

Skulls and Crossed Bones?: A Forensic Study of the Remains of Hyrum and Joseph Smith

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For more than eighty years the gravesite of Joseph Smith Jr., his wife Emma, and Hyrum Smith has drawn devoted and curious visitors alike to a small cemetery plot located in the Smith Family Cemetery in Nauvoo, Illinois. Today, their graves are marked by a large, sloping granite slab erected in their memory in 1991 by the Joseph and Hyrum Smith Family Foundation, the third such marker placed over the graves since 1928.¹ Before that date, visitors to this cemetery would not have found grave markers for the martyred brothers, and indeed few would have known that their graves were located there.

Following the June 29, 1844, public viewing, the bodies of the two men were secreted in a room of the Mansion House while sandbag-filled coffins were used for the public burial. Under the cover of darkness later that night, a small group of men carried coffins containing the actual bodies and buried them across the street in the basement of the unfinished Nauvoo House.² With work on the Nauvoo House at a standstill when the brothers were killed, the secret burial site remained undiscovered, unknown except to family members and the select few who assisted with the nighttime burial. But the bodies did not long remain at this initial site. Only months later, in the fall of 1844, Emma had the bodies removed from the Church-owned Nauvoo House and reinterred on Smith-owned land. According to Oliver Huntington, his brothers William and Dimick helped move the bodies of Joseph and Hyrum “from where they were first buried, in the cellar of the Nauvoo House, to the cellar or pit under a little outhouse” on Smith property.³ This second burial, a move

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designed to maintain Emma's control over the disposition of her husband's body, was carried out with even more secrecy than the first.⁴ But again, the bodies did not lie at this site for long.

As many Latter-day Saints were preparing for exodus to the West, Emma feared that Brigham Young might take some action to obtain control of the bodies. Young had publicly declared his willingness to do all possible to see Joseph's wishes regarding burial in his tomb on the Temple block fulfilled, but Emma was unwilling to cede any control in the matter.⁵ Joseph F. Smith recalled that "just before the departure of the Twelve from Nauvoo [in 1846], his aunt Emma had the bodies removed again, this time to the Hibbard Woods, below the Nauvoo House, near the river."⁶ How long the bodies remained at the Hibbard farm is unknown; but the bodies "were removed back to the old place" once the perceived danger was past.⁷

At the death of Emma Smith in 1879, there was no visible trace of the little building under which the brothers' remains lay, and within the next thirty years, knowledge of the exact location of the graves was practically lost, although family members and other close and trusted friends knew the graves were on the Homestead property. Joseph Smith III, who had visited the site with his mother, pointed out the spot to a few others on at least one occasion; but with his death in 1914, only the general location of the gravesite was known among the descendants of Joseph.⁸

The 1928 Exhumation and Reinterment

With the completion of the Keokuk Dam in 1913, the waters of Mississippi slowly began to rise and encroach on the Homestead property. The Reorganized Church of Jesus Christ of Latter Day Saints, owner of the land since about 1908, became concerned about the possibility that the graves of Hyrum and Joseph would be submerged, and made several unsuccessful attempts to address the issue during the 1920s.⁹ Finally, in December 1927, RLDS Church President Frederick M. Smith, a son of Joseph Smith III, appointed William Oscar Hands, a close friend and an engineer from Kansas City, to locate the unmarked graves and remove the remains to a new site on higher ground where a suitable monument to the brothers could be erected. Smith also provided Hands with the few details he knew of the secret gravesite to assist in the effort.¹⁰

On his arrival in Nauvoo on January 9, 1928, Hands hired a small crew to assist with the search for the remnants of the outbuilding where the bodies of Hyrum and Joseph were said to have been buried. After initially digging unsuccessfully near the shoreline, the team moved uphill, and on the third day of the search began trenching around the grave of Emma Smith. They soon



Homestead outbuilding, May 2009. This small structure, located a few yards south of the Homestead, is a replica of the building under which the bodies of Hyrum and Joseph Smith were once buried. In 1928, the remains of the two men were discovered beneath the remnant of the original building. The current gravesite, only a few feet north of the outbuilding, is partially visible through the fence on the right side of this photograph.

Photograph by Curtis G. Weber.

unearthed a skeleton located nearly three feet east of the foot of Emma's grave marker, but they quickly determined from grave artifacts—a woman's hair comb and remnants of a brown silk dress—that these were in fact the remains of Emma herself.¹¹

On January 16, the sixth day of digging, they discovered the brick foundation and floor of a small building not far from Emma's grave; and upon removing the northwest corner of the floor they unearthed a skull. Hands immediately identified this skull as belonging to Hyrum.¹² A few minutes later a second skull, uncovered lying next to the first, was identified as Joseph's.¹³ Hands telephoned President Smith with news of the discovery and had the site covered and guarded until Smith and other RLDS officials arrived in Nauvoo three days later on the January 19. Once on site, President Smith authorized the removal of Joseph and Hyrum's skulls from the ground so they could be examined further. Accordingly, the skulls were taken to an upper room of the Mansion House, where they were photographed and measured. Ten witnesses signed an affidavit stating they were satisfied that the identifications were correct.¹⁴

The next day, Friday, January 20, the remains of Emma, Joseph, and Hyrum were reinterred side by side in a brief ceremony at the newly prepared gravesite just a few feet from where they had been discovered. Joseph's remains were placed in the center grave, with Emma's to his right, and Hyrum's to his left.¹⁵ From that cold winter morning in 1928 to this day, they have lain at this site undisturbed.

A Recent Controversy

In more recent years, a small controversy has arisen over the 1928 identification of the remains of Hyrum and Joseph. At the 1994 Mormon History Association conference in Park City, Utah, Ron Romig and Lachlan Mackay presented their belief that the martyrs' remains had been misidentified in 1928—that Hyrum's remains are mistakenly buried under Joseph's grave marker, and vice versa. They had arrived at this conclusion after conducting "primitive comparisons" between the 1928 skull photographs, Joseph's death mask, and the Scannel daguerreotype, a purported photographic image of Joseph Smith taken in life. They noted a "striking correspondence" between Joseph's death mask, the daguerreotype, and the skull identified in 1928 as Hyrum's.¹⁶ The following year, Shannon Michael Tracy published *In Search of Joseph*, a book containing evidence supporting this conclusion. In 2008, Tracy refined and expanded his evidence in a second book, *Millions Shall Know Brother Joseph Again: The Joseph Smith Photograph*.¹⁷ Furthermore, Joseph and David Lyon concurred with Tracy's findings in their analysis of the Carthage Jail crime scene in an article which appeared in a 2008 issue of *BYU Studies*.¹⁸

In March 2008, I met sculptor Dee Jay Bawden, who shared with me unpublished forensic drawings he had created in 1995 in response to Tracy's first book. He concluded that Tracy had ignored basic principles of anatomy and arrived at the wrong conclusion, and that the 1928 identifications were indeed correct. After Tracy's second book was released in April 2008, I carefully reviewed the evidence and arguments on the subject and determined that existing studies were deficient, and that a much more rigorous and scientific examination than had hitherto been attempted was both possible and warranted. That month I designed and initiated a two-dimensional forensic study to attempt to settle the matter for myself. Beginning with no commitment to either position in the controversy, I accepted the possibility that the results might be inconclusive. I worked on the study periodically from April 2008 through May 2009 with the encouragement and assistance of many individuals.¹⁹ The remainder of this article is a brief overview of the methodology, results, and conclusions of that study.

Report of a Forensic Study of the 1928 Identification of the Remains of Hyrum and Joseph Smith

The purpose of this examination was to determine whether sufficient data exist to confirm that the remains uncovered on January 16, 1928, in Nauvoo, Illinois, were indeed the remains of Hyrum and Joseph Smith, and whether the specific identifications of the remains were correct. This study improved on prior efforts in that it was the first attempt to combine all of the pertinent historical data with modern anatomical data. This data include: (1) the 1928 photographs and measurements of the skulls of Hyrum and Joseph Smith; (2) the two earliest known sets of death masks of Hyrum and Joseph Smith; (3) the 1840 phrenology measurements of Joseph Smith's head; and (4) modern anatomical studies of the human head.

The 1928 Skull Photographs

As noted earlier, in 1928 the skulls of the two brothers were taken to an upper room of the Mansion House, where they were photographed and measured. The first skull uncovered, identified as Hyrum's, was photographed in the Mansion House from four different angles—anterior, right lateral, posterior, and inferior views are seen in the extant photographs. This skull, which I will refer to as Skull 1, was missing a large portion of the maxilla and was measured to be 7.25 inches in size, front to back. The second skull discovered, which I will refer to as Skull 2, was identified as Joseph's. This skull was photographed from three different angles—anterior, right lateral, and posterior images are extant. The facial bones of Skull 2 are entirely missing in the photographs, and this skull was measured to be 7.625 inches in size. The right lateral views of each skull provide the easiest angle for verifying its identification by comparison to the death masks.

Death Masks of Hyrum and Joseph Smith

The two oldest known sets of death masks of Hyrum and Joseph Smith are located in the Museum of Church History and Art in Salt Lake City (Fig. 1). The so-called Dibble masks, which are on permanent display in the Museum, first appear in the historical record in 1849, but the date and circumstances of their creation are uncertain. The original death mask molds were made from the faces of the martyred brothers sometime prior to the public viewing on June 29, 1844, and are not extant. It is believed that George Cannon, who participated in making the original molds, originally owned this set of masks. Upon Cannon's death in August 1844, it is believed that William Rowley obtained the masks, since a September 1849 letter reports that Philo Dibble had

recently purchased the masks from “Brother Rowley.”²⁰ The “pedestal” death masks—so named for the rough form or pedestal that extends from the back of each mask—are of less certain provenance. This set of masks has been in the possession of the LDS Church since at least the 1930s. Mark Staker, museum curator, has proposed that these masks were copies of the Dibble masks made by John Taylor in 1849.²¹

One important detail differentiates the two sets: the chins of the Dibble masks have been broken off and repaired. Notably, the original chin of the Dibble Hyrum mask was lost and a new, larger chin was formed on the mask. Because the pedestal masks have not been significantly damaged, I consider them to be more accurate and have chosen to use them in the forensic images included in this article. However, I’ve duplicated the steps of this study using the Dibble masks as well and have arrived at the same approximate results and conclusions.

Mention should be made here about the reliability of Joseph’s death mask, because some doubt it is an accurate representation of his face in life. Specifically, some claim that the violent events of his death created facial fractures which distorted his lower face, making the mask elongated compared to his actual face in life.²² However, the accuracy of the proportions of his mask to his face in life can be easily demonstrated. On June 25, 1842, Joseph sat for profile artist Sutcliffe Maudsley, who traced the profiles of his subjects in order to produce his artwork.²³ Comparisons of the mask to Maudsley’s drawings reveal a near-exact profile match: the forehead, nose, lips and chin all align very closely (Fig. 2). The only reasonable explanation for the closeness of this match is that both Maudsley’s drawings and the death masks were derived from Joseph’s natural, undistorted head.

Joseph Smith’s 1840 Phrenology Measurements

While in Philadelphia in January 1840, during his trip to visit Martin Van Buren, Joseph Smith had his head measured by a phrenologist, Dr. Alfred Woodward. The extant measurement card from that examination is located among the Joseph Smith Papers in the LDS Church History Library in Salt Lake City.²⁴ One key 1840 phrenology measurement, “Individuality to Occipital Spine,” is listed at 8.25 inches and sets a standard against which the lateral view skull photographs can be tested.

Principles of Anatomy

Three anatomical principles used in craniofacial reconstruction—the approximate reconstruction of an individual’s face from a skull—are fundamental to this study. First, in the average face the eye is recessed within the socket

such that the front of the eyeball rests within a few millimeters on either side of the plane between the top and the bottom of the socket bone.²⁵ The second principle is the relative position of the lips and teeth—a person's lips meet approximately where the teeth meet.²⁶ These two principles—the natural position of the eye in the socket and of the lips in relation to the teeth—guide the scaling and fit of the death masks on the skulls.

The third anatomical principle applied in this study is tissue depth. One's skull largely determines the shape of one's head, especially from the nasal bones to the back of the head; and on average, less than one centimeter of tissue covers the bones over this area. Studies of tissue depths at various craniometric points on the skull have been published in numerous scientific works. I have conducted this study twice, each time using a different set of tissue-depth averages, each time arriving at the same result. For the sake of brevity, only images created using the set of tissue depth data published in the *Journal of Forensic Sciences* (Fall 2008) are included in this article (Fig. 3).²⁷

Study Methodology

By using established anatomical principles, I sought to find the best anatomical fit of each of the four death masks over each skull by superimposing images of the masks at different degrees of rotation and tilt over the 1928 lateral-view photographs of the skulls. Once the best match for a mask to a skull was found, I tested the result against additional average tissue depths, against the 1928 skull size measurements, and in the case of Joseph's masks, against one of his 1840 phrenology measurements. Previous studies had either ignored or made only partial use of some of these data, and therefore none were conducted following this precise methodology. Specifically, the 1928 skull measurements had never been tested against either the skull photographs or Joseph's 1840 phrenology measurements; tissue-depth studies had never been consulted; and the actual death masks had never been used.²⁸

Preparation of the Skull Photographs

To create clear comparisons and measurements, I isolated the skull from the background in each lateral view photograph in an extremely precise manner so as not to alter the shape of the skull. The next step in preparing these isolated views of the skulls was to attempt to correct the position of the mandibles relative to the craniums. When each skull was photographed in 1928, the mandible was positioned below its corresponding cranium in an anatomically incorrect position. This corrective step was possible with Skull 1 because the necessary bones were intact and visible in the lateral view photograph. However, this was impossible for Skull 2 because it was missing most of the neces-

sary bones, and posterior portions of the mandible are obscured in the lateral view photograph.²⁹

Photographing the Death Masks

With the permission and assistance of the staff at the Museum of Church History and Art, I photographed the Dibble and pedestal death masks at hundreds of angles, each mask at differing degrees of rotation and tilt, in an attempt to match the rotation, tilt, and pitch of the skulls in the 1928 photographs. To accomplish this, I designed and constructed a fixed-pitch, 360°-rotating rig which holds a death mask at a known degree of rotation, tilt, and pitch relative to a fixed-position camera (Fig. 4). This rig allowed me to produce a vast library of images of the actual death masks at varying angles, with each angle documented and each image containing a ruler placed above the mask in the rig. By lowering the ruler in image-editing software, I took measurements, accurate to within 0.25 millimeters, of the apparent skull size and tissue depths when a given death mask photograph was superimposed over a skull.

Pedestal Joseph Death Mask on Skull 1

I began with comparisons of Joseph's death mask to Skull 1, identified in 1928 as Hyrum's skull. I compared the mask to the skull at many degrees of rotation and tilt, adjusting the scale based on the relative position of the eye to the socket and the lips to the teeth, then setting the mask to average tissue depth at the forehead and chin.

Joseph's death mask fits Skull 1 best when rotated 70° camera right, or 20° shy of a perfect 90° rotation. The eye is situated acceptably within the socket, the teeth and lips align, and the tissue depth at the forehead and chin are set to average (Fig. 5). At this best fit, (1) the tissue depth along the forehead varies when it should be consistent; (2) the left brow of the skull and mask do not align; and (3) the tissue depth at the nose is far greater than the depth at either the brow or forehead when typically the tissue depth at this point narrows.

In addition to visually examining the fit, tissue depths at several craniometric points can be measured and compared to average depths (Fig. 6). With the mask at best fit, the depth at the glabella is 86% of average; at the nasion, 135% of average; and at the end of the nasal bones, 300% of average.³⁰

An additional tissue depth at the back of Joseph's head can be tested using the 1840 phrenology measurement of the distance from his "Individuality to Occipital Spine," which corresponds to points over the glabella and the inion. This distance, including the soft tissues, was recorded in 1840 as being 8.125 inches, which on Skull 1 results in a tissue depth at the inion that is 171% of average.

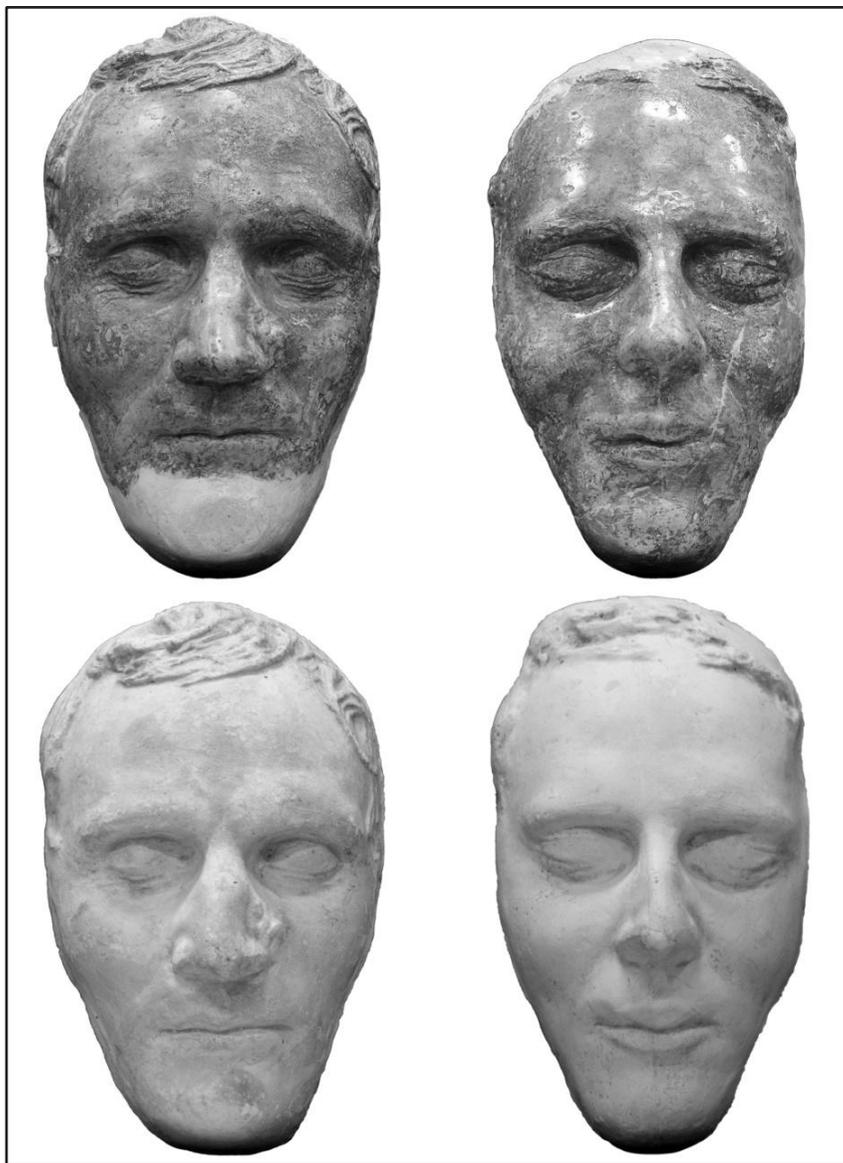


Fig. 1. Oldest known death masks of Hyrum and Joseph Smith. The Dibble masks (top), on display at the Museum of Church History and Art in Salt Lake City, are castings of Hyrum (left) and Joseph (right) that were likely created in 1844. The pedestal masks (bottom), also in the possession of the Museum, are not on public display. This second set may have been created from the Dibble masks in 1849. Photographs by Curtis G. Weber.



Fig. 2. Comparison of pedestal Joseph mask to Maudsley profile drawing. Both the Dibble and the pedestal masks align closely with profile drawings of Joseph Smith made by Sutcliffe Maudsley, demonstrating the accuracy of the mask's vertical proportions. Only the size of the nose in the drawings is noticeably off. This is likely due in part to the fact that the drawings are very small reductions—the face in this drawing is less than 1.25 inches tall—of the life-size tracing Maudsley worked from; it may also reflect either some inaccuracy in the original tracing or an artistic choice to reduce the size of the nose. Maudsley drawing courtesy the Museum of Church History and Art, Salt Lake City, Utah.

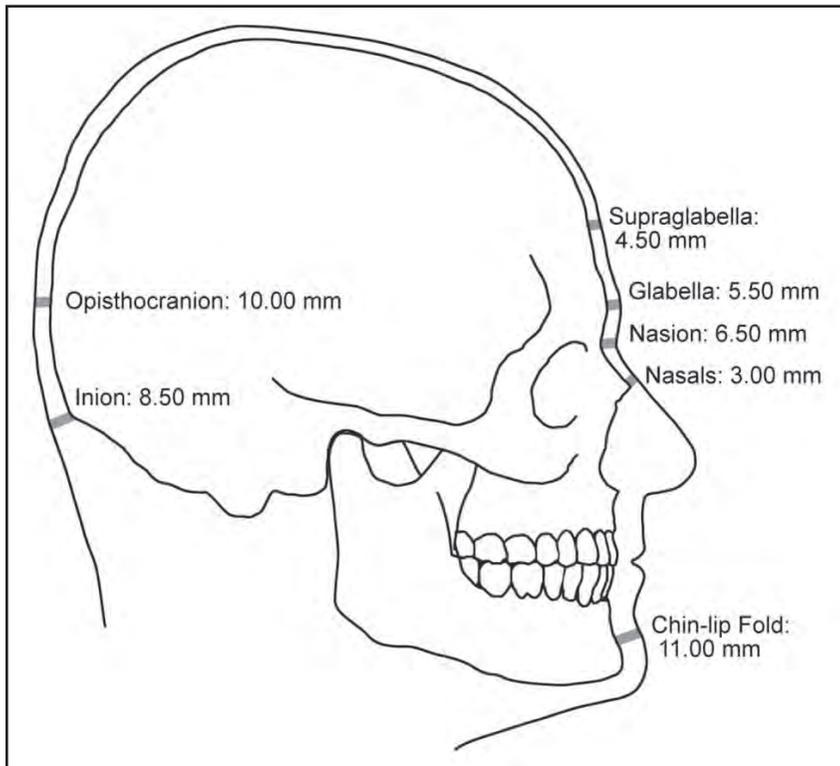


Fig. 3. Craniometric points and corresponding average tissue depths. This illustration, derived from an MRI scan, lists the craniometric points along the midsagittal plane that are pertinent to this 2-D study. Such data are used in craniofacial reconstruction, or the approximate reconstruction of a face from a skull. In this study the anatomical data are used to test the fit of the death masks on the given skulls.



Fig. 4. Dibble Hyrum mask in rig. This 360°-rotating rig allowed me to create a library of hundreds of death mask images at different angles. The ruler placed above the mask is used later in image editing software to determine scale and tissue depths.

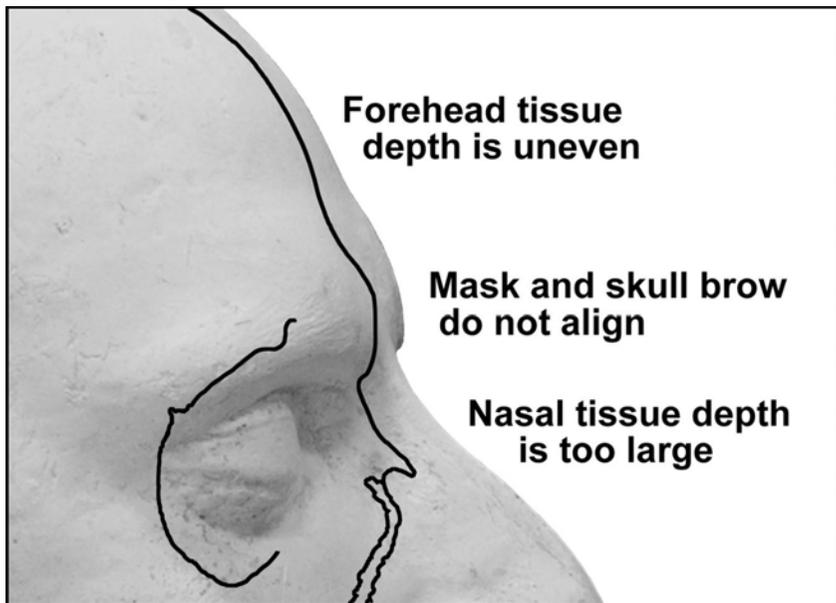


Fig. 5. Detail of pedestal Joseph mask on Skull 1. With the mask at best fit—here rotated 70° camera right and tilted 4° mask right (toward the camera)—there are significant anatomical problems. The tissue depth over the nasal bones is abnormally large, and the forehead and brow contours do not align well. However, I have not been able to achieve a better overall fit at any other degree of rotation and tilt.

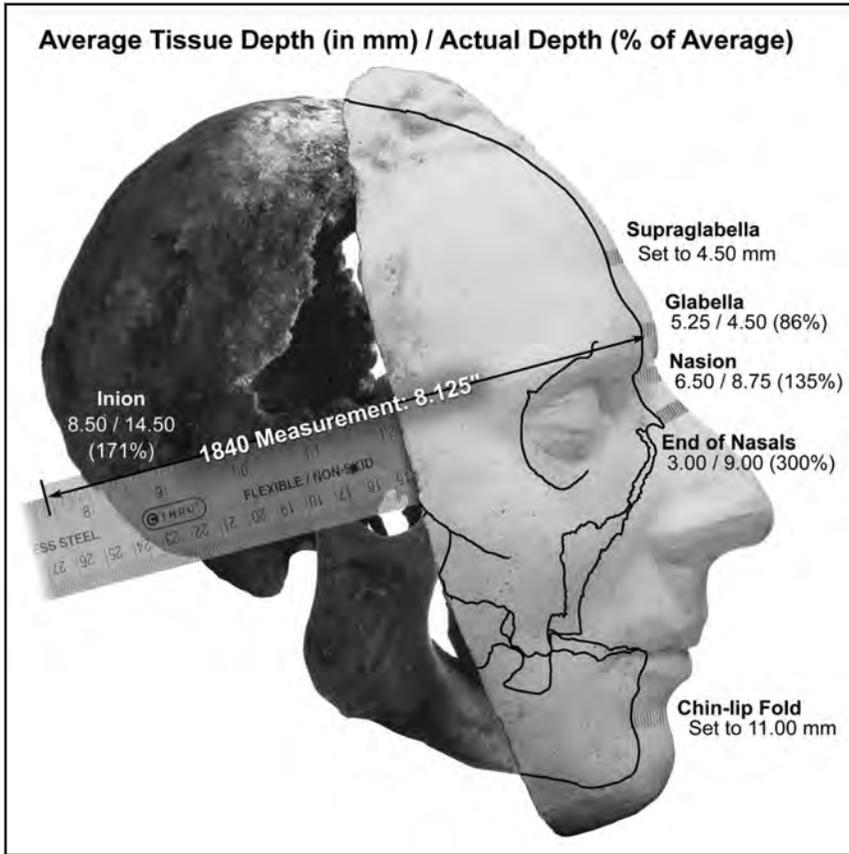


Fig. 6. Tissue depths of pedestal Joseph mask on Skull 1. While the tissue depths at the glabella and, to a lesser degree, the nasion are within normal ranges, the actual depth at the nasal bones is extremely large; in fact, over twice as large as the average depth at this point in obese individuals, according to one study. Joseph, with an approximate BMI of 28 at the time of his death, was overweight but not obese. The tissue depth at the inion, determined by Joseph's 1840 phrenology measurement, is also problematic. Reinterment photograph of the skull courtesy of the Community of Christ Library-Archives, Independence, Missouri.

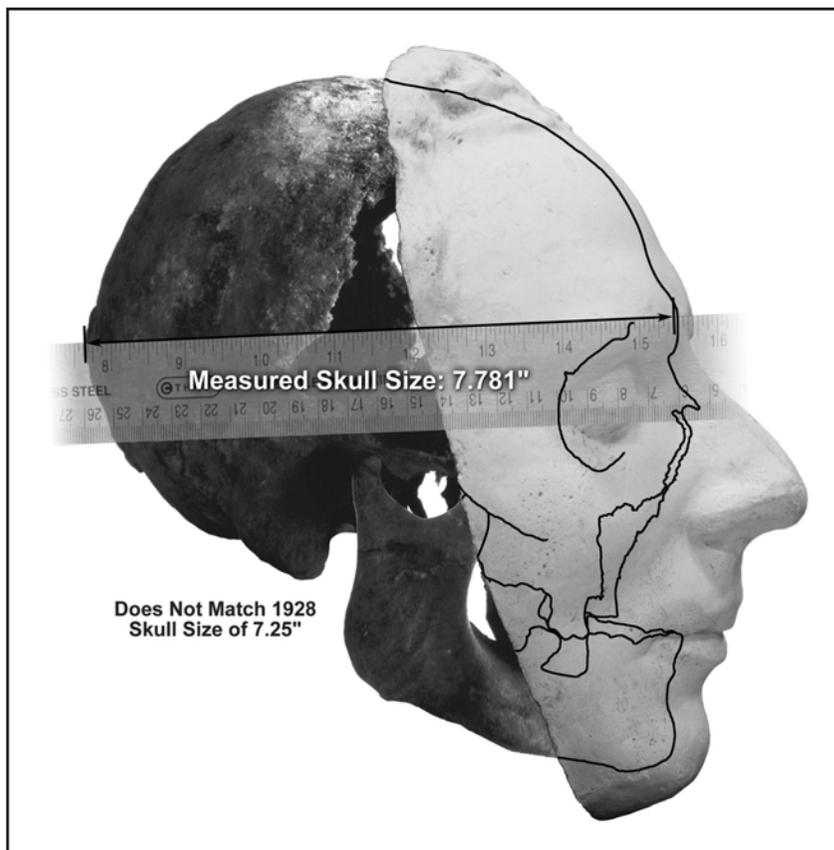


Fig. 7. Skull size with pedestal Joseph mask on Skull 1. With Joseph's mask scaled to its best overall fit, the resultant skull size matches neither the 1928 measurement of Skull 1 nor of Skull 2 (an indication that the skull measurements were not accidentally switched in 1928). Skull size, also referred to by anthropologist and anatomists as the "maximum cranial length," is measured from the glabella to the opisthocranium; and whether those who measured the skulls in the Mansion House knew this or not, the distance between these two points is the largest measurement on most skulls, and is most likely the "front to back" measurement recorded in 1928. Reinterment photograph of the skull courtesy of the Community of Christ LibraryArchives, Independence, Missouri.

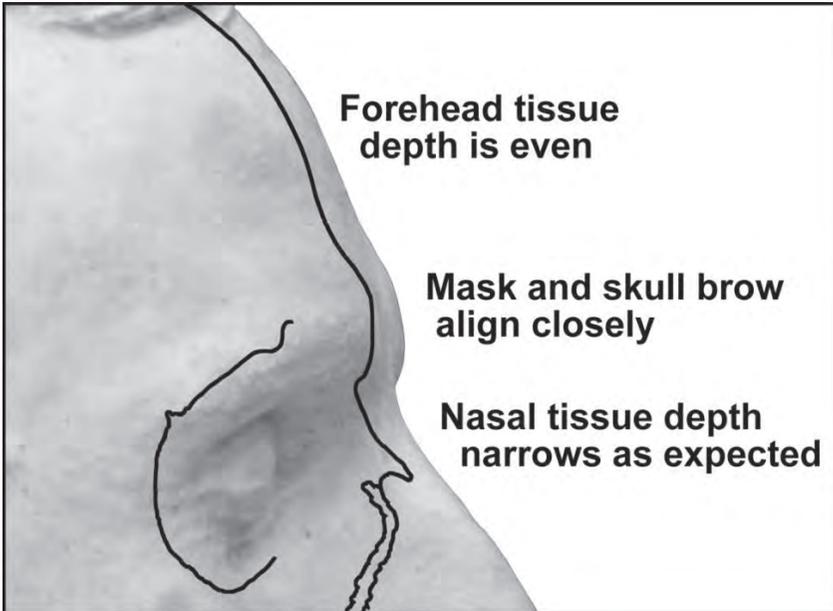


Fig. 8. Detail of pedestal Hyrum mask on Skull 1. With the mask at best fit—rotated 76° camera right and tilted 3° mask right (toward the camera)—the tissue depth along the forehead is consistent, the brow contours align well, the tissue depth narrows over the end of the nasal bones, and the fit of the eye and the contour of the tissues around the socket are anatomically correct.

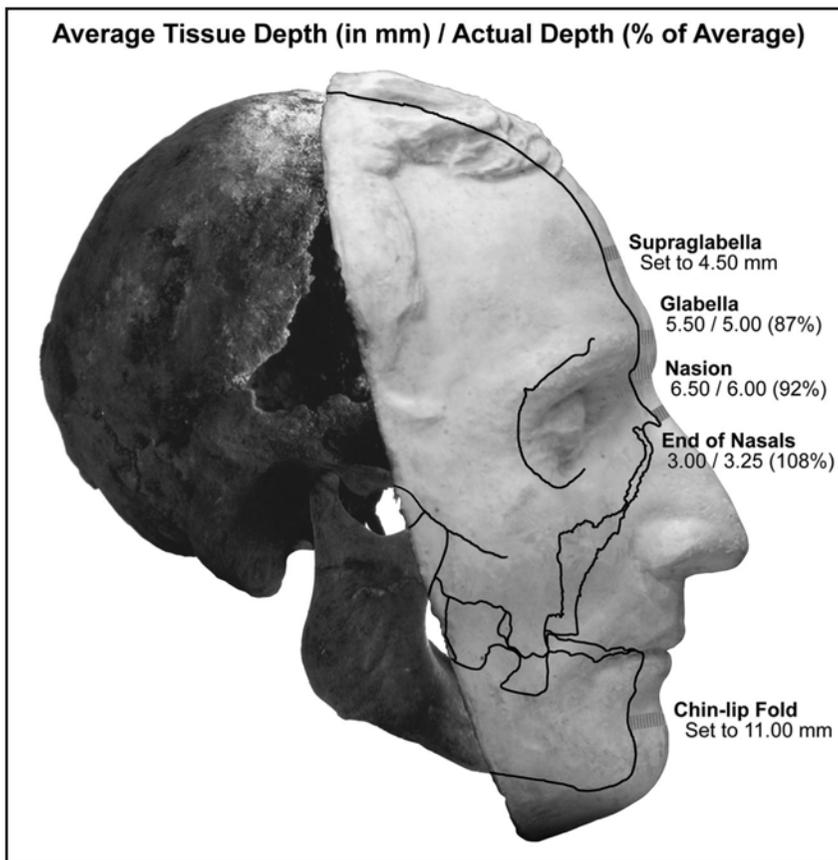


Fig. 9. Tissue depths of pedestal Hyrum mask on Skull 1. The tissue depths at the glabella, nasion, and end of the nasal bones are within normal range, and are in fact nearly textbook average. Reinterment photograph of the skull courtesy of the Community of Christ Library-Archives, Independence, Missouri.



Fig. 10. Skull size with pedestal Hyrum mask on Skull 1. With Hyrum's mask scaled to its best overall fit on this skull, the measured skull size exactly matches the 1928 "front to back" measurement of Skull 1. Reinterment photograph of the skull courtesy of the Community of Christ Library-Archives, Independence, Missouri.

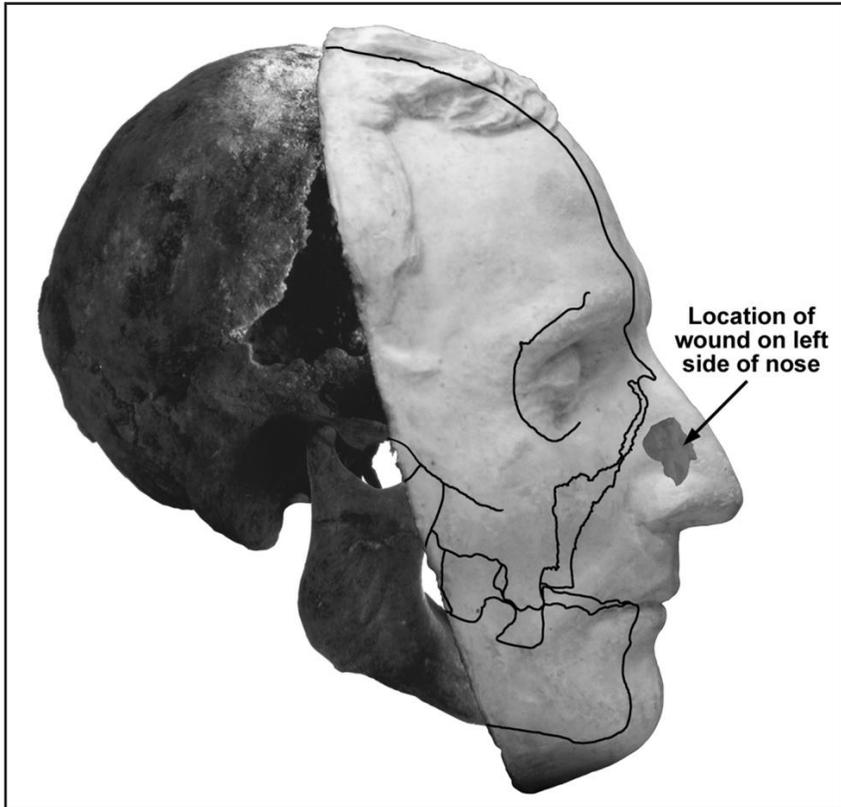


Fig. 11. Location of Hyrum's facial wound. When viewed face on, the wound site on Hyrum's mask appears over intact bone. However, when viewed at this angle, the wound site on the mask does not come into contact with the bone. This suggests that the ball entered the side of the nose at a steep angle, passed through the mouth, then exited under the right side of the chin or neck. This wound path explains why there are no exit wounds evident in Hyrum's skull. Reinterment photograph of the skull courtesy of the Community of Christ Library-Archives, Independence, Missouri.

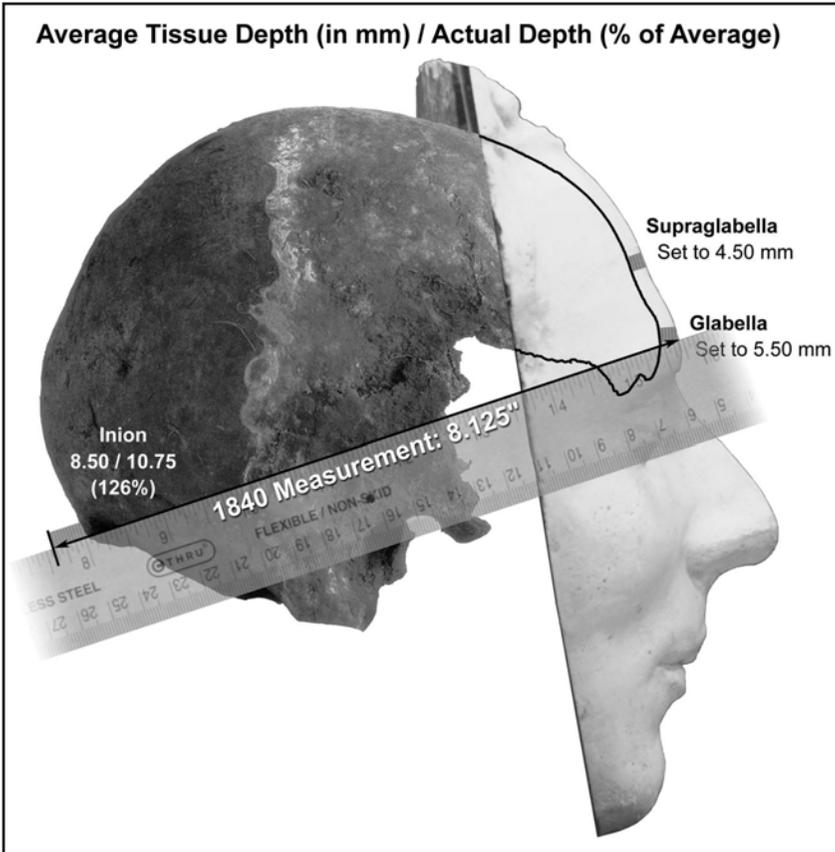


Fig. 12. Tissue depths of pedestal Joseph mask on Skull 2. With Joseph's mask placed at average tissue depth, the 1840 measurement from Joseph's glabella to his inion results in a tissue depth that is 2.25 mm larger than average, an acceptable anatomical variance. The contours of the mask and skull at the forehead also align closely. Reinterment photograph of the skull courtesy of the Community of Christ Library-Archives, Independence, Missouri.

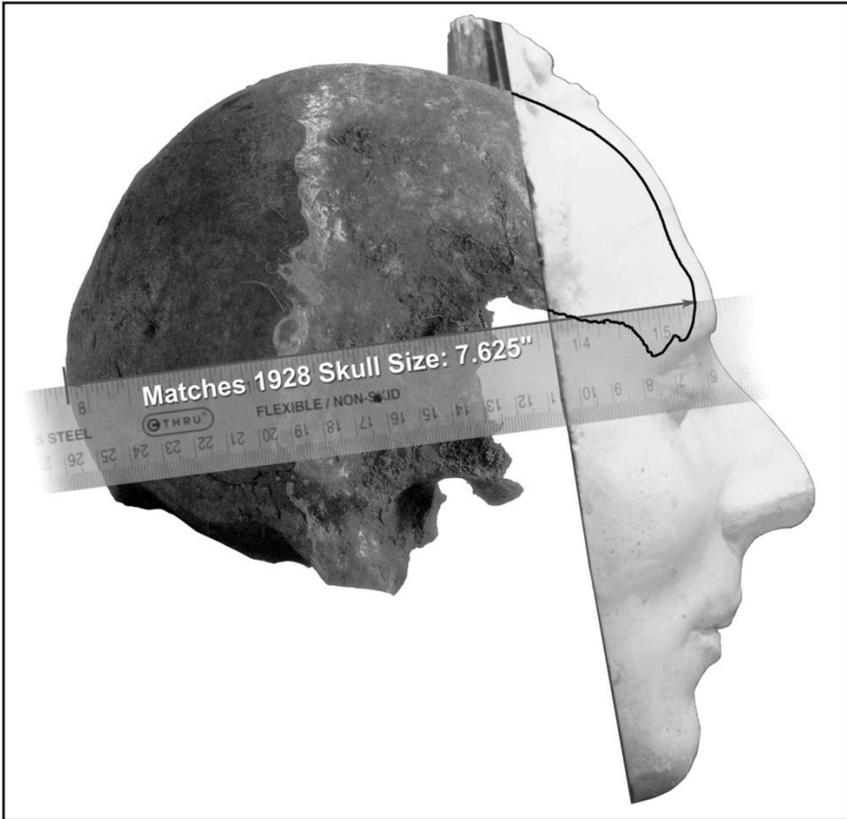


Fig. 13. Skull size with pedestal Joseph mask on Skull 2. With Joseph's mask scaled to its best overall fit, the resultant skull size matches the 1928 measurement of Skull 2. Reinterment photograph of the skull courtesy of the Community of Christ Library-Archives, Independence, Missouri.

Also, with the mask at this best fit, Skull 1 does not match its 1928 measured size. The skull at this scale measures 7.781 inches, while in 1928 this skull was measured to be only 7.25 inches (Fig. 7), a difference of just over half an inch.

Pedestal Hyrum Death Mask on Skull 1

By contrast, Hyrum's death mask fits best on Skull 1 at 76° rotation, or 14° shy of a perfect 90° rotation (Fig. 8). With the mask scaled to position the eye and lips properly and the mask set to average tissue depth at the forehead and chin, (1) the tissue depth along the forehead is consistent; (2) the left brow of the skull and mask align correctly; and (3) the tissue depth at the nose narrows as it does in the typical face.

Measured tissue depths with Hyrum's death mask at this best fit are very close to average. At the glabella, the depth is 87% of average; at the nasion, 92% of average; and at the nasal bones, 108% of average (Fig. 9).³¹ Additionally, at this scale the skull measures 7.25 inches, the exact size of this skull as recorded in 1928 (Fig. 10).

Conclusions from Comparisons of the Death Masks to Skull 1

Considering the above evidence, I am led to conclude the following: (1) Skull 1 cannot be Joseph's skull, because Joseph's death mask cannot be positioned on this skull in an anatomically acceptable manner; nor can this skull be made to match known historical measurements even when the poor match of Joseph's mask to Skull 1 is set aside. (2) The near textbook-perfect fit of Hyrum's death mask to this skull and the confirmation of the 1928 skull size measurement positively identify this as Hyrum's skull.

The Gunshot to Hyrum's Face

In light of these conclusions, I here briefly address the gunshot wound to Hyrum's face. The wound site on the death mask does not come into contact with the skull when viewed at this lateral angle (Fig. 11). Considering the location of this wound, taken together with the facts of the wound on the right side of Hyrum's neck, Hyrum's height, the height of the extant bullet hole in the door in Carthage Jail, and the angles at which the ball passed through the door, the simplest explanation is that a single ball passed through the door as Hyrum braced it, his head turned to his right as he pressed against and leaned into the door. Under this theory, the ball entered the left side of his nose, striking the upper edge of the maxilla as it passed largely through the nasal cavity, continued downward through the mouth, then exited under the right side of

the jaw or neck, entirely missing the bone seen in the 1928 photographs. Thus a single shot likely accounts for the wounds to the face and neck.³²

Pedestal Joseph Death Mask on Skull 2

Considering the positive identification of Skull 1, it could be assumed that Skull 2 is Joseph's, since the two men were buried side by side; but there is also forensic evidence to confirm this identification. With the pedestal Joseph mask set to average tissue depth at the forehead and brow over Skull 2, Joseph's 1840 phrenology measurement of 8.125 inches results in a tissue depth at theinion of 10.75 millimeters, which is 126% of average (Fig. 12). The contours of the mask and skull along the forehead also correspond well. In addition, at this scale, Skull 2 measures 7.625 inches, which is the precise size of this skull as measured in 1928 (Fig. 13). In other words, when fitted with Joseph's mask, Skull 2 matches two historical measurements within a combined margin of error of 2.25 millimeters. By contrast, the margin of error for these same measurements when Joseph's mask is placed on Skull 1 is 145.00 millimeters. These findings, taken together with the fact that this skull was discovered next to Hyrum's, lead me to conclude that Skull 2 is Joseph's skull as identified in 1928.

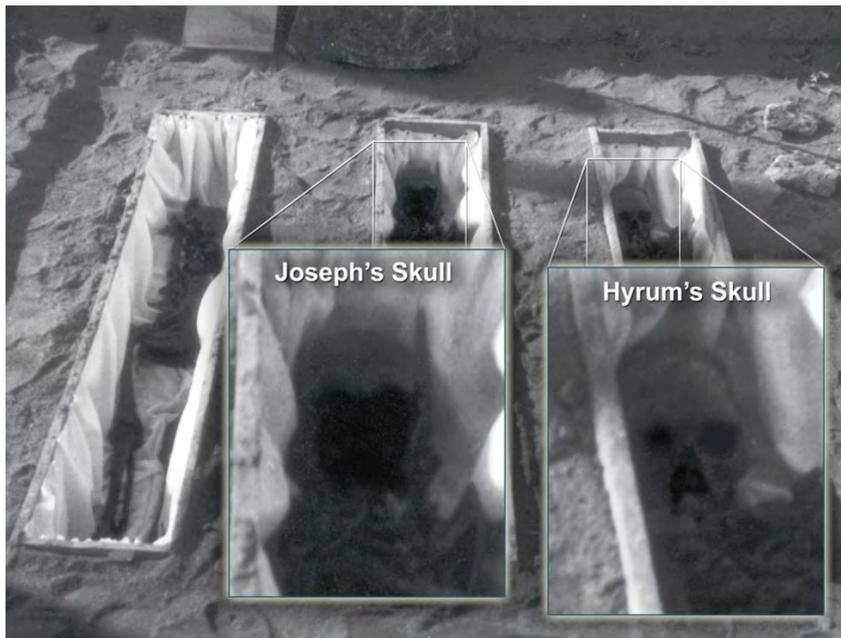
Study Conclusions and Further Research

Every finding of this study points to the conclusion that the remains unearthed on January 16, 1928, in Nauvoo, Illinois, are indeed the remains of Joseph and Hyrum Smith, and that they were correctly identified. This study confirms the general accuracy of Dee Jay Bawden's forensic studies and contradicts Shannon Tracy's evidence.³³ That the graves were and are correctly marked is also confirmed by a January 20, 1928, photograph which shows the three sets of remains lying in the new but still uncovered graves, with Joseph's skull clearly visible in the center grave, and Hyrum's skull visible in the grave to Joseph's left. This conclusion may be of most importance to the descendants of Joseph, Hyrum, and other Smith family members; but all who visit these graves in the Smith Family Cemetery can reflect on that sacred ground without the cloud of uncertainty that has existed over the site for the past decade-and-a-half.

This study has also confirmed the reliability of the death masks of both Hyrum and Joseph. The anatomically precise fit of Hyrum's death mask to his skull not only identifies the skull, but attests to the reliability of the mask as well. If postmortem swelling or decay had significantly altered Hyrum's appearance by the time the original death mask mold was created, this would be evident and even measureable when the mask is fit to his skull; but no

evidence supporting this possibility was found. Once the effect of the gunshot wound is taken into account, Hyrum's death mask may be used with confidence in artistic and forensic attempts to reconstruct his appearance in life. The accuracy of Joseph's death mask cannot be determined as fully from his skull due to the condition in which it was discovered in 1928; but through careful comparison to the artwork of Sutcliffe Maudsley, the proportions of Joseph's face in the mask are shown to be accurate.

This study also establishes a baseline of reliable biometric data pertaining to the appearance of Hyrum and Joseph Smith that may be of interest to artists and other researchers, but further research will provide even more data. I have begun with Patrick Bishop to design a 3-D study that will make use of all-known relevant data and 3-D modeling technologies to verify the findings of this 2-D study and produce anatomically accurate 3-D models of the heads of Hyrum and Joseph. This 3-D study will verify the identities of the remains of the two men to the fullest extent the data will allow and will result in 3-D



Skeletal remains of Emma, Joseph, and Hyrum Smith in new graves, January 20, 1928. W. O. Hands personally moved the remains from where they were discovered to the newly prepared graves shown above. This photograph, taken from the east looking west, clearly shows Joseph's skull in the center grave with Hyrum's to his left. Emma's skull, not clearly discernable above, was found to be in worse condition than either Joseph's or Hyrum's skull, despite the fact that their remains had been in the ground for thirty-five years longer.

Rinterment photograph courtesy of the Community of Christ Library-Archives.

models of the size and shape of their heads at the moment of death, models from which their appearance in life can be approximated with a degree of accuracy never before achieved. It is hoped that the findings of these studies will be of use in the analysis of purported photographs of Hyrum and Joseph Smith or the creation of accurate artistic depictions of these men.³⁴



Gravesite of Emma, Joseph, and Hyrum Smith, May 2009. The gravesite today is marked as it was in 1928. Joseph Smith is in the center grave with Emma to his right and Hyrum to his left. The findings of this study confirm the identifications of the remains of Hyrum and Joseph made by William O. Hands and the others who examined the remains in 1928.

Photograph by Curtis G. Weber.

Notes

1. For a more detailed discussion of the gravesite in the Smith Family Cemetery see Lachlan Mackay, "A Brief History of the Smith Family Nauvoo Cemetery," *Mormon Historical Studies* 3, No. 1 (Fall 2002), 240–52.

2. See Joseph Smith, Jr., *History of The Church of Jesus Christ of Latter-day Saints*, ed. B. H. Roberts, 2d ed., 7 vols. (Salt Lake City: Deseret Book, 1978), 6:628.

3. Oliver Boardman Huntington, Journal, March 8, 1897, Book 18, 62, L. Tom Perry Special Collections Library, Harold B. Lee Library, Brigham Young University, Provo, Utah. Oliver dates this burial as taking place seven months following the martyrdom (ca., January 1845). It appears that the second burial is the one being described in the *History of the Church*, 6:628–29, although the date given there is the fall of 1844. The source of

the details in the *History of the Church* is an 1856 account by Dimick Huntington. I favor Dimick Huntington's date (fall 1844) over that of his brother Oliver (ca., January 1845), since Dimick was an actual participant in the reburial and his account was given twelve years after the events described. Oliver, on the other hand, was a non-participant, and his account is an 1897 recollection. For a discussion of the location of this burial, see note 7.

4. See Linda King Newell and Valeen Tippetts Avery, *Mormon Enigma: Emma Hale Smith*, 2d ed. (Champaign: University of Illinois Press, 1994), 212–13.

5. See "Conference Minutes," *Times and Seasons* 6, no. 16 (November 1, 1845): 1014–15.

6. Journal History of the Church, April 20, 1911, 2, LDS Church History Library, The Church of Jesus Christ of Latter-day Saints, Salt Lake City, Utah. I am indebted to Joseph Johnston of Hamilton, Illinois, for making me aware of this source and consenting to my inclusion of this material in this article.

7. Journal History, April 20, 1911, 2. This recollection is in possible conflict with the account in the *History of the Church*, which states that the second burial was on land near the Mansion House. Smith recalled that the bodies were "removed back to the old place" without specifying where they were returned to. Smith may have incorrectly assumed the bodies were returned from the Hibbard farm to a previous burial site on the Homestead, forgetting or lacking detailed knowledge of the second burial on the Mansion House property. Whatever the case, the bodies were discovered in 1928 on the Homestead property.

8. See Barbara Hands Bernhauer, *Still "Side by Side: The Final Burial of Joseph and Hyrum Smith*, 2d ed., (n. p.: 2001), 4–9. This booklet is an updated version of Bernhauer's article of the same title that appeared in *John Whitmer Historical Association Journal* 11 (1991): 17–33. Hyrum's descendants and others in Utah claimed knowledge of the secret gravesite that Frederick M. Smith did not seem to possess. For instance, see "Truth Told Regarding Prophet's Burial Place," *The Deseret News*, January 31, 1928, Section 2, 1, 8.

9. Bernhauer, *Still "Side by Side,"* 7–9.

10. Bernhauer, *Still "Side by Side,"* 9–10.

11. Bernhauer, *Still "Side by Side,"* 10–11. Positive identification was made by local residents who recognized the dress as the one Emma was buried in. Apparently her grave marker had been incorrectly placed some time after her burial, as further excavation revealed no grave under the marker.

12. Bernhauer, *Still "Side by Side,"* 14–15. Hands had incorrectly been told that Hyrum was shot under the right eye. Thus this initial identification was made based on the fact that a large portion of the maxilla bone was missing from this skull, including a larger portion missing under the right eye socket. The wound evidence on Hyrum's death mask shows that he was shot on the left side of the face toward the base of the nose.

13. This second skull was missing all of the facial bones, which Hands thought evidence of the natural result of being buried for nearly eighty-four years. He attributed the preservation of the first skull to a large, flat rock that was unearthed lying directly over the skull.

14. Bernhauer, *Still "Side by Side,"* 15–16. Aside from the incorrect information about the location of the gunshot to Hyrum's face, other factors were considered in making the 1928 identifications. Samuel O. Bennion, who witnessed part of the Mansion House examination, seemed convinced of the identification based in part on the shape of the mandibles: "The lower jaw of Hyrum Smith is just as near like the pictures of Hyrum as it could be. His jaw was very large and was quite square especially at the chin compared with Joseph's. Joseph's jaw was more pointed, but Hyrum's was a little more square all around than Joseph's." S. O. Bennion to President Heber J. Grant and Counselors, January 21, 1928, Church History Library. Dee Jay Bawden has informed me that in the 1990s he con-

ducted interviews with two longtime Nauvoo residents who witnessed the 1928 events and who claimed that identification was confirmed by evidence of surgery on one of Joseph's leg bones. Bawden intends to publish his research on this topic in a forthcoming book tentatively scheduled for publication in 2010.

15. Bernhauer, *Still "Side by Side,"* 17. The relative position of the bodies here describes the orientations when viewed from the side of the gravesite nearest Homestead and looking west. Those who view the gravesite from within the Smith Family Cemetery face east and are actually standing at the head of the graves, though the slope of the current granite marker might suggest otherwise.

16. Ronald E. Romig to Curtis G. Weber, email correspondence, February 19, 2009.

17. See Shannon M. Tracy, *In Search of Joseph* (Orem, Utah: KenningHouse, 1995), 58–68; and S. Michael Tracy, *Millions Shall Know Brother Joseph Again: The Joseph Smith Photograph* (Salt Lake City: Eborn, 2008), 82–96.

18. See Joseph L. Lyon and David W. Lyon, "Physical Evidence at Carthage Jail and What It Reveals about the Assassination of Joseph and Hyrum Smith," *BYU Studies* 47, no. 4 (2008): 33, n. 48.

19. Several people have provided me encouragement and assistance. My wife, Jennifer, and our children, Grant, Dana, Noah, Seth, and Ian, have been most supportive of my efforts. Andrew Ehat has been a friend and mentor in many ways, and put me on the path that led to this study. Patrick Bishop provided insight and feedback from the inception of the project, sharing sources and tracking down anatomical and historical data for me. Dee Jay Bawden encouraged this study and openly shared his own forensic research. Shannon Tracy's books introduced me to the controversy, and he provided copies of the 1928 photographs. Fabio Sagebin offered technical suggestions and assistance in photographing the death masks, as did Matthew Madden and Stewart Bridge. CarrieAnn Madden provided me with scientific articles relating to anatomy. Mark Staker, Jim Raines, Gloria Scovil, Carrie Snow, Tamara Day, and Jennifer Hadley from the Museum of Church History and Art gave either permission, access, or their time and assistance as I photographed death masks. Lori Allred lent photographic equipment and expertise. Brandon Allred assisted with the construction of the death mask rig. Mark Ashurst-McGee inspired a more scientific study than was initially intended by asking about future publication of the study (none had been contemplated at the time). Joseph Darowski, Richard Jensen, Alex Smith, Richard Bennett and others from the Joseph Smith Papers project saw an early presentation of the study and gave encouragement and helpful suggestions. And last but not least, Barbara H. Bernhauer, Lachlan Mackay, and Ron Romig from the Community of Christ have conducted and published research vital to this study. I am also indebted to the Community of Christ for granting permission to use the 1928 photographs in my efforts.

20. John M. Bernhisel to Brigham Young, September 10, 1849, Church History Library.

21. Mark L. Staker in his May 2009 presentation at the Mormon History Association conference in Springfield, Illinois, suggested that these may be the masks that John Taylor took to England in 1850 to have accurate busts of Hyrum and Joseph Smith created.

22. See Reed Simonsen, Chad Fugate, and Jim Fugate, "A Comparison with the Death Mask," "The Skull—The Missing Link," "Did Joseph Receive Facial Fractures?" and "Facial Fractures Explain the Differences Between the Death Mask and the Photograph," on the website <http://www.photographfound.com>, accessed 2009.

23. Joseph Smith, *Diary*, June 25, 1842, Church History Library. See also Steven Bule, *From Calico Printer to Portrait Painter: Sutcliffe Maudsley, Nauvoo Profelist* (Orem, UT: A Better Place, 2002), 28–29.

24. "Measurements of the Head of Mr. Joseph Smith Jr. by Alfred Woodward, M.D."

Joseph Smith Papers, 1827–1844, LDS Church History Library.

25. See Karen Taylor, *Forensic Art and Illustration* (Boca Raton, FL: CRC Press, 2000), 382.

26. Taylor, *Forensic Art and Illustration*, 434–36.

27. I first conducted this study using the tissue-depth averages found in Taylor, *Forensic Art and Illustration*, 351. I then repeated the study using averages published in Carl N. Stephan and Ellie K. Simpson, “Facial Soft Tissue Depths in Craniofacial Identification (Part I): An Analytical Review of the Published Adult Data,” *Journal of Forensic Sciences* 53, no. 6 (November 2008), 1–16. However, neither of these studies includes tissue-depth averages for the inion. The inion depth used in this study was determined through tissue depth research conducted specifically for this study by James Boulter, a radiologist in Sheridan, Wyoming. I am grateful to Patrick Bishop for arranging to obtain this crucial tissue-depth average.

28. Dee Jay Bawden produced his forensic drawings using projected profiles of copies of the Dibble death masks, the 1928 skull measurements, and handmade tracings of the skull outlines taken from the 1928 photographs. Joseph’s 1840 phrenology measurements do not appear to have been used in his work. Bawden used his skill as an artist to hand-correct rotations of the skull outlines to present true 90° rotations of each skull. This procedure introduces a degree of subjectivity into his work. Also, his drawings do not incorporate any scientific soft-tissue data and depict tissue depths that are too shallow, though generally correct in proportion to tissue-depth averages. Tracy’s work, on the other hand, accomplished using 3-D computer models of copies of the pedestal death masks, shows little evidence of any regard for soft-tissue depths. Tracy makes use of the 1840 measurements in his second book, but only as ratios and without reference to the death masks to set the scale for measuring the skulls. See Tracy, *Millions Shall Know Brother Joseph Again*, 88–93. Tracy also doubts the usefulness of the 1928 skull measurements and makes no attempt to test them. See Tracy, *Millions Shall Know Brother Joseph Again*, 78.

29. Due to the sensitive nature of the subject matter, the Community of Christ has requested that I not show the 1928 photographs nor the full skull images derived from them. Instead, I have included extremely accurate outlines showing the contours of the portions of the skulls that are obscured when the death masks are superimposed.

30. As noted earlier, the same procedure was followed using the Dibble Joseph death mask, and essentially the same result was achieved. With the Dibble mask placed at the same rotation and tilt, the tissue depth at the glabella is 5.25 mm (95% of average); at the nasion, 8.75 mm (135% of average); and at the end of the nasal bones, 8.50 mm (283% of average). The slight difference at the glabella may stem from the margin of error in my measurements, a slight difference in the rotation of the death mask rig in the two photographs, or in the shape of the masks themselves at this point.

31. With the Dibble Hyrum mask placed on Skull 1 at the same rotation and tilt as the pedestal Hyrum mask, only the tissue depth at the end of the nasal bones is different, being 3.50 mm (116% of average).

32. This theory contradicts the somewhat complicated view that Hyrum was shot in the head twice—once in the face, the first ball producing no exit wound; and then a second time from beneath the jaw on the right side of his neck (again without producing an exit wound) while he fell or lay on his back on the floor as a result of the first shot. I first learned of this “single-shot” theory in March 2008 from Dee Jay Bawden and my research suggests it is the more plausible one. Joseph Lyon and David Lyon also favor this theory based on their research. See Lyon and Lyon, “Physical Evidence at Carthage Jail,” 27–34.

33. I have analyzed many of the images and evidence in Tracy’s books in an attempt to understand the sources he used and reconstruct the methodology he followed. The in-

tent and scope of this article will not permit a full discussion here; but in summary, I have found several fundamental flaws in Tracy's work, including the following: (1) a crucial inaccuracy in the isolation of Skull 1 from the 1928 lateral view photograph; (2) violation of basic anatomical principles in fitting the death masks to the skulls; (3) failure to critically examine the 1928 skull measurements; and (4) failure to properly consider or consult tissue depth studies.

34. Anyone interested in discussing the findings of the 2-D study, or in assisting the 3-D study by providing technical or financial support, is welcome to contact the author by email.