nineteenth-century observers discovered photography's "truthful" images using their eyes and hands – especially if their occupations depended on it, as was the case with physicians and artists. Given that daguerreotypes were commercially available at affordable prices, most middle-class families had experience viewing such photographs. Certainly, many had their own portraits made by photographers who practiced daguerreotypy.

Viewers of Duchenne's photographs, then, were familiar with the practice of handling photographic images to reveal the "truth" they ostensibly document. Duchenne's instructions for manipulating photographs repeated viewing practices already routinely performed by his readers, accustomed to their constitutive role in the construction of photographic truth through tactile engagement with images. Tactile perception was instrumental to ways of looking associated with early photography; nineteenth-century viewers handled plates to reveal images captured by photographic processes.

SENSING BODIES:
TACTILE PERCEPTION IN NINETEENTH-CENTURY SCIENTIFIC EDUCATION

Touch also served a similar epistemological function in scientific education. As numerous scholars have noted, anatomists adopted a heuristic approach that involved the

[167] Elizabeth Edwards, "Photographs as Objects of Memory," in *Material Memories*, eds. Marius Kwint, Christopher Breward, and Jeremy Aynsley (Oxford: Berg, 1999), 227.
[168] Edwards, "Photographs as Objects of Memory," 228.

participation of both professional and lay spectators throughout the early modern period.[169] Three-dimensional forms meant to accurately reproduce the appearances and volumes of bodily interiors, such as wax models and plaster casts, were used alongside écorchés as surrogates for cadavers, which were not always available for dissection.[170] Medical students also often looked at anatomy books as they cut into cadavers. This practice speaks to the importance of tactility, vision, and text in medical learning.

While the creation of wax models was popular in eighteen-century Italy, Paris became the epicenter of wax modelling in the nineteenth century. One of the most prominent workshops was Vasseur-Tramond, located in the building next to l'Ecole de Médicine's anatomical theatre, which made models for many schools.[171] These educational tools emulated human bodily structures, including muscles, nerves, bones, and skin, and were sculpted and coloured to appear like "real" bodies. A Vasseur-Tramond model that represents the lymphatic system of the neck (Fig. 18), for instance, replicates the shapes, colours, and textures of anatomical features with precision. The lymph nodes are rendered in a transparent, milky-white colour and form a web-like structure atop the long, fibrous red forms used to indicate neck muscles. This model, and others like it, were educational instruments that functioned in ways similar to real dissection. Namely, they allowed medical students to obtain a visual and tactile understanding of the body's three-dimensional form. While models made the body's internal features tactually sensible when cadavers were not available, they could not entirely replicate the experience of dissection, which involved cutting open and manipulating human flesh.

The tactile engagement facilitated by the analysis of anatomical models and the practice of dissection has recently been examined by art historian Naomi Slipp. She describes dissection as "an epistemological unfolding that is absorbed both visually and through the tactile

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[169] See, for example, Kemp and Wallace. *Spectacular Bodies*, 23; Stafford, *Body Criticism*, 48; Deanna Petherbridge and Ludmilla Jordanova, *The Quick and the Dead: Artists and Anatomy: National Touring Exhibitions* (Berkeley: University of California Press, 1997); Jonathan Sawday and Margaret M Lock, *The Body Emblazoned: Dissection and the Human Body in Renaissance Culture* (London: Routledge, 1995).

[170] See also Martin Postle, "Flayed for Art: The Écorché Figure in the English Art Academy," *The British Art Journal* Vol. 5, No. 1 (Spring/Summer 2004): 55–63; Elizabeth Stephens, "Inventing the Bodily Interior: Écorché Figures in Early Modern Anatomy and von Hagens' Body Worlds," *Social Semiotics* Vol. 17, No. 3 (September 2007); Jessica Adkins, "Authenticity in Anatomy Art." *J Med Humanit* v. 40 (2019): 117–38.

[171] J F Pastor et al., "Uncovered Secret of a Vasseur-Tramond Wax Model," *Journal of anatomy* vol. 228,1 (2016): 184–9.

manoeuvres of hands on scalpel and flesh."[172] Moreover, she maintains that plaster casts and wax models of human bodies and their parts encourage "a three-dimensional tactile engagement" by inviting the viewer to "handle, turn, and probe their interiors."[173] Both visually and tactually sensible, such models "collapse information about surface and depth into one richly complex object that rewards long, slow visual and tactile exploration."[174] In this way, she argues, the information gleaned through the study of anatomical models is informed by how the practice of viewing them imitates the practice of dissection: both are visual and tactile processes that require skillful manipulation carried out by dexterous hands and trained eyes.

Like the three-dimensional models used in anatomical education, Duchenne's photographs collapse surface and depth when viewed according to his instructions. However, in his photographs, the external features visible on the skin's surface come to signify the internal structures and movements believed to generate visually discernible signs. In other words, Duchenne's photographs document the appearance of folds and creases across the surface of the skin *and*, when viewed according to his directions, the implied contraction of muscles beneath it.

What is more, viewers, in moving their hands across the surface of the photograph, mimic the process by which Duchenne determined each facial muscle's boundaries. The doctor, like the medical student examining an anatomical model, gathered information through touch, feeling the skin of his subjects' faces while stimulating specific muscles. Tracing the topography of the skin's surface with his fingers and rheophore, Duchenne sensed where the vibration caused by electrical stimulation to each of the facial muscles ceased, and so uncovered the boundaries between the muscles:

> It seems to me these experiments demonstrate that there really exists a line of demarcation between the fibers of these different muscles that in appearance are continuations of each other. If these points of separation did not exist … then the muscular contraction would be felt throughout the length of these very short muscular fibers.[175]

Here, touch confirmed what sight could merely imply. For Duchenne, and his readers, the boundaries between each of the facial muscles are not necessarily "visible" to optical vision

[172] Naomi Slipp, "Thomas Eakins and the Human Écorché: Understanding the Body in Three Dimensions," *The Sculpture Journal*, London, Vol. 24, No. 3 (2015), 333–50.
[173] Slipp, "Thomas Eakins and the Human Écorché," 339.
[174] Slipp, "Thomas Eakins and the Human Écorché," 341.
[175] Duchenne, *Physiologie des Mouvements*, 827.

alone. Gliding a piece of card across the image's surface, viewers, like the doctor whose prescriptive viewing instructions they follow, may use hands to validate that which eyes cannot alone understand.

The significant role that tactile perception plays in visual experience more generally has since been thoroughly examined by numerous scholars of phenomenology. French philosopher Maurice Merleau-Ponty famously argued in 1945 that our perception of objects in space is multi-sensory:

> Each organ of sense explores the object in its own way, [and] is the agent of a certain type of synthesis … The senses are distinct from each other and distinct from intellection in so far as each one of them brings with it a structure of being which can never be exactly transposed … And we can recognize it without any threat to the unity of the senses. For the senses communicate with each other … The experience of the separate 'senses' is gained only when one assumes a highly particularized attitude.[176]

Merleau-Ponty's model of sensory synthesis draws upon earlier studies in phenomenology by German philosopher Edmund Husserl (1900) and elaborates upon the theory of vision proposed by French philosopher Hippolyte Taine (1884), who was working at the same time as Duchenne. Taine argued that visual perception has a preliminary phase in which it is devoid of the subject/object distinction.[177] Further, he claimed that during this preliminary phase, sight is coupled with a sense of our potential to touch objects; while the newborn may apprehend sensations of colour as "within her," as she matures she will begin to relate the visual sensations she experiences to the surfaces of objects by referring to a "visual atlas" of her body.

Taine's approach to vision echoed the philosophy of visual perception presented by French philosopher Étienne Bonnot de Condillac in his 1754 *Traité des Sensations*, wherein he argues that vision is a "gradually acquired" skill "learned through the application of mental judgment to sensory experience."[178] More recently, philosopher Alva Noë has revitalized this conception of vision, suggesting that seeing is a "style of skillful interaction with the things that

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[176] Maurice Merleau-Ponty, *Phenomenology of Perception*, trans. Donald A. Landes (Abingdon, Oxon: Routledge, 2012 [1945]), 223–25.
[177] Hippolyte Taine. *On Intelligence*, trans. T. D Haye (New York: H. Holt, 1884). See also Richard Shiff, "Cézanne's Physicality: The Politics of Touch," in *The Language of Art History*, ed. Salim Kemal and Ivan Gaskell (Cambridge: Cambridge University Press, 1991), 129–80; Paul Smith, "Cézanne's 'Primitive' Perspective, or the "View from Everywhere," *The Art Bulletin*, Vol. 95, No. 1 (March 2013): 102–119.
[178] See Goulet, *Optiques*, 9.

we see."[179] For him, vision is best understood as a "bodily activity" through which embodied movements "actively produce changes in sensory stimulation to your eyes."[180] By way of this reciprocal and mutually-constitutive relationship between perceiver and perceived, he asserts, "how things look depends, in subtle and fine-grained ways, on what you do."[181] From a phenomenological perspective, viewers are always active, embodied, and localized – the way they interact with their surrounding environment determines what and how they see.

The viewing instructions outlined in Duchenne's *Mécanisme* embrace such a phenomenological conception of vision. If vision is an embodied skill to be learned, the doctor could train his reader to see in a specific, multi-sensory way. Moving a piece of card across the surface of the plate that pictures Duchenne stimulating the "muscle of pain" (Fig. 16), for example, physically alters the photograph and, thus, the visual information it presents. This technique of "skillful interaction," to use Noë's term, encourages the viewer to read the face as divisible. The old man's face, re-made each time the card is repositioned to cover a different set of features, appears as if comprised of sections that may be broken apart and put back together. Covering the forehead, for instance, isolates the eyes, nose, and mouth from the features that modify their signifying value, reinforcing Duchenne's conclusion that each facial muscle is anatomically and functionally independent. To compare, covering the left half of the face reveals that the overall impression imparted by the facial expression is an illusion caused by the tendency to incorrectly interpret the discrete parts as a unified whole. Interacting with the plate according to Duchenne's instructions, viewers' hands ensure that their eyes will not be met with a human face but, instead, with its fragments.

Motivated by phenomenologically-grounded theories of embodied sight, numerous scholars of art history and visual culture have studied how the senses inform our perception of images. Elspeth Brown, Thy Phu, Margaret Olin, and Vivian Carol Sobchack, amongst others, have explored the tactile aspects at play in the visual apprehension of photographs.[182] In a similar

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[179] Alva Noë, *Out of Our Heads: Why You Are Not Your Brain, and Other Lessons from the Biology of Consciousness* (New York: Hill and Wang, 2009), 65. See also J. Kevin O'Regan and Alva Noë, "A Sensorimotor Account of Vision and Visual Consciousness," *Behavioural and Brain Sciences* 24 (2001): 939–1030; A. David Milner and Melvyn Goodale, *The Visual Brain in Action* (Oxford: Oxford University Press, 1995); Pierre Jacob and Marc Jeannerod, *Ways of Seeing: The Scope and Limits of Visual Cognition* (Oxford: Oxford University Press, 2003).

[180] Noë, *Out of Our Heads*, 60.

[181] Noë, *Out of Our Heads*, 60.

[182] Elspeth Brown and Thy Phu, "Introduction," in *Feeling Photography*, eds. Elspeth Brown and Thy Phu (Durham: Duke University Press, 2014), 13–14; Margaret Olin, "Touching Photographs: Roland Barthes's 'Mistaken'

vein, Laura Marks has investigated how our navigation of visual spaces is guided by a combination of optic and haptic modes of perception. Much like Noë, Marks proposes that the embodied, localized quality of visual perception informs a mutually-constitutive relationship between perceiver and perceived: "In a haptic relationship our self rushes up to the surface to interact with another surface. When this happens there is a concomitant loss of depth – we become amoebalike, lacking a center, changing as the surface to which we cling changes."[183] In this way, she asserts, the relationship between the viewer and the image is most accurately described as one of "mutual embodiment."[184]

For *Mécanisme*'s readers, I would argue, the meeting point of their hands and Duchenne's photographs constituted a "changing surface" that allowed the doctor's images to articulate meaning. Through their haptic relationships to the plates, they facilitated the visual unfolding and enlivening of information embedded in these images. For Susan Stewart, the transitivity and motility of tactile engagement facilitate an experience of "animating" that which is perceived.[185] As with Marks, Stewart describes the tactile relationship between perceiver and perceived as a form of "mutual embodiment."[186] She argues that with touch, as opposed to sight and hearing, we are able to perceive ourselves caught up in the act of perceiving: "We do not see our eyes when we see or hear our ears when we hear, but tactile perception involves perception of our own bodily state as we take in what is outside of that state. The pressure involved in touch is a pressure on ourselves as well as upon objects."[187] Further, she claims that this doubling of perception may provoke an impression whereby the "live" perceptive being brings the "dead" perceivable object to life:

Identification," in *Photography Degree Zero: Reflections on Roland Barthes's Camera Lucida*, ed. Geoffrey Batchen (Cambridge, Mass.: MIT Press, 2009), 75–90. For film scholar Vivian Carol Sobchack, vision is "not isolated from our other senses … [it] is only one modality of my lived body's access to the world and only one means of making the world of objects and others sensible." See Sobchack, *Carnal Thoughts: Embodiment and Moving Image Culture* (Berkeley: University of California Press, 2004), 64.

[183] Laura Marks, *Touch: Sensuous Theory and Multisensory Media* (Minneapolis: University of Minnesota Press, 2002), xvi.

[184] Marks, *Touch*, xx.

[185] Susan Stewart, "Prologue: From the Museum of Touch," in *Material Memories*, eds. Marius Kwint, Christopher Breward, and Jeremy Aynsley (Oxford: Berg, 1999), 18–36.

[186] Stewart, "Prologue: From the Museum of Touch," 31.

[187] Stewart, "Prologue: From the Museum of Touch," 31. See also Renu Bora, "Outing Texture," in *Novel Gazing: Queer Readings in Fiction*, ed. Eve Kosofsky Sedgwick (Durham, NC: Duke University Press, 1997), 94–127; Elizabeth Abel, "Skin, Flesh, and the Affective Wrinkles of Civil Rights Photography," in *Feeling Photography*, eds. by Elspeth Brown and Thy Phu (Durham: Duke University Press, 2014), 93–124.

> Because all immediate tactual perception involves contact between a sensitive portion of the body and the things perceived, it also involves perception of this contact itself. There is a carrying-over from experience to experience of the experience, a kind of doubling which finds its illustration in the image of a living thing bringing a dead thing to life through the transitivity of touch.[188]

Stewart's understanding of touch's capacity to animate is grounded in Condillac's assertion that the mutually-constitutive relationship between perceiver and perceived enabled by touch is fundamental to human agency: "touch and the reciprocal motility of touch are the beginning of agency. Touch is the most important vehicle for our access to reality."[189]

For Duchenne, touch imbued his viewers with agency by expanding the epistemological scope of their vision. Following the doctor's instructions carefully, viewers were trained to mobilize their tactile agency toward a photograph, enlivening the image as they glide their fingers across it. Just as Duchenne animated the face in repose by way of tactile manipulation and electricity, the viewer is encouraged to animate the still photograph by making physical contact with, and so augmenting what is visible upon, its surface. The viewer's touch, like the doctor's, can reveal the boundaries between the individual muscles of the human face. Without an electrical probe in hand, they can nonetheless animate the face by covering one part of the photograph and exposing another.

CONCLUSION

The importance of tactile engagement to Duchenne's study is revealed in the traces of silver nitrate visible on the doctor's fingers in some of the photographs (Figs. 19, 20). As these images demonstrate, Duchenne's hands played a key role in shaping living subjects' expressions their photographic representations. The doctor's hands were intermediaries between two research objects – the expressive face and its photograph. They first animated the inert subject using localized electrization, then transformed the expressive subject's likeness into a mobile photographic image, reproduced in a book and ready to be animated by an audience. The reader, following Duchenne's instructions, is invited to participate in the construction of photographic and scientific truth through tactile and visual practices of looking already established in mid

[188] Stewart, "Prologue: From the Museum of Touch," 33. My emphasis.
[189] Etienne Bonnot de Condillac, Book II, "A Treatise on the Sensations," in *Philosophical Writings*, trans. Franklin Phip with Harlan Lane (Hillsdale, NJ: 1982).

nineteenth-century photography and science. The photograph becomes the object of study. Viewers cannot feel the warm flesh of the live subject excited, arrested, and examined through Duchenne's novel method of "living anatomy." Yet like the doctor, they may place their hands atop the research object's surface to trace the expressive muscles of the human face.

Since their publication in 1862, Duchenne's photographs have continued to circulate. In 1872, heliotypes and woodcuts based on Duchenne's photographs were published in Charles Darwin's *The Expression of the Emotions in Man and Animals*. In a letter to Duchenne from March 1871, Darwin assured the doctor that his work would reach a wider audience in England: "all my previous books have sold well in England, & have been translated into various languages, so that I think my essay on expression would aid as an advertisement of yours, all your works are not as well known in this country as they deserve to be."[190] Indeed, it was through Darwin's *Expression* that Duchenne's photographs made their way to a broader European public. Travelling across geographic boundaries and language barriers, the Boulogne doctor's images quickly became accessible to a wider audience of middle-class, educated men working in science and medicine. Further, it is possible that Duchenne's images travelled beyond Western Europe while Darwin was conducting research for *Expression*. Five years before the publication of his book, Darwin (who owned two copies of Duchenne's *Mécanisme* at the time) circulated a series of printed queries to numerous countries in an effort to determine the universality of expression among the so-called "different races" of men.[191] Darwin's application of Duchenne's photographs in *Expression* will be discussed at length in chapters two and three.

[190] Quoted in Mathon, "Duchenne de Boulogne," 20.
[191] Darwin, *Expression*, 17. See also Prodger, *Darwin's Camera,* 81.

CHAPTER 2

THE UNIVERSAL RECOGNIZABILITY OF THE HUMAN SMILE: THE PURPOSEFUL ARRANGEMENT OF DUCHENNE'S PHOTOGRAPHS IN CHARLES DARWIN'S *THE EXPRESSION OF THE EMOTIONS IN MAN AND ANIMALS* (1872)

In March of 1871, the English naturalist Charles Darwin wrote Dr. Guillaume Duchenne de Boulogne asking for permission to reproduce a small number of the photographs originally published in *Mécanisme* for his forthcoming work on expression:

> I am going next autumn or winter to publish an essay on expression in mankind & animals. I procured some years ago your great album … I write now to ask whether you would permit me the great favour to have … some 4 or 5 of your photographs, printing beneath them that they are copied from your work.[192]

In the letter, Darwin emphasized that Duchenne's photographs played a crucial role in shaping his upcoming book, *The Expression of the Emotions in Man and Animals* (1872), going so far as to characterize the images as essential to the publication. While Darwin had been collecting and commissioning photographs, drawings, and prints for *Expression* since 1869, he believed that Duchenne's photographs were instrumental to his own contributions on the subject:[193] "I have photographs which would serve my purpose, but they are not so good as yours; nor are the others indispensable for my work."[194] Darwin included eight of Duchenne's images in his publication. Six of them were reproduced photographically using the heliotype process and two were transformed into woodcuts.

This chapter examines Darwin's strategic use and arrangement of Duchenne's photographs in *Expression.* More specifically, it explores the visual display strategies Darwin used to establish and corroborate his argument that human expression is a universal, biologically-governed phenomenon. *Expression*'s Plate III (Fig. 21), located in the book's eighth chapter, is used as the main case study: this plate is a composite heliotype that includes six photographs framed by oval *passepartouts* and arranged in a two-by-three table. The left column, comprised

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[192] Charles Darwin, letter to Dr. Guillaume Duchenne de Boulogne, 10 March 1871. University of Cambridge: Darwin Correspondence Project.
[193] Prodger, *Darwin's Camera*, xiii. See also Prodger, *An Annotated Catalogue of the Illustrations of Human and Animal Expression from the Collection of Charles Darwin: An Early Case of the Use of Photography in Scientific Research* (Lewiston, N.Y.: Edwin Mellen Press, 1998), 4.
[194] Darwin, letter to Duchenne, 10 March 1871.

of figures 1 through 3, contains photographic portraits of three pleasantly smiling young English girls. Two were made by the London studio photographer Oscar Gustave Rejlander and one by the British medical doctor and professional photographer George Charles Wallich. Figures 4 through 6, which make up the plate's right column, reproduce Duchenne's photographs of the old toothless man. I argue that Darwin's arrangement of Duchenne's photographs drew upon popular nineteenth-century photographic display formats, such as *cartes-de-visite* albums and stereographs, that were familiar to his Victorian readers through their personal relationships to photography. Darwin deployed these presentational strategies to guide his readers' interpretations of his book's images and to encourage them to draw conclusions that supported his belief in human expression's universality.

This study of how photographs functioned in Darwin's widely circulated and cited text is important because it reveals how the personal (often associated with the subjective) and the scientific (linked to the objective) modes of representation were more intricately intertwined in later nineteenth-century scientific studies than has previously been studied. I argue that Darwin could not have made the arguments he did in *Expression* without drawing upon popular and personal uses of photography – and understandings of the medium – in the Victorian era. His readers, particularly lay readers, would not have understood the images, and thus his arguments, otherwise. As I outlined in this dissertation's introduction, objectivity and subjectivity, as well as scientific detachment and personal connection, may seem contradictory but they were in fact profoundly connected in the production and communication of scientific ideas. In *Expression*, these ostensibly opposing modes of constructing and publicizing knowledge were both needed for Darwin's work to be understood by a wide audience.

Expression, published on 26 November 1872, is Darwin's only book to contain photographs. It was also one of the first photographically illustrated scientific books to attract a large audience.[195] The volume includes thirty-two photographs and twenty-one original woodcuts. Published by John Murray shortly after *The Descent of Man and Selection in Relation to Sex* (1871), the well-known and controversial text in which Darwin proposed that humans share a common ancestor with apes, *Expression* was highly anticipated by scientists and the

[195] See Prodger, *Darwin's Camera*, 6.

general public alike.[196] Darwin intended to include his work on expression in *Descent*, but ultimately decided to dedicate an entire volume to the subject. The primary readership for Darwin's publications, and Victorian natural history books more generally, was assumed to be educated and middle-class.[197] Darwin's ideas, however, also trickled down to the masses through the popular press.

Expression was an instant success, selling 5,267 copies on the day of publication.[198] Although other scientifically-oriented books about expression, such as Duchenne's *Mécanisme*, were published around the same time, Darwin's was undeniably the most widely circulated. This is not surprising given that Darwin was, at this point, a well-known public figure. *Expression*'s immediate popularity was not only due to Darwin's following and the ongoing debates surrounding evolutionary theory, but also the general popularity of studies on expression throughout the second half of the nineteenth century.[199] Though *Expression* was published late in Darwin's career, he had begun studying the subject nearly 40 years earlier. In private notebooks from the 1830s, Darwin commented on his emotionally expressive responses to certain artworks and pieces of music.[200] Of the various contemporary approaches to understanding expression,

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[196] Paul Ekman, "Preface," in *Darwin and Facial Expression: A Century of Research in Review* (New York: Academic Press, 1973), x; Janet Browne, "Darwin and the Expression of the Emotions," in *The Darwinian Heritage*, ed. David Kohn (Princeton, NJ: Princeton University Press in association with Nova Pacifica, 1988), 308; Jonathan Smith, *Charles Darwin and Victorian Visual Culture* (Cambridge: Cambridge University Press, 2006), 179; Frederick Burkhardt, "Introduction," in *The Correspondence of Charles Darwin Vol. 20, 1872* (Cambridge: Cambridge University Press, 2013), xvii. The 6th edition of Darwin's *Origin of Species* was also published shortly before *Expression* in February of 1872.

[197] Nicola Gould "'What is Meant by this System?' Charles Darwin and the Visual Re-Ordering of Nature," in *Endless Forms: Charles Darwin, Natural Science, and the Visual Arts*, eds. Diana Donald and Jane Munro (Yale Center for British Art Series. Cambridge, UK: Fitzwilliam Museum, 2009), 119.

[198] J. Huxley and Kettlewell, *Charles Darwin and His World* (New York: Viking Press, 1965), 102. The day before the publication of *Expression,* John Murray's assistant Robert Cooke notified Darwin that they had not yet received the full order of heliotype illustrations for the print run. He advised Darwin that this may upset the public and suggested that they request police presence at the publishing house: "We must publish your work tomorrow & have only 4000 instead of 7000 to do so. The Trade & public will be dissatisfied, but we must defy them & it may be advisable to get 6 Policemen to defend this house." See Darwin and Burkhardt, *Correspondence Vol. 20*, 524.

[199] Paul Ekman, "Introduction," in *Darwin and Facial Expression: A Century of Research in Review* (New York: Academic Press, 1973), 1–10; Gesa Stedman, *Stemming the Torrent: Expression and Control in the Victorian Discourses on Emotion, 1830-1872* (London: Routledge, 2018), 1–24; Fay Bound Alberti, *Matters of the Heart: History, Medicine, and Emotion* (Oxford: Oxford University Press, 2010), 140–156; Benjamin Morgan, *The Outward Mind: Materialist Aesthetics in Victorian Science and Literature* (Chicago: University of Chicago Press, 2017), 9–22; Liz Gray, "Body, Mind, and Madness: Pain in Animals in Nineteenth-Century Comparative Psychology," in *Pain and Emotion in Modern History*, ed. Rob Boddice (Houndmills, Basingstoke, Hampshire: Palgrave Macmillan, 2014), 148–163.

[200] For an analysis of Darwin's early observations on emotional expression, see Gillian Beer "The Backbone Shiver: Darwin and the Arts," in *After Darwin: Animals, Emotions, and the Mind,* ed. Angelique Richardson (Amsterdam: Rodopi, 2013), 89–99.

Darwin's was the first widely-read study to suggest that the complex expressions traditionally believed to differentiate humans from animals evidenced our descent from a common primordial ancestor. The argument that much of human expression is biologically-governed and universal (he believed a select few gestures, such as the raising of the hands in excitement, were socially determined) underpinned his theory. This idea, like Darwin's evolutionary theory, was controversial as it challenged long-standing creationist belief systems and the authority of the Christian Church, which argued that the natural world and its beings were of divine origin.

Darwin mapped out genealogical relationships between humans and animals by examining a wide range of expressions in various subjects, including men, women, children, cats, dogs, birds, and chimpanzees. The book is divided into three general sections. The first focuses on animal expressions, the second explores ordinary and everyday human expressions, and the third examines the human expressions that Darwin believed were closest to primordial ones – acute terror, horror, and agony. There are fourteen chapters, most of which are dedicated to a group of related emotional states and their associated expressive signs. For example, chapter eight focuses on "Joy, High Spirits, Love, Tender Feelings, and Devotion," whereas chapter eleven analyzes "Disdain, Contempt, Disgust, Guilt, and Pride." Accompanied by thoughtfully selected photographs and woodcuts, the book describes many familiar expressions encountered in everyday life, such as smiling and laughing, and chronicles Darwin's efforts to trace their relationships and origins.

Though the premise of Darwin's theory of expression was provocative, the promise of seeing photographs of these states made the book all the more popular. Darwin undeniably knew that illustrations of human and animal expression would be crucial to substantiate his observations and draw interest. As such, he dedicated a great deal of time to collecting, selecting, and commissioning images for *Expression* in the years leading up to its publication.[201] Given that Darwin was not a trained artist nor photographer, he was dependent on others to illustrate the volume. *Expression* reproduced pictures by five photographers: one by the Scottish psychiatrist James Crichton-Browne, six by the German artist Adolph Diedrich Kindermann, one by Wallich, nineteen by Rejlander, and six by Duchenne. Of the six photographs by Duchenne, four show the old toothless man upon which the neurologist conducted most of his experimental

[201] Burkhardt, *Correspondence Vol. 20*, xx.

study. The other two show a young man that Duchenne claimed had exceptional control over his facial muscles.[202]

Although Darwin relied on others to illustrate *Expression*, he was nevertheless heavily involved in the production and organization of the images he included.[203] As Voss has shown, Darwin was not merely a collector or patron of images, but a vigilant editor who chose the pictures he included in many of his published works.[204] In his career's later stages, Darwin had the funds and influence to ensure even greater control over illustrations for his books.[205] This is perhaps most clearly evidenced by the long-standing debate between Darwin and his publisher John Murray regarding the reproduction of photographs for *Expression*. While Murray believed that photographs were too costly to justify, Darwin persisted that they were essential.[206]

In exercising his authority, Darwin chose what would be shown in the images, who would create them, how they would be reproduced, and where they would be in the text. Darwin's hands-on approach to studying, editing, and selecting photographs and prints was typical of leading scientific and medical figures of his time. As historian Jonathan Smith has claimed, Darwin's thorough engagement with the process of preparing images for his publications indicates that, for him, images were not just descriptive.[207] Pictures not only delineated his observations and provided visual evidence to corroborate them, but also actively contributed to his arguments. These carefully selected images, as well as their deliberate arrangement, also helped build Darwin's reputation and made his ideas more accessible.

In this chapter, I undertake a focused reading of *Expression's* Plate III (Fig. 21) to argue that Darwin's strategic arrangement of photographs was a deliberate choice made in service of his argument for expression's universality. Writing such a precise history is important because it makes us reconsider Darwin's use of images across his oeuvre. It also sheds new light on the

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[202] Duchenne wrote that this young man "has practiced moving the muscles of his eyebrows. He is such a master of it that not only can he give his eyebrow various expressions, but he can move the muscles in opposite directions." Duchenne, *Mécanisme*, 57–58.
[203] Darwin's involvement in the publication of his works has been aptly demonstrated by scholars such as Frederick Burkhardt, Jonathan Smith, Phillip Prodger, and Julia Voss. See Burkhardt, *Correspondence Vol. 20*, xviii; Smith, *Charles Darwin and Victorian Visual Culture*, 4–10; Prodger, *Darwin's Camera*; Julia Voss, *Darwin's Pictures*, 249–256.
[204] Voss, *Darwin's Pictures*, 249.
[205] Smith, *Charles Darwin and Victorian Visual Culture*, 6.
[206] See, for example, correspondence between Darwin, Murray, and Cooke in Darwin and Burkhardt, *Correspondence Vol. 20,* 324; 384; 393; 425; 515.
[207] Smith, *Charles Darwin and Victorian Visual Culture*, 9.

uses and applications of scientific photography in the later nineteenth century. Darwin sought to make *Expression* both scientifically credible and accessible to a lay audience. As illustrated by the correspondence cited above, Darwin believed that Duchenne's photographs were instrumental to establishing *Expression*'s credibility. In fact, Duchenne's were the only scientifically-oriented photographs he reproduced.[208] How did Darwin repurpose scientific photographs for a publication that was largely aimed at a nonspecialist readership?

The project of illustrating *Expression* was not just one of finding appropriate visual evidence, but also of presenting images in a way that would be acceptable for and understandable by Darwin's target audience. As discussed in chapter one of this dissertation, *Mécanisme*'s photographs required a participant to activate their epistemological potential. While Duchenne implored his scientific readership to manipulate his photographs with their hands, Darwin asked something different of his audience. By arranging Duchenne's photographs alongside three others in a three-by-two table on Plate III, Darwin invited his reader to distill similarities and differences between images.

This chapter demonstrates how Darwin's selection and organization of photographs for Plate III helped substantiate and publicize his belief in the universality of the "genuine smile" across age, gender, and class. With these six photographs, Darwin was making two distinct yet interrelated arguments: (1) that a "genuine smile" is a biologically-governed expression of joy; and (2) due to the expression's biological origin, a "genuine smile" is universally recognizable. I argue that he used figures 1 through 3 (portraits of young girls' faces) to establish a baseline or reference point through which figure 5, Duchenne's scientific photograph of the old toothless patient, could be legible as a representation of a "genuine smile." Figure 4, which shows the old man in a neutral state, and figure 6, which shows him with a false smile provoked by Duchenne's rheophores, are foils against which the other photographs are understood. I propose that connections between the two sets of images – the studio portraits of girls on the left and the scientific photographs of Duchenne's subject on the right – are established by the similarities in the poses and expressions exhibited by the sitters. Further, I demonstrate how these connections are reinforced by the organization of the photographs into a grid-like layout that evokes how

[208] Darwin also emphasized the French neurologist's expertise throughout *Expression*, writing that he "cannot quote a better authority" on the subject than Duchenne. Darwin, *Expression*, 140.

photographs were arranged in popular later nineteenth-century formats, such as family photo albums.

The photographs in *Expression* required readers to perform a mixture of personal and scientific looking to bring their didactic functions to life. In this chapter, I argue that Darwin relied on display conventions associated with popular and personal uses of photography to make his work on expression appeal to a wider audience, who would flip through his book much like they would a photo album. In the first part of the chapter, I conduct a close reading of Plate III to elucidate how the six photographs articulated Darwin's argument about expression's universality. Next, I outline *Expression*'s underlying principles and explicate how Darwin constructed and supported his argument using scientific and personal modes of knowledge acquisition. Then, I discuss Darwin's process of collecting and organizing images and demonstrate how photography was crucial to his belief in expression's universality. Lastly, I consider how Plate III's arrangement of photographs embraced broader trends in Victorian visual culture enabled by innovations in photographic and printing technologies. Ultimately, I argue that the use of photography in *Expression* reveals a slippage – and, at times, a merging – between so-called objective and subjective modes of representing, generating, and sharing scientific knowledge. Darwin intentionally converged personal and scientific applications and understandings of photography to not only garner a wider audience of specialist and lay readerships but, also, to convince his readers of his beliefs.

DARWIN'S COLLECTION OF "GENUINE" AND "FALSE" SMILES: PLATE III'S SUBJECTS AND ORGANIZATION

The juxtaposition of the two sets of photographs on Plate III is unusual, especially when considering Darwin's primary audience. How would middle-class Victorian readers have responded to a page that placed portraits of young British girls who could have been their daughters next to experimental scientific photographs of an older male medical patient in France? While scholars, such as Voss and Prodger, have examined *Expression*'s photographs, the seemingly odd juxtaposition of these two sets of photographs on the same plate has yet to be investigated. To be sure, the two groups of images are used to make two separate arguments. On the left, the three photographs of young girls support Darwin's argument that genuine

expressions of joy, such as smiling and laughter, are innate. This set of photographs, noted Darwin, demonstrates "different degrees of moderate laughter and smiling."[209] The fact that Darwin chose to use photographs of children makes good sense, as they bolster his claim that expressions of joy are present from childhood – inborn rather than learned. "We clearly see this," Darwin wrote, "in children at play, who are almost incessantly laughing."[210] It is unclear why Darwin chose to include photographs of girls rather than boys to illustrate this point.

The three photographs on the right of the plate delineate an argument about smiling derived from Duchenne's *Mécanisme*. Figure 4 shows the old man in a passive condition, figure 5 depicts him smiling naturally, and figure 6 captures an unnatural smile provoked by localized electrization. Together, Darwin argued, these three photographs evince that a genuine smile is universally recognizable. He wrote that figure 5, which shows the man looking out at the viewer with an open-mouthed smile, can be "instantly recognized by every one" as "true to nature."[211] To compare, Darwin noted that the artificially-induced smile in figure 6 is not easily recognizable and, therefore, not "natural":

> That the expression is not natural is clear, for I showed this photograph to twenty-four persons, of whom three could not in the least tell what was meant, whilst the others, though they perceived that the expression was of the nature of a smile, answered in such words as 'a wicked joke,' 'trying to laugh,' 'grinning laughter,' 'half-amazed laughter,' &c.[212]

If Darwin was using these photographs to make two separate claims about expressions of joy, why are they presented together on the same plate? At first glance, it may seem that this decision was made to cut production costs. However, that Darwin's arrangement was intentional is evidenced by his annotated sketch for Plate III. The sketch (Figs. 22, 23), currently held at the Cambridge University Library, delineates Darwin's plans for the plate's general organization. On the left, three rudimentary line drawings define the basic shapes of the girls' portraits. To the right, three shakily-drawn ovals indicate where Duchenne's photographs will be placed. A blue coloured pencil marks each figure with its corresponding number.

Only one photograph of the old man on Plate III captures an expression elicited by localized electrization. While the picture on the top right shows the device behind the man's

[209] Darwin, *Expression*, 202.
[210] Darwin, *Expression*, 198.
[211] Darwin, *Expression*, 203–04.
[212] Darwin, *Expression*, 203–04.

ears, it is not in use. Though Darwin's text references many photographs that show Duchenne electrically stimulating ordinary expressions, the photograph that depicts the galvanic apparatus in use – the image found on the bottom right-hand corner – demonstrates a "false" expression.[213] As Voss has explained, the image's "oval *passepartouts* almost completely obscure Duchenne's electrical machinery."[214] However, it is important to note that the two probes responsible for inciting the expression are still clearly visible. Darwin presented this photograph to reveal that the mouth's elevation alone cannot produce a genuine expression of joy. As Duchenne argued in *Mécanisme*, lifted mouth corners must be paired with the orbicular muscles of the lower eyelids' contraction for a smile to appear "genuine."[215] Darwin, in agreement with Duchenne, included this photograph on Plate III to demonstrate the visual differences between a "genuine" and "false" smile.

The photographs Darwin acquired for *Expression* were important to him and to the credibility of his research. Apart from the photographs donated by Duchenne, many were given to him by trusted colleagues and friends, who regularly mailed each other photographs. For example, Darwin received the photograph of the smiling girl in a hat reproduced as figure 2 on Plate III from Wallich.[216] In February of 1872, Darwin wrote Wallich asking for permission to include this portrait, identified as the doctor's daughter Beatrice, in his book.[217] Pictured in a floppy sunhat with a decorative band around the crown, Beatrice looks out at the viewer with a confident smile. Two vertical lines run from the sides of her nose down to the corners of her mouth, framing her toothy grin. Darwin assured his readers that her smile was sincere: "The figure of the little girl, with the hat, is by Dr. Wallich, and the expression was a genuine one."[218] The original photograph by Wallich (Fig. 24) is a head and shoulders portrait that shows his daughter framed by a subtle vignette. Darwin was especially complimentary after receiving Wallich's permission to reproduce the portrait, declaring that it would be the most beautiful one

[213] Darwin referenced Plates 48 and 49 from Duchenne's *Mécanisme* in his chapter on suffering and weeping but chose not to include the images. Darwin, *Expression*, 151.
[214] Voss, *Darwin's Pictures*, 205.
[215] Duchenne, *Mécanisme*, 69–73.
[216] George Charles Wallich opened his own photography studio in Kensington in 1870. Darwin had asked him to provide a photograph of a screaming baby for *Expression*, but he did not end up producing the image. See Phillip Prodger, "Appendix III: Photography and *The Expression of the Emotions,*" in *The Expression of the Emotions in Man and Animals*, ed. Paul Ekman, (Oxford: Oxford University Press, 1998), 407.
[217] Charles Darwin, letter to George Charles Wallich, 24 February 1872. Darwin and Burkhardt, *Correspondence Vol. 20,* 83.
[218] Darwin, *Expression*, 202.

on Plate III: "I thank you sincerely for the use of this beautiful work of art, which, however, will make all the others on the same Plate look ugly."[219]

As Darwin's sentiment suggests, *Expression* also included photographs of people who were less likely to be considered visually pleasing by its readers. Indeed, Wallich's photograph of fresh-faced Beatrice is located opposite one of the old man likened to an "irritable cadaver" throughout *Mécanisme*. Although Plate III may be interpreted as two sets of three photographs oriented toward two separate arguments, the six photographs are organized so that they can also be read horizontally as three pairs: they invite comparison. Like the young girl in the hat, the old man is shown looking out at the viewer with an open-mouthed smile. While his mouth, much like Beatrice's, is framed by deep nasolabial folds, his eyes are punctuated by marks of a joyful expression. Deep creases rest below his eyes, mirroring their shape, and shallow wrinkles extend from their outer corners toward his temples.

Similarities in the poses and expressions captured by these photographs demonstrate a degree of universality with respect to the expression of joy in humans by exhibiting continuity across gender, age, and class. Yet such similarities also make the differences between the subjects' appearances more palpable. While the young girl's hat calls attention to the absence of hair atop the old man's head, her toothy smile highlights the absence of teeth in the man's open mouth. In addition to differences in age and gender, the photographs' arrangement highlights disparities in class and health. Although Beatrice and the old man have different facial features and represent individuals from different socioeconomic backgrounds, their expressions of joy are remarkably similar.

Plate III contains two more pairs of photographs that similarly juxtapose the old man with a smiling girl. Figure 1, located above the photograph of Beatrice, is a portrait by Rejlander of a young girl with a gentle smile. At the time Darwin was collecting photographs for *Expression,* Rejlander was a well-known studio photographer who specialized in genre scenes and portraiture. In his photograph, the girl's blonde hair is parted neatly down the middle and tucked behind her ears, exposing the contours of her face. With her face positioned slightly to the right in a three-quarter view, the upturned corners of her mouth, partially open to reveal her front teeth, rest just beneath her full cheeks, which have risen to form creases beneath her eyes. Like

[219] Charles Darwin, letter to George Charles Wallich, 20 March 1872. Darwin and Burkhardt, *Correspondence Vol. 20,* 83.

the other photographs on this plate, the picture has been cropped into an oval format, showing only the subject's face. In comparison, the original photograph (Fig. 25) pictures the girl from the waist up, leaning forward and resting her arms on a soft cushion. This is a studio portrait, as we can see from the background, set dressing, and pose of the sitter. On Plate III, the girl's facial expression has been isolated from surrounding variables – her relaxed pose and Rejlander's photography studio are excluded from view.

Beside her photograph is one of the old man in repose. In *Mécanisme*, the man's expression is described as neutral. Darwin, echoing Duchenne, wrote that this photograph shows the man "in his usual passive condition."[220] Though the subject's downturned mouth and heavy eyebrows impart a sense of concern, both men understood this photograph as one of the patient "at rest." While the young girl and the old man are pictured wearing two different expressions, a visual parallel between the two photographs is established by similarities in the sitters' poses and the play of light and shadow upon their facial features. The three-quarter angle of the old man's face, for example, mimics that of the girl's with near perfect accuracy. Further, both photographs feature a light source positioned beyond the upper right-hand corner. As a result, both subjects exhibit dark shadows beneath their lower eyelids, noses, and lips.

Figure 3, located below Beatrice's photograph, depicts another girl with a modest, closed-lipped smile. Her hand is held up to her face in a pose of contemplation or pause. The photograph, also made by Rejlander, shows the girl from the shoulders up in a three-quarter angle. Her gaze extends beyond the frame's right-hand edge as she delicately extends her index finger across her cheek. Her dark hair is pulled back behind her ears, save for a small tuft that frames her cheekbone and draws attention to the point where her finger meets her skin. In Rejlander's original photograph (Fig. 26), the girl stands in front of a dark backdrop in the photographer's studio. Shown upwards from just below the hips in a light, white blouse and heavy, pleated skirt with a striped sash at the waist, she cradles her left elbow with her right hand as she poses for her portrait. This is an image of a cheerful young girl assuming a pose for the camera. Like the other photograph by Rejlander on Plate III, Darwin cropped the image so that only the subject's head and shoulders are in view. Cropping the image distilled the expression under analysis by isolating the subject's face from the larger context of the original studio photograph. To the right of Rejlander's photograph is Duchenne's old man, forced to smile by

[220] Darwin, *Expression*, 201.

localized electrization. Two electrical probes press into his skin, echoing the placement of the young girl's index finger atop her cheek.

The girls' portraits, gifted to Darwin by friends, had very different meanings before they were transformed into scientific images for *Expression*. Although the photographs were posed and made in studios, Darwin considered them to be "genuine" (or, at least, genuine enough) for his study, and used them as examples of sincere smiles. By cropping the photographs, framing them in oval *passepartouts*, and arranging them alongside Duchenne's photographs in this composite plate, Darwin crafted a visual schema by which his readers could distill the differences between false and genuine expressions of joy.

THE PERSONAL MEETS THE SCIENTIFIC: DARWIN'S HEURISTIC APPROACH TO SENSING AND SEEING EXPRESSIONS

In *Expression,* Darwin encouraged his readers to confirm the differences between a false and genuine smile for themselves by touching and moving their own faces: "if any one will place his finger on his lower eyelid, and then uncover his upper incisors as much as possible, he will feel, as his upper lip is drawn strongly upwards, that the muscles of the lower eyelid contract."[221] In carrying out these instructions, Darwin's readers' intimate relationships to their own sensing bodies confirmed what his text and photographs could merely describe. In this way, phenomenological, first-person experience was crucial to Darwin's scientific work on expression. Acting out expressions at will, his readers' faces – and the physical sensations they felt while moving them – were transubstantiated into further evidence in support of Darwin's claims. Here, for instance, they confirmed that the lower eyelids' contraction is necessary for a smile to appear "genuine." The readers' required hands-on approach to engaging with the text is another example of how Darwin's continued reliance on the personal in *Expression* merged subjectivity and objectivity. Both worked together in a mutually reinforcing way so that Darwin's audience could confirm his claims through first-hand experience and bodily involvement with the text.

For Darwin, the personal and subjective were also crucial to determining the veracity of photographs. In particular, subjective responses to Duchenne's photographs established their

[221] Darwin, *Expression*, 201.

scientific legitimacy for Darwin. To add further credibility to Duchenne's claim that the lower orbicular muscles' contraction is essential for a "true" smile, Darwin recounted that he had shown the image of the old man's electrically-stimulated smile to acquaintances who were perplexed by the photograph.[222] They were unable to recognize the old man's expression as genuine. As cited above, some of Darwin's circle described the expression as one of "a wicked joke" or "trying to laugh."[223] Through subjective responses to expressive phenomena, and to photographs of expression in particular, Darwin looked to his peers, acquaintances, and readers to help build and corroborate his arguments.

In the year leading up to *Expression*'s publication, Darwin relied on his acquaintances' interpretations of Duchenne's photographs to validate the "truthfulness" of the expressions he wished to depict. In an experiment carried out from March to November of 1868, he showed many of Duchenne's photographs to family, friends, and colleagues, requesting that they tell him which emotion they believed each image portrayed. The data he gathered from this experiment is cited at several points throughout *Expression.* In fact, most of Darwin's references to photographs by Duchenne are accompanied by the testimony of his inner circle. For example, he reasoned that a photograph by Duchenne represented surprise "with much truth" because those he showed the image to were able to recognize the intended expression:

> Dr. Duchenne has given us a photograph of an old man with his eyebrows well elevated and arched by the galvanization of the frontal muscle; and with his mouth voluntarily opened. This figure expresses surprise with much truth. I showed it to almost twenty-four persons without a word of explanation, and one alone did not understand what was intended.[224]

Darwin's reliance on the conclusions of this experiment reveals that he largely judged the "truthfulness" of Duchenne's photographs by the degree to which the proposed expressions were recognizable by his selective group of viewers.[225]

With this in mind, it is important to acknowledge that Darwin's dependence on subjective responses to Duchenne's photographs privileged a particular group of people's opinions. More specifically, he favoured how a select group of white, British, educated, and middle-class people

[222] Darwin, *Expression*, 202.
[223] Darwin, *Expression*, 203–04.
[224] Darwin, *Expression*, 278.
[225] Duchenne's images were, in fact, the first Darwin considered appropriate to illustrate *Expression.* See Prodger, *Darwin's Camera*, 81.

attributed facial expressions to emotions. For Darwin, the fact that the individuals in this group had almost unanimous reactions to these images encouraged him to transform their subjective, personal responses into a collective claim – ostensibly objective and scientific – that supported his reading of Duchenne's photographs. Yet the testimony of his inner circle functions not as entirely subjective or objective evidence but, instead, exists somewhere between the two. It represents the general consensus reached by people Darwin believed were capable of accurately linking expressions to emotions that he claimed they represent.

Looking closely at Darwin's use of his peers' testimony, as well as *Expression*'s heuristic instructions, encourages us to think differently about how relationships between subjectivity and objectivity were conceptualized in the Victorian era. While they are often thought to be diametrically opposed points of access for discovering, evaluating, and understanding reality and truth, the prominent role that individual and group experiences played in the corroboration of Darwin's arguments reveals that the two were inextricably linked. Rather than two contradictory metaphysical or epistemological qualities, subjectivity and objectivity are perhaps more accurately described as two poles on a spectrum. Evidence can be more (or less) objective (or subjective) depending on the tools and techniques used to ascertain it (and, at times, depending on how many people believe it to be true). The testimony of Darwin's inner circle, for example, functions as a form of "collective subjectivity" by representing the agreement of several individuals. While the group's testimony is not completely "objective," I argue that, for Darwin, it approached objectivity in a way that the testimony of a single individual would not. For him, collective testimony represented a body of evidence rather than a single, anecdotal interpretation.

Since Darwin wanted *Expression* to be received as a convincing scientific study, he needed his readers to validate his observations for themselves. The personal involvement of his readers added credibility to his claims. It also allowed readers to play a constituent role in the discovery and authentication of scientific ideas. While many nineteenth-century scientists, natural historians, and anthropologists thought subjectivity to be antithetical to the aims of their work, it was instrumental to the substantiation of *Expression*'s arguments. For example, by following Darwin's instructions, his readers, familiar with their own bodies, emotions, and appearances, could transform themselves into specimens (and thus evidence) to support his claim that the lower eyelids' contraction is necessary for smile to appear "genuine." Through their

bodies and subjective responses, Darwin's audience took on a participatory role and became further proof of human expression's universal recognizability.

Correspondence between Darwin and his followers shows that *Expression*'s audience used their own personal experiences to corroborate the book's arguments. In June 1873, for example, Charles Hinton wrote to Darwin from San Francisco with observations about his expressive responses to different emotional states. As the letter demonstrates, Hinton trusted that, although he was not a scientist or specialist on the topic, his personal testimony would be useful for Darwin's study: "It has occurred to me that perhaps I, although wholly unscientific, might yet enlist myself in your corps of observers, and with this hope I send you a few experiences of my own."[226] Hinton then described circumstances in which he noticed his body reacting to emotional stimuli. In the most detailed account, he explained how he felt his facial muscles responded to an incident that provoked great anger and sorrow:

> I was once informed by a friend that a young man for whom I had a great attachment had expressed the opinion to several others that I was a 'great fool.' At first I would not believe it, but when my informant assured me in the most positive terms of its truth I felt my lip begin to tremble and although I endeavored to prevent it by drawing it between my teeth, the trembling increased; at the same time I felt a chill through my body and finally burst into tears.[227]

In the years following *Expression*'s publication, Darwin received many similar letters from nonspecialist and scientific readers. An 1873 letter from doctor and asylum superintendent Stanley Haynes, for instance, related several details about his own facial and bodily movements:

> I have noticed my left ear moving once or twice, but cannot do so voluntarily … I am able to move my scalp, but not without effort and raising of the eyebrows … Dilation of my pupils was very marked after I had been frightened by a large dog instantaneously appearing and springing upon me in the dark … my mouth was dry and wide open, my teeth chattered for a long time after.[228]

For many of Darwin's readers, subjective accounts of their own expressive behaviour were evidence that could either support or discredit *Expression*'s claims. In this way, the subjective

[226] Darwin Correspondence Project, "Letter no. 8944," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-8944.xml
[227] Darwin Correspondence Project, "Letter no. 8944," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-8944.xml
[228] Darwin Correspondence Project, "Letter no. 8708," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-8708.xml

and the anecdotal were crucial to determining whether or not Darwin's arguments would be accepted by his audience.

DARWIN'S ARGUMENT FOR EXPRESSION'S UNIVERSALITY: THE CIRCULATION OF ANECDOTAL EVIDENCE IN COLONIAL AND SCIENTIFIC NETWORKS

Darwin and Duchenne both sought to establish the universal recognizability of emotional expression across humanity, yet *Expression* and *Mécanisme* oriented the principle of universality toward antithetical ends. In *Mécanisme*, Duchenne argued that expression's universality is evidence of an intelligent designer that crafted one common language through which to express and recognize emotional states: "In the face, our Creator was not concerned with mechanical necessity. He was able, in his wisdom … to put particular muscles into action … when he wished the characteristic signs of the emotions, even the most fleeting, to be written briefly on man's face."[229] Darwin, in comparison, claimed that universality is evidence of a common ancestor and further substantiates evolutionary theory.[230] For him, human expressions are best understood as "evolutionary phenomena";[231] they are not the fleshy manifestations of a fixed expressive lexicon gifted to us by a divine creator but, instead, are enmeshed within a long, complex, and continuous story of physical transformation and adaptation.

Throughout *Expression*, Darwin did not conceal the fact that he relied on personal, anecdotal observations of expressive behaviour to validate this hypothesis. He related stories about strangers he observed out in public, as well as his own family members and pets. Darwin even went so far as to experiment on his own children to gather information for this study. In an early review of *Expression* published in *Literary World* on 29 November 1872, Darwin's treatment of his young children as test subjects is ridiculed: "[Darwin] has experimented on his own infants so boldly that one is almost tempted to rejoice that one was not the child of a man of science."[232] Although the use of young children as subjects of scientific experimentation may seem cruel and unreliable by today's standards, these first-hand accounts formed the foundation of Darwin's theory of expression.

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[229] Duchenne, *Mécanisme*, 19.
[230] Darwin, *Expression*, 355.
[231] Smith, *Charles Darwin and Victorian Visual Culture*, 179.
[232] DAR 226.2 132 "Mr. Darwin's New Book," *Literary World* n. 161 v. 11, 29 November 1872: 337-38

Darwin also turned to anecdotal observation to prove that emotions are expressed ubiquitously across the world. In the years leading up to the publication of *Expression*, Darwin attempted to verify expression's universality by sending a list of queries to missionaries and "protectors of the aborigines."[233] His global network of informants included Mr. Winwood Reade, Mrs. Barber, Mr. J.P. Mansel Weale, and Professor and Mrs. Asa Gray, stationed in Africa, and Mr. Bridges, Dr. Rothrock, and Mr. Washington Matthews, who reported from America. Darwin requested that his informants' responses include answers to the following questions, among others: "Does shame excite a blush when the colour of the skin allows it to be visible?"; "Is extreme fear expressed in the same general manner as with Europeans?"; and "Do the children, when sulky, pout or greatly protrude the lips?"[234] Below the list of (arguably leading) questions, he notes that observations "on natives who have had little communication with Europeans would be of course the most valuable."[235] Such observations were undoubtedly "most valuable" as Darwin believed they would help him discern whether expressions are biologically determined by way of inheritance or socially acquired by way of imitation (intelligent design was, of course, simply out of the question).

According to Darwin, the uniformity of emotionally expressive behaviour across groups of people who were socially and geographically isolated from one another – and therefore immune to mimicry – would prove the repertoire of human expression and the processes through which it is materialized to be inherent and biologically hard-wired like an organ system:

> Whenever the same movements of the features or body express the same emotions in several distinct races of man, we may infer with much probability, that such expressions are true ones, – that is, are innate or instinctive. Conventional expressions or gestures … would probably have differed in the different races, in the same manner as do their languages.[236]

The observations Darwin gathered from his informants demonstrated to him that "the same state of mind is expressed throughout the world with remarkable uniformity."[237] For him, they confirmed that expression is an inborn, biologically-governed bodily function just like any other.

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[233] Darwin, *Expression*, 18.
[234] Darwin, *Expression*, 18.
[235] Darwin, *Expression*, 18.
[236] Darwin, *Expression*, 16.
[237] Darwin, *Expression*, 18.

Darwin proposed that all of humanity originated from a single common ancestor by citing the universality of emotional expression across the globe. In this way, *Expression* drew connections between the so-called separate races of humankind. Yet it is imperative to acknowledge that Darwin and his research were embedded in, and benefited from, the colonial and racist ideologies and practices of his time. As historian Thomas Prasch has observed, Darwin's study depended on the exchange of information colonial networks offered.[238] Further, while Darwin insisted on the unity of humankind, he did not propose that all cultures were equal.[239] In fact, Darwin's conclusions led him to believe quite the opposite.

The personal was crucial to Darwin's scientific work. He peppered countless anecdotes that he believed corroborated expression's universality throughout the book. As historian Hugh Ridley has noted, Darwin's argument is largely grounded in anecdotal evidence that he received from non-scientific sources.[240] This was partly because, unlike Darwin's previous works, such as *The Voyage of the Beagle* (1839), which required travel and long periods away from home, *Expression* dealt with "observable phenomena" of the present. Many of the subjects the book discusses were embedded in the everyday conditions of modern social life familiar to Darwin's audience; dogs play fetch, infants cry, and young ladies blush. While ordinary people's observations constitute a significant portion of the material Darwin interpreted, much of the information he cites as evidence of expression's universality was obtained from his global network.[241] Upholding his conviction that expression is universal and innate, he contends that any apparent differences in expressive gestures associated with the same emotional state are simply a matter of degree. While expressions themselves are not socially acquired, the intensity with which they may be acceptably enacted is socially prescribed.

Darwin provided ample anecdotal evidence to support this argument. For instance, he maintained that although the expression of fear is universal, its display is "exaggerated in Hindoos and the natives of Ceylon."[242] On the subject of grief, he recounted that he "saw in

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[238] Thomas Prasch, "Descended from a Single Parent Stock: Expressive Resemblance as an Argument for the Unity of Races in Darwin's *Expression* (1872)" (presentation, Interdisciplinary Nineteenth-Century Studies Conference, Austin, Texas, March 2010).
[239] Prasch, "Descended from a Single Parent Stock."
[240] Hugh Ridley, *Darwin Becomes Art: Aesthetic Vision in the Wake of Darwin: 1870-1920* (Amsterdam: Editions Rodopi, 2014), 164.
[241] In his discussion of "joy and high spirits," for example, he recalled that the women of isolated tribes in Southern Africa and North America weep from excessive laughter just as Europeans do. Darwin, *Expression*, 207–08.
[242] Darwin, *Expression*, 294.

Tierra del Fuego a native who had lately lost a brother, and who alternately cried with hysterical violence, and laughed heartily at anything which amused him."[243] He also compared the grieving man's behaviour to men who inhabit the supposed "civilized nations of Europe," declaring that "Englishmen rarely cry, except under the pressure of the acutest grief."[244] As a general rule, noted Darwin, "children and women cry much more freely than men."[245] Further, he asserted that the so-called insane "notoriously give way to all their emotions with little or no restraint." To corroborate this claim, Darwin cites an account of a weepy "melancholic girl" relayed to him by Browne: "One melancholic girl wept for a whole day, and afterward confessed to Dr. Browne that it was because she remembered that she had once shaved off her eyebrows to promote their growth."[246] Bolstering his claims with an assortment of visually evocative and, at times, extraordinarily racist and sexist anecdotes from today's perspective, such as the story of a woman able to exert "the great influence of the will on the mammary glands, even on one breast alone,"[247] Darwin built his argument upon comparisons between several highly dramatized accounts of human behaviour, evaluating them in terms of expressive intensity. Ultimately, Darwin's argument for expression's universality, while ostensibly uniting humankind, relied upon a prejudiced nineteenth-century taxonomy that evaluated and compared human beings on the basis of race, sex, age, and mental state to justify discrepancies in expressive behaviour.

The relationship between Darwin's research and his commitment to the abolition of slavery has been widely debated.[248] Historians of science Adrian Desmond and James Moore, for example, have explored how the politics of antislavery were vital to Darwin's research on evolution. For them, Darwin's studies were a response to the scientific racism that underpinned many nineteenth-century studies in anthropology and science.[249] Indeed, Darwin's central theory – that all of humanity descended from a single parent stock – challenged the foundations of

[243] Darwin, *Expression*, 153.
[244] Darwin, *Expression*, 153.
[245] Darwin, *Expression*, 190.
[246] Darwin, *Expression*, 154. For more on Darwin's relationship with Browne, see Sander Gilman, "Darwin Sees the Insane," *Journal of the History of the Behavioural Sciences* no. 15 (1979): 253–262.
[247] Darwin, *Expression*, 339. Darwin cites page 95 of Mr. Braid's 1852 publication *Magic, Hypnotism* as the source of this exceptional tale.
[248] James Lander, *Lincoln & Darwin: Shared Visions of Race, Science, and Religion* (Carbondale: Southern Illinois University Press, 2010), 4; Stephen G. Alter, "Race, Language, and Mental Evolution in Darwin's Descent of Man," *Journal of the History of the Behavioral Sciences* 43, no. 3, (summer 2007): 239–55; Voss, *Darwin's Pictures*, 250.
[249] Adrian J Desmond and James R Moore, *Darwin's Sacred Cause: How a Hatred of Slavery Shaped Darwin's Views on Human Evolution* (Boston: Houghton Mifflin Harcourt, 2009).

widely-held racist ideas about the inferiority and superiority of different ethnic and cultural groups. As cultural studies scholar B. Ricardo Brown has elucidated, taxonomic frameworks used in the sciences shape how the relationships between such groups were and continue to be understood.[250] These classificatory systems likewise contribute to how sociopolitical structures are constructed, upheld, and challenged.

Darwin's construction of a racial and gendered hierarchy whereby human beings are ordered according to degrees of perceived resemblance is not exclusive to *Expression*. As historian of science and philosophy Tim Lewens has argued, Darwin regarded the subjects he studied as parts of a "natural system" wherein organisms are not only categorized by relative resemblance but, also, organized hierarchically.[251] The tiered arrangement of beings was central to Darwin's approach as he was not only interested in *how* the natural world is ordered, but also *why* it is ordered in such a way. By positioning beings along a spectrum of evolutionary advancement, Darwin's "natural system" placed its subjects into what Lewens describes as "a hierarchical system of resemblance, while at the same time revealing the ground of that resemblance in terms of a set of genealogical relationships."[252]

I argue that in *Expression*, Darwin used photography to visualize this "system of resemblance." The recognition of resemblance is crucial to how the six photographs function on Plate III. Since Darwin aimed to provide visual evidence that expressions are made and recognized with uniformity, his decision to include images of individuals from different backgrounds and demographics seems appropriate. However, the photographs he chose to include on Plate III (and in *Expression* as a whole) exclusively show white Europeans. This was not due a lack of supply when it came to photographs of people from different countries and cultures. Darwin possessed several photographs of individuals who were not white Europeans. For example, he obtained four photographs by the Italian studio photographer Giacomo Brogi that show an older Black man responding to different forms of sensory stimuli. The reason behind Darwin's decision not to include these photographs, or any others that show people of colour, is unclear.

[250] B. Ricardo Brown, *Until Darwin, Science, Human Variety and the Origins of Race* (London: Pickering & Chatto, 2010), 3.
[251] Tim Lewens, *Darwin* (London: Routledge, 2007), 74.
[252] Lewens, *Darwin*, 75.

Duchenne's photographs, on the other hand, were indispensable for Darwin because he believed they were instrumental to establishing the credibility of his research. On Plate III, the three photographs by Duchenne fulfill multiple functions simultaneously. As a set of three, they illustrate the characteristics of a genuine smile by visualizing differences between expressions deemed "false" and "truthful" by Darwin and his circle. When pictured alongside the three photographs of smiling girls, Duchenne's photographs – in particular figure 5 – demonstrate the smile's universality across two demographics. Duchenne's old, labouring, sick French subject was different enough from the young, healthy British girls that the six photographs together exhibited a degree of diversity.

COLLECTING RESEARCH OBJECTS: BUILDING AN ARCHIVE OF HUMAN EXPRESSION

In the mid 1860s, Darwin began to amass a personal collection of over two hundred photographs, illustrations, and engravings of human and animal expressions. Now held in two portfolios at the Cambridge University Library, the archive contains a broad range of visual material, including: photographs of patients at the West Riding Lunatic Asylum by Browne; photographs of wailing children by Kindermann; and a woodcut of a menacing panther atop a cliff by Cooper. This diverse archive of images, accumulated by Darwin from a wide variety of sources, was systematically edited and categorized into the group of thirty-two photographs and twenty-one woodcuts that illustrate *Expression*. This thoughtfully chosen selection of images was celebrated in many reviews issued in the months following the book's publication. In January 1873, for example, a review printed in *The Argus* noted that the images had been attentively chosen: "The woodcuts and heliotypes are very characteristic and valuable, since we may feel sure they have been carefully selected."[253]

Darwin's process of assembling, selecting, and organizing visual representations of humans and animals for *Expression* was consistent with the approach he had employed for his previous projects, including *Origin* and *Descent*. When beginning to explore a particular subject,

[253] "Review of *Expression in Man and Animals*," *The Argus* n. 8, Thursday January 23, 1873. Cambridge University Library: DAR 226.2: 117-119.

Darwin would gather, arrange, and analyze as many examples as he could find.[254] This approach grew out of the material and sociopolitical conditions specific to nineteenth-century England that were also shared by other European countries: they all collected specimens from across the globe and competed to expand research in a wide range of fields from anthropology and archeology to the natural sciences.[255] As a result of England's rise to colonial power, the British Museum in London boasted the world's most comprehensive collection of natural history objects. These objects were later moved to the Museum of Natural History, which was fueled by and appealed to Victorian culture's collecting craze. Endorsed by the state, men of science such as Darwin went on expeditions to South America, Africa, Asia, and Australia, returning to England with innumerable specimens. Many of these objects were sourced unethically by today's standards. The goal was to expand Britain's national collection and publicly exhibit British colonial power and "knowledge." The state also profited by selling large quantities of objects to museums. The seemingly infinite number of objects from around the globe in British collections enabled those who examined the specimens to detect variations within a single species. This discovery of variation ultimately led Darwin to contemplate what he would eventually term "evolution."[256]

Teeming with a range of examples from stories of weeping elephants to images of smiling young English girls, *Expression* outlines the conclusions Darwin drew from a comparative analysis of anecdotal observations and visual representations related to expression that were found within his own collection. To this end, Darwin's research method embodied a fundamental shift away from "typological" thinking by adopting "population" thinking as its primary epistemological framework.[257] As Lewens has explained, "typological" thinking is grounded in the assumption that for each natural phenomenon there exists an idealized form from which unique samples diverge. To compare, "population" thinking altogether rejects the concept of idealized forms. Instead, it is rooted in the principle that the general features of any given thing can be distilled by statistically determining averages amongst a group of unique samples.

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[254] Prodger, *An Annotated Catalogue*, 1.
[255] Voss, *Darwin's Pictures*, 8. See also Gordon McOuat, "Cataloguing Power; Delineating 'Competent Naturalists' and the Meaning of Species in the British Museum," *British Journal for the History of Science* no. 34 (2001): 1–28; Jenny Beckman, "Do Collections Make the Collector? Charles Darwin in Context," in *From Private to Public: Natural Collections and Museums*, ed. Marco Beretta (Sagamore Beach, MA: Science History Publications: 2005).
[256] Voss, *Darwin's Pictures*, 9.
[257] Lewens, *Darwin*, 84. See also Ernst Mayr, "Typological versus Population Thinking," in *Evolution and the Diversity of Life*, Cambridge, MA: Harvard University Press, 1976; Elliot Sober, "Evolution, Population Thinking, and Essentialism," *Philosophy of Science*, no. 47 (1980): 350–83.

Darwin's work on expression unmistakably grows out of this approach. In *Expression*, this approach relied on the visual: Darwin analyzed expressive responses to emotional stimuli by categorizing photographs that show people making expressions.

One of the first widely circulated scientific books to contain photographic images, *Expression* was instrumental in popularizing the use of the photograph as both an object and means of analysis in the sciences. Not only were photographs detailed, but they were faster to produce than drawings and paintings. As Prodger has noted, Darwin's use of photography in *Expression* marked one of the earliest known efforts to arrest movement for study photographically, preceding the renowned photographic studies of motion carried out by British-American photographer Eadweard Muybridge in 1878 and French photographer Étienne-Jules Marey in 1879.[258] As scholars of photography such as Stanley Burns and John McElhone have shown, novel photographic technologies emerged from and led to significant discoveries in the sciences. While American and British physicians contributed to the development of later nineteenth-century technologies, such as collodion "wet-plate" paper prints, "tin-types," and stereography, eighteenth- and nineteenth-century studies of light-sensitive materials, developing agents, and "optical sensitizers" brought about simultaneous and parallel advances in physics, chemistry, physiology, and optics.[259] Reproducing the appearances of his human subjects photographically, Darwin connected human expressions with the scientific discoveries productive of and enabled by photographic processes. By linking human expression to scientific innovation through photography, *Expression*'s visual evidence spoke to later nineteenth-century beliefs about the mutually reinforcing relationships between photographic processes, modernity, and truth.

Printed using the innovative technology of the heliotype process, the photographs included in *Expression* were mass produced for Darwin's large print run.[260] This differed from earlier photographic printing methods, such as those used in Duchenne's *Mécanisme*, where actual photographs were "tipped-in" to books through a labour-intensive, expensive process. In

[258] Prodger, "Appendix III," 401.
[259] Burns, *Early Medical Photography in America,* 790–95; John P. McElhone, "The Signature of Light: Photo-sensitive Materials in the Nineteenth Century," in *Beauty of Another Order: Photography in Science*, eds. Ann Thomas and Marta Braun (New Haven, CT.: Yale University Press in Association with the National Gallery of Canada, Ottawa, 1997), 60–69. "Optical sensitizers" are chemical dyes that make plates more sensitive to yellow, green, and red light.
[260] For a thorough explanation of the heliotype process, see Prodger, "Appendix III," 401.

comparison, heliotypes were manufactured on a larger, cost-effective scale and could be printed on ordinary paper, making them easy to bind along with pages of text. In preparation for *Expression*'s publication, Darwin ordered 7,000 heliotype plates from Mr. McLeod at the Heliotype Company in London. Just as Darwin's use of photographs established a connection between the people shown in *Expression* and scientific discovery, the reproduction of these photographs by way of the novel heliotype process linked human expression to technological innovation. This was important to Darwin because, for him, the breadth and subtlety of human expressions were evidence of humankind's high standing on the spectrum of evolutionary advancement.[261] The use of heliotypes for *Expression* also promoted Darwin's work as cutting edge and in demand. This innovative medium enabled the wider circulation of photographic images, and thus linked Darwin's ideas with advances in science, technology, and industry.

PHOTOGRAPHS OF EXPRESSION: TRANSFORMING PORTRAITS INTO SCIENTIFIC SPECIMENS

Darwin's decision use photography was typical of the times: photography made certain research objects portable, reproducible, and easier to examine. Given that facial expressions are transitory, they are difficult to analyze effectively with the naked eye. Darwin, like Duchenne, was aware of this fundamental challenge. As he noted in *Expression*'s introduction, the analysis of human expression is "difficult, owing to the movements being often extremely slight, and of a fleeting nature."[262] However, photography could suspend expressions in time, permitting them to be fixed, analyzed, and compared. While photography was not yet instantaneous, exposure times significantly decreased throughout the 1850s. By the time Darwin was collecting images for *Expression*, a clear photograph could be captured in as little as two seconds in clear, diffuse light.[263]

Darwin's use of photographs in *Expression* exhibits a profound tension between scientific and aesthetic demands. While he hoped his photographs would be accepted as suitable scientific evidence, he needed to present them in a way that appealed to a broad audience. On Plate III,

[261] Darwin's argument for the evolution of expression in humans will be discussed at length in chapter three.
[262] Darwin, *Expression*, 13.
[263] Delaporte, *Anatomy of the Passions*, 48.

Darwin used three portraits that were made in studios. His Victorian audience was familiar with the process of sitting for portraits and knew sitters had to remain still. The practice of posing for a photograph involved holding a particular expression for longer than one would when not posing. In this way, portraiture – a genre linked to posing and stillness – also helped capture the fleeting nature of expressions. For example, the three girls shown on Plate III would have been instructed to remain still until the camera operator had captured the photograph. This makes us question if such photographs captured genuine expressions or not.

Darwin's decision to crop these photographs and frame them with oval *passepartouts* also complicates how nineteenth-century readers would have interpreted the images. As a result of their presentation, these photographs straddle the line between portraits and specimens. While Darwin presented them as visual evidence to be analyzed and compared, he also clearly relied on portraiture's display conventions. For example, he could have chosen not to use the oval shapes, which would have been instantly recognizable as linked to portraiture by his audience. Instead, he could have made these photographs appear more scientific by drawing upon established conventions from the world of science, such as excessive labelling, using squares, or obscuring the patients' identities by blacking out extraneous visual information. By looking to popular uses of photography, and to photographic portraiture in particular, Darwin ensured that his visual evidence would be comprehensible to a wide Victorian audience.

Like Duchenne, Darwin treated photographs of expression as surrogates for the expressive behaviours they captured. That said, he also considered photographs to be more than just substitutes for their subjects. For Darwin, as for Duchenne, a single credible photograph fulfilled two functions simultaneously: the photograph, understood as an impartial visual record, was both specimen and evidence. This conflation of specimen and evidence was crucial for scientific study because it made data capturable, reproducible, and portable. While Duchenne chose to produce his own photographs by documenting his experiments with galvanism, Darwin instead elected to use a selection of suitable photographs by purchasing, commissioning, and accepting as gifts pictures of human facial expressions.

Darwin's use of photography in the study of emotional expression, I would argue, was also motivated by the currency of photographs within scientific circles during the later nineteenth century. Like many of his contemporaries, Darwin believed that photography was the most

suitable visual representation for the analysis of human subjects.[264] For the study of human expression in particular, photography could accomplish what drawing and painting could not: photographs froze for analysis the transient expressions that pass across the human face. While drawing and painting could represent emotional expressions, they relied on the artist's memory or in-person study of a model, and therefore were commonly linked to subjectivity and the imagination.[265] Although photographs were not unequivocally recognized as objective records of the events or specimens they captured, the systematic application of photography toward scientific ends granted them a degree of credibility.

The preparation of *Expression* was the primary motivation for Darwin's picture-collecting practice. Darwin travelled around England looking for suitable photographs despite being in poor health.[266] Throughout his search for relevant images, he explored a variety of different suppliers, such as The London Stereoscopic Company and the Leicester firm of John Burton & Sons.[267] The London photography industry peaked in the 1860s, growing from 150 studios at the start of the decade to 275 by 1867, giving Darwin a wealth of photographic material to choose from.[268] In addition to scouring the London shops and studios, which were overflowing with a variety of photographic genres, including the low-cost portrait photographs that Darwin collected for *Expression*, he also approached suppliers outside of England, including the French firm of Fernand Vadon & Cie, the American photographer James Landry, and the Italian photographer Brogi.[269] While Darwin amassed a sizeable photography collection documenting a range of human expressions through such suppliers, he did not reproduce any of the images he purchased in *Expression*.

Much has been written about how the conventions of painted portraiture dictated how people posed for photographs and how photographers composed their images.[270] Clients of early

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[264] Prodger, *An Annotated Catalogue*, 3.
[265] Daston and Galison, *Objectivity*, 143; 161.
[266] Darwin suffered from digestive upset for much of his adult life and his symptoms grew worse with age. Prodger, *An Annotated Catalogue*, 4.
[267] Prodger, "Appendix III," 404.
[268] Prodger, *Darwin's Camera*, 15.
[269] Prodger, "Appendix III," 404.
[270] See, for example, art historians Tanya Sheehan, Elizabeth Anne McCauley, Graham Clarke, Roger Cardinal, and Elspeth Brown. Sheehan, *Doctored*, 48–80; Elizabeth Anne McCauley, *Industrial Madness: Commercial Photography in Paris, 1848 – 71* (New Haven: Yale University Press, 1994) 74–97; Graham Clarke, "Introduction," in *The Portrait in Photography,* ed. Graham Clarke (London: Reaktion, 1992), 1; Roger Cardinal, "Nadar and the Photographic Portrait in Nineteenth-Century France," in *The Portrait in Photography*, 6; Brown, *The Corporate Eye*, 23–64.

photography studios sought small-scale photographs that replicated the styles of painted portraits at a lower price-point.[271] Due to these demands, portrait photography embraced the conventions of portraiture from the outset, such as profile, three-quarter views, and head-and-shoulders compositions.[272] Photographic portraits, like painted ones, communicated the social identities of their sitters through posing, accessories, props, backdrops, and dress. For example, Victorians wore their finest clothes for portraits, displaying their wealth and class before the camera. Those from lower classes borrowed the clothing and props lent by the studios. In the early 1870s, posing guides taught patrons how to sit.[273] This led to the standardization of poses amongst sitters, who were often captured with neutral facial expressions that appear stiff and forced. Children were typically pictured assuming similar poses, and sometimes were held still by their mothers, who were carefully hidden under draped fabric. Two studio portraits of young girls by Rejlander (Figs. 27, 28), for example, show the sitters with neutral expressions and holding poses that appear rigid and awkward by today's standards.

As a consequence of these conventions, the photographs Darwin bought from professional suppliers primarily functioned as examples of how photographs captured people's expressions as they posed for portraits. As such, they were not appropriate for *Expression*, especially since most sitters were portrayed with serious expressions, did not show their teeth, and rarely smiled. While a studio portrait highlighted a sitter's constructed identity, it could not necessarily communicate anything about the expressive behaviours Darwin considered to be biologically determined. Many of the photographs from friends and colleagues that Darwin included in *Expression*, however, do embrace the conventions of studio portraiture. As outlined above, the three photographs of young girls on Plate III were made in studios and are typical examples: the girls are shown wearing fine clothing, in front of studio backdrops, and hold gentle, pleasant poses for the photographer.

The second section of *Expression*, dedicated chiefly to "everyday" human expressions, is similarly illustrated by photographic portraits of middle-class Europeans making pleasant faces and acting out subtle expressions. In some photographs, grumpy toddlers frown and well-

[271] Heinz K. Henisch and Bridget Ann Henisch, *The Photographic Experience, 1839-1914: Images and Attitudes* (University Park, Pa.: Pennsylvania State University Press, 1994), 11.
[272] Clarke, *The Portrait in Photography*, 3.
[273] One such publication was the American Edward L. Wilson's booklet, published in 1871 in the *Philadelphia Photographer.* The booklet was translated into many languages and sold upwards of 1 million copies over the next decade. See Siegel, *Galleries of Friendship and Fame*, 34.

dressed men scrunch up their noses in disgust. Most of these images feature people Darwin's primary readership recognized as everyday middle-class children, neighbours, and friends. The arrangement of these photographs on composite plates complicate their status as either portraits or scientific specimens. Instead, they emerge as part of a hybrid genre that allows them to function as both simultaneously.

HABITS OF LOOKING: ENGAGING WITH PHOTOGRAPHIC OBJECTS

Much like Duchenne, who invited his readers to explore photographs with their eyes and hands, Darwin required something of his audience. The recognition of expression's universality necessitated that readers identify expressive similarities amongst a group of distinct people. The organization of multiple photographs on composite plates enabled readers to make such associations. By the time Darwin's readers reached Plate III in *Expression,* they would have already encountered a similarly organized plate. Six photographs, also framed by oval *passepartouts* and arranged comparably on Plate I (Fig. 29), were the first to address human expressions. The plate, located in the chapter entitled "Special Expressions of Man: Suffering and Weeping," is the first set of photographs to appear in the book.[274] Organized in a three-by-two table, the photographs show screaming and crying children.

Readers' engagement with Plate I's arrangement prepared them to interpret Plate III. As Edwards and Hart have argued, presentational devices impart meaning through habitual encounters that elicit specific forms of viewer engagement.[275] On Plate I, Darwin used photographs to visualize his textual descriptions of weeping in young children: "Infants, when suffering even slight pain, moderate hunger, or discomfort, utter violent and prolonged screams."[276] Such an expression of suffering, Darwin noted, is characterized by firmly closed eyelids, the contraction of the forehead into a frown, the wide opening of the mouth, and the retraction of the lips. On Plate I, six photographs capture Darwin's description of crying and provide the reader with visual data upon which to reflect: "It is easy to observe infants whilst

[274] The plate includes five photographs by Rejlander and one photograph by Kindermann.
[275] Edwards and Hart, "Introduction," 6.
[276] Darwin, *Expression*, 147–48.

screaming but I have found photographs made by the instantaneous process the best means for observation, as allowing more deliberation."[277]

Like with Plate III, the photographs on Plate I illustrate visual similarities in expression amongst different people. Here, they show a group of children who vary in age. The child pictured in figure 1, for example, appears to be about one or two years old. The boy sits upright with his body facing the left-hand edge of the photograph. His hands curl into fists and he looks out toward the viewer with scrunched up eyes and an open mouth. Figure 2, located directly below this photograph, depicts an infant that looks only a few months old. Lacking the strength to support the weight of his own head, the baby reclines on a soft cushion. Like the child shown in the first figure, his body is positioned toward the left-hand side of the image. With his eyes clenched shut and mouth open wide, his expression mimics that of the older child pictured above him. These two photographs are unmistakably similar in terms of composition, framing, pose, and expression – the primary difference between the images is the age of the children.

A comparable visual strategy is at play in the two other vertical pairings of photographs on Plate I. Figures 3 and 4, for example, both picture the same baby in the midst of a tantrum. Figure 3 shows her facing the camera with a pair of little hands wrapped around her waist. In figure 4, she is held by an older child, who looks inquisitively at her severe, open-mouthed cry. To compare, figures 5 and 6 are also framed photographs that show children of different ages with similar poses and facial expressions. While figure 5 features a weepy infant, figure 6 shows the older child in tears. Like with Plate III, the six photographs on Plate I can be read as three pairs. In Plate I, the top row of photographs is echoed by the bottom row; the compositions of the photographs and the poses and expressions of their subjects are mirrored in three vertical couplings.

In *Expression,* the arrangement of photographs on Plate I primes Darwin's readers for their engagement with Plate III. Already in the business of distilling the similarities amongst individual photographs presented together as a group, the reader is encouraged to notice the visual parallels between the young English girls' smiles and the old man's grin. Darwin created similar presentational formats to invoke comparable habits of looking. This mode of repetitive looking is reflected in one of Darwin's underlying principles in *Expression*: "the principle of

[277] Darwin, *Expression*, 148.

serviceable associated habits."[278] By way of association and habit, Darwin maintained, actions that were once consciously performed come to be performed automatically when the same state of mind is even faintly stimulated.[279] Darwin activated this principle in his arrangement of plates for *Expression*.

On Plates I and III, photographs are presented as reliable visual data to be interpreted by Darwin's middle-class, educated audience. As Daston and Galison have shown, transformations in image-making and publishing practices gradually established the ideal of mechanical objectivity (the attempt to remove subjectivity from processes of documentation as the "scientific norm") by the mid nineteenth century.[280] In *Expression*, Darwin used photographs that, for many, satisfied the ideal of mechanical objectivity to which the sciences aspired. However, the individual photographs alone could not enable the viewer's acknowledgement of the expressive similarities that Darwin sought to highlight. In providing his audience with a modest collection of photographs arranged on the same plate, shown in a way that encouraged direct comparison between images, Darwin outsourced the work of constructing "reasoned images" to his reader. By analyzing the group of photographs arranged in a grid-like format, the reader could easily synthesize and compare the key features and, in so doing, distill the "typical specimen" from the pictured variations. This process of cognitive synthesis enabled the reader to, like Darwin, engage in "population" thinking and, as a result, participate in the construction of expression's universal recognizability.

While Darwin's project required his readers to synthesize individual units of visual data "in their minds," efforts to generate synthesized images photographically were undertaken by the late 1870s. One of the pioneers of this photographic practice was Darwin's cousin Francis Galton, polymath and prominent advocate of eugenics. Galton layered photographs of up to 100 individuals onto a single photographic plate to produce images of general "types." For example, in his 1877 series *Composite Portraits of Criminal Types* (Fig. 30), Galton presented a collection of eleven composite photographs that each combine the likenesses of up to eight individuals. These composite portraits, which show the faces of men in repose staring out at the viewer, were intended to reveal what were believed to be the general physiognomic features of male criminals.

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[278] Darwin, *Expression*, 34.
[279] In such instances, the action may no longer be useful.
[280] Daston and Galison, *Objectivity*, 115–190.

Galton also used this photographic process to discern what he thought to be the average facial features of individuals with certain mental illnesses, tuberculosis patients, and Jewish people. As art historian Josh Ellenbogen has argued, Galton used photography to picture "extravisual objects"; the composite portrait makes visible average values through a synthesis of data but does not bear complete visual fidelity to any of the individual appearances reproduced.[281] Galton was primarily concerned with the mind's ability to produce generic images through the synthesis of sensory information. Given that earlier physiognomic generalizations were based on a very limited sample set, Galton transcended the inferential analysis of case studies by generating material composites. As scholar of photography Allan Sekula has recounted, Galton believed that his composites exceeded the intellect's ability to generalize.[282] Galton's composite portraits attempted to visualize evidence of racial types and hereditarian laws by embedding "the archive in the photograph."[283]

Although Darwin denounced physiognomy as a legitimate science and stressed the similarities amongst people from various ethnic and cultural backgrounds, his project still required that the features of individual specimens be synthesized to reveal shared characteristics. Unlike Galton, who superimposed several photographs to create composite images of general "types," Darwin outsourced the process of generalization to his readers, who were encouraged to make such connections cognitively as they interpreted the relationships amongst photographs. The text printed alongside *Expression*'s Plate III*,* which described the three photographs of young girls as showing "different degrees of moderate laughter and smiling," invited Darwin's readers to make generalizations.[284] The photographs are not presented as showing different expressions, but are examples of the same expression performed with various degrees of intensity. Readers, faced with this group of photographs, could extract the general characteristics of the expressions in each individual example. In this way, the objective of Plate III is much like that of Galton's composite photographs. However, in *Expression*, the synthesized image appears to readers in their minds rather than on the page.

[281] Ellenbogen, *Reasoned and Unreasoned Images*, 1–24
[282] Sekula, "The Body and the Archive," 47.
[283] Sekula, "The Body and the Archive," 55.
[284] Darwin, *Expression*, 202.

SYNTHESIZING VISUAL OBJECTS:
THE STEREOGRAPH IN VICTORIAN CULTURE AND EXPRESSION "IN THE GRID"

Photographs worked together in various ways throughout the Victorian era, and imagination or mental visualization were part of viewing practices associated with a variety of visual formats. While some of Darwin's readers may have been acquainted with Galton's work, there were comparable display modes known by his lay audience. For example, the stereoscope, which was immensely popular in the second half of the nineteenth century, similarly combined multiple photographs to produce a single, unified image. Developed to mimic binocular human vision, stereographs combined a pair of two nearly identical photographs of the same subject matter from slightly different vantage points. When these two photographs were placed side-by-side and viewed through a stereoscope, an optical device designed specifically for viewing stereographs, a single three-dimensional image emerged.[285] First displayed to the public in 1851 at the Crystal Palace Exhibition in Hyde Park, London, stereographs earned the praise of Queen Victoria, who voiced her approval of the new photographic format.[286] Stereographs quickly became a popular commodity amongst the middle class; their purchase and exchange produced an instant craze.[287]

Comparing Darwin's paired photographs with stereographic images is important because it demonstrates that his audiences' personal relationships to popular photographic formats were

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[285] As historian of photography Naomi Rosenblum has recounted, the widespread production and dissemination of stereographs in the later nineteenth century was made possible by the tremendous expansion of industry; stereographs were "produced in large editions by steam-driven machinery and mounted on cards using assembly-line methods … [and] reached a substantial clientele." Naomi Rosenblum, *A World History of Photography* (New York: Abbeville Press, 2019 [1981]), 34.

[286] Rosenblum, *World History of Photography*, 35.

[287] The stereograph "mania" of the later nineteenth century, notes Rosenblum, can be compared to the rise of home television sets a century later: "Like television, it was a spectator activity, nourishing passive familiarity rather than informed understanding." Rosenblum, *World History of Photography*, 35. In 1832 at King's College London, the English scientist Charles Wheatstone developed a technique that would ultimately lead to the invention of the photographic stereoscope. This rudimentary technology used a set of two images that were drawn as if viewed separately by each eye. When placed side by side and viewed through a stereoscope, the two pictures would appear as one three-dimensional image. As per Wheatstone's instructions, the photographer should allow for 1 foot of separation between lenses per every 25 feet of distance between the camera and the subject. In 1849, Wheatstone's technology was adapted for photography by the British scientist David Brewster. Three years later, the French optical firm Duboscq presented stereoscopic devices at the Crystal Palace Exhibition. See Rosenblum, *World History of Photography*, 199; Nathan G. Burgess, *The Photograph Manual: A Practical Treatise Containing the Cartes De Visite Process, and the Method of Taking Stereoscopic Pictures, Including the Albumen Process, the Dry Collodion Process, the Tannin Process, the Various Alkaline Toning Baths, Etc., Etc*. (New York: D. Appleton & Co, 1863), 178.

vital to the efficacy of *Expression*'s plates. Due to the stereograph's popularity, Darwin's audience was acclimatized to a process by which two photographs, when placed side-by-side, could create a third, "extra-visual" composite image in the mind.[288] That Darwin's readers were acquainted with the format is evidenced by primary source correspondence. For example, on 6 November 1877, A.D. Austin, a civil engineer and fellow of the Royal Astronomical Society, wrote Darwin about the prospect of using a stereoscope to study expressions in humans and animals:

> I have taken the liberty of writing to you on a small discovery I have made in binocular vision in the stereoscope. I find by taking two ordinary *carte-de-visite* photos of two different persons' faces, the portraits being about the same sizes and looking about the same direction, and placing them in a stereoscope, the faces blend into one in a most remarkable manner, producing in the case of some ladies' portraits in every instance a *decided improvement* in beauty … Perhaps something might be made of this in regard to the expression of emotions in man and the lower animals, &c. I have not time or opportunities to make experiments, but it seems to me something might be made of this by photographing the faces of different animals, different races of mankind, &c. I think a stereoscopic view of one of the ape tribe and some low caste human face would make a very curious mixture.[289]

Although stereographic images were not traditionally used to combine two photographs that depicted different subject matter, the possibility of using them to visualize the amalgamation of two distinct, separate images had piqued the interest of some of Darwin's following.

By the time *Expression* was published, stereographs were popular amongst lay audiences and within scientific circles. Many scientists applauded the various instructive functions of stereographs.[290] By 1870, physicians had deemed them important to the visualization of the varying stages of disease.[291] For example, in his 1856 treatise *The Steoreoscope: Its History,*

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[288] With stereographs, the synthesis of images occurred mechanically. As for their technology, the binocular cameras employed by most operators were multi-use. For instance, it was common practice for photographers to use binocular cameras when producing *cartes-de-visite*. The stereoscopic lens permitted the operator to manufacture four negatives on a single glass plate, facilitating the speedy production of *cartes*. See Burgess, *The Photograph Manual*, 207.

[289] Darwin Correspondence Project, "Letter no. 11226A," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-11226A.xml

[290] Stereographic photographs were initially created by capturing two pictures with a single camera; a photographer would move his camera laterally and take two images a few inches apart. In the 1850s, the French photographer Achille Quinet patented his technology for a binocular camera. By 1856, a twin-lens stereoscopic camera developed by the British scientist and photographer John Benjamin Dancer was available for purchase. This emerging technology received much attention from men of science. See Rosenblum, *World History of Photography*, 199.

[291] Rosenblum, *World History of Photography*, 178; Alex J. Macfarlan, "On the Application of Photography to the Delineation of Disease with Remarks on Stereo-Micro Photography," *The Photographic Journal* 116 (December 16, 1861), 326–29.

Theory and Construction, British scientist and inventor David Brewster claimed stereographs served important educational and research functions. Brewster applauded the visual detail and plastic sense of three-dimensional volumes made possible by the stereoscope for the field of natural history: "When we reflect upon the vast number of species which have been described by zoologists … we can hardly attach too much importance to the advantage of having them accurately delineated and raised into stereoscopic relief."[292] Like the photograph, the stereograph could arrest the scientist's object of study in time, capturing its visual details with fidelity. By employing a binocular lens that mimics human vision, the stereograph brought the captured moment or object into three-dimensional relief. This novel technology provided scientists with reliable images that, when combined and viewed through a stereoscope, communicated a greater sense of volume and depth than a photograph alone.

Outsourcing the work of depth perception to technology, stereographs made two-dimensional images appear three-dimensional in the viewer's mind. American scientist Oliver Wendell Holmes, in his 1861 treatise *The Stereoscope and Stereoscopic Photographs*, explained that the viewing device simulated the act of squinting one's eyes that would otherwise be necessary to apprehend the third, three-dimensional image that emerged through the visual union of two stereoscopic photographs. The stereoscope, he wrote, squints "for you" to "produce an appearance of reality which cheats the senses with its seeming truth."[293] The illusion is so successful, he argued, because it replicates the manner in which our eyes and mind work together to obtain a plastic sense of what we see:

> We see something with the second eye which we did not see with the first; in other words, the two eyes see different pictures of the same thing … By means of these two different views of an object, the mind, as it were, *feels round it* and gets an idea of its solidity.[294]

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[292] David Brewster, *The Stereoscope: Its History, Theory, and Construction with its Application to the Fine and Useful Arts and to Education*. (London: John Murray, 1856), 189.
[293] Oliver Wendell Holmes, *The Stereoscope and Stereoscopic Photographs* (11th ed. New York: Underwood & Underwood, 1906 [1861]), 16.
[294] Holmes, *The Stereoscope*, 17. The Scottish mathematician William O. Lonie presented a similar explanation in his 1856 *Prize Essay on the Stereoscope*. He described the stereoscope as "an instrument for the creation of solid images, arising, by its power, from the plane pictures of any object or landscape, previously taken from two points of sight, and corresponding with the retinal pictures taken from nature by our two eyes." See William O. Lonie, *Prize Essay on the Stereoscope* (Nineteenth Century Collections Online: Photography: The World Through the Lens. London: London Stereoscopic Co, 1856), 10.

By the early 1860s, the stereograph was a staple in most photography studios. Later nineteenth-century London boasted over 130 commercial studios where photographic images were offered in stereographic formats.[295] In his 1863 photography manual, New York photographer Nathan G. Burgess proclaimed that they would be a long-lasting component of photography: "The stereoscopic pictures have become a permanent feature in photography. They are now considered as one of the most beautiful, and perhaps wonderful, productions of this fascinating art."[296] Further, he contended that each family should own a device to view such wonders, writing that "no drawing-room or parlour will be considered complete without a stereoscope."[297] At the time *Expression* was published, stereographs were valuable, instructive scientific tools. They were also used for entertainment in domestic middle-class settings.

I argue that much like the stereograph, which required the active participation of its viewer, Plate III combined separate images that, when viewed together, generated a third, "extra-visual" composite photograph within the mind. On Plate III, Darwin used the grid format to present a set of photographs that demonstrated a degree of variation while also encouraging his readers' recognition of resemblance and generality. Though historian Phillip Thurtle has deemed the grid a twentieth-century phenomenon, objects of scientific inquiry had long been arranged in a similar modular format. Duchenne's *Mécanisme*, for example, featured composite plates that organized photographs in a grid-like layout. Comparable arrangements had also been used to organize illustrations that populated eighteenth- and nineteenth-century texts on physiognomy. Though both Darwin and Duchenne opposed physiognomy and, instead, studied emotional expression, the grid framework still proved useful for the display and analysis of variations in the face's appearance. For them, the grid was a visual tool that facilitated comparison and the identification of similarity and difference amongst a group of discrete specimens.

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[295] Following its debut in 1851, the new technology was quickly made available at a variety of different price points. While simple, inexpensive instruments were manufactured by the French photographer Antoine Claudet and Wendell Holmes, more elaborate devices were also on offer for those who could afford them. Rosenblum, *World History of Photography*, 211.

[296] Burgess, *The Photograph Manual*, 4.

[297] Like Wendell Holmes and Lonie, Burgess also compared the stereoscopic format to human vision: "The philosophy of the stereoscope has been explained as the true philosophy of vision; that as we view objects through the medium of two eyes, the two impressions are made upon the retinae of the two eyes, precisely in the same manner as the stereoscopic impression is made by the camera-obscura. Each eye has a distinct reflection of all objects brought within its view, and there is no doubt of the fact, that there are represented the two pictures, as accurately as seen in the stereoscopic production; and the reason we do not see the two distinct, is only because *the mind has become accustomed to resolving the two into one*. This is called binocular vision, or seeing two objects at once with the two eyes." Burgess, *The Photograph Manual*, 18; 177.

Display practices are integral to the visualization and communication of scientific ideas. As physicist Francis David Peat has explicated, diagrams and visual schemas are what make scientific data legible and comprehensible: "for scientific thinking to take its next step, some mode of expression external to itself is needed which can then be internalized and manipulated by thought."[298] In *Expression*, Darwin explicitly relied on popular applications and understanding of photography "external to" science to articulate and visualize his arguments.

Darwin's use of grid-like layouts for *Expression*'s composite plates also allowed him to define the relationships between the individual photographs and what they represented. The organizational formats used to arrange visual data in the sciences, such as diagrams and grids, describe phenomena along with the connections that bring them about.[299] In the early twentieth century, the grid became the primary configuration by which scientific, commercial, and social information was organized.[300] The pervasiveness of this visual schema brought to light novel methods for understanding relationships between parts of a given whole and proposed new ways that discrete specimens could be related to one another.[301] In particular, the grid enabled scientists to think more explicitly about how individual parts of an organism or group are both autonomous and deeply enmeshed in a larger structure of being. As Thurtle explains, each unit of a grid is part of a larger collection of multiple units, but also retains a level of independence in delineating its "self-organization" within the visual schema.[302] Thurtle grounds his argument in the work of Brazilian media theorist and philosopher Vilém Flusser, who contended that visual formats such as diagrams and grids facilitate the apprehension and synthesis of information in a unique and specific way. Notably, they permit the viewer to grasp the entirety of the image "at a glance," and then to examine its constituent parts.[303] The grid, for example, allows for the quick apprehension of similarity and difference. Though the individual elements included in this arrangement may carry their own specific meanings, a pattern of similarity and difference emerges when the elements are viewed within the larger context of the group.

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[298] Francis David Peat, "Photography and Science: Conspirators," in *Photography's Multiple Roles: Art, Document, Market, Science,* eds. Denise Miller (Chicago: Museum of Contemporary Photography, Columbia College, 1998), 144.
[299] Phillip Thurtle, *Biology in the Grid: Graphic Design and the Envisioning of Life* (Posthumanities, 46. Minneapolis: University of Minnesota Press, 2018), 3.
[300] Thurtle, *Biology in the Grid*, 5.
[301] Thurtle, *Biology in the Grid*, 5.
[302] Thurtle, *Biology in the Grid*, 5.
[303] Vilém Flusser, *Writings*, ed. Andreas Strohl, trans. Erik Eisel (Minneapolis: University of Minnesota Press, 2002), 22–23.

Looking to more recent theories about knowledge acquisition from the history of science to understand Victorian readers illuminates how Darwin's audience likely interpreted *Expression*'s composite plates. On Plate III, Darwin's chief goal was to make the human smile's general characteristics legible to his readers. By providing a number of visual examples that could be apprehended together in a single glance, the grid format encouraged Darwin's readers to recognize patterns of similarity and difference amongst the presented photographs. Analyzing the set of images as a whole, the reader could determine that the general features of the smile – the outward manifestation of joy and high spirits – are expressed with uniformity by all four individuals represented on the plate.

PLATE III IN THE CONTEXT OF VICTORIAN PHOTOGRAPHIC ALBUMS

By the 1860s, there were a number of formats in which photographs were placed side-by-side. Stereographs, *carte-de-visite* albums, advertisements, and the display of photographs on the walls of Victorian homes all positioned photographs next to one another. The images in *Expression* are products and producers of this age. Notably, on Plate III, the six photographs are organized in a format suggestive of photo albums containing *cartes-de-visite* in which portraits of family members, friends, and well-known cultural figures were displayed. The *carte-de-visite*, a three-and-a-half by two-and-a-half-inch photograph mounted on card, was patented by the French photographer André Adolphe-Eugène Disdéri in 1854.

Comparing the arrangement of photographs in *Expression* to popular nineteenth-century uses of photography is significant because it shows us how Darwin relied upon visual conventions external to science to make his work accessible to the public. It also reveals that a mixture of personal and scientific looking was crucial to the efficacy of photographs within his scientifically-oriented study on expression. The pages of *Expression* and *carte-de-visite* albums are similar. They both present an assemblage of individuals who, when viewed together in a single instant, formed a unified, visual whole. This synthesis of visual information was crucial to Darwin's theory, which drew direct relationships between individuals and their expressions based on resemblance.

Why were the viewing conventions of *carte-de-visite* photo albums, as well as their internal arrangements, deemed appropriate for a scientific study? I argue that by replicating the

display formats and visual tropes associated with such albums, Darwin's photographs encouraged ways of looking that were already practiced by his audience. The personal helped confirm the genuine emotion represented in the photographs. Although personal albums and *carte-de-visite* were associated with subjective connections and memories, and thus seemed separate from the detached aims of science, they were nonetheless believed to contain truthful representations of genuine emotion and character. That these album photographs were thought to represent real emotion made them perfect for Darwin's scientific argument. His discussions with friends, colleagues, and acquaintances about the old man's expression in figure 6 on Plate III, which they collectively decided was provoked rather than genuine, demonstrates that Darwin placed great emphasis on capturing the real. Under a scientific gaze, reproducing "real" emotion could have proved problematic in ways that posing for photographs made for personal mementos and sharing did not.

By drawing upon the presentational form of the *carte-de-visite* album and its associated use patterns, Plate III's arrangement encouraged Darwin's audience to distill the similarities between the depicted subjects and synthesize the disparate photographs into a cohesive visual object. Like Duchenne, Darwin required that his reader participate in the construction and validation of his scientific claims through the interactive interpretation of photographs. Plate III's arrangement, in facilitating the cognitive synthesis of carefully selected visual evidence, is best understood as a rhetorical strategy by which Darwin implored his readers to confirm for themselves that the human smile is both biologically governed and universally recognizable.

Primary source correspondence between Darwin and his peers demonstrates that they collected photographs and organized them in albums. On 3 May 1873, for instance, the Estonian biologist Karl Earnst von Baer wrote Darwin asking for a *carte-de-visite* to add to his album containing portraits of naturalists: "I possess your portrait in Octavo from the German translation of your work on variation. But I have a collection of little photographical portraits of naturalists in a so called *album* and there your photograph is wanting."[304] In a letter to the Dutch naturalist Pieter Harting from the mid 1870s, Darwin mentioned sending him two photographs for

[304] Darwin Correspondence Project, "Letter no. 8900," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-8900.xml

consideration in his album: "It gives me much pleasure to send you two photographs, & you can select which you like for your Album & throw away the other."[305]

Darwin likewise sought portraits of his peers to add to his own albums. For instance, on 13 March 1879, he wrote the Belgian botanist Léo Errera requesting a copy of his portrait: "If you have a photograph of yourself & can spare a copy, I sh[d]. like to add it to my album."[306] In a letter from 17 March 1881, Darwin likewise sought a portrait of the Swiss minerologist Henri de Saussure: "If you would honour me by sending your photograph I should much like to add it to my collection."[307]

Darwin and his peers also presented albums to each other as gifts. For example, Darwin was gifted an album containing 165 portraits of his German and Austrian admirers for his 68th birthday. On 16 February 1877, he wrote the German zoologist Ernst Haeckel to express his utmost gratitude for the album: "The album has just arrived quite safe. It is most superb. It is *by far the greatest honour which I have ever received* … The album contains some of the most highly honoured names in Germany, & your own photograph is wonderfully good. I thank you all from my heart."[308] That same spring, Darwin received an album from Harting of his Dutch admirers, containing 217 portraits of professors and scientists. On 17 March, Darwin expressed his thanks in a letter: "An account of your countrymen's generous sympathy in having sent me on my birthday the magnificent Album has been published in almost every newspaper throughout England; & you may well believe that the present has given me & my family lasting pleasure."[309] Indeed, news of the album was printed in *Nature, The Times*, the *York Herald*, and *Bristol Mercury*. For Darwin and his peers, photographic portrait albums played an instrumental role in constructing social identity and status by connecting individual personalities to their larger professional groups. As a result, these albums straddled the personal and professional.

The organization of photographs within the two albums Darwin received as birthday gifts, now held at the Cambridge University Library, share much in common with *Expression*'s

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[305] Darwin Correspondence Project, "Letter no. 11062," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-11062.xml

[306] Darwin Correspondence Project, "Letter no. 11928," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-11928.xml

[307] Darwin Correspondence Project, "Letter no. 13088F," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-13088F.xml

[308] My italics. Darwin Correspondence Project, "Letter no. 10847," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-10847.xml

[309] Darwin Correspondence Project, "Letter no. 10899," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-10899.xml

Plate III. For example, the album of Darwin's Dutch admirers, bound in red velvet and adorned with silver embossing, features four equally sized *cartes-de-visite* on each page (Figs. 31, 32). The *cartes*, bust portraits of Darwin's followers framed by oval cut-outs and vignettes, are placed behind ornamental mats arranged in a two-by-two table (Fig. 33). The German and Austrian album, to compare, includes a variety of arrangements. While some pages of the album contain nine equally sized *cartes* organized in a three-by-three table (Fig. 34), others feature *cartes* of various sizes. For instance, the page entitled "Wien III" (Fig. 35) is comprised of ten *cartes* made in three different sizes. As with the Dutch album, the *cartes* are framed by ornamental mats. Here, the mats contain text that identified each sitter's name and occupation.

These albums were produced by innovations in photographic and printing technologies. In his 1862 treatise on albumen photography, American inventor and chemist Silas R. Divine outlined the conventions of and processes for producing *cartes-de-visite*. Frequently produced in sets of eight, *cartes-de-visite* were made using a four-lens camera that featured both a vertical and horizontal septum. The operator captured eight exposures in a single sitting by sliding the plate holder within the camera.[310] Once the photographs were developed, a low-wage worker separated the pictures with a sharp knife and pasted each image onto card.[311] Reassuring his reader that four-lens cameras were available at "a very moderate price," Divine argued that the devices would prove "much more convenient" by permitting the operator to "save time in printing."[312] As he explained, *cartes-de-visite* were commonly either full-length portraits or made "in the vignette style, representing only the head and bust."[313] The inventor also described how to manufacture oval vignettes. First, the plate was printed with a raised piece of cardboard "in which a hole is cut nearly the shape of an egg" placed about an inch above the glass.[314] Then,

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[310] Rosenblum, *World History of Photography*, 62.
[311] The American inventor and chemist Silas R. Divine provided instructions for the mounting and pressing of *cartes* in 1862: "[the] print [is] set between two sheets of glass, then trimmed with a knife. Then placed into a damp cloth until pliant. Adhesive material applied to back with small brush, then print placed upon card and 'pressed down by laying a clean piece of paper over it and rubbing with the hand.'" Silas R. Divine, *A Practical Treatise on Albumen Photography: Containing the Collodion Negative Process, and the Methods of Preparing, Printing, and Toning Albumenized Paper: Also, the Most Approved Modes of Making Cartes De Visite* (Nineteenth Century Collections Online (Ncco): Photography: The World through the Lens. New York: J.H. Ladd, 1862), 68–69.
[312] Divine, *Practical Treatise on Albumen Photography*, 66. As Burgess remarked a year later, these cameras functioned in practically the same way as those used in the creation of stereographs: *cartes-de-visite* "are in reality stereoscopes, only not viewed in pairs – for every card picture can be so arranged as to produce the stereoscopic effect, as most of them are taken with … sets of lenses." Burgess, *The Photography Manual*, 19.
[313] Divine, *Practical Treatise on Albumen Photography*, 66.
[314] Burgess, *The Photography Manual*, 223.

a piece of white tissue paper was pasted over the hole, allowing light to "pass through, and converge around the head, and produce the cloudy appearance so much desired."[315] On *Expression*'s Plate III, the photographs are composed, cropped, and framed in a manner that replicate many of these conventions. Apart from figure 1, which is cropped to show only the young girl's face, the photographs show their sitters from the shoulders up. All six images are framed by equally sized oval *passepartouts*, which was a common practice when it came to the storage of *cartes-de-visite* in albums.

By 1860, the *carte-de-visite* format was extremely popular. Portrait studios across Europe and America produced hundreds of millions of photographs showing people from a range of socio-economic backgrounds. The *carte-de-visite* traversed class boundaries and, as such, made portrait photography accessible to wide audiences; the aristocracy, bourgeois, tradesmen, and working class could all afford to have their likenesses made.[316] While the *carte-de-visite* provided the public greater access to studio portraiture, it also served an important function in commerce and advertising. For example, *cartes* quickly replaced the engravings and lithographs once responsible for marketing fashion and beauty products.[317] Further, *carte-de-visite* portraits promoted the royal family, celebrities, and politicians. Queen Victoria, for instance, commissioned countless *cartes* depicting herself and close family members. Although many of these photographs were viewed by the royal family in private, Queen Victoria and Prince Albert permitted the English photographer John Jabez Edwin Mayall to release portraits of the couple to the public in 1860.[318] One such photograph (Fig. 36), a full-length portrait of the royal couple, shows Prince Albert reclining on a carved armchair, his legs crossed as he holds open the pages of a book. With his body turned toward the centre of the image, he faces Queen Victoria, raising his head slightly as he looks up at her. To his left stands the Queen, who rests her right hand upon Prince Albert's arm and looks toward the ground. These images of the royal family served as a prototype for a healthy marriage and family, as photographic portraiture more generally provided models of ostensibly healthy, moral people. With the mass publication of this and

[315] Burgess, *The Photography Manual*, 223.
[316] As new technologies emerged offering reduced exposure times and multi-lens exposures, portrait photography became more lucrative for operators and accessible to the public. The use of multi-lens cameras peaked during the *carte-de-visite* craze, and many photographers took sixteen photographs in a single exposure to increase profits. Further, due to decreased exposure times, a greater variety of poses could be captured. See Henisch and Henisch, *The Photographic Experience*, 23; Rosenblum, *World History of Photography*, 62.
[317] Rosenblum, *World History of Photography*, 63–4.
[318] Langford, *Suspended Conversations*, 41.

similar *cartes-de-visite*, photo-realistic representations of the royal family were now available for the public. Tens of thousands of copies of such images were bought, sold, and exchanged throughout the second half of the nineteenth century. In the 1860s, millions of *cartes-de-visite* depicting well-known individuals were in circulation. These photographs, which sometimes included the signature of the pictured subject on the back, inspired a "collecting fever" – they were purchased and traded in large quantities, much like baseball cards.[319]

Cartes-de-visite were displayed in a number of ways, but personal collections were typically arranged in photo albums like the ones compiled by Darwin and his peers. Albums comprised of *cartes* first emerged in Paris in 1858.[320] In England, the sale of albums and framing mats for *cartes* was bolstered by the interests of Queen Victoria, who owned over one hundred albums containing portraits of European royalty.[321] The popular photograph size for such albums increased to a four-by-six-inch "cabinet" card after the mid 1860s.[322] Further, more extravagant album and framing options became available. For example, studios sold ornamental mats with cut-outs into which *cartes* could easily be inserted, like the those featured in the albums gifted to Darwin.[323]

On *Expression*'s Plate III, the photographs are arranged and framed in a simpler fashion. The cropped photographs are not bordered by filigree like those included in Darwin's albums but, instead, are enclosed within clear-cut, unadorned ovals. While Darwin evoked the general organization of album pages with *Expression*'s composite plates, he did not embrace the more lavish conventions of album framing and binding. To do so would have been impractical for a few reasons. Ornamental mats would need to be fixed into each copy individually and, more importantly, may have distracted the reader from the content of the photographs. The cost would have been prohibitive as well.

In England, albums of *cartes-de-visite* communicated the tastes of their owners.[324] While the initial pages of a family's photo album were typically devoted to *cartes* featuring Queen Victoria, Prince Albert, and the royal family, much of the book was dedicated to portraits of immediate family and their highly regarded relatives. Photographic albums, like stereographs,

[319] Henisch and Henisch, *The Photographic Experience*, 151.
[320] Henisch and Henisch, *The Photographic Experience*, 151.
[321] Rosenblum, *World History of Photography*, 64.
[322] Henisch and Henisch, *The Photographic Experience*, 151.
[323] Henisch and Henisch, *The Photographic Experience*, 151.
[324] Henisch and Henisch, *The Photographic Experience*, 156.

were generally stored in a family's front parlour or drawing room, where visitors were often encouraged to peruse collections.[325] *Cartes-de-visite* albums offered Victorian families a way to craft their visual and collective identities. These albums connected their owners to family members, their immediate social circle, as well as the larger socio-political context of their time. In this way, the album format functioned much in the same way as Plate III: it brought likenesses of disparate individuals together to form a cohesive whole.

ADDING ONE'S OWN LIKENESS TO THE ALBUM: "COGNITIVE SUPERIMPOSITION" AND THE GENUINE SMILE ON PLATE III

Victorian readers' personal relationships to photography mirrored Darwin's. Much like the renowned natural scientist, they amassed, stored, and organized a sizeable collection of photographs accumulated from variety of different sources. Their reading of *Expression*'s Plate III, then, was not only informed by Plate I, but also by the use patterns of the personal albums in which they arranged their own photograph collections. *Cartes-de-visite* albums were a site for the cohesion of disparate identities and appearances. Drawing on this popular presentational format, Darwin prepared a collection of photographs for *Expression* that, by evoking the use pattern of the album, similarly encouraged the conceptual coherence of disparate visual elements.

Darwin's readers were also accustomed to adding their own portraits to a group of images. As Siegel has explained, the conventions of album-viewing required that visitors made their own contributions to albums: "every new viewer will have to relinquish his or her *carte* to add to the pile."[326] Albums that were once focused on immediate family expanded to contain a broader social circle of friends and extended family. Siegel describes this ritual as one of "community and inclusion" that transformed the observer of the album into the observed.

That Darwin and his circle participated in this ritual is evidenced by primary source correspondence. For example, in January 1878, the Bohemian engineer Carl Kraus sent Darwin his portrait (Fig. 37) and a letter requesting it be added to the album of his German and Austrian followers: "Allow me … to ask whether my photograph would be granted a place among your

[325] As Henisch and Henisch relate, "it became a social ritual, almost a social obligation, to examine with deliberate care the contents of a friend's collection." Henisch and Henisch, *The Photographic Experience*, 157; 440.
[326] Siegel, *Galleries of Friendship and Fame*, 113.

followers and admirers?"[327] Kraus's *carte*, a bust portrait framed by an oval *passepartout*, would have fit seamlessly amongst the photographs of Darwin's followers included in the album. Kraus conceptualized himself as part of the circle of men represented by Darwin's album, and the inclusion of his *carte* in the collection was a visual indicator of his inclusion in the pictured group. The act of submitting one's photographic portrait to a larger collection of organized images was typical of the times. This facet of the etiquette of album-viewing, relates Siegel, was expressed in a poem that could be found at the beginning of many collections: "Yes this is my album,/But learn ere you look:/That all are expected/To add to my book./You are welcome to quiz it/The penalty is,/That you add your own portrait/For others to quiz."[328] Just as Darwin's scientific book invited a form of personal looking, the *carte-de-visite* album encouraged a type of scientific analysis of the individuals whose photographs it contained.

Expression's Plate III, organized in a manner suggestive of these albums, evokes the practice of adding one's own portrait to a collection of photographs. Projecting their own likeness onto the set of images presented on the plate, Darwin's readers conceptualized themselves as members of the pictured group. Through this act of cognitive superimposition, the reader's own self-image became further evidence for human expression's universal recognizability. More specifically, the visual characteristics shared between one's own smile and those of the young girls and old man pictured on Plate III were additional confirmation of Darwin's argument that joy is expressed with uniformity. This act of cognitive superimposition, with its capacity to transform Darwin's reader into an observable specimen, was made possible by the visual and material connections between Plate III and the *cartes-de-visite* album.

Moreover, *Expression* would have been read in various places, including the same domestic setting that housed such albums – the parlour.[329] In her study of Victorian parlours, historian Katherine C. Grier describes this room as a site for the complex synthesis of domesticity and cultural convention.[330] A semi-public space within the private realm of the home, the parlour was a place for entertaining guests. The room's central table typically held

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[327] Darwin Correspondence Project, "Letter no. 11342," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-11342.xml

[328] Siegel, *Galleries of Friendship and Fame*, 113.

[329] Nineteenth-century natural history books directed at a lay audience were typically read by families in domestic settings, such as the parlour. See Gauld, "'What is Meant by this System?'," 119.

[330] Katherine C. Grier, "The Decline of the 'Memory Palace': The Parlor after 1890," in *American Home Life, 1880-1930: A Social History of Spaces and Services*, eds. Jessica H Foy and Thomas J Schlereth (Knoxville: University of Tennessee Press, 1992), 53–58.

objects that represented the core family, such as family Bibles with ornate coverings and photo albums. The connection between the parlour and portrait photography was further strengthened by the reception rooms of photography studios, which were often designed and decorated to replicate the domestic Victorian parlour. Bridging the gap between the public space of the studio and the private space of the domestic sphere, reception rooms and parlours were cultural sites wherein the production, purchase, display, and exchange of likenesses could unfold. While the studio and its operators made possible the transformation of one's image into *cartes-de-visite*, the parlour was home to the album that would house such photographs.[331] Not only would Darwin's reader flip through *Expression* much like they would a photo album, but they would also likely be reading his book in the very same spaces they spent time viewing personal albums.

The photographs contained in Victorian albums, like those included in *Expression*, required an active viewer to realize their meaning-making potential. As Edwards and Hart have convincingly argued, photo albums have "performative qualities."[332] By arranging photographs in a particular manner, they claim, the album's creator "narrativizes" images and, in so doing, guides the viewer's interpretation of the collection. Further, they assert that the material form of an album informs how the viewer interacts with and reads its images. In other words, the album's materiality directs the "embodied conditions" of its viewing.[333] Victorian *cartes-de-visite* albums, for instance, often featured embossed covers, gold-edged pages, metal clasps, and gold tooling – all details which evoked the conventions of medieval devotional texts.[334] Art historian Elizabeth Anne McCauley has contended that such references led to the *cartes-de-visite* album "becoming a form of secular Bible."[335] Darwin's albums, bound in luxurious velvet and embossed with silverwork, are emblematic of these conventions. The scientific and lay audiences that read *Expression* possessed similar albums at home. Like the collectors who narrativized their photographs by organizing them within the pages of albums, Darwin arranged

[331] Burgess noted the popularity of compiling albums of *cartes-de-visite* in his treatise: "Arranged in Photographic Albums, they grace the parlours of all who profess to keep pace with the fashions of the hour, and they have almost become the text-book of our personal friends, as indeed they are when well filled with beautiful specimens of the art." Burgess, *The Photography Manual*, 4.
[332] Edwards and Hart, "Introduction," 11.
[333] Edwards and Hart, "Introduction," 11.
[334] Edwards and Hart, "Introduction," 11.
[335] Elizabeth Anne McCauley, *A.A.E. Disdéri and the Carte De Visite Portrait Photograph* (Yale Publications in the History of Art, 31. New Haven: Yale University Press, 1985), 48.

his collection of photographs of expression on composite heliotype plates that brought distinct images together to form a single, coherent narrative that supported his claims.

The album's storage format also followed management systems that were already employed in the realms of science and art. As Langford has noted, in the Victorian era "a hobbyist's way of collecting and organizing pictures may mimic scientific or curatorial practice."[336] Photo albums both protected *cartes* from becoming damaged and offered collectors a way to contain and organize their images.[337] Unlike the daguerreotype, which was usually protected by a hard case lined with fabric, *cartes-de-visite* were simply pasted on a piece of cardboard.[338] This made them more susceptible to damage. While albums allowed individuals and families to articulate their own conceptualizations of selfhood, group identity, and modes of storytelling, they also served a practical purpose – to help preserve photographs.[339]

Darwin amassed and arranged photographic images of his inner circle in his photographic albums in the same way he did for his study of human expression. For him, collecting and organizing photographs in the manner exemplified by Plate III extended to both the personal and the professional, the idiosyncratic and the scientific. In this way, Darwin's arrangement of photographs in *Expression* bridged the gap between popular and scientific applications of photography, a strategic move that made his work not only legible to the masses but also appealing to a broad audience who were immersed in a world flooded with photographs.

CONCLUSION

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[336] Langford, *Suspended Conversations*, 41.

[337] "The *carte-de-visite* album was an early attempt to furnish the photographic consumer with a tool for collection management: convenient, safe, and flexible storage for the stacks of *cartes-de-visite* left by relatives, friends, and acquaintances, and recklessly augmented by purchase." See Langford, *Suspended Conversations,* 23. As Langford recounts, the photo album grew out of the autograph album, which was an established format by the seventeenth century.

[338] Henisch and Henisch, *The Photographic Experience*, 434.

[339] Photographic albums provided families with an opportunity to express their own visual histories. See Anne-Marie Galat, *Photos de famille* (Éditions du Seuil, 1994); Henry M. Sayre, *The Object of Performance: The American Avant-Garde since 1970* (Chicago and London: University of Chicago Press, 1989), 2. For Langford, family albums are "vehicles of storytelling," crafted by their compilers to be "performed" in certain ways. On the subject of later nineteenth-century *cartes-de-visite*, she notes that implied in having one's portrait taken in this format was its inclusion in an album. By inserting one's *carte-de-visite* into a family album, one secured their place in the family's history and, as a result, in the memories of generations yet to come: in an effort to "install themselves in the memories of their descendants … the act of sitting for a *carte-de-visite* was an expression of modernity and confidence in the future." See Langford, *Suspended Conversations*, xii; 149.

As this chapter has argued, the organization of the six photographs on Plate III of *Expression* embraced broader trends in Victorian visual culture to activate the communicative potential of Darwin's images toward specific ends. Placed side-by-side in a two-by-three table, Plate III's arrangement encouraged Darwin's readers to synthesize the similarities and differences amongst the photographs. The material recontextualization of Duchenne's photographs in this way allowed Darwin to mobilize them in support of his own argument: that expressions of joy are universally performed and recognizable. For Darwin, as for Duchenne, photographs were not sufficient epistemological tools when viewed in isolation. A single photograph of a smiling person, for example, cannot communicate that joy is expressed with uniformity across age, gender, and geographic location. Darwin needed multiple photographs to provide evidence for this point. Like Duchenne, Darwin brought his reader along for the process of scientific discovery and verification. By referencing photographic arrangements in Victorian albums, the photographs on Plate III were read in a manner that was familiar Darwin's audiences. This practice of looking complicated, and often merged, the relationship between subjectivity and objectivity. By projecting their own likeness onto the group of photographs on Plate III, readers became further evidence for expression's universal recognizability.

CHAPTER 3

THE PRIMORDIAL ORIGINS OF TERROR, HORROR, AND AGONY: WOODCUTS AFTER DUCHENNE'S PHOTOGRAPHS IN DARWIN'S *EXPRESSION*

On 25 March 1871, Dr. Guillaume Duchenne de Boulogne wrote Charles Darwin describing the behaviour of a monkey with whom he lived:

> Allow me, Sir, … a few remarks I have made on the expression on the face of the monkey with which I have lived for almost a year; who was attached to me; he dined at my table and was very fond of sweets. When I gave him one he knew; I noticed an expression of satisfaction in his physiognomy, by a slight elevation of his labial commissures …[340]

In his letter, the French neurologist recounted in great detail how the monkey responded to external stimuli. He noted, for example, the particular expressive movements which he believed indicated that the monkey was engaged in reflective thought when presented with a foreign object: "[if] I presented something unknown to him, his eyebrows rose, showing great attention, then taking this object between his fingers and thumb, he looked at it, lowering his eyebrows which became straight, which gave his physiognomy an expression of reflection."[341] While the identity of Duchenne's monkey and the precise reasons for their relationship are unknown, it is clear that the doctor took an interest in documenting the monkey's expressive behaviour and thought he should share his reflections with Darwin.

Given Duchenne's dedication to the study of expression, it is reasonable that the rise and popularity of Darwin's theory of natural selection piqued his curiosity about the relationships between expressive behaviours in humans and animals. The monkey, famously proposed by Darwin to be man's closest living relative, seemed a sensible subject to investigate such relationships.[342] However, Duchenne, unlike Darwin, believed that an intelligent creator endowed humans – not animals – with physiological and cognitive traits designed specifically for the purposes of emotional expression and recognition. In 1862, he asserted this belief with

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[340] Dr. Guillaume Duchenne de Boulogne, letter to Charles Darwin, 25 March 1871. University of Cambridge: Darwin Correspondence Project.
[341] Duchenne, letter to Darwin, 25 March 1871.
[342] Charles Darwin, *The Descent of Man, and Selection in Relation to Sex*, ed. Paul H Barrett and R. B Freeman (London: Routledge, 2017 [1871]), 12–13.

conviction throughout *Mécanisme*.[343] Yet the final lines of his letter to Darwin nearly a decade later suggest that he may have begun to entertain the possibility of a biological basis for the similarities that his pet monkey's expressions bore to those of humans: "I am convinced that the expressive movements of the eyebrow (of attention and reflection) that I have just described are natural in the monkey, and that they are not the result of imitation."[344]

Significantly, Darwin publicized Duchenne's change of opinion by including it in *Expression*. Duchenne's playful anecdote about his monkey was cited in chapter five, entitled "Special Expressions in Animals," where Darwin recounted Duchenne's story to illustrate observable similarities between the expressions of monkeys and humans:

> Dr. Duchenne – and I cannot quote a better authority – informs me that he kept a very tame monkey in his house for a year; and when he gave it during meal-times some choice delicacy, he observed that the corners of its mouth were slightly raised; thus an expression of satisfaction, partaking of the nature of an incipient smile, and resembling that often seen on the face of a man, could be plainly perceived in this animal.[345]

Duchenne's observations about his sweet-toothed pet, buried in a sea of other lighthearted anecdotes about chuckling orangutans and smiling chimpanzees, were useful for Darwin because they advanced one of *Expression*'s primary objectives: to draw connections between humans and animals in a sphere traditionally assumed to differentiate one group from the other – that of emotional expression.

Darwin was undoubtedly careful about how he presented his groundbreaking (and, to some, frightening) ideas. In the later nineteenth century, the line between what was considered "human" and what was believed to be "animal" was complicated, ever-evolving, and fraught with anxiety. *Expression* famously and controversially proposed a slippage between these two categories of beings. Rather than two discrete groups whose defining characteristics could be held in opposition, Darwin claimed that differences between humans and animals were not a

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[343] See, for example, Duchenne, *Mécanisme*, 19.

[344] Duchenne, letter to Darwin, 25 March 1871. Duchenne's consideration of a biological basis for expressive similarities across these two species is further evidenced by the fact that he used the criteria he had established for describing and evaluating human expressions to interpret the expressive movements of his monkey. See, for example, his descriptions of "attention" and "reflection" in humans in *Mécanisme*, 49–52.

[345] Darwin, *Expression,* 140. Darwin also related Duchenne's observations regarding the monkey's reaction to encountering unfamiliar objects: "Dr. Duchenne informs me that when he gave to the monkey formerly mentioned some quite new article of food, it elevated its eyebrows a little, thus assuming an appearance of close attention. It then took the food in its fingers, and, with lowered or rectilinear eye-brows, scratched, smelt, and examined it, - an expression of reflection being thus exhibited. Sometimes it would throw back its head a little, and again with suddenly raised eyebrows re-examine and finally taste the food." See *Expression*, 151–52.

matter of *type*, but of *degree*.[346] More specifically, he argued that expressions linked to the most acute human emotions, such as *terror*, *horror*, and *agony*, evince our shared ancient lineage with other primates. In this way, *Expression* profoundly complicated ideas about what was human and what was animal in the modern era.

Victorians interacted with animals in several ways: animals were curious spectacles, labourers, food, clothing, and scientific specimens. However, at the time, the most common human-animal relationships were with domestic pets. Although Darwin discussed the emotions of dogs and cats at length in *Expression*, he argued that the ape – a wild animal that largely symbolized degeneration – is our closest evolutionary relative and the animal with whom we share the greatest number of expressive similarities. For Darwin, Duchenne's monkey was the perfect example to settle his readers' anxieties about their biological connection to apes. This monkey was an animal who had been transformed into a tame pet. Domesticated to the extent that he lived in the neurologist's home and dined alongside him at his table, Duchenne's monkey was more like a polite houseguest than an untamed beast.

While Darwin cited his correspondence with Duchenne about this monkey to reinforce his theories, the choice of media he used to visualize his ideas about humans and animals shaped how scientific knowledge was presented to *Expression*'s readers. In the book, animals are depicted exclusively in woodcuts while humans are predominantly shown in photographs reproduced by the heliotype process. This important distinction tells us that Darwin was thinking about the roles that different media – and their accompanying characteristics, conventions, and cultural associations – play in the construction of ideas and identities. In nineteenth-century Europe, for example, woodcuts were an "earlier" art form associated with natural history books and illustrated stories, while photography was a newer technology that was enmeshed in the social and cultural lives of humans through its connections to portraiture, commerce, science, art, and entertainment. Darwin's use of these two forms of media speaks to the mutually-informing relationships between art and science that were critical to how scientific ideas were produced and disseminated.

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[346] Lori Gruen, "Introduction," in *Critical Terms for Animal Studies* (Chicago: University of Chicago Press, 2018), 3; Matthew Calarco, *Animal Studies: The Key Concepts*. of *Routledge Key Guides* (London: Routledge/Taylor & Francis Group, 2021), 23.

This chapter argues that Darwin's choice of media was directly tied to his claims about evolutionary links between humans and animals. Unlike previous histories that have predominantly examined *Expression*'s images based on what they depict,[347] I explore how Darwin utilized particular media and their associated conventions to promote his cutting-edge and provocative scientific theories. Specifically, I argue that *Expression*'s scientifically-oriented images made meaning through the cultural conventions from which they drew. They embraced visual tropes and strategies familiar to Darwin's readership as a result of their own interactions with popular media's various forms, such as woodcut prints in fictional texts and theatrical *cartes-de-visite*. Woodcuts, an art form that dates back to fifth-century China and flourished in fifteenth-century England, were used to represent beings that Darwin proposed were less "evolved" than humans. To compare, photographs, a novel European technology born of chemical and scientific processes, were predominantly used to show people that Darwin argued were most "evolved": Europeans of the middle and upper classes.

As previously discussed in other chapters of this dissertation, Darwin accumulated images for *Expression* from a wide variety of sources. The woodcuts, transcribed from illustrations by the well-known British artist Briton Rivière, the zoological illustrator Thomas Wood, the German draughtsman Joseph Wolf, and the up-and-coming teenage artist Arthur Dampier May, were prepared by the master engraver James Davis Cooper. The photographs were a mixture of donated and commissioned works.[348] To supplement the photographs given to him by colleagues and friends, Darwin commissioned several pictures from the acclaimed London studio photographer Oscar Gustave Rejlander. Soon after the two men met in 1871, Darwin directed the photographer to produce over 70 images of various human expressions, nineteen of which were published in the book.[349]

Darwin's authority over the choice of media used to illustrate his ideas is best exemplified when comparing the two woodcuts after Duchenne's photographs of the old man in distress (Figs. 1, 2), located in *Expression*'s twelfth chapter, with the photographs of the old man smiling and in a "passive condition" on Plate III (Fig. 21). Why did Darwin use photographs to

[347] Voss, *Darwin's Pictures,* 181–248; Prodger, *Darwin's Camera,* 3–20; Ridley, *Darwin Becomes Art,* 163–214.
[348] Prodger, *An Annotated Catalogue*, 7.
[349] Prodger, "Appendix III," 399.

show the man in a state of joy and woodcuts to depict him in states of *terror*, *horror*, and *agony*? How did the choice of media reinforce Darwin's views on human and animal expression?

Scholars such as Prodger, Voss, and psychologist Paul Ekman have noted the peculiarity of Darwin's decision to transform these photographs into woodcuts. As they rightly observe, this choice is inconsistent with the way images are used throughout the rest of the book. For these scholars, Darwin's decision is either explained away as purely financial (woodcuts cost less money to make) or remains unexamined.[350] The possibility that Darwin made this decision to bolster his argument has yet to be considered.

In *Expression,* Darwin claimed that that the origins of human expression are located in the expressive behaviours of animals. In this chapter, I argue that Darwin transformed Duchenne's photographs into woodcuts to support this theory. Without such visual "evidence," his argument would not have been as quickly accepted by the public, nor would it have been as easily legible. These woodcuts were unusual in the context of *Expression*, as Darwin chiefly used photographs to represent humans. Only three woodcuts depict humans: two show Duchenne's old man in highly emotional states and the other pictures an agitated female patient at the West Riding Lunatic Asylum. In the woodcut entitled *Terror* (Fig. 1), the old man is depicted with raised eyebrows and bulging eyes, staring beyond the image with his mouth agape, the force of his jaw creating a series of deep folds beneath his chin. In the other, intended to portray *Horror and Agony* (Fig. 2), he is shown in a similarly distressed condition, this time gazing out at the viewer with a look of desperation in his round, deep-set eyes.

Although the original photographs in *Mécanisme* (Figs. 38, 39) show Duchenne and his assistant galvanically stimulating the *platysma myoides, frontalis,* and *corrugator supercili* muscles on the old man's face, Darwin's woodcuts in *Expression* leave out the apparatus and its operators entirely. That this blatant omission was a deliberate choice made by Darwin is verified by his note to Cooper, in which he instructed the engraver to "omit galvanic instruments and hands of operator."[351] Darwin's manipulation of Duchenne's photographs altered their visual content and meaning. In the two woodcuts of the old man, the subject's frightening expressions appear spontaneous rather than purposefully provoked.

[350] See, for example, Prodger, "Appendix III," 400.
[351] Quoted in Prodger, *An Annotated Catalogue*, 405.

While Duchenne conducted his photographic experiments to demarcate the boundaries between human facial muscles, Darwin transformed some of Duchenne's photographs into woodcuts to stress the ties between human and animal expression and thus strengthen his argument. For Darwin, Duchenne's monkey and the old man had something important in common: both were believed to be intermediary figures who bridged the gap between human and animal. While the monkey bore an expression of joy that appeared almost human, the old man's face – galvanically contorted to exhibit acute *terror* – displayed an emotion that Darwin argued evinces human expression's roots in our primordial past. How did Darwin's choice of media aid in the elucidation of this idea?

Victorian audiences were accustomed to confronting a range of visual materials, sometimes within the same book, and to assigning particular characteristics to images based on the medium. Since Darwin's *Expression* was one of the first photographically illustrated natural history books to reach a mass audience, it required new ways of looking. Previous natural history books, which educated readers about animal and plant life from around the world, were mostly illustrated by woodcuts and copper engravings.[352] In the months following *Expression*'s publication, Darwin's readership praised his use of both woodcuts and photographs. A review published in the *Daily News* on 5 November 1872 stated that "nothing can be more complete and well arranged within the limits to which he has confined himself than the order and method of his illustrations."[353]

This chapter examines Darwin's strategic use of media in *Expression* by beginning with a discussion of the book's guiding principles, which chronicle the evolution of expression as the progressive attenuation of expressive signs. The first half of the chapter focuses on Darwin's images of animals, particularly dogs and monkeys. The second examines humans, concentrating on Rejlander's self-directed photographs and the woodcuts based on Duchenne's photographs of the old man. By conducting a comparative analysis of the woodcuts and photographs, I unearth the visual strategies Darwin used to draw connections and distinctions between humans and animals to support his argument that they share a common primordial ancestor. Ultimately, I argue that Darwin's manipulation of Duchenne's photographs and his purposeful choice of

[352] Gauld, "'What is Meant by this System?'," 120–137.
[353] "Mr. Darwin's New Book," *Daily News*, 5 November 1872, 1205-07. Cambridge University Library: DAR 226.2 122.

media were critical to the visualization of this theory. For him, the visible signs of man's most intense emotions reveal that humans and animals exist along the same spectrum of evolutionary advancement.

THE "VESTIGIAL REMNANTS" OF OUR ANCIENT PAST: EVOLUTION AND THE GRADUAL ATTENUATION OF EXPRESSION

In *Expression*, Darwin identified and reinforced evolutionary connections between humans and animals to prove that all human expression evolved from a common primordial ancestor. To do so, he first had to establish the universality of emotional expression in humans. As explained in chapter two of this dissertation, Darwin offered a range of anecdotal evidence obtained from his global network of informants to justify expression's universality across age, gender, culture, and race. Maintaining that human expression is both universal and biologically-governed, Darwin argued that any discrepancies in expressions related to the same emotional state were merely differences in severity. For him, expressions themselves are biologically determined whereas the severity with which they can be appropriately exhibited are socially and culturally established.

In the book, Darwin argued that animals, as well as women, children, the criminally insane, and so-called "savages," tend to display more acute, and so less inhibited, expressions. In accordance with this rationale, *Expression* argues that the evolutionary advancement of expression is evidenced by the increasing ability to wilfully restrain expressive behaviour. As historian Stéphanie Dupuoy has convincingly demonstrated, Darwin's analysis of anecdotal evidence established a hierarchy whereby expressive intensity was inversely correlated with what he believed was evolutionary advancement.[354] In *Expression*, he ordered examples of expression by degrees of perceived similarity along a spectrum of intensity. Perhaps it is unsurprising, then, that Darwin's carefully selected "evidence" all pointed toward the conclusion that "civilized" Englishmen were most capable of controlling their emotions. In a self-congratulatory gesture, he reasoned that it was men like him who stood at the top of the

[354] Stéphanie Dupuoy, "The Naturalist and the Nuances: Sentimentalism, Moral Values, and Emotional Expression in Darwin and the Anatomists." *Journal of the History of the Behavioral Sciences* 47, no. 4 (2011): 352.

evolutionary hierarchy, their "scientifically justified" privileged position granting them a superior vantage point from which to observe and evaluate all those beneath them.

For Darwin, the Englishman was the quintessential example of expression's highest evolutionary form not because he was believed to feel a greater variety or depth of emotional states, but because he had learned to hide the visual signs that let others know he felt anything at all. In fact, Darwin argued that restraining a given expression would actively reduce the severity of its associated emotional state: "The free expression by outwards signs of an emotion intensifies it. On the other hand, the repression, as far as this is possible, of all outward signs softens our emotions. He who gives way to violent gestures will increase his rage; he who does not control the signs of fear will experience fear in a greater degree."[355] As historian of science Angelique Richardson has noted, Darwin's *Expression* was one of the first widely circulated scientific books to propose that the phenomena we experience as "mental" are actually "functions of the body."[356] Indeed, the idea that physical states constitute mental ones, exemplified by Darwin's claim that an expression's intensity has a direct and proportional effect on the intensity of the emotion as it is felt, underscores *Expression* as a whole.

In chapter one, entitled "General Principles of Expression," Darwin outlines three fundamental concepts that form the basis of his theory: (1) *the principle of serviceable associated habits*, (2) *the principle of antithesis*, and (3) *the principle of actions due to the constitution of the nervous system, independently from the first of the will, and independently to a certain extent of habit*. The first principle is grounded in the premise that many of the complex actions we acknowledge as "expressive" were first consciously performed under specific states of mind with the intention of gratifying or relieving certain needs, desires, and sensations. Darwin claimed that through habit and association, such actions are involuntarily performed when similar states of mind are stimulated.[357] In such instances, the action may no longer be useful. For example, Darwin noted that "few can resist" the impulse to extend their arms in front of their bodies when "falling on a soft bed."[358] He argued that this unconscious habit is the consequence of a once willed, serviceable action: "everyone protects himself when falling to the

[355] Darwin, *Expression*, 365.
[356] Angelique Richardson, "Introduction," in *After Darwin: Animals, Emotions, and the Mind,* ed. Angelique Richardson (Amsterdam: Rodopi, 2013), 6.
[357] In such instances, the action may no longer be useful.
[358] Darwin, *Expression*, 37.

ground by extending his arms."[359] While the threat of physical harm – and so the need to protect one's body – is hardly present in the event of "falling on a soft bed," the action of extending the arms is still performed due to the event's association with "falling to the ground."

However, Darwin asserted that once serviceable actions are not always performed to their fullest extent when motivated by association and habit. To this end, he contended that a number of once serviceable actions could be wilfully attenuated:

> Some actions ordinarily associated through habit with certain states of the mind may be partially repressed through the will, and in such cases the muscles which are least under the separate control of the will are the most liable still to act, causing movements which we recognize as expressive.[360]

Darwin supported this claim by comparing infant screaming fits to ordinary expressions of sadness in adults. As he explained, the *depressor* muscles of the mouth that contract in screaming young children are "less under the separate control of the will" than the other adjoining muscles engaged in this expression.[361] With the continued inhibition of the expression over time, Darwin argued, the depressor muscles are "not brought into such strong action" in older children and adults. Nevertheless, given that these muscles are particularly difficult to control, they may still act, however subtly, from feelings of sadness.[362] On this subject Darwin related a personal anecdote, noting that his *depressor* muscles tend to quiver when he is moved by a touching story:

> I have myself felt … that when tears are restrained with difficulty, as in reading a pathetic story, it is almost impossible to prevent the various muscles, which with young children are brought into strong action during their screaming-fits, from slightly twitching or trembling.[363]

The gradual attenuation of certain expressions, Darwin maintained, results in more understated expressive signs caused by muscle movements that cannot be wilfully restrained.

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[359] Darwin, *Expression*, 37.
[360] Darwin, *Expression*, 34.
[361] Darwin, *Expression*, 151.
[362] As William Charlesworth and Mary Anne Kreutzer have explicated, Darwin here suggested that many of the expressions commonly exhibited by adults are "already present" in young children, who have simply not yet learned how to repress the expressive signs that overpower more subtle expressions. William R. Charlesworth and Mary Anne Kreutzer, "Facial Expressions in Infants and Children," in *Darwin and Facial Expression: A Century of Research in Review,* ed. Paul Ekman (New York: Academic Press, 1973), 102.
[363] Darwin, *Expression*, 152.

What is more, Darwin argued that the wilful restraint of an expression may also necessitate muscle movements which were not involved in performing the action it evolved from: "In certain other cases the checking of one habitual movement requires other slight movements; and these are likewise expressive."[364] This proposition is best illustrated in his discussion of expressions of grief in adults. As Darwin explicated, the *pyramidals* are – like the *depressors* of the mouth – less under the separate control of the will than their adjoining muscles. By consequence, their action can only be "checked" by the antagonistic contraction of the frontal muscle's central fasciae.[365] The result of this antagonistic contraction is what Darwin refers to as the "grief expression," characterized by the elevation of the inner corners of the brows and deep, horizontal furrows confined to the central portion of the forehead. As Dupuoy has observed, Darwin proposed that many of the expressions that appear to be distinctly "human," such as the "grief expression," are ones that result from attempts to "hide expression (or at least its more primitive forms)."[366] These ancillary expressions, born out of efforts to restrain expressive behaviour, complicate the communicative functions of expression altogether. The "grief expression," for example, signifies not just the miserable emotional state of the person who bears it but also their efforts to hide its identifiable signs.

Darwin's *principle of antithesis* similarly presents certain expressions as responses to once serviceable actions. He contended that when a "directly opposite state of mind" to one expressed through a *serviceable associated habit* is induced, there is a "strong and involuntary tendency" to act out movements of a "directly opposite nature" to those that characterize the serviceable action. Such antithetical movements, he noted, are purely expressive and of no practical use.[367] While Darwin's notion of dichotomous "opposites" is certainly dubious (are joy and dejection "opposite" emotional states, or are they simply two different types of experiences?), he confidently embraced the *principle of antithesis* to explain expressive behaviours that do not seem to have any serviceable origins.[368] As with the expressions attributable to the *principle of serviceable associated habits*, Darwin believed those derived from

[364] Darwin, *Expression*, 34.
[365] Darwin, *Expression*, 190.
[366] Dupuoy, "The Naturalist and The Nuances," 354.
[367] Darwin, *Expression*, 34.
[368] For example, Darwin noted that a dog in the presence of his master will typically crouch and arch his back in demonstration of affection. He argued that this posture is an antithetical response to the dog's serviceable expression of hostility when in perceived danger, as a dog approached by a stranger will often take on a rigid stance to defend himself. See Darwin, *Expression*, 55–56.

the *principle of antithesis* were once voluntarily performed and have since "become habitual in us and in the lower animals."[369] Darwin's third principle, *of actions due to the constitution of the nervous system*, describes the physiological processes involved in involuntarily reflex actions, such as the trembling of the muscles under certain states of mind.

By deeming expressions the remnants of once serviceable noncommunicative functions, Darwin's philosophy of expression noticeably departed from those of his forerunners. Most notably, Darwin challenged the widely accepted idea that specific muscles were deliberately designed for the purpose of expression. Before the circulation of Darwin's text, expression was generally considered to be a universal, absolute system of signs granted to humankind to facilitate the communication of emotions. In this regard, Duchenne's views on the subject were typical of his time. But for Darwin, and for those who accepted his theories, expression was instead believed to be an evolutionary phenomenon and by-product of non-expressive biological functions. As anthropologist Suzanne Chevalier-Skolnikoff has claimed, the central thesis of Darwin's theory is that "noncommunicative behaviour has been modified to serve communicative functions."[370] Historian Richard Burkhardt has similarly upheld that Darwin's book suggests expressions "had been neither specially created nor naturally selected for a communicative function."[371] According to Darwin's *principle of serviceable associated habits*, human expressions are "tag-alongs" – the consequences of physical processes that were initially carried out toward noncommunicative ends.

Many studies on *Expression*, such as those by psychologist Alan Fridlund and historian of science Robert Richards, centre on the dichotomy between creationism and evolution ostensibly delineated by the text.[372] As a result, Darwin's work on expression is chiefly believed to be distinguished from its predecessors by its renunciation of an intelligent creator and advancement of evolutionary theory. For Charles Bell, Jacques-Louis Moreau de la Sarthe, and Louis Pierre Gratiolet, pioneers in the study of expression who carried out their work during the first half of the nineteenth century, it is the complexity, variety, and subtlety of expressive

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[369] Darwin, *Expression*, 67.
[370] Suzanne Chevalier-Skolnikoff, "Facial Expression of Emotion in Nonhuman Primates," in *Darwin and Facial Expression: A Century of Research in Review*, ed. Paul Ekman (New York: Academic Press, 1973), 30.
[371] Richard W. Burkhardt, "Darwin on Animal Behaviour and Evolution," in *The Darwinian Heritage*, ed. David Kohn (Princeton, NJ: Princeton University Press in association with Nova Pacifica, 1988), 360.
[372] See Alan J. Fridlund, *Human Facial Expression: An Evolutionary View* (San Diego: Academic Press, 1994), 13–27; Robert J. Richards, *Darwin and the Emergence of Evolutionary Theories of Mind and Behavior* (Chicago: University of Chicago Press, 1987).

movements in humans that separate our expressions from those of animals. In Moreau's translated edition of Lavater's *Physiognomy* (1806), for example, he contended that the large number of muscles present in the human facial structure grants us the greatest and most nuanced expressive range of all animals.[373] For Darwin's predecessors, this heightened expressive potential signified humanity's moral and intellectual superiority.[374] For Darwin, it was the control rather than breadth of expression that indicates such superiority.[375] This viewpoint is exemplified by his racist and discriminatory assertion that "the children of savages should exhibit a stronger tendency to protrude their lips, when sulky, than the children of civilized Europeans; for the essence of savagery seems to consist in the retention of a primordial condition."[376]

One of Darwin's central objectives was to uncover the origins of human expression in the expressive behaviours of animals.[377] Exploring the continuities and variances in expressions across a range of species, Darwin determined human ones to be both derivative of animal experience and shaped by the particularly human tendency to attenuate expressive signs. It is in this way, according to Darwin, that expression both establishes our connection to a common primordial ancestor and illuminates the distinctly human traits that enable its inhibition. For him, the habitual and willful repression of expressions effectively transformed them into what Dupuoy has fittingly described as the "vestigial remnants of our animal past" that function like the "behavioural equivalent of atrophied organs."[378] Janet Browne, a well-known Darwin biographer, has similarly contended that he sought to demonstrate that "our faces [are] not, so to speak, our own, but [are] instead the complex product of 'descent with modification'."[379]

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[373] Jacques-Louis Moreau de la Sarthe, *L'art de Connaître les Hommes par la Physionomie, par Johann Caspar Lavater* (Paris: Depelafol, 1820 [1806]), 108. As Dupuoy has noted, this is the edition Darwin consulted for his own work on emotional expression. Charles Bell similarly highlighted the complexity of human facial structure compared to other animals in *The Anatomy and Philosophy of Expression as Connected with the Fine Arts, Fourth Edition* (London: Murray, 1847).

[374] According to Dupuoy, it was largely accepted that humanization and civilization "went hand-in-hand with an increase in expressive power and a growing individuation of the countenance." She notes the contrast to Darwin who proposed that humanization and civilization "manifest themselves not by the enlargement and refinement of the expressive range, but by the restraint and discipline of expression." See Dupuoy, "The Naturalist and the Nuances," 337.

[375] Dupuoy, "The Naturalist and the Nuances," 335.

[376] Darwin, *Expression*, 232–33. Darwin does not provide any images to substantiate this claim.

[377] Ridley, *Darwin Becomes Art*, 163.

[378] Dupuoy, "The Naturalist and the Nuances," 335; 346.

[379] Janet Browne, "Darwin and the Face of Madness," in *The Anatomy of Madness: Essays in the History of Psychiatry. Volume 1: People and Ideas*, eds. W.F. Bynum, Roy Porter, and Michael Shepherd (London: Tavistock Publishers, 1985), 153.

Darwin provided groundbreaking evidence that supported the view that there is continuity of emotional, behavioural, mental, and physiological features in human and animal life.[380] According to his theory, the closer an animal was to humans evolutionarily speaking, the more reasonable it was to apply an anthropomorphic explanation to that animal's behaviour.[381] Prior to the publication of *Expression*, the principal framework used to conceptualize ontological relationships between humans and animals was the *great chain of being* – a hierarchical model dating back to Renaissance Christian traditions wherein human and animal were conceived as two distinct categories.[382] Darwin's work famously problematized this fundamental distinction, suggesting a slippage between the two groups by revealing that their perceived differences were less concrete than had previously been imagined. Given this, it is unsurprising that Darwin's work on *Expression* has formed the basis for discussions about anthropomorphism in the field of animal studies. As scholars such as Matthew Calarco, Frans de Waal, Lori Gruen, Fiona Probyn-Rapsey, Alexandra Horowitz, and Barbara King have noted, *Expression* instigated debates about whether or not descriptions of emotions in animals were simply projections of our own human experiences.[383]

By proposing an evolutionary relationship between humans and animals on the basis of expression, Darwin argued that any expressive differences between the two groups were a matter of *degree* rather than *type*. However, the connection between humans and animals implied by evolutionary theory as a whole was controversial. As with *Descent*, *Expression* linked humans and animals in a realm previously believed to differentiate the two groups. Many believed that animals were incapable of feeling and expressing genuine, complex emotions – this sphere of experience was largely thought to be exclusive to humankind. In this way, *Expression* proposed a slippage between human and animal that challenged the prevailing dichotomies and hierarchies used to relegate beings into one of two distinct categories.

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[380] Frans B. M. de Waal, "Anthropomorphism and Anthropodenial: Consistency in Our Thinking about Humans and Other Animals," *Philosophical Topics* 27, no. 1 (1999): 258.
[381] Calarco, *Animal Studies*, 23.
[382] Calarco, *Animal Studies*, 69.
[383] Calarco, *Animal Studies*, 23–26; de Waal, "Anthropomorphism and Anthropodenial": 255–80; Lori Gruen, "Introduction," 3; Fiona Probyn-Rapsey, "Anthropocentrism," in *Critical Terms for Animal Studies*, ed. Lori Gruen (Chicago: University of Chicago Press, 2018), 49; Alexandra Horowitz, "Behaviour," in *Critical Terms for Animal Studies*, ed. Lori Gruen (Chicago: University of Chicago Press, 2018), 65; Barbara King, "Emotion," in *Critical Terms for Animal Studies*, ed. Lori Gruen (Chicago: University of Chicago Press, 2018), 125.

As a result, Darwin's delineation of what he believed were the fundamental distinctions between humans and animals likely made his argument more acceptable to a wide readership. Throughout the volume, Darwin stressed what he saw as the distinctly human capacity to wilfully repress the expressions rooted in our primordial past. It is the "wondrous power of the will," he reasoned, that keeps us from acting out the impulse to throw an infantile tantrum: "In all cases of distress, whether great or small, our brains tend, through long habit, to send an order to certain muscles to contract, as if we were still infants on the point of screaming out; but this order we, by the *wondrous power of the will*, are able partially to counteract."[384] As per the *principle of serviceable associated habits*, Darwin believed that even the subtlest of triggers arouses such an impulse. Yet he insisted that through discipline and control, impulses could be regulated – were it not for the "wondrous power of the will," our emotional lives would be nothing but a series of childish meltdowns.

Darwin did not perceive the will to be an exclusively human faculty. Rather, he believed that the distinctly human state of self-awareness allows for expressive restraint. Through practice and repetition, Darwin argued, the habit of wilfully inhibiting expressions may be inherited and become an inborn human tendency. Here, the process of natural selection that Darwin proposed drives evolutionary change is united with human reason, discipline, and use-inheritance.[385] His argument implied that the evolution of expression is not simply a unidirectional process whereby subjects are shaped according to the features of their environments. Instead, he presented expression's evolution as a development course that his audience could actively shape.

Embedding heuristics within the presentation of his theory, Darwin invited his reader to prove man's capacity to control the movements of his facial muscles for himself. Throughout *Expression,* he provided instructions detailing how to isolate and move specific muscles to generate or control certain expressions. For example, he included a step-by-step guide on how to imitate the expressive movements of a temper tantrum: "Anyone who will gradually contract the muscles round his eyes, will feel, as he increases the force, that his upper lip and the wings of his nose … are almost always a little drawn up."[386] In another set of instructions that describe how to

[384] Darwin*, Expression*, 191. My italics.
[385] Lewens, *Darwin*, 243.
[386] Darwin, *Expression*, 149.

produce the appearance of a genuine smile, Darwin suggested that his readers practice before a mirror:

> As a gentle smile increases into a strong one, or into a laugh, every one may feel and see, if he will attend to his own sensations and look at himself in a mirror, that as the upper lip is drawn up and the lower orbiculars contract, the wrinkles in the lower eyelids and those beneath the eyes are much strengthened or increased.[387]

Conscious of how they appear while gazing at their own reflections, readers could validate Darwin's anatomical and physiological descriptions of emotionally expressive movements by making faces at will. As discussed in chapter two of this dissertation, the readers' bodily involvement in Darwin's text was instrumental to their understanding and verification of the naturalist's ideas.

For Darwin, the state of self-awareness which motivates man to control how he appears to others has its very own expressive sign: the blush. "Of all expressions," Darwin declares, "blushing seems to be the most strictly human."[388] According to him, blushing results from man's sensitivity to his own appearance, is involuntary, and cannot be instigated physically. Instead, "it is the mind which must be affected" to stimulate a blush.[389] While Darwin confidently asserted that women have a stronger tendency to blush than men, he failed to consider the possibility that women were more frequently put in uncomfortable and embarrassing situations involving their appearances. This is all the more mystifying given the fact that most of his anecdotes on the subject describe women who blush when made to undress in front of men.[390]

Darwin did not attempt to illustrate the blush in *Expression*. Instead, he relied on textual descriptions of the phenomenon relayed to him by trusted colleagues and friends. He recounted, for example, a disturbing account of a 27-year-old patient with epilepsy told to him by Dr. James Crichton-Browne:

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[387] Darwin, *Expression*, 202.
[388] Darwin, *Expression*, 363.
[389] Darwin, *Expression*, 310. In his discussion on blushing, Darwin looked to an 1839 treatise on the blush by Dr. Thomas Henry Burgess, who wrote that "the entire phenomenon is certainly intimately connected … with the Soul." Thomas Henry Burgess, *The Physiology or Mechanism of Blushing: Illustrative of the Influence of Mental Emotion on the Capillary Circulation; with a General View of the Sympathies, and the Organic Relations of Those Structures with Which They Seem to Be Connected* (London: John Churchill, 1839), 4. Darwin also contended that blushing is different from most other expressive signs in that any effort to restrain the expression will typically prolong it.
[390] Darwin, *Expression*, 313–14

> Dr Browne … visited her whilst she was in bed. The moment that he approached, she blushed deeply over her cheeks and temples; and the blush spread quickly to her ears. She was much agitated and tumultuous. He unfastened the collar of her chemise in order to examine the state of her lungs; and then a brilliant blush rushed over her chest, in an arched line over the upper third of each breast, and extended downwards between the breasts nearly to the ensiform cartilage of the sternum.[391]

Darwin's vivid description of the event provides a detailed picture of the young woman's reddening skin and deep discomfort as she underwent medical observation. He cited a similarly chilling account from Moreau, who "relates, on the authority of a celebrated painter, that the chest, shoulders, arms, and whole body of a girl, who unwillingly consented to serve as a model, reddened when she was first divested of her clothes."[392]

Due to the technological limitations of photography at the time, the blush's hue could not be captured photographically or in print but could be presented textually. As literary scholar Mary Ann O'Farrell has shown, detailed textual descriptions of blushing populated many widely-read Victorian novels as the blush served as "an implicit promise to render body and character legible."[393] In Victorian culture more generally, blushing signified one's sensitivity to others – it made thoughts and feelings about interpersonal events visible upon cheeks. This conceptualization of the blush as a signifier of inner experience, notes O'Farrell, established a link between the propensity to blush and truthfulness: "the blush – as an act of self-expression – performs a somatic act of confession."[394]

In *Expression*, the evolutionary hierarchy of expressive signs, from most to least expressive, is ordered chronologically. The uninhibited expressions of emotional states such as fear and rage are considered to be ancient whereas blushing in response to self-attention is described as a more recent development.[395] This historical chronology is made visually evident through choice of media. Woodcuts represent the most intense human expressions, whereas the more restrained ones are captured photographically. For Darwin, the woodcut, as an older medium, was more appropriate for "older" emotions, while the photograph, a modern medium, was linked to more contemporary expressions. Throughout the book, Darwin ordered humans

[391] Darwin, *Expression*, 313.
[392] Darwin, *Expression*, 314.
[393] Mary Ann O'Farrell, *Telling Complexions: The Nineteenth-Century English Novel and the Blush* (Durham, N.C.: Duke University Press, 1997), 4.
[394] O'Farrell, *Telling Complexions*, 5.
[395] Dupuoy, "The Naturalist and the Nuances," 351.

and animals along a spectrum of expressive intensity, emphasizing the similarities and differences between the two groups. Employing his chosen images as both illustrative tools and visual evidence, he located the source of ordinary human expressions in the once serviceable actions consciously performed by man's primordial ancestors.

PICTURING EXPRESSIVE ANIMALS: THE ACTIVE POSTURES OF DOGS

Many of *Expression*'s woodcuts show domestic animals that Darwin's audience were familiar with and draw upon the conventions of late eighteenth- and early nineteenth-century publications aimed at the general public, including illustrated stories, journals, and natural history books. Indeed, Darwin looked to woodcuts to illustrate *On the Origin of Species* (1859) and *The Descent of Man* (1871). Generally speaking, natural history books directed at lay audiences were heavily illustrated.[396] By the 1870s, London had over 100 wood-engraving studios, making them an affordable and accessible option for naturalists to visualize their research.[397] Woodcuts made the subjects of their texts, such as animals, plants, and habitats, visually comprehensible to nonspecialist audiences that included men, women, and children. Woodcuts also illustrated newspapers and popular journals, such as *Punch* and *The Illustrated London News*, as well as gift books and children's stories.[398] The English wood-engraver and natural history author Thomas Bewick's *Selected Fables of Aesop and Others* (1818), for example, contained 141 original woodcuts. These examples, and others like them, are significant because their pictorial conventions permeated Victorian visual culture and were known to

[396] Gauld, "'What is Meant by this System?'," 119.
[397] Throughout the eighteenth century, prints made from copper engravings were favoured for the illustration of natural history texts. By the end of the century, a new stage in the publication of natural history books was initiated by Bewick, whose illustrated guide *A General History of Quadrupeds* was published in 1790. Bewick devised a technique whereby text and engraving could be printed together on a single page. Illustrated by countless woodcuts depicting horses, bison, sheep, and goats, *A General History of Quadrupeds* was a cheap and accessible guide to the phenomena of the natural world. At the turn of the nineteenth century, woodcuts quickly began to replace copper engravings and became the principal medium used to illustrate books. This was because they were the most affordable and accessible option. See David E. Latané, "Graphic Arts," in *Victorian Britain: An Encyclopedia*, eds. Sally Mitchell (New York and London: Garland, 1988), 344. See also Gauld, "'What is Meant by this System?'," 119; Geoffrey Wakeman, *Victorian Book Illustration: The Technical Revolution* (Detroit. Michigan: Gale Research, 1973); Voss, *Darwin's Pictures*, 12.
[398] Latané, "Graphic Arts," 344; Lorraine Janzen Kooistra, *Poetry, Pictures, and Popular Publishing: The Illustrated Gift Book and Victorian Visual Culture, 1855-1875* (Athens, Ohio: Ohio University Press, 2011), 1–10.

Darwin's readership. For example, animals were often defined by clear, bold outlines, shown in frontal or profile views, and situated in domestic, pastoral, and nondescript settings described by unidirectional hatch marks.

Darwin was concerned with the scientific credibility of his images, particularly his woodcuts. In *Expression*'s introduction, he wrote that the woodcuts were all produced by Cooper's method of "photographic engraving" and that the details offered by this process evidenced their claims to scientific truth. The method was much less costly than the heliotypes that Darwin used to reproduce photographs, but he declared that it ensured the commissioned drawings were replicated with precision. To produce a "photographic engraving," first, a reproduction of the image was transferred onto the woodblock photographically. Then, Cooper engraved the picture into the block, tracing the photograph with his instrument. Darwin claimed that "by this means almost complete fidelity is ensured."[399] Darwin's efforts to reassure his reader about the visual accuracy of the woodcuts speaks to the relationship between truth and photography that underscored the photograph's status as a reliable research object in the later nineteenth-century sciences. It also reflects the pursuit of "mechanical objectivity" in the sciences more broadly.[400] Woodcuts required explicit human intervention in the image-making process, and therefore could not offer the same claims to objectivity that photographs did. However, this was not a problem for Darwin when it came to illustrating his scientific ideas. For him, differences between woodcuts and photographs, like those between humans and animals, were not a matter of *type*, but of *degree*. According to Darwin, engravings could be "photographic" as long as the means of their production involved photographic processes.

Letters between Darwin and the individuals who prepared his woodcuts for *Descent* and *Expression* demonstrate that the naturalist thought the medium could capture the details of animals' bodies with precision. On 23 March 1870, he wrote a letter praising the woodcuts of feathers prepared by George Henry Ford for *Descent:*

> I fairly gloat over them. The only evil is that they will make all the other woodcuts look very poor! They are all excellent, & for the feathers I declare I think it the most wonderful woodcut I ever saw: I cannot help touching it to make sure that it is smooth.[401]

[399] Darwin, *Expression*, 26.
[400] Daston and Galison, *Objectivity*, 115–190.
[401] Darwin Correspondence Project, "Letter no. 7146," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-7146.xml

As this flattering note to Ford demonstrates, an expertly prepared woodcut could look as if it was a three-dimensional object, giving the viewer a plastic sense of how the pictured specimen appeared "in real life."

Expression contains fifteen woodcuts dedicated to animals, many of which depict dogs, which were familiar and appealing subjects for Darwin's middle-class audience.[402] In the Victorian era, relationships with and understandings of dogs were complex. Dogs were treasured pets who often lived inside the home, where they formed emotional bonds with their human family members. At the same time, Victorians knew that dogs descended from wild animals, were capable of aggressive behaviour, and were vectors of disease. Despite these threats, Victorians identified similarities between their own emotions, mental states, and behaviours and those of their beloved pets.

The first original woodcut in *Expression*, *Small Dog Watching a Cat on a Table* (Fig. 40), shows a pointer gracefully balancing with a front leg raised in a nondescript setting. The pictured dog was named Polly and belonged to Darwin's daughter, Henrietta. In this print, the dog's head is cocked and she is at the ready. According to the print's explanatory notes, the figure illustrates the behaviour of a dog whose attention has been aroused: "dogs of all kinds when intently watching and slowly approaching their prey, frequently keep one of their fore-legs doubled up for a long time, ready for the next cautious step."[403] The dog's stance and focused gaze – both crucial to the image's stated purpose – are articulated by bold black outlines that construct the dog's solid form and repetitive thin lines that in unison form shadows and communicate a subtle sense of movement: the dog is still but ready to spring into action. The dog's subtly arched back and the tops of her legs are formed by short, straight marks that cast the left side of her head into deep shadow, concealing her facial expression from view. When examined alongside Darwin's textual description of the dog's stance, this woodcut demonstrates that the animal's temperament and state of mind can be read from her bodily gestures alone – the reader does not need to see the expression on her face to know that her attention has been aroused.

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[402] *Expression*'s introduction contains three woodcuts, made after diagrams first published in Dr. Charles Bell's *Essays on the Anatomy of Expression in Painting* (1806) and Dr. J. Henle's *Handbuch der Knochenlehre des Menschen* (1855), that are used to depict the anatomical structure of human facial muscles. Of the remaining eighteen woodcuts in Darwin's book, fifteen depict the expressions of animals. See also Voss, *Darwin's Pictures*, 214.

[403] Darwin, *Expression*, 49.

Below the image, Darwin noted that the woodcut was made after a photograph by Rejlander. The fact that Darwin chose to have Rejlander photograph his dog in order for the image to be later reproduced as a woodcut suggests that he did not believe that photography was necessary for the representation of animals. In contrast, Darwin deemed photographs necessary for the illustration of human expressions. In a letter to his publisher in August of 1872, Darwin noted that he "could not possibly have given many of the [human] expressions by wood-block."[404] Why, then, was a woodcut considered appropriate for the representation of Polly? It is possible that Rejlander's photograph of the dog was transformed for the purpose of visual continuity; by reproducing the photograph as a woodcut, the image fits seamlessly into the sequence of subsequent woodcuts devoted to animal expression. It could also be argued that Darwin switched to woodcuts for financial reasons. However, I would argue that Darwin's decision to convert the photograph into a woodcut was a conscious decision: by using different media, Darwin upheld a division between humans and animals by ensuring that the two groups were consistently represented through two distinct forms of visual illustration.

Darwin's curiosity about the behaviour of dogs began decades before the preparation of *Expression*. There are numerous letters between the naturalist and his colleagues and friends on the topic, which was of great interest at the time. Many of these letters include good-humoured anecdotes about canine behaviour. In November of 1872, for example, A.J. Cupples wrote to Darwin's wife Emma about "a wonderful dog in St Andrews who used to … not only howl to music but played the piano and howled to his own playing."[405] Dogs that accomplished tasks which appeared almost human excited Victorians, who welcomed these animals into their families and domestic spaces. A letter to Darwin from the botanist Maxwell Tylden Masters dated to May 1871, for instance, relates the story of a neighbour's bulldog with an impressive sense of time: "A dog … calls the servant every 'lawful' morning at seven a.m. by barking or scratching at her door but on Sunday mornings the dog does not rouse the servant till eight a.m. The dog has done this without fail for several years."[406]

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[404] Darwin Correspondence Project, "Letter no. 8474," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-8474.xml
[405] Darwin Correspondence Project, "Letter no. 8611," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-8611.xml
[406] Darwin Correspondence Project, "Letter no. 7740," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-7740.xml

Darwin also shared his own anecdotes about his family pets in letters, often noting the similarities between his animals' expressions and human ones. Writing to Frances Power Cobbe in November 1872, Darwin recounted an experience with the family dog that led him to "believe rather more than I did in dogs having what may be called a conscience":

> My dog, the beloved & beautiful Polly, is at such times extremely affectionate towards me; & this leads me to mention a little anecdote. When I was a very little boy, I had committed some offence, so that my conscience troubled me; & when I met my father, I lavished so much affection on him, that he at once asked me what I had done, & told me to confess. I was so utterly confounded at his suspecting any thing, that I remember the scene clearly to the present day; & it seems to me that Polly's frame of mind on such occasions is much the same as was mine, for I was not then at all afraid of my father.[407]

As evinced by this letter, Darwin perceived notable similarities between his own moral sense and the "conscience" he believed Polly experienced. Through his relationship with his beloved pet, Darwin identified a slippage between the categories of human and animal when it came to morality and its expression.

While most of the anecdotes about dogs shared between Darwin and his circle were playful, some described disturbing and violent behaviour. In the mid 1860s, for example, the English diplomat and naturalist Robert Swinhoe wrote Darwin regarding a gruesome account of what he deemed "dog morality" while abroad in China:

> The story that I am about to relate has been told to me by Mr. T. Watters … [who] was walking on the Wall of Peking when his attention was attracted to two Chinese Dogs below … The big one commenced to caress the smaller one, but the latter at first objected. At last after many affectionate appeals the smaller dog yielded. Whilst in the act of sodomy several other dogs came up and barked angrily and bit at them. They then retired for a time as if for consultation, and having evidently watched for the termination of the crime, returned just as the operation was finished. They then rushed upon the big dog. One seized him by the head, two others by the hind legs, and a fourth caught and entirely bit off his *penis*. The mutilated dog ran away howling … it appears not to be an unusual punishment for dogs to inflict on one another for this crime.[408]

This shocking story demonstrates that Victorians wanted to know if dogs possessed a sense of morality and, if so, how it was expressed within their social structures. Furthermore, the language that Swinhoe used to describe the incident intimates that the observed behaviour was

[407] Darwin Correspondence Project, "Letter no. 8652," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-8652.xml
[408] Darwin Correspondence Project, "Letter no. 4727," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-4727.xml

understood by dogs the same way it was understood by humans – as a *crime*. For him, the mutilation perpetrated by the group of four dogs demonstrated that they believed the "big one" had committed a crime for which he must be punished.

In the later nineteenth century, dogs were the focus of anthropological and scientific inquiry, cherished pets, and the subjects of art and poetry. However, they also posed significant threats to human health due to rabies exposure. When Darwin was preparing *Expression* in the late 1860s, this threat was at an all-time high. In England and Wales, hydrophobia (as rabies was often called because it caused throat spasms in response to water) deaths in humans peaked in 1866, then again in 1871 and 1877.[409] There was significant anxiety surrounding "mad" dogs who had been infected, as well as their capacity to bring disease into the home. Likewise, there were fears that humans regressed into animals when infected with the disease, which causes symptoms such as biting and foaming at the mouth.[410] While many Victorians felt a special kinship with dogs, they were also vectors of a horrific disease which was nearly always fatal.

In *Expression*, the woodcuts of dogs visualize their complicated status in Victorian culture. This is evident in a pair of images by Rivière (Fig. 41, Fig. 42) that illustrate Darwin's *principle of antithesis*: one is titled "dog approaching another dog with hostile intentions," and the other "the same in a humble and affectionate frame of mind."[411] Like the woodcut of the attentive pointer, these two prints demonstrate dogs' postures in certain mental states. Smooth lines form the dog's tail and legs with precision, encouraging a visual comparison between the two images. The woodcut of the dog in a "hostile" condition (Fig. 41) shows the animal with an upright tail, straight back, and stiff legs planted firmly on the ground. His eyes are open, his fur is raised, and his mouth is turned into a growl. As Darwin noted, this image illustrates the moment "when a dog approaches a strange dog or man in a savage or hostile frame of mind he walks upright and very stiffly … his tail is held erect and quite rigid."[412] In contrast, the woodcut of a dog in a "humble and affectionate" state (Fig. 42) shows the animal with a limp tail, arched back, upward gaze, and bent legs. This posture, Darwin claimed, demonstrates that if

[409] Neil Pemberton and Michael Worboys, *Mad Dogs and Englishmen: Rabies in Britain, 1830 – 2000* (Basingstoke: Palgrave Macmillan, 2007), 69.
[410] Mary Hunter, "Mouths that Bite: Rabies, Sexuality and Pasteur's Cure," in *Picturing Evolution and Extinction: Regeneration and Degeneration in Modern Visual Culture*. Eds. Fae Brauer and Serena Keshavejee (Cambridge Scholars Publishing, 2015), 41–60.
[411] Darwin, *Expression*, 57.
[412] Darwin, *Expression*, 55.

"the dog suddenly discovers that the man whom he is approaching is not a stranger, but his master … his whole bearing is reversed … the body sinks down or even crouches … his tail, instead of being held stiff and upright, is lowered."[413] Like with the woodcut of the attentive pointer, posture and bodily gesture are visually presented as key signifiers of a dog's temperament and mental state.

Correspondence between Darwin and Rivière about the woodcut portraying the hostile dog demonstrates that the naturalist meticulously supervised the preparation of commissioned images. In a letter to the artist from May 1872, Darwin requested a few minor changes to the density and direction of the dog's hair: "the hairs on the neck and shoulders (and not on loins) ought to stand closer (a serried mass) and to be more erect."[414] As the specificity of Darwin's notes to Rivière attest, his management of the image-making process extended to the smallest of details.

For Darwin, visual reproductions were the best way to teach his audience how to recognize expressions in real life. In the case of dogs, readers could learn how to recognize their emotional states from bodily poses and gestures. Unlike simply reading a text, which would require that readers imagine how expressions might appear, studying an illustrative example provided clear visual information about certain expressions' characteristics. In Darwin's book, these images presented readers with easily comprehensible visual evidence that they could corroborate for themselves. For example, they could compare the woodcut of a "humble and affectionate" dog with their own pets and find similarities between the image and real-life canines.

The instructive value of the woodcuts was acknowledged by Darwin's audience. In December 1872, a review in *The Examiner* noted that Darwin's *principle of antithesis* was "difficult to follow … without the aid of his woodcuts."[415] The same month, *The Lancet*'s review praised the prints for the fidelity they bore to the expressive postures they represented: "The *principle of antithesis* he illustrates by descriptions and very faithful drawings (made by Messrs. Rivière, May, and Wood) of dogs and cats in an angry and affectionate frame of mind, showing

[413] Darwin, *Expression*, 56.
[414] Darwin Correspondence Project, "Letter no. 8339," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-8339.xml
[415] "Mr. Darwin on the Expression of the Emotions," *The Examiner*, 7 December 1872, 1205-07. Cambridge University Library: DAR 226.2 127-8.

how the ordinary position and movements of the animals are reversed according to their mood."[416]

Expression's woodcuts of dogs evoked those in nineteenth-century illustrated books. Bewick's prints of dogs for children's fables, for instance, similarly suggest connections between animals' postures and their inner mental states. Primary source evidence shows that Darwin was familiar with Bewick and was particularly interested in his work on dogs. In a letter to his second cousin, clergyman William Darwin Fox, from 31 July 1855, Darwin wrote "I did not know Bewick had written on Dogs; I will see to it."[417] In a woodcut accompanying Bewick's story, *The Dog and The Shadow* (Fig. 43), a dog is pictured lowering his head and peering into a stream to meet his own reflection. This image exemplifies how domesticated animals were typically shown through the woodcut medium: he is shown in a natural setting, surrounded by lush vegetation, and perched along a wooden bridge above the water. Crucial to this print is the dog's posture, which is emphasized through its central position in the composition and highlighted by the oval frame which draws attention to his figure. With his hind legs slightly bent and tail up, he leans forward with a piece of flesh held in his mouth. As the fable outlines, this is the posture of a greedy dog:

> A dog … saw his own shadow represented in the clear mirror of the limpid stream; and believing it to be another Dog who was carrying another piece of flesh, he could not forbear catching at it; but was so far from getting anything by his greedy design, that he dropt the piece he had in his mouth, which immediately sunk to the bottom, and was irrecoverably lost.[418]

Like the woodcuts of dogs in Darwin's *Expression*, this picture does not offer a detailed rendering of the animal's facial expression. Instead, the position of the dog's body as he carries out an action motivated by greed alerts readers to his temperament.

While the woodcuts of dogs in *Expression* repeat established conventions of the medium, Darwin nonetheless made compositional and editorial choices that made the images suitable for their intended scientific purpose: to teach readers how to interpret animals' expressive

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[416]"The Expression of the Emotions in Man and Animals," *The Lancet,* 7 December 1872: 817-18. Cambridge University Library: DAR 226.2 130-31.
[417] Darwin Correspondence Project, "Letter no. 1733," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-1733.xml
[418] Thomas Bewick, Edwin Pearson, Aesop, Oliver Goldsmith, and Robert Dodsley, *Bewick's Select Fables of Aesop and Others, in Three Parts: I. Fables Extracted from Dodsley's, Ii. Fables with Reflections in Prose and Verse, Iii. Fables in Verse* (London: Bickers & Son, 1871 [1818]), 87.

movements. By showing the dogs in front of blank backdrops, for example, the dynamic poses that Darwin believed communicated these animals' mental and emotional states were isolated from surrounding variables. It was through these familiar and instructive images that Darwin's readers could examine the behaviours of these cherished and, at times, threatening animals. In the woodcuts that followed his discussion of dogs, Darwin drew connections and distinctions between house pets and the animals he believed bore the closest biological and expressive similarities to humans: apes.

THE APE AS INTERMEDIARY FIGURE: WOODCUTS OF THE CYNOPITHECUS NIGER AND THE CHIMPANZEE

Darwin famously conceived of apes as intermediaries between humans and animals. In *Expression,* he used three woodcuts to position them as liminal figures that bridge the two groups. Although the majority of the fifteen animal woodcuts picture bodies in dynamic poses, the ape illustrations focus solely on facial expression (Figs. 44, 45). While the woodcut medium connects the apes to the other animals depicted in *Expression*, their composition visually links them to the humans whose expressions are presented photographically later in the book, such as the girls who are shown on Plate III. In all three woodcuts, the monkeys are portrayed according to the conventions of portraiture, a genre typically used to represent humans. They appear decidedly human-like as an emphasis is placed on the apes' individual identities through the detailed focus on their faces and characters. As with close-up portraits of humans, they are shown with a slight turn of the head and in a three-quarter view.

Yet the intended purpose of these woodcuts – to educate readers about ape expressions and their similarities to human ones – complicate their status as portraits. Are these apes subjects who had their portraits made or scientific specimens who had their behaviour documented? As historian Ludmilla Jordanova has argued, a portrait is a "representation, in any medium, of a specific human being who has a name even if it has been lost, and in such a way that they could, somehow, be recognised."[419] Although the apes are certainly not humans, they are beings who had names and were recognized by their caretakers and by Darwin. The apes and

[419] Ludmilla Jordanova and Royal College of Physicians of London, *Physicians and Their Images* (London: Little, Brown, 2018), 15.

the images Darwin had made of them do not fit neatly into discrete categories. While the monkeys blur the line between human and animal, the woodcuts that represent them are not entirely portraits or scientific records – these images exist somewhere between the two.

In a set of two woodcuts made after drawings by Wolf, a *cynopithecus niger* is shown both "in a placid condition" (Fig. 44) and "when pleased by being caressed" (Fig. 45).[420] Like the prints of dogs, these images were intended to be compared to learn about the animal's expressions. Wolf made these drawings at the Zoological Gardens in London. In a letter to the artist from 3 March 1871, Darwin outlined what he hoped the drawings would capture:

> You said that you would be so kind as to endeavour to make a sketch for a wood-cut of a monkey's face when laughing, as the keepers express it … the *cynopithecus niger* of Celebes … can be easily caught, and … put in a separate cage to be drawn. There ought to be a drawing of the face when tranquil and the mouth closed; and another of the same size and in the same position, whilst laughing. When Sutton the keeper allows this monkey to play with his hair, it chuckles or laughs, and keeps moderately still. The face then becomes a good deal wrinkled, and … the skin is especially raised and wrinkled under the lower eyelids. When I asked Mr. Barlett whether he thought you could possibly draw the laughter of so restless an animal, he answered that "Mr. Wolf has got an eye like photographic paper, it will seize on anything!"[421]

Likening Wolf's process to that of photography, Darwin trusted that the artist could produce a faithful rendering of the ape. The ape's human-like features are emphasized in the print of the placid monkey: he wears a gentle expression of curiosity as his wide-open eyes are transfixed upon an object beyond the image's left-hand edge. His facial features are framed by thick shoulder-length hair, an impressive coiffure that sits atop his head, and excessively long eyebrows. In the illustration depicting him in a delighted state, he is shown in profile with an enormous smile spreading across his face to expose two rows of teeth. Much like Duchenne's pet monkey, he exhibits a playful expression of joy that appears almost human. While the ape's toothy grin is certainly evocative of a human smile, his large, round protruding eyes and sizeable teeth set him apart from the photographed humans in *Expression*. In this way, the *cynopithecus niger*'s expression of contentment both resembles and departs from his human counterpart. Through the depiction of the ape's sharp-toothed grin, Darwin shows that the creature does not

[420] Darwin, *Expression*, 135.
[421] Darwin Correspondence Project, "Letter no. 7535," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-7535.xml

fit neatly into the category of human or animal but, rather, is an intermediary that brings both together.

Darwin's followers observed similarities between apes and humans before *Expression*'s publication. For example, in June 1869, the American merchant Alexander F. Boardman wrote Darwin about a chimpanzee he encountered at a circus: "His resemblance to man struck every one as being very much greater than they had ever seen in any other animal … Many thought he might be a mixture of human & ape."[422] After the publication of *Expression*, admirers and colleagues continued to contact Darwin about the resemblances between the two species. While some commented on similarities in facial features and expressions, others observed a great degree of likeness when it came to internal organs. On 2 March 1878, the American microscopist John Michels wrote Darwin about the dissection of two chimpanzees by a surgeon in New York:

> All of the organs strikenly resembled those found in the Human race, when the Brain was removed all present were struck by its great resemblance to the Human Brain, this being especially apparent on looking at the base … One of the most important human like features of this brain is the absence of the Trapezium, and the presence of the olivary bodies …[423]

The ape was a complicated being and category within Darwinian discourse, as well as a complex symbol of his revolutionary ideas. Following the publication of *Descent*, the ape quickly became a symbol of Darwin's theory of evolution, referred to colloquially as "monkey theory."[424] Further, this symbol was often used in caricature in the popular press to poke fun at the "absurdity" of *Descent*'s central argument.[425] Though Darwin's theory did have a favourable reception amongst some of his scientific readership, the idea that man and ape were so closely related was heavily debated and ridiculed by scientific and lay audiences. In Europe, Darwin's proposition that humans are related to apes inspired genuine and widespread anxiety about the

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[422] Darwin Correspondence Project, "Letter no. 6796," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-6796.xml

[423] Darwin Correspondence Project, "Letter no. 11393," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-11393.xml

[424] Voss, *Darwin's Pictures*, 227.

[425] For the use of monkey and ape imagery in relation to Darwin's theory of evolution in popular literature, see Janet Browne, "Darwin in Caricature: A Study in the Popularization and Dissemination of Evolution," *Proceedings of the American Philosophical Society* no. 145 (2001): 496–509.

possibility of evolutionary degeneration.[426] As scholars such as Anthea Callen, Susanne Navarette, Leo Henkin, Sandra Siegel, and Patrick Bade have demonstrated, these concerns were reflected in various forms of art and literature produced during the later nineteenth century.[427] To ease pervasive anxieties surrounding the threat of human degeneration, many reasoned that any resemblance apes bore to humans was purely physical. In an age of rapid modernization and colonization, Europeans feared the dissolution of the social order and human descent into criminality, delinquency, and chaos. The antithesis of polite society, apes were deemed vicious, vulgar, and dangerous. Although they shared some physical similarities with humans, they were widely considered to be devoid of human virtues.[428]

Roughly ten years before his prints were reproduced in *Expression*, notes Voss, Wolf produced an illustration of a gorilla that addressed fears of evolutionary degeneration symbolized by the ape (Fig. 46). However, this 1861 print also captured the animal's human side. Originally published as the frontispiece for the French-American anthropologist Paul Du Chaillu's *Explorations and Adventures in Equatorial Africa*, Wolf's *The Gorilla* depicts the animal with a threatening stance and menacing grimace. Like the woodcuts of dogs included in *Expression*, Wolf's gorilla is in a dynamic, expressive pose. His right foot grips the thick roots of a tree while his dexterous fingers grasp the branch he pulls toward his body with his right hand. Light illuminates the fur atop his arms, highlighting the muscles that give him the strength to accomplish such a task. In this active, dominating pose, the gorilla governs his environment, towering over the natural landscape that he manipulates by the sheer force of his strength. Here, the ape is pictured with a chilling, open-mouthed grimace and baring his sharp teeth.

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[426] See, for example, Daniel Pick, *Faces of Degeneration: A European Disorder, c. 1848-1918* (Cambridge: Cambridge University Press, 1993), 1–36; 155–175; J. Edward Chamberlin and Sander L Gilman, "Degeneration: An Introduction," in *Degeneration: The Dark Side of Progress*, eds. Chamberlin and Gilman (New York: Columbia University Press, 1985), ix–xiv; Fae Brauer, "The Janus Face of Evolution: Degeneration, Devolution and Extinction in the Anthropocene," in *Picturing Evolution and Extinction: Regeneration and Degeneration in Modern Visual Culture*, eds. Fae Brauer and Serena Keshavjee (Newcastle upon Tyne, UK: Cambridge Scholars Publishing, 2015), xv–xxii; xxv–xxix.

[427] See, for example, Callen, *The Spectacular Body*, 1–35; Susanne Navarette, *The Shape of Fear: Horror and the Fin de Siècle Culture of Decadence* (Lexington: University Press of Kentucky, 1998), 1–8; Leo Henkin, *Darwinism in the English Novel, 1860 – 1910; The Impact of Evolution on Victorian Fiction* (New York: Russell & Russell, 1963). See also Sandra Siegel, "Literature and Degeneration: The Representation of 'Decadence'" and Patrick Bade, "Art and Degeneration: Visual Icons of Corruption" in *Degeneration: The Dark Side of Progress*, 199–219; 220–240.

[428] Voss, *Darwin's Pictures*, 227.

While, at first glance, *The Gorilla* portrays the ape as a frightening creature, it is also evident that Wolf's treatment of the animal's pose emulates an art-historical precedent typically used to represent humans. In fact, as Voss has pointed out, Wolf's *The Gorilla* references Albrecht Dürer's 1504 print *Adam and Eve* (Fig. 47). Dürer was a leading printmaker in the fifteenth and sixteenth centuries and remains one of the most renowned artists associated with the medium. Wolf referenced Dürer's well-known print to make his own points about the complexity of human and animal relationships.

Dürer's *Adam and Eve* shows the "original couple" standing in the Garden of Eden with leaves covering their genitalia, symbolizing their fall from grace and original sin. Groups of thin, thoughtfully placed hatch marks emphasize their idealized forms.[429] Both figures are in a contrapposto pose, with their weight on one leg and the other bent. Adam, in a manner nearly identical to Wolf's gorilla, uses his right hand to grasp a tree branch. By emulating the pose of the "original man" in his depiction of the gorilla, Wolf may have been making a joke about Darwin's theory of evolution by visually linking the ape to Adam. By drawing attention to the gorilla's covered groin, and thus his hidden genitals – the sites of fertility and lineage –, the figure is symbolically positioned as Adam's predecessor and the real "first" man. The animals included in Dürer's print symbolized what were believed to be the four human temperaments or humours: the elk represents melancholic, the cat choleric, the bull phlegmatic, and the rabbit sanguine. Here, animals are used to signify humans' mental, biological, and emotional states. In Wolf's *Gorilla*, these animal representations of human's inner lives are altogether removed – the gorilla is alone in his natural environment.

Wolf's image further addresses the complexity of the human and ape connection by drawing upon other art-historical conventions known to his audience. For example, the leaves covering the ape's genitalia were often used to cover naked human bodies in sixteenth-century Italian art.[430] Further, the ape stands in a contrapposto-like pose, signaling a popular artistic convention used from ancient Greece to nineteenth-century Europe. Like the idealized bodies in many historic artworks, the ape's pectoral muscles and biceps are highlighted. By drawing on

[429] As historian Stephen Greenblatt has explicated, Dürer was committed to perfecting the representation of Adam's idealized form. Greenblatt, *The Rise and Fall of Adam and Eve* (New York: W.W. Norton & Company, 2017), 249–250.

[430] In 1563, the Council of Trent initiated what is known as the "fig leaf campaign" to censor genitalia, which were believed to be lewd and inspire lustful thoughts, in religious images.

established artistic conventions that historically represented idealized human forms, Wolf's illustration bestows a human quality and sense of dignity upon the gorilla. Though *The Gorilla* suggests several connections between human and ape, the figure's animality remains through his threatening grimace.

The complex relationship between ape and human are also evident in Wolf's drawing of the smiling *cynopithecus niger* for *Expression*, where the ape's open mouth carries a contradictory meaning. Despite how it may appear at first, the *cynopithecus niger*'s toothy grin was not intended to be frightening or intimidating but, instead, meant to illustrate an expression resembling human joy. The print's title notes that the image shows the ape "when pleased by being caressed." In her reading of Wolf's representations of a "placid" and a "pleased" ape, Voss claims that the facial expression "that had made this gorilla into a monster now demonstrates the macaque's kinship to mankind."[431]

I would argue that the composition of these woodcuts further solidifies the link between ape and human. Unlike the woodcuts of dogs, whose bodies and stances indicate disposition, the image of the *cynopithecus niger* focuses exclusively on the animal's facial expression. The composition also draws a visual connection between the ape and the humans who are shown in similar head-and-shoulder portrayals throughout the second section of the book.

The final image of a primate in *Expression* is by Wood (Fig. 48) and further fortifies the complex connection between ape and human. This woodcut of a chimpanzee is a product of conversations Darwin was having with Seth Sutton, a zookeeper at the London Zoological Garden, since 1876 about chimpanzee behaviour. In a letter from 8 August of that year, Sutton responded to Darwin's request for information about the animals:

> In accordance with your request, I beg to say that I have made the following observations respecting the animals you referred to. The Chimpanzee and Orang, when they cough or sneeze they then shut their eyes. When screaming violently they *do not* shut their eyes, and if suddenly alarmed they then erect their hair. At extraordinary noise, such as *Thunder – hammering* &c, they become excited, and if teased or annoyed the same. When they listen or are astonished their mouths are *closed*.[432]

As noted in the title of Wood's image, this print depicts the chimpanzee in a "disappointed and sulky" condition. This woodcut offers a close-up, detailed account of the animal's facial

[431] Voss, *Darwin's Pictures*, 246.
[432] Darwin Correspondence Project, "Letter no. 5602," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-5602.xml

expression. While his protruding, pouty lips curve to form a delicate ellipse, his half-closed eyelids are framed by the series of subtle folds beneath his brows. Like Wolf's illustrations of the *cynopithecus niger*, Wood's print shows the chimpanzee exhibiting an expression that resembles human ones. The chimpanzee, shown in profile, pouts his lips in a manner described by Darwin as analogous to sulky youngsters: "The accompanying drawing represents a chimpanzee made sulky by an orange having been offered him, and then taken away. A similar protrusion or pouting of the lips, though to a much slighter degree, may be seen in sulky children."[433]

That this expression of disappointment in chimpanzees was recognized as comparable to human emotions is demonstrated in the *Daily Telegraph*'s November 1872 review of *Expression*. It refers to the pictured ape as a member of the human species, claiming the "engraving representing a chimpanzee in the sulks" to be "the most strikingly hideous caricature of our species one could well wish to be behold."[434] Like the prints by Wolf, Wood's woodcut links humans and primates by drawing on portraiture conventions and providing a detailed rendering of recognizable facial expressions. However, despite these similarities, Darwin kept a distinction between the two groups through the choice of medium: photography for (most) humans and woodcuts for animals. In these ways, apes do not appear to belong entirely to one group or the other but are pictorially shown as liminal figures bridging the two. As evinced by the review in the *Daily Telegraph*, the expressive apes blurred boundaries between human and animal.

THE DRAMA OF EXPRESSION: REJLANDER AS PHOTOGRAPHER AND PERFORMER

In contrast to the woodcuts of animals in the first section of *Expression*, the second section contains many photographs of the studio photographer Rejlander posing for the camera. These photographs show the refined and restrained expressions that Darwin argued developed as a product of human self-awareness. Unlike the woodcuts of animals, whom Darwin thought were unaware of how they appeared to others, the photographs of Rejlander visualize and

[433] Darwin, *Expression*, 140.
[434] "Mr. Darwin on Expression," *Daily Telegraph*, 5 November 1872. Cambridge University Library: DAR 226.2 124.

literalize Darwin's belief that man's nuanced, controlled expressions, such as surprise and disgust, are forms of "acting." For him, the most evolutionary advanced expressions are consciously supressed responses to external stimuli; though emotions are involuntarily provoked, their visible expressions result from degrees of deliberate repression. Therefore, the fact that Rejlander's photographed expressions were "put on" was not a problem for Darwin. In fact, it was in total alignment with his argument that the "newer" expressions exclusive to humans were involved a degree of performance.

Before commissioning Rejlander, Darwin was desperate for photographs of adults performing ordinary expressions. Despite asking for photographs from friends and colleagues, he had only collected eleven that he deemed suitable for the book. While the expressive content of found and donated photographs was determined by circumstances beyond Darwin's control, commissioning a photographer allowed him to construct the precise images he believed necessary to illustrate his arguments. Rejlander not only took pictures for Darwin but posed for a number of them himself. By hiring Rejlander as both photographer and actor, Darwin undoubtedly had a significant amount of authority over the photographic process and its outcomes. He could control what expression was shown, how it was performed, Rejlander's costumes, and the set dressings. In this way, working with Rejlander considerably expanded the expressive potential of Darwin's photograph collection.[435] This allowed Darwin to symbolically be a photographer and artist of sorts.

Darwin considered Rejlander his best photographer. In a letter to an editor who had requested Darwin's portrait for a print review, the naturalist praised Rejlander's pictures of him, writing on 21 October 1871 that "the best photographs of me have been taken by Mr. Rejlander, & as it will save you trouble I send you one."[436] As discussed in chapter two of this dissertation, Rejlander was a well-known artist-photographer when Darwin hired him.[437] His approach to

[435] In a letter to Dr. James Crichton-Browne, Darwin disclosed: "I am … now rich in photographs, for I have found a photographer in London. Rejlander, who for years has had a passion for photographing all sorts of chance expressions exhibited on various occasion." See Charles Darwin, letter to James Crichton-Browne, 7 April 1872. Cambridge University Library: Darwin Correspondence Project.
[436] Darwin Correspondence Project, "Letter no. 8003," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-8003.xml
[437] As Delaporte has elucidated, later nineteenth-century "artistic photography" largely followed the conventions of expressive portrait painting. Applying the principles of painting, practitioners of artistic photography sought to faithfully communicate their sitter's likeness through a thoughtful, aesthetically pleasing composition. Producing an image that appeared "true to life" was not the sole aim of artistic photography but, rather, an objective that could be compromised by other aesthetic choices. François Delaporte, *Anatomy of the Passions*, 139.

photography as an art is exemplified by his most celebrated photograph, *Two Ways of Life* (Fig. 49), from 1857. The photograph, whose narrative focuses on the moral choice between vice and virtue, was made by combining more than thirty negatives, each of which was shot separately.[438] It was first shown in 1857 in Manchester at the *Art Treasures of Great Britain* exhibition, where it received a mixed response from photographers and patrons. While many professionals were intrigued and impressed by Rejlander's technical processes, the scene's nude figures were controversial. Set on a wide stage framed by ornate drapery and columns, the photograph shows an older gentleman guiding two young men into a large group of figures. On the left side of the image, semi-clothed women and gambling men serve as allegories of the path of vice. To the right, figures are shown praying, reading, and working, representing that chastity and education signify the path of virtue. Created by the meticulous arrangement of multiple negatives in a darkroom, this composite image demonstrates that Rejlander was an expert at manipulating photographs. As art historian Jonathan Fardy has argued, Rejlander's photograph unites art photography, art studies, and the art of combination printing. Many of the figures are taken from art-historical sources such as works by Titian and Michelangelo and the composition echoes Raphael's *School of Athens* (1509–11). These art historical references, Fardy claims, render Rejlander's *Two Ways of Life* "a study of painting nested in photography."[439]

When it came to making photographs for Darwin, Rejlander found the process of making faces for the expressive pictures an art in and of itself. In a pair of eerie and humorous photographs now located in Darwin's archives at Cambridge (Fig. 50), he imitates the facial expressions of a screaming child with uncanny precision. Like the upset child whose expression he simulates, Rejlander is pictured with eyes squeezed firmly shut, a scrunched-up nose, and an open mouth with exposed teeth. His hands, like the child's, are held up in fists to the sides of his torso. While the photograph's intended purpose is unknown, it is probable that Rejlander was illustrating the similarities and differences between a child's and adult's performance of the same expression.

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[438] Jonathan Fardy, "Seeing Photographically: Reading Rejlander's 'Apology,'" *Photographies* 8, no. 2 (2015): 162.
[439] Fardy, "Seeing Photographically," 163. As Bear has recently recalled, there was a severe public reaction when this photograph was first exhibited at the 1857 *Art Treasures* exhibition in Manchester. Art historians such as Malcolm Daniel have argued that contemporary viewers believed the photograph was taken from life, and so found the image offensive because they thought it truly captured young men in the presence of nude women. See Bear, *Disillusioned*, 33; Malcolm Daniel, "Darkroom vs. Greenroom: Victorian Art Photography and Popular Theatrical Entertainment." *Images* 33, nos. 1–2 (Fall 1990): 13–19.

Although Darwin did not publish these photographs in his book, many of those by Rejlander that he included feature the photographer as model. In a letter to Darwin, Rejlander wrote that he posed for the pictures because other people could not produce convincing expressions at will: "It is very difficult to get, at will – those expressions you wish – Few have the command or imagination to appear real. In time I might catch some – So I have tried *in propria persona* – even cut my moustache shorter to try to please you …"[440] For Rejlander and for Darwin alike, authenticity was not a requirement for a good photograph. Rejlander did not need to feel the emotions he was expressing in the images. The expression need only "appear real" to fulfill its intended purpose in the book: to demonstrate what certain emotions look like in humans.

Rejlander's photographs in Darwin's book show him displaying expressions and gestures associated with various emotional states, such as helplessness. In *Shrugging of the Shoulders* (Fig. 51), for example, he is depicted from the knees up wearing a loose, velvet jacket with his hands held out and palms facing outward. His brows are slightly raised, causing horizontal lines to spread across his forehead, and his eyes are framed by a series of shallow wrinkles. The photographer's mouth, surrounded by facial hair, is turned into a moderate frown. That Rejlander's expressions are contrived rather than genuine may, at first, seem inconsistent with Darwin's scientifically-informed approach to understanding expression. To be sure, Rejlander's photographs are reminiscent of the *cartes-de-visite* and *cartes-du-cabinets* of actors that show them in character. For example, an 1870 *carte-de-visite* of the English actor Charles Fechter in costume for a production of Hamlet (Fig. 52) pictures the performer leaning on a pedestal with a forlorn look on his face. Hamlet, one of most melancholic characters in history, provided an ideal example for Rejlander to emulate. In another photograph that depicts the German actor Daniel E. Bandmann in the role of Narcisse (Fig. 53) from 1863, the entertainer strikes a dynamic pose and wears a velvet jacket similar to Rejlander's.

These photographs, and others like them, signify key characteristics or "expressions" associated with the portrayed characters. Fechter in the role of Hamlet, for example, appears melancholy: his mouth is turned into a restrained frown, his brows are slightly furrowed, and his right hand is tentatively raised toward his face, suggesting that the character is in a morose, pensive state. On the other hand, Bandmann in the role of Narcisse appears self-assured: he

[440] Quoted in Prodger, "Appendix III," 409.

looks out with a confident gaze, his fist is held securely under his chin, and his right foot is planted firmly on the ground. Photographs such as these popular theatrical pictures were purchased, traded, and collected en masse.

Rejlander's photographs, then, can be situated within the broader context of later nineteenth-century photographic practice. The photographs' formal qualities, such as lighting, composition, and the sitter's dress, however, drew on theatrical rather than scientific conventions. Both Rejlander and Bandmann, for example, are shown lit from overhead, wearing velvet jackets, and holding facial expressions and bodily poses particular to the scenes they "act out." Why would Darwin choose to include photographs of someone "acting out" expressions in a scientific book?

As explained in chapters one and two of this dissertation, the photographic technology of the time did not allow operators to easily capture fleeting expressions. Photographs of people were typically taken in studios and were posed rather than candid. As a result, Rejlander's "acting out" of expressions was necessitated by the limitations of the technology. However, it was also consistent with Darwin's belief that man's attenuated expressions are the result of consciously inhibiting more severe expressive behaviour. According to Darwin, it is man's sensitivity to his own appearance that brought about expression's gradual attenuation. Rejlander saw himself represented photographically and could revise his "expressive" performances to make them seem more real. Yet Rejlander's performances also point to Victorian attitudes toward the theatre more generally. As cultural historian Katherine Newey has explained, the nineteenth century marked a turn toward more "natural" theatrical performances that resulted in the conflation of the actor and the character portrayed: "the move from actor to character was made to appear seamless … the craft, skill, and technique of acting was ignored by audiences and public commentary, resulting in an over-identification of actor with role."[441]

Rejlander's photographs are filled with contradictions. By presenting his readers with these photographs, Darwin used imagery that grew out of the world of theatre, which was commonly linked to artifice, to make a scientific point about expression. Though photographic processes were associated with the pursuit of "objective" data, Darwin necessarily relied on

[441] Katherine Newey, "Victorian Theatricality," in *The Victorian World*, ed. Martin Hewitt (The Routledge Worlds. London: Routledge, 2012), 570. See also T.C. Davis and T. Postlewait, "Introduction," in *Theatricality* (Cambridge, Cambridge University Press, 2003), 19.

visual conventions outside of the sciences to make the pictures legible to a lay audience. While Rejlander's photographs were, for the most part, well received, not all of Darwin's readers found the photographer's performances convincing.[442] A review of *Expression* issued by *The Athenaeum* on 16 November 1872 criticized the images:

> We do not think that Mr. Rejlander, to judge by his photographs, is a first-rate actor, or a subtle director of actors. We believe the photographic illustrations of this volume have suffered greatly from a sort of galvanized look they wear … We are far from thinking that Mr. Darwin has acted unwisely in introducing them into his book, but Mr. Rejlander's performances are almost sure to mislead anyone who puts much faith in them.[443]

Although Darwin was confident in Rejlander's ability to successfully act out ordinary expressions, some readers thought his performances were too artificial to be believable.

Rejlander's sheer dedication to producing these expressive photographs, coupled with Darwin's choice to include a number of them in *Expression*, suggests that both men believed the photographer had a significant degree of control over the expressive muscles of his face. For Darwin, this made him an appropriate subject to portray man's attenuated expressions. Perhaps Darwin hoped that by providing instructions on how make and regulate certain expressions, his reader could, with practice, become as skilled an actor as the London photographer.

While Rejlander's supposed superior ability to control his expressions implied his high standing in the evolutionary hierarchy, the fact that he posed for the pictures himself speaks to the state of self-awareness that Darwin proposed is exclusive to humankind. In capturing his own likeness, Rejlander encountered his own appearance from a perspective akin to the vantage point from which others perceive him. In this way, the photographic technology used to capture restrained human expressions was connected to what Darwin believed was the characteristically human state of self-awareness. Conscious of how he appeared as he posed before the camera, Rejlander could (and did) repeat his performances until they satisfied Darwin. While making these photographs, Rejlander continually refined his expressions, thus mimicking the way

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[442] For example, a review of *Expression* printed in *The Athenaeum* on 8 November of 1872 applauded the photographs: "Suffice it to say that he has found in Mr. Rejlander's photographic camera ample materials for the illustration of his own meaning, and for the adornment and the elucidation of his remarks." See "The Expression of the Emotions in Man and Animals," *The Athenaeum* n. 2350, 9 November 1872, 591. Cambridge University Library: DAR 226.2 120-121.

[443] "The Expression of the Emotions in Man and Animals," *The Athenaeum* n. 2351, 16 November 1872, 631-32. Cambridge University Library: DAR 226.2 120-121.

Darwin believed humankind had produced the nuanced, controlled faces that he argued set us apart from animals.

THE THREAT OF FEAR LEFT UNCHECKED: VISUALIZING THE DESCENT INTO TERROR

In *Expression*'s third and final section, woodcuts and photographs are brought together to reinforce Darwin's argument that the most severe manifestations of human expression reveal our connection to a common ancestor shared with animals. This group of images is in chapter twelve, entitled "Surprise – Astonishment – Fear – Horror," which describes the expressive movements associated with overpowering emotional states, such as extreme fright and abject terror, and details what Darwin believed to be their primordial origins. Darwin argued that these states and their accompanying visceral expressions exist on a spectrum of relative intensity. For example, he claimed that *terror* is the gradual progression of *attention*: "Attention, if sudden and close, graduates into *surprise*; and this into *astonishment*; and this into stupefied amazement. The latter frame of mind is closely akin to *terror*."[444] According to Darwin, ordinary emotional states become progressively acute through a domino effect: the sudden rousing of one's *attention* may set off a chain of events culminating in the experience of *terror*. Further, he proposed that the severity of an expression as it is enacted directly coincides with the severity of the emotion as it is experienced. For example, while *attention* is commonly expressed by the eyebrows being "slightly raised," its evolution into *surprise* results in the eyebrows being "raised to a much greater extent, with the eyes and mouth widely open."[445]

Darwin selected two photographs and three woodcuts to illustrate the expressions that characterize these emotional states. While the first image is a photograph that shows Rejlander performing an expression of moderate surprise, the chapter opens with a discussion about a photograph he did not include: one by Duchenne. The omitted photograph is in *Mécanisme* (Fig. 54) and shows Duchenne galvanizing the *frontalis* muscles (responsible for the elevation of the eyebrows) of the old man, who had voluntarily opened his mouth to simulate an expression of *surprise*. Duchenne argued that this photograph (*Mécanisme*'s Plate 56) demonstrates the

[444] Darwin, *Expression*, 278.
[445] Darwin, *Expression*, 278.

important role that elevated eyebrows play in communicating *surprise*: "Plate 55, where just the mouth is opened, certainly does not express any emotion. But we feel, when looking at Plate 56, that the subject has just received unexpected news or caught sight of something that surprises him."[446] Although Darwin chose not to reproduce this photograph, he deemed it a faithful representation of *surprise:* "This figure expresses surprise with much truth. I showed it to twenty-four persons without a word of explanation, and one alone did not at all understand what was intended."[447] If Duchenne's photograph was such an accurate representation, why did Darwin not include it?

I would argue that while Darwin could have excluded this photograph to lower production costs, it is more likely that he made this decision to better support his argument. The expression of moderate *surprise*, according to Darwin, was one that evinces man's capacity to wilfully restrain his expressive behaviour. Though *surprise* is not an expression he believed man consciously performs, he thought it was produced by the will's desire to prevent the expression's exponential growth. For Darwin, an expression of *surprise* indicates that the individual bearing it has managed to halt the expression's evolution into *fear* and *terror*. As a result, a photograph of this expression provoked by galvanization would not have supported his argument that attenuated expressions were the result of deliberate self-restraint. In other words, Duchenne's photograph of artificially stimulated *surprise* could not justly illustrate an expression Darwin believed was the product of wilful inhibition. This also explains why Darwin textually referenced but did not visually reproduce Duchenne's accounts of galvanically stimulating ordinary expressions.

While a look of *surprise* was common on European middle-class faces, Darwin maintained that it was made with "remarkable uniformity" around the globe.[448] As elucidated above, Darwin believed that the universality of certain human expressions was proof that they resulted from evolutionarily determined biological impulses. According to his *principle of serviceable associated habits*, many unconsciously performed expressive facial movements were

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[446] Duchenne, *Mécanisme*, 88.
[447] Darwin, *Expression*, 278. It is clear that Darwin is referring to Plate 56 from *Mécanisme* as he describes the image accordingly: "Dr. Duchenne has given a photograph of an old man with his eyebrows well elevated and arched by the galvanization of the frontal muscle; and with his mouth voluntarily opened."
[448] To further support this claim, Darwin noted that the expressive movements characteristic of *surprise* were exhibited by Laura Bridgman, an American woman who became both deaf and blind after contracting scarlet fever at the age of two: "That the eyebrows are raised by an innate or instinctive impulse may be inferred from the fact that Laura Bridgman invariably acts thus when astonished." Darwin, *Expression*, 280.

once consciously performed toward a practical end. For example, Darwin claimed that raised eyebrows are caused by eyes rapidly opening, increasing one's field of vision to determine the source of surprise. Employing a heuristic approach, Darwin implored readers to simulate the action in front of a mirror: **"**Any one who will try to open his eyes as quickly as possible before a mirror will find that … the energetic lifting up of the eyebrows opens the eyes so widely that they stare, the white being exposed all around the iris."[449] Feigning a moderate degree of surprise, readers could prove that opening one's eyes rapidly causes the eyebrows to raise as they practiced making expressions at will.[450]

Darwin also addressed bodily gestures associated with *surprise*. As he explained, a surprised individual "often raises his opened hands high above his head, or by bending his arms only to the level of his face."[451] Darwin believed that raising opened hands when *surprised* is instinctual, like elevating the eyebrows.[452] However, unlike expressive facial movements, he did not believe that this gesture was once serviceable. Instead, he argued that the tendency is "explicable on the *principle of antithesis*."[453] This, he rationalized, is evidenced by the fact that an emotionally neutral individual has his arms lax by his sides with fingers held close together: "to raise the arms suddenly… and to separate the fingers … are movements in complete antithesis to those preserved under an indifferent frame of mind, and they are, in consequence, unconsciously assumed by an astonished man."[454]

The first image in the final section of the book is a photograph of Rejlander entitled *Surprised Person* (Fig. 55) that combines the facial expression and bodily stance of *surprise*. The London photographer is shown from the waist up, staring in wonder with his eyebrows moderately raised, mouth agape, and palms held up near his shoulders. Wearing a brimmed hat and the same loose, velvet jacket pictured in *Shrugging the Shoulders*, Rejlander strikes a theatrical pose indicative of astonishment. While the source of surprise is not visible to the

[449] Darwin, *Expression*, 281.
[450] As for opening the mouth, the other hallmark of a surprised expression, Darwin proposed that the action may have enabled man to better distinguish the cause of alarm auditorily by permitting him to breathe quietly. He also suggested that an open mouth allowed for a "deep and full inhalation" in preparation for "great exertion" once the source of surprise had been determined.
[451] Darwin, *Expression*, 286.
[452] Darwin here again cited the behaviour of Laura Bridgman as evidence that the expressive movements associated with surprise are inherent.
[453] Darwin, *Expression*, 288.
[454] Darwin, *Expression*, 288.

viewer, he looks moderately startled.[455] His facial expression and bodily comportment do not convey a sense of extreme fright but, rather, the sudden onset of modest bewilderment.

By the time Darwin's reader encountered this photograph, Rejlander's face would have been a familiar one; two photographs that show him expressing *helplessness* close the preceding chapter. Moreover, Darwin had identified Rejlander as a man capable of effectively acting out ordinary expressions at will.[456] Able to capture his own disciplined performance of certain expressive gestures, he was a willing and capable model. According to Darwin, *surprise* is best understood as *terror* purposefully atrophied; it is an everyday expression that, without some degree of wilful restraint, could escalate in intensity and eventually take on the appearance of its primordial form. That *surprise* is represented photographically and follows conventions associated with theatrical *cartes-de-visite* of actors, particularly their ties to performances of emotion, reinforces its continuity with Rejlander's earlier photographs of ordinary human expressions in the book's second section.

Following his discussion of *surprise*, Darwin examined *fear* and *terror.* In his analysis of these expressions, he defined their visual characteristics and delineated their positions on a spectrum of expressive intensity. *Fear*, he asserted, is "preceded by *astonishment*" and is similarly expressed by open eyes and mouths. *Terror*, or "extreme *fear,*" is conceived as the "violent" conclusion of *fear* left uninhibited.[457] As Darwin explicated, the sheer magnitude of *terror* results in varied expressive outcomes: "As fear increases into an agony of terror, we behold, as under all violent emotions, diversified results … there is a death-like pallor; the breathing is laboured; the wings of the nostrils are widely dilated."[458] It is at this peak of emotional intensity, Darwin argued, that the individual succumbs completely to the forces of *terror*: "All the muscles of the body are relaxed. Utter prostration soon follows, and the mental powers fail. The intestines are affected. The sphincter muscles cease to act, and no longer retain the contents of the body."[459]

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[455] Darwin noted that expressions of surprise similar to the one performed by Rejlander can be found in Leonardo da Vinci's *Last Supper* (1495): "two of the Apostles have their hands uplifted, clearly expressive of their astonishment." See *Expression*, 287.
[456] Of the two photographic self-portraits that show Rejlander expressing *helplessness*, Darwin wrote that he had "successfully acted the gesture of shrugging the shoulders." See *Expression*, 265.
[457] Darwin, *Expression*, 290.
[458] Darwin, *Expression*, 292.
[459] Darwin, *Expression*, 293.

While Darwin stated that humans may lose complete control of their bodily functions, including their bowels, when sensing *terror*, he reassured his middle-class audience that this looming threat was of more immediate concern to people elsewhere: "Many savages do not repress the signs of fear so much as Europeans … With savages, the sphincter muscles are often relaxed, just as may be observed in much frightened dogs, and as I have seen with monkeys when terrified by being caught."[460] Implicit in this racist passage wherein comparisons are made between humans, monkeys, and "much frightened dogs" is Darwin's conviction that the evolutionary advancement of emotional expression is best charted as the increasing ability to consciously inhibit expressive behaviour. Assuring his primarily European readership that they were able to repress "the signs of fear," Darwin suggests that the possibility of "utter prostration" should not be cause for distress so long as they continue to restrain their frightful expressions.

In drawing such cruel comparisons between so-called "savages," monkeys, and dogs, Darwin forged a connection between *fear*'s expression in humans and animals on the basis of fear-induced incontinence. Later in the chapter, he strengthened this connection by citing instances where the erection of hair, displayed by numerous animals under the influence of *fear,* was observed in fearful humans. Unsurprisingly, Darwin noted that manifestations of this tendency were not found amongst middle-class Europeans. Instead, he argued that they are predominantly exhibited by "the insane."

DARWIN'S WOODCUT OF DR. JAMES CRICHTON-BROWNE'S "INSANE" PATIENT

Darwin's studies of the emotive responses of "the insane" were largely based on case studies of patients related to him by his close collaborator, Browne. At this time, insanity was characterized by unconventional conduct that did not align with the accepted standards of polite society. Throughout 1870 and 1871, Browne sent Darwin photographs of several of his patients at the West Riding Lunatic Asylum.[461] Darwin's collection of images for *Expression* contains over 30 photographs by Browne, who used photography to document the physical manifestations of his patients' psychiatric conditions. Like many later nineteenth-century photographs of

[460] Darwin, *Expression*, 295.
[461] Dr. James Crichton-Browne oversaw inmates at the West Riding Asylum. The institution had its own photographic studio built around 1870.

patients, Browne's relied upon the conventions of studio portraiture. His patients are shown from the waist up with their bodies positioned toward the camera. Photographed in front of simple, unadorned backdrops, they look out at the viewer. While most of Browne's patients are portrayed in repose, some offer playful smirks. In a photograph of a young woman entitled *Euphoria, Hilarious Mania* (Fig. 56), for example, the patient has an open-mouthed smile. Her hair is neatly styled into ringlets and her dress is ordered.

Darwin was interested in how psychiatric patients' hair responded to acute emotions: "I begged for information from Dr. Crichton-Browne with respect to the insane. He states in answer that he has repeatedly seen their hair erected under the influence of sudden and extreme terror."[462] Darwin believed that this tendency was frequently observed in "chronic maniacs" during bouts of violence. Further, he believed that hair standing up when under the violent passions of insanity "agrees perfectly with what we have seen in the lower animals."[463] Here, unchecked emotions in certain groups of humans are again proposed to induce bodily changes akin to those displayed by animals.

To further illustrate this idea, Darwin included an image describing the condition of a so-called "lunatic's" hair which he had obtained from Browne. In June 1870, the psychiatrist mailed Darwin a small photograph of a female patient whose hair was made to stand on end under the influence of *terror*. The photograph, transformed into a woodcut for *Expression* (Fig. 57), shows the woman staring calmly out at the viewer with her stiffened, tightly wound hair framing her face to emphasize her expression.[464] The texture and tight coil of her hair takes a prominent position in this print. Its large, weighty form differs from Browne's other patient's hair (Fig. 56), which was made into neat ringlets for a photograph. In the woodcut, the plain, solid nature of the patient's cloak makes her hair stand out even more. The empty space surrounding her further highlights her hair's dramatic shape, size, and rigidity, thus accentuating the characteristics demonstrative of *terror* that Darwin believed connected "the insane" to "the lower animals." It is as if her hair stands in for her frazzled state.

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[462] Darwin, *Expression*, 295.
[463] Darwin, *Expression*, 296.
[464] James Crichton-Browne, letter to Charles Darwin, 6 June 1870. Darwin and Burkhardt, *Correspondence Vol. 18*. Darwin responded to Browne's letter in February of 1871: "You were so kind as to send me 2 *small* photographs of insane women, with their hair extraordinarily rough, almost like mulattress. Is it credible that their hair ever was, or could again become, smooth?" See Charles Darwin, letter to James Crichton-Browne, 8 February 1871. Darwin and Burkhardt, *Correspondence Vol. 19*.

As Darwin noted, Browne trusted that "the state of [the patient's] hair is a sure and convenient criterion of her mental condition."[465] More specifically, Darwin recounted that the psychiatrist believed the "persistently rough condition" of patients' hair was attributable "in part to their minds being somewhat disturbed" and "in part to the effects of habit – that is, to the hair being frequently and strongly erected during their many recurrent paroxysms."[466] Browne's theory, and the related photographic evidence, appealed to Darwin because it was grounded in beliefs about association, habit, and behaviour that were similar to those he championed in *Expression*. Like Browne, Darwin believed that the repetition of a given physiological response or conscious action led to its habitual reinforcement.

Darwin and Browne also connected over Duchenne's work on facial expression.[467] In the years leading up to Darwin's publication, the two men exchanged notes on *Mécanisme* and its plates, sending a copy of Duchenne's work back and forth by mail.[468] Browne's interest in the photographic study of expressive behaviour persisted into the mid 1870s, and he continued to send Darwin expressive photographs of his patients after *Expression* was published. In March 1873, for example, Browne sent Darwin another series of photographs of patients taken at the West Riding Asylum, noting that he would be "happy to supply [Darwin] with many more."[469] One month later, he gifted Darwin a set of fifteen photographs that show his wife, whom he claimed had "considerable control over her features," acting out various facial expressions.[470] Although Browne contributed significantly to Darwin's collection of photographs of human expression, only his photograph of the frizzy-haired "insane woman" was transformed into a woodcut for the book.

The absence of Browne's photographs, except for the one woodcut, in Darwin's book is surprising given their shared interest in photography's role in scientific study. While historians

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[465] Darwin, *Expression*, 297.
[466] Darwin, *Expression*, 298.
[467] In his letters to Darwin, Browne noted that he and his colleagues at the asylum had begun taking larger photographs of their patients, using Duchenne's images as a point of reference for their scale: "We are beginning to take large photographs here, the size of Duchenne's & will I think secure some interesting observations. I shall send you some." Darwin Correspondence Project, "Letter no. 7220," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-7220.xml
[468] Darwin Correspondence Project, "Letter no. 7220," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-7220.xml
[469] Darwin Correspondence Project, "Letter no. 8795," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-8795.xml
[470] Darwin Correspondence Project, "Letter no. 8861," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-8861.xml

have studied their relationship and Browne's photographs in Darwin's collection, they have not considered that Darwin's omission of Browne's photographs was strategic. Up until this point in *Expression*, Darwin had relied exclusively on photographs to visualize expressive behaviours in humans. Why, then, did he reproduce Browne's photograph of an "insane" woman as a woodcut? I argue that through the change in media from photograph to woodcut, Darwin differentiated Browne's frightened "insane" patient from the "healthy" humans who were photographed in *Expression*. This critical change in media linked the woman to the animals depicted in woodcuts in the first section of the book, much the same way the woodcuts of Duchenne's patient in extreme emotional states were connected to "the animal" as well.

Prodger has argued that Darwin's decision to include more woodcuts than photographs was based on production costs.[471] He has suggested that the abrupt change from one medium to another was "intended to add dramatic emphasis to the sections on 'normal' human expression."[472] By bookending the photographic portraits of human expression, Prodger contends that the woodcuts "provide a visual counterbalance to the photographs ... and help to integrate photography into the book in a visually exciting way."[473] I would argue that this is unlikely because photographs were overwhelmingly more attractive to Victorian readers. That Darwin's audience was enthusiastic about the photographs in *Expression* is well documented. Countless reviews praised the photographs: *Literary World* deemed them "well chosen and instructive"; *The Daily Post* celebrated *Expression*'s "well-executed heliotypes"; and *The Saturday Review* applauded the "series of skillfully taken photographs."[474] Darwin's acquaintances and colleagues, too, expressed excitement about the photographs. In a letter from November 1872, Darwin's collaborator Alfred Russel Wallace remarked that the photographs had captivated the attention of his young children.[475] Since the large-scale reproduction of photographs in print was part of an up-and-coming industry facilitated by new techniques and technologies, photographically-illustrated texts were surrounded by an aura of excitement and novelty.

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[471] Prodger, "Appendix III," 400.
[472] Prodger, "Appendix III," 400.
[473] Prodger, "Appendix III," 400.
[474] "Mr. Darwin's New Book," *Literary World* n. 161 v. 11, 29 November 1872: 337-38. Cambridge University Library: DAR 226.2 132; "Mr. Darwin on Expression," *Daily Post*, 15 November 1872. Cambridge University Library: DAR 226.2 123; "Darwin on Expression in Man and Animals," *The Saturday Review*, 16 November 1872: 633. Cambridge University Library: DAR 226.2 137.
[475] Alfred Russel Wallace, letter to Charles Darwin, 15 November 1872. Darwin and Burkhardt, *Correspondence Vol. 20*, 506.

Given the popularity of photography, Darwin's choice to transform the photograph of the "insane woman" into a woodcut certainly served another purpose: to further show the links between humans and animals. Reproducing Browne's patient in a woodcut contrasts her with the photographed people who illustrate ordinary, "healthy" human expressions. Furthermore, for Darwin and his readership, she was considered more animal-like because of nineteenth-century understandings about female mental illness, particularly hysteria. "Hysteric" patients, who were mostly women, were viewed as child-like and lacking control over their emotions. In a letter Browne sent to Darwin in May 1869, he compared his female patients to animals. Regarding a patient who had recently died of tuberculosis, for example, Browne wrote that "the habits of this woman, as well as her bodily configuration, had many points in common with those of wild creatures."[476] In *Expression*, the change in medium from photograph to woodcut symbolically linked Browne's patient to the "lower animals" with which Darwin believed her expression shared a special kinship.

The depiction of Browne's patient in the twelfth chapter is the first woodcut Darwin's readers would have seen after the print of the sulky chimpanzee (Fig. 48). In fact, these two woodcuts that bookend most of the photographs have visual similarities. In both, the subject is situated in a nondescript setting with elongated, unidirectional hatch marks that extend diagonally across the image. They both picture their subjects' illuminated faces with a frame of dark hair. In the woodcut of Browne's patient, only the woman's facial skin is shown – the rest of her body is covered in a shroud. Her prickled hair forms a large, weighty mass around her identifying features. Her face, like the chimpanzee's, is suffocated by the hair that surrounds it.

In staging a visual link between the chimpanzee and Browne's patient, Darwin drew upon widespread gendered and racialized stereotypes. As Callen has shown, these stereotypes drew on pseudo-scientific theories of physiognomy and phrenology, including those propounded by anatomists and anthropologists Petrus Camper, Paul Broca, and Césare Lombroso, and the associated pictorial systems that visualized a "hierarchy of social types" and differentiated people on the basis of gender, class, and race.[477] These theories posited that the features of working-class women's bodies and faces signified a "degenerate type" inferior to middle- and

[476] Darwin Correspondence Project, "Letter no. 6752," https://www.darwinproject.ac.uk/letter/?docId=letters/DCP-LETT-6752.xml
[477] Callen, *The Spectacular Body*, 10.

upper-class women and men. This idea was informed by the gendered relationship drawn between evolutionary degeneration and criminality outlined by Lombroso and Camper's theory of the "facial angle," whereby an acute facial angle was thought to signify a "fall into the resemblance of monkeys."[478]

In *Expression*, the visual similarities between the woodcut of the chimpanzee and Browne's patient strengthen the connection between humans and animals that Darwin sought to validate. For him, Browne's patient was a specimen that affirmed this connection; her voluminous and coiled hair, standing erect under the influence of *fear*, evidenced humankind's relationship to a primordial ancestor. While she is human, Darwin proposed that her mental state caused her to exhibit expressive signs typically shown in animals. Like the gloomy chimp, she is portrayed as a being whose expressive responses bridge the two groups, emphasizing her role as an intermediary between the worlds of humans and animals.

WOODCUTS AFTER DUCHENNE'S PHOTOGRAPHS

As I have argued previously, Darwin believed Duchenne's photographs to be faithfully rendered and easily recognizable examples of *terror, horror,* and *agony*, but transformed them into woodcuts to emphasize human ties to animals. Yet the change of medium had an additional strategic motivation: converting the photographs into woodcuts allowed Darwin to make changes to the content of the images. During the process of copying a photograph by engraving, original elements could be erased or altered and details could be added in. A few such changes are visible when comparing *Terror* (Fig. 1), the woodcut included in *Expression*, to its prototype (Fig. 38), Plate 61 of *Mécanisme*. For example, extra hair has been added atop the old man's head and the shadows beneath his jaw are wider and darker.

The most evident change, however, is the removal of Duchenne's galvanic instruments. The original photograph shows four probes pressed against the subject's skin – two above the brows' outer edges and two stimulating the *platysma* – as well as the hands of the operator. In the woodcut, the complex operation that provoked the expression, carried out by expertly trained hands and purposefully designed tools, is entirely absent. Though Darwin explained that the old man's expression had been achieved by way of galvanism, the woodcut presents the expression

[478] Callen, *The Spectacular Body*, 16.

as though it were spontaneously generated. Here, *terror*'s expressive signs appear to have been produced without the help of technologies and techniques specifically designed for eliciting facial expressions. The same is true of the woodcut depicting the expression of *horror and agony* (Fig. 2), which Duchenne had likewise provoked by galvanism.

Darwin likely instructed his engraver to remove the galvanic probes to make the details of the depicted expressions clearer and give the subject a more natural appearance.[479] Prodger suggests that Darwin may have also removed the probes from Duchenne's "chilling, horrific images" to avoid upsetting his readers. However, despite deleting such signs, some late nineteenth-century readers still found the images frightening. This is evinced by reviews of Darwin's book printed shortly after its publication. A December 1872 review of *Expression* published in *The Times*, for example, warned its readers of the disturbing images.[480] This and other primary sources call into question Prodger's assertion that Darwin's decision to have Duchenne's photographs reproduced as woodcuts primarily served to make the images more palatable for his Victorian audience. Protecting his sensitive readers from the "distressing shock" that Duchenne's photographs may have incited was without a doubt of concern to Darwin, who wished for *Expression* to reach a wide audience.

However, I would argue that his decision to transform the photographs into woodcuts and exclude the galvanic probes created images that better served his argument. Firstly, the removal of the probes and Duchenne's arms in these prints visually highlighted Darwin's argument: the blank background placed greater emphasis on the old man's face rather than the surrounding action of Duchenne's work. This was a compositional strategy that directed the viewer to focus on the facial expression, whereas Duchenne's photographs were intended to demonstrate the relationship between facial expressions and the muscles excited by the galvanic instrument. While the absence of the galvanic probes from the woodcuts does, as Prodger proposes, clarify the expressive details communicated by the images, this glaring omission also obfuscates the context in which the pictured expressions were made. In the woodcuts, the old man's severe expressions do not appear to be produced by instruments designed for the purpose of communicating emotionally expressive signs. Instead, they seem to have arisen as a

[479] Prodger, "Appendix III," 405.
[480] "The Expression of the Emotions," *The Times*, 12 December 1872: 4a–e. Cambridge University Library: DAR 226.2 142-44.

consequence of his descent into a primordial state of mind – an idea that, within the internal logic of Darwin's book, is reinforced by the medium in which he is rendered.

By showing the toothless man expressing *terror, horror,* and *agony* through woodcuts, his expressions are distanced from those of the humans represented photographically. As I have argued earlier with respect to the print of Browne's patient, the man's *terror* is linked to expressions exhibited by animals shown in woodcuts in the first section of the book. Like the print of Browne's patient, these ones present a subject and expression that, while unquestionably human, are visually anchored in the non-human realm of our evolutionary past. By exhibiting *terror*, *horror*, and *agony*, the old man was, according to Darwin's logic, revealing the potential outcomes of *fear* left unchecked – a fear tinged with madness and irrationality that threatened the human race with evolutionary descent. The woodcuts, then, not only underline the expressive features of some of the most visceral emotional states experienced by humans but, perhaps more pertinently, illustrate the consequences of a subject's failure to repress the signs of *fear*. For Darwin, possible causes of this inability to repress included mental illness, sex, and race. In this way, the woodcuts of the old man represent Darwin's notion that expressions which exceed our control evince our connections to the "lower animals": these prints illustrate *fear*'s descent into a primordial form so intense that it has outwitted the subject's will to suppress its expressive signs.

The final photograph included in *Expression*, entitled *Great Mental Distress* (Fig. 58), again shows the old man, here with his *platysma* contracted and eyebrows rendered oblique by way of galvanism. This heliotype is a cropped version of *Mécanisme*'s Plate 64 (Fig. 3) that focuses on the man's face and neck. Though Duchenne and his assistant were cut from the image, the doctor's hands, carefully positioning galvanic probes above the subject's brows, are visible. The presence of Duchenne's apparatus illuminates that this expression was intentionally triggered. Darwin remarked that the induced expression was "very striking; the obliquity of the eyebrows adding the appearance of great mental distress."[481] Further, as he did with other photographs of Duchenne's experiments, Darwin recounted that the expression was easily recognizable: "The original was shown to fifteen persons; twelve answered terror or horror, and three agony or great suffering." That Darwin chose to publish this chilling photograph and keep the galvanic apparatus in frame may, at first glance, appear to contradict the argument I have made above. Darwin believed that human expressions of *terror, horror*, and *agony* signified

[481] Darwin, *Expression*, 299.

man's descent into a primordial state, and therefore converted Duchenne's photographs into woodcuts to visually connect these expressions to those of animals. Why, then, would he have included this heliotype of the old man expressing *mental distress* under the control of Duchenne's galvanic probes?

I would argue that while the two woodcuts visually connect the old man's expressions of anguish to those of animals, this heliotype – presented at the end of the book – reminds the reader that the bearer of these severe expressions is nonetheless human. When looking at this unsettling photograph, Darwin's reader would already recognize Duchenne's patient from his pictures alongside the photographic portraits of smiling young girls on Plate III. Though the old man was not the most attractive person on Plate III, he had an ordinary and acceptable expression: a moderate smile indicative of high spirits. To compare, the photograph included in the penultimate chapter depicts him in an extreme and frightening expressive state. Moreover, it discloses that his unnerving expression is controlled by another person. The old man's horrified expression cannot be managed by the conscious repression of expressive movements. Governed by the operator of the galvanic apparatus, this expression cannot be restrained by the subject's will power alone.

Ekman, in his annotated edition of *Expression*, was stumped by Darwin's decision to include the photograph showing Duchenne's galvanic probes: "I don't know why he left them in. Perhaps he thought it would be less distracting, and when he could eliminate them (when woodcuts were made) he did so, but they remained in the photograph from which he could not easily delete them."[482] Though, as Ekman suggests, it would have been difficult to remove the apparatus, Darwin's choice to leave it in does not weaken his argument. More specifically, this photograph is a reminder that there are human expressions conducted or directed by a force other than the will. While the photograph's form reinforces the man's humanity by connecting him to the other people photographed in *Expression,* the presence of Duchenne's hands and the electrical probes suggest that the pictured "primordial expression" is beyond the old man's capacity to control. In emulation of the intelligent creator Duchenne believed designed facial muscles for the purpose of emotional expression, the neurologist developed a technology and technique to provoke expressive movements. But for Darwin, the creative force behind our emotional lives and their outward signs was not an intelligent designer. Instead, he believed the

[482] Darwin, *Expression*, 302.

creative force was expression's primordial forms, atrophied but alive in us – the acute expressive signs that he argued evince our connection to a common ancestor shared with animals.

The final photograph in *Expression* thus embodies the overarching argument of Darwin's theory of expression as a whole: that a "descent" into the most extreme of emotional states occurs when expressions are beyond man's capacity to repress them. Like an alarm bell, Duchenne's chilling photograph of the old man warns Darwin's readers that, should they fail to control their expressions of *fear*, they too may end up in an emotional state beyond their control. The photograph also tested readers' abilities to temper their own responses to the frightening expression. After showing this final photograph, Darwin offered them a few comforting anecdotes suggesting that, with practice, the *muscle of fright* can, indeed, be controlled by the will: "A lady, an excellent musician, in singing certain high notes, always contracts her platysma … So does a young man, as I have observed, in sounding certain notes on the flute."[483]

CONCLUSION

Expression's study of emotive responses and their visualization played a significant role in nineteenth-century understandings about human and animal ontology. Moreover, the lasting effects of Darwin's work are still relevant in various disciplines and fields today, including psychology, anthropology, animal studies, and ethnology. Darwin's argument that humans and animals are not distinct, separate categories but rather exist alongside each other in a complex story of evolutionary change fundamentally challenged ideas about what was considered "human" and "animal" in the Victorian period. The category "animal," then and now, includes a wide variety of beings such as dogs, apes, ducks, cows, and whales. The key feature that these creatures, and all others that are classified as "animal," have in common is that they are "non-human." In *Expression*, Darwin's search for humanity's link to a primordial, primate ancestor broadened the definitions of both categories. The woodcuts of dogs and apes, along with the self-directed photographs by Rejlander, helped Darwin draw similarities and distinctions between the two groups. The book's collection of images demonstrated that both humans and animals express emotions. Yet at the same time, they illustrated that the distinctly human state of self-awareness enabled the wilful repression or "acting out" of certain expressions.

[483] Darwin, *Expression*, 302; 303.

In *Expression*'s twelfth chapter, Darwin used Browne's photograph of an "insane" woman and Duchenne's photographs of the old toothless man to advance this project. By transforming these photographs into woodcuts, and thus visually linking them to the woodcuts of animals in the first section of the book, Darwin connected the acute emotions of humans to those of animals. As this chapter demonstrates, Darwin's manipulation of Duchenne's plates was a deliberate decision made to illustrate the old man's descent into *terror*, *horror*, and *agony* – emotions whose expressions Darwin believed were evidence of our connection to a primordial ancestor shared with animals. By removing Duchenne and his scientific apparatus from the woodcuts, the old man's horrified faces are presented as evidence of human expression's origins in our primordial "animal" past.

CONCLUSION

"… looks like Grandpa Joe."

elidunbar, Instagram

Duchenne's photographs and the woodcuts Darwin made after them continue to circulate amongst lay audiences today. They are shared across apps, such as Instagram and Twitter, where users add their witty and, at times, callous observations. On an Instagram post by vault_editions that reproduces the woodcut *Horror and Agony* from Darwin's *Expression*, one user compares the old man photographed by Duchenne to Grandpa Joe, a well-loved character from Roald Dahl's children's novel, *Charlie and the Chocolate Factory*. More users join in on poking fun at Duchenne's model: venti_americano writes "Jim Carrey?," likening the old man's expressions to the exaggerated faces made by the famous Canadian comedian, and _michael_7 simply posts a long string of laughing emojis. Other Instagram users wonder why these images were created in the first place. Without the context provided in *Mécanisme* and *Expression*, or the historical framework from which to understand them, the arguments Duchenne and Darwin made through these images are largely lost.

When Duchenne's photographs are shared on these platforms, much of the discussion tends to be about what contemporary viewers see as the unsettling nature of his method of localized electrization. In a Twitter post that reproduces *Mécanisme*'s Plate 64 (Fig. 3), user WstLondonGarden writes, "#FunFact: this is Neurologist Duchenne de Boulogne working in 1862 to understand facial expression by electrocuting a man's face. This must be his OMG expression." In another post that reproduces the same plate and also incorrectly describes Duchenne as "electrocuting" his model, several users comment on the disturbing character of the photograph: JFarles writes "doesn't look very pleasant" and anikas_h sarcastically comments that the image is "definitely not at all creepy, unsettling, or morally questionable." While Duchenne's photographs are, indeed, alarming, the precise purpose for their production – to reveal the boundaries between the individual muscles of the human face – is missing when they are buried in the endless feeds of social media.

The relative illegibility of these decontextualized images testifies to the importance of the viewing practices established within *Mécanisme* and *Expression*. In other words, the didactic functions that these photographs and prints served for Duchenne and Darwin are disrupted when they are removed from the frameworks of their respective texts. As this dissertation has

demonstrated, the conditions for the intended interpretations of these images were established by the authors' presentational strategies and viewing instructions. Their chosen display modes and efforts to operationalize viewing processes activated their images' epistemological potential.

The social media posts cited above demonstrate that the photographs and woodcuts of the old man do not carry out their intended didactic objectives in isolation. For example, the woodcut from *Expression* shared by vault_editions does not communicate that, for Darwin, the look of horror pictured on the old man's face was meant to evince our connection to a primordial ancestor shared with animals. The "work" that this image does for Darwin's argument was made possible by his strategic use of media and the way he narrativized the evolution of human expression. Without this larger framework wherein image and text come together to communicate meaning, the woodcut may take on an entirely new life devoid of its application in support of Darwin's theory.

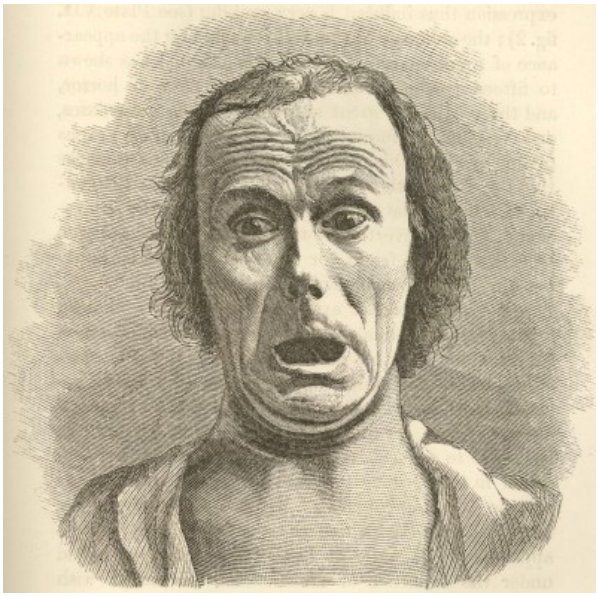
As this dissertation has shown, the pictures of the old man at the Salpêtrière serve as both specimens and evidence in *Mécanisme* and *Expression*. Moreover, the photographs' evidential value is realized through the reader's guided engagement with them. While Duchenne implored his audience to explore his photographs with their hands to reveal the boundaries that separate the muscles of the face, Darwin invited his readers to draw similarities and distinctions between individual specimens through the arrangement of composite photographic plates and the strategic use of two distinct forms of media. As has been demonstrated, the didactic functions that the images of the old man serve for Duchenne and Darwin are facilitated by how they are presented – they operate according to the strategies of display deployed by the texts in which they are situated.

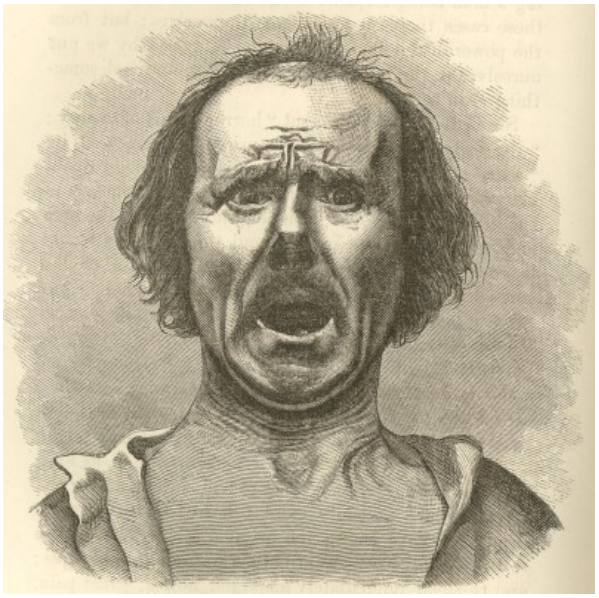
Further, neither *Mécanisme* nor *Expression* is a closed system; both texts embrace broader nineteenth-century conventions in art, photography, visual culture, and science. Darwin and Duchenne drew upon historically and culturally specific viewing practices and modes of display that were already familiar to their readerships. The mutually-constitutive relationship between vision and touch presumed in Duchenne's viewing instructions mirrored the practices of viewing daguerreotypes and tactually exploring three-dimensional models in anatomical education. In a similar manner, the process of cognitive synthesis enabled by the photographs' arrangement on Plate III of Darwin's *Expression* mimicked the pre-existing Victorian practice of viewing family albums of *cartes-de-visite*. Moreover, the use of woodcuts and photographs to

draw connections and distinctions between humans and animals in *Expression* embraced the traditions of illustrated natural history books and theatrical photography.

Ultimately, the images' epistemological functions and their capacity to support Duchenne's and Darwin's arguments relied on the specific material contexts of *Mécanisme* and *Expression* as well as the larger cultural and historical contexts in which these publications circulated. While this dissertation has explored how display strategies and interactive processes of viewing operated within these two seminal later-nineteenth century texts on emotional expression, such considerations are undoubtably pertinent to other areas of study as well. In the age of digitization and image sharing platforms, expert and lay audiences alike are regularly confronted with decontextualized images. Removed from the material, cultural, and historical contexts in which they were originally published, their meanings may be transformed or altogether lost. Presentational formats and use patterns are determined by user interface designers and algorithm writers who, much like Duchenne and Darwin, aim to operationalize the viewing process to incite a particular modes of viewer engagement. As Darwin's repurposing of Duchenne's photographs makes plain, the presentational format in which an image is displayed can significantly alter the message it communicates. By examining the shifting meanings of Duchenne's photographs of the old toothless man in *Mécanisme* and *Expression*, this dissertation maps the story of how strategies of display shape the ways in which viewers derive messages from these images.

FIGURES





Left: Fig. 1. James Davis Cooper after Dr. Duchenne de Boulogne, *Terror*, 1872.
Right. Fig. 2. James Davis Cooper after Dr. Duchenne de Boulogne*, Horror and Agony*, 1872.

Fig. 3. Dr. Duchenne de Boulogne, Plate 64 in *Mécanisme de la Physionomie Humaine*, 1862.
Proof on salted paper with protective layer. 23 x 16.8 cm.

Fig. 4. Dr. Duchenne de Boulogne, Plate 33 in *Mécanisme de la Physionomie Humaine*, 1862.
Proof on albumen paper. 27.7 x 17.5 cm.

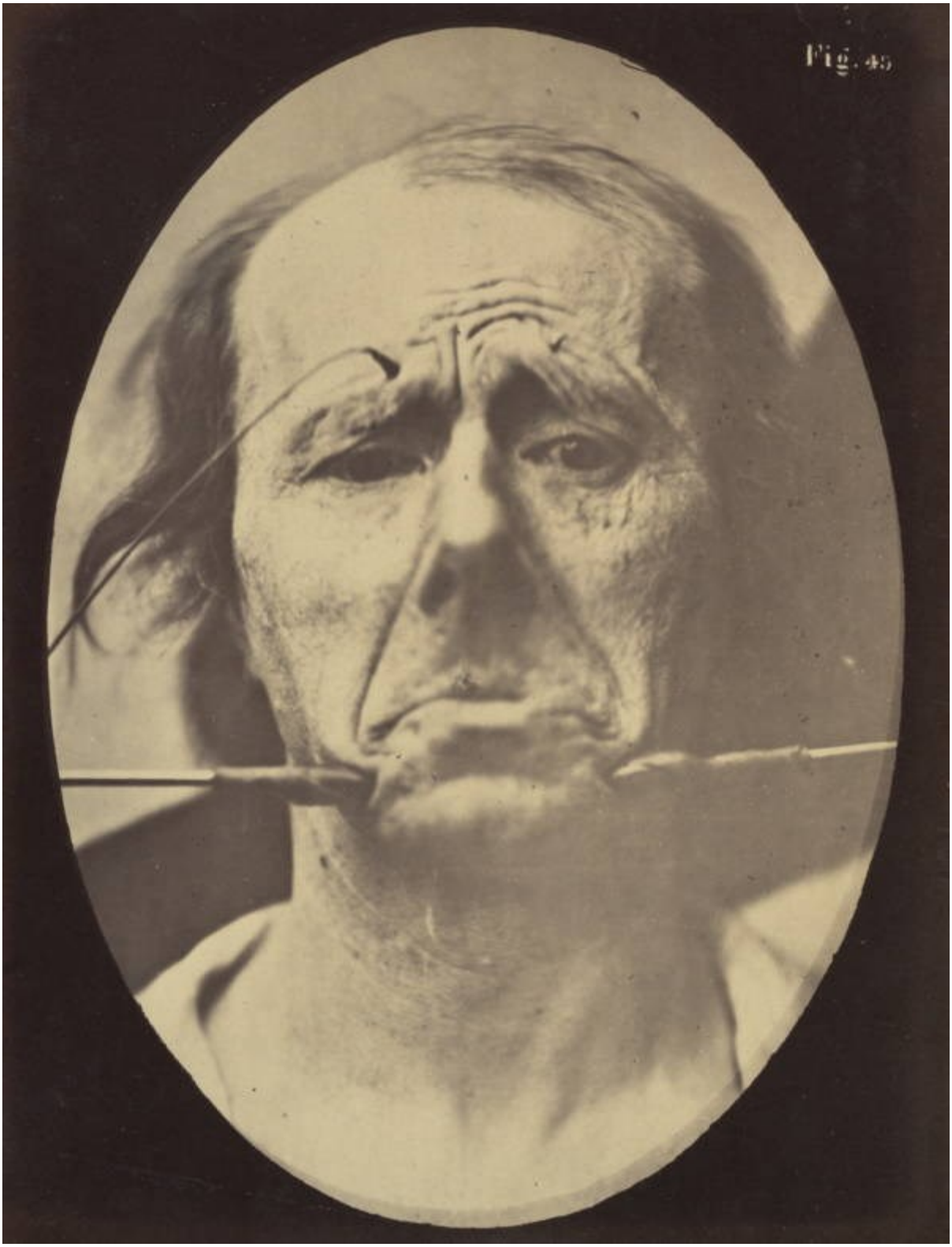


Fig. 5. Dr. Duchenne de Boulogne, Plate 45 in *Mécanisme de la Physionomie Humaine*, 1862.
Proof on salted paper with protective layer. 30 x 21.8 cm.

Fig. 6. Dr. Duchenne de Boulogne, Plate 27 in *Mécanisme de la Physionomie Humaine*, 1862.
Varnished photographs mounted on canvas and wooden frame, removeable cover. 30 x 21.8 cm.

Fig. 7. Henry Testelin after Charles Le Brun, *The Expressions*, 1696.
Etching. 33.1 x 45.1 cm.

Left: Fig. 8. Detail: Henry Testelin after Charles Le Brun, *The Expressions*, 1696.
Right. Fig. 9. Detail: Henry Testelin after Charles Le Brun, *The Expressions*, 1696.

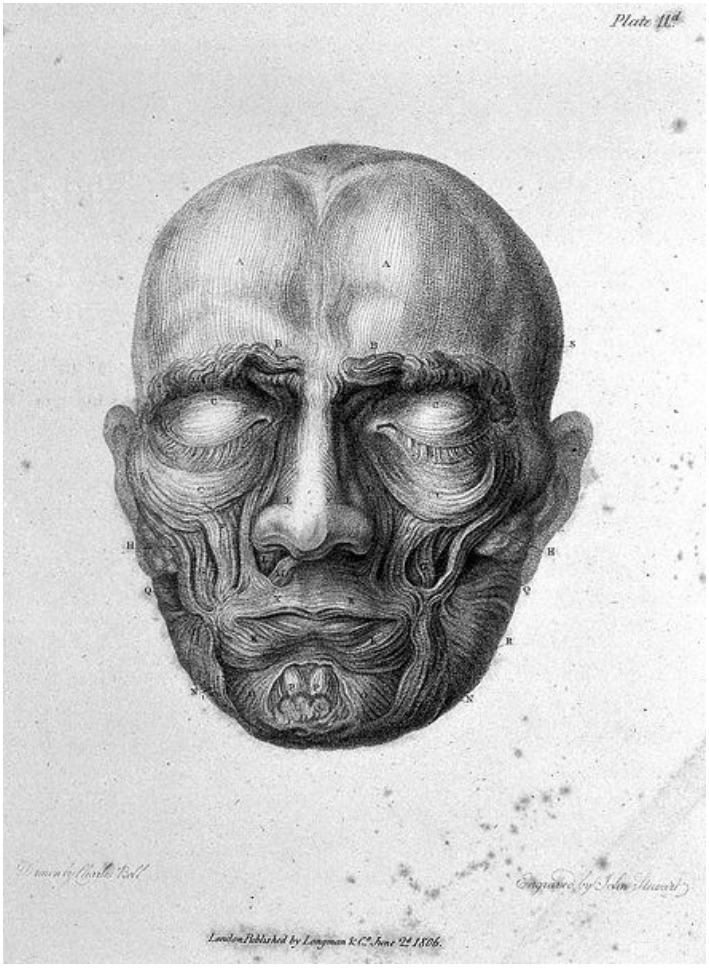
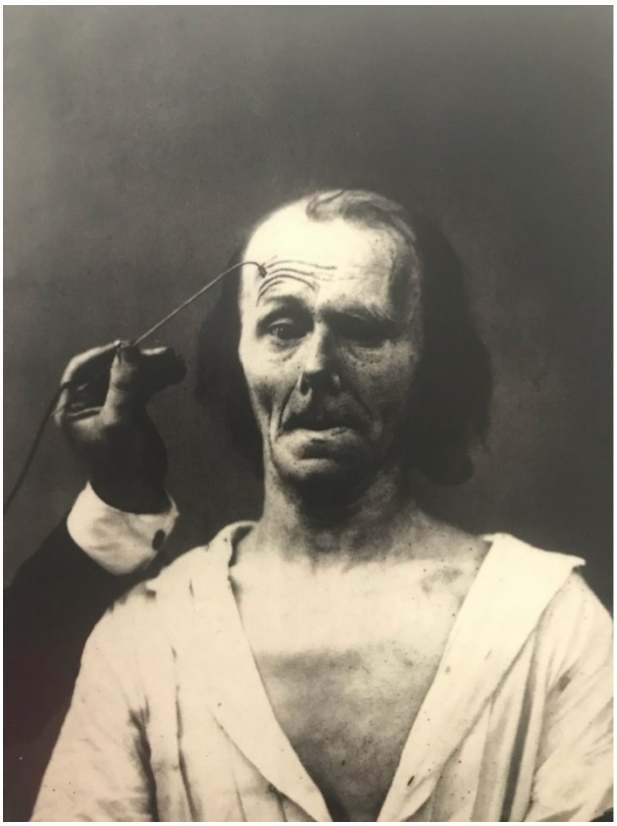
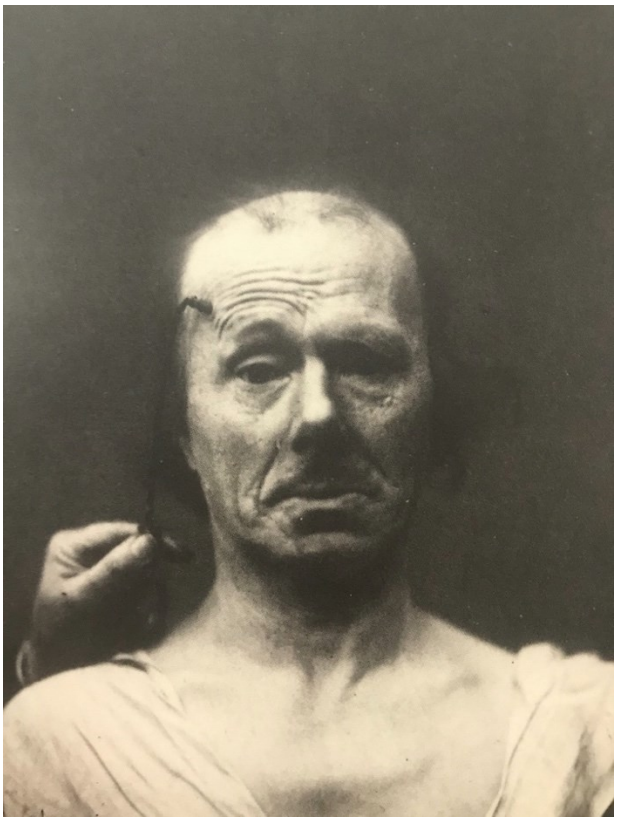


Fig. 10. Charles Bell, *Facial Muscles Used in Expression*, 1806.

Fig. 11. Dr. Duchenne de Boulogne, Plate 18 in *Mécanisme de la Physionomie Humaine*, 1862.
Proof on salted paper with protective layer. 22.1 x 16.3 cm.

Fig. 12. Rembrandt van Rijn, *Portrait of a Man*, 1632.
Oil on wood. 75.6 x 52.1 cm. The Metropolitan Museum of Art.

Fig. 13. Rembrandt van Rijn, *The Anatomy Lesson of Dr. Nicolaes Tulp*, 1632.
Oil on wood. 216.5 x 169.5 cm.

Left: Fig. 14. Dr. Duchenne de Boulogne, Plate 7 in *Mécanisme de la Physionomie Humaine*, 1862.
Proof on salted paper with protective layer. 22.5 x 16.3 cm.

Right. Fig. 15. Dr. Duchenne de Boulogne, Plate 9 in *Mécanisme de la Physionomie Humaine*, 1862.
Proof on salted paper with protective layer. 22.4 x 16.6 cm.

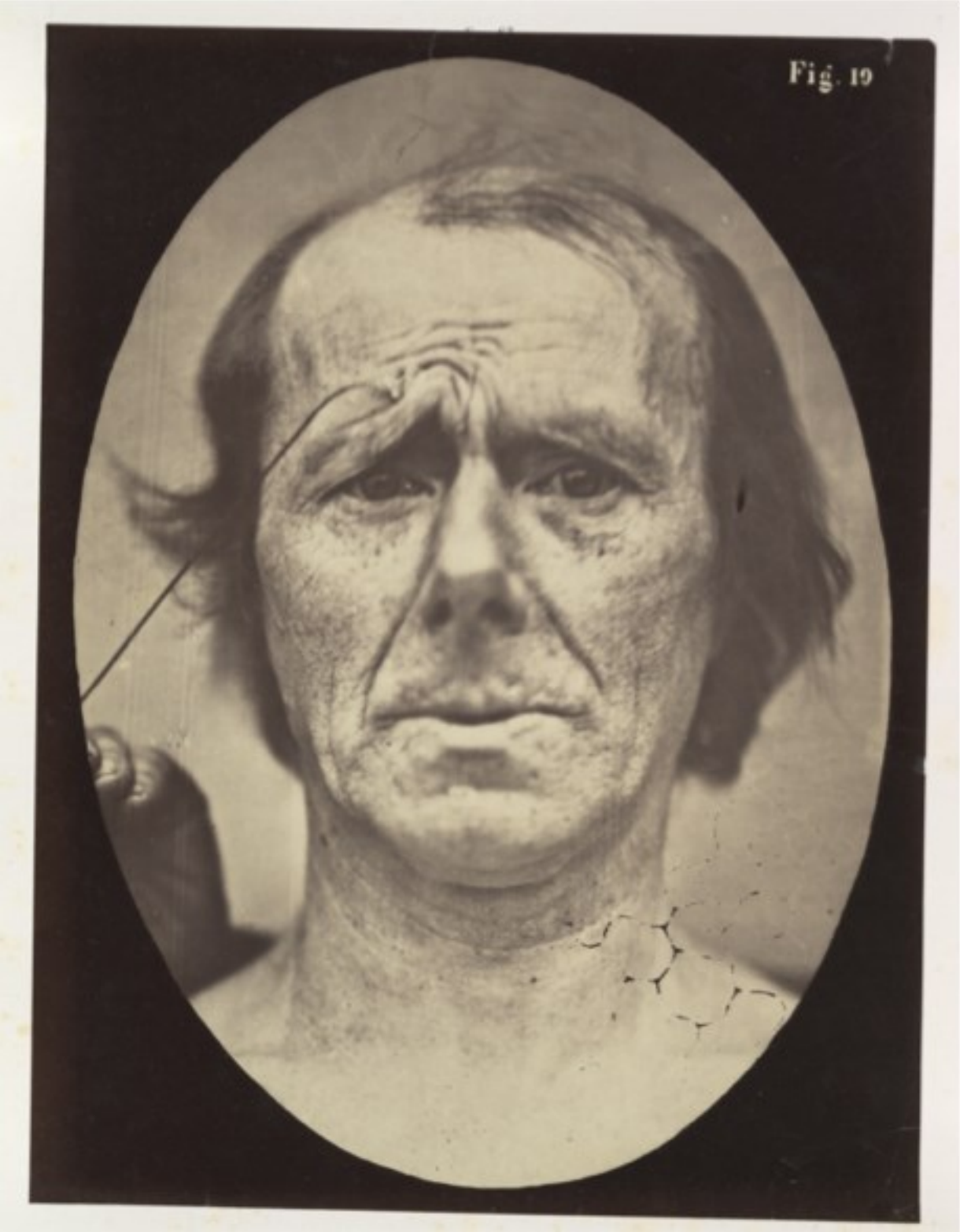
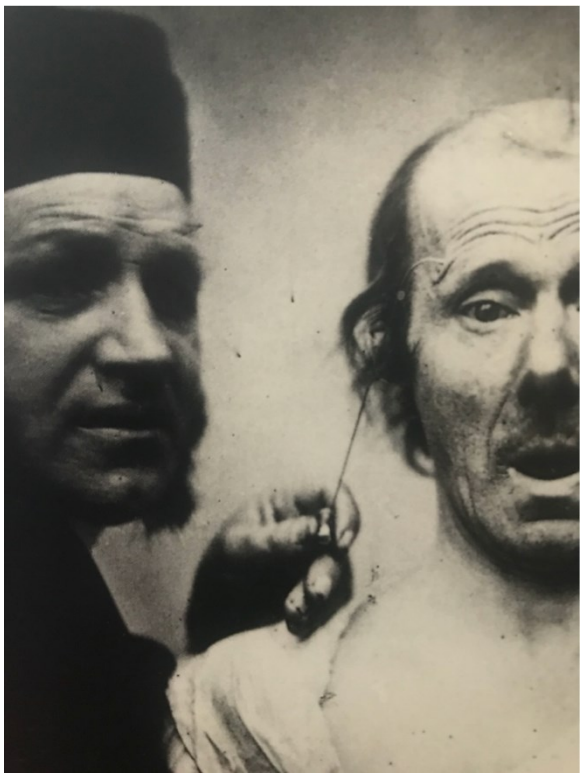
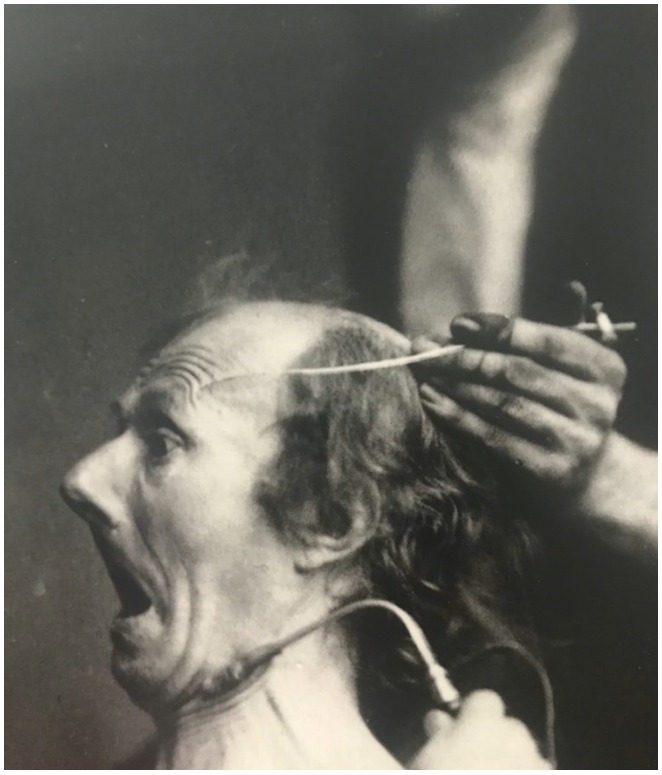


Fig. 16. Dr. Duchenne de Boulogne, Plate 19 in *Mécanisme de la Physionomie Humaine*, 1862.
Proof on salted paper with protective layer. 30 x 27.8.

Fig. 17. Dr. Duchenne de Boulogne, Synoptic Plate 1: Figs. 3–12, in *Mécanisme de la Physionomie Humaine*, 1862. Proofs on albumen paper. Sheet: 27.5 x 17.2 cm. Photographs: 13.6 x 10.8 cm.

Fig. 18. Vasseur-Tramond, *Wax Anatomical Model Lymph Nodes of the Neck*, c. 19th century. Mütter Museum of the College of Physicians of Philadelphia.

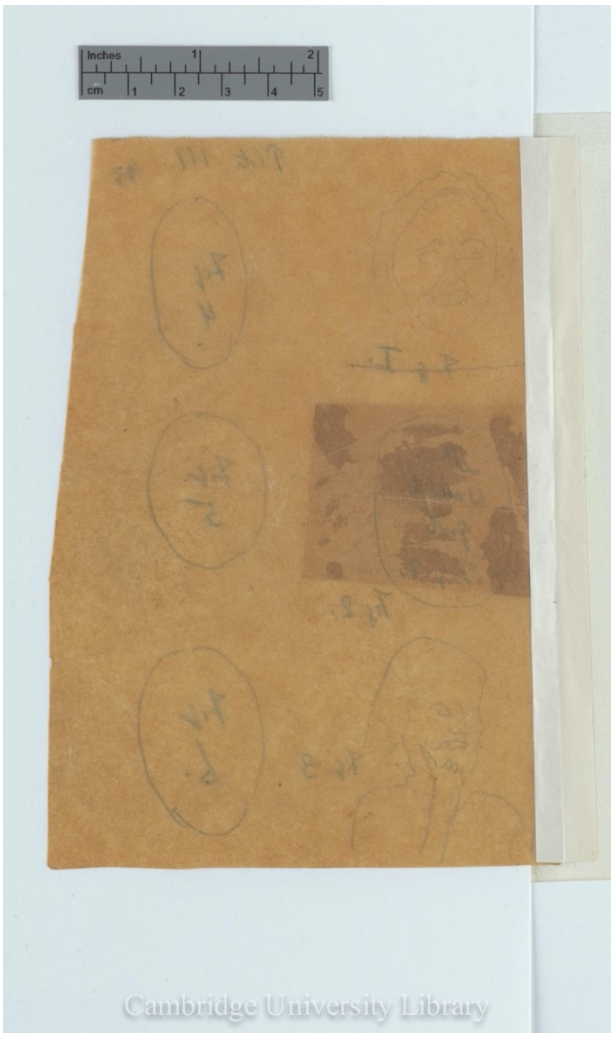


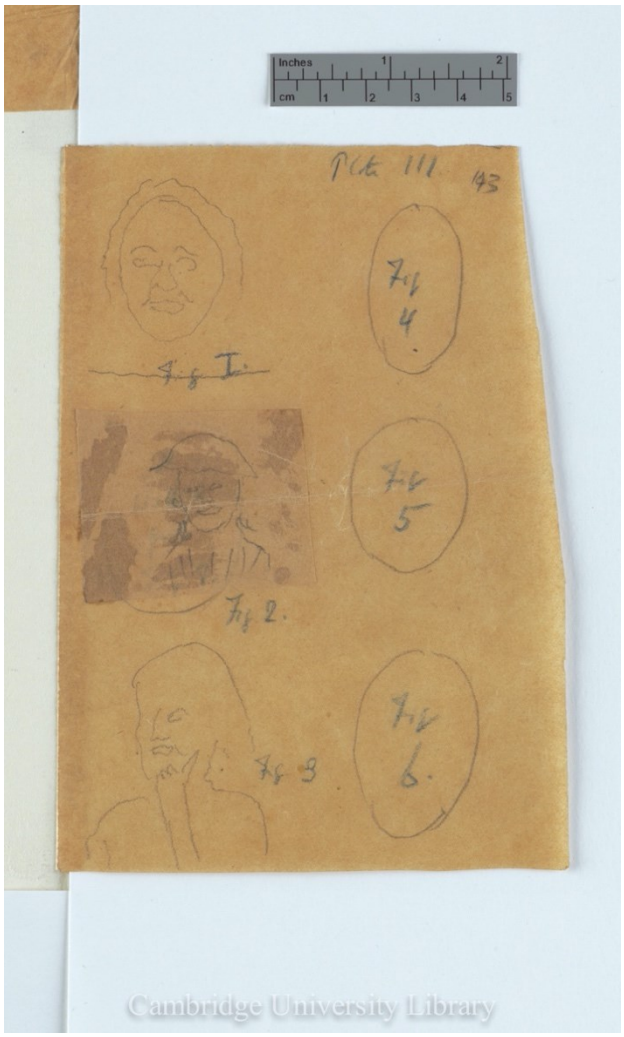


Left: Fig. 19. Detail: Dr. Duchenne de Boulogne, Plate 56 in *Mécanisme de la Physionomie Humaine*, 1862. Proof on salted paper with protective layer. 22.4 x 16.5 cm.

Right. Fig. 20. Detail: Dr. Duchenne de Boulogne, Plate 62 in *Mécanisme de la Physionomie Humaine*, 1862. Proof on salted paper with protective layer. 22.6 x 16.6 cm.

Fig. 21. Plate III in Charles Darwin, *The Expression of the Emotions in Man and Animals,* 1872.





Left: Fig. 22. Charles Darwin, *Annotated Sketches for Plate III (front),* n.d. Cambridge University Library.
Right: Fig. 23. Charles Darwin, *Annotated Sketches for Plate III (back),* n.d. Cambridge University Library.

Fig. 24. Dr. George Charles Wallich, *Portrait of Beatrice Wallich*, 1871. Cambridge University Library.

Fig. 25. Oscar Gustave Rejlander, *Portrait of a Girl*, 1872.
Cambridge University Library.

Fig. 26. Oscar Gustave Rejlander, *Portrait of a Girl*, 1872.
Cambridge University Library.

Fig. 27. Oscar Gustave Rejlander, *Unkown Girl*, c. 1860–66.

Fig. 28. Oscar Gustave Rejlander, *Lady Antonia Lillian Adam (née Maude)*,1866.

Fig. 29. Plate I in Charles Darwin, *The Expression of the Emotions in Man and Animals*, 1872.

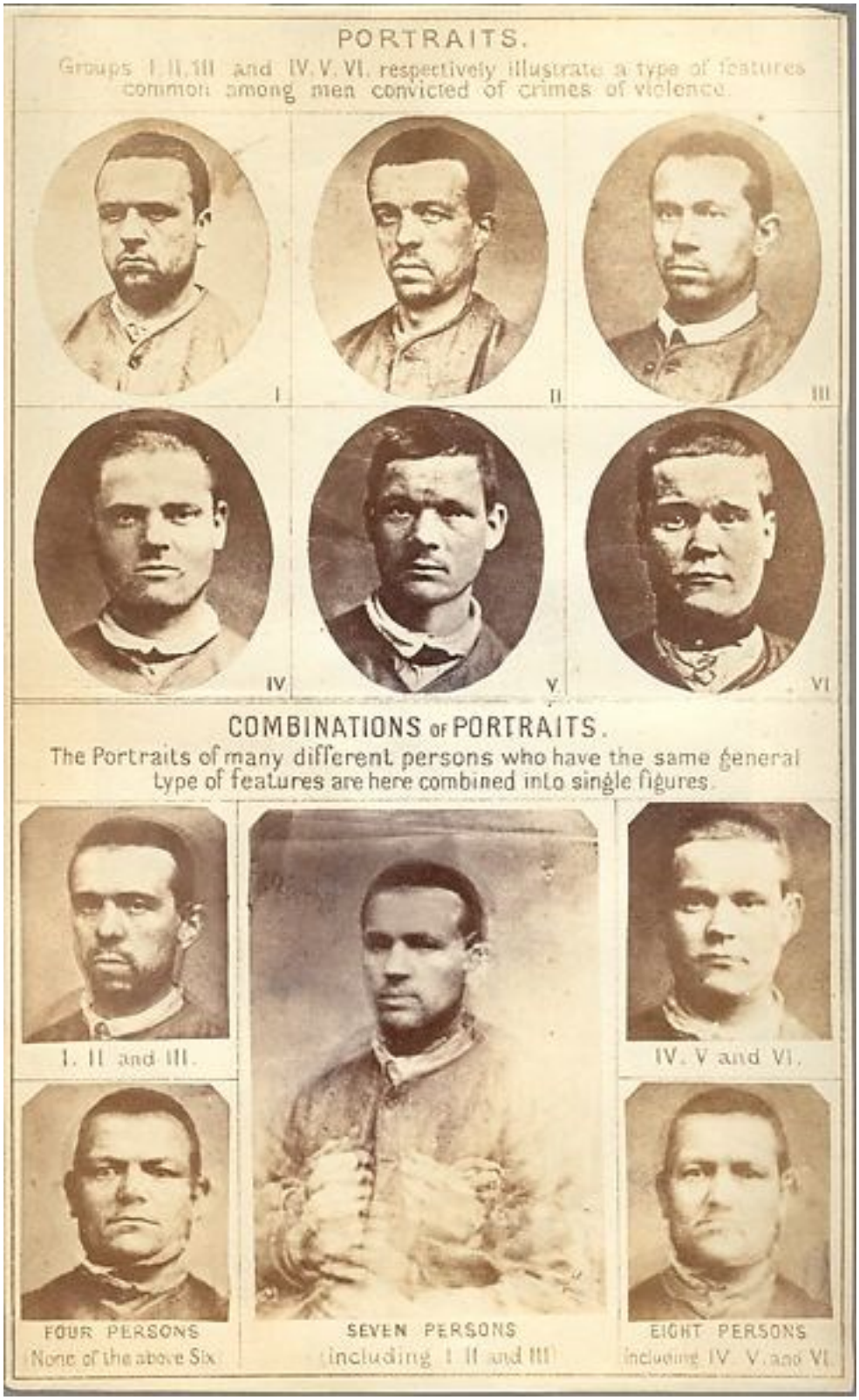


Fig. 30. Francis Galton, *Composite Image of Criminal Types,* 1877.

Fig. 31. *Presentation Album of Photographs of Scientists from the Netherlands*, 1877. Cambridge University Library.

Fig. 32. *Presentation Album of Photographs of Scientists from the Netherlands*, 1877. Cambridge University Library.

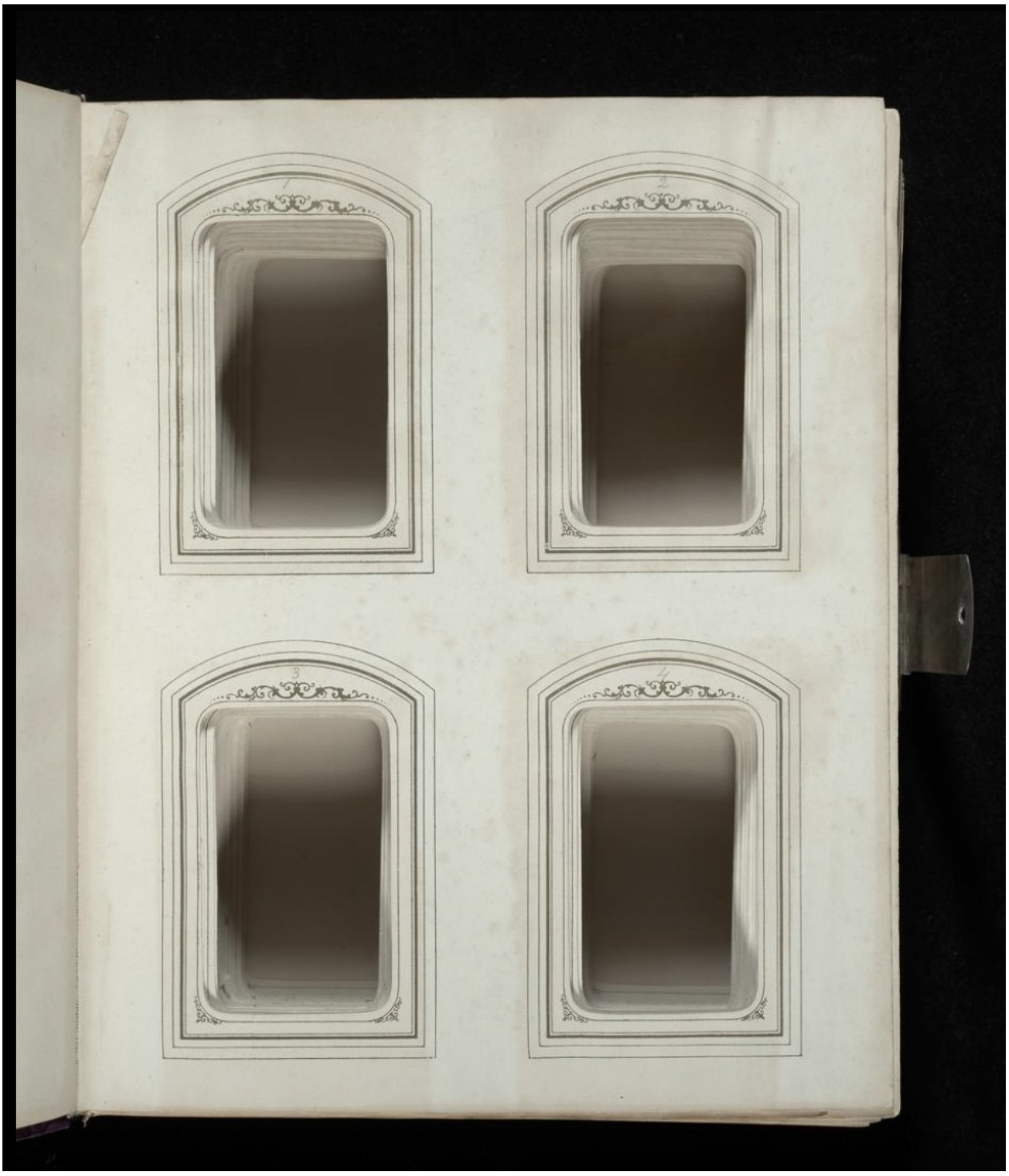


Fig. 33. *Presentation Album of Photographs of Scientists from the Netherlands*, 1877.
Cambridge University Library.

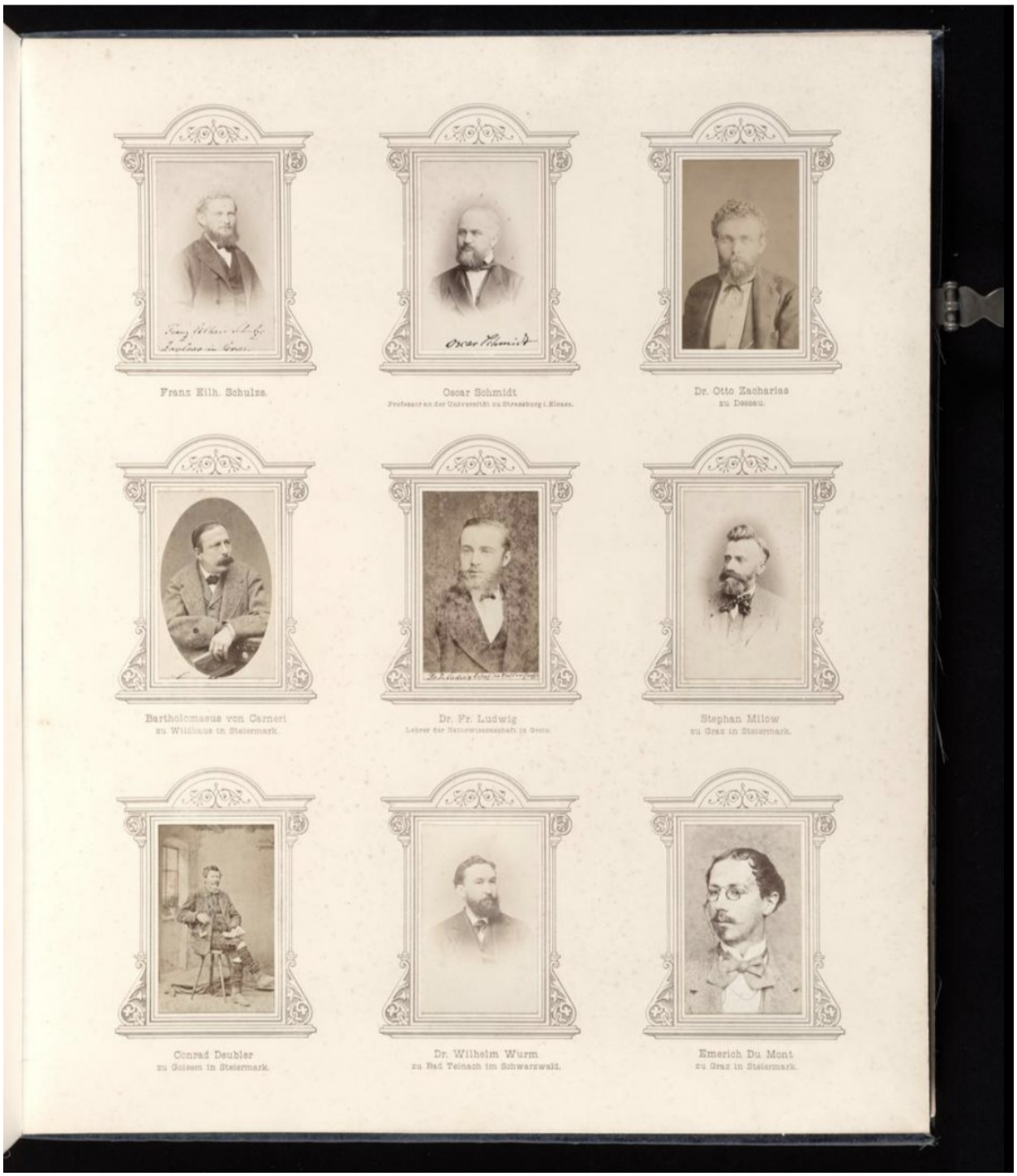


Fig. 34. *Album of Portrait Photographs Presented to Darwin by German and Austrian "Men of Science*," 1877. Cambridge University Library.

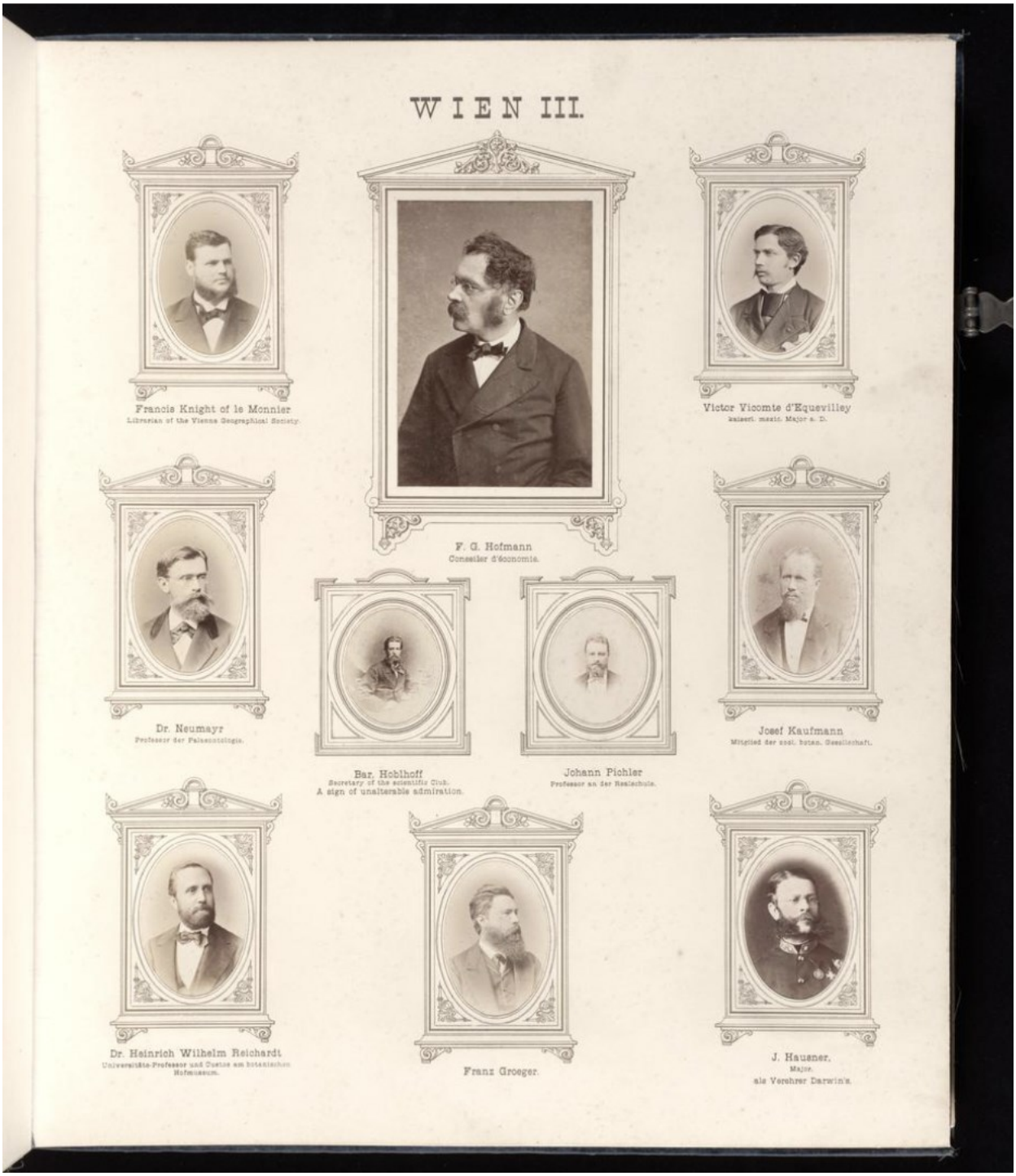


Fig. 35. *Album of Portrait Photographs Presented to Darwin by German and Austrian "Men of Science*," 1877. Cambridge University Library.

Fig. 36. John Jabez Edwin Mayall, *Queen Victoria and Prince Albert,* 1860.

Fig. 37. *Portrait of Carl Kraus,* c. 1878.

Left: Fig. 38. Detail: Dr. Duchenne de Boulogne, Plate 61 in *Mécanisme de la Physionomie Humaine*, 1872.
Right: Fig. 39. Detail: Dr. Duchenne de Boulogne, Plate 65 in *Mécanisme de la Physionomie Humaine*, 1872.

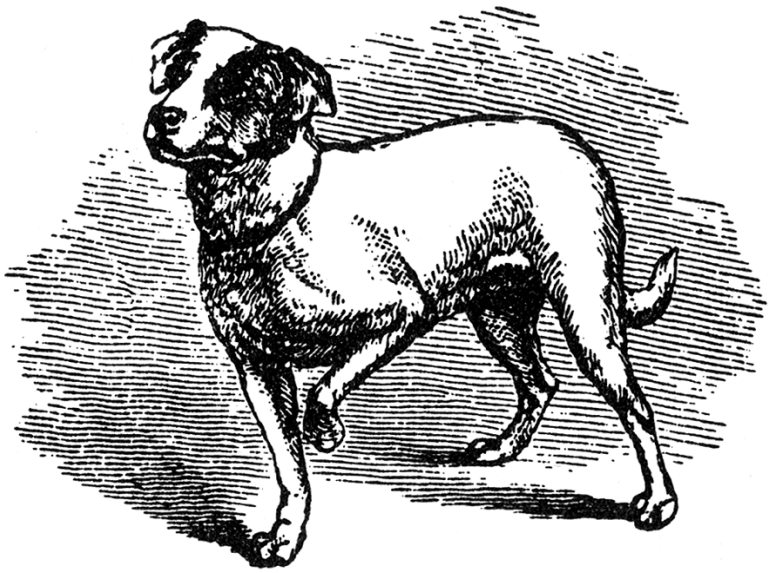


Fig. 4.—Small dog watching a cat on a table. From a photograph taken by Mr. Rejlander.

Fig. 40. James Davis Cooper after Oscar Gustave Rejlander, *Small Dog Watching a Cat on a Table*, 1872.

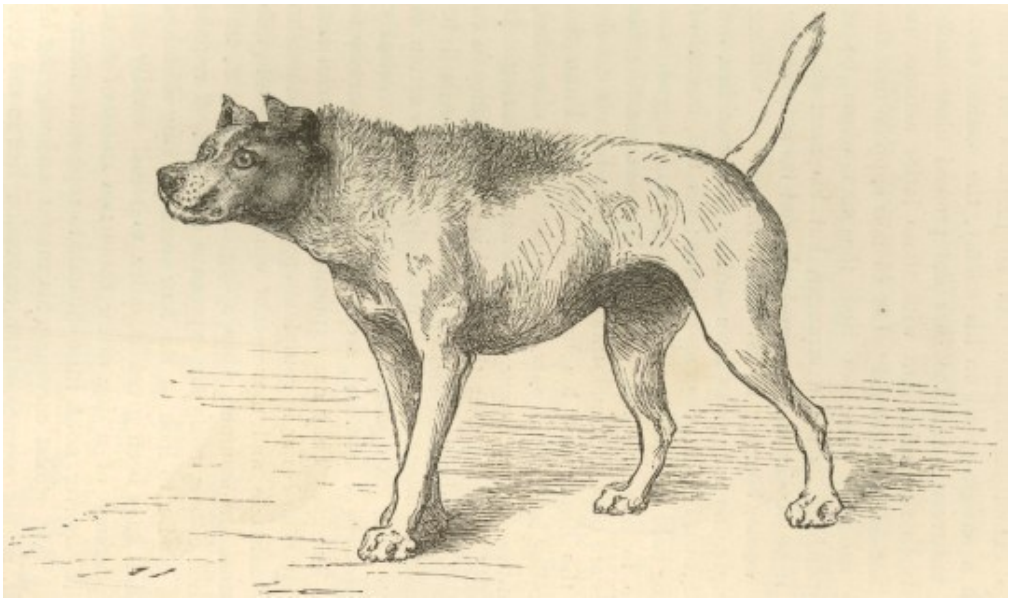


Fig. 41. James Davis Cooper after Briton Rivière, *Dog Approaching Another Dog with Hostile Intentions*, 1872.

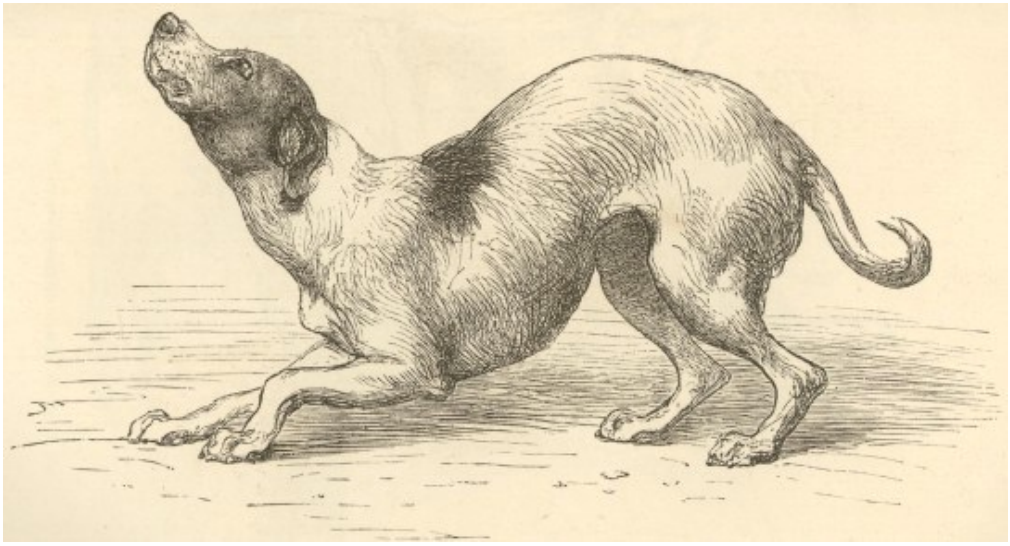
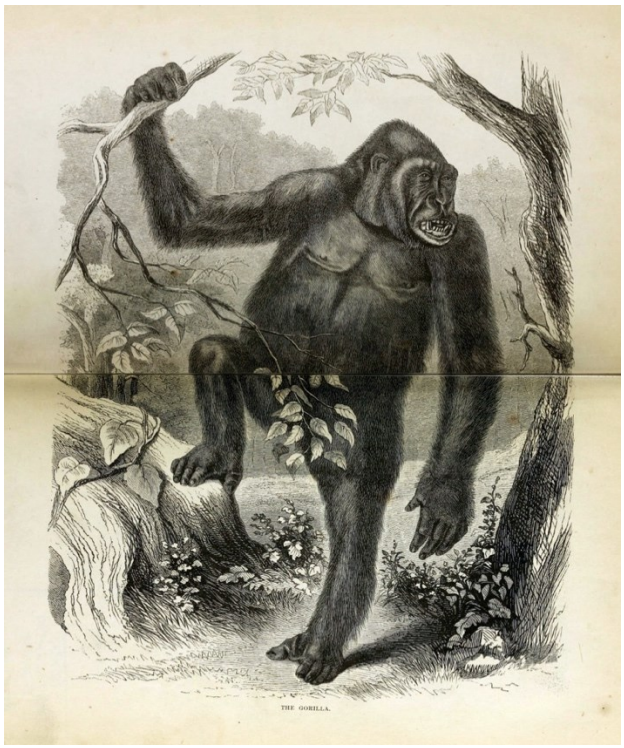


Fig. 42. James Davis Cooper after Briton Rivière, *The Same in a Humble and Affectionate Frame of Mind*, 1872.

Fig. 43. Thomas Bewick, *The Dog and the Shadow,* 1818.
Published in Select Fables of Aesop and Others, 1818.

Left: Fig. 44. James Davis Cooper after Joseph Wolf, *Cynopithecus Niger in a Placid Condition*, 1872.
Right: Fig. 45. James Davis Cooper after Joseph Wolf, *The Same When Pleased by Being Caressed*, 1872.




Left: Fig. 46. Joseph Wolf, *The Gorilla*, 1861. Frontispiece for Du Chaillu, *Explorations and Adventures in Equatorial Africa,* 1861.
Right: Fig. 47. Albrecht Dürer, *Adam and Eve*, 1504.

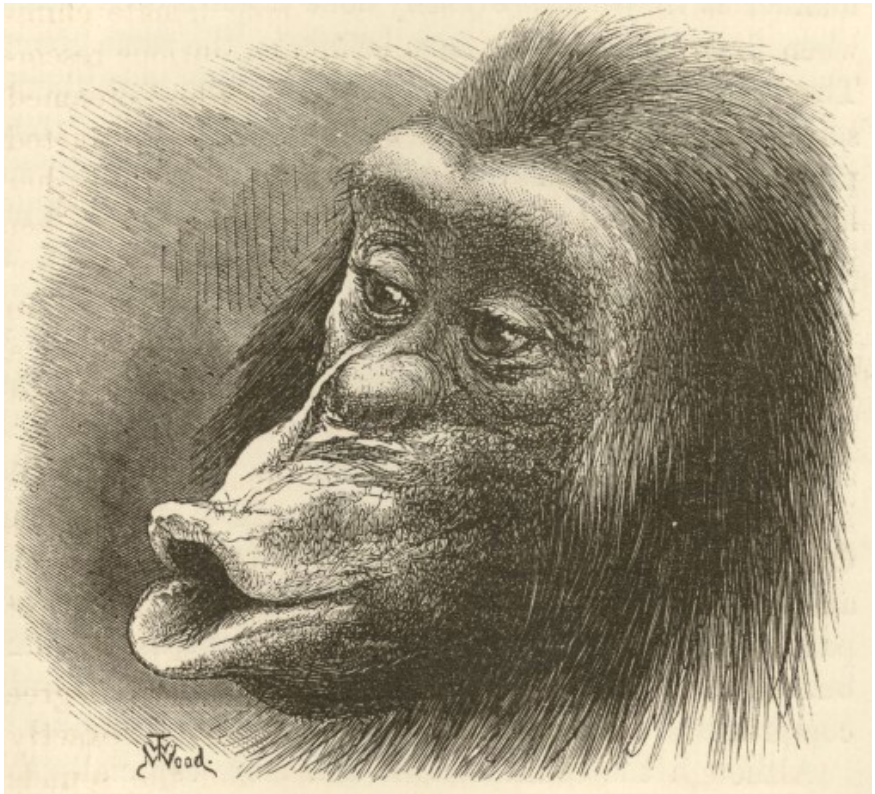


Fig. 48. James Davis Cooper after Thomas Wood, *Chimpanzee Disappointed and Sulky,* 1872.

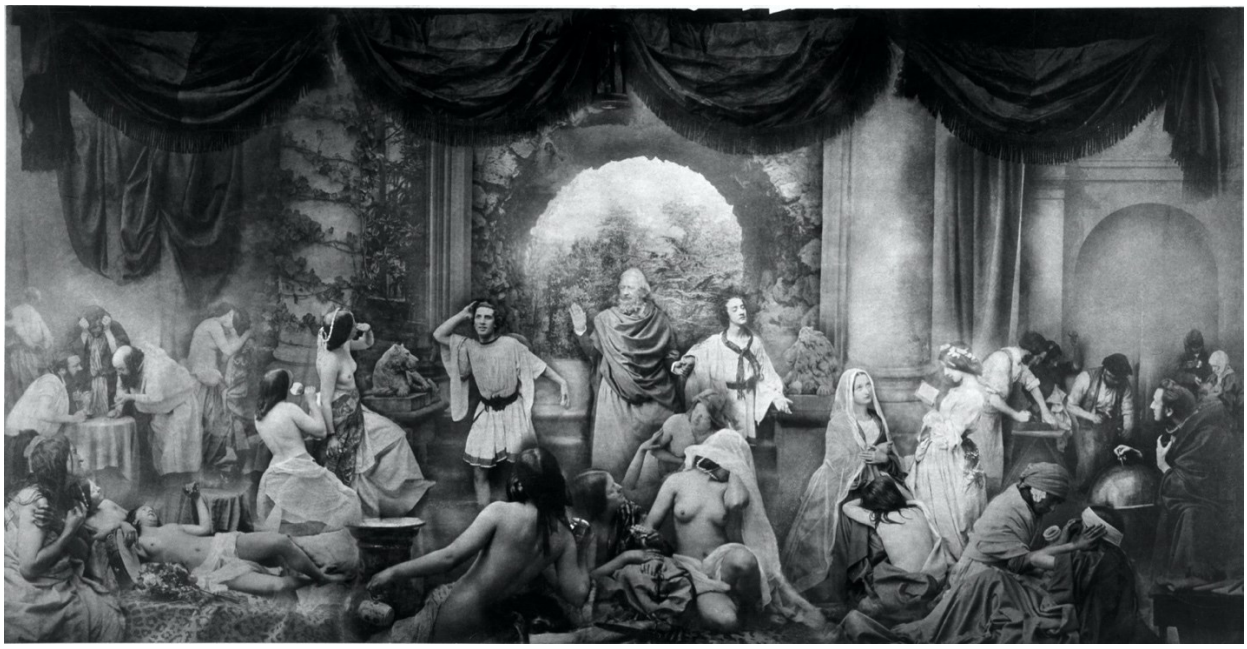


Fig. 49. Oscar Gustave Rejlander, *Two Ways of Life,* 1857.

Fig. 50. Oscar Gustave Rejlander c. 1871.
Cambridge University Library.

Fig. 51. Oscar Gustave Rejlander, *Shrugging the Shoulders*, 1872.

Fig. 52. Napoleon Sarony, *Charles Fechter in Costume for a Production of Hamlet*, c. 1870.
Silver gelatin print mounted on cardboard, 1.5 x 4 inches. MSCUA, University of Washington Libraries.

Fig. 53. Charles D. Fredricks & Co., *Daniel E. Bandmann in the Role of Narcisse in a Production for the Play Narcissa*, 1863.
Silver gelatin print mounted on cardboard, 2.5 x 4 inches. MSCUA, University of Washington Libraries.

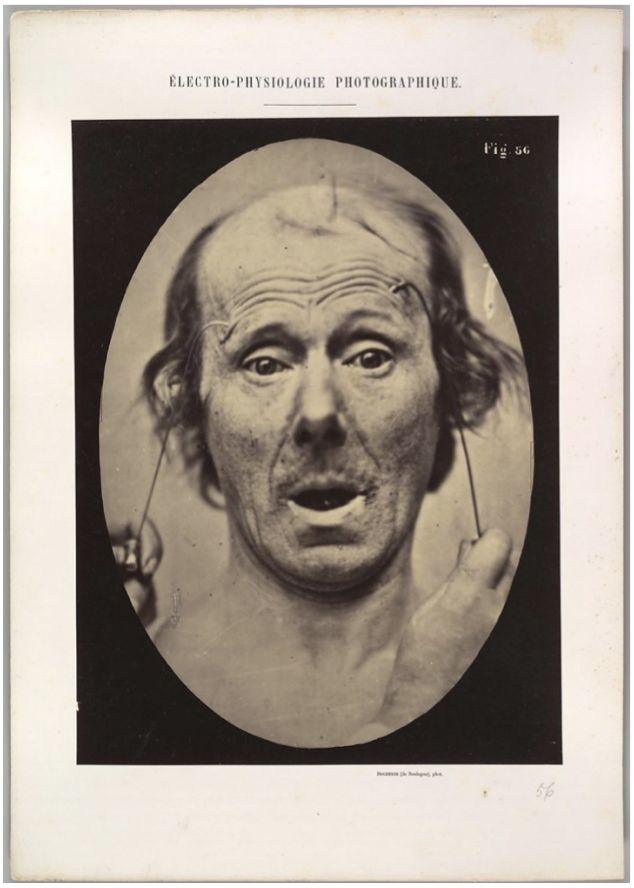


Fig. 54. Dr. Duchenne de Boulogne, Plate 56 in *Mécanisme de la Physionomie Humaine*, 1872.

Fig. 55. Oscar Gustave Rejlander, *Surprised Person,* 1872.

Fig. 56. Dr. James Crichton-Browne, *Euphoria, Hilarious Mania*, c. 1870. Cambridge University Library.

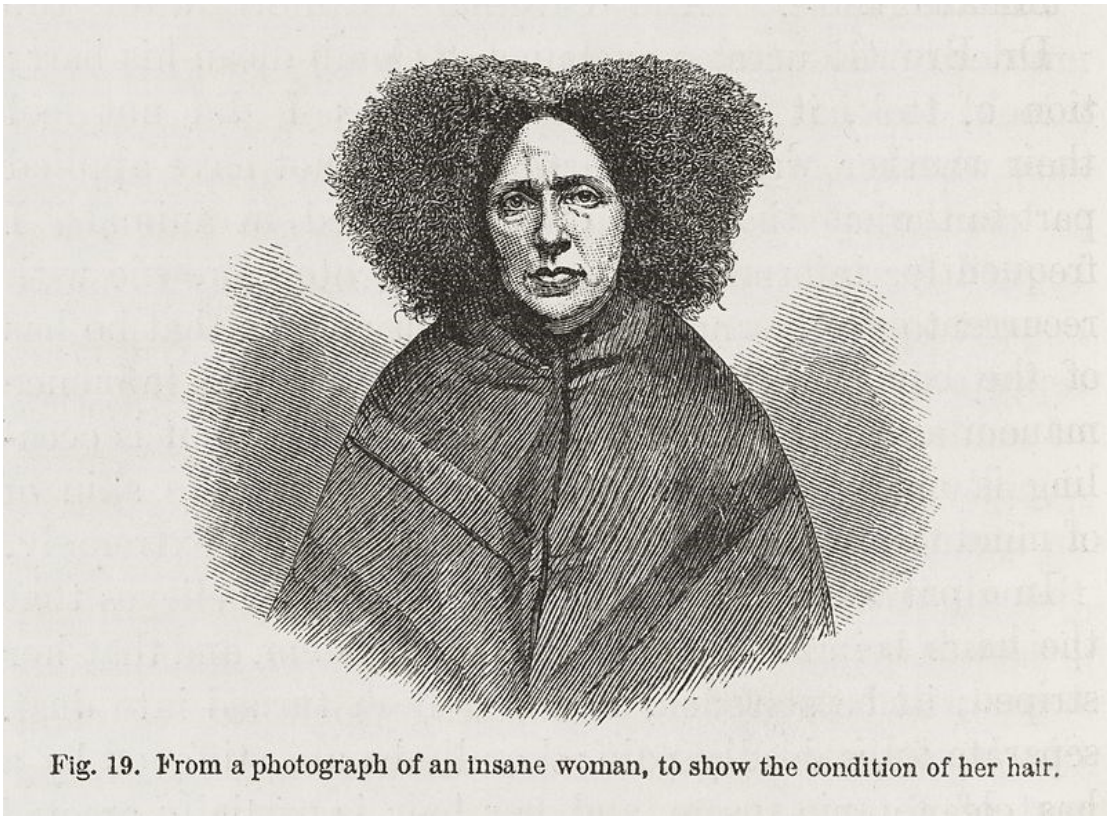


Fig. 57. James Davis Cooper after Dr. James Crichton-Browne, *From a Photograph of an Insane Woman, to Show the Condition of her Hair*, 1872.

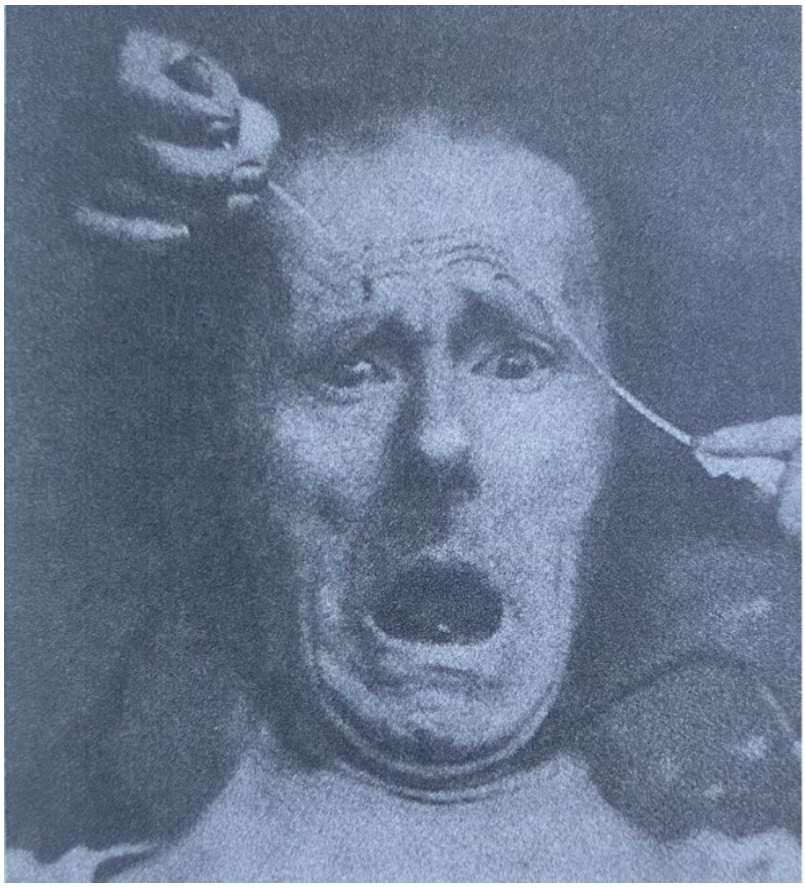


Fig. 58. Heliotype after Dr. Duchenne de Boulogne, *Great Mental Distress*, 1872.

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