Improved Identification of Portraiture of the Julio-Claudian Period with Mobile Apps

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Abstract. *We present the results of our image analysis of portrait art from the Roman Empire's Julio-Claudian dynastic period. Our novel approach involves processing pictures of ancient statues, cameos, altar friezes, bas-reliefs, frescoes, and coins using modern mobile apps, such as Reface and FaceApp, to improve identification of the historical subjects depicted. In particular, we have discovered that the Reface app has limited, but useful capability to restore the approximate appearance of damaged noses of the statues. We confirm many traditional identifications, propose a few identification corrections for items located in museums and private collections around the world, and discuss the advantages and limitations of our approach. For example, Reface may make aquiline noses appear wider or shorter than they should be. This deficiency can be partially corrected if multiple views are available. We demonstrate that our approach can be extended to analyze portraiture from other cultures and historical periods. The article is intended for a broad section of the readers interested in how the modern AI-based solutions for mobile imaging merge with humanities to help improve our understanding of the modern civilization's ancient past and increase appreciation of our diverse cultural heritage.* © 2021 Society for Imaging Science and Technology.
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1. INTRODUCTION

The Julio-Claudian dynasty was founded by the famous Roman dictator Gaius Julius Caesar (c. 12–13 Jul 102 BC–15 Mar 44 BC) and ruled the Roman Empire for almost 97 years, counting from the date of Mark Antony's suicide (1 Aug 30 BC) until Nero's suicide (9 Jun 68 AD). The five Roman emperors that belonged to the Julio-Claudian dynasty were Augustus, Tiberius, Gaius (Caligula), Claudius, and Nero. The main title of those rulers was *princeps civitatis* ("First Citizen"), and each of them also served as *pontifex maximus* (the High Priest). The latter position was held by the dynasty's founder since the election of 63 BC and until his death at the hands of the conspirators. Marcus Aemilius Lepidus was then selected to fill the vacancy. Despite falling out of favor with Augustus due to a failed attempt to seize power in 36 BC, he retained the title until his death, believed to be a natural one, circa late 13 or early 12 BC, at which point the princeps took over as *pontifex maximus*.

The rich and diverse art of the Julio-Claudian dynastic period comprises numerous artifacts stored in museums and private collections of the world. These artifacts include statues, cameos and other carved jewelry, altar friezes, bas-reliefs, wall paintings, and minted coins. In this paper, we will primarily study the ancient art objects that contain portraits of the members of the imperial family, along with portraits of other people who lived during that time period. In the next section of the article, we will provide an essential literature review, list the limiting factors that tend to interfere with successful identification, and describe some of the historically important art objects, the images of which have served us as input for processing and analysis. By doing so, we establish the necessary background.

Our main objective is to confirm the existing identifications of the subjects portrayed, resolve some of the uncertainties, and occasionally propose corrections or alternative identifications based upon our image analysis using modern mobile apps, along with other significant evidence, such as the results of comparative analysis of hairstyles. The objectives of our study will be elucidated in the third section of the paper.

The fourth section of our work will describe the tools and technology used. In particular, we will discuss and illustrate the capabilities and limitations of mobile apps for image and video processing such as Reface, FaceApp, Adobe Photoshop Mix, and GIF Maker-Editor.

Our novel approach that involves making *multi-source art-based facial composites* to improve identification of the historical subjects portrayed will be presented in the fifth section, devoted to outlining the methodology and experimental design. We will utilize a combination of relevant features found in several mobile apps, along with some extra functionality provided by PC software, such as IrfanView.

The sixth section is devoted to the technique and criteria for choosing head models for the facial composites.

The seventh and largest section of the article will present and illustrate the results of our study, complete with the arguments and assessment of the degrees of certainty of the confirmed and newly proposed identifications of the people featured in Julio-Claudian portraits. We will summarize our conclusions in the eighth section of the paper. Finally, we will discuss our plans for the future work and demonstrate that our approach can be extended to analyze portraiture from other cultures and historical periods.

2. BACKGROUND

Our research has been primarily inspired by the publications by Professor John Pollini on the image of Gaius (Caligula) [1, 2] and about the people of the Julio-Claudian period featured on the Ara Pacis Augustae, the Altar of Peace constructed in Rome on the order of the Senate in the time of Augustus [3], and by the late Professor Charles S. Rhyne's magnificent website entitled *Ara Pacis Augustae* [4]. More information on who is who on the Ara Pacis can be found in the works by Holloway [5], Curchin [6], and Sande [7]. The website [4] provides an extensive online bibliography listing more than 460 relevant titles.

Traditional identifications of many Augustan and Caligula portraits can be found in the authoritative catalog in German produced by Boschung [8, 9], complete with the necessary descriptions, illustrations, and detailed image analysis. We would like to emphasize that our approach is different from the photorealistic reconstructions of likenesses, such as those by Voshart [10], in that our multi-source art-based facial composites are made primarily to facilitate better identification of the art objects, and any possible likeness is incidental to that. Varner [11] penned an illuminating article about several sculptural portraits of Caligula that are believed to have been re-carved to resemble Claudius.

Evolution of the image of Nero on his coinage is well-documented by Hiesinger [12] and Heckster et al. [13]. Interesting analysis of the biometric properties of images found on ancient Roman coins was published by Sparavigna [14].

We will intentionally keep all instances of our presentation of the relevant historical facts and opinions as concise as possible. The readers interested in the details of the genesis and history of the Julio-Claudian dynasty are referred to the classical works by Tacitus [15], Cassius Dio [16], Suetonius [17], Plutarch [18], Appian [19], Julius Caesar [20], Cicero [21], Augustus [22], and Nicolaus of Damascus [23], along with such modern studies as those found in a collection edited by Smith and Powell [24] on the lost detailed autobiography of Augustus. For example, the latter source tells us that the story of Augustus divorcing his wife Scribonia, marrying Livia, and registering Livia's newborn child Drusus Major (also known as Drusus the Elder) as the son of her former husband is based on that lost long autobiography. This is important to us, given that the preserved short autobiography of Augustus [22] is known to contain some blatant lies, propaganda, and significant omissions, to the extent that Marcus Aemilius Lepidus is not mentioned by name there. Unsurprisingly, Drusus Major was rumored to be a biological son of Augustus, and this is of interest to us from the standpoint of whether Drusus Major resembled Augustus enough for his appearance to give credence to the rumor. For brevity, we will consistently use the Latin designations Major and Minor instead of "the Elder" and "the Younger", respectively, throughout the rest of the paper.

Our selection of ancient art objects for analysis has been greatly influenced by the following nine important factors that made the task of identification of the human subjects portrayed by the sculptors, artists, and artisans of the Julio-Claudian era very complex. First of all, with the notable exception of coins, Roman portraits usually lack inscriptions on them or in adjacent locations that would help identify the people depicted, while the coins only show people's profiles and are subject to counterfeiting. Secondly, provincial sculptors were usually better at replicating the hairstyles of the imperial family members than their characteristic facial features, so we will have to rely upon the images found in or near Rome or the popular vacation spots of the Roman elite more than on those discovered in the former remote provinces of the Empire, even though some of the provincial portraits may have been good quality copies. In many cases, the traditional hairstyle analysis will have to take precedence over the study of facial features. Thirdly, sometimes different family members wore the same popular hairstyle, such as the famous Livia's *nodus*, or knot, also worn by Julia Major (the only daughter of Augustus by Scribonia) and Octavia Minor (believed to be a sister of Augustus), so we will still have to pay close attention to the facial features. Fourthly, the hairstyles of the same person occasionally evolved or changed over the person's lifetime, Julius Caesar's receding hairline being a prime example. The fifth factor in play is that the people's facial features evolved with time as well, Nero presenting the most glaringly obvious example of that. The sixth significant issue for us to deal with is that the faces seen in the portraits of the imperial family members often exhibit considerable similarity to each other, in part due to the family ties compounded by inbreeding, and in part due to the desire to demonstrate legitimacy of an adopted heir by having him look more like the princeps who adopted him. Our seventh problem is that the portraits in altar friezes, cameos, and bas-reliefs have reduced depth. The eighth negative factor is, the paint that used to cover busts and statues is nearly or completely gone, so the researchers have been analyzing the remaining pigments to colorize physical replicas or digital models of the ancient works of art [1]. Such colorized copies or digital models may serve as *single-source art-based facial composites*. Last but not least, many ancient portraits withstood other kinds of visible damage, the most common ones being broken noses of statues and signs of wear on coins, e.g., discoloration of the high points and flattening of high areas of the coin relief. A head of Caligula that is currently exhibited in Yale shows visible signs of damage by plant roots from being once buried underground for a prolonged period of time near Ponte Milvio, a bridge over the Tiber in Rome [11].

Thankfully, researchers have been taking advantage of availability of group portraits, such as those found in altar friezes, cameos, and some coins. In the course of our research, we have formed an opinion that some of the distinctive facial features of the imperial family members may have been intentionally exaggerated in some of the cameos, in a manner similar to the modern comics and

Figure 1. Altar of Lares Augusti dedicated by the magistrates of Vicus Sandaliarum, Uffizi Gallery © 2018 Egisto Sani.

caricatures, presumably to help the viewers recognize the people portrayed. The same is well known to be the case with respect to many portraits found on ancient coins. Although, we don't count this as a negative factor, it will have to be taken into account when making facial composites from images of cameos and coins.

The first of the Julio-Claudian collective portraits that we will employ in our analysis is a group of three people on the Altar of Lares on display in the Uffizi Gallery in Florence, Italy. Its photo from Sani [25] is shown in Figure 1.

The importance of this scene has to do with the inscriptions that indicate that this altar was dedicated by the magistrates of Vicus Sandaliarum ("the village of sandal-makers") during the consulate of Augustus (for the 13th time) and Marcus Plautius Silvanus, i.e., in January–June of 2 BC, according to the list of Roman consuls [26]. Here, from left to right, we see the young and handsome Gaius Caesar (20 BC–21 Feb 4 AD), who was then the designated heir of Augustus; the visibly older (!) Augustus acting in his capacity of *pontifex maximus*; a woman, who is either Livia (the wife of Augustus), or Julia Major (the mother of Gaius Caesar) feeding a sacred chicken to perform augury. We will be discussing the identification of this woman in later sections. For now, it is worth noting that Julia Major was exiled from Rome some time in 2 BC. Gaius Caesar can be readily recognized by a split lock (pincer) on the right side of

his head. The features of the old Augustus are reminiscent of his adoptive father, Gaius Julius Caesar. It is commonly said that Augustus was depicted youthful at all ages, yet here we see an exception to that. Marcus Aemilius Lepidus could not possibly be part of this scene, because he'd been dead for 10 years by that time. (This obvious fact will prove important later.)

The second group portrait is a long altar frieze that shows members of the Julio-Claudian imperial family in a procession located on the original south side of the Ara Pacis (it is now facing the east). Pollini [27] was the first to identify this procession as a representation of the ceremony of *inauguratio* of the place upon which the Altar of Peace was to be erected. The procession is shown in Figure 2 that we have copied from [4] and cropped to select the region of interest. We will illustrate and discuss a few detailed views in later sections.

Augustus, who is heading the procession, is shown on the left of the fragment seen in Fig. 2. Curchin [6] states that Augustus is followed by the two consuls (see Figure 3 for a detailed view of this part of the procession). However, if we take into consideration that the Altar of Peace was commissioned by the Senate on 4 Jul 13 BC and consecrated on 30 Jan 9 BC, there are three more facts to take into account. Firstly, Tiberius, who was consul in 13 BC, is seen elsewhere in the procession, as we have easily confirmed. Secondly, Pollini [3] has suggested that the second consul of 13 BC, Publius Quinctilius Varus, is the person following Tiberius (the person's head was not preserved), and that we are looking at the the ceremony that took place 4 Jul 13 BC. Thirdly, Marcus Vipsanius Agrippa, a loyal lieutenant and son-in-law of Augustus, whom we will re-identify and confirm his presence at the ceremony, fell ill and died in early March of 12 BC in Campania after a brief successful campaign in Pannonia that began in winter of that same year. It is conceivable that two out of three people immediately following Augustus were the consul-elects for 12 BC, namely, Marcus Valerius Messala Appianus, who died in office on Mar 6 12 BC, and Publius Sulpicius Quirinius, who was replaced as consul after Aug 29. We consider this identification uncertain. For the future discourse, the one of

Figure 2. Ara Pacis Procession, the original south side, collage by Tony Moreno (fragment) © 2011 Reed College and C. S. Rhyne.

Figure 5. Grand Camée de France, c. 23-26 AD, Cabinet des Médailles, Bibliothèque nationale de France, Paris © 2008 Marie-Lan Nguyen / Wikimedia Commons.

Figure 6. Augustus, Livia, and young Nero, 1st century AD © 1998–2014 The State Hermitage Museum, St. Petersburg, Russia.

is believed to have been purchased by Louis IX the Saint of France in Constantinople c. 1247 AD. The composition features 24 figures of people and deities (5 human figures in the top row, 9 in the middle row, and 10 in the bottom row), along with Pegasus (a mythical winged horse), and two human heads placed on two out of three shields that belong to those depicted in the bottom row.

The non-controversial identifications of the subjects portrayed in the *Grand Camée* are as follows. The sitting male figure in the center of the middle row represents Tiberius with the symbols of power of the princeps. The man in the middle of the top row is Divus Augustus, the late adoptive father of Tiberius. In the left top corner of the cameo, we see Drusus Minor (7 Oct 13 BC–14 Sep 23 AD), the late son of Tiberius, who was one of his two heirs. He is easily recognized by his remarkable nose, the largest in the family. In the right top corner, Germanicus (24 May 15 BC–10 Oct 19 AD) is seen riding Pegasus. The goddess flying while holding a disk in the top row is *Venus Genetrix*, with *Cupid* to her right. Given that her hairstyle appears to be similar to the Hellenic hairstyle of Cleopatra VII, whose gilded bronze statue Gaius Julius Caesar once had placed in the Temple of *Venus Genetrix* dedicated by him 26 Sep 46 BC, we will compare the goddess's features against the known portraits of Cleopatra VII. The boy on the left-hand side of the middle row is definitely Gaius (Caligula), identified by his custom child-size military uniform [1]. The nickname "Caligula", by which Gaius is popularly known, literally means "small military boot". Finally, the woman sitting by the left hand of Tiberius (to the right of him on the cameo) is his elderly

mother Livia Drusilla (d. 28 Sep 29 AD), her red hair presumably dyed with henna. The identifications of Drusus Minor and Livia frame the date of the cameo between late 23 AD and September of 29 AD. Tiberius left Rome in 26 AD to never return, and that historical fact narrows down the date to a timespan between late 23 AD and 26 AD.

Figure 6 shows the fifth art object of interest, a cameo that came to The Hermitage from the collection of Prince Nikolai Yusupov in 1917, when that private collection was confiscated by the Bolsheviks. The cameo is labeled "Augustus, Livia, and young Nero."

The cameo features Augustus (left), the redhead boy Nero Julius Caesar Germanici f. (top) identified by the complex hairstyle typical of the three sons of Germanicus, and either Livia, or Agrippina Major of the type with a rounded profile (right). It should be noted that emperor Nero (born Lucius Domitius Ahenobarbus and named Nero by his adoptive father Claudius) is not known to have worn this distinctive hairstyle, which will be analyzed later. Throughout the rest of the paper, we will refer to Nero Julius Caesar Germanici f. as *Nero Julius Caesar* and call his emperor namesake simply *Nero*, for the sake of brevity. St. Augustine of Hippo [30] in the 5th century AD retells the *Nero Redidivus* legend that was popular in the 1st century AD. According to that legend, Nero would return and be restored to his kingdom *(Aug. XX, 19, 3)*. Some early Christians took Nero to be the Antichrist. We will abbreviate Drusus Julius Caesar Germanici f. as *Drusus III* to reflect that he followed in the footsteps of Drusus Major and Drusus Minor. The cameo should be most likely dated either shortly before the death of Augustus (he died 19 Aug 14 AD), when young Nero Julius Caesar was his contemporary, or between the deaths of Germanicus and Drusus Minor, i.e., 19–23 AD, before Drusus III was called to step in as the second co-heir to the throne of Tiberius. The former timespan should be considered in the context of the efforts by Augustus to encourage the Roman citizens to have more children. The latter possibility may have to

Figure 7. Gaius Caesar and Lucius Caesar, or Nero and Britannicus; Sebasteion of Aphrodisias, Turkey © 2018 The Ancient World Podcast.

do with Drusus Minor's nickname being "Castor", the name of the mortal one (in some mythical versions) of the two Dioscuri brothers, so Nero Julius Caesar had to be positioned to take over from Germanicus as "Pollux", the immortal one (in all versions where one of both Dioscuri are immortal). Immortality of Pollux (Greek *Polydeuces*) was attributed to him being a son of Jupiter (*Zeus*), and statues of Augustus depicted as Jupiter are known. Castor was a mortal king's son. Furthermore, Suetonius reports that Caligula "even boasted that his own mother [Agrippina Major] was born in incest, which Augustus had committed with his daughter Julia" (*Suet. Calig. 23, 1*). Even though we do not believe this version, its very existence and the peculiar composition of the cameo from The Hermitage make us consider the possibility of incest between Augustus and Agrippina Major, his granddaughter.

Finally, we would like to introduce a dual sculptural portrait illustrated in Figure 7. The image was cropped by the author to keep only the top portion of the monument needed for fair use (identification). A difference of opinions exists as to whether the dual portrait shows, left to right, Gaius Caesar and his brother Lucius Caesar (17 BC–20 Aug 2 AD), or Nero and Britannicus (12 Feb 41 AD–11 Feb 55 AD), the ill-fated son of Claudius and Valeria Messalina.

In the next section of the article, we lay out the detailed objectives of our study.

3. OBJECTIVES

As we have already indicated in the introduction, the primary objective of our study is to confirm many of the established identifications of Julio-Claudian portraiture, resolve some of the uncertainties, and occasionally propose corrections or alternative identifications. While working toward that main objective, we perform our image analysis using modern mobile apps. Single-source and multi-source art-based facial composites will be generated and modified for the purpose of comparison of characteristic facial features of the subjects portrayed. In addition to that, we will perform the necessary traditional comparative analysis of hairstyles.

To partially address the challenge posed by lack of inscriptions, we will produce facial composites using identifiable portraits found on ancient coins. We will focus more heavily on the portraits found in or near Rome or the popular vacation spots of the Roman elite, such as Tusculum and Pompeii, to limit the noise factor due to poor quality

provincial portraiture. In order to identify subjects with more accuracy, we will decipher the inner logic behind the structure and composition of the ancient group portraits. In our analysis, we take advantage of the information provided by the historical sources.

To overcome the damage to sculptural portraits, we will employ our technology's limited capability to restore broken noses. Some of the technology's limitations will be partially remedied by making *multi-view art-based facial composites* from multiple images of the same object taken at different viewing angles and/or under different lighting conditions. A review of the tools and technology used in the study is the subject of the next section of our paper.

4. TOOLS AND TECHNOLOGY

Most of the image processing tools used for this study are mobile apps for Android—Reface, FaceApp, Adobe Photoshop Mix, GIF Maker-Editor, and NiceEyes. The latter tool helps correct eye color, and was only needed in two cases when the eye color of a person was known from historical sources. Firstly, Suetonius conveys to us that Gaius Julius Caesar "is said to have been tall of stature with a fair complexion, shapely limbs, a somewhat full face, and keen black eyes" *(Suet. Jul. 45)*. Secondly, Pliny the Elder [31] stated that the eyes of Augustus were *glauci (Plin. Hist. 11.143)*, which most likely means a light sea-gray color, according to Pollini [1].

The Reface app for Android currently available from Play Store presents itself as a toy editor that instructs the user to take a selfie while looking straight into the camera, then load the selfie into the custom gallery of faces and let the app detect the face, extract the user's distinct facial features and substitute them for faces of other people located in videos, photographs, and artworks in the app's extensive database that the user is allowed to search and select from. Conveniently for us, other images can be loaded to let the app's face detection module find images of human faces in them. We have tested the Reface app as a black box and discovered that it is capable of detecting and using people's profiles and their portraits captured at other viewing angles. Figure 8 illustrates extraction of facial features of Livia from her *Grand Camée* profile and a recently restored statue from Pompeii's Villa dei Misteri photographed at an intermediate viewing angle. Throughout the rest of the article, we will call the images produced using the Reface app *refaces* of the corresponding original portraits. Livia's hair in the refaces was "dyed" red using FaceApp, which has proven itself useful as a pre-processing and post-processing tool.

The immediate observations regarding the single-source art-based facial composite in Fig. 8(c) are that Livia's features in the cameo appear exaggerated as compared to the sculptural head from Pompeii, and that Livia's long nose was made too broad. It is also possible that the sculptor flattered Livia somewhat to make her look glamorous, but her long narrow beak-like nose is recognizable in other sculptures, such as the famous Livia from The Louvre once mistaken for Octavia Minor. Livia's lips and eyebrows are

a) Livia from the Grand Camée

b) Livia from Villa dei Misteri © 2008 Roger B. Ulrich
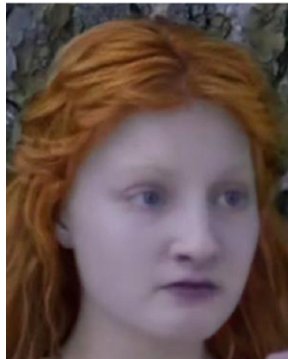
c) Reface of Livia from the Grand Camée
(head model: Margot Robbie as Jane in "The Legend of Tarzan", 2016)

d) Reface of Livia from Villa dei Misteri

Figure 8. Livia from the Grand Camée and Villa dei Misteri: originals (a, b) and refaces (c, d).

understandably under-emphasized in Fig. 8(d). The two main good properties of Julio-Claudian images that help make better refaces of them are, no makeup and no smiles.

In addition to the feature that let us set Livia's hair color, FaceApp provides additional relevant functions such as shaving, hairstyles, multiple options for age regression, makeup, gender change, addition and removal of eyeglasses, etc. Why would we need them? It turns out, the viewing angle is not the only factor that can influence the output of Reface. Lighting plays a major role as well, as we will illustrate below by working with two images of the woman from the Altar of Lares (Livia or Julia Major) as shown in Figure 9. The front view was mistaken for a portrait of a male, even though the profile was not. In some cases, a shadow under the nose is taken to represent a moustache.

Once the mistakes of Reface are rectified using FaceApp—spurious moustaches and eyeglasses removed, gender and age adjusted, etc.—Adobe Photoshop Mix lets us create multi-view art-based facial composites like those shown in Figure 10. Given the known date of the Altar of Lares, Fig. 10 would be our most reliable facial composite of Livia, if we could rule out Julia Major.

We have used the GIF Maker-Editor app to convert GIFs to videos for subsequent taking of screenshots in the X-plore

Video video player app. A RED Hydrogen One smartphone has been our workhorse for this research.

Through experimentation, we have discovered that Reface has the limited capability to restore broken noses of statues. To demonstrate this, let's consider Figure 11 that shows three photographs of the head of the famous Esquiline Venus statue on display in Rome's Musei Capitolini. They were sourced from the Italian Ways website [32] and cropped.

It is evident that the statue's nose was damaged and apparently sharpened afterwards in an attempt to improve appearance. Figure 12 shows the refaces of the three views.

While the refaces of the front view and the intermediate angle view largely preserve the ugly "plastic surgery", the reface of the profile fixes the nose best, in our opinion. Our explanation as to why the Reface app can restore broken noses is that its neural network is likely to have been trained on a large dataset of images of faces with intact noses.

The hair color was set to brown to match the hair color in some of the portraits identified as Cleopatra VII, because it has been posited by Bernard Andreae et al. [33] that the Esquiline Venus was a copy of the aforementioned lost statue of Cleopatra VII as Goddess Isis from the Temple of *Venus Genetrix*. It can be discerned that the head model's face is wider than the face of the original. We have used the same

a) The front view

b) The profile view

c) Reface from the front view

d) Reface from the profile view

Figure 9. Woman from the Altar of Lares (Livia or Julia Major): two original views (a, b) and two refaces (c, d).

Figure 10. Multi-view art-based facial composites of the woman from the Altar of Lares (Livia or Julia Major)–old (left) and young (FaceApp's ''Young 3'', right).

head model as before to emphasize the observed similarity to Livia in Fig. 8(d), whose face grew wider as she aged.

In addition to the mobile apps, we have used Windows-based IrfanView and Paint for several pre-processing and post-processing tasks. We provide more details about those tasks and elucidate them in the next section of our article, where we explain our methodology and experimental design, including the workflow.

5. METHODOLOGY AND EXPERIMENTAL DESIGN

A *fixed point*, or *invariant point* of a function f is its input x (an element of the function's domain) such that the function's output

$$f(x) = x. \tag{1}$$

In other words, x is mapped to itself by the function f. Let's denote a video (or still image) produced by applying the Reface app to a portrait image $p(s)$ of a subject s and a video (or still image) $v(h)$ of a head model h as

$$v'_{s,h} = R(p(s), v(h)), \tag{2}$$

where R is the *reface function*. Then a perfect reface function would have to possess a *stable fixed-point property* expressed by the formula

$$v'_{h,h} = v(h) \quad \text{for all } h. \tag{3}$$

Figure 11. The Esquiline Venus © 2017 Musei in Comune.

Figure 12. Three refaces of the Esquiline Venus.

With that desired property in place—hypothetically, of course—we would expect substitution of the facial features of any human subject h extracted from any portrait image $p(h)$ for those same features contained in a video (or still image) $v(h)$ to produce an output leaving $v(h)$ unchanged. We performed limited black-box testing of the Reface app's fixed-point behavior by using images of several well-known actors and actresses to reface video sequences from movies with their participation. The results have confirmed our intuitive expectation that we should be selecting head models with head shapes and facial features as close as possible to those of our subjects at the first stage of our process in order to produce realistic facial composites. We have also discovered, with the Statue of Liberty as our subject s, that the Reface app tends to introduce a bump in long, straight noses at angles close to the profile view, making such noses appear crooked at those angles. Furthermore, long, beak-like noses of the Julio-Claudian type tend to be shortened by Reface whenever $p(s)$ is close to being a front view. More details on the art of head model selection will be provided in the next section of the paper.

In light of our findings, we have developed and implemented the workflow for making multi-view and/or multi-source art-based facial composites illustrated in Figure 13. We have skipped the trivial steps of GIF-to-video conversion (performed as needed) and image cropping.

The only stage of the workflow that still needs clarification is the optional pre-processing step that may be necessary to help the Reface app detect the face and load it into the face gallery. We present three examples of such necessary pre-processing.

The wall painting from the house of Marcus Fabius Rufus in Pompeii identified as Cleopatra VII and her son Caesarion by Roller [34] required significant pre-processing of the Wikimedia Commons image [35] to restore Cleopatra's lips and chin well enough for Reface to handle her portrait correctly. The cropped original, the pre-processed image, and the post-processed reface are shown in Figure 14.

We can observe the artifacts above the eyebrows triggered by the remaining unfiltered noise, but the identification of Cleopatra VII is not in doubt here. The portraiture of Cleopatra VII and Livia is diverse, and Livia is considered younger than Cleopatra VII by just 8 years. Suetonius conveys to us that Mark Antony left a will "naming his children by Cleopatra among his heirs" and Augustus "spared the rest of the offsprings of Antony and Cleopatra, and afterwards maintained and reared them according to their several positions, as carefully as if they were his own kin." *(Suet. Aug. 17.)* One of those three children pardoned
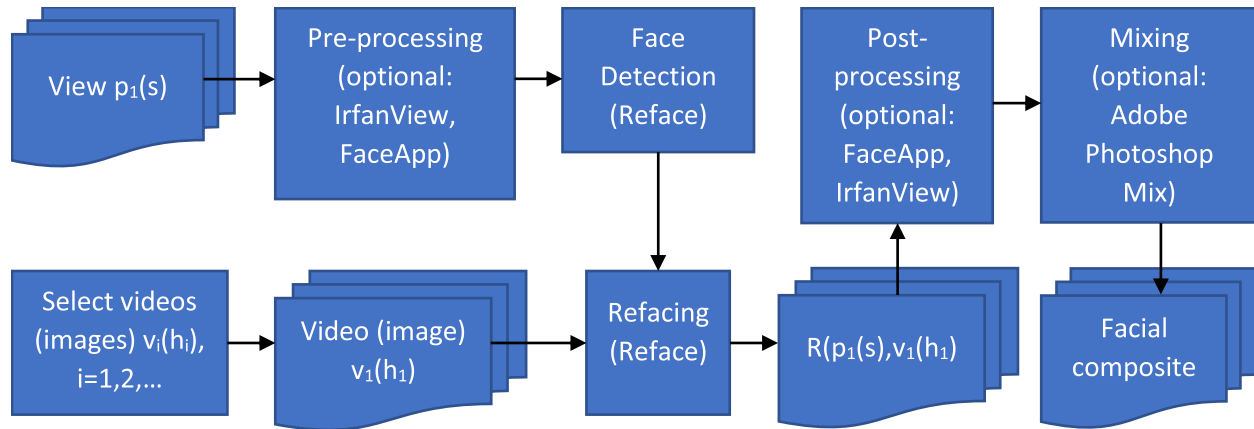
Figure 13. Workflow for making multi-view and/or multi-source art-based facial components.

Figure 14. Cleopatra VII from Pompeii: The cropped public domain original, the pre-processed version, and the post-processed reface.

by Augustus, Cleopatra Selene II, married King Juba II of Mauretania in 25 BC, according to Roller [36], and had a son known as Ptolemy of Mauretania. The destiny of the other two children of Antony and Cleopatra VII—Alexander Helios and Ptolemy Philadelphus II—is unknown, other than that they "were taken up by Octavia and reared with her own children." *(Plut. Ant. 87.)* Suetonius tells us that "after introducing his son Drusus [Minor] to public life, he [Tiberius] at once moved from the Carinae and the house of the Pompeys to the gardens of Maecenas on the Esquiline" *(Suet. Tib. 15).* According to Witherstine [37], the house of Pompey on the Carinae became property of Antony after Pompey's death. Given that Mark Antony had abandoned his wife Octavia Minor for Cleopatra VII, it should be understood that, by the Roman law in force in the 1st century BC, children born out of wedlock to a Roman citizen father and a foreign mother were not considered Roman citizens and had no right to hold official positions. The opposite was the case with respect to the out-of-wedlock children of a foreign father and a Roman citizen mother, prior to a legislative change enacted in the 1st century AD to deprive those latter children of their Roman citizenship.

These circumstances will influence our subsequent treatment of the composition of the Ara Pacis Procession.

Various pre-processing methods are often needed to feed profiles from coins to the Reface app's face detection module successfully. It is illustrated in Figure 15 that shows our second example, a pre-processed image of a Cretan coin featuring Claudius and Valeria Messalina, to the right of the original found at CNG Coins [38]. The color of the original image was modified and many details that would otherwise interfere with face detection were blurred.

The immediate purpose of the exercise here was to compare the image of Messalina from the coin to that of Messalina from The Louvre as shown in Figure 16, complete with two refaces (one from the sculptural portrait and one from the coin from Fig. 15) and the average facial composite. In his Satire VI, Juvenal [39] mentioned that Messalina's hair color was black, but that she would don a blond wig to sneak out of the palace *(Juv. Sat. 6.120).* The head model is Kylie Jenner. No attempt was made to make Messalina's upper lip fuller, like we did in the previous example. Our next goal was to identify a credible Britannicus by similarity to

Figure 15. Cretan coin of Claudius and Valeria Messalina: the original image (left) and the pre-processed image (right).

Figure 16. Messalina from The Louvre © Christoph Houbrechts Vanhoorne; reface from The Louvre portrait; reface from Fig. 15; Messalina's facial composite.

Figure 17. A reface of Visualforensic's Mary Magdalene reconstruction (left) and a Messalina-Magdalene mix (right).

his parents Claudius and Messalina, and then compare him against Lucius Caesar or Britannicus from Fig. 7.

Meanwhile, we made a reface of a digital reconstruction of Mary Magdalene produced from photogrammetry data of the skull contained in the relic from Saint-Maximin-La-Sainte-Baume, France, by the Visualforensic project [40] and a Messalina-Magdalene mix presented in Figure 17. The authors of the Mary Magdalene reconstruction presumed her a brunette and equipped her with full lips for good measure. This exercise demonstrates the entertaining possibility of doppelgänger contemporaries with similarly controversial reputations and matching holes in their biographies. From the methodology standpoint, it is clear that we should strive to avoid creating multi-source art-based facial composites from portraits of two or more different subjects, and that's why the first view in Fig. 13 is labeled $p_1(s)$ and not $p_1(s_1)$.

The third example of pre-processing is a nifty technique that allowed us to quickly extract faces of women partially obscured by the images of their husbands in the cameos. We will illustrate the process using an image of the famous Gonzaga Cameo from The Hermitage. We have achieved successful face detection by attaching the front of the blond woman's profile to the back of her husband's head. The head model for the reface is Lena Headey as Cersei Lannister in "Game of Thrones". We will discuss the problem of identification of the two people in the Gonzaga Cameo in Section 7. The same little trick helped us extract Agrippina Major and Agrippina Minor from Gemma Claudia shown in Fig. 4.

Clearly, a major advantage of our novel approach is that it lets us generate facial composites quickly, even for several head models.

Another significant advantage is that, in addition to allowing us to conveniently mix the refaces, our approach makes it possible to apply traditional difference methods of pattern recognition that require exact alignment of the images under comparison, as explained in Pratt's monograph [41].

One disadvantage especially important when applying our technique to identification of Julio-Claudian portraits is that the subjects' hairstyles and some other features, such as forehead wrinkles and furrows, do not carry over from a portrait to its reface. Hairstyle analysis will have to be performed separately, and we will provide examples of such analyses in the next two sections of our article.

6. HEAD MODEL SELECTION

As we have pointed out in the previous section, head models for facial composites should be chosen so as to achieve good matches with respect to both head shapes and facial features. While the task of selecting head models has not been

Figure 18. The Gonzaga Cameo © 1998–2014 The State Hermitage Museum, St. Petersburg, Russia (left); the pre-processed image (middle); the reface (right).

automated and, as such, remains somewhat of an art, we will outline our experimental approach to head model selection and present criteria and recommendations grounded in experience. They will be illustrated by two examples. The first example will involve a female sculptural portrait and a female head model. The second example will utilize three male sculptural portraits (two of them sporting beards), a copy of one of the three portraits, and two different head models. It will form the bulk of the basis for our first identification to be made in the next section of the article.

6.1 Criteria and Recommendations
Given that the facial features of the head model are about to be replaced by the Reface app, it is important to concentrate on matching the overall shape and proportions of the head first and foremost, while paying special attention to the face shape, e.g., oval, round, square, diamond, heart, pear, or oblong. We prefer a photograph or screenshot taken at an intermediate angle, without makeup or smile, with the mouth closed. Other important initial considerations are the head model's gender, age, race, the size and type of the chin (e.g., square, round, protruding, receding, long, short and narrow) and the size and type of the forehead (for example, small, broad and sloped). Beards and moustaches are undesirable, unless the face models have similar ones. The head should not be covered, and the hair should not obscure the face too much.

The secondary considerations involve facial features. The first important parameter to consider here is the size and shape of the model's nose. We have observed that the nose in the reface is likely to end up too short if the head model's nose is short. Likewise, the nose in the reface is likely to appear too long at angles close to the profile if the head model's nose is long. It's good to have a video of the head model available, in which the head can be viewed at different angles, for example, if the head is being slowly turned by the model, or the camera is slowly changing its viewing angle and moving around the head. We may reface the whole video and then capture a

screenshot or two. The second criterion pertinent to the facial features is the shape of the model's lips, followed closely by the vertical distance between the nose and the mouth. It is then desirable to match the distance between the eyes and how deeply the eyes are set. Lighting should not flatten the facial features.

6.2 Example 1: Cleopatra VII from Berlin and a Modern Head Model
The Altes Museum in Berlin, Germany, is in possession of a famous bust of Cleopatra VII that was discovered in a Roman villa along the Via Appia. With permission from Ms. Alina Li, we use her recent photograph here to illustrate successful head model selection, along with the necessary pre-processing and post-processing, in Figure 19.

6.3 Example 2: "Marcus Aemilius Lepidus" and Gaius Caesar
Vatican's Chiaramonti Museum is holding a Roman marble bust conventionally identified as "Marcus Aemilius Lepidus." A plaster cast copy of that same "Marcus Aemilius Lepidus" from Tsvetaev's collection is on display in The Pushkin State Museum of Fine Arts (Moscow, Russia). Meanwhile, The History Blog [42] tells us the story of a rare bust of Gaius Caesar with a beard, identified as belonging to one of the five types of Gaius Caesar thanks to a monograph by Pollini [43]. We have compared the "Marcus Aemilius Lepidus" and its Moscow copy to the Gaius Caesar with a beard and the reference Gaius Caesar from the Altar of Lares. Figure 20 illustrates the sculptural portraits involved in the comparison.

In Fig. 20(b), it is easier to discern the "trademark" Gaius Caesar split lock on the right side of the head. It just happens to be partially covered by another lock above it.

In order to investigate similarity of the subjects' facial features, we have produced refaces of the sculptural portraits using two different head models. Figure 21 features the refaces with Patrick Swayze as head model.
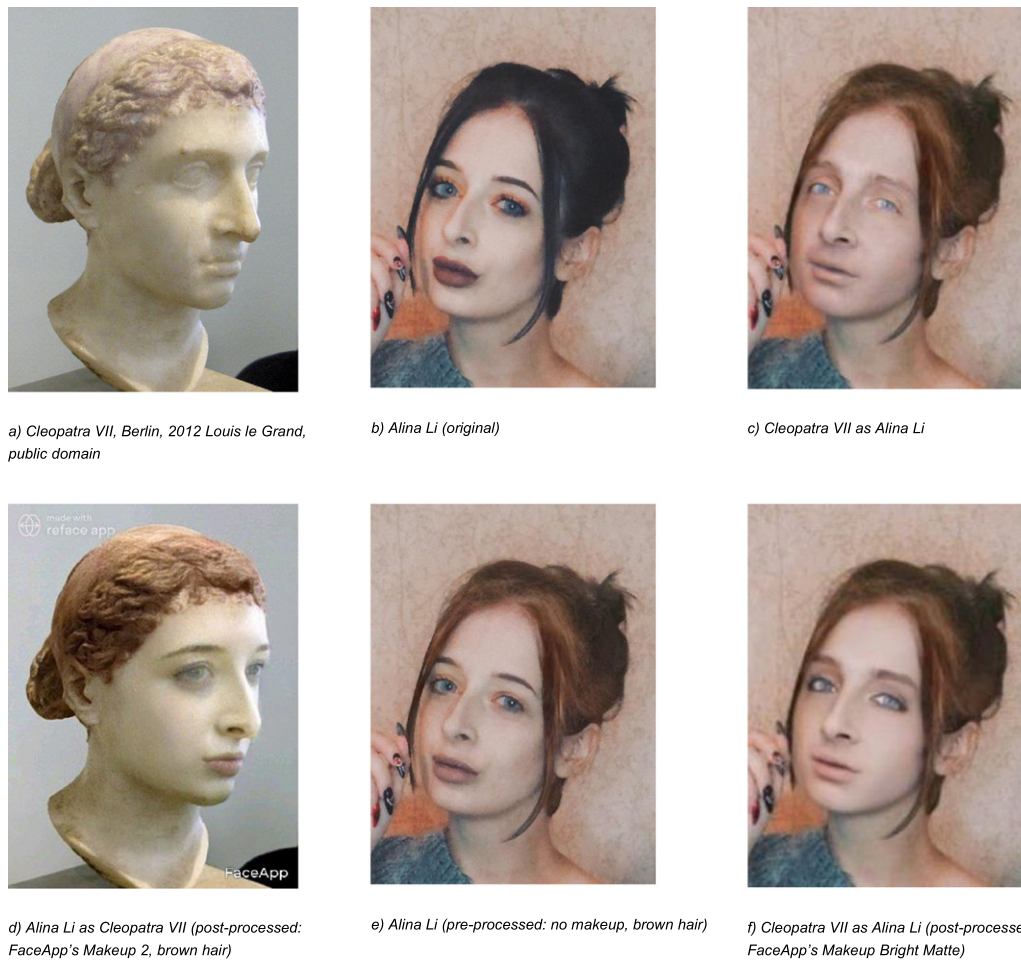
a) Cleopatra VII, Berlin, 2012 Louis le Grand, public domain

b) Alina Li (original)

c) Cleopatra VII as Alina Li

d) Alina Li as Cleopatra VII (post-processed: FaceApp's Makeup 2, brown hair)

e) Alina Li (pre-processed: no makeup, brown hair)

f) Cleopatra VII as Alina Li (post-processed: FaceApp's Makeup Bright Matte)

Figure 19. Cleopatra VII from Altes Museum, Berlin, and a modern head model.

A natural question arises, "Will the choice of a head model influence our conclusions as to whom the facial features belonged to?" Vin Diesel served as head model for the refaces shown in Figure 22.

In the first three images in Figs. 21 and 22, the chin was clearly enhanced by presence of a beard. Other than that, the facial features match across the board. We will reach our verdict as to the subjects' identification in the next section, where the additional coin evidence on Marcus Aemilius Lepidus will be presented.

7. RESULTS

The sequence in which we present our identifications is important, because some versions that we eliminate early on would otherwise have to be considered later. Due to that, some of the previously introduced Julio-Claudian group portraits will have to be revisited more than once to identify different people.

7.1 *Identification 1: "Marcus Aemilius Lepidus" → Gaius Caesar*

In addition to the arguments based upon our analysis of the subjects' hairstyles and facial features presented in the

previous section, we have located two images of coins claimed to show the profile of Marcus Aemilius Lepidus. The coins are shown in Figure 23.

In Fig. 23, we see an older beardless person without a characteristic pincer on the right. Arguably, when Marcus Aemilius Lepidus was as young as the person seen in Fig. 20(a) and (b), a sculptural portrait of him was unlikely to be made. Based on the hairstyle analysis, facial characteristics, the coin evidence, and the historical context, we conclude with certainty that all sculptural portraits in Fig. 20 represent Gaius Caesar, the grandson of Augustus.

7.2 *Identification 2: Couple with Two Children on the Ara Pacis*

According to Pollini [3], most modern scholars have agreed that the two adults shown in the company of their two minor children near the right end of the Ara Pacis Procession are Antonia Major and her husband Lucius Domitius Ahenobarbus. Their children are conventionally identified as Gnaeus Domitius Ahenobarbus (the future father of Nero) and his sister Domitia. The main reason behind this identification is that Antonia Major's sister Antonia Minor, her husband Drusus Major, and their two-year-old son

a) "Marcus Aemilius Lepidus", Chiaramonti © 2008 Sergey Sosnovskiy

b) "Marcus Aemilius Lepidus" (copy), The Pushkin Museum © 2019 Wikipedia / Shakko

c) Gaius Caesar © 2013 The History Blog

d) Gaius Caesar, Altar of Lares © 2018 Egisto Sani

Figure 20. "Marcus Aemilius Lepidus" versus Gaius Caesar: Sculptural portraits.

Figure 21. The refaces of "Marcus Aemilius Lepidus" (original and copy) and Gaius Caesar (with and without a beard); head model: Patrick Swayze.

Germanicus are shown just ahead of the couple with two children in the procession.

We agree that the identifications of Antonia Minor, Drusus Major, and Germanicus are certain. The way we see it, the scholars have resorted to this line of reasoning, because (a) nobody knows how Lucius Domitius Ahenobarbus and his daughter Domitia looked like, except for the sculptural portraits on the Ara Pacis, (b) we have observed similarity between another sculptural portrait identified as Antonia Major and a bust identified as Julia Minor, yet not enough

similarity of that Antonia Major to the mother of the two children in the Ara Pacis Procession (or to Antonia Minor), so it may very well be the case that we don't know how Antonia Major looked like, either, unless the famous Juno Ludovisi marble head in Museo Nazionale Romano, Rome, is her and not her sister Antonia Minor, whose positively identified statue as *Venus Genetrix* is in the Uffizi Gallery, and it's difficult for us to imagine that the same sister would be portrayed as two different goddesses (Juno and Venus), and (c) the only sculptural portrait identified as Gnaeus Domitius

Figure 22. The refaces of "Marcus Aemilius Lepidus" (original and copy) and Gaius Caesar (with and without a beard); head model: Vin Diesel.

Figure 23. Coins of Marcus Aemilius Lepidus.

Ahenobarbus shows him as an old man, so we will test age regression on him. And, in absence of better arguments, we are about to present what we see as convincing evidence.

7.3 Identification 2-1: "Lucius Domitius Ahenobarbus" → Marcus Vipsanius Agrippa
We have examined images of four sculptural portraits of Agrippa—the bust from Gabii currently in The Louvre (and its copies in the Ara Pacis Museum and the Pushkin Museum), the bust in the Uffizi Gallery, the head on display in the Altes Museum, Berlin, and the head of a statue from Museo Archeologico of Venice, Italy. All of these Agrippa portraits are consistent with each other and the Agrippa coins. Figure 24 demonstrates a visual match of "Lucius Domitius Ahenobarbus" in the Ara Pacis Procession to Agrippa from Gabii/The Louvre.

We have concluded that "Lucius Domitius Ahenobarbus" on the Ara Pacis is an Agrippa of the Gabii type.

7.4 Identification 2-2: "Domitia" → Julia Minor
"Domitia"'s head is a patched Roman original that has weathered so much, the Reface app has mistaken the child's sculptural portrait for an image of an old woman. FaceApp's "Young 3" age regression remedies the problem, as demonstrated in Figure 25. The reface of Julia Minor from Innsbruck shows leftover signs of damage to the nose of the original. The head model is Connie Nielsen as Lucilla from "Gladiator" (2000). In the context of the previous find, the conclusion is inevitable: "Domitia" on the Ara Pacis is Julia Minor.

7.5 Identification 2-3: "Gnaeus Domitius Ahenobarbus" → Lucius Caesar
Pollini [3] pointed out that the head of the young boy commonly identified as "Gnaeus Domitius Ahenobarbus" was completely restored. Thankfully, the Ara Pacis Augustae website [4] features images of 16th and 17th century drawings of the Ara Pacis Procession made prior to Francesco Carradori's restoration of 1784. Figure 26 illustrates how "Gnaeus Domitius Ahenobarbus" was seen by artists before the restoration and how his restored head looks like now (two views). We have concluded that Carradori must have gone to great length to restore the original look of the damaged Roman original.

Chiaramonti Museum has a Roman bust identified as Gnaeus Domitius Ahenobarbus. Figure 27 shows an image of the bust and the outcome of applying FaceApp's "Child" age regression filter to it. We see no similarity to the boy in Fig. 26. (Obviously, the defect of the left eye must be ignored.)

Figure 28 shows refaces obtained from the restored head, the image of Lucius Caesar from Fig. 7, and the image of Gnaeus Domitius Ahenobarbus as a child. The head model is Macauley Culkin. We identify the Ara Pacis boy as Lucius Caesar.

7.6 Identification 2-4: "Antonia Major" and the Altar of Lares woman → Julia Major, "Antonia Major"-2 → Julia Minor
Figure 29 shows the mother of the two children from the Ara Pacis Procession, the head classified as Antonia Major (Musei Capitolini), the head of a statue identified as Julia Major or her daughter, Agrippina Major, and the head of Julia Major from Vienna. That latter Julia Major wearing the Livia nodus hairstyle is a young girl. In the Ara Pacis Procession, we expect to see an older Julia Major, the mother of four children, soon to be pregnant by the fifth one (Agrippa Postumus, born 3 months after his father's death). Julia Major is usually shown with a straight nose, except one head in Copenhagen. This trait is uncommon in the Julio-Claudian imperial family. It is our best guess that Julia Major must have inherited it from her mother Scribonia.

Figure 30 shows the corresponding refaces. Interpretation of the eyebrows is influenced by lighting.
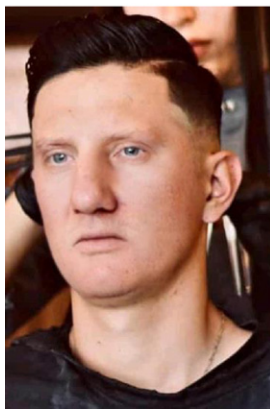
We posit that the mother of the two children on the Ara Pacis is Julia Major, daughter of Augustus, wife of Agrippa.

a) "Lucius Domitius Ahenobarbus" © 2011 Reed College and C. S. Rhyne / © 2012 R. Rumora / Institute for the Study of the Ancient World / Wikimedia Commons
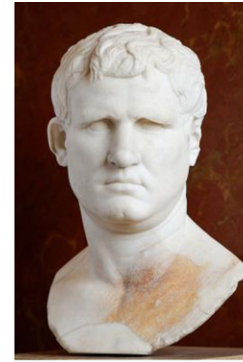
b) Marcus Vipsanius Agrippa, The Louvre © 2009 Marie-Lan Nguyen / Wikimedia Commons

c) "Lucius Domitius Ahenobarbus", reface

d) Marcus Vipsanius Agrippa, reface

Figure 24. ''Lucius Domitius Ahenobarbus'' on the Ara Pacis vs. Marcus Vipsanius Agrippa in The Louvre.

"Antonia Major" from Musei Capitolini is a Julia Minor of the same type as the one from Innsbruck. The head of the statue from Tindari on display in Palermo, Sicily, almost certainly belongs to Julia Major, but one has to take into account that the details of the face have been repaired with stucco. On the first of those calls, we have discovered that we are not alone. Figure 31 features a fragment of a gravure by an unknown artist dated 1675, complete with its reface. The inscription in the gravure claims that it is showing Julia Major, and the woman's head looks as if it were based on that of the Ara Pacis mother with two children, except for the headdress that matches the woman on the Altar of Lares, so we have added a reface of the latter to Fig. 31. The Altar of Lares woman is Julia Major, and so is "Antonia Minor" of chalcedony from The Getty Museum, also in the figure. In all cases, we recognize the straight nose and the heavy chin.

7.7 Identification 3: "Marcus Vipsanius Agrippa" on the Ara Pacis → Gaius Julius Caesar

In the Ara Pacis Procession, near the center of Fig. 2, we see a tall old man covering his head with his toga. He is preceded by a lictor carrying the sacrificial axe and a shorter person in the background. That tall man has traditionally been identified as Marcus Vipsanius Agrippa acting as priest.

We have just identified a different figure as Agrippa. Who is this person, then? Our main clue came from a statement by Prof. Leonard Curchin [6], "Conspicuous by his absence is the Pontifex Maximus or chief priest. At the time the monument was designed in 13 BC, the Pontifex Maximus was Lepidus. . . " Having looked at the Lepidus coins in Fig. 23, we can positively confirm that Lepidus is not the man we are presently seeking to identify. However, we contend that a *pontifex maximus* is present in the procession. We identify the tall old man covering his head with the toga as Divus Gaius Julius Caesar, a demigod and the predecessor of Marcus Aemilius Lepidus as *pontifex maximus*. During an actual *inauguratio* procession, a statue of Caesar may have been carried to symbolize his divine presence. Either way, as a demigod, he can be in attendance without a problem. (We cautiously suggest that the three men wearing laurel wreaths that are preceding Caesar, mixed in with the flamens and lictor, are some *quindecemviri*.) Indeed, let's look at the images of the tall man shown in Figure 32, with and without the restored nose, and including a fragment of the 17th century drawing by dal Pozzo-Albani.

The man has a sharp nose, unlike Agrippa's, a narrower face, more pronounced nasolabial folds, several forehead

a) "Domitia" © 2011 Reed College and C. S. Rhyne/ © 2012 R. Rumora /
Institute for the Study of the Ancient World / Wikimedia Commons

b) Julia Minor, Innsbruck, Wikipedia,
public domain

c) "Domitia", reface (left); "Young 3" (right); Head model: Connie Nielsen

d) Julia Minor, reface

Figure 25. "Domitia" on the Ara Pacis vs. Julia Minor from the Archaeological Museum of Innsbruck, Austria.

Figure 26. "Gnaeus Domitius Ahenobarbus" on the Ara Pacis, left to right: 16th c. drawing; 17th c. drawing (dal Pozzo-Albani); two views of the restored head © 2011 Reed College and C. S. Rhyne.

wrinkles and furrows, and a somewhat receding hairline. We understand why the latter feature would be under-emphasized. For comparison, we have produced a multi-source art-based facial composite of Gaius Julius Caesar by building a mixed "pyramid of the 8 Caesars" as a binary tree. Specifically, we have processed images of the sculptural portraits of Caesar from Tusculum, Pantelleria, Chiaramonti, Arles, Naples, Berlin ("the Green Caesar"), Pisa ("Caposanto"), and Rome shown in Figure 33, left to right (top row), along with their corresponding refaces (bottom row). Prince Harry served as the head model. The eight refaces were paired up and mixed until we were down to one facial composite. Notice that the forehead

wrinkles were lost in the refaces. We gave the final mix a haircut, found a head model with wrinkles on the forehead (Alexander Skarsgård as Tarzan in "The Legend of Tarzan", 2016) and changed the eye color to black. From the first four images in Fig. 32, we made a multi-view art-based facial composite of "Marcus Vipsanius Agrippa" from the Ara Pacis Procession and handled it likewise. (The fifth image was understandably mistaken for a female portrait.) The resulting facial composites are shown in Figure 34.

It is our verdict that the man previously mistaken for Marcus Vipsanius Agrippa on the Ara Pacis is definitely Gaius Julius Caesar, *pontifex maximus*, of the Chiaramonti type.

Figure 27. Gnaeus Domitius Ahenobarbus, Chiaramonti © 2010 Wikimedia Commons/Sailko (left); FaceApp's "Child" (right).

Figure 28. Refaces of "Gnaeus Domitius Ahenobarbus" on the Ara Pacis (left), Lucius Caesar (middle), and Gnaeus Domitius Ahenobarbus as a child (right).

7.8 Identification 4: The "Barbarian Prince" and His Parents on the Ara Pacis → Ptolemy of Mauretania, Cleopatra Selene II, and Juba II

The tall man whom we have just identified as Divus Gaius Julius Caesar is immediately followed by a couple in the background. The mother is touching the head of her little boy known as the "barbarian prince", because of his clothes, see Figure 35 below.

We have found the mother's trapezoid-like face shape (lost in refaces) strongly reminiscent of the few known images of Cleopatra Selene II, with her masculine features. Even though the current estimates have Ptolemy of Mauretania born between 13 BC and 9 BC, we find it entirely plausible that he was older than Germanicus, who was born in 15 BC, by a year or so, given that his parents married in 25 BC. We have concluded that the "barbarian prince" is not a hostage as some have speculated, but a family member and a foreign guest of honor at the *inauguratio* ceremony.

7.9 Identification 5: Livia on the Ara Pacis

The full-faced woman following the "barbarian prince" and his parents has been traditionally identified as Livia or Julia Major. We have found Julia Major elsewhere in the Ara Pacis

Procession, so we are almost ready to identify the full-faced woman as Livia, with Fig. 8(d) as our best facial composite of her so far. The top row of Figure 36 shows the full-faced woman with and without the restored nose (three views), the aforementioned Livia from The Louvre (Egyptian basalt), Venus Genetrix from the *Grand Camée*, Cleopatra VII from The Hermitage (Egyptian basalt), Cleopatra VII from Tomba Nerone / The Pius-Clementine Museum in Vatican, and a bas-relief from Dendera believed to show Cleopatra VII depicted as goddess Isis. The middle and bottom rows of Fig. 36 display the corresponding refaces.

The Reface app has handled the task gracefully, except for failing to recognize that this is such a narrow and long beak-like nose when it worked from the *Grand Camée* profile. We have confirmed the common identification of the full-faced woman in the Ara Pacis Procession as Livia Drusilla. The task of figuring out whether Livia was Cleopatra VII who had survived by making a deal with Augustus, ditching Mark Antony, his son Antyllus by Fulvia (whom Antony had designated as his official heir) and her own chambermaids, and by altering her hairstyle and hair color falls beyond the scope of this paper. None of our

a) "Antonia Major" on the Ara Pacis © 1953 The British Academy, after [4]

b) "Antonia Major"-2, Musei Capitolini © 2009 Marie-Lan Nguyen / Wikimedia Commons
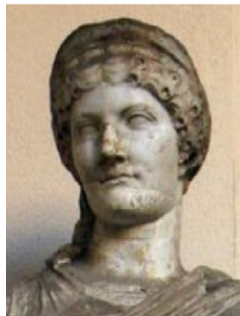
c) Julia Major or Agrippina Major from Tindari, Palermo © 2008 Roger B. Ulrich
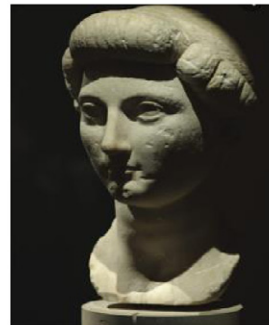
d) Julia Major, Wien, Kunsthistorisches Museum © 2012 Ilya Shurygin

Figure 29. "Antonia Major" on the Ara Pacis; "Antonia Major"-2, Musei Capitolini; Julia Major or Agrippina Major, Palermo; Julia Major, Vienna.

Figure 30. Refaces of Fig. 29(a), (b), (c), and (d).

Figure 31. Left to right: Julia Major, a gravure (1675); refaces of the gravure and the Altar of Lares woman; "Antonia Minor" from The Getty Museum, no copyright.

Figure 32. ''Marcus Vipsanius Agrippa'' on the Ara Pacis, left to right: two views without the nose; two views with a restored nose; 17th c. drawing (dal Pozzo-Albani); © 2011 Reed College and C. S. Rhyne / © 1953 The British Academy, after [4].
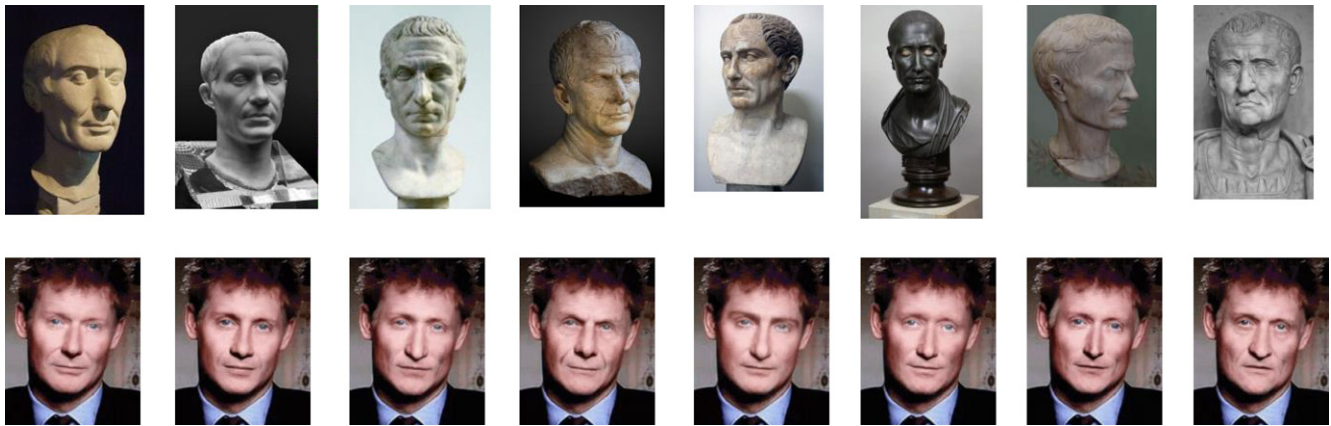

Figure 33. The eight Caesars (top row) and their respective refaces (bottom row).

Figure 34. Facial composites of ''Marcus Vipsanius Agrippa'' on the Ara Pacis (left) and Gaius Julius Caesar (right).

identifications depend on this theory, which we have briefly introduced here mostly for its entertainment value.

7.10 Identification 6: Iullus Antonius (?), Tiberius, and Publius Quinctilius Varus (?) on the Ara Pacis

Figure 37 demonstrates, by a direct visual match, that the same man is shown on the Ara Pacis in the North Procession (on the original slab stored in The Louvre and on its copy in situ), where he accompanies the 7-year-old Gaius Caesar, and in the South Frieze's Procession immediately behind Livia in the background. The hairstyle and the facial features match.

It has been suggested that this man is Iullus Antonius (43 BC–2 BC), another son of Mark Antony by Fulvia. We have accepted this tentative identification, because Iullus Antonius was older than Tiberius, so this place in the South Procession (just in front of Tiberius) is appropriate for him, considering that we have easily confirmed the traditional identification of the man that comes next as Tiberius. Not only was the head of the person following Tiberius completely restored by Carradori [3], but it was never preserved in the first place, as the 16th and 17th century drawings confirm [4]. Under these circumstances, we agree with the tentative identification of that person as Publius Quinctilius Varus, proposed by Pollini [3].

7.11 Identification 7: Lictor with a Sacrificial Axe on the Ara Pacis → Gaius Caesar

Gaius Caesar was only a 7-year-old boy in 13 BC, so it is surprising that the lictor with an axe looks so much like him (see Figure 38). He and his brother Lucius Caesar were adopted by Augustus in 17 BC, so he was already a namesake
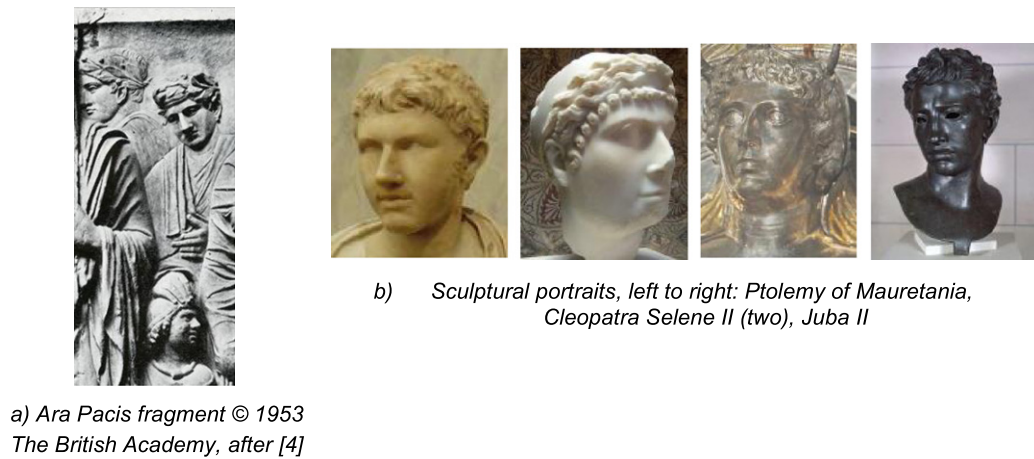
b)   *Sculptural portraits, left to right: Ptolemy of Mauretania,
Cleopatra Selene II (two), Juba II*

*a) Ara Pacis fragment © 1953
The British Academy, after [4]*

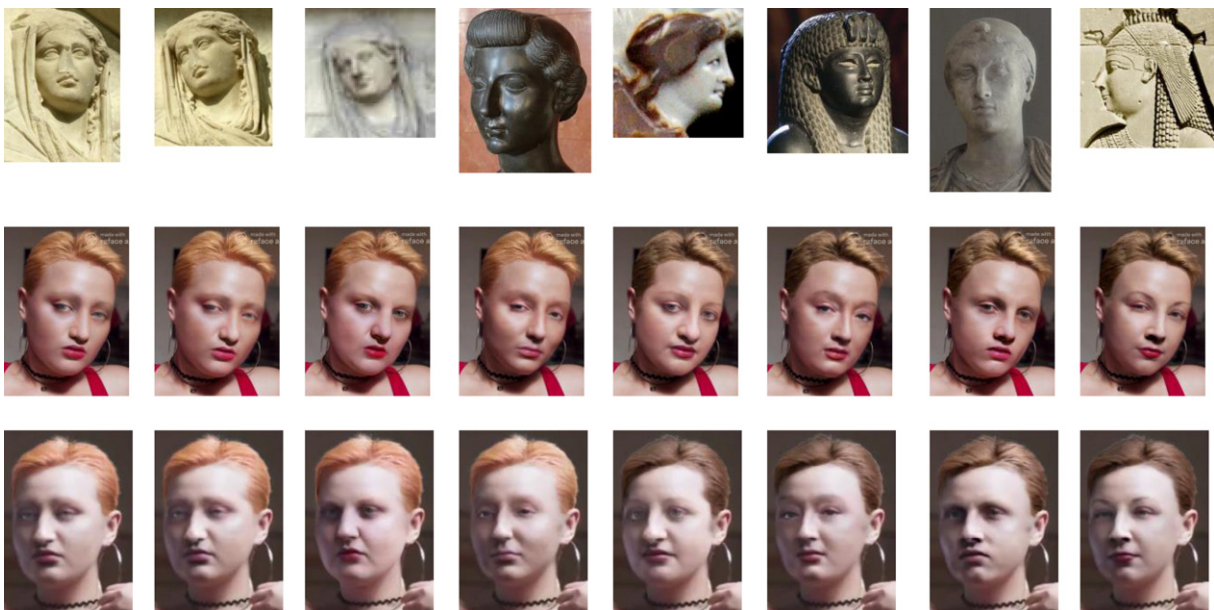**Figure 35.** *Ptolemy of Mauretania, Cleopatra Selene II, and Juba II.*

Figure 36. *Livia on the Ara Pacis and in The Louvre; Venus Genetrix from the Grand Camée; three portraits of Cleopatra VII; the corresponding refaces.*

of his predecessor, Gaius Julius Caesar. It stands to reason that he would be entrusted with the task of carrying the sacrificial axe in front of the divine *pontifex maximus*, provided the axe was not too heavy for him. The lictor is shorter than most adults in the procession, but visibly taller than the 6-year-old Julia Minor. In the reface, we seem to notice his familial similarity to Agrippa.

Gaius Caesar seen in the North Procession on the Ara Pacis is shorter (see Fig. 37), but he isn't playing the same role there. The hairstyle is similar. We do see the "trademark" pincer on the right side of the head of Gaius Caesar in the North Procession, but that lock is so far to the right, that it would likely be obscured in the South Frieze due to the lictor's head turn.

Pollini [43] reported that statue bases inscribed with the names of Gaius Caesar and Lucius Caesar have been excavated not far from where the sculptural group identified

as them was found in the Sebasteion of Aphrodisias, so we are almost ready to rule out the possibility that the two statues in Fig. 7 might represent Nero and Britannicus. We have studied a Britannicus portrait on a coin showcased by Geranio [44] and a sculptural portrait identified as Britannicus by Phoenix Ancient Art and featured in Alchetron [45]. Both portraits are shown in Figure 39, complete with the derived facial composites and with two views and a 2-view facial composite of Lucius Caesar (?) from Aphrodisias. The head model is Elijah Wood as Frodo.

While our Britannicus does look like a son of Claudius and Messalina, we had to follow up with a more detailed hairstyle analysis of the pair of sculptural portraits from Aphrodisias. By tracing the hairlines, we have concluded that the portraits represent Gaius Caesar (Type IV) and Lucius Caesar (Type III) in Pollini's classification [43] and included the most similar respective portraits in Figure 40.

Figure 37. Iullus Antonius (?) in the North Procession and South Procession on the Ara Pacis © 2011 Reed College and C. S. Rhyne / © 1953 The British Academy, after [4].

a) Lictor with an axe © 2011 Reed College and C. S. Rhyne / © 1953 The British Academy, after [4]

b) Lictor with an axe, 2-view facial composite; Head model: Tom Cruise as Maverick in "Top Gun" (1986)

c) Gaius Caesar or Nero, Sebasteion of Aphrodisias, Turkey © 2018 The Ancient World Podcast / © 2009 Joe Geranio

d) Gaius Caesar or Nero, 2-view facial composite

e) Gaius Caesar in the North Procession on the Ara Pacis, The Louvre © 1987 John Pollini

f) Gaius Caesar, facial composite

Figure 38. Lictor with a sacrificial axe: views (a) and a 2-view facial composite (b); Gaius Caesar or Nero, Sebasteion of Aphrodisias, Turkey: views (c) and a 2-view facial composite (d); Gaius Caesar in the North Procession on the Ara Pacis: a view (e) and a facial composite (f).
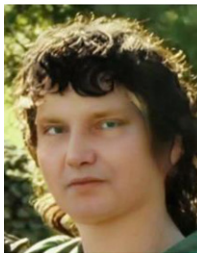
a) Britannicus coin © Classical Numismatic Group

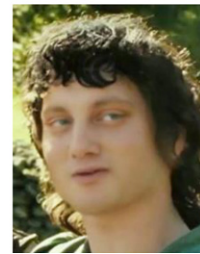
b) Britannicus © Alchetron / Phoenix Ancient Art

c) Lucius Caesar or Britannicus, Sebasteion of Aphrodisias, Turkey © 2018 The Ancient World Podcast / © 2009 Joe Geranio

d) Britannicus from coin, facial composite

e) Britannicus, facial composite; two-source facial composite

f) Lucius Caesar or Britannicus, two-view facial composite

Figure 39. Britannicus versus Lucius Caesar.

Figure 40. Examples of Gaius Caesar (Type IV, left) and Lucius Caesar (Type III, right) © 1987 John Pollini, after [43].

The observed color differences in Fig. 38(c) left us wondering if someone "patched" the pincer of Gaius Caesar from Aphrodisias. Furthermore, we are not ready to discard the possibility that those Gaius Caesar and Lucius Caesar were once re-carved to look like Nero and Britannicus. Pollini [43] gave an example of a Nero recut from Gaius Caesar (Type V).

7.12 *Identification 8: Antonia Minor at Villa dei Misteri and in the Grand Camée de France*

We have easily confirmed the traditional identification of Antonia Minor on the Ara Pacis. In addition to that, we propose to identify the redhead woman from Villa dei Misteri as Antonia Minor. Images of the original portraits are shown in Figure 41. Figure 42 features the corresponding refaces. Angelina Jolie served as head model. Importantly, we have

become convinced that the redhead woman from the portrait on the wall of Villa dei Misteri is not Livia.

This result came in handy when it was time for us to identify Antonia Minor in the *Grand Camée de France*. Figure 43 displays images of two relevant Antonia Minor coins minted during the reign of her son Claudius alongside the cropped fragment of the *Grand Camée de France* showing the woman whom we believe to be Antonia Minor. She is located in the middle row of the *Grand Camée de France*, just left from (by the right hand of) Tiberius. This is a certain identification, and it will soon help us find her sister Antonia Major on the Ara Pacis.

7.13 *Identification 9: Octavia Minor on the Ara Pacis*

We identify the woman making a sign ostensibly calling for silence in the background between Antonia Minor and Drusus Major in the Ara Pacis Procession as Octavia Minor (d. 11 BC), Antonia Minor's mother. The portraits of that woman and a much younger Octavia Minor wearing the Livia *nodus* hairstyle are shown in Figure 44, along with the corresponding refaces. Ornella Muti served as head model. The results are consistent with the proposed identification, considering lack of depth and the impact of the woman's age in the Ara Pacis portrait and taking into account the corrected damage to the nose of the Octavia Minor bust from Velletri. The hair color is set to red to match the hair color selected by the authors of the colorized replica of the famous statue of Augustus from Prima Porta installed in Braga, Portugal. We consider this identification certain, given that this place is where Octavia Minor naturally and logically belongs in this composition.

Figure 41. Antonia Minor on the Ara Pacis (two leftmost images; © 2011 Reed College and C. S. Rhyne) and in the Uffizi Gallery (two middle images; © 2018 Egisto Sani); redhead woman at Villa dei Misteri (right; © 2015 Ministry of Cultural Heritage and Activities and Tourism, Italy).

Figure 42. Refaces of Antonia Minor on the Ara Pacis (left) and in the Uffizi Gallery (middle), redhead woman at Villa dei Misteri (right).

Figure 43. Antonia Minor on two coins minted under Claudius (left and middle) and in the Grand Camée de France (right).

7.14 Identification 10: Antonia Major on the Ara Pacis and as Juno Ludovisi

Figure 45 demonstrates two views of a previously unidentified woman from the Ara Pacis Procession located immediately behind Drusus Major in the background. To the right of them, an image of the so-called Juno (or Hera) Ludovisi in Palazzo Altemps, Museo Nazionale Romano, Rome is displayed.

Two-view reface mixes of the Ara Pacis woman following Drusus Major and of Juno Ludovisi are shown in Figure 46.

The degree of visual similarity between Antonia Minor, the woman following Drusus Major, and Juno Ludovisi is so stunning that we are not surprised that so many people have taken Juno Ludovisi to be just a different type of Antonia Minor. The readers who have remembered a Julia Major mistaken for Antonia Minor from Fig. 31 should be ready to accept our dual identification of Juno Ludovisi and the woman following Drusus Major as Antonia Major—the older sister of Antonia Minor and a cousin of Julia Major.
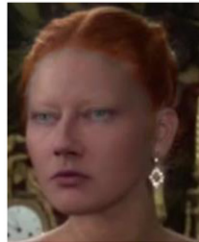
We have failed to positively identify the elderly man between Julia Major and Agrippa. Considering that Agrippa
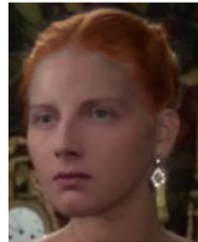
a) Woman calling for silence on the Ara Pacis © 2011 Reed College and C. S. Rhyne

b) Octavia Minor from Velletri, Museo Nazionale Romano, Palazzo Massimo © VRoma Image Archive

c) Reface of the woman calling for silence

d) Reface of Octavia Minor
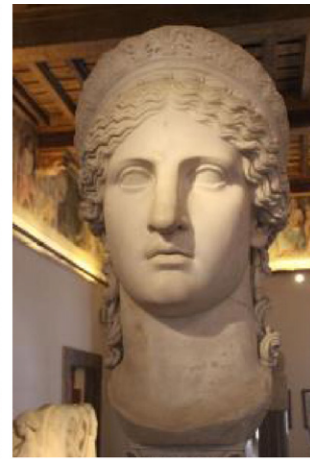
Figure 44. Octavia Minor.

Figure 45. The woman following Drusus Major on the Ara Pacis (left) © 2011 Reed College and C. S. Rhyne / © 1953 The British Academy, after [4]; Juno Ludovisi in Palazzo Altemps (right) © 2015 Wikimedia Commons / Miguel Hermoso Cuesta.

died at the approximate age of 50–52, we can't help wondering if Agrippa's father Lucius Vipsanius was still alive and present at the ceremony. Likewise, we have been unable to identify a younger man following Agrippa. It might as well be the elusive 36-year-old Lucius Domitius Ahenobarbus, but we cannot be sure of that. His known children are believed to have been born c. 8 BC (Domitia Major), c. 5 BC (Domitia Lepida Minor), and c. 2 BC (Gnaeus Domitius Ahenobarbus), so it's understandable that we don't find them on the Ara Pacis. For the sake of completeness, we are showing the two men around Agrippa in Figure 47.

7.15 Identification 11: Figures in the Bottom Row of Grand Camée de France

Let's identify the mythical and historical figures portrayed in the bottom row of the *Grand Camée de France*.

7.15.1 Identification 11-1: Numa or Aeneas

Figure 48 illustrates visual similarity of the leftmost figure in the bottom row of the *Grand Camée de France* and Numa or Aeneas on the Ara Pacis.

Numa or, more likely (in our view, due to presence of a sow in the scene), Aeneas represents Italy and, possibly,

Figure 46. Two-view reface mixes of the woman following Drusus Major on the Ara Pacis (left) and Juno Ludovisi (right).

Figure 47. The Ara Pacis Procession fragment, left to right: Agrippa's father Lucius Vipsanius (?), Marcus Vipsanius Agrippa, Lucius Domitius Ahenobarbus (?).

Figure 48. Numa / Aeneas in the Grand Camée de France (left) and on the Ara Pacis (right).

the constellation of Boötes. According to a legend told by Virgil [46], Tiberinus prophesied to Aeneas in a dream that Aeneas would found a city in a place where he encounters a white sow.

7.15.2 *Identification 11-2: Alexander the Great (?)*
We have tentatively identified the second figure from the left in the bottom row of the *Grand Camée de France* as Alexander the Great of Macedon. He symbolizes the province of Egypt, where he was worshipped as god, and, possibly, the constellation of Orion long associated with the image of a Pharaoh smiting enemies of Egypt. In Egypt, Augustus visited the tomb of Alexander the Great, yet he did not bother to see the tomb of the Ptolemies.

7.15.3 *Identification 11-3: Hercules and the Nemean Lion*
The third figure from the left in the bottom row of the *Grand Camée de France* is Hercules, readily recognized by his muscular build and by what appears to be the skin of the legendary Nemean lion atop his shield. Hercules symbolizes the province of Africa and the constellation of Hercules. The Nemean lion symbolizes Libya and the constellation of Leo.

7.15.4 *Identification 11-4: Moses*
The fourth figure from the left in the bottom row of the *Grand Camée de France* is Moses, recognized by his caduceo-like staff and a horn on his head. Moses symbolizes the province of Judaea and the constellation of Ophiuchus.

7.15.5 *Identification 11-5: Great Idaean Mother of the Gods (Cybele, Astarte) and Attis (Adonis)*
The composition featuring a mother and child in the middle of the bottom row of the *Grand Camée de France* portrays *Mater Deum Magna Idaea* (Great Idaean Mother of the Gods, also worshipped as Cybele and Astarte) and Attis (Adonis). They represent the provinces of Asia Minor and Syria, respectively. River Adonis (now the Abraham River, Nahr Ibrahim) flows through the part of Syria that is now Lebanon. The corresponding constellations are Virgo and, most likely, Capricorn or Aries.

7.15.6 *Identification 11-6: Dioscuri*
The twin figures to the right from the mother-and-child duo are the legendary Dioscuri—Castor and Pollux. They have served as a trademark of Augustus' favorite gem cutter Dioscurides and his disciples. They represent the Roman imperial provinces of Achaea and Macedonia established by Tiberius in 15 AD, and their constellation is Gemini. It is our best guess that the brother holding his torch up is the immortal Pollux. (One brother held his torch up when the other one held his down, in correlation with the observed behavior of planet Venus, which was once taken to be two twin stars—the Morning Star and the Evening Star.)
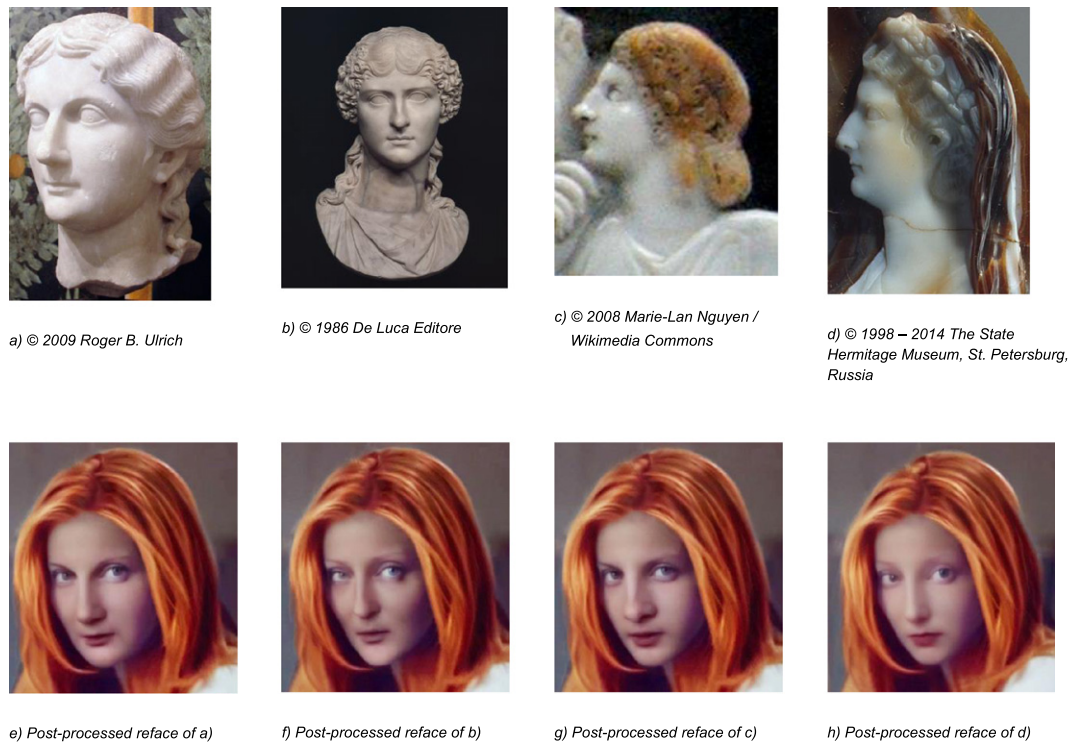
a) © 2009 Roger B. Ulrich

b) © 1986 De Luca Editore

c) © 2008 Marie-Lan Nguyen / Wikimedia Commons

d) © 1998 – 2014 The State Hermitage Museum, St. Petersburg, Russia

e) Post-processed reface of a)

f) Post-processed reface of b)

g) Post-processed reface of c)

h) Post-processed reface of d)

Figure 49. Agrippina Major.

7.15.7 Identification 11-7: Perseus and Andromeda (?)

The second figure from the right in the bottom row of the *Grand Camée de France* is Perseus, recognized by the head of Gorgon Medusa on his shield. We reckon that the damaged female figure to his right represented Andromeda. Perseus and Andromeda are found among the constellations. They represent, most likely, Marmarica, where the Oracle of Ammon (in the Siwa Oasis) announced that King Cepheus had to sacrifice his daughter Andromeda to Cetus (a sea monster), and the nearby Cyrenaica.

7.16 Identification 12: Agrippina Major in the Grand Camée de France and the Hermitage Cameo ("Livia")

Two sculptural portraits of Agrippina Major are shown in Figure 49. One of them (of the rounded profile type) came from Troy and is currently located in Pennsylvania (see Fig. 49a). The second one (of the Tiberius-like type) is a marble bust on display in Palazzo Nuovo, Musei Capitolini, Rome. Its image from a catalog by Eck et al. [47] can be seen in Fig. 49(b). The woman seated in the rightmost place in the middle row of the *Grand Camée de France* is shown in Fig. 49(c). A fragment of the Hemitage cameo showing "Livia" is placed in Fig. 49(d) for the readers' convenience. The corresponding post-processed refaces occupy the second row of Fig. 49. The head model for the refaces is Carmen Electra.

We take the woman seated on the right in the middle row of the *Grand Camée de France* to be Agrippina Major of the later, Tiberius-like type. We identify "Livia" from the Hermitage cameo as Agrippina Major of the earlier, rounded

Figure 50. Agrippina Major from Pergamon, now in Istanbul Archaeological Museum (left; © 2004 David John); her pre-processed reface (right).

profile type with a similar hairstyle. In addition to that, Figure 50 shows a sculptural portrait of Agrippina Major from Pergamon, now in Istanbul Archaeological Museum, side-by-side with its post-processed reface. This portrait is also of the rounded profile type.

7.17 Identification 13: Domitia Lepida Minor (?) as Eunomia in the Middle Row of the Grand Camée de France

It's hard not to notice the inherited similarity of hairstyles from Julia Major to her daughters Julia Minor and Agrippina Major, and then from Agrippina Major to her daugher Agrippina Minor. We have also observed that the hairstyle of the woman seen behind Gaius (Caligula) in the middle row of the *Grand Camée de France* (Fig. 5) bears uncanny similarity to that of Valeria Messalina in the Cretan coin shown in Fig. 15. That woman is holding a scroll symbolizing

Figure 51. A sitting person in the Grand Camée de France (left; © 2008 Marie-Lan Nguyen / Wikimedia Commons) and an allegory of Armenia (right; © 2020 Jona Lendering).

goddess Eunomia of good order. She is sometimes identified as Livilla, the widow of Drusus Minor, considering her place in the composition, symmetric to that of Agrippina Major, the widow of Germanicus. However, we see no similarity to other sculptural portraits believed to be those of Livilla. We have tentatively identified the woman with the scroll as Domitia Lepida Minor, the mother of Valeria Messalina. Domitia Lepida Minor is known to have helped raise Nero when his mother Agrippina Minor was exiled by Caligula. In our opinion, it stands to reason that she may have also played a role in Caligula's own upbringing. No portraits of Domitia Lepida Minor are known, so this identification cannot be certain.

Messalina's father Marcus Valerius Messala Barbatus is believed to have died around 20 or 21 AD. It is estimated that Domitia Lepida Minor married her second husband Faustus Cornelius Sulla Lucullus in 21 AD, and their son Faustus Cornelius Sulla Felix was born c. 22 AD. We are inclined to cautiously challenge this conventional estimate and suggest that Domitia Lepida Minor may have still been a widow when the *Grand Camée de France* was made. Faustus Cornelius Sulla Felix went on to marry Claudia Antonia (c. 30 AD–66 AD), a daughter of Claudius and his second wife Aelia Paetina. If our hypothesis were correct and Faustus Cornelius Sulla Felix were three or four years younger than is currently estimated and therefore closer in age to Claudia Antonia, then all women in the middle row of the *Grand Camée de France* would be widows. Symbolically, this would complement the fact that all four men shown in that row are sons of widows.

7.18 *Identification 14: Livilla (?) in the Middle Row of the Grand Camée de France*
We have tentatively identified the person in a hat sitting just to the right from Livia (by her left-hand side) as Livilla, the widow of Drusus Minor, pretending to be grieving. Figure 51 juxtaposes the fragment showing that sitting person and a fragment of an image showing an allegory of Armenia from the sculptural group "Nero subdues Armenia" in the Sebasteion of Aphrodisias. Armenia's breasts are shown to demonstrate that this sculptural portrait does represent a woman.

It would be an easy way out for us to conclude at this point that the sitting woman in an ancient Armenian hat is also an allegory of Armenia. However, we are inclined

to consider this hat a souvenir that would have been sent to Livilla either by her late husband Gaius Caesar after he won the battle of Artagira in 2 AD, or, less likely, by her late brother Germanicus who fought in Armenia in 17 AD. Neither of the two men came back home to Rome alive after their successful Armenian campaigns. Livilla's lover Sejanus is told to have had accompanied Gaius Caesar to the east, but we find it doubtful that Livilla would dare flaunt her lover's gift. Perhaps, Sejanus had delivered the souvenir from Gaius Caesar. (We find it more believable, yet not certain that Sejanus may have helped Gaius Caesar leave this world early in a manner similar to how he later allegedly had Livilla's second husband Drusus Minor poisoned with a slow poison.) Let's compare a reface of the sitting person to those of three sculptural portraits believed to be those of Livilla. They are shown in Figure 52, along with the facial composite derived by mixing them with even weights of 1/3. No post-processing was applied. Having taken into consideration that the refaces from the *Grand Camée* profiles tend to have wider noses, we have concluded that the image of the sitting person is consistent with the presumed Livilla. Visually, it also makes sense that the eyes of the statues ended up rendered narrower than the eyes recovered from the *Grand Camée* profile.

7.19 *Identification 15: Nero Julius Caesar and Drusus III in the Middle Row of the Grand Camée de France*
Our next result addresses the problem of identification of the two young men wearing helmets in the middle row of the *Grand Camée de France*. One of them is saluting Tiberius, and the other one is standing behind Tiberius and looking up at Germanicus, while ostensibly trying to console Agrippina Major (see Identification 12). The saluting brother has been traditionally identified as Nero Julius Caesar, the oldest surviving son of Agrippina Major, and the brother looking upward has been identified as Drusus III, his younger sibling. Even though it is natural to assume that the saluting big brother with the larger head is the older sibling and the first heir to Tiberius, we're about to present our evidence and arguments that the correct identification should go the other way around. This is important, because many identifications of other sculptural portraits rely upon this one.

7.19.1 *Argument 1: Tiberian Coin Evidence*
We have located images of four coins of the Tiberian period depicting heads of the two brothers—Nero Caesar and Drusus Caesar, the *duumviri* (or *duoviri*), facing each other. All four coins are small coins of the variety called the *as*, or *assarius*. Two of the coins belong to one type, and the other two coins belong to a second type, each type characterized by a different inscription text. Figure 53 shows all four Tiberian coins, alongside the fragments of the *Grand Camée de France* featuring the profiles of the two brothers at the same scale. We have rotated the profile of the smaller brother to look straight.
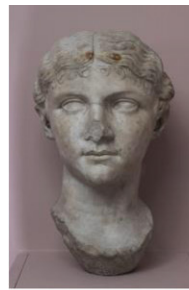
Coin 1 (of the first type) from the Richard Baker collection was sold for € 65 on NumisBids [48] in 2019. Coin 2 (also of the first type) from the Archer M. Huntington Collection was sold for $550 on CNG Coins website [49]
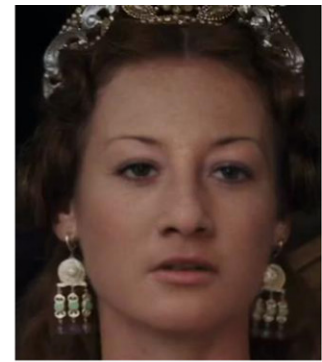
a) Musei Vaticani © 2006 Christoph Houbrechts Vanhoorne
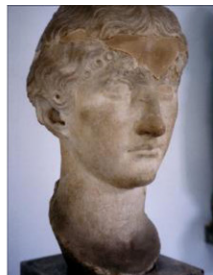
b) Museo Archeologico © 2009 Christoph Houbrechts Vanhoorne

c) MBA Lyon © 2018 Xavier Caré / Wikipedia, public domain

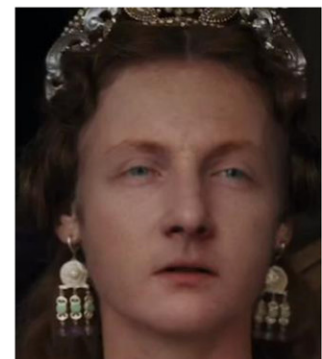*d) A sitting person in a hat in the Grand Camée de France: reface*

e) Reface of a)

f) Reface of b)

g) Reface of c)

h) Livilla: facial composite

Figure 52. Portraits of Livilla and the sitting person in a hat in the Grand Camée de France, along with their respective refaces.

in 2012. Each coin depicts Tiberius (*Divi Avgvsti f.*) on the obverse and heads of Nero and Drusus on reverse. Both coin descriptions on the auction websites mistake Tiberius for Augustus, but the document header gets the name right. Coin 3 (of the second type) was sold for € 140 on NumisBids [50] in 2021. The coin description on the website gets Tiberius right, but contains a typo—"Druso" instead of "Drusus", contrary to the readable inscription on the coin. Coin 4 (of the second type) was sold for € 130 by Tauler & Fau, according to CoinArchives [51, 52].

The big important assumption that we are making here is that the minters of both types of coins had placed the inscriptions on the coins in a manner that would let the viewer tell which brother is which by associating their names with the nearby portraits. We hope that the reader finds this assumption realistic and sensible. In all four cases, the name Nero is placed closest to the smaller of the two heads. Likewise, the name Drusus is hovering over and/or is positioned closest to the larger head.

7.19.2 *Argument 2: Caligula Coin Evidence*
Gaius (Caligula) had equestrian coins minted to honor his late brothers Nero Julius Caesar and Drusus III as Dioscuri. This tells us right away that the two brothers looked a lot like

each other. Figure 54 shows the reverse sides of two of such coins showing the two brothers riding horses (Münzkabinett, Staatliche Museen zu Berlin).

We have found four more images of such coins, but those coins weren't preserved as well as these two. We posit that, the positioning of the names in the inscription notwithstanding, the older and smaller brother (Nero Julius Caesar) is riding first, further away from the viewer, and the younger and bigger brother (Drusus III) is riding second, closer to the viewer. This seems to us the only good way to design a dual equestrian composition. Arguably, any minter who dared mint a coin showing two horse tails and one horse head would be sold to slavery or forced to join the gladiators. Also arguably, the laws of perspective were unknown, or at least didn't matter to the coin makers, so it would be difficult to explain away the head size difference by application of those laws.

The appearance of the closest brother in the left coin in Fig. 54, along with the peculiar location of the pattern of discoloration of the high points in the profile of the big brother in Fig. 53(b), has suggested to us that the minters may have attempted to show the big brother's long sideburns. We have also observed that the big brother is the only character in the *Grand Camée de France* with a considerable amount
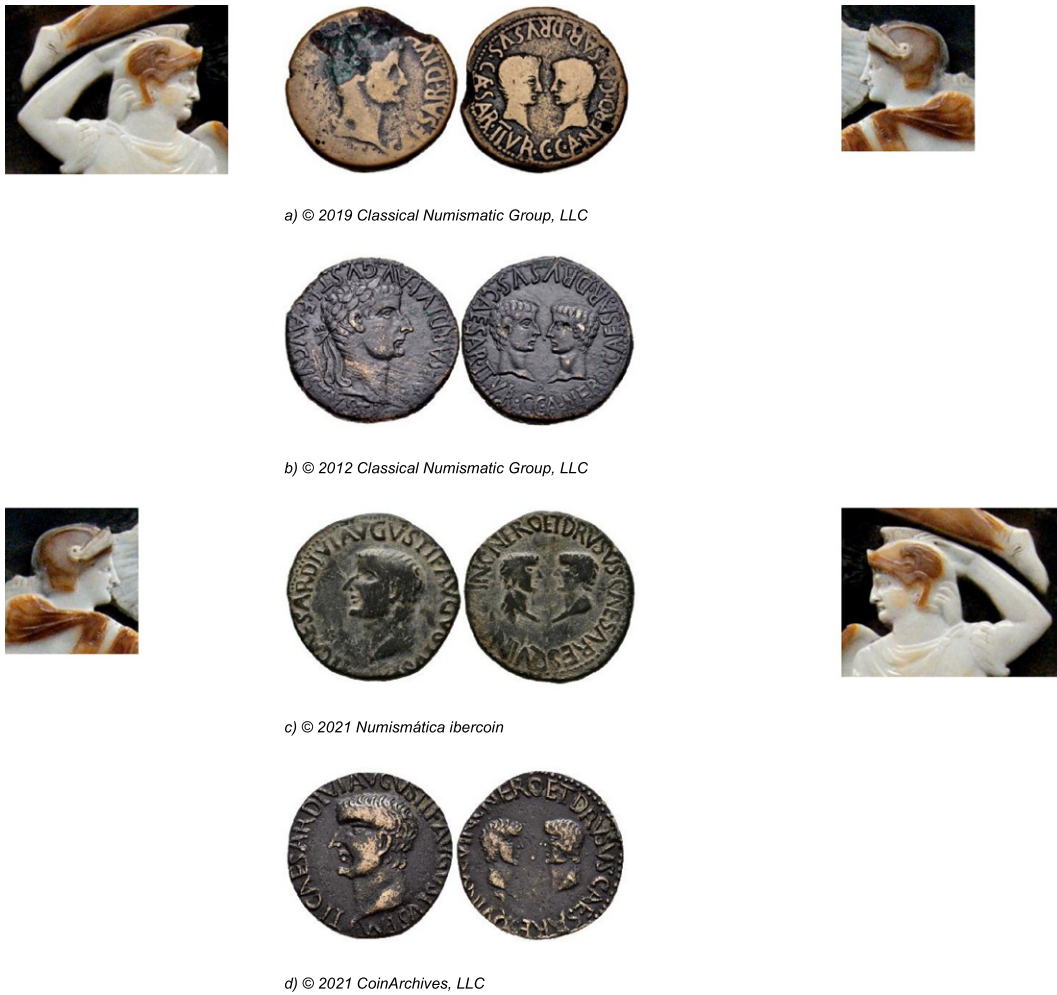
a) © 2019 Classical Numismatic Group, LLC

b) © 2012 Classical Numismatic Group, LLC

c) © 2021 Numismática ibercoin

d) © 2021 CoinArchives, LLC

Figure 53. Nero Julius Caesar and Drusus III on Tiberian coins.

Figure 54. Caligula equestrian coins showing Nero Julius Caesar and Drusus III riding as Dioscuri © Staatliche Museen zu Berlin.

of the red layer left on his cheeks. Rather than making him appear to blush, we wonder if the cameo carver had intended to hint at his red sideburns this way. We have hypothesized

that both brothers wore the same hairstyle, with the only exception that Drusus III had sported the long sideburns and sometimes a beard. At a later point, Gaius (Caligula) wore

Figure 55. Left-to-right: Post-processed refaces of "young Nero" from the Hermitage cameo, the "little" brother from the coin and from the Grand Camée de France, and the "big" brother from the coin and the Grand Camée de France.

the same hairstyle as Nero Julius Caesar, likewise without the long sideburns, as we will show.

7.19.3 Argument 3: Placement of Nero Julius Caesar and Drusus III in the Composition of the Grand Camée de France

We are taking into account that Nero Julius Caesar received his *toga virilis* (adult clothes) at a traditional Roman coming-of-age ceremony in 19 AD, the year Germanicus died, and Drusus III received his *toga virilis* in 23 AD, the year Drusus Minor died. With that in mind, it is our argument that the position of established trust behind Tiberius (following him) and below Germanicus (literally looking up to him) with the opportunity to console Agrippina Major is the proper place for the first heir of Tiberius, Nero Julius Caesar who had replaced Germanicus. The saluting brother Drusus III is, in our view, being welcomed as the incoming second heir, with the task of "filling the shoes" of his deceased namesake Drusus Minor, and that's why he is shown below Drusus Minor. To complete the intended line of succession, Caligula is shown behind the saluting brother as the boy who would grow up and follow Drusus III, which is what transpired.

7.19.4 Argument 4: Comparison to "Young Nero" from the Hermitage Cameo

We have successfully loaded the image of "young Nero" from the Hermitage cameo (Fig. 6) and the two coin profiles of the brothers from Fig. 53(b) into the Reface app's face library and created three of the refaces shown in Figure 55. (The quality of the other coin profile images from Figs. 53 and 54 has proven insufficient for this purpose.) We have also loaded the profiles of the two brothers from the *Grand Camée de France*, refaced them, and added the output images to Fig. 55.

From this figure, we conclude that the two brothers did look alike, but the "little" brother is the one whose facial features most closely resemble "young Nero" from the Hermitage cameo. (Clearly, Drusus III could not possibly be shown in that cameo, instead of his elder brother Nero Julius Caesar.)

Our identification here is that the saluting brother is Drusus III and the brother looking upward is Nero Julius

Figure 56. Multi-source art-based facial composites of Nero Julius Caesar (left) and Drusus III (right).

Caesar. Figure 56 shows the multi-source facial composites of the two brothers derived from the three leftmost and two rightmost images from Fig. 55 for the purpose of subsequent identification of sculptural portraits of Nero Julius Caesar and Drusus III, respectively. As before, the eyebrow differences must be ignored. The head of Drusus III should be bigger, which is not reflected here due to scaling.

7.20 Identification 16: Sculptural Portraits of Drusus III and the Couple in the Gonzaga Cameo

We have identified the eight Julio-Claudian portraits shown in Figure 57 as those of Drusus III. In particular, we conclude that the couple in the Gonzaga Cameo (Figure 18) are Drusus III and his wife Aemilia Lepida (d. 36 AD), a granddaughter of Paullus Aemilius Lepidus (c. 77 BC–after 11 BC), who was a paternal nephew of Marcus Aemilius Lepidus, *pontifex maximus*.

The four identifications that take this son of Germanicus to be Nero Julius Caesar are not "wrong" per se. Those who have assigned them (including Pollini [1] with respect to Fig. 57h) meant the "big" brother from the *Grand Camée de France*, and so do we. The identification by someone at Museum of Corinth is correct, in our view, and we're left wondering if that person saw similar coin evidence before we did. Our approach is quite simple here, we count in whoever wears the modification of the fancy hairstyle of the sons of Germanicus enhanced by the long sideburns and, in two cases, a little bit of a beard, provided that the facial features

a) Drusus Julius Caesar, Museum of Corinth © 2005 Christoph Houbrechts Vanhoorne

b) "Nero Julius Caesar", Tarragona, Museo Archeologico © 2009 Christoph Houbrechts Vanhoorne

c) "Germanicus", Ashmolean Museum, Oxford © 2020 Gareth Harney

d) Julio-Claudian Prince, The J. Paul Getty Museum, Malibu, California, open content (no copyright)

e) "Nero Julius Caesar", Landesmuseum Württemberg, Stuttgart © H.Zwietasch

f) "Nero Julius Caesar", The Louvre © 2005 Christoph Houbrechts Vanhoorne

g) Gonzaga Cameo, fragment © 1998 – 2014 The State Hermitage Museum, St. Petersburg, Russia

h) "Nero Iulius (Germanici f.)" from Ephesos, Selçuk Museum, Turkey, after J. Inan and E. Alföldi-Rosenbaum [52]

Figure 57. Confirmed and newly identified portraits of Drusus III (Drusus Julius Caesar Germanici f.).

Figure 58. Germanicus: Musée Saint Raymond, Toulouse, France (left); Ny Carlsberg Glyptotek, Copenhagen (right) © 2009 Christoph Houbrechts Vanhoorne.

match the composite reasonably well (they all do). The only identification that we have truly rectified here is that of the portrait in Fig. 57(c) mislabeled as "Germanicus". Figure 58 shows two sculptural portraits of Germanicus to supplement his profile from Fig. 4. Germanicus has thin lips, a wide face, and his hairstyle, while close, is not quite as ornate as his sons'. It looks like the face of his son Drusus III became broader as he aged, not unlike what happened later to his nephew Nero, just not to that ridiculous extent.

7.21 *Identification 18: Sculptural Portraits of Nero Julius Caesar*

Figure 59 presents our annotated hairstyle analysis of four Julio-Claudian sculptural portraits in comparison to "young Nero" from the Hermitage cameo.

The top right image is that of a Caligula bust from Museo Archeologico in Venice. That particular bust was restored in the 16th century. The way it is now, it definitely shows us Gaius (Caligula) wearing the hairstyle of the sons of Germanicus, of the type without the sideburns. The only hairstyle feature lacking there is the one we call a "chamomile flower."

The two images near the bottom left corner of Fig. 59 are photographs by John Pollini [1]. They provide two views of a sculptural portrait from Rusellae, Italy, associated with an inscription discovered nearby mentioning *Drusus Iulius Caesar Germanici f.* Boschung [9] classifies this portrait as Nero Iulius (i.e., Nero Julius Caesar, in our terminology). Pollini [1] argues convincingly that, "by comparison with Nero Iulius' nose with its pronounced hook [. . .], that of Drusus Iulius has only a slight bump [. . .], discernible in the figure of Drusus Iulius (armored figure behind Tiberius) on the *Grand Camée.*" The reason why this argument between the specialists is at all possible is that the sculptural portraits of Nero Julius Caesar and Drusus III would be installed together, so the inscription found nearby merely indicates
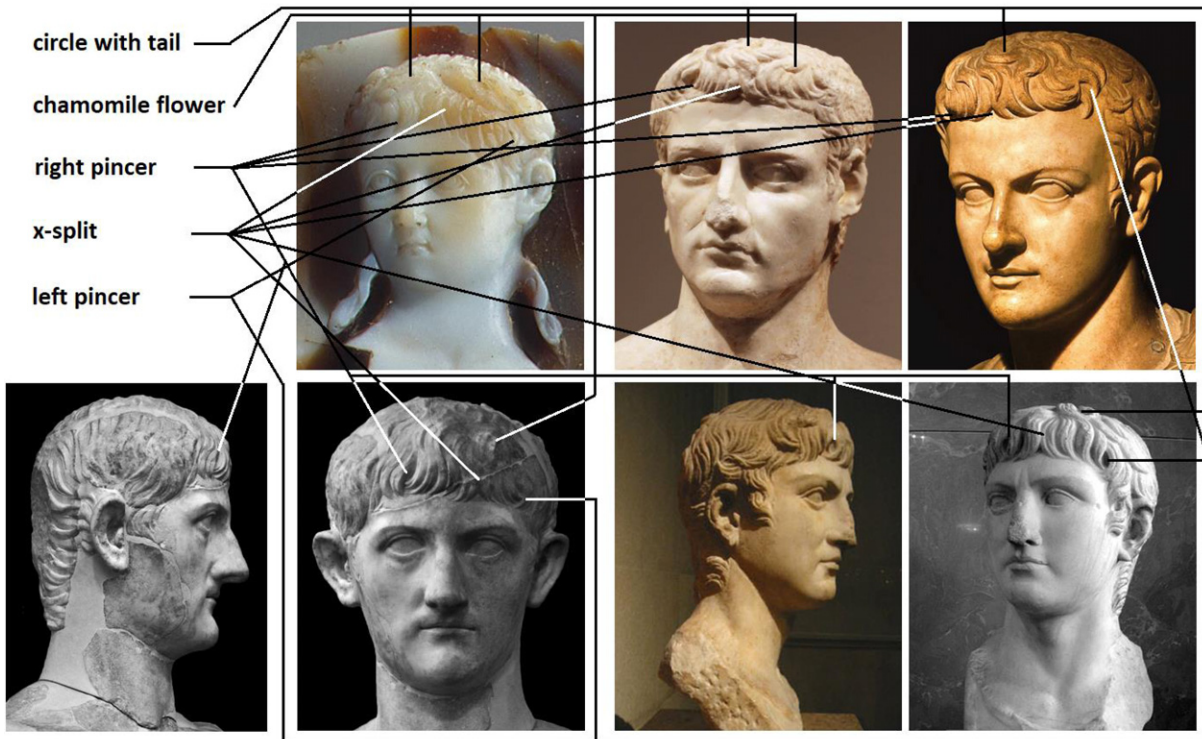
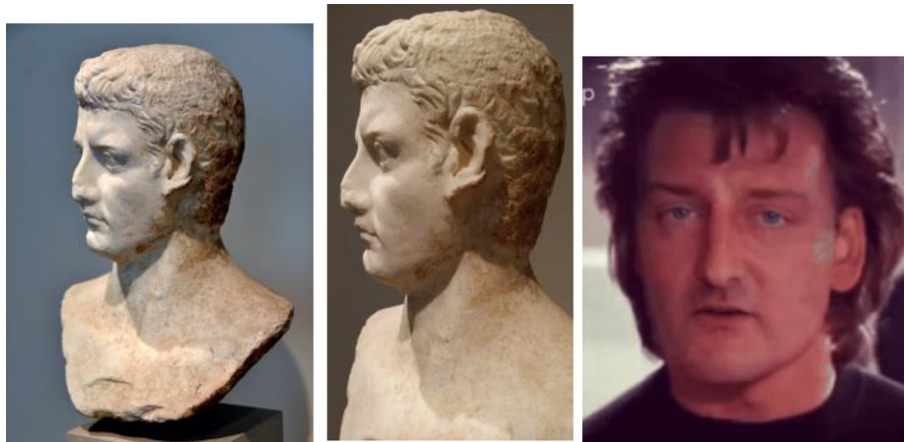**Figure 59.** Nero Julius Caesar and Gaius (Caligula): A comparative hairstyle analysis.

Figure 60. "Caligula recut as Claudius" from Acerra, Italy, now in Altes Museum, Berlin, Germany: two profile views (left and middle; © 2019 Osama Shukir Muhammed Amin / Wikimedia Commons; © 2016 Tom Ljevar) and a reface (right).

to us that this is one of those two brothers. In addition to Pollini's argument quoted above, we have noticed the absence of long sideburns and classified this portrait as... Nero Julius Caesar, because that's who we take the "armored figure behind Tiberius" to represent.

The two images near the bottom right corner are views of a bust of "Germanicus" in The Louvre that is not to be confused with the statue of Germanicus, also in The Louvre. This bust has been independently reclassified as "Drusus Iulius Caesar" by Christoph Houbrechts Vanhoorne [53] based on the hairstyle and lips. Again, the sideburns are not long enough for this to be our Drusus III, so we have

identified this portrait as Nero Julius Caesar. We are in agreement with Mr. Vanhoorne that this is the brother looking upward in the *Grand Camée*.

Finally, the image placed immediately to the right from "young Nero" in Fig. 59 is of a Julio-Claudian bust from Acerra, Italy, currently in Altes Museum, Berlin. It has been classified as Caligula re-carved to make him look like Claudius (*Büste von Kaiser Claudius*, Inv. 1965.10). Varner [11] mentions that there are 18 portraits so designated and analyzes four of them. Three faces of those recut sculptures ended up looking like Claudius, while the other portrait retained Caligula's facial features, but the hairstyle

Figure 61. Claudius and his refaces: from Museo Archeologico, Naples (left) and Ny Carlsberg Glyptotek, Copehnagen (right) original photos © 2009 Christoph Houbrechts Vanhoorne.
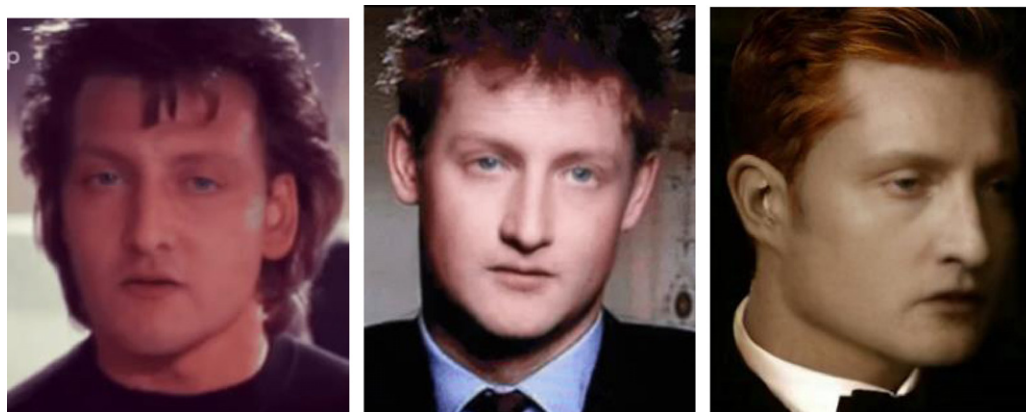

Figure 62. Nero Julius Caesar (Nero Julius Caesar Germanici f.): three six-source art-base facial composites; Head models: Patrick Swayze, Prince Harry, Ed Westwick.

was modified to make it look like the hairstyle of Claudius. In this picture by Anagoria/Wikimedia Commons, we see neither. What we see are the damage to the fringe locks on the sides and back of the head (arguably, the least effective way to enforce *damnatio memoriae*) and a total match of the hairstyle and facial features to "young Nero". In particular, we see more pronounced nasolabial folds than what Caligula normally exhibits and an H-like mouth, but the latter feature depends on the lighting. Figure 60 shows two profiles and a reface of the bust from Acerra/Altes, which we identify as Nero Julius Caesar. The reface (from the image by Anagoria) has yielded an excellent match to the facial composite of Nero Julius Caesar from Fig. 56.

To rule out Claudius, we provide two portraits of him in Figure 61, complete with their respective refaces.

7.22 *Multi-Source Art-Based Facial Composites of Nero Julius Caesar, Drusus III, and Gaius (Caligula)*

For simplification of future identifications, we have produced a set of multi-source art-based facial composites of three sons of Agrippina Major—Nero Julius Caesar, Drusus III, and Gaius (Caligula). For Nero Julius Caesar, we have used the six sources identified in this paper. For Drusus III, we have mixed the refaces of nine identified sources (excluding Fig. 57(h), due to the badly broken nose). As sources for Caligula, we have used the images of his nine sculptural

portraits from (1) Schloss Fasanerie, (2) Ny Carlsberg Glyptotek (head), (3) Ny Calrsberg Glyptotek (cuirass bust), (4) Metropolitan Museum of Art (marble), (5) Worcester Art Museum, (6) Thrace/The Louvre, (7) The Getty Museum, (8) Yale, and (9) Campi Flegrei (by Joe Geranio). For each brother, we have picked a custom head model, in addition to two common head models. The resulting facial composites are shown in Figures 62–64.

The reader is welcome to compare Fig. 64 to the image in the top right corner of Fig. 59 that was not part of the set for making Fig. 64 to make sure that that was indeed a Caligula there.

8. CONCLUSIONS

We have introduced a novel technique for using mobile apps to create multi-view and/or multi-source art-based facial composites. This technique helps improve identification of people featured in works of art, as we have demonstrated by applying it to a diverse plethora of Julio-Claudian portraits.

9. FUTURE WORK

While there is more to be done in the Julio-Claudian realm, we are also planning to extend our approach to analysis of portraiture from other cultures and historical periods.

Figure 63. Drusus III (Drusus Julius Caesar Germanici f.): three nine-source art-base facial composites; Head models: unknown, Prince Harry, Ed Westwick.

Figure 64. Gaius (Caligula): three nine-source art-base facial composites; Head models: James McAvoy, Prince Harry, Ed Westwick.
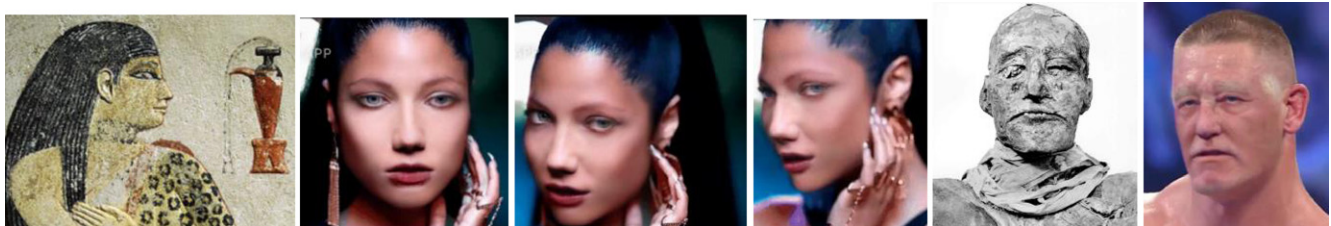

Figure 65. Images and refaces of Princess Nefertiabet (left) and Ramesses III (right).

Figure 65 demonstrates our refaces of the images of Egyptian princess Nefertiabet and the mummy of Ramesses III.

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