

A view of the
completed figure
of the 19-year-old
Washington.

GETTING
TO KNOW

George Washington

By Jeffrey H. Schwartz

*I*N THE SPRING OF 2003, I FOUND MYSELF LEARNING MORE ABOUT OUR COUNTRY'S FIRST PRESIDENT AND 18TH CENTURY ART, CLOTHING, AND DENTISTRY THAN I EVER DREAMED LIKELY. BUT THERE I WAS ONE DAY IN APRIL, SITTING WITH LAURA FISHER, EXECUTIVE DIRECTOR OF FRENCH AND INDIAN WAR 250, WHO WAS ASKING ME IF I THOUGHT I COULD RECONSTRUCT A LIFE-LIKE REPLICA OF GEORGE WASHINGTON IN 1754.

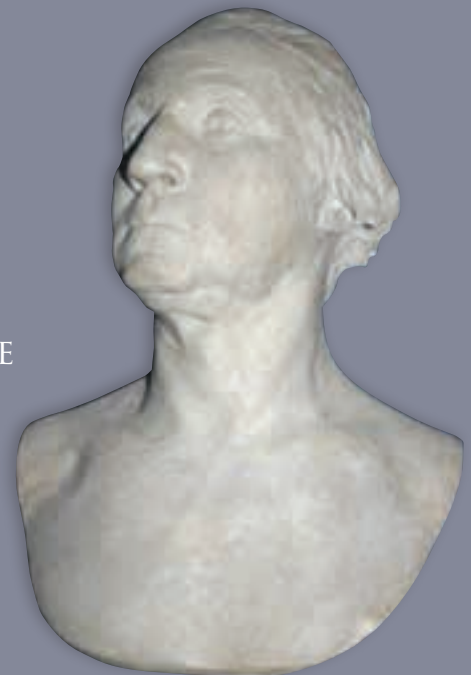


Figure 1. Bust of George Washington.
Images courtesy of Jeffrey H. Schwartz.

A view of the completed figure of the 45-year-old Washington on his horse Blueskin.



That would be when he was 22 years old, a junior officer in the English militia stationed in Western Pennsylvania. I had been working for some 20 years as the forensic anthropologist with the Coroner's (now Medical Examiner's) Office of Allegheny County, which is how Laura found me.

I've always been intrigued by the kind of forensic reconstruction like in the movie *Gorky Park*—using clay plugs representing averages of soft tissue depths at different landmarks of the skull and lower jaw as a guide to transforming bone into a face—and thought this would be once-in-a-lifetime challenge. Of

course I said I would take on the project, not only because it meant reconstructing George Washington but also because it would be the first time anyone tried to de-age an individual without the aid of photographs and image-manipulating computer software. Only after agreeing did Laura tell me that the authorities at George Washington's Mount Vernon did not allow anyone access to Washington's bones. No bones? What's a forensic anthropologist, especially a skeletal specialist like me, to do? The challenge deepened but I had to do this, somehow. Indeed, good fortune turned out to be on my side.

hairline) and produced a terracotta bust—the face of which, I later figured out, must have been a replica of the life mask. He also took body measurements for a marble statue (Figure 1) that he sculpted upon his return to Paris that is so detailed one can see seams in clothing and “impressions” of fingernails under tight-fitting gloves. In contrast to other people of power, who wanted their likenesses portrayed larger than life, Washington insisted that the statue reflect his true height, which, at 6 feet, 2-1/2 inches (by my calculations), was still appreciably taller than the average man of that time.



EVEN IF I HAD BEEN PERMITTED TO MEASURE THESE THREE-DIMENSIONAL REPRESENTATIONS OF WASHINGTON I WOULD HAVE BEEN TOO NERVOUS TO HANDLE THEM, MUCH LESS PUT THE SHARP TIPS OF CALIPERS UPON THEM.



In 1785, internationally renowned French court artist Jean-Antoine Houdon declined an opportunity to immortalize Catherine the Great of Russia in favor of a request from Washington's supporters to capture the image of the former Commander of the Continental Army. Thus, when Washington was 53 years old, Houdon spent two weeks at Mount Vernon. Any details of the visit that Houdon recorded were lost when his atelier in Paris and everything in it were burned to the ground during the French Revolution (1789-1799). We do know that Houdon followed Washington through his daily activities, making sketches and notes that would help him imbue his work with the essence of his subject. Houdon made a life mask (a positive plaster replica taken from the plaster mold made of Washington's face just past the

Even if I had been permitted to measure these three-dimensional representations of Washington, I would have been too nervous to handle them, much less examine with the sharp tips of calipers. Who wants to be the first person to damage the life mask of George Washington? Someone else had already dropped the bust, fortunately not cracking the face, but a repair around the hair is very noticeable.

However, while lecturing at Arizona State University on human fossils and evolution, I was introduced to a group, PRISM, which had been collaborating with physical anthropologists to scan bones in 3-D and then digitally measure and compare them. This was perfect for analyzing the life mask, bust, and statue, especially because no matter what the measurements taken by hand, they would

Statue of George Washington.



Figure 2. The Mount Vernon dentures: the only surviving complete set. The plates are made of lead; the teeth in the upper are horse (front) and cow (rear); the teeth in the lower are human but not all in their correct location. I dated these dentures to at least 30 April 1789; the manufacturer remains unknown.



Figure 3. One of the digitized Peale portraits of Washington in his 40s with the scanned bust oriented so the facial features align. Note the differences in the lower face, particularly the lips and chin.

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never faithfully recreate a complex three-dimensional object, such as a face. There was no hesitation from PRISM about assisting with my Washington project.

About this time a new education center was started at George Washington's Mount Vernon Estate and Gardens. Laura introduced me to Executive Director James Rees, who envisioned—as centerpieces in the new exhibit hall—life-sized replicas of Washington at three different ages representing important moments in the first president's life. The youngest was Washington at 19 years old, when he was a surveyor in Virginia trying to support his mother and numerous half- and full-siblings. The second was Washington at age 45, when he and his nearly disintegrated army suffered the winter at Valley Forge. The third was 57-year-old Washington being inaugurated on April 30, 1789, near what it now lower Manhattan's Wall Street.

Scanning Houdon's creations was the beginning of the reconstruction. Washington was 53 years old when the life mask was made and I needed to recreate a biologically believable 57-, 45-, and 19-year-old. If Washington had not suffered from decades of tooth and subsequent bone loss, the process of de-aging would not have been as significant a problem. For instance, as you and I age, the cartilage toward the tip of the nose and throughout the ears continues to grow. Thus at 19 years of age, one's nose would be shorter

and the ears generally smaller than, say, at 65. We also lose fat from our faces, especially below the cheekbones and around the eyes, which become more hollow looking or sunken as we grow older. In children of both sexes the bone of the upper rim of the eye socket and the region above the bridge of the nose is smoothly continuous. After puberty and especially in males, the bone in these areas often thickens. With these facts in mind, it was relatively simple for me to conceptualize the young Washington: manipulate the scanned 53-year-old face to slightly reduce the length of the nose and overall size of the ears, fill in the cheeks and around the eyes, and flatten out the swollen bone “under” and between the eyebrows.

In Houdon's reproductions as well as in reliable portraits of Washington, such as those by Charles Willson Peale and Gilbert Stuart, one feature stands out: a small depression in the left cheek. Some scholars have speculated that this slight deformity resulted from infections that afflicted Washington's teeth, gums, and jaws. If true, I would have expected some degree of destruction of underlying bone that would be evident in the life mask and bust or any legitimate portrait of Washington as an older man. But in all of these representations, the right and left sides of Washington's face are not dramatically different in shape and contour. There was, however, another possible explanation of that depression.

Nineteen-year-old Washington contracted smallpox while visiting his tuberculous half-brother Lawrence on Barbados. Yet no reliable portrait, much less the life mask—the closest thing to realizing Washington's facial skin—depicts typical signs of smallpox-induced scarification. The simplest conclusion, I thought, was that the “dimple” in Washington's cheek was his only visible scar, a small “souvenir” of his bout with the disease. I wanted the detailed expressions and poses for each Washington to be unique, so I digitally removed the scar, thereby situating the 19-year-old Washington prior to visiting Barbados.

The primary factor affecting Washington's face was his decades-long struggle with tooth decay and no doubt general infection of his gums, which would have led to tooth loss, primarily through extraction. After a tooth is lost the surrounding bone then resorbs. With complete tooth loss in the upper jaw, the bone that once extended fully down around long tooth roots retreats to lie almost right under the nose and on back. In the lower jaw, the bone thins from top to bottom by more than half and, especially in males, the angle at the back becomes softer looking and less prominent under the skin, muscle, and fat.

I was certain that Washington's jaws were fairly close to this condition when Houdon made the life mask and bust, which I used with little alteration as the 57-year-old Washington's face. I also thought that loss of lower front teeth had contributed to the odd shape of the inferior margin of his chin: it was straight and very broad from side to side, but on a slant, from the right “corner” up to the left. This contrasted with the narrower, symmetrically and downwardly curved chin Peale portrayed in the two earliest paintings we have of Washington, at 40 and 47 years old. With such obvious facial remodeling occurring in only six or so years, I needed another part of the puzzle: his dentures. (Figure 2)

From letters, diaries, and other documents at Mount Vernon, we receive a partial picture of Washington's “oral history.” His senior officer in the British militia remarked of Washington at age 25 that while he was tall, lanky, sinewy, and strong, he was already so self-conscious of his dental demise that he was reluctant to speak for fear of exposing his blackened teeth. Nevertheless, Washington, a self-confessed walnut addict, would crack their shells with his teeth. This had to have traumatized the ligaments and soft tissue investing these teeth, providing a perfect breeding ground for bacterial infection that would then produce an abscess requiring tooth extraction, which, in turn, would lead to bone loss.

Washington's own writing tells of his oral agonies, his ongoing attempts to scrape and otherwise keep clean teeth that were on their way out and those still firmly in place, and of his applying the latest poultices and other concoctions to retard his oral disease. But his was a losing battle. By the early 1789, Washington had lost all but two teeth. By April 30, 1789, when he was inaugurated, Washington retained only one: the lower right second bicuspid.

While Washington may have had a few more teeth when Houdon visited him, I am certain he no longer had any front teeth. One day, after months of studying the two Charles Willson Peale portraits of Washington at the



Rembrandt Peale, son of Charles Wilson Peale (who painted over 60 portraits of Washington), followed in his father's footsteps with his critically acclaimed portraits such as this one, painted six decades after the first president's death.

Mount Vernon Ladies' Association, Bequest of Luisita L. Cofer.



Figure 4. The digital reconstruction of the 19-year-old Washington.



Figure 5. The digital reconstruction of the 45-year-old Washington.



Figure 6. The digital reconstruction of the 57-year-old Washington.

ages or 40 and 47, and with the image of the 53-year-old burned into my brain, I had an epiphany. In the portraits, Washington's chin was narrow and rounded, its distance from the nose greater, and his lips less wide and relaxed.

Ellen Miles, the curator of 18th century art at the National Portrait Gallery, had alerted me to Peale's tendency to paint his subjects with oval faces. When I sought to verify my visual observations, I scanned only the major facial features of the portraits (eyes, brows, nose, lips, chin) before importing each 2-D file into the field of the scanned 3-D face of the bust. I then oriented the scanned bust until it aligned with Washington's pose in the scanned portrait. I did not know that comparing 2- and 3-D digital images was a first. I was satisfied to discover that my visual evaluation of differences between the 53-year-old and 40-something Washington was confirmed (Figure 3). I attribute the greater distance from nose to chin in the younger Washington to the presence of at least some of his front teeth, which would also explain why his lips then were relaxed rather than widely and tautly drawn, as they are in the life mask and would have been as they strained to keep his dentures in place.

I felt secure that morphing the scan of the bust's face to the spatial relationships of facial features in the digitized portraits would lead to the best reconstruction of the face of 45-year-old Washington. From this three-dimensional face, I could "de-age" him to 19 years of age in nose, cheeks, and brow. For individuality I removed the smallpox scar. I also created a strong, well-defined angle at the back of the lower jaw because it would be another four or five years before Washington began to lose teeth and because, although strong and active, he would not have reached full physical maturity, especially in muscle mass. For all reconstructions, I used the scanned bust to complete the head and neck.

Recreating the bodies was by comparison a relatively simple task. As with the bust, life mask, and dentures, PRISM scanned the statue and worked with me to manipulate the digital images. But I needed to check on whether the statue was close to Washington's own body both in length (for instance, not just total height, but of upper versus lower arms as well as legs) and in girth. Here, Linda Baumgarten, Colonial Williamsburg's 18th century clothing expert, provided invaluable help.

First, regardless of his down-to-earth persona, Washington was still of English



Figure 7. The clay version of the 19-year-old's head with his facial features and expression defined.

aristocratic background, as were his contemporaries such as Thomas Jefferson, John Adams, and Benjamin Franklin. This, as Linda told me, meant that Washington would have been corseted until the age of five in order to produce a body in which the shoulders were pulled down and back and the inward curve in the lower vertebral spine accentuated. This manipulation created a torso with a long sloping neckline and shoulder blades that lay flat across the back. The lower spinal curvature accentuated the bulge of the belly, even if one was not fat. The statue captured all of this detail. Even though these boys were apparently not corseted beyond five years of age, it was sufficient to forever alter the shape of their torsos. Consequently, all of my reconstructed Washingtons had this ballet-dancer appearance.

The other important aspect of reconstructing the body was that, being a "gentleman," Washington would have worn form-fitting clothing. For instance, his waistcoat would have hugged his chest, belly, and waist, his coat his shoulders and its sleeves his arms, his gloves his hands, his breeches the area around his knee, and his boots his calf. Unfortunately, there are no surviving

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documented gloves, boots, or shoes (and in any case there was no difference between right and left shoe casts at that time). For that matter, there were no hats or eyeglasses, except for a pair of magnifying spectacles one could buy “off the rack,” as today in any pharmacy chain store.

But there is clothing that is well documented as having been Washington’s and not tailored to fit another individual later on. Linda and I measured Washington’s clothing, most of which dates to the period of his inauguration and after, using landmarks also visible in the Houdon stature. The length or linear measurements of arms, legs, and parts of the torso were virtually identical, so the lanky-armed and -legged Washington represented in the statue was realistic. Differences lay particularly in girth of torso and thigh, indicating that Washington was a bit “thicker” than in the statue, although not appreciably so. The scan of the statue was adjusted accordingly. Since the clothing was the same vintage as the inauguration, I knew I “had” the body of Washington (Figure 4).

What of the younger representations of Washington? Envisioning the 19-year-old surveyor was straightforward. After assuming the presidency, and especially during his second term, when he was under extreme stress from detractors that included Thomas Jefferson, Washington was noted for being thin, as his clothing attests. As a young man not yet hormonally and physically mature, Washington would have been even thinner, lankier, and more sinewy. Hours of tedious computer manipulation finally produced a figure I considered realistic (Figure 5).

For the 45-year-old, clues came in two different ways. I again turned to the Peale portraits of the 40- and 47-year-old Washington. There was something about them I could not figure out: he looked different than the man in the statue, but how?

A possible answer emerged when I returned to Washington’s own writing.

After Washington resigned his commission from the Continental Army and returned to his farming, fishing, and distillery ventures, and then through his two terms as president, he would not accept a dinner invitation without first being assured that the food would be soft, not requiring him to chew. Although macerators—manufactured “jaws” with blades imbedded in them—were common in the 19th century as devices to chop up food so a toothless individual could manipulate it with the tongue and then swallow, their use during the 18th century is not documented. I discovered during this

Washington began to change his diet to softer, more easily swallowed food. Fat, suet, bone marrow, and the like, which begins to dissolve in the heat of one’s mouth, was probably becoming more prevalent in his diet. But even an active man, as Washington clearly was, has caloric limitations, and it appears that Peale, Washington’s friend and comrade since militia days, captured this in his portraits. The scene that Mount Vernon’s Jim Rees envisioned for Washington at Valley Forge had him on horseback (most likely riding Blueskin, although Nelson was later his favorite horse), so my reconstruction had to embrace not only the further exaggeration of the lower back that sitting alone would produce but also

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project that it would have been impossible for Washington to use his dentures, particularly those preserved at Mount Vernon, for anything but filling space between his nearly toothless jaws, so he probably took them out before dining. No wonder he preferred soft, mushy, dissolvable foods.

More of my staring at the Peale portraits of Washington at 40 and 47 years eventually led me to another epiphany: Washington had a belly. Not just the abdominal exaggeration caused by his artificially curved lower spine, but a bit of a paunch that was made more prominent by his long and lanky arms and legs. Perhaps, I thought, this was when

Washington’s abdominal expanse (Figure 6).

After the faces and bodies reached my standard of acceptability, then came the more arduous task of manipulating the computer software to imbue each face with the expression and each body with the pose, poise, and energy that I thought best reflected each moment in time. Consequently, the surveyor has a slight smile around the eyes and corners of his lips as he looks up and out into the unknown future. The commander at Valley Forge has to pull together every ounce of the charisma he had to keep the Continental Army going under the direst of conditions. And, having rejected an offer to become king, the president-elect found

Left: The 57 year-old Washington being sworn in as the first U.S. president.

himself at a ceremony that would charge him with an office and government that had not ever before existed.

With the images as close as I could get to my expectations, I went with PRISM folks to a company in northern California with which they had worked in converting digital images into tangible representations. This is done by cutting up the virtual image into sections and using the data from each section to inform something like a huge lathe to carve that particular piece from a block of high-density Styrofoam. In this case, I got a head, a torso, and parts of limbs that then had to be put together. Although the body parts came out fairly close to what I had created in the digital world, the detail of the faces, and in particular the expressions I had worked on so long, did not. Nevertheless, according to plan, the three Styrofoam Washington manikins were packed carefully and shipped to an artists' studio in Brooklyn with whom I worked, turning my conceptualizations into life-like replicas of our first president.

Since the heads would be the most visible parts, this is where we concentrated our efforts. Each Styrofoam head was molded and clay packed into each mold. I then collaborated with sculptor Stu Williamson to bring detail back into these faces and ensure that the expression in each was as I had envisioned (Figure 7). Stu was feisty about this process but, after hours of back and forth and

discussing the feeling I thought each face had to project, Stu met me halfway—not only in “doing” George Washington but in working with a perceived “non-artist.” Eventually our collaboration resulted in the facial expressions I had hoped for.

The studio, Studio Eis, proposed to mold the faces out of plaster but I objected. After so much intensive thought and labor, why cut financial corners now? So Madame Tussauds, here we come. After each head had been sculpted to my specifications, it was molded again. Layer after thin layer of liquid wax was carefully poured into each mold, which was rotated in order to achieve uniform thickness. Each “eggshell” of a face was then implanted with real hair, as close to Washington’s color as possible, sufficiently behind the hairline that a wig placed behind would not be perceptible. Then glass eyeballs, each pair reflecting the piecing egg-shell blue of Washington’s irises but also the discoloration of the surrounding white that emerges with age, were “implanted” from behind and the facial details of color, tiny blood vessels, and beard stubble painted onto the wax face (Figure 8). Last, although hardly least, was the task of getting the clothing not only as it would have been in each moment, but of sewing it onto each manikin.

As you can imagine, this was not an intellectually or interpersonally simple project to enact, but we did it. Every time I overhear someone comment not only on how lifelike

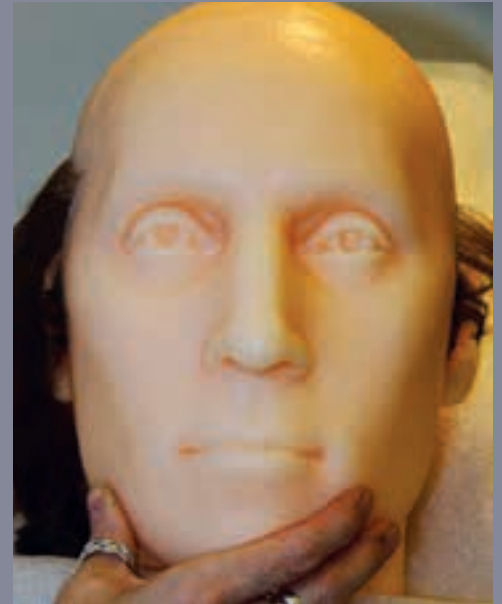


Figure 8. The wax replica of the clay 19 year-old's head with the implanted hair and wig behind, hand-painted glass eyeballs in place, and finishing touches to the skin still being painted.

my reconstructions are but also how each one is George Washington, I burst with pride. While I cannot envision another project ever rivaling the challenge and national significance of this one, I will be forever grateful that I had this opportunity. ☀

Jeffrey H. Schwartz is professor of Physical Anthropology and of History and Philosophy of Science at the University of Pittsburgh. His decades-long association with the Allegheny Medical Examiner's Office led to this once-in-a-lifetime project.

I thank James Rees, executive director, Mount Vernon Estate and Gardens, for entrusting me with this project and permission to reproduce images I took during this work. I also thank the many institutions whose curators made their Washington artifacts available for study.

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