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FACE TO FACE WITH THE PAST:

Reconstructing a Teenage Boy from Early Dilmun

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One fall afternoon at San Francisco State University, several undergraduate students gathered around their anatomy instructor, eager to catch a glimpse of the molded clay bust that she was preparing to reveal. As she removed the drape that covered the face of a teenage boy who lived almost four thousand years ago, the students' eyes widened and their voices abruptly went silent. Finally one young man marveled, "He looks like us!" while a woman of Middle Eastern ancestry intoned, "He's an emissary."

These reactions embody the goals of the facial reconstruction program pursued by the Dilmun Bioarchaeology Project (DBP). Bioarchaeologists draw upon multiple lines of evidence, including human skeletal remains, burial objects, and culture history, to reconstruct personal biographies and population histories from the past (Buikstra and Beck 2006; Larsen 1997). This knowledge gains purpose and relevance as it is shared with interested and invested communities in the present day. Although the written word is the most common mode of communication, it is complemented by visual media such as scientific illustration and facial reconstruction, which have produced remarkable outcomes in settings as diverse as third century B.C.E. Macedonia (Prag and Neave 1997) to the colonial Chesapeake region (Owsley and Bruwelheide 2009). The DBP's facial reconstruction program is inspired by these successes and, accordingly, is predicated on the following tenets. First, presenting the people of the past in a tangible, material fashion facilitates a connection to contemporary audiences that is much more vivid than even the most detailed words on a page. Second, by highlighting our shared humanity, facial reconstructions encourage empathy for people of the past, which in turn facilitates understanding for present-day people living in different societies and in distant places.

Achieving these ends required a highly collaborative process in which the authors combined insights and skill sets from our diverse disciplines. As the DBP neared completion in its analysis of two- to four-thousand-year-old skeletons and burial objects from the island of Bahrain, the remarkable preservation of certain bones and artifacts was noted. Having been carefully curated for over seventy years, skeletons such as that of a male twelve to fifteen years old (Cat. No. 12-10156), for whose burial the time, place, and grave goods were known, whispered of further stories yet to be told. Taking advantage of this new research opportunity required bringing in the skills of a physical anthropologist specializing in 3D scanning of skeletal remains and a forensic artist (who is also the anatomy instructor mentioned above). Yet as important as these contributions were—from culture history, ceramic analysis, osteological research, 3D scanning, and facial reconstruction—the true leader of this program has been the teenage boy himself, an emissary of Early Dilmun society.

The Dilmun Bioarchaeology Project (DBP)

In late 1940 and early 1941, Peter B. Cornwall, a doctoral student in anthropology at Harvard University, led an archaeological expedition to Bahrain and eastern Saudi Arabia. The first month of this sojourn was spent on the island of Bahrain, where he conducted a surface survey and excavated at least twenty-one undisturbed burial mounds (tumuli), mainly on the north and west sides of the island (fig. 1). Cornwall provided a key with vague descriptions of some of these locations, only some of which can be identified today with the help of more recent excavations and satellite images. The few remaining field photographs show various stages of excavation in progress, carried out by the local workmen whom Cornwall hired to assist him (figs. 2, 3). No excavation images or records remain to aid in reconstructing the design of burial chambers, the position and orientation of the bodies, or the precise location of associated objects and animal bones.

The remainder of Cornwall's explorations took place in Saudi Arabia, where he was a guest of the California-Arabian Standard Oil Company. There he surveyed at least sixteen archaeological sites in Saudi Arabia's al-Hasa region (known today as *Mintaqah al-Sharqiyah*); detailed descriptions and maps of these sites are provided in his "Ancient Arabia" article (Cornwall 1946a). Cornwall gathered stone, ceramic, glass, and metal objects from the surface of many sites that he visited (over 3,700 of which would later be accessioned by the Hearst Museum). Before shipping artifacts, field notes, and photographs to the United States, Cornwall coated human remains and some objects with a consolidating agent, probably a type of shellac.

Returning in May 1941, he spent the next few years analyzing and restoring the collection at his family's house in Ross, California, a small town north of San Francisco. He published portions of the data in his 1944 Harvard dissertation, "The History of Bahrein Island before Cyrus," and a handful of journal articles that presented aspects of his research on the Bahrain tumuli (1943) and the Eastern Province survey (1946a). In these publications and others (e.g., 1946b), Cornwall concluded that modern Bahrain and eastern Saudi Arabia had once made up the ancient polity of Dilmun. Although he may not have known it at the time, Cornwall's preliminary analysis of these materials was the only scholarly attention that they would receive for many decades. It would fall to scholars such as Højlund (1987, 2007), Laursen (2008), and Mughal (1983) to reexamine some of these areas and confirm the region's identity as Dilmun.

Based in part on Cornwall's familial connections to the San Francisco Bay Area and the University of California, Berkeley, his expedition had been endorsed and given limited financial support by the University of California (now Phoebe A. Hearst) Museum of Anthropology. In December 1945, Cornwall deposited the entire collection there; an inventory of its contents was undertaken by the museum staff over the next several years without his assistance. Beyond standard cataloging and conservation procedures carried out by museum staff, it was to be decades before systematic research was conducted on the collection.

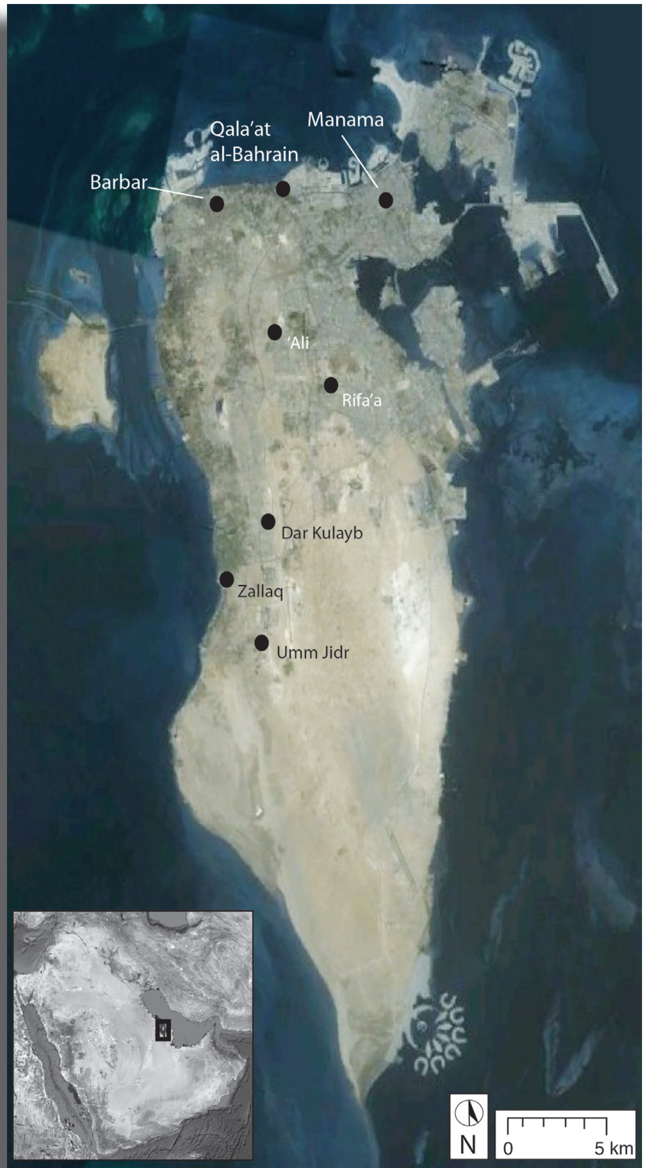


Figure 1. Map of Bahrain showing key Bronze and Iron Age settlements. Image modified from Google Earth 2011 (Image: US Geological Survey; Data: SIO, NOAA, US Navy, NGA, GEBCO; © 2012 Cnes/Spot Image).

The DBP was formed in 2008 by two of the authors (Porter, Boutin), who have since created a collaborative, interdisciplinary team of students and professionals with unique talents and complementary research interests. The DBP's goal is to conduct a comprehensive bioarchaeological analysis of the skeletal and artifactual remains from Cornwall's expedition now kept

Figure 2 (left). Cornwall's team excavating Tumulus B3 in Bahrain. Figure 3 (below). Peter Cornwall and his hired laborers posing for a photograph in front of an unspecified tumulus in Bahrain. Both photos courtesy of the Phoebe A. Hearst Museum of Anthropology.

at the Hearst Museum. Thus far we have concluded that the skeletal remains of at least thirty-four individuals are present, the majority of whom are adult males. Several types of paleopathology are frequent, including osteoarthritis and antemortem tooth loss. Most burials contained one or two objects and occasionally bones from a sheep or goat. The accompanying funerary kits often provide relative dates ranging from the late third millennium B.C.E. to the end of the first millennium C.E. (for further details of the DBP's findings, see Porter and Boutin 2012).

Early Dilmun (2050–1800 B.C.E.)

Individual 12-10156 lived and died in ancient Dilmun, a polity that spanned the Arabian Gulf's west coast from Bahrain through eastern Saudi Arabia and possibly Kuwait. Dilmun served as a setting for Mesopotamian creation myths and fantastical events. For instance, the hero Gilgamesh found Utnapishtum there, a former king who was granted immortality after a great flood in a story that mirrors that of the biblical Noah. Archaeologists have been investigating Dilmun for more than fifty years and have pieced together its history from material evidence and written sources. During the centuries when individual 12-10156 lived, Dilmun developed unprecedented forms of political and economic organization, beginning around 2050 B.C.E. and achieving its peak around 1850 B.C.E. (Højlund 2007, 123–27). Evidence for sedentary life is observed at Qala'at al-Bahrain, a fortified settlement with well-planned streets and houses (Højlund and Andersen 1994), and evidence for organized religious practice was found in the nearby Barbar temple (Andersen and Højlund 2003).

Dilmun at this time was known as a trading entrepôt for commercial networks extending to the north and south. The polity had extensive trading relationships with the Ur III societies of Mesopotamia, Magan in Oman, and Meluhha, the Harappan societies of the Indus River Valley. The presence of administrative seals and ceramic vessels from these regions speaks to extensive international interactions. In fact, it is possible that people from Mesopotamia, Magan, and Meluhha were living in Dilmun during this time. Early Dilmun society saw its prosperity diminish in the eighteenth century B.C.E., a trend that would last for three centuries.

When people died in Early Dilmun, their bodies were laid to rest in distinct mortuary monuments that are still visible across the island today (Højlund 2007). These mounded tumuli frequently consisted of a stone-lined burial chamber covered by a cone of sediments and gravels. In most tombs, one or sometimes two individuals were interred, often in a relaxed, fetal position. Surrounding them were ceramic vessels, jewelry, metal weapons, and, rarely, alabaster vessels or ivory objects. A sheep or goat was also occasionally included, likely an offering for the deceased to carry into the afterlife. Not all tumuli had the same level of elaborate commemoration. Differences in the size of individual monuments and the amount and quality of objects indicate that the privileged and wealthy were granted the most elaborate burial conditions.

For more information about Dilmun and the archaeology of ancient Bahrain, see Geoffrey Bibby's classic text, *Looking for Dilmun* (1970), and, more recently, MacLean and Insoll's *An Archaeological Guide to Bahrain* (2011).

Getting to Know Our Subject: Osteological and Mortuary Evidence for 12-10156

The remains of the teenage boy known variously as 12-10156 or "the emissary" were excavated by Cornwall from Tumulus G20, which we believe belongs to the Dar Kulayb mound cemetery near the island's western coast. The only ceramic vessel found in this mound was a nearly complete "pear-shaped" jar, its rounded body and flat base made of a pink fabric and covered with a white slip (fig. 4). This vessel type is common in Early Dilmun–period burial assemblages, suggesting that the burial dates between 2050 and 1800 B.C.E. (Højlund 2007, 124–26, figs. 207, 217, 254). Six bones of a sheep or goat were recovered from his burial. Zooarchaeologist Jennifer Piro advises that these belonged to an animal that was less than six months old when it died.

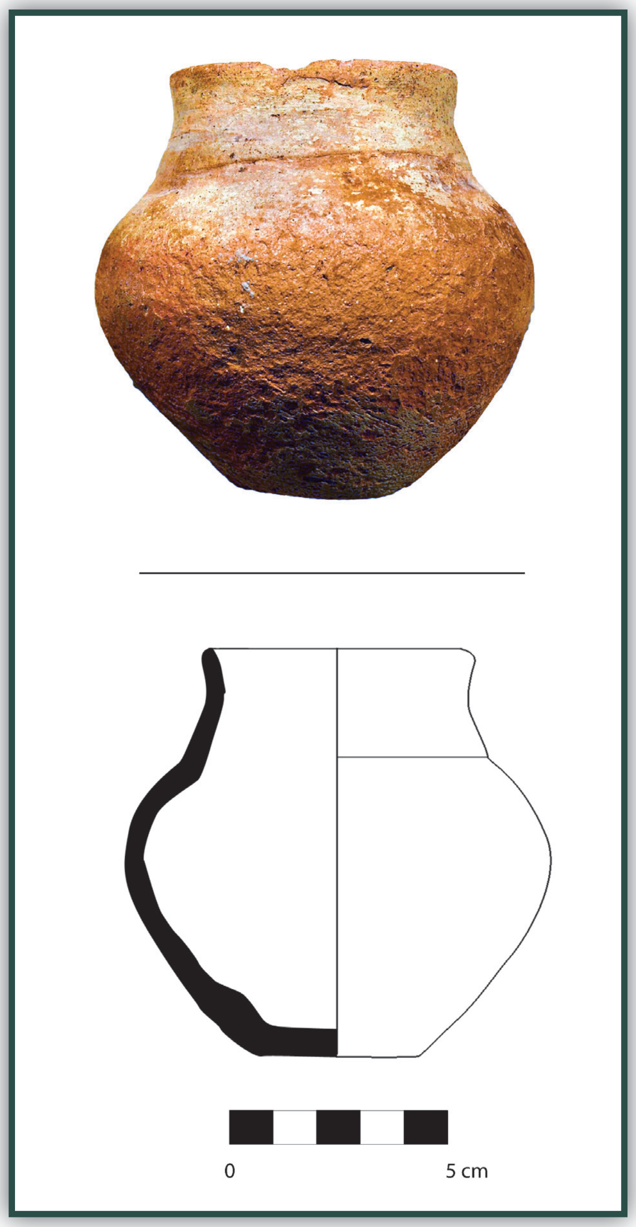


Figure 4. A small nearly complete wheel-thrown ceramic vessel (9-4048) associated with Tumulus G20 and individual 12-10156. The diameter is 6 cm in length. The vessel has a pink (2.5 YR 8/4) colored fabric and is partially covered with a white (7.5 YR 8/3) slip. Photo: C. Morgan; illustration: K. Leu.

As with all skeletal individuals in the Cornwall collection, the first step in analyzing 12-10156 was to create an inventory of bones and teeth. Next we collected detailed morphological and metric data (after Buikstra and Ubelaker 1994) from the skeleton to learn as much as possible about its identity. This skeleton proved to be one of the most complete in the collection, missing only portions of the left side of the face and cranial vault (fig. 5) and some ribs, hand, and foot bones. It offered an unmatched opportunity to reconstruct the identity of a person from ancient Dilmun based on age, sex, and health/nutritional status. It quickly became evident that this skeleton belonged to a juvenile, because few of the growth plates in the ends of the limb bones had closed at the epiphyses.

Because juveniles have not yet completed puberty, they lack the secondary sexual characteristics that make skeletons sexually dimorphic (Rogers 2009). Thus it is impossible to determine conclusively the sex of a juvenile skeleton without the help of ancient DNA. We nevertheless observed that this skeleton's bony maturation was vastly outpaced by its dental development, a pattern more characteristic of males, who generally enter puberty some two years after females. Therefore, we identify this skeleton as probably belonging to a male (Porter and Boutin 2012, 44).

Juveniles' bodies undergo very complex and rapid changes as they grow and mature, allowing a fairly narrow time frame for their age at death to be estimated from their skeletons. In the case of 12-10156, a minimum age of twelve years was derived from the formation and eruption of the permanent teeth (Liversidge et al. 2006). Few of the growth plates in the limb bones had closed; this fact, combined with an evaluation of the sizes and shapes of their epiphyses (Scheuer and Black 2004), resulted in a maximum age of fifteen years, if we are correct in assuming that 12-10156 is a male. Therefore, we believe that this boy was an adolescent who died between the ages of twelve and fifteen years.

Like many of his contemporaries, this teenage boy experienced poor dental health. Characteristic lines on certain of 12-10156's tooth crowns represent disruptions in enamel formation: these linear enamel hypoplasia (LEH) result from generalized metabolic and/or nutritional stress suffered during childhood (Ritzman, Baker, and Schwartz 2008). Four of his incisors and canines exhibit LEH (seven, in total). Because the timing of human crown development is well-documented, a person's age at defect formation can be estimated with some precision (Goodman and Rose 1991). The formation of 12-10156's LEH encompasses an age range of 3.0–5.5 years, although two clusters (ages 3.5–4.0 and 4.5–5.0 years) may indicate peaks of physiological disruption. Three of his teeth exhibit effects of dental caries (or "cavities"). Caries completely destroyed the crown of one upper first molar and are probably to blame for the antemortem loss of another. This tooth loss

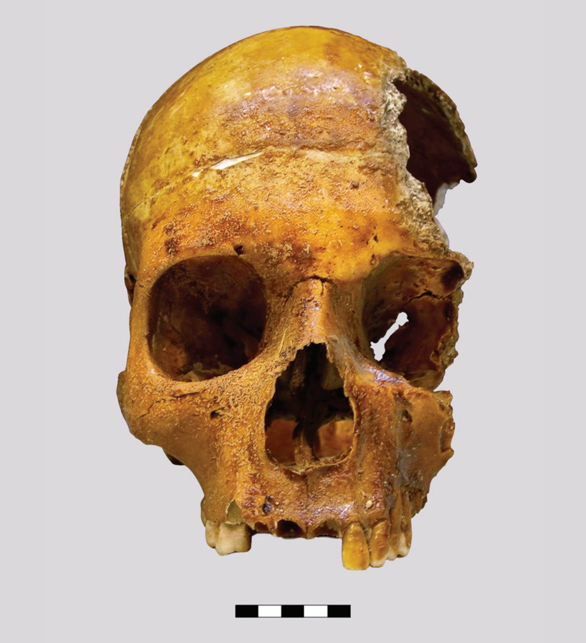


Figure 5. Anterior view of 12-10156's cranium. Note differential preservation of right and left halves, and linear enamel hypoplasia on LI^2.

Figure 6. Inferior view of 12-10156's maxillary arcade. Note extensive resorption of RM^1 alveolus and carious destruction of LM^1 crown and root.

occurred quite some time before his death, based on the filling in of the associated socket with bone (figs. 5, 6).

High frequencies of linear enamel hypoplasia, dental caries, and antemortem tooth loss have been observed elsewhere on Bahrain during this and following periods (Littleton 2007). Littleton and Frohlich (1993) point to agriculture-based diets containing many fermentable carbohydrates (e.g., dates) as the cause of the caries rates in particular. Contemporary medical traditions likely also played a role in antemortem tooth loss, as Højgaard (1986, 66) has proposed the intentional extraction of diseased teeth.

Despite the nutritional and health challenges that this teenage boy's teeth reflect, his skeleton exhibits no signs of poor health. This begs the question, Why did he die so young? Many acute, infectious diseases attack the body's soft tissues (circulatory, respiratory, neurological) systems first, killing the person before a bony response has time to develop. As with many skeletons recovered from archaeological contexts, no direct evidence for the cause of the teenage boy's death has been preserved in bone. However, the skeleton is not a perfect record of injury and health in living populations, as bioarchaeologists' lively debate over the "osteological paradox" illustrates (Wood et al. 1992). In the words of Wright and Yoder, "Does a skeleton without evident lesions represent a healthy person or a weak individual who perished at first exposure to a pathogen?" (2003, 45). Based on current evidence, we cannot answer that question for 12-10156.

Overall, the excellent preservation of this teenage boy's skeleton produced many tantalizing insights into his identity and experiences. Additionally, the available evidence about his burial provided a time frame for his life and hinted at the treatment of his body after death. The unparalleled condition of his skull confirmed that this teenage boy would provide the DBP's best opportunity to create an accurate, well-contextualized facial reconstruction. Our choice was confirmed by forensic artist (and author) Gloria Nusse. The remainder of this article will trace the steps taken to visualize the teenage boy's living appearance.

Creating a 3D Virtual Model of 12-10156's Skull

Whenever museum researchers work with human remains, great care is taken to minimize potential damage to the bones. This is all the more crucial when the bones at issue are approximately four thousand years old and are dry and brittle. Accordingly, we wanted to avoid moving the bones out of the collections area of the museum. We also sought to obtain a model of the skull through noninvasive and nondestructive means. Nusse advised that stereolithography (scanning the object with lasers to create a digital file, which is then "printed" in plastic) was the best option. This process would produce a three-dimensional plastic model of the skull upon which the face could be reconstructed.

Postdoctoral researcher (and author) Sabrina Sholts brought a NextEngine 3D laser scanner into the collections facility where the teenage boy's skeleton is stored. She placed the cranium on a turntable platform and secured it in place with nonmarking putty and a soft rubber gripper (fig. 7). Four thin, evenly spaced red lasers slowly swept in unison across the cranium's contours. When a pass was finished, a bright light popped on, and the turntable rotated slightly. Periodically a camera lens would click as it worked to capture RGB color. This pattern continued until a 360-degree view of all of the cranium's surfaces had been obtained. Sholts then changed the position of the skull to ensure that all data from the face, as well as the back of the cranium, were captured. The mandible (lower jaw bone) also required its own set of scans. A grand total of twenty scans over the course of an hour provided the data needed to create the three-dimensional digital image.

As the scanner worked, Sholts monitored its progress from her laptop computer. A schematic image of the skull, visible on the computer screen, refreshed every few minutes as the turntable rotated: its voids were progressively filled in, its colors became more nuanced, and the image became increasingly more three-dimensional. Once the scanner's work was done, the images were stitched together into a coherent whole by selecting common landmarks on the images of the skull as it was scanned at different angles, aligning them, and eliminating any overlap in areas that had been recorded more than once. The resulting digital image file was then prepared to send to the printer (fig. 8).

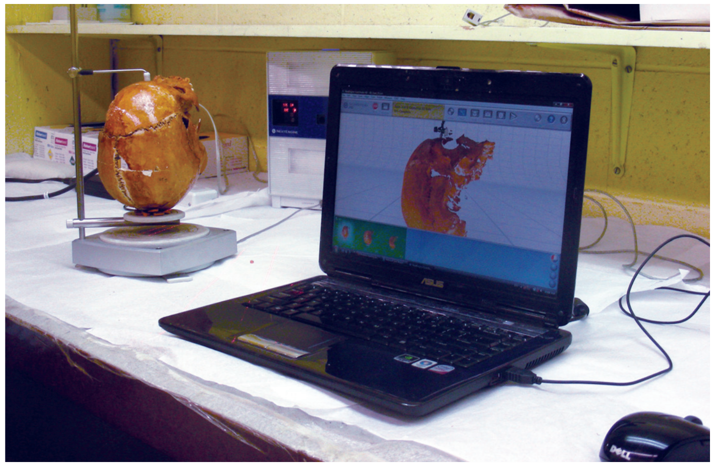


Figure 7. 12-10156's skull on turntable platform, with NextEngine portable 3D scanner in the background. The image captured by the scanner is visible on Sholts's laptop computer.

Facial Reconstruction of 12-10156

Before the plastic model of the teenage boy's skull was created, Nusse prepared a two-dimensional reconstruction, that

3D Scanning of Human Remains

Three-dimensional laser scanners have become increasingly affordable and user-friendly in recent years, making the benefits of 3D modeling available to researchers in many countries and fields of study. In bioarchaeology, 3D laser scanning has the particular advantages of facilitating the digital documentation and analysis of remains that are often fragile, rare, and/or difficult to access. Because the laser scanner utilizes surface-reflected light, this imaging technology is noninvasive, unlike the bulk-penetrating X-rays of computed tomography (CT), which can damage ancient biomolecules in bone (Grieshaber et al. 2008). Operating with both laser and normal white light, the instrument's laser beams sweep across the surface of the object being digitized, allowing detectors to measure the distance from the light source to the object's surface. The resulting data set, or point cloud, contains hundreds of thousands of 3D coordinates, or vertices. Triangles are drawn between these vertices to create a continuous "mesh" surface that approximates the surface contours of the original object. In addition, a built-in digital color camera captures high-resolution color images of the object's surface, and these images are mapped onto the mesh surface, producing a full-color 3D rendering of the scanned object. With the latest generation of portable laser scanners, the entire process of data capture can be performed in the regular workspace of a museum or laboratory, requiring only a standard power supply and high-performance laptop to operate the scanner and its software applications.

Once a 3D model is created, the options for analysis are virtually endless. For visual inspection or enhanced display, the user can move, rotate, and scale a 3D model, as well as alter its color and light source. As illustrated by the "mirroring" procedure implemented for the DBP facial reconstruction, the 3D mesh also can be modified with respect to geometric entities (such as planes) that are automatically generated or user defined. Quantitative data can be obtained from a 3D model in the form of surface area and volumetric measurements (Sholts et al. 2010), linear and curvilinear distances, and precise xyz coordinates of specific anatomical landmarks on the mesh surface (Sholts et al. 2011a). Using 3D modeling tools, recently developed techniques of shape analysis show great promise for identifying and understanding patterns of variation in the human skull (Sholts et al. 2011b; Sholts and Wärmländer 2012), as well as other skeletal elements and material objects. Thus, as 3D technology continues to improve and more techniques are developed, the 3D model of the teenage boy from Dilmun may continue to yield new information for years to come.

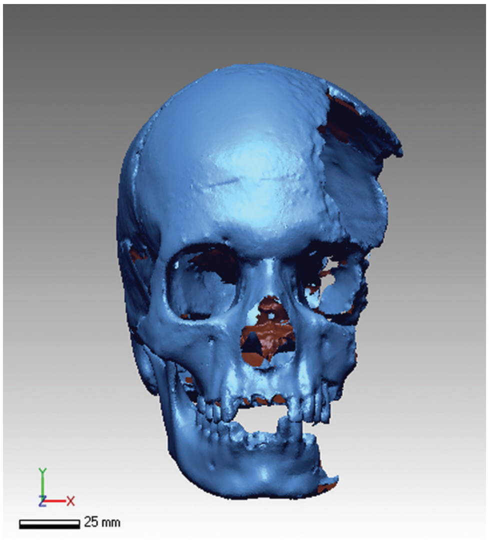


Figure 8. Completed 3D image of 12-10156's skull, following Sholts's normalization of scanner data with Rapidworks software.

is, a drawing of what his face would have looked like during life. This required several hours of preliminary analysis, which included taking extensive notes, creating drawings and photographs from multiple angles, and taking numerous measurements of cranial and facial dimensions (fig. 9).

Nusse had already been informed of the skull's estimated sex and age and its geographic origin and antiquity. The other major type of information needed before reconstruction could commence was odontological, that is, concerning the teeth. As the only visible part of the skull, the teeth's accurate representation has a significant impact on the reconstruction's effectiveness. Having already rearticulated the teenage boy's skull on a cushioned platform, Nusse placed thin barriers of nonmarking putty between his upper and lower teeth to create a more lifelike (i.e., nonclenched) bite; this process also revealed that our subject exhibited an overbite. The skull's numerous "adolescent" characteristics progressively became apparent to Nusse, including a proportionately large nose, bulging ("bossing") at the top corners of the cranial vault, and a rounded jawline. Nusse also noted an asymmetry between the right and left sides of the face (the left side was receding compared to the right). For the purposes of facial reconstruction, we hypothesized that this asymmetry was present during the teenage boy's life, perhaps resulting from a benign developmental anomaly. However, the asymmetry equally could have resulted from the same postmortem factors that damaged the left side of his cranio-facial skull. Like many other aspects of the teenage boy's re-created appearance described below, our current understanding of his skull asymmetry is only one of many possible interpretations. The resulting two-dimensional reconstruction provided an intriguing glimpse of the persona beyond the skull and validated our desire to move forward with a three-dimensional version.

We eventually were notified by the printing company that its software was having difficulty processing the voids on the left side of the teenage boy's face and skull, so Sholts digitally mirrored the right (unbroken) half of the face onto the left side. This produced an image that was unnaturally symmetrical, but more suitable for printing in plastic. Accordingly, when reconstructing the face, Nusse worked in close consultation with the actual skull (and photos of it) to ensure that its potentially original asymmetry was represented accurately (fig. 10).

The first step was to attach tissue depth markers to the plastic skull replica at standard cranial landmarks (fig. 11). Next, oil-based modeling clay was used to simulate the cranio-facial muscles, with "skin" of the same material eventually added to meet the height of the markers (fig. 12). How much soft tissue is applied depends on the subject's sex, age, and ancestry. Nusse had recently used a combination of tissue-depth data from Rhine and colleagues (1980, 1982) and Manhein et al. (2000) to reconstruct the face of an unidentified man thought to be of Middle Eastern ancestry. The success of this approach, which led to the positive identification of a deceased Palestinian-American man, supported the use of the same combined data for the Dilmun teenager. To replicate facial features that have no skeletal framework, such as the nose, ears, and lips, Nusse made educated inferences based on measurements of the skeletal armature. After measuring the nasal aperture's width and the length of the nasal spine, she drew tangents from the top and bottom of the bony nasal aperture: the nose was estimated to project as far as the intersection of these tangents. Nusse also correlated the corners of the mouth to the locations of the maxillary first premolars and related the height of the lips to the level of gum line discoloration still visible on the teeth. Once the basic form of the face had been completed, Nusse made small adjustments to the shapes of certain features, such as the eyelids and lips. The final step involved using a sponge to

Figure 9. Nusse and Sonoma State University undergraduate Emily Carleton take measurements of 12-10156's skull in preparation for drawing.

Figure 10 (above). Side-by-side comparison of 12-10156's skull with the 3D model printed in plastic.

Figue 11 (right). Nusse attaches tissue depth markers to specific cranio-facial landmarks on the plastic model of 12-10156's skull.

texturize the facial skin and the application of paint to provide a more lifelike skin tone.

The Final Step: Hair, Eyes, and Clothes

When we look at a person, we see his or her face within its broader cultural context, and we begin to form an idea of that person's life. The image that the forensic artist creates tells this story using multiple visual cues. Skin pigmentation, hair color and texture, and eye color are products of a person's place of geographic origin and ancestral population. Yet time period, social trends, and economic status also strongly influence hairstyle, clothing, jewelry, and makeup. In the case of 12-10156, this meant allowing his final appearance to reflect the broadest contexts for his life. Therefore, the forensic artist's task does not end when the final layer of skin is applied.

Compared to neighboring Mesopotamia, Early Dilmun lacks abundant visual culture and written sources from which additional characteristics of 12-10156's appearance could be reconstructed.

Forensic Facial Reconstruction

Facial reconstruction (also called facial approximation or reproduction) is a method for creating a three- or two-dimensional image of a deceased individual using features of the skull as guides. Most modern practitioners of this process, known as forensic artists, use a combination of soft-tissue depth markers and an understanding of the underlying facial anatomy to build the reconstruction. While the modern technique of facial reconstruction was developed in Europe over a century ago, the idea of reanimating the skull has been a part of the human story for thousands of years. In the Pre-Pottery Neolithic B Levant (Bonogofsky 2003) and Late Neolithic Anatolia (Özbek 2009), skulls were unearthed after a socially appropriate amount of time had passed, then covered with plaster, clay, and pigments that were shaped and painted to resemble the dead person. In the late nineteenth and early twentieth centuries, forensic sculpture as we know it today was developed by anatomist Hermann Welcker to compare the skulls of various famous persons (e.g., Raphael, Schiller, and Kant) with portraits painted of them during life. Later anthropologist Wilhelm His with artist Carl Seffner used the same techniques to authenticate the skull of Johann Sebastian Bach. His's data was augmented, tested, and later published by anatomist Julius Kollmann with artist W. Büchly (Verzé 2009).

The skull forms a bony architecture for the facial musculature and skin. Therefore, careful analysis of the skull can reveal the form that the soft tissues of the face would have taken during life. The practice of forensic facial reconstruction locates specific landmarks on the skull and then overlays them with clay to approximate the tissue depth at those points (Nusse 2007). Tissue studies, which measure the depth of soft tissue at particular landmarks on the skull, have been conducted for over 120 years. Although the earliest studies relied on cadavers (Welcker 1883; Rhine and Campbell 1980; Rhine et al. 1982), today scientists use ultrasound (Manhein et al. 2000) and CT scanning technology (Wilkinson 2004) to collect these data from living people. The artist and anthropologist use these measurements when applying a replica of soft tissue that conforms to the anatomy of the skull. A deep understanding of the anatomy of the face and skull, as well as artistic skill, is needed to complete the reconstruction. The resulting image is a delicate balance between scientific analysis and artistic interpretation.

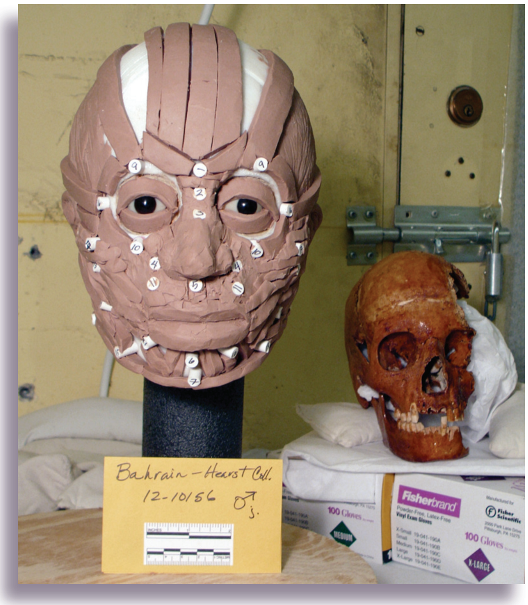


Figure 12. Facial reconstruction of 12-10156 in progress, following the application of modeling clay to simulate cranio-facial muscles and features.

Nevertheless, Porter and Nusse sought analogical information from various published reports containing materials from Early Dilmun. Dilmun's stamp seals and their sealings in preserved clay often depict humans or deities, yet these images lack the detail needed to determine specific characteristics of outfit and design. The chance discovery of textiles from excavations at Qala'at al-Bahrain did help with designing 12-10156's garment (Højlund and Andersen 1994, 415–16, figs. 2069–2075). Nusse pored over samples of raw silk at a fabric store in downtown San Francisco before settling on the one that most closely approximated the ancient textiles' loose weave and slightly uneven texture. There was also hope that neighboring Mesopotamians would have made observations about the physical traits of the Dilmun population. Although casual mention of the hair and skin color of Meluhha society is made, there is as of yet no known mention of similar features in Dilmun. More generally, there are cuneiform tablets containing lists of words (lexical lists) that mention different hair colors (e.g., black hair, red hair), eye color (e.g., black), and styles (e.g., tufted hair, pony tail).[1] While not describing Dilmun directly, these descriptions were used cautiously to make decisions about 12-10156's dark eye and hair color, and hair texture and style.

A survey of publicly available photographs of modern Arabian Gulf citizens strengthened our confidence in these decisions and was therefore used to make up for the shortfalls in direct evidence from the Early Dilmun Period. Employing this kind of information in facial reconstruction projects is potentially problematic, because it cannot be assumed that four-millennia-old populations would closely resemble contemporary populations of the same region. However, because the project's goal was to provide as close an interpretation as necessary, this information from modern societies served as the best available substitute for historical and archaeological evidence.

Recapturing the lived visage of any deceased person bears certain indelible challenges: the no-longer-present must be made manifest. The technique of forensic facial reconstruction does have critics within the anthropological community. Stephan (2005) writes that this method's inherent limitations call its utility into question, particularly when applied to human remains from archaeological sites. Because reconstructions of prehistoric faces can never be proven accurate or inaccurate, they potentially mislead interested public audiences. Wilkinson (2010) counters that forensic artists reconstruct the vast majority of the face based on a systematic, scientific procedure that relies on anatomical accuracy. Artistic interpretation is necessary, but only for exclusively soft-tissue features such as the lips and ears.

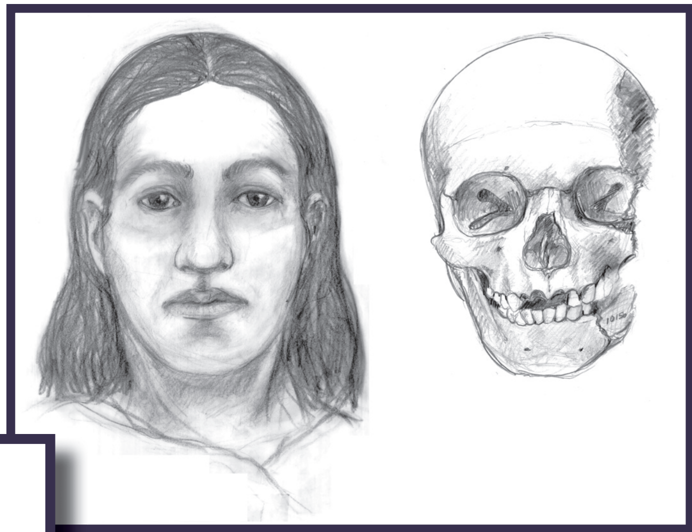
For our part, we believe that facial reconstruction is inescapably a blend of art and science. Nusse relies in equal parts on her artistic training, decades of experience in scientific illustration, and knowledge of human cranio-facial anatomy. Nevertheless, her 2D reconstruction of the teenage boy is not completely accurate, nor is the 3D reconstruction that she created. No representation, written or visual, can accurately depict the life of a person who lived in a different society thousands of years ago. There is no single "correct" answer about how to interpret bioarchaeological (or any anthropological or historical) data. However, as long as standardized, peer-reviewed methods of data collection and analysis are used, multiple interpretations can be equally valid. For this reason, we present Nusse's 2D and 3D reconstructions (figs. 13 a–b, 14) with equal amounts of confidence that they will tell a fascinating story to contemporary audiences, despite the clearly apparent differences between them.

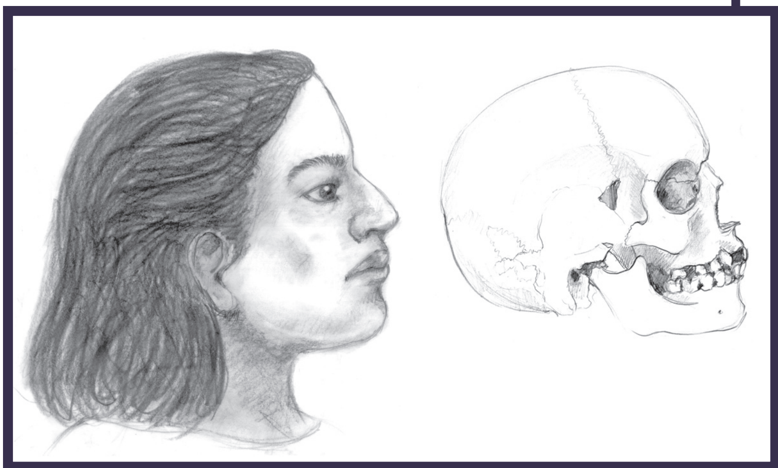
Some people, including one peer reviewer of this article, argue that facial reconstructions reify the biological determinism and racial typing that characterized nineteenth- and early twentieth-century physical anthropology. We as authors are well aware of this unfortunate intellectual heritage (e.g., Caspari 2003), as well as the seemingly irresolvable politics of cultural representation in the world in which we live. Nevertheless, we are not content to be silenced by this tension between ideologies. Representations of the past, whether in the writing of history, the renovation of ancient architecture, or the facial reconstruction presented here, are always and already anachronistic. Yet it is precisely through such anachronistic practices that contemporary societies translate human life in past societies into recognizable forms. We invite challenges to our interpretations of the teenage boy's appearance as well as alternative representations, and we look forward to the constructive dialogue that we hope will ensue.

Closing Thoughts and Future Directions

Because the Cornwall collection has already spent the better part of a century out of the public eye, the DBP wants to share its insights about Early Dilmun society with a broad audience. Our findings have already been presented at professional conferences and have appeared (or soon will) in peer-reviewed journals and edited volumes. However, our colleagues require little convincing that an assemblage of human remains and artifacts excavated decades ago and thousands of miles away is of scholarly value. We also wish to share with a nonacademic audience these stories of lived experience in Early Dilmun society. Bioarchaeological analyses can shed a unique light on the persons who lived, loved, worked, ailed, and died not unlike those of us living today. It is our hope that meeting "the emissary" will facilitate empathy for people in distant times and places. He is a potent reminder that we all—whether in the past or present, near or far—share a common humanity.

This first public exhibition of 12-10156's facial reconstruction is planned for fall 2013, in the University Library Art Gallery at Sonoma State University. By this time we hope to have completed another facial reconstruction from the Cornwall collection. We anticipate that this will be the first of several showings, beginning at each of our home institutions and traveling elsewhere in California and, perhaps, beyond. Displaying this teenage boy's face at venues where he will be encountered by people not much older than him is strategic. In a world that is both highly networked and increasingly insular, many college students in their late teens and early twenties have little firsthand experience with people from other countries and little sense of human history. A face-to-face encounter with the teenage boy will help demystify faraway places and narrow the four thousand years that separate their lives, allowing a student to see just another person not so different from herself.





Figures 13a (above) and b (left). Completed 2D reconstruction of the teenage boy, 12-10156. A: Frontal view. B: Profile view.

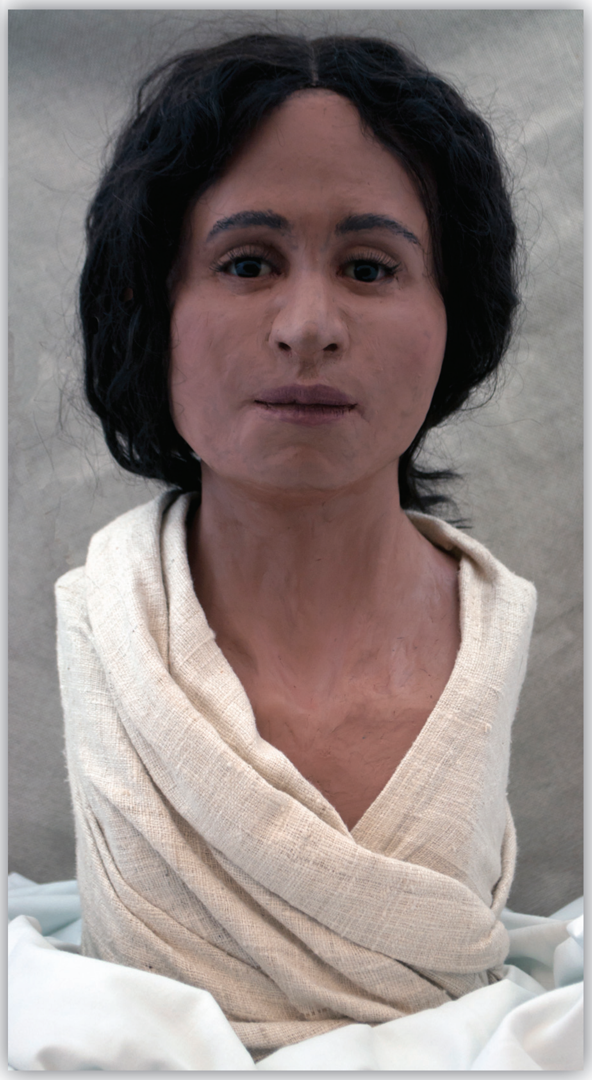


Figure 14. Completed 3D reconstruction of the teenage boy, 12-10156. Note differences from 2D depiction.

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Note

1. For example, a lexical list from Old Babylonian Nippur called the Uguma tablet lists different body parts and styles. See http://oracc.museum.upenn.edu/cgibin/oracc?prod=list&project=dcclt&seq=period,corpus,designation&perpage=25&k0=_all&zoom=1&zoomforce=1&page=1&item=22&trans=en.

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