

Degas the Sculptor: Innovative and Nontraditional

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It is unclear when Edgar Degas first began to make sculpture. Only one, *Little Dancer, Aged Fourteen*, was ever exhibited in his lifetime, in the sixth impressionist exhibition of 1881, and only those who were privileged to visit his studio knew of his devotion to the plastic arts. Yet in 1919 his dealer, Joseph Durand-Ruel, wrote that Degas “spent a good deal of time not only in the later years of his life, but for the past fifty years, in modeling in clay. Thus, as far as I can remember—that is to say, perhaps forty years—whenever I called on Degas I was almost as sure to find him modeling in clay as painting.”¹ Even after Degas’s death in 1917, when the contents of his studio were made public, the sculptures were often dismissed as models fashioned by an old man too blind to paint, and only recently has the interest in Degas as a sculptor truly sparked.²

The extent of Degas’s productivity as a sculptor is unknown as well. Much of the work crumbled in his studio or was destroyed by his own hand. Unlike Auguste Rodin (1840–1917), his contemporary, Degas never cast his sculptures in bronze, claiming that “it is a tremendous responsibility to leave anything behind in bronze—this medium is for eternity.”³ Instead, he chose wax as his medium.

However, while no bronze sculpture by Degas is known to have been cast in his lifetime, he was clearly interested in the casting process from a young age and was known to have cast in plaster and wax.⁴ Two letters written to his father in 1858 describe problems with plaster sculptures that were broken and being repaired by a molder.⁵ The correspondence is unclear on whether the damaged sculptures were created by Degas, or if they were purchased from an art store to be used as studio models. One could argue that having the sculptures repaired by a molder suggests that they were more important to Degas than studio models and could well have been his own. More importantly, however, upon Degas’s return to Paris from his first trip to Italy, he may have visited the Barbedienne foundry in 1859 or 1860, perhaps intending to cast the sculptures resulting from his Italian venture into bronze. The notation, “Barbedienne/ateliers/rue de Lancry 63,” in a sketchbook lists the address of the foundry itself, not the gallery located at 30 boulevard Poissonnière.⁶

Perhaps never entirely abandoning the idea of casting his waxes into bronze, Degas purportedly

visited the Hébrard foundry and its master founder Albino Palazzolo. In the mid-1870s, he refers to “M. Gonon” first at “21 Avenue du/Seine,” and again at “78 ou 80/rue de Sèvres.”⁷ Located at 80 rue de Sèvres was the Gonon foundry, renowned for its technical expertise and credited for reviving the lost wax casting process in France.⁸ The fact that the foundry prided itself on technique is precisely what attracted Degas. Eugène Gonon, its master founder during Degas’s lifetime, was sketched by Degas;⁹ the two clearly knew one another.

Living in an era of rapid technical and scientific development, Degas was immersed in a culture that equated experimental procedure with intellectual acumen. “A scientific framework—whether technical, methodological or thematic—was a sign of modernity in art in this time.”¹⁰ The choice of a malleable medium such as wax or combinations of wax and modeling clay found in Degas’s works reflects this duality of experimental practice and the quest for perfection.¹¹ Wax can be easily modeled or re-modeled while retaining its pliability, yet at the same time it provides a surface that can be carved and finished with the finest precision. Although Degas’s original sculptures are usually referred to simply as “waxes,” the term is misleading. Not a single sculpture has been found to be exclusively of wax and none was intended to be sacrificed and melted during lost-wax casting. Degas’s quixotic approach to his sculptures, filling them with any material on hand, including cork, wood, paper, or paint brushes, or using cloth, metal, porcelain, paper, or color on the exterior to achieve a desired appearance, establishes his three-dimensional works among the most avant-garde efforts of the nineteenth century.

Many lacunae surround the history of Degas as a sculptor and, as a result, no definitive chronology of his sculpture has ever been realized. Despite the obvious difficulties of dating Degas’s three-dimensional work, this essay aims to chronicle a stylistic and technical evolution of his works with a more precise range of dates than has been attempted previously. Using the sculpture itself as a primary resource and focusing on the role of interior metal armatures in the formation of the sculpture, the combinations of materials employed, and the degree of surface finish, we have been able to propose a chronology based on Degas’s own working methods. In many cases, Degas’s personal notebooks as well as literature about the artist support this chronology. The majority of the examples cited in this article refer to the horse sculptures with a few dancers and bathers included. A complete study of the Degas sculptures in the collections of the National Gallery of Art is forthcoming.

Degas’s interest in three-dimensional work can be traced to his Italian years, from July 1856–

March/April 1859. As early as 1857, Degas sketched sculptural armatures.¹² Notebooks from this period are filled with drawings of classical sculpture. His earliest extant sculpture, *Study of a Mustang* (fig. 1), dates to 1859–1860, shortly after his return to France. The pose of the *Mustang*, clearly derived from classical antiquity, recalls that of the standing horse in the painting *Sémiramis Building a City* (Musée d'Orsay, Paris), which, according to Degas's contemporary, the painter James Tissot (1836–1902), was not yet completed in 1862.¹³ Indeed, a drawing of the same horse, *Etude de cheval et group de suivantes* (Musée du Louvre, Paris), is generally dated 1860–1862, a range consistent with the date of *Study of a Mustang*.¹⁴ Charles Millard has further linked the pose with a student sketch of a classical relief by Degas.¹⁵

However, the horse's tail on the sculpture appears strikingly different from the drawing and painting, where the root is set noticeably high on the croup. On the sculpture, the tail is perpendicular to the haunches. This distinction might be explained by the sculpture's x-radiograph (fig. 2), which shows a repair to the tail. Originally it may have resembled that of the horse in the student drawing, as a section of braided wire hangs along the contour of the haunches, and Degas himself may have reworked its position. The wire armature also suggests that Degas may have intended the tail to be longer than it is today, perhaps mimicking the tail of the horse in *Etude de cheval et group de suivantes*. Degas ultimately folded the internal wire armature over itself for the tail's current length.

The radiograph of *Study of a Mustang* provides an interior glimpse into Degas's approach to sculpture. As was typical of works in clay or wax, the piece was roughly modeled over an inner wire structure. What distinguished Degas's sculptural works from those of many of his contemporaries is that he not only combined clay and wax, but he often bulked the interiors with cork or easily available household materials in order to save money. In the case of *Study of a Mustang*, wine bottle corks, which are lightweight, inert, and readily available, are held in place with modeling clay and are used to fill the rib cage and stomach. Both the green clay and a wine bottle cork are visible on the exterior of the statuette under the rib cage.

The fabrication of *Study of a Mustang* as observed in the x-radiograph is typical of early sculptures modeled by Degas. Characterized by tightly wrapped and intricately twisted wires, a labor-intensive contour of the entire horse is suggested, complete with an arched neck and facial silhouette. A second sculpture from this period, *Horse at a Trough* (fig. 3), is dated by John Rewald to 1866–1868

based on the conviction that it served as a model for the horse in *Mademoiselle Fiocre in the Ballet "La Source"* (fig. 4), exhibited in the 1868 Salon.¹⁶ It is more likely, however, that the sculpture dates from the early 1860s and merely reflects Degas's interest in the pose of a grazing horse, as do numerous drawings from that time.

Rewald's observation is important, nonetheless, as *Horse at a Trough* does bear a striking resemblance to the horse in *Mademoiselle Fiocre in the Ballet "La Source,"* and it is quite possible that the statuette served as the inspiration for the horse in the painting. The statuette probably predates the painting, but it would be unfair to dismiss the wax horse as a mere model. The highly articulated surface, with the finely incised mane and carefully constructed angled base, indicates a finished work. The radiograph (fig. 5) reveals the intricate network of carefully wrapped and coiled armature wires to be similar to the construction of *Study of a Mustang*, a fact that also points to an early date.

Degas's choice of medium was not unique, although no one else incorporated the variety of materials found on both the interior and exterior of his works. Several of his contemporaries modeled and exhibited statuettes of wax horses, notably Joseph Cuvelier (d. 1870), about whom little is documented. Cuvelier is described as "l'ami de Degas"¹⁷ and is mentioned three times in Degas's notebooks.¹⁸ He exhibited two equestrian portraits in wax at the Salon of 1869.¹⁹ Furthermore, Degas and Cuvelier were both grappling with the subject of the fallen jockey in the mid- to late 1860s, and while no sculpture of a fallen jockey by Degas exists today, a number of his paintings and drawings of the subject survive. Many of the horses depicted with fallen jockeys are shown in a stylized flying gallop popularized by English sporting prints. In both sporting prints and works of the fallen jockey, the splayed posture was justified since the horse was clearing an obstacle and not galloping. Degas later acknowledged that he did not fully comprehend equine movement as evidenced in some of his early works: "even though I had the opportunity to mount a horse quite often, even though I could distinguish a thoroughbred from a half-bred without too much difficulty, even though I had a fairly good understanding of the animal's anatomy and myology, having studied one of those plaster models found in all the caster's shops, I was completely ignorant of the mechanism of its movements..."²⁰

A small bronze toy racehorse found in Degas's studio bears an uncanny resemblance to the horse in Cuvelier's *Jockey Falling off His Horse*.²¹ The two artists were clearly familiar with the same

stylized horses and may have worked in collaboration. Cuvelier's *Standing Horse* is similar in pose to Degas's *Standing Horse* (Musée d'Orsay, Paris).²² Theodore Reff has postulated that Degas's *Standing Horse* is in fact a tribute to his old friend Cuvelier, who was killed 21 October 1870 during the Franco-Prussian War. Reff notes that Degas intentionally borrows from the "finely worked equestrian sculptures, also typically seen in a classical profile view, in which Cuvelier specialized."²³ Such cross-fertilization undoubtedly occurred before Cuvelier's death but need not indicate that Degas's *Standing Horse* postdates 1870.

The influence of Gustave Moreau (1826–1898), Degas's friend and mentor, is also apparent in *Standing Horse*. Moreau created his own horse in wax (Musée Gustave Moreau, Paris), and it assumes the pose of Degas's horse, but appears to be more a hybrid of *Standing Horse* and *Horse Walking* (fig. 6).²⁴ Moreau modeled a textured but loosely rendered exterior, foretelling the direction in which Degas's sculptures would evolve. *Horse Walking* has subtly displayed this quality but nonetheless exhibits an earlier, more formal approach, shared with *Thoroughbred Horse Walking* (fig. 7) and *Horse Walking* (fig. 8). The affinity between the three walking horses mentioned above and works of other *animalier* sculptors such as Emmanuel Fremiet (1824–1910) is also significant. Degas's sculptures of horses have even been included among the so-called French impressionist school of *animalier* sculptors.²⁵ Fremiet's bronze *Pair of Horses and Jockeys* shares similar postures with the walking horses by Degas but is entirely different conceptually. Fremiet's horses are wed to a more formal, realistic tradition, so that the tiniest details—a braided mane, bulging veins, or a woven saddle blanket—are laboriously reproduced. Degas's sculptures of walking horses, however, share their mobility with those of Fremiet; no longer are the horses' four feet firmly planted on the ground. This subtle introduction of motion into Degas's works may well have been inspired by Fremiet's lively compositions of African natives and orangutans, which, as Millard noted, "were among the most advanced explorations of an open sculpture to be made."²⁶

By the mid-1870s, after completing his walking horses series, Degas succeeded in boldly capturing action in his sculpted horses. *Horse and Jockey*, *Horse Galloping*, *Turning the Head to the Right*, *the Feet Not Touching the Ground* (fig. 9), was his first sculpture to include a jockey. The examination of the x-radiograph of this kinetic sculpture reveals an armature more experimental than the

earlier well-defined interiors of the standing or slowly moving horses (fig. 10). Degas abandoned his standard rigid wrapped wire leg supports for an armature system observed for the first time in this wax sculpture. In fact, its internal construction bears a remarkable similarity to that of Moreau's *Hercules* of the same period.²⁷ Degas and Moreau may have shared ideas and materials while sculpting these particular figures; the same unusual hardware is found on the interior of both works. The constructions incorporate identical, tightly coiled wires reminiscent of tiny bed springs wrapped around multistrand wire, and both employ the same system of fixed wire sections, tightly looped at either end around the flexible wire network and producing a movable joint between rigid sections. An expandable armature, with fixed points between the hard wires for making adjustments, permitted the artist to change a pose during any stage of production. The fact that the Moreau armature is unique among those observed in more than one hundred radiographs of wax sculptures, published by the National Museums of France, suggests that Moreau and Degas collaborated in searching for new ways to make wax sculpture. *Horse and Jockey, Trotting, Head Turned to the Right* is one of only two Degas waxes studied thus far that display such an inner framework. The other, *Dancer Moving Forward* (figs. 11, 12), while generally considered a later work, shares the same tightly coiled springlike wires as well as a fixed wire section with loops at the end.²⁸

Perhaps the tentative use of inner springs by the two artists did not prove productive since Degas chose not to incorporate them inside any other figure, regardless of the extent of the movement being portrayed. The unfinished state of *Horse and Jockey*, together with its experimental armature, confirm that the statuette was a work in progress; numerous patches of interior green modeling clay, tooled to receive a top coat of red-brown wax, are visible on the head, belly, and legs of the horse. Seen in only two examples, the cumbersome armature with coils and articulated joints of *Horse and Jockey*, delineating the entire inner skeleton, establishes it as a transitional piece of the 1870s. The sculpture takes its place precisely between the traditional and academic constructions of Degas's early works of the 1860s and the lively horses of the 1880s and 1890s with more fluidly shaped interiors.

The similarity of armatures in the sculptures by Degas and Moreau may be another argument for dating *Horse and Jockey* to the mid-1870s, when Moreau was actively making sculpture. Moreau's wax *Hercules* has been dated to the period between 1870 and 1876, based on the exhibition of his

painting *Hercules et l'hydre de Lerne* (The Art Institute, Chicago) in the Salon of 1876.²⁹ Since Degas's *Horse and Jockey* appears in a number of his paintings, the sculpture must have served as a reference for the artist over the course of several decades. Although the wax horse's right rear foot now rests on the wooden base, a photograph taken in 1918³⁰ shows the horse with its feet off the ground, a concept that would become hotly debated at the end of the nineteenth century.

Studies of animal motion, especially that of the horse's gaits, became a great fascination as early as the 1860s through the work of Etienne-Jules Marey (1830–1904), a French physiologist.³¹ Intrigued by Marey's experiments, Leland Stanford, governor of California from 1862 to 1863, commissioned the English photographer Eadweard Muybridge (1830–1904) to analyze a horse's movement using a camera. In 1872 Muybridge succeeded in capturing a horse in mid-stride on film. By 1878 his extensive collection of stop-action or instantaneous photographs created considerable excitement among artists in America and Europe, prompting a radical change in the representation of a galloping horse. Debunking the prevailing artistic convention of a splayed-leg gallop, Muybridge's photographs proved that a horse tucks its legs up under its belly at the point when all four legs leave the ground during the gallop. Images of the galloping horse in this spiderlike, mid-air position jolted the art world. As previously noted, even the astute draftsman Degas had depicted running horses in the same stylized flying gallop found in English sporting prints, with which he was keenly familiar.³² Drawings and paintings from the late 1850s through the 1870s depict horses "galloping" inaccurately. After the 1880s, Degas's renderings of horses in motion emulate the positions of the Muybridge photographs.³³ Though news of Muybridge's results spread through Europe almost immediately, among the first actual images reproduced in France were illustrations in the 14 December 1878 issue of *La Nature*.³⁴ A notation by Degas at the bottom of a page in his notebook of 1878–1879 reads, "Journal: La Nature/Victor Masson (année 1878),"³⁵ undoubtedly to remind himself about the critical article.

Possibly even more influential to Degas was the presence of Muybridge and Stanford on lecture tours in Europe in 1881 and 1882. On 29 November 1881, Jean Louis Ernest Meissonier (1815–1891) invited Muybridge to his studio to meet a number of prominent Parisian painters and sculptors and to view some of the horse locomotion studies. Degas was not present, but would have known of the event. As an admirer of Meissonier's work,³⁶ Degas may have had access to the photographs while

his friend was painting Stanford's portrait, or he may have seen them in Muybridge's 1878 publication *Horse in Motion*.

Only two of Degas's extant horse figures embrace the latest scientific discovery by portraying horses with all four feet off the ground: *Horse with Jockey* and *Horse Trotting, the Feet Not Touching the Ground* (fig. 13). Each of these works depicts a horse whose two opposing legs alternately tuck while the other two are outstretched, rather than a galloping horse in the four-leg tuck position.³⁷ In *Horse Trotting, the Feet Not Touching the Ground*, the raised figure of the horse is supported only by a slender rod below the belly that prevents any of the hooves from making contact with the ground. Even the bare, concave base deliberately curves away from the lifted horse, thereby increasing the tension and the acute sense of movement. On close scrutiny of the sculpture's fabrication, it is clear that Degas struggled and reworked the legs of this red wax horse in order to portray such a complex movement. In fact, the x-radiograph reveals that Degas relied on a fairly traditional wrapped wire armature with body cavity, neck, head, tail, and four appendages supported by a central T-bar, which is still the standard framework used by sculptors to construct quadrupeds in clay and wax.

After the late 1870s, the stylized flying gallop disappeared from Degas's pictures, but he does not appear to have replaced it with the accurate, photo-documented gallop position achieved by other major horse and battle scene painters of the late nineteenth century. In other words, Degas ceased painting horses in rapid motion inaccurately, but he also did not produce an image or a sculpture in the scientifically correct, tucked-up leg position of the gallop recorded by Muybridge.

Muybridge's images of the 1880s are also reflected in Degas's sculptures of dancers. *Dancer Putting on Her Stocking* (fig. 14) may have been inspired by one of Muybridge's sequences, as noted by Richard Kendall.³⁸ While this sculpture may not form part of a larger stop-action series, such as the group of dancers looking at the sole of their feet, or the arabesques, it is likely inspired by Muybridge's photograph *Woman Sitting Down in a Chair and Pulling on Stocking*.³⁹ Of the three sculptures in this pose, only one bears a supporting board. Apparently concerned about the price of pure beeswax and of plastilene modeling clay, Degas sought ways to bulk the figures with less costly items or to layer the wax over the plasticene. Although the presence of these additional materials later contributed to the disintegration of some sculptures, Degas incorporated a variety of lightweight substances such as cork

and pieces of wood that could serve as additional structural supports. Simple wine bottle corks were readily obtainable and are present in a number of examples. *Dancer Putting on Her Stocking* is a sculpture composed of a mixture of beeswax, starch, and pigments,⁴⁰ fashioned over numerous corks and an armature of fine twisted wire that establish the form and two heavier wire segments that support the legs. A contour image drawn over the x-radiograph (fig. 15) delineates the sculpture's internal structure of wire and cork. Especially prominent on the proper left side of the figure, the assorted corks replace a considerable quantity of wax and may be the contributing factor in the sculpture's apparent instability. It is possible that Degas was working on this cork-filled sculpture when he expressed his annoyance: "I must be a fool to have put corks in this figure. Imbecile that I am, with my mania for wanting to make economies of two coppers! There is my [*sic*] back entirely destroyed! Oh, why did I thrust myself into sculpture at my age?"⁴¹ As danger of the figure's collapse from migrating corks and delaminating wax became imminent, the artist probably added a backboard as a prop against which the wax could lean.

In 1887 Muybridge expanded on his earlier work and published the complete set of photographs in *Animal Locomotion*. Degas is not named as a subscriber, unlike many American and European artists, but it is evident that he consulted the volumes and at times directly copied some of the images. The exquisitely finished *Horse Galloping on Right Foot* (fig. 16), the largest of the horse statuettes and probably made in 1889, duplicates the position of the horse in Muybridge's "*Annie G.*" *Galloping*.⁴² There is even a textile impression, enhanced by using a single point tool across the horse's back to replicate the blanket under the jockey in the photograph. While lacking a jockey today, it is quite possible that *Horse Galloping* once carried a jockey that has since been destroyed or placed on another sculpture.⁴³ In *The Jockey* (Philadelphia Museum of Art), a pastel of 1889 that borrows from the same Muybridge frame for the horse's body, tail, and legs, Degas altered the horse's neck and the angle of the jockey to create a slightly awkward stance for the horse that shows less active motion than the sculpture.

An 1889 date for *Horse Galloping on Right Foot* can be assumed independently of the pastel, on the basis of the large corks on the base and its highly realistic and carefully finished surface. While cork from wine bottles is found on the interior and exterior of a number of waxes, only *Horse*

Galloping on Right Foot and *The Tub*, 1889 (fig. 17), incorporate large, semicircular pieces of cork approximately 14 cm in diameter, similar to those found on mustard jars. Both *Horse Galloping on Right Foot* and *The Tub* exhibit scant internal armatures that bear little resemblance to the complex inner frameworks observed in the radiographs of Degas's early horse figures. Conversely, the surfaces are carefully worked, preserving details of the modeling, the musculature, and the features. Perhaps both statuettes were on the artist's mind when he wrote to Albert Bartholomé, "Happy sculptor...but I have not yet made enough horses. The women must wait in their basins."⁴⁴

A discussion of Degas's sculptures would not be complete without reference to his mixed media works, which are frequently described as precursors to the modern sculpture of cubist, surrealist, and later twentieth-century artists. *Little Dancer, Aged Fourteen; Woman Washing Her Left Leg; Horse and Jockey*; and *The Tub* are often cited as examples of Degas's inventiveness and daring. These sculptures introduce exotic elements as well as color into the contemporary monochromatic sculptural repertoire. *The Tub* represents a realistic and carefully finished work. It is totally modern in its departure from the principles of late nineteenth-century sculpture by incorporating multiple materials, colored beeswax, plaster, cloth, cork, wood, wire, and a lead alloy strip. Although it has been noted repeatedly that the bather holds a real sponge, only a ball of wax is in fact present in her outstretched hand. The examination of the sculpture's underside leads to unexpected observations (fig. 18). The darkened wax of the bather was initially a deep red, and the lead tub is not a true basin, but an incomplete band of a lead-zinc alloy secured in the wax. From an impression in the wax on the underside and the presence of two breaks in the metal band, seen only on the original sculpture, it becomes clear that the diameter of the tub was originally conceived in a smaller dimension. Large semicircular pieces of cork are apparent only on the underside of the sculpture or as unidentifiable shapes on the x-radiograph. The large pieces of cork, bits of wood, and red wax foundation are hidden by a thin layer of plaster that serves as the water on the inside of the formed tub. As its final feature, Degas added a rectangular plaster base surmounted with crushed and plaster-coated cotton rags. The overflow of the poured plaster is also evident on the underside. In his note to Bartholomé dated 13 June 1889, Degas confirmed that he spent considerable time modeling the figure and had invented a method for providing it with a base, "I have worked the little wax a great deal. I made a base for it with rags soaked in a more or less well-mixed

plaster.’⁴⁵

Of all the posthumous casts, *The Tub* has probably suffered the most by its translation into bronze. Not only are the textures of the assembled and broken elements indiscernible, but the exceptional effects of color are also incompletely realized in the patinated bronze despite Albino Palozzolo’s attempt to faithfully replicate the colors of the originals.

Horse with Jockey, Horse Galloping on Right Foot the Back Left Only Touching the Ground (fig. 19), Degas’s last race horse, should be dated to the 1890s. For Degas, the challenge was to capture the physical tension of a rider straining together with his horse, even as the base undulates. This impressionistic sculpture admirably achieves Degas’s aim. By this time Degas was more assured in how to achieve his desired final product and thus very little armature is found (fig. 20); it consists of a simply constructed wire fabrication that can be easily manipulated and adjusted. On the other hand, evidence of Degas’s love of experimentation is present both in the horse’s unnaturally elongated neck and in the mixed media aspect of the work. While modeling the horse’s neck, Degas pulled and folded the wax over itself. The finger prints and impressions still visible even show how Degas squeezed thumb and forefinger into the soft wax. The jockey sports a real cloth shirt, cap, and boots, and he is seated on a fabric saddle.

Degas was engaged in experimentation and novel developments during his entire artistic career, be it with his intense use of pastels, his forays into photography, or his ability to create sculpture in a thoroughly new fashion. Even the hidden interiors of the sculptures attest to Degas’s inventiveness. Degas did not restrict himself to postures approved by the academic circles: he explored women at their toilet and in various states of undress. He incorporated traditional materials with an innovative approach to resolving a problem. Confronting the ongoing debate about the use of color in sculpture, Degas definitely influenced the changing aesthetic of the late nineteenth century by pigmenting his waxes and combining an array of colorful and nontraditional elements within the compositions. That these extraordinary works, fashioned from ephemeral materials, have endured is yet another gift of genius, and far from blemishing Degas’s reputation, as he lamented,⁴⁶ they constitute some of the finest sculptures ever created.

Notes

1. Royal Cortissoz, *Personalities in Art* (New York, 1925), 245. Although the quote refers specifically to his working in clay, Degas generally used a combination of wax and clay.
2. Recent scholarship includes Anne Pingeot, *Degas sculptures* (Paris, 1991), and the entire issue of *Apollo* (August 1995). See Daphne Barbour and Shelley Sturman, “The Materials of the Sculptor: Degas’ Techniques,” 49–55; Sarah Campbell, “Degas’ Bronzes: Introduction,” 6–9, and “A Catalogue of Degas’s Bronzes,” 10–48; Patricia Failing, “Authorship and Physical Evidence: The Creative Process,” 55–59; Richard Kendall, “Striking a Blow for Sculpture: Degas’ Waxes and Bronzes,” 3–5, and “‘Who Said Anything About Rodin?’ The Visibility and Contemporary Renown of Degas’ Late Sculpture,” 72–77; Anne Pingeot, “The Casting of Degas’ Sculptures: Completing the Story,” 60–63; and Theodore Reff, “The Morbid Content of Degas’ Sculptures,” 64–71; Barbour and Sturman, “The Horse in Wax and Bronze,” in *Degas at the Races* [exh. cat., National Gallery of Art] (Washington, 1998).
3. Ambroise Vollard, *Degas* (Paris, 1924), 112.
4. Three plaster casts were found in Degas’s studio at the time of his death. See Pingeot 1991, 160, 169, and 178. The National Gallery of Art owns a wax sculpture for which casting was also employed as part of its fabrication. See Daphne Barbour, “Degas’s *Little Dancer*: Not Just a Study in the Nude,” *Art Journal* (Summer 1995), 28–32.
5. Charles Millard, *The Sculpture of Edgar Degas* (Princeton, 1976), 3. The letters are dated 28 August 1858 and 6 October 1858.
6. Theodore Reff, *The Notebooks of Edgar Degas* (Oxford, 1976), 1:89, notebook no. 16, 43. Reff dates the Paris notebook to 1859–1860. For the foundry address, see Isabelle Vassalo, *Barbedienne*

et Rodin: l'histoire d'un succès, Rodin sculpteur: oeuvres méconnues [exh. cat., Musée Rodin] (Paris, 1992), 189, fig. 2. Millard 1976, 74 n.16, also notes that Degas had written “Barbedienne” in a notebook.

7. Reff 1976, notebook no. 26, 7, 8.

8. For the foundry address see: Monique Laurent, “Observations on Rodin and His Founders,” in *Rodin Rediscovered* [exh. cat., National Gallery of Art] (Washington, 1982), 288. Michael Shapiro, *Bronze Casting and American Sculpture 1850–1900* (London, 1985), 114–117, writes that Eugène Gonon’s father, Honoré Gonon, intensely pursued the knowledge of the lost wax casting process and was credited with rediscovering its ancient methods. His treatise on lost wax casting was considered important enough to be purchased by the French government in 1876. Eugène Gonon sold the manuscript, today in the Ecole des Beaux-Arts library, for an annual stipend. Suzanne Glover Lindsay, in *European Sculpture of the Nineteenth Century* (New York, 2000), 262 n. 8, discusses the creation of the foundry. See also G. Vapereau, *Dictionnaire Universel des Contemporains* (Paris, 1870), 783; and Bernard Metman, “Documents sur la sculpture française, Répertoire des fondeurs du XIXe siècle,” *Archives de l’Art française* (1989), 3:197.

9. Reff 1976, notebook no. 26, 89.

10. Anthea Callen, *The Spectacular Body: Science, Method and Meaning in the Work of Degas* (New Haven, 1991), 1.

11. Wax had long been the preferred material for funereal effigies, but does not appear to have been used in France for sculpture until the late seventeenth century. One hundred years later, Philippe Curtius (1737–1794), whose works were exhibited at the Salon des Refusés, established the Cabinet de Cire in Paris. In 1802 his niece, Madame Tussaud, took her wax collection to London where Degas later visited it. The Parisian equivalent of this collection, the Musée Grévin, opened in 1882. Jean Adhémar,

“Les musées de cire en France: Curtius, le ‘Banquet royal’ les Têtes coupées,” *Gazette des Beaux-Arts* (December 1978), 203–214. Edward Gatacre and Laura Dru, “Portraiture in Le Cabinet de Cire de Curtius and Its Successor Madame Tussaud’s Exhibition,” *La ceroplastica nella scienza e nell’arte, Atti del I Congresso Internazionale* (Florence, 1977), 619–623.

12. Reff 1976, 64, notebook no. 10, 23, 25.

13. Henry Loyrette, “What Is Fermenting in That Head Is Frightening,” in *Degas*, ed. Jean Sutherland Boggs [exh. cat., The Metropolitan Museum of Art] (New York, 1988), 91. See also Paul André Lemoisne, *Degas et son oeuvre*, 4 vols. (Paris, 1946–1949), 1:230.

14. The drawing is published in Jean Sutherland Boggs, *Degas at the Races* [exh. cat., National Gallery of Art] (Washington, 1998), 31, cat. 7.

15. Millard 1976, 59.

16. John Rewald, *Degas’s Complete Sculpture* (New York, 1944; rev. ed. 1956, reprint San Francisco, 1990), 14.

17. See, for example, the letter from Edouard Manet to Suzanne Leenhof, dated 23 October 1870, in *Lettres du Siège de Paris* (Paris, 1996), 61.

18. Reff 1976, notebook no. 21, 13v; notebook no. 22, 220; notebook no. 23, 157.

19. Salon [Société des artistes français] 1869 (Paris, 1969), 468: 3343, 3344.

20. François Thiébaud-Sisson, “Degas sculpteur raconté par lui-même,” *Le Temps* (23 May 1921), 3. See also Loyrette in exh. cat. New York 1988, 123.

21. For an illustration of the small bronze toy and Cuvelier's sculpture, see Daphne S. Barbour and Shelley G. Sturman, "The Horse in Wax and Bronze," in exh. cat. Washington 1998, 185, figs. 4, 5.
22. For an illustration of Cuvelier's *Standing Horse*, see Millard 1976, fig. 3; for Degas's *Standing Horse*, see Barbour and Sturman in exh. cat. Washington 1998, 185, fig. 6.
23. Reff 1995, 65.
24. For an illustration of Moreau's wax horse, see Barbour and Sturman in exh. cat. Washington 1998, 186, fig. 7.
25. James Mackay, *The Animaliers* (London, 1973), 89–95.
26. Millard 1976, 96–97.
27. See the x-radiograph of Moreau's *Hercules* in Sylvie Colinart, France Drihon, and Guilhem Scherf, *Sculptures en cire de l'ancienne Egypte à l'art abstrait* (Paris, 1987), 326–327. Radiographs of Moreau's horse sculptures have not been published. Future comparisons between the internal structures of Degas and Moreau horses could prove worthwhile.
28. Five Degas waxes are exhibited at the Musée d'Orsay. For x-rays of the four originally at the Musée du Louvre, see Colinart 1987, 226–237. Of the approximately forty sculptures by Degas radiographed to date, only *Horse and Jockey*, *Trotting*, *Head Turned to Right* and *Dancer Moving Forward* exhibit the distinctive armature described. Moreau's *Hercules* and *Dancer Moving Forward* share another unique element, a lengthy coiled sleeve describes as "manchon flexible."

29. Guilhem Scherf, in his entry on the *Hercules*, reviews the various dates and arguments related to Moreau's sculpture in respect to serving as models for his paintings, Colinart 1987, 325.
30. Pingot 1991, 193.
31. See Françoise Forster-Hahn, "Marey, Muybridge and Meissonier: The Study of Movement in Science and Art," in *Eadweard Muybridge: The Stanford Years, 1872–1882* (Palo Alto, 1972), 86–89.
32. In his painting, *Sulking*, Degas included a copy of a sporting print by J. F. Herring, *Steeplechase Cracks*. In this case, the position of the animal is accurate, as the horses are jumping a hurdle. Théodore Géricault's painting, *Course de Chevaux à Epsom, le Derby en 1821*, shows the typically rendered but inaccurate position for a galloping horse.
33. These same observations are made by Aaron Scharf in *Art and Photography* (London, 1968), 158.
34. Gaston Tissandier, *La Nature* (14 December 1878), 23–26. In his letter of 18 December 1878 Etienne-Jules Marey wrote, "So far as artists are concerned, it would create a revolution for them, since one could furnish them with true attitudes of movement, positions of the body during unstable balances in which a model would find it impossible to pose."
35. Reff 1976, notebook no. 23, 81. Millard 1976, 23, clarified that Victor Masson et fils was a Paris bookseller.
36. François Thiébault-Sisson quotes Degas as stating that "he wanted to work at least as well as Meissonier...the poor painter who was one of the men most informed about the horse whom I've ever known." See *Ernest Meissonier* [exh. cat., Musée des Beaux-Arts] (Lyon, 1993), 240. Paul Valéry

reported that when he visited the Durand-Ruel gallery with Degas, the artist kept him in front of the little Meissonier equestrian bronze horse of Napoleon, praising the work and describing the beauty of all its parts. See Paul Valéry, *Degas Danse Dessin* (Paris, 1938), 74.

37. Meissonier also produced a wax sculpture of a horse trotting, *Cheval au Trot*, which is very similar to Degas's work while dependent on Muybridge as well. Unlike Degas's horse, Meissonier's has a thick, wax-covered support below the belly. In that sense, the figure appears much closer to Moreau's flying pony, also with feet not touching the ground.

38. Richard Kendall, *Degas: Images of Women* (London, 1989), 53.

39. Kendall 1989, 53.

40. Suzanne Lomax, unpublished Analysis Report, National Gallery of Art scientific research department, 5 May 1988.

41. Alice Michel, "Degas et son modèle," *Mercure de France* (1919), 623: "Faut-il que je sois bête d'avoir mis de bouchons dans cette figure! Imbécile que je suis, avec ma manie de vouloir faire des économies de deux sous! Voilà mon dos tout abîmé!... Ah! Pourquoi me suis-je fourré dans la sculpture, à mon âge?"

42. For an illustration of "Annie G." *Gallop*ing, see Eadweard Muybridge, *Animal Locomotion* (Philadelphia, 1887), 9: plate 626.

43. A Durand-Ruel inventory photograph shows two horses facing each other. One of these is *Study of a Mustang*, the other *Horse and Jockey*, *Horse Galloping on Right Foot*, without the jockey.

44. Marcel Guérin, ed., *Lettres de Degas* (Oxford, 1948), 127.

45. Guérin 1948, 132.

46. Degas to François Thiébauld-Sisson, 1921. See Thiébauld-Sisson 23 May 1921, 3.

Illustrations

Fig. 1. Edgar Degas, *Study of a Mustang*, 1859–1860, wax and clay, Virginia Museum of Fine Arts, Collection of Mr. and Mrs. Paul Mellon

Fig. 2. X-radiograph of figure 1

Fig. 3. Edgar Degas, *Horse at a Trough*, early 1860s, wax and clay, Virginia Museum of Fine Arts, Collection of Mr. and Mrs. Paul Mellon

Fig. 4. Edgar Degas, *Mademoiselle Fiocre in the Ballet “La Source,”* 1867–1868, oil on canvas, The Brooklyn Museum of Art, Gift of James H. Post, John T. Underwood, and A. Augustus Healy

Fig. 5. X-radiograph of figure 3

Fig. 6. Edgar Degas, *Horse Walking*, early 1870s, wax and clay, National Gallery of Art, Washington

Fig. 7. Edgar Degas, *Thoroughbred Horse Walking*, early 1870s, wax and clay, National Gallery of Art, Washington

Fig. 8. Edgar Degas, *Horse Walking*, early 1870s, wax and clay, Virginia Museum of Fine Arts, Collection of Mr. and Mrs. Paul Mellon

Fig. 9. Edgar Degas, *Horse and Jockey, Horse Galloping, Turning the Head to the Right, the Feet Not Touching the Ground*, mid-1870s, wax and clay, National Gallery of Art, Washington

Fig. 10. X-radiograph of figure 9

Fig. 11. Edgar Degas, *Dancer Moving Forward*, late 1880s, wax and clay, National Gallery of Art, Washington

Fig. 12. X-radiograph of figure 11

Fig. 13. Edgar Degas, *Horse Trotting, the Feet Not Touching the Ground*, 1880s, wax and clay, National Gallery of Art, Washington

Fig. 14. Edgar Degas, *Dancer Putting on Her Stocking*, 1880s, wax and clay, National Gallery of Art, Washington

Fig. 15. Computer-generated image of figure 14, identifying the different components of the sculpture as determined in the x-radiograph. KEY: Black, original internal armature; pink, new metal; green, cork; purple, original wood; purple with grid pattern, new wood

Fig. 16. Edgar Degas, *Horse Galloping on Right Foot*, 1889/1890, wax, clay, and cork, National Gallery of Art, Washington

Fig. 17. Edgar Degas, *The Tub*, 1889/1890, wax, plaster-soaked rags, lead strip, and cork, National Gallery of Art, Washington

Fig. 18. View of underside of figure 17, revealing the artist's working methods and materials; note the

large semicircular corks, rectangular wooden pieces, and balls of red wax

Fig. 19. Edgar Degas, *Horse with Jockey; Horse Galloping on Right Foot, the Back Left Only Touching the Ground*, 1890s, wax, clay, and cloth, National Gallery of Art, Washington

Fig. 20. X-radiograph of figure 19