
BLOW-UP

Darcy Grimaldo Grigsby

Blow-Up: *Photographic Projection, Dynamite, and the Sculpting of American Mountains*

> *Without some effective substitute for the thousands of enslaved craftsmen of the Egyptian days, our undertaking would never come to an end.*
> Gutzon Borglum, 1932[1]

The screen remained entirely black. "Night after night," the American sculptor Gutzon Borglum (1867–1941), most famous for making Mount Rushmore, projected a two-and-a-half-inch glass slide with a paper "X" onto a huge canvas.[2] This improvised screen, measuring at least twenty-eight by thirty feet, was hung between two telegraph poles seven hundred feet from Borglum's house in Connecticut. The outsize projector was inordinately powerful yet the canvas remained blank, a "shadow." Why? Was the beam of light still too weak? the night too bright? the canvas too far away? the projected image too small to be seen at a distance? Or was it too unfocused and dispersed? What was responsible for this failure of projection? The questions proliferated as did the media. Like a scientist, like an engineer, the sculptor carefully isolated and tested variables.

Photograph of projection of Borglum's design onto Stone Mountain at night, ca. 1922–1923 (detail, see fig. 4).

To no avail: the screen remained blank, empty, mute. In this optical nowhere, this absence of light at the interstices of material constraints, scale is elusive. In such a vacuous darkness, we are no size and the object is immaterial, not even an image. The measurements of the slide, the screen, and its distance from the projector promised

a bounded certainty that the blankness annihilated. What difference does the size of the canvas make when it remains a vacancy?

"Finally one night they discovered a sharp streak of light on the screen . . . inexplicable because there was nothing of that sort on the slide."[3] The appearance of a shape on the screen that did not correlate with the shape on the slide was mystifying, challenging faith in the indexicality of projection, the lockstep between cause and effect. Only up-close examination of the slide betrayed the answer. Borglum had failed to appreciate how very dramatically projection magnifies size:

> *In cutting out the strips of black paper, some one had let the shears slip, ever so slightly, and there was a sliver of paper almost cut off along the edge of one of the strips. The cut was so slight that it had not been noticed when the paper was pasted on the slide, yet through that hair-like opening had slipped the ray that struck a streak of light clear across a screen twenty-eight by thirty feet. Then they realized the situation. The enlargement of the X was so enormous that the shadow cast by the strips of paper where they crossed had actually blotted out that gigantic screen.*[4]

Projection had made the small "X" so immense that it had blocked all projected light from reaching the canvas. The sculptor had not been able to understand why the screen remained dark because he was not thinking big enough: for him, enlargement at this scale had been unimaginable. Blown up so large, the "X" was not legible; without a ground of adequate size, its edges were not visible. In this experiment, colossal magnification made form invisible as form, turning it into a mere blank ground.

Loss of legibility, or recognizability, everywhere underwrites the story of colossal making. How can an artist construct gigantic things, especially mimetic sculptures, when their very size prevents apprehension by exceeding the optical field?[5] And given that great distance is needed to apprehend the gigantic as form, how can this distant view be reconciled with the up-close gaze needed for manual labor? When form is so big that it fills the field, threatening to become ground not figure, how can makers locate its boundaries and make discriminations?

After Borglum had discovered the "hair-like opening" that had inadvertently created the gash of light on his canvas, he knew what he needed to do: he painted a slide black and "with a pin point, [he] scratched through the black a [man's] head not as large as a split pea."[6]

He thereby inverted the light and dark of the first slide, and sought to make form visible not as occlusion (the black "X") but as illumination (the scratched-away head). Once projected, "in lines of blazing light the head stood out on the dark screen, covering its surface. It was as clear and distinct as if it had been cut there with a keen knife. The problem of casting a sharp-edged shadow seven hundred feet had been solved."[7] In this triumphant narrative, a process that had begun as additive and two-dimensional—paper pasted onto a glass slide in turn projected onto a canvas—here becomes subtractive and sculptural. After having been scratched out from the black ground, the projected image appeared "as if it had been cut there with a keen knife."

The language here is not coincidental. Sculpture was Borglum's ultimate goal. That winter, in 1922, five years before he began sculpting Mount Rushmore, he was trying to devise a way to carve a colossal relief commemorating the Confederacy on the face of Georgia's Stone Mountain, the "largest body of granite in the world."[8] The memorial had been initiated by an elderly Confederate widow marvelously named Helen Plane, president of the United Daughters of the Confederacy, who had first approached Borglum on the fiftieth anniversary of the end of the Civil War. When Borglum had traveled to Atlanta to meet Plane in August 1915, he arrived only months before the opening of D. W. Griffith's *Birth of a Nation* and the ceremonial revival at Stone Mountain of the Ku Klux Klan, which had been officially disbanded since 1869.[9] The monument, film, and ceremony all attested to the lingering, acute resentment of the Northern defeat of the Confederacy and its abolition of slavery fifty years earlier. Stone Mountain was closely identified with the KKK, whose members controlled the committee established to oversee the sculpture's construction. Borglum's politics were inconsistent, but he had long believed in white supremacy. Conviction and opportunism led him to join the KKK between 1922 and 1925, the very years of his work on the Confederate Memorial.

Borglum's imagery—a line of men riding horses—at once glorified the Confederacy and suggested the night rides of the KKK. How subliminal was that echo between the South's past and its present? its nineteenth-century defeat and its twentieth-century menace? Borglum's subject was incendiary, but this essay focuses on his use of the relatively new technologies of photographic projection and dynamite to sculpt at a colossal scale both at Stone Mountain and Mount Rushmore. Examination of these monuments' construction rather than their subject matter can be construed as an avoidance of their politics,

but Borglum's technological innovations, I will argue, were also responsive to the recent history of the Civil War.[10]

As Borglum himself came to realize, he had begun his colossal projects unrealistically; he admitted that he had initially "thought more or less in terms of hand work, measured and judged at arm's length."[11] But handwork could not carve immense sculptures out of rock mountains; it "could not get rid of the useless mass of stone fast enough."[12] Colossal scale thus forced Borglum, the studio marble-cutter, to experiment with modern technologies such as photographic projection and dynamite; it also forced him to think like an engineer. To design such sculptures, Borglum needed to see them as images viewed from afar; the impact of the colossal is first and foremost dependent on a distance adequate to allow apprehension of the whole, not solely the part.[13] This essay examines the tension between optical and haptic models of making and perceiving sculpture. Borglum's mountain sculptures were seen from a distance; they were made not by the hand, or by slaves wielding simple tools, but by modern technologies and the laborers hired by engineers.

Mountain as Screen

Stone Mountain is peculiar and immense; its exceptionally smooth, flat, and continuous surface measures almost six hundred acres. A photograph shows Borglum with binoculars gazing at the mountain from its base: the sculptor as viewer (fig. 1). From the first, Borglum appreciated that his challenge was to make a sculpture large enough to appear monumental against such an enormous ground. He immediately dismissed his patrons' proposal that he sculpt a ten-foot high head of Robert E. Lee as far too miniature, "equivalent to sticking a postage stamp on the side of a barn. It would be absurd. It would be ridiculous."[14] Instead of the single head of a general, Borglum imagined Robert E. Lee, Stonewall Jackson, and Jefferson Davis leading their soldiers on horseback.

The goal was quixotic. To appear monumental, the relief had to be gargantuan. Like so many builders both then and now, Borglum wanted his sculpture to surpass colossal precedents, not just figural monuments such as the Sphinx, Colossus of Rhodes, and Statue of Liberty, but also engineering projects such as Egypt's pyramids and the Panama Canal, all of which were mentioned repeatedly in the promotional literature.[15] A 1923 press caption, for instance, unselfconsciously compared Borlum's projected relief of a Confederate general to ancient Egypt's monuments in order to vivify its immensity: "The

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Photograph of Borglum looking at Stone Mountain through binoculars, ca. 1922–1923. Stone Mountain Confederate Monumental Association photographs and sketches, Box 18, Folder 4. Manuscript, Archives, and Rare Book Library, Emory University, Atlanta, Georgia.

great Sphinx at Gizah would be hidden by Lee's hat, the Colossi of Memnon at Thebes would barely reach to Lee's stirrup, while the apex of the great pyramid of Egypt would lack a hundred feet of touching the hoofs of Lee's horse."[16]

Comparing the size of Robert E. Lee's hat to that of the Sphinx may seem fanciful and absurd, but comparison is the name of the game when it comes to scale. Scale, scholars emphasize, depends on physical comparisons: size relative to the whole, to other parts, to usual size, to human size.[17] Since we typically compare the size of things to our bodies, the colossal poses unique perceptual challenges because it is so radically unlike ourselves.[18] One may recognize (or comprehend, to use German philosopher Immanuel Kant's terms) that something colossal is big, but it is extremely difficult to apprehend *how* big it is.[19] Our difficulty apprehending immensity is compounded by distance because things that are far away naturally appear smaller. Thus, "it is . . . quite hard for a person to perceive the size of something relative to his or her size unless that something is fairly nearby."[20] Perceptually, the relationship between the sculptural and the optical is especially complicated: faraway three-dimensional things such as

sculpture are necessarily perceived by us as two-dimensional images, not physical real-size objects.

Borglum's goal was to make a remote *and* monumental sculpture. He planned to center his carved relief on Stone Mountain, suspending it some five hundred feet from the mountain's top and four hundred feet from its base. His sculpture would remain physically inaccessible, a distant sight, a decision that made its construction absurdly challenging. Just the transfer of his design onto the precipitous mountain face would prove inordinately difficult. Borglum had initially attempted to draw directly on the rock face, only to discover the impossibility of making visual discriminations at such a size while only an arm's length from the mountain's surface: "Over the gulf, [Borglum] swung, swaying in the wind, and, when he could, dabbing at the rock with his paint-brush; but when he was drawn up again, he couldn't see his work! On that vast area his little lines made no more impression than a bright new pin would make, if it were dropped into a hay-field. . . . He had been trying to draw a picture on seven acres of stone. . . . The mountain had won, without a doubt."[21] The sculptor came to realize that he "would be literally battered to pulp before the design was one-tenth transferred."[22] He also began to recognize how labor-intensive was work at this scale.

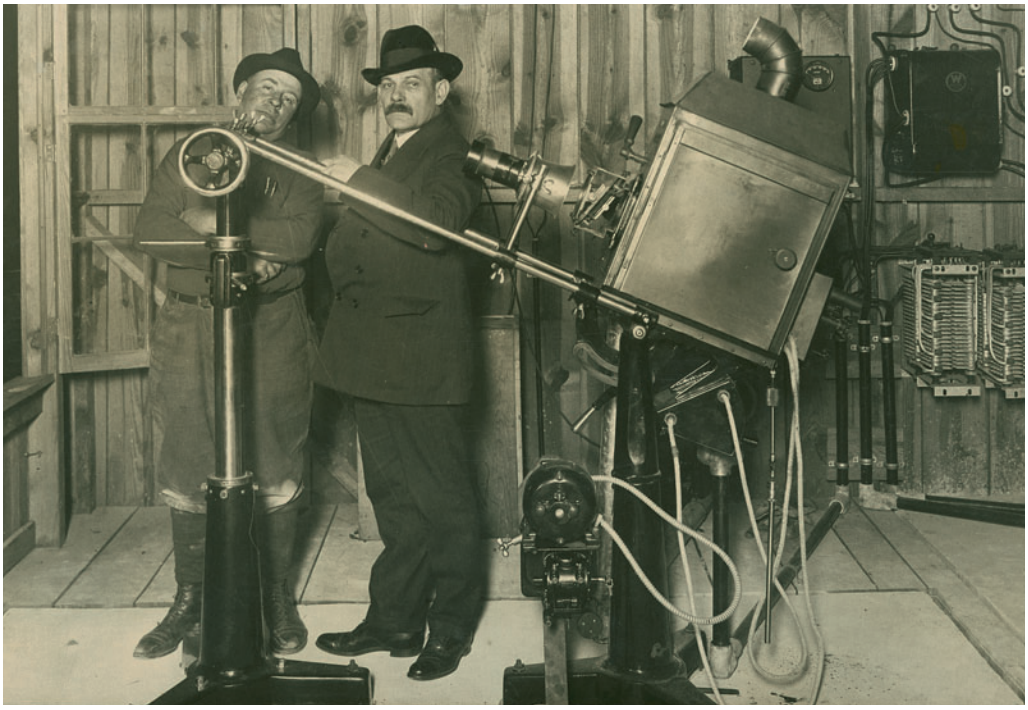
Borglum had consistently objected to what he called "mechanical enlargement," by which he meant sculptors' traditional enlargement of a model by the simple method of laboriously gridding the measurements, or points, of the model's surface, then mathematically multiplying those measurements. According to Borglum, sculpture enlarged by the rote multiplication of the dimensions of a small model

> *is lifeless because it is not struggled over in the making* full size, *but simply copied. I have been conscious of this quality of death in all modern architectural sculpture . . . and I early determined no mechanical intermediary should take what soul I possessed out of my work.* . . . Finished models *should not be made; in them all the creative impulse has expressed itself, the enlargement is inevitably a stillborn, dead, soulless thing. I was determined . . . to develop some means by which I could quickly put my design in place and see it from below, change, correct, with the same freedom I would in my studio and with as little cost to one's own strength.*[23]

Borglum knew he needed a model to make his colossal sculpture, but he did not want that model to dictate his artistic decisions at full size; rather he wanted a method that permitted continual improvisation and experimentation in the designing of his final sculpture. Rejecting the three-dimensional model that required measurement and multiplication in three dimensions, he embraced the photographic projection of images. (Curiously, Borglum never seems to have conceived of photographic projection as a "mechanical enlargement," despite its reliance on machines twice over: the camera and the projector.)

Borglum was confident that projection was his answer. After all, didn't Stone Mountain resemble a mammoth screen? The method also promised flexibility. Alter a model of whatever size and whatever medium and then photograph it to make a new slide. Here was an inexpensive method capable of immediate, extraordinary magnifications in scale. As he pointed out, "Enlargement was so great that a pin scratch on the slide measured nine inches in width on the mountain. . . . The slide was small enough so that I could hold it in the hollow of my hand, but the picture . . . covered nearly an acre."[24]

Ultimately, Borglum succeeded in projecting his designs onto a colossal mountain because he refused to believe experts at Kodak and Westinghouse who told him extant projectors could not shoot light that far, extant lamps were not sufficiently bright, and prolonged illumination would melt a slide (unlike quickly moving film). Luckily, he found a perfect collaborator. Inventor, projectionist, film director for Thomas Edison, and president of the Precision Machine Company, Edwin Porter (1870–1941) was a man Adolph Zukor described as more in love with machines than with people.[25] Ultimately, Porter, hooked by the challenge, manufactured Borglum's projector at his company's own expense. For intense illumination, they found their "answer in carbon. . . . The heart of every moving picture projector and every powerful searchlight, [carbon] provides the highest possible candle power light from the smallest center insuring projection of a maximum of light rays through the slide, and thence to the face of the precipice."[26] A caption to a photograph of the projector in Borglum's scrapbook reads, "The huge projector, a 150 Ampere Arc built especially for this 900 foot throw by the Precision Company of N.Y. The most powerful in the world" (fig. 2).[27] The "Connecticut Power Company ran the electricity through a special wire," and the National Carbon Company supplied the light source.[28] Borglum had mobilized corporate America, specifically northeastern America, on behalf of a grandiose and implausible artwork celebrating the Confederacy in the South.



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Photograph of Borglum with giant projector, ca. 1922–1923. Stone Mountain Confederate Monumental Association photographs and sketches, Box 18, Folder 4. Manuscript, Archives, and Rare Book Library, Emory University, Atlanta, Georgia.

No wonder Borglum thought he had licked the problem. Still, the challenges posed by projection were perpetual and surprising in degree. In Connecticut in 1922, when Borglum had replaced his scratched-out head with a photographic slide of his sculpted model, he once again stared at a blank screen in utter frustration. Nothing. Like the "X," the model's sculpted generals had disappeared once projected. Ultimately, a child saw what and where he could not: "Suddenly, my little six year old daughter exclaimed and told me to look at the horses and soldiers on the snow on a hill beyond, over 1500 feet away, so distinct I could have redrawn them on the snow."[29] Once again Borglum had not been able to predict the radical magnification of projection. Like the "X," the army had been too big for the canvas; instead it filled the distant landscape with the disturbing hallucination that spectral Southern men were riding horses at night across New England's snow-covered hills. He called the landscape "a perfect screen . . . one thousand five hundred feet away!"[30]

Mountain as Photograph

Projection it would be, but not merely as light. Borglum's success had made him all the more grandiose and unrealistic. In 1922, the headline of the *Atlanta Journal Magazine* crowed "World's Biggest Photograph

3
Angus Perkerson, "World's Biggest Photograph to Be Printed on the Face of Stone Mountain," *Atlanta Journal Magazine*, December 10, 1922, cover page.

DEAD MAN WITH LIVING HAND PAGE 5

The Atlanta Journal MAGAZINE

EDITED BY ANGUS PERKERSON

ATLANTA, GEORGIA, SUNDAY MORNING, DECEMBER 10, 1922

World's Biggest Photograph to Be Printed on Face of Stone Mountain

BY ANGUS PERKERSON

THE biggest photograph ever made will be printed this month on the granite face of Stone Mountain in exactly the same way that a photographer in his darkroom prints a picture on a piece of sensitized paper.

The photographer usually uses a strip of paper about eight inches wide and ten inches long. Gutzon Borglum, the sculptor, will use the steep side of Stone Mountain, which is 900 feet high and hundreds of feet in width.

He will pour over the side of the mountain barrels of chemicals to make the rock sensitive to light just as the photographer's paper is made sensitive.

Before doing that he will set up on a concrete base at the foot of the mountain the most powerful projecting lamp ever built in this country. Then he will place in the lamp a negative made from one of his drawings which is an exact model of the army of figures that he intends to carve across the face of the mountain as a memorial to the Confederacy.

The lamp, shining through the glass negative, will throw the drawing upon the mountain side. The sensitized rock, like the photographer's sensitized paper, will receive the impression. The work will be done at night, and the night itself will furnish Mr. Borglum his dark room.

For one, two, three hours, perhaps, the lamp will shine through the negative upon a section of the mountainside 700 feet distant. Think of it, 700 feet! And the photographer in making prints in his studio seldom "throws" the light over six or eight feet.

Barrels of "Developer"

AFTER the light has shone long enough on the mountain to convince Mr. Borglum that the rock has received the impression of the negative, he will send workmen up to the top of the mountain and will have them pour down the side barrels of developing solution.

This is exactly what the photographer does when he takes his rectangle of white, sensitized paper from in front of his lamp and immerses it in a solution of "developer." When the paper is removed from its place before the lamp it is still white and blank. The impression of the negative is there, but is hidden. Immediately after the paper is dipped into the chemical and rubbed slightly the picture begins to appear.

Mr. Borglum can't take the side of the mountain and immerse it in a tub of developing solution, but he hopes to gain the same effect by pouring over the granite gallons of chemicals that will tend to develop the picture thrown against the sensitized rock.

If he succeeds this far, he will continue to follow the processes of the photographer by pouring a "fixing bath" down the mountainside so that the picture after being developed will be held in the rock. A photographer usually has three trays, or shallow pans, in his dark room. In one is "developer," in the other is the "fixing bath," and in the third is clear water.

He places the print in the first tray in order to develop and make visible the picture impressed on the sensitized paper by the rays of the lamp shining through the negative. He next places the print in the second tray in order to "fix" it; that is, prevent it from fading. He finally places it in the third tray to wash off all the chemicals.

At the top, the steep side of Stone Mountain where Gutzon Borglum will carve his memorial to the Confederacy. Just below on the left, a drawing to show how he will print his sketch of the monument on the side of the mountain. On the right, a photograph of Mr. Borglum made at Stone Mountain a few days ago.

Night for His Dark Room

GUTZON BORGLUM will take each of these three steps. First he will wash the mountainside with "developer," then with "fixing" chemicals, and finally with clear water.

He will attempt the gigantic feat of using the night for his darkroom and the face of a mountain for his photographer's paper, because this seems to him to be the simplest way to print on the mountainside the figures he intends to carve there.

Since he conceived his plan of carving on the sheer side of Stone Mountain an army of figures as a memorial to the Confederacy, one of Mr. Borglum's chief problems has been how to outline the figures before the work of carving them began. It has been easy for him to make models and to complete sketches showing just what he wants the memorial to be, but he has never been able until now to devise a satisfactory way of transferring his drawings to the mountainside.

The reason can be made clear at once by showing the situation that confronts Mr. Borglum.

He is going to carve his memorial on the steep side of the mountain, where the rock goes almost straight up and down. He has selected a point 300 feet from the ground as the place where he will cut the figures into the granite. Of course, before the actual carving begins the figures must be outlined on the mountain just as Mr. Borglum wants them sculptured. They must be exact in size, in proportion and in location.

You may ask why the sculptor doesn't have himself lowered over the side of the mountain and trace there with paint the figures just as he wants them to be. That method would not do because he would lack perspective. He would be so close to the mountain that he couldn't tell what he was doing. Every now and then, he would have to have himself lowered to the ground, a distance of 300 feet, so that he could stand off and see what he was doing. This would make the task impossible.

To Make Print by Dec. 15

THE plan of sketching the figures on canvas and stretching the canvas along the side of the mountain was suggested, but it was not feasible because the canvas would not fit closely enough against the rock and would slip out of place.

Finally, some means of projecting the figures on the mountainside was found to be the only practical plan, and many experiments were made toward this end. For one thing, a shed was built at the foot of the mountain and the figures were outlined on a window in this shed so that when you looked through the window you could see the figures on the mountain in the size they are to be when they are carved there. The light passing through the window would spread out before it reached the mountain and would make the figures as you saw them there much larger than they were on the window in the shed. Mr. Borglum's plan was to look through this window and by means of telephones, direct workmen on the mountain so that they would outline the figures as he desired. But this plan, too, failed to work out. Then, at last, Mr. Borglum hit on the device of printing his sketch on the mountainside, just as a photographer prints a photograph, and he is now completing arrangements for this experiment.

"By December 15 I expect to have a successful print on the face of the

(Continued on Page 7)

to Be Printed on the Face of Stone Mountain" (fig. 3).[31] The article quoted Borglum: "We will have to use great pains, and . . . our task of completing the outline of the memorial will not be finished in a night. But I have no fear of failure. I not only believe, but I know, that if I could get a lamp strong enough I could print pictures on the moon." Astonishingly, the sculptor really meant photographic *printing*, not projection. He was planning to treat the mountain itself as chemically sensitized photographic paper:

> *First, by several nights' work I will determine the exact location for General Lee's figure; then I will print the figure there, print it just as a photographer prints a photograph in his darkroom. I will make that spot on the mountain sensitive to light by pouring sensitizing chemicals over it; then, working at night, because the night itself will be my dark room, I will let the rays of the lamp shine against the mountain for several hours. After that I will pour developing fluid, then fixing fluid over that part of the mountain where the light has been shining. In this way I will develop the picture, I will fix it on the granite, and then I will wash away the chemicals. By morning I will have my picture ready for my workmen to begin carving. I will treat the various figures of the memorial in this way until finally I have the biggest photograph ever made, printed on the granite face of the memorial.*[32]

4
Photograph of projection of Borglum's design onto Stone Mountain at night, ca. 1922–1923. Stone Mountain Confederate Monumental Association photographs and sketches, Box 18, Folder OBV 3, Item 5. Manuscript, Archives, and Rare Book Library, Emory University, Atlanta, Georgia.

Borglum never attempted to realize this fantasy that the mountain itself could become a photograph, but projection became prominent in all publicity. In 1924, numerous regional newspapers published an illustrated article entitled "Stone Mountain—Giant Cameo of Historic South" that featured a beam of light crossing the entire page.

Yet even at this late date, Borglum continued to misunderstand photographic projection:

> *We were ready for work. I had made slides of my central group; I was ready to draw in my design over the wall of stone from my projected picture. . . . I sent my foreman down over the mountain. The night was dark; it was about eight thirty; slides were in perfect shape; lens and lamp*

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GUTZON BORGLUM Stone Mountain Memorial PUBLISHERS' PHOTO SERVICE
STAMFORD, CONN.

all in order. . . . My foreman was dressed in white; his mission was to descend down from the scaffold in a swing with paint and draw in over the picture on the mountain side the [twenty-foot] head of Lee, following the shadow on the mountain. . . . Finally he appeared in the field of light like a white speck, passed the rim of Lee's hat, on down, disappeared in the shadow that made the eye, then reappeared in the light ray that defined the nose.

By megaphone I asked him where he was. He replied he did not know. I told him that he was on the nose and asked him to draw the nose. He replied he could not see the nose, only light and dark blurs.[33]

Unlike the cutout "X," unlike the scratched-out drawing of a head, the photographed model appeared a tonal blur of light and shadow once projected and magnified (fig. 4). Up close, form disappeared; without edges or contour lines, without anchoring details, the worker suspended four hundred feet off the ground in the dark of night could not recognize a nose larger than himself. The problem was multiple: the immense design was unrecognizable and disorienting up close, the stone face offered few anchoring signposts, and finally, the tonal medium of photography could not provide precise contours for carving (despite late nineteenth-century "photosculpture," which pretended that photographs of a subject in the round could be mechanically translated into statues).[34]

Borglum finally recognized his mistake. Suddenly, "conscious how little forethought there is in any of us," the sculptor realized that a photograph simply records "objects that had reflected the light" and is no more than "a variegated assemblage of shading"; moreover, "any photograph seen too near or in part was meaningless."[35] Certainly, the foreman's failure to recognize the referent in a photographic detail when seen too closely contributed to his disorientation, but far more decisive was the fact that photography is a tonal medium, capturing only light and shade and not the outlines of things. For good reason, Borglum returned to drawing, inscribing outlines akin to the hard-edged contours of the cutout "X" that he had first projected: "I ordered the foreman down. The next day I took one of my photos and with a crow-quill pen drew in fine outline on tracing canvas the group, made half a dozen slides and tried again. The experiment was perfect. Two men were now sent down and for two hours painted with white the dark lines shown in the field of light."[36] Repeating the

negative-positive inversion of photography, Borglum's workers now painted dark lines white.

The hairlike opening that had created a streak of light back in Connecticut had also taught Borglum that microscopic details on the slide produced unforeseen consequences on the mountain. Precision was essential. The projector needed to be "absolutely motionless" because "a tiny error in the adjustment of the lamp or in the proportions of the drawing on the negative, will be magnified many fold on the mountain."[37] And even after the photographed model had been simplified as a contour drawing, distracting noise threatened to fill the pictorial field. The outlines on the mountain face were barely visible, as can be seen in a photograph of the celebratory unveiling of Robert E. Lee's sadly "postage-stamp"-size head (fig. 5). How utterly uninformative were these crude, spindly, and childlike contour drawings for the sculptor and his workers!

Add to this the extreme distortion of the projected image. As Borglum lamented:

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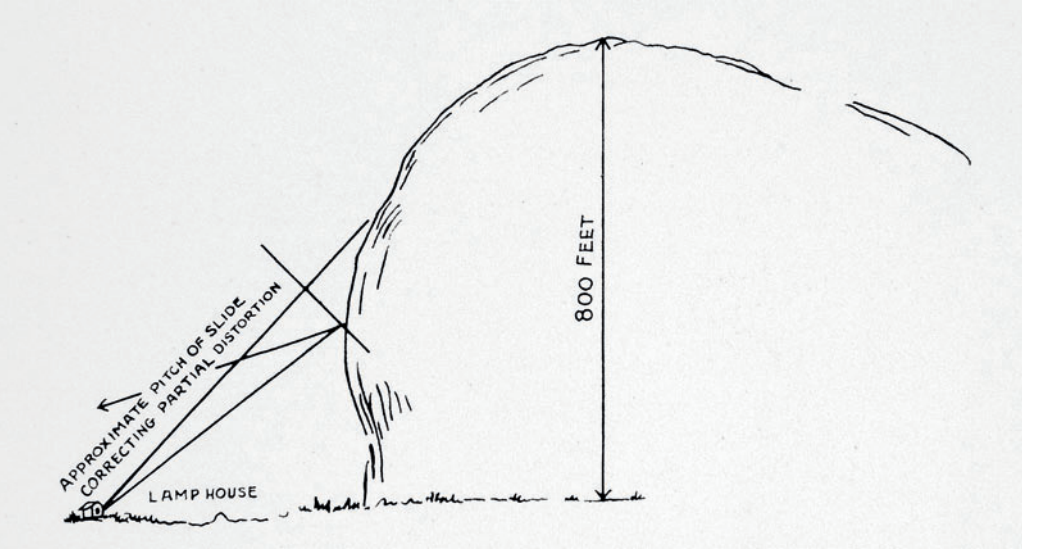
Photograph of celebratory unveiling of head of Robert E. Lee, 1924. Stone Mountain Confederate Monumental Association photographs and sketches, Box 18, Folder 4. Manuscript, Archives, and Rare Book Library, Emory University, Atlanta, Georgia.



> *In the morning we examined our work. I had expected distortion, but on going back twenty-five hundred feet from the mountain, it would be difficult to express my amazement to find the problem of distortion our drawing showed. From the lamp-house all seemed as it should be; on Flat Rock, . . . everything was changed. The bottom of the picture seemed fairly accurate but two hundred feet higher Lee's head and his body began to lengthen. . . . I was "stumped" as the saying goes. I applied to the cameramen again for advice. Again I met with shrugs.*[38]

Although Borglum's photographers proved unhelpful, movie projectionists had just begun to tackle precisely this problem. An article in 1920 announced the invention of a curved or "paraboloidal" movie screen intended to reduce the distortion of projection onto a flat surface: "Unlike the flat screen which distorts the image. The new screen, the invention of a French professor of medicine, gives the true form of image at every angle."[39] A recent commentator clarifies why projections deform: "On a flat screen, light from the projector travels a shorter distance to reach the middle of the screen than it does to reach the edge of the screen. Since the size of the projected image is determined by the distance to the screen, this makes the image appear slightly larger towards each end. . . . By curving the ends of the screen towards the projector, the distance traveled by the light can

be equalized."[40] To eliminate distortion, a screen should be concave so that the projecting rays everywhere traverse the same distance. At Stone Mountain, Borglum had to contend with an even greater distortion because its surface, while relatively flat and smooth, was convex: the mountain bulges. Borglum's acute angle of projection onto a convex rather than concave site four hundred feet above further deformed his design.

In his article "Engineering Problems to Be Met in Mountain Sculpture," Borglum devoted two illustrations to the distorting effect of his projection (fig. 6). Nowhere did his projector's powerful rays meet a flat surface at a right angle: "It will be clearly seen that the distortion increases in an exaggerated degree as we near the top of the ray, owing to the back curvature of the mountain. Finally it crossed my mind . . . that if I could tip the mountain over so as to place its surface at right angles to the center of the lens I would get approximately a true picture, or if I built a tower four hundred feet high I could project a fairly accurate picture. Each was impossible."[41] Borglum was still thinking in the colossal dimensions of material things: the mountain that needed to be tipped, the four-hundred-foot-high tower that was needed to elevate the projector. But he quickly shifted to models, remembering that miniatures can be manipulated photographically.

6
Gutzon Borglum, "Engineering Problems to Be Met in Mountain Sculpture," *Black Hills (SD) Engineer*, November 1930, 311, fig. 3.

Borglum's step-by-step experimentation, so fully laid out in his article on engineering, attests to a perseverance and ingenuity worthy of an engineer. In the process, he voyaged from actual colossal size—so difficult to manage—to the slippery, liberatory rabbit hole of representation, the land of scale or ratios. We witness his shifts from what we might call materiality—the physicality and dimensions of colossal things (mountain and tower)—to images of small substitutes, including photographs, which he physically manipulated. He tried to reverse the distortion, first, by photographing a tilted sculpted model only to realize that he had not designed his shallow relief to be seen from its side; then, by tilting the camera itself so as to take photographs of the clay model at an angle from above; and finally, by photographing a tilted photograph of the model. Ultimately, he recognized an even simpler manipulation: rather than rephotographing the photograph, why not put "the slide holder on hinges, and tip the slide[?] I did this and this became our working method."[42]

Dynamite, not Slavery

If the need to transfer his design onto the inaccessible rock face had paradoxically led Borglum away from the mountain and into the

studio where he devised photographic projection, the actual carving of the sculpture necessarily forced him back out of that traditional space of art making. Outside, he was forced to think like an engineer confronting the obdurate nature of matter.[43] Appreciating the sheer immensity of mass at the scale of geography, engineers knew that their job was to minimize the time and labor required to manipulate it. Borglum was forced to think and act like them. He admitted that he had begun Stone Mountain thinking "in terms of studio marble work": "Being an experienced marble cutter myself, I thought more or less in terms of hand work, measured and judged at arm's length. I had not proceeded long before I realized that the small amount of stone I was removing, costing me so and so much a foot to remove before I could begin carving was destructive and too costly. . . . I tried every known method but with little improvement. I could not get rid of the useless mass of stone fast enough."[44]

In another essay, Borglum emphasized the need to invent technological solutions to compensate for the loss of ancient Egyptian slavery. He was echoing an argument made repeatedly during the nineteenth and early twentieth centuries championing modern industrial innovation and its swift conquest of colossal dimensions:

> *Without some effective substitute for the thousands of enslaved craftsmen of the Egyptian days, our undertaking would never come to an end. I spent days and weeks experimenting with ways and means of blocking out masses of unnecessary stone and trying, by plug and feather wedge and drills to split them off. All these efforts proved childish and inadequate. After months and trials and failures and careful calculation of costs, I began to see that the work would be next to interminable with the labor we could afford and by then known methods at our disposal.*[45]

Enter the Belgian engineer who had come to Stone Mountain to "see the lantern work." Projection drew him to the site, but he left behind dynamite.[46] Borglum had already entertained the use of explosives but was wary of their destructive force: "I had thought some of explosives but, knowing little about them, had vetoed their use. The general idea is that high explosives can only be used to destroy, disrupt, tear asunder and wreck. As I thought this subject over, much as I am writing it, another thought came to me; why not *control* the explosive force?"[47] The Belgian convinced him that such control and

precision were possible. Digging a tunnel in Europe, the engineer had learned how to "measure his charge in such nicety that the shock was precisely enough to split off ten inches." Borglum immediately contacted "a powder man" from DuPont. "With the result the world knows; we have literally carved with dynamite."[48]

When Borglum turned to DuPont for expert advice and its commercial product, he was approaching the suppliers of dynamite for the excavation of the Panama Canal, where "high explosives" were indeed "used to destroy, disrupt, tear asunder and wreck."[49] The differences between Borglum's needs as a sculptor and those of engineers attempting to dig a channel across Panama's endlessly resistant, muddy mountains should not obscure their shared need to excavate, to eliminate matter. (Dynamite's primary use during World War I had also been to dig trenches). The sculpting of Stone Mountain and Mount Rushmore was a subtractive rather than additive procedure. Borglum was not molding as had, for instance, the French sculptor Bartholdi in the building of his hollow, metal Statue of Liberty.[50] Instead he was cutting away his site-specific medium: "split off just what you want to remove and no more, and . . . under no conditions so charge your load as to injure the stone left in place."[51] Once rock was subtracted from mountains it could not be replaced; the process was irreversible and the technique had to be learned: "We have had men on our work who have so overcharged their blast that stones that should simply have been loosed and slide off the mountain have on two occasions gone beyond their calculation, [but] it has been these overcharges that have taught us our limitations and warned us how wise and careful we must be."[52]

By 1925, Borglum and his workers had removed twenty-four thousand cubic yards of rock from Stone Mountain, each weighing about two and one-quarter tons.[53] No wonder he would boast about the efficacy of dynamite after he had deployed it in even greater quantities at Rushmore, once again comparing his accomplishment to that of ancient Egyptians: "I doubt if the ancient Egyptian craftsmen could handle such a volume of work even though they labored shoulder to shoulder over that entire surface; and I doubt too, if the work we shall do in less than sixty days, with the aid of explosives, could be done in three years by the old methods or at less than six times the cost."[54]

Early twentieth-century American grandiosity and hubris were answered by dynamite. Here was a modern invention that was economical, efficient, and also symbolic of unprecedented power. But Borglum's repeated reference to the loss of Egyptian slavery was, of course,

7
Composite photograph superimposing Borglum's design onto a photograph of Borglum looking at Stone Mountain through binoculars (see fig. 1), ca. 1922–1923. Stone Mountain Confederate Monumental Association photographs and sketches, Box 18, Folder 4. Manuscript, Archives, and Rare Book Library, Emory University, Atlanta, Georgia.

euphemistic; the slavery no longer available to Borglum was black slavery. If ancient Egyptian monuments provided a comparative measure for modern colossi, vivifying their immensity, ancient Egyptian slavery served as a way for Americans to speak about the loss of slavery after the Civil War. At Stone Mountain, dynamite made it possible to build a colossal memorial to the Confederacy without black slaves. Borglum's assumption was that a postslave society needed dynamite.

Borglum's loyal photographer Charles d'Emery (1899–1992) nevertheless observed how minimal the effect of so much blasting was: "Nearly half a million tons of granite have been blasted from the mountain top to date, but from a distance it is just a scar."[55] A scar. During its construction, Stone Mountain certainly looked mutilated: pale gashes incised on dark stone could be seen from the ground, but figuration was slow to come into visibility. The surface looked uneven, marred, quarried, not sculpted. And unlike the many projections and manipulated photographs and postcards, Borglum's stone sculpture did not project from the mountain's surface as a relief (fig. 7). Instead its projection required removal of the mountain's surface, the making of a ditch in the rock as deep as twelve feet against which the figures slowly appeared. Oddly, the sculptor never considered how he would frame that hacked-away space. The fantasy of additive relief that the photographic manipulations had invited (as if the final sculpture would project from the surface rather than subtract from or carve into it) seems to have blinded him to the ugliness of his work's gash into a pristine granite surface.

8
Completion of Augustus Lukeman's design at Stone Mountain by Walter Hancock in 1972. Photographic postcard. Author's collection.

In 1925, only Robert E. Lee's head had been finished and ceremonially unveiled when relations between Borglum and his patrons broke down. The conflict was political, involving different factions of the KKK, and also financial. Borglum had designed an immensely successful half-dollar coin to raise funds for the memorial; when a KKK opponent in charge of the memorial appropriated the money for other uses, Borglum protested to President Coolidge and the Treasury.[56] In retaliation, the committee fired him in February of 1925. Furious at this betrayal after years of effort, the sculptor destroyed all his models both in his studio and on the mountainside and fled to North Carolina a wanted man. In April 1928 the *New York Times* announced the final destruction of Borglum's four years of effort. Six years after he had stared at a blank screen, his twenty-foot carving of Robert E. Lee was "rattled down the mountain side to the shapeless heap of broken stone at the base. Since then forty stone carvers working not with chisels but with pneumatic drills, have been devoting eleven hours of every

day on their frail scaffolds, 800 feet up on the face of the precipice, to chip away the stone down to the lines of the sculptor's models."[57]

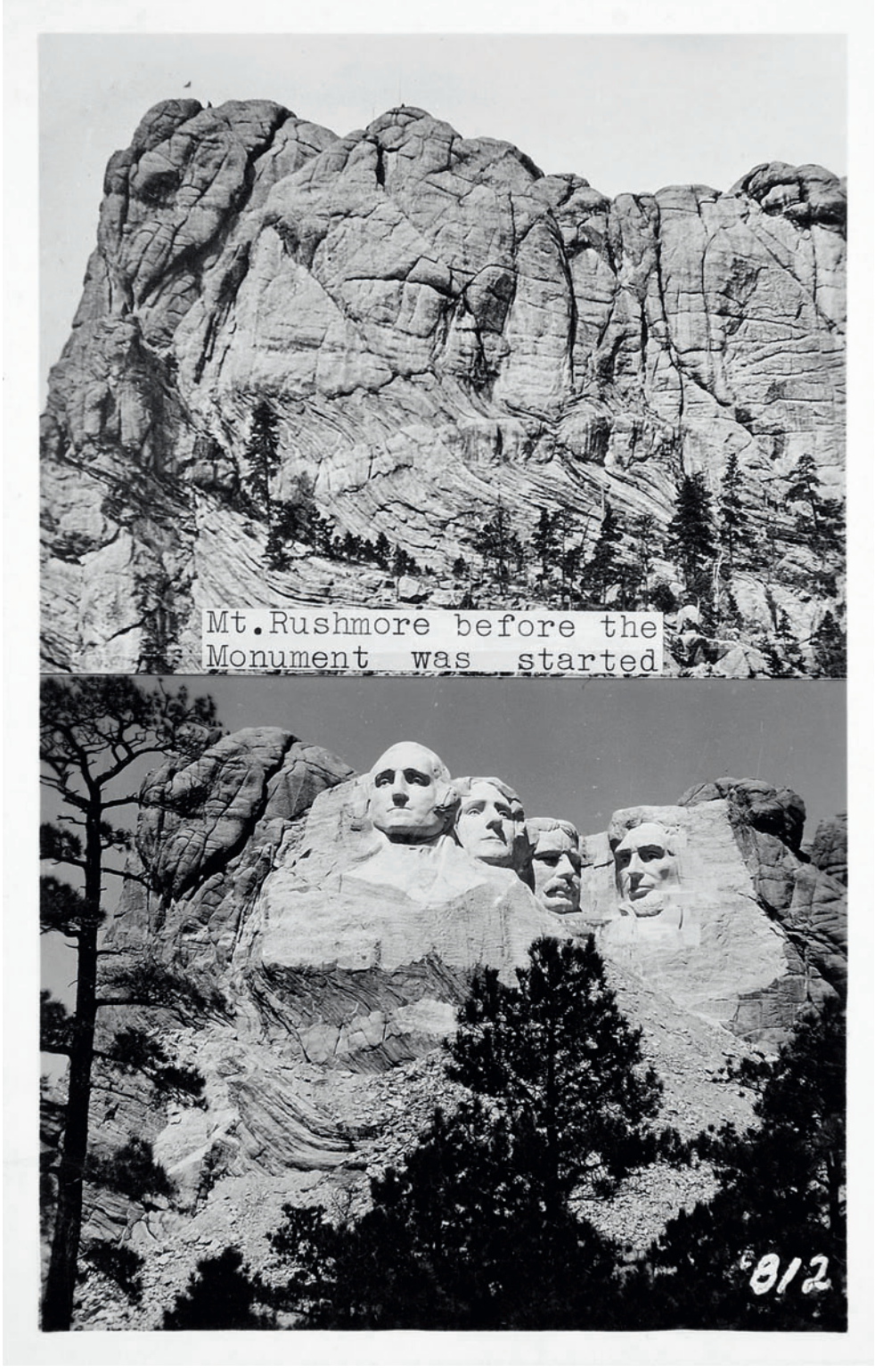
Excavation became erasure. Between 1925 and 1928, a younger sculptor, Augustus Lukeman (1872–1935), oversaw the destruction of Borglum's work and began carving the stiff, far less accomplished relief we see on Stone Mountain today (after a hiatus of thirty-six years, Lukeman's design was completed by Walter Hancock [1901–1998] in 1972) (fig. 8). For decades, Borglum's heads of Robert E. Lee and Stonewall Jackson hovered above as blunt, pale scars. Figuration persisted as erasures, still visible above Lukeman's excavation in the ditch that Borglum had been forced to leave behind.

Mountain as Mass

Unlike the Confederate Memorial, Borglum's sculpture at Mount Rushmore appears a protrusion, a physical (not merely optical) projection (fig. 9).[58] Successfully completed in 1941 after fourteen years of carving, Rushmore's monumental, volumetric, and illusionistic sculpture makes Stone Mountain appear a sketchbook, a site for experimentation and mistakes, ultimately erasures, so many crossed-out steps and negative examples from which Borglum learned: Do not center your composition in the middle of a mountain so that it floats unmoored and appears small and arbitrary. Do not create a ditch, but make your sculpture mimic the rock promontories at the mountain's apex as if they share its convexity and geological mass and weight. Do not sculpt full-length figures with spindly extremities (that even horses could not make adequately monumental). Instead focus on the massive simplicity of heads, their large planes and legibility from a great distance (although initially, ridiculously, Borglum had proposed to sculpt full-length standing figures over four hundred feet high).[59]

The site of Rushmore in and of itself had made success more likely. Stone Mountain's sculptural beauty rested on its unmodulated simplicity, its massiveness as a minimalist horizontal slab. And the mountain's surface was an immense, unmarked, almost two-dimensional plane. On it, Borglum's figural sculpture appeared pathetically small and scratched in, an unfinished etching diminished by the monumental scale of geological time. Mount Rushmore, by comparison, was craggy, lumpy, irregular, wrinkled—in a word, sculptural. The mountain itself forced Borglum to think like a sculptor, that is, three-dimensionally; it offered no screen for virtual sculpting. Here Borglum could not be deceived by a slide projection's optical overlay of relief onto a flat rock face, as if stone sculpture could be added onto, rather than subtracted from, its surface.

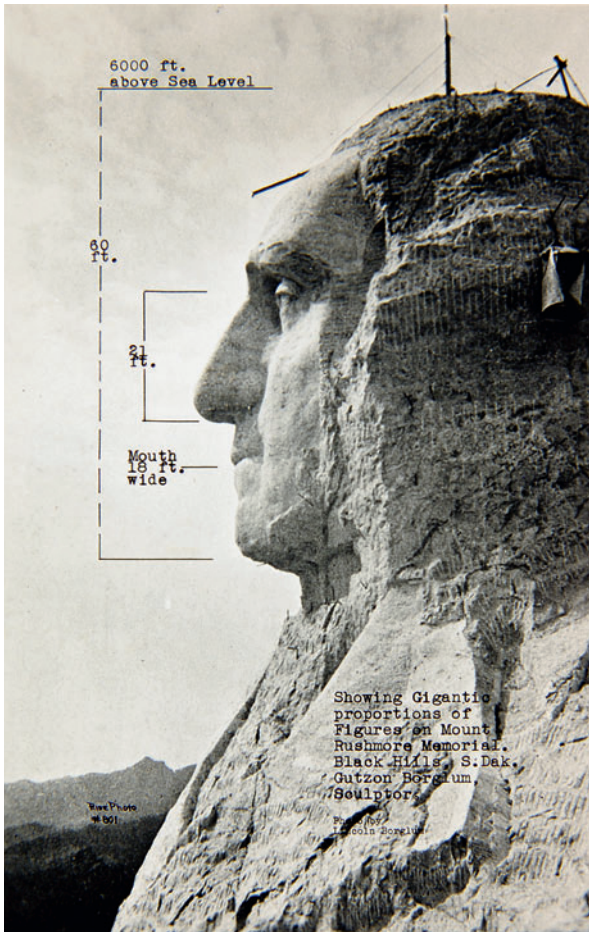
9
Before and after the carving of Mount Rushmore, ca. 1941. Photographic postcard. Author's collection.


Mt.Rushmore before the
Monument was started
'812

Mount Rushmore also obliged the sculptor to interact with its specificity because its geology is complex. As Borglum explained, "Mount Rushmore is a conglomerate mass. . . . The great presence of feldspar, a very hard substance, therefore more subject to intense heat and cold, causes the veins . . . to break away. . . . Rushmore is cross-hatched with these seams and I have been unwilling to determine on the precise location in juxtaposition of one figure with the other, until the stone was sufficiently cut away to warrant determination."[60] Geology forced respect. In his essay "Engineering Problems," Borglum devoted pages of description to his experiments with photographic projection in Connecticut and Georgia; clearly that challenge had mesmerized him and he was proud of his invention. But once he turned to Rushmore, he admitted that projection was useless: "I have not used the lamp and slides for Mount Rushmore chiefly because it has been impossible to determine precisely where each head of the presidents could be carved and any use of the slide labor-saving device might lead us into the adoption of locations that the stone would not fit."[61] In what may have felt a retreat from principles, Borglum returned to traditional methods of enlargement from a three-dimensional model: the gridding of points, measurement, and multiplication. Less precipitous than Stone Mountain, Rushmore could more easily accommodate the installation of the large mobile beams (called "booms"!) needed to maneuver the measuring devices and cutting tools. At this greater scale, Borglum needed the traditional point system to map and carve the immense volumetric masses of colossal heads, each some sixty feet high.

The feature of the face that protrudes or "projects" most acutely in angle and size is, of course, the nose. No wonder its absurd prominence—both visual and textual—in this story of colossal sculpting (fig. 10). Comically, the nose dominates accounts of Borglum's pursuit of form. Remember the foreman's frustrated efforts to discover its edges among the blurry photographic shadows projected onto Stone Mountain in 1922: "I told him that he was on the *nose* and asked him to draw the *nose*. He replied he could not see the *nose*, only light and dark blurs."[62] Noses were intended to orient, to define location. They were also repeatedly deployed to emphasize colossal scale: "The nose of Washington is twenty feet—six inches longer than the whole face of the Sphinx" is a common caption to postcards and other publicity.

Although the procedure of mechanical enlargement at Rushmore was not optical but resolutely mathematical, noses played an even more decisive role there: "The first step in accurate pointing a head is



10
"Showing Gigantic Proportions of Federal Carving on Mt. Rushmore Nat'l Memorial, Black Hills, S. Dak. Gutzon Borglum—sculptor. (Photo by Lincoln Borglum. Rise Studio)," ca. 1934. Photographic postcard. Author's collection.

to locate in the stone the point of the *nose*. This because it is the extreme projection on the face. . . . When we had located approximately the end of the *nose*, let us say, six feet and some inches too much stone, we made a red dot, drew a circle around the dot and painted on the side of the circle point No. 1, 6 feet."[63]

Despite its apparent positive force, its promontory-like mass, the sculpture at Rushmore was still made by subtraction: at point 1, subtract six feet to reach the tip of the nose. Maintaining enough stone was just as imperative as it had been at Stone Mountain: "An approximation of the mass necessary for the head to be carved is drilled off by workmen in swings. [A] great egg-shaped mass is formed . . . the contour from three to six feet larger than the final head. This cautious procedure is maintained, making each explosion lighter and lighter as we approach the face."[64]

11
Charles d'Emery, *Dynamite Explosion at Mount Rushmore*, ca. 1930s. Photograph. National Park Service, Mount Rushmore National Memorial, Keystone, South Dakota, Charles d'Emery Photograph #30.

Still, carelessness handling the boom could lead to errors and the wind "was a constant menace." At one juncture, "there occurred a slight twist or bend in the boom, which eventually appeared in the great mass of stone left for the *nose*. I had observed this but paid little attention to it until I saw the fault appearing in the *nose*, giving the mass a slight twist—not important at this moment as we had ample stone, but important in the final measurement. This fault was, of course, corrected."[65] Borglum emphasizes the extent to which "pointing" could lead to mistakes, but he also tells us that it could accommodate adjustments so long as the stone mass had not been compromised in size or material strength. He had invented photographic projection to ensure creative improvisation, but mechanical enlargement offered a surprising degree of flexibility so long as subtraction was executed slowly. Rushmore's promontories required but also accommodated improvised responses to the geological complexity of the mountain. Theodore Roosevelt's head is set far back, for example, because only there was the rock solid enough to be sculpted.

At Mount Rushmore, DuPont's dynamite blasted away 450,000 tons of rock (fig. 11). Oft repeated is the claim that over 90 percent of Borglum's sculpture was carved by dynamite. In 1930, the DuPont company magazine advertised its role in an article entitled "A Memorial for the Ages. DuPont Explosives are playing an important part in sculpturing colossal figures on Mount Rushmore in South

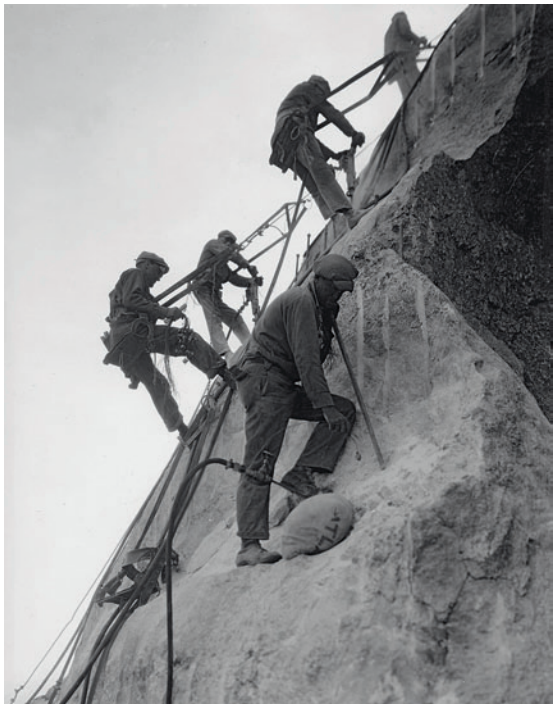
Dakota."[66] That same year, Borglum boasted about the precision of his technique, once again referring to the nose: "We have developed the drilling and blasting away of stone on Mount Rushmore to such a nicety that I can shape out a *nose* to within an inch or two of the finish surface, even down to the point of the *nostrils*."[67]

Of course Borglum was downplaying mistakes. Despite "utmost caution," "one of the first blasts was so powerful that a boulder flew 186 feet," snapping a nearby tramway cable. Most dramatically, mistakes in dynamiting Thomas Jefferson's head, originally to the left of Washington, led to its complete destruction by dynamite, an event recorded on film (fig. 12). Dynamite could shape a nose and it could also blow away a sixty-foot head.

Preliminary blocking out, careful fine-tuning, utter erasure: unexpectedly, dynamite proved to be a versatile instrument. Borglum was able to use dynamite to make changes similar in kind if not in size to those he had made in the studio. He was, for instance, always sensitive to conditions of lighting and made shifts to his composition in order to maximize the hours of illumination: "These experiments turned the head of Washington about twenty degrees further toward the south than originally intended. This permitted the sun to fall on

12
Film stills of the dynamiting of the first head of Jefferson, 1934. Digital transfer from 16 mm film. National Park Service, Mount Rushmore National Memorial, Keystone, South Dakota.

13
Charles d'Emery, *Workers Drilling Holes to Insert Dynamite, Mount Rushmore*, ca. 1930s. Photograph. National Park Service, Mount Rushmore National Memorial, Keystone, South Dakota, Charles d'Emery Photograph #15.



the north side of his face as late as one o'clock. I would have preferred to have turned it further but the stone left in place for the hair on his left side would not permit further turning."[68] Halting dynamiting, Borglum watched the play of daylight across the colossal head and adjusted his composition. He was still conceiving of stone sculpture in terms of light, as a sight apprehended from afar.

Sculpture as Sight

At Rushmore and Stone Mountain, Borglum's working process was marked by the tension between optical and haptic models of sculpture: sculpture seen from a distance and sculpture made up close. Making, of course, entailed physical contact with the mountains. Men strapped themselves into swings, clung to cables, and marched up and down cliff faces; they were physically intimate with the hardness and density and heaviness of stone, and the frightening force of gravity (fig. 13). They chiseled and drilled and polished sixty-foot heads and twenty-foot noses and mouths and eyebrows and ears. But the final audience of these remote monuments was never intended to experience such bodily tactile contact. Unlike viewers of most sculpture, visitors

14
Lee Friedlander, *Mount Rushmore, South Dakota*, 1969. Gelatin silver print, 8 1⁄16 × 12 1⁄8 inches (20.5 × 30.8 cm). Museum of Modern Art, New York, 177.2002.

did not apprehend Borglum's colossi by walking around them; they did not compare the size of their own bodies to his gargantuan heads. Instead visitors saw and continue to see Borglum's hovering colossal sculptures as images, a fact thematized by Lee Friedlander (1934–) in his 1969 photograph of Rushmore twice removed, a distant sight seen only as a reflection on the glass of the visitor center (fig. 14).[69]

Borglum's conception of colossal sculpture as an optical achievement made the carved mass of stone, the hours of labor, the shattering force of dynamite blasts, all but disappear. And disappearance also characterized these sculptures' making: the physical task of carving a mountain was a negative process, entailing removal not amassing, subtraction not addition. When dynamite's explosive force subtracted rock to leave figuration in its place, white clouds of exploded rock obscured sculpture's form, stone's mass, creating yet another optical screen. At the moment of detonation, the workers were required to stand at a distance from the rock face, to watch it explode from afar, stone turned into airborne dust.

The immensity of the settings at Stone Mountain and Mount Rushmore had challenged extant means of carving and perception itself. Unprecedented dimensions required apprehension of form across great heights and immense distances; the figurative illusion had to be sustained both from below and also from afar. Figures needed to be legible against the ground of America's landscape: Borglum's experiment with the projected "X" had taught him that much, but his figures also needed to appear large, not paltry. Note that legibility requires the visibility of a figure's discrete edges against the ground (which was missing from the oversize projected "X"), but immensity also entails a magnification of the figure so that it appears to fill, even exceed, the ground. Herein lies the contradictory challenge of making colossal things.

At Stone Mountain and Mount Rushmore, Borglum had advanced new technologies, photographic projection and dynamite, to serve as "affordable" alternatives to slave labor. The post–Civil War sculptor depended on technological innovations to compensate for the loss of the slavery that had once made Egyptian colossi feasible: "After months and trials and failures and careful calculation of costs, I began to see that the work would be next to *interminable with the labor we could afford* and by then known methods at our disposal."[70] He called photographic projection "the slide *labor-saving* device" and continually boasted about the efficacy of sculpting by dynamite.[71] But the fundamental differences between the two innovations got Borglum

into trouble. Once mastered, projection effortlessly magnified size: "a pinhead on the slide . . . was enlarged to the height of 24 feet."[72] It was precisely the ease of projection's magnification that made it such a treacherously deceptive model for sculpting. Optical achievements could not be so easily realized materially, even with dynamite. Blasts rid the mountain of tons of rock but the result appeared "a scar." Figures were tediously slow to appear; in two years at Stone Mountain, Borglum had only completed the head of Robert E. Lee. Borglum's success at Mount Rushmore was due in part to his need to sacrifice photographic projection and to conceive of the sculpture's construction three-dimensionally. Like an engineer, he oversaw laborers whose manual tasks were clearly dictated by physical measurements, not ambiguously suggested by two-dimensional projections. Still for Borglum, the final effect of his sculpture was meant to be optical, a volumetric monument hovering as an illusion seen from afar and modified by the changing sunlight.

In the *Black Hills Engineer*, Borglum chose to pair his article "Engineering Problems" with an essay called "What Is Beauty in Sculpture?" In the latter, the sculptor lingered not on material form or ideal shape or canons of beauty, but on the role of light: "Given certain conditions of light, a certain time of day which means nature's adornment, [mediocre monuments] rise into the elemental, they become a part of creation, they succeed not only as fitting memorials to the great that they represent but acquire a nobility and beauty."[73] At sunset, even the Washington Monument, abhorred by Borglum, appeared magnificent: "Like a finger of God, [it] rose into eternity, silent as the pyramids, lonely as Washington."[74] To define beauty in sculpture, Borglum proposed a thought experiment that betrayed a fascination not only with light but with the black box that is photography's site of origin (whether as camera or projector):

> *Let us imagine a square space, utterly devoid of light, therefore devoid of color or visible form. It is as a blind clouded night. Let us imagine then that suddenly a beam of light is freed from somewhere above. In the center of this dark space, light reveals a round, soft, blurred spot of gold; from this about halfway down springs a line suggesting the segment of a circle, somewhat like the inverted crescent of a moon. . . . Suddenly you recognize it's the head of a child, and with this recognition all that's latent in human relations responds. . . . Every fine*

15
Photograph of Charles d'Emery holding his camera on Mount Rushmore, ca. 1930s. National Park Service, Mount Rushmore National Memorial, Keystone, South Dakota.

emotion one possesses is awakened, and yet light has revealed only a circle of soft gold.[75]

A beam of light descends on "a square space, utterly devoid of light . . . or visible form," creating a soft round blur of light, like the moon in the dark, unexpectedly recognizable as a white child's golden head! The sculptor most famous for his colossal stone heads here imagines a head as an unanchored, immaterial apparition, capable of awakening "all that's latent in human relations." We see Borglum in the dark of night staring up at the circular projection on Stone Mountain, imagining an optical shortcut to colossal sculpting, an illuminated relief of unprecedented size and brilliance.

A picture of Borglum's photographer Charles d'Emery shows him smiling, perched high against the rock face of Mount Rushmore with a large wooden box—his camera—in hand (fig. 15). How fascinating is this photograph of the image-making man propped against a rock surface so immense that figurative carving remains illegible, invisible, but sequestered perhaps as an image within the darkness of the camera's interior! D'Emery's box holds the elusive promise of photography, its capacity to turn the stone colossus so unintelligible up close into a remote and apprehensible sight, but while d'Emery's box may transform carved colossi into image, it here withholds Borglum's sculpture inside its lightless void.

Later Projections

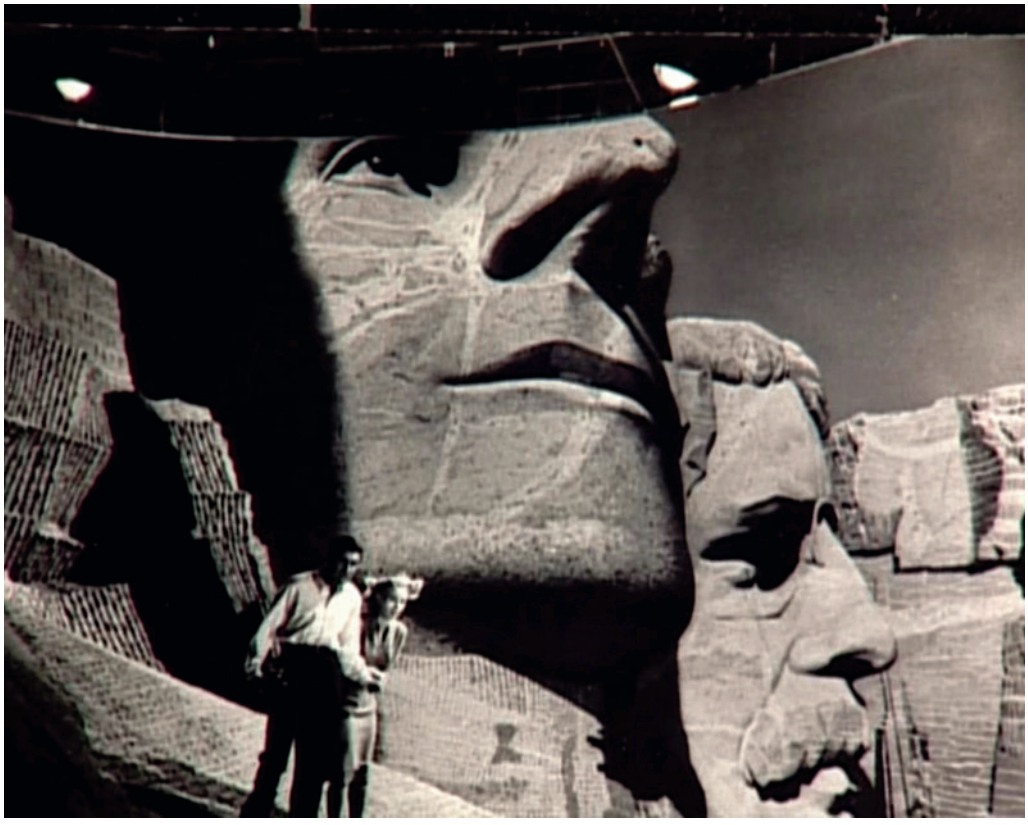
Both Stone Mountain and Mount Rushmore have had afterlives as projections. Today's laser shows at Stone Mountain return that mountain to the status of a screen, the role it was always best suited to perform. Over the clumsy carved relief, Stone Mountain's laser spectacles superimpose the Union's stars and stripes (!) and lively line drawings of galloping Confederate troops on horseback. Images, yet colossal scale still matters to advertisers: "The new show will be taller than the Statue of Liberty and up to five times the size of an IMAX screen."[76] "Mountainvision," as it is called, can produce a spectacle far more immense than laboriously extricated sculptural form. Larger than the Statue of Liberty and IMAX: the confusion of sculpture and screen is ongoing.

Alfred Hitchcock's 1959 film *North by Northwest* represented Mount Rushmore as the (physical) site for its climactic chase scene and also from afar as an (optical) sight seen through the visitor center's telescope. Prior to filming, rumors circulated that the director intended to have his actors scramble over the faces of the presidents,

although Hitchcock had insisted that he would be respectful—"When they say we'll do something on Lincoln's nose, this is very bad. We wouldn't dream of it."[77] Abruptly, Rushmore authorities prohibited the filming of live actors not only on the real sculpted heads but also, even more problematically, with studio models. Ultimately, Hitchcock was given permission to use "a Mount Rushmore mock-up on the condition that the presidents' faces be shown below the chin line in scenes involving live actors."[78] But Hitchcock had no intention of building an actual-size, colossal model of Rushmore on a soundstage in Los Angeles. Instead he relied on mock-ups of fragments of the sculpture, primarily nonfigurative portions of the surrounding rock: "just enough to put the actors on so we could get down shots, up shots, side shots, whatever we needed."[79] For the heads themselves, he rear-projected different still photographs of Borglum's sculpture on a curving screen (fig. 16).

Hitchcock's remark about Lincoln's nose and the authorities' final stipulation that actors could not be shown alongside the presidents'

16
Cary Grant and Eva Marie Saint on the MGM soundstage of Alfred Hitchcock's *North by Northwest*, 1959. Note the top edge of the curving screen on which the monument was rear-projected.



17
Cary Grant and Eva Marie Saint on the MGM soundstage of Alfred Hitchcock's *North by Northwest*, 1959.

faces suggest how transgressive physical contact with the sculpted heads was felt to be. Rushmore was intended to function as an image; respect was contingent on an absence of touch. And on the soundstage, Hitchcock's actors did not touch the carved faces themselves; instead they touched Hollywood's quickly fabricated substitutes for the stone surround to Borglum's sculpted heads. The heads themselves remained unattainable, immaterial projected images. But the frisson of the close-ups of Cary Grant and Eva Marie Saint clinging to precipitous rock face partly derives from the fact that their bodies come close to, even hang from, a sculpture whose remoteness as image is sacrosanct (fig. 17).

1 Gutzon Borglum, "Mountain Sculpture," *DuPont Magazine* 26, nos. 8–9, Summer 1932, 7–8.

2 Gerald W. Johnson, *The Undefeated* (New York: Minton, Balch, 1927), 36.

3 Ibid.

4 Ibid.

5 I have written extensively on scale, perception, and labor, as well as the way machines progressively replaced slaves, in *Colossal: Engineering the Suez Canal, Statue of Liberty, Eiffel Tower and Panama Canal* (Pittsburgh, PA: Periscope Publishing, 2012); and "Two or Three Dimensions? Scale, Photography and Egypt's Pyramids," in *Photography's Orientalism: New Essays on Colonial Representation*, ed. Ali Behdad, and Luke Gartlan (Los Angeles: J. Paul Getty, 2013), 115–28.

6 Johnson, *The Undefeated*, 37.

7 Ibid.

8 "Stone Mountain—Giant Cameo of Historic South," *Alton* (IL) *Evening Telegraph*, June 7, 1924, 9. The article also appeared in the *Corsicana* (TX) *Daily Sun*, June 11, 1924, 6; and *Portsmouth* (NH) *Herald*, June 20, 1924, 2.

On Stone Mountain, see, in chronological order, Robert J. Casey and Mary Borglum, *Give the Man Room: The Story of Gutzon Borglum* (Indianapolis, IN: Bobbs-Merrill, 1952), 171–81; Rex Allen Smith, *The Carving of Mount Rushmore* (New York: Abbeville Press Publishers, 1985), 60–76; Harkness Kenimer, *History of Stone Mountain* (Atlanta, GA: Kenimer Publishing, 1993); Deborah Yost, *Georgia's Stone Mountain Park* (Norcross, GA: Ariel Photography Services, 1994); Jesse Larner, *Mount Rushmore: An Icon Reconsidered* (New York: Thunder's Mouth Press/Nation Books, 2002), 187–238; Grace Elizabeth Hale, "Granite Stopped Time: Stone Mountain Memorial and the Representation of White Southern Identity," in *Monuments to the Lost Cause. Women, Art and the Landscapes of Southern Memory*, ed. Cynthia Mills and Pamela H. Simpson (Knoxville: University of Tennessee Press, 2003), 219–33.

9 On Borglum's ties with the Ku Klux Klan, the best source is Larner, *Mount Rushmore*, 187–238. See also Howard Shaff and Audrey Shaff, *Six Wars at a Time* (Sioux Falls, SD: Center for Western Studies, Augustana College, 1985); Albert Boime, "Patriarchy Fixed in Stone: Gutzon Borglum's Mount Rushmore," *American Art* 5, nos. 1–2 (Winter–Spring 1991): 142–67. On *The Birth of a Nation*, see Michael Rogin, "'The Sword Became a Flashing Vision': D. W. Griffith's *The Birth of a Nation*," *Representations* no. 9 (Winter 1985): 150–95.

10 Teresa Bergman, for instance, has argued that the National Park Service film *The Shrine* (1986) responded to a backlash against political correctness during the 1980s and 1990s by downplaying "history lessons" and focusing "on the less controversial accomplishment of the physical carving. . . . By highlighting the colossal physical aspects of the memorial, the film placed the audience in the position of admiring the feat of the carving without asking for reflection on (or an interpretation of) the nature of the country's history, its future or *why* this memorial was created." Bergman, *Exhibiting Patriotism: Creating and Contesting Interpretations of American Sites* (Walnut Creek, CA: Left Coast Press, 2013), 164–65.

11 Gutzon Borglum, "Engineering Problems to Be Met in Mountain Sculpture," *Black Hills (SD) Engineer*, Nov. 1930, 325.

12 Ibid.

13 On the problem of perception of part and whole in colossal monuments, see my discussion of Immanuel Kant's "Analytic of the Sublime" in *Colossal*, 34–35; see also Grigsby, "Two or Three Dimensions?," 118–19; and Whitney Davis, "Opticality and Rhetoricity in Paul De Man's 'Historical Materialism,'" in *Replications: Archaeology, Art History, Psychoanalysis* (University Park: Pennsylvania State University Press, 1996), 232–56.

14 Johnson, *The Undefeated*, 6.

15 On the central role of ancient Egypt, specifically the Pyramids, in European and American conceptions of immensity from the eighteenth to the early twentieth centuries, see Grigsby, *Colossal*, esp. 52, 95–96, 104, 120–21.

Among comparisons of Mount Rushmore to other monuments, see the following in the South Dakota Historical Society Digital Archives: Gutzon Borglum, "Proposal to Carve One or More Granite Needles Upon or Near Mount Harney, South Dakota," Oct. 22, 1924: "colossal figures of Washington,

Lincoln and Roosevelt approximately 200 feet high with heads in the dimensions of the Egyptian Sphinx"; Doane Robinson to Charles Edward Rushmore, Dec. 18, 1925: "The figures 200 feet from head to waist will stand in silohout [*sic*] on the skyline; these busts will be almost twice the height of the entire Statue of Liberty in New York harbor"; Doane Robinson to Herbert Myrick, Feb. 12, 1927: "The sculpture is more than four times greater than any other colossi ever executed. . . . It will dwarf the Sphinx and the Pyramids"; untitled pamphlet, c. 1927, in the Doane Robinson Papers: "These figures . . . are scaled to the proportions of men 465 feet high; the heads are 60 feet from chin to top. In comparison: the Colossus of Rhodes was 96 feet high; the Sphinx, 66 feet; the Bartholdi Statue of Liberty 110 feet 9 inches."

16 *Chicago Daily Tribune*, Aug. 19, 1923, repeated verbatim in "Making a Monument Out of a Mountain: Stone Mountain Memorial—Greatest Work of Sculpture in History," *Scientific American*, Aug. 1924, 90.

17 See, for instance, Charles Moore and Gerald Allen, *Dimensions: Space, Shape & Scale in Architecture* (New York: Architectural Record Books, 1976), 17.

18 See Grigsby, *Colossal*; and Grigsby, "Two or Three Dimensions?"

19 Immanuel Kant, "Analytic of the Sublime," in *Critique of Judgment*, trans. James Creed Meredith (1911) (Oxford: Clarendon Press, 1991), 90–134. See also Grigsby, *Colossal*, 34–35; and Grigsby, "Two or Three Dimensions?," 118–19.

20 Moore and Allen, *Dimensions*, 20.

21 Johnson, *The Undefeated*, 32–33. "By laying a cable along the top and dropping other cables vertically at intervals of fifty feet, he did succeed in dividing the cliff into panels. He fastened himself into a harness and was lowered over the face of the cliff with a bucket of white lead and a diagram was cut into squares like an ordnance map" (ibid.).

22 Ibid.

23 Borglum, "Engineering Problems," 316–17 (emphasis in original).

24 Casey and Borglum, *Give the Man Room*, 185–86; Borglum, "Mountain Sculpture," *Scientific American*, Jan. 1933, 7–9 (quote, 8).

25 Robert Sklar, *Movie-Made America: A Cultural History of American Movies* (New York: Vintage, 1994), 24. Porter's most famous film was *The Great Train Robbery* (1903). See Charles Musser, *Before the Nickelodeon: Edwin S. Porter and the Edison Manufacturing Company* (Berkeley: University of California Press, 1991).

26 "Stone Mountain—Giant Cameo of Historic South."

27 Stone Mountain Confederate Monumental Association photographs and sketches, Box 18, Folder 4, Manuscript, Archives, and Rare Book Library, Emory University, Atlanta, Georgia.

28 Casey and Borglum, *Give the Man Room*, 185; "Stone Mountain—Giant Cameo of Historic South." For a pertinent contemporary discussion of powerful lamps, see "Carbon Arcs for Searchlights," *Proceedings for the Institution of Electrical Engineers* 58 (1920): 83–106.

29 Borglum, "Engineering Problems," 319.

30 Johnson, *The Undefeated*, 37.

31 Angus Perkerson, "World's Biggest Photograph to Be Printed on the Face of Stone Mountain," *Atlanta Journal Magazine*, Dec. 10, 1922, 7.

32 Ibid.

33 Borglum, "Engineering Problems," 321.

34 On nineteenth-century fantasies about sculptures produced photographically, see Grigsby, *Colossal*, 74–77.

35 Borglum, "Engineering Problems," 320.

36 Ibid.

37 Borglum, quoted in Perkerson, "World's Biggest Photograph," 7.

38 Borglum, "Engineering Problems," 321–22: "The problem I had to meet and whip was to stand five hundred feet from a mountain wall, throw a picture on the mountain two hundred feet square, the bottom of the picture being at least 400 feet from the ground, the mountain wall curving backward as shown in illustration No. 3."

39 John J. Furia, "A 'Stereoscopic' Movie Screen," *New Science and Invention in Pictures* 8 (1920): 134. On the history of photographic and cinematic projection, there is a surprisingly scant secondary literature; the bulk of it concerns the early history of magic lantern slides. See, for example, Tom Gunning, "The Long and Short of It: Centuries of Projecting Shadows from Natural Magic to the Avant-Garde," in *The Art of Projection*, ed. Stan Douglas and Christopher Eamon (Ostfildern: Hatje Cantz Verlag, 2009), 23–35. Unfortunately, Jill H. Casid's forthcoming book, *Scenes of Projection: Recasting the Enlightenment Subject* (Minneapolis: University of Minnesota Press, 2015), was not available at the writing of this essay. For a sensitive theoretical discussion of projection, see Mary Ann Doane, "The Location of the Image: Cinematic Projection and Scale," in Douglas and Eamon, *Art of Projection*, 151–66: "Projection also indicates the action of throwing, ejecting, propelling away from oneself. To project is literally to throw forward" (157). On the "'larger than life' scale of the image" in cinema, see ibid., 163. Intriguing but beyond the scope of this essay is Doane's discussion of the psychoanalytic conception of projection as "a refusal to recognize (méconnaissance), which has as its counterpart the subject's ability to recognize in others precisely what he refuses to acknowledge in himself" (ibid., 161); Doane is here quoting from Jean Laplanche and J. B. Pontalis, "Projection," *The Language of Psychoanalysis* (New York: W. W. Norton, 1973), 354.

40 Jeff Tyson, "How Movie Screens Work," accessed Oct. 3, 2015, http://entertainment.howstuffworks.com/movie-screen1.htm/printable.

41 Borglum, "Engineering Problems," 322.

42 Ibid., 333.

43 On engineering, see Grigsby, *Colossal*, esp. the introduction and chs. 2, 4, 5.

44 Borglum, "Engineering Problems," 325.

45 Borglum, "Mountain Sculpture," 7–8. On the longstanding nineteenth-century association of monumental building with slave labor, and the need to find modern substitutes, see Grigsby, *Colossal*, esp. 33–34, 52–56.

46 On the history of dynamite, see Stephen R. Bown, *A Most Damnable Invention: Dynamite, Nitrates, and the Making of the Modern World* (Toronto: Viking Canada, 2005); G. I. Brown, *The Big Bang: A History of Explosives* (Stroud, UK: Sutton, 1998); Jack Kelly, *Gunpowder, Alchemy, Bombards, and Pyrotechnics: The History of the Explosive That Changed the World* (New York: Basic Books, 2004); William S. Dutton, *Du Pont, One Hundred and Forty Years* (New York: Charles Scribner's Sons, 1942).

47 Borglum, "Mountain Sculpture," 8.

48 Borglum, "Engineering Problems," 326.

49 Regarding the DuPont contract at the Panama Canal, see *Wall Street Journal*, July 8, 1908, 8.

50 See Grigsby, *Colossal*, 70–93.

51 Borglum, "Engineering Problems," 327.

52 Ibid.

53 Johnson, *The Undefeated*, 23.

54 Arthur Millier, "Borglum, Noted Sculptor, Tells of Mountain Carvings," *Los Angeles Times*, Dec. 29, 1936. This comparison is repeated by Charles d'Emery, "Winter Halts Work on Rushmore Shrine," *Washington Post*, Jan. 5, 1936; and Mrs. Gutzon Borglum, "From the Beginning," *Mount Rushmore National Memorial: A Monument Commemorating the Conception, Preservation, and Growth of the Great American Republic* (n.p.: Mount Rushmore National Memorial Society of the Black Hills, 1948), 14.

55 D'Emery, "Winter Halts Work on Rushmore Shrine."

56 On the financial disputes that led to Borglum's resignation, see Smith, *Carving of Mount Rushmore*, 60–76. On his ties to the KKK, see note 9 above.

57 Charles A. Selden, "Lee Rides on in Living Granite," *New York Times*, Apr. 8, 1928.

58 On Mount Rushmore, in chronological order, see Casey and Borglum, *Give the Man Room*, 275–99; Smith, *Carving of Mount Rushmore*; Boime,"Patriarchy Fixed in Stone"; Cecelia Tichi, *Embodiment of a Nation: Human Form in American Places* (Cambridge, MA: Harvard University Press, 2001); Larner, *Mount Rushmore*; John Taliaferro, *Great White Fathers: The Story*

of the Obsessive Quest to Create Mount Rushmore (New York: Public Affairs, 2002); Bergman, *Exhibiting Patriotism*. See also the two official pamphlets published by the Mount Rushmore Memorial Commission: both titled *The Mount Rushmore National Memorial* and published in 1930 and 1948, respectively.

59 "Carving a Mountain into a Monument," *New York Times*, Apr. 19, 1931: "Here . . . will stand against the sky four more-than-heroic figures, each 450 feet tall, 100 feet across the shoulders and 60 feet from the chin to the top of the head."

60 Borglum, "Engineering Problems," 323–24.

61 Ibid., 323.

62 Ibid., 321 (emphasis added).

63 Ibid., 332 (emphasis added).

64 Ibid.

65 Ibid. (emphasis added).

66 E. H. Simpson, *DuPont Magazine* 24, no. 12, Dec. 1930, 11.

67 Borglum, "Mountain Sculpture," 10 (emphasis added).

68 Borglum, "Engineering Problems," 332.

69 Alan Trachtenberg, "Imaginary, Nation: Photographic Constructions of 'America,'" *Revue française d'études américaines* 89 (June 2001): 10–19.

70 Borglum, "Mountain Sculpture," 7–8 (emphasis added).

71 Borglum, "Engineering Problems," 323 (emphasis added).

72 Perkerson, "World's Biggest Photograph," 7.

73 Gutzon Borglum, "What Is Beauty in Sculpture?," *Black Hills (SD) Engineer* 18, no. 4, Nov. 1930, 307.

74 Ibid.

75 Ibid., 304.

76 "Stone Mountain Unveils Lasershow Spectacular," *Atlanta Journal-Constitution*, May 26, 2011, http://www.accessatlanta.com/news/entertainment/calendar/stone-mountain-unveils-lasershow-spectacular-20/nQ9G3/.

77 Todd David Epp, "Alfred Hitchcock's 'Expedient Exaggerations' and the Filming of *North by Northwest* at Mount Rushmore," *South Dakota History* 23, no. 3 (Fall 1993): 181–96, reprinted at PBS American Experience, accessed Oct. 3, 2015, http://www.pbs.org/wgbh/americanexperience/features/primary-resources/rushmore-north-northwest.

78 Ibid.

79 *Old Hollywood* (blog), Dec. 10, 2007, accessed Oct. 3, 2015, http://oldhollywood.tumblr.com/post/2167348407/cary-grant-eva-marie-saint-on-the-set-of-north.