



ARA · PACIS · AVGVSTAE

An Astro-Archaeological Analysis

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ABSTRACT

The *Ara Pacis Augustae* (Altar of Augustan Peace) is examined as a shrine of light consistent with the astro-orientation principles of Roman architect Vitruvius (c. 15 BC). Italian archaeologists excavated (1937-38) and relocated the altar along Rome's Tiber River - rotating it 75° counter-clockwise from its original orientation. While its magnificent marble architecture may be viewed at the Museo dell'Ara Pacis, a key astronomical component of the altar's architectural design has until now remained encoded on a paper map. The author calculated the horizon declination (+11.3° decl.) of the altar's original north-east opening with Program STONEHENGE (Hawkins 1983, 328-330), the Gatti 1938 site map, and Google Earth satellite imagery: True Azimuth ≈ 75°; Latitude/Longitude = 41° 54' 10.47" N/12° 28' 44.60" E; Elevation ≈ 10 meters ASL; and Horizon Altitude ≈ +1.1°. The Ara Pacis was dedicated in 9 BC (Moretti 1947, 7). Calculations show that the axis of the Ara Pacis enclosure's northeast opening originally was oriented to the rising Sun (+11.0° decl.) on both April 21st and August 27th. However, the iconography of the Ara Pacis supports an interpretation that only the April 21st sunrise was intended, because each sculpture of the "Tellus" frieze (woman, flowing amphora, pair of fishes, ram, bull, pair of infants) uniquely mirrors the astronomy: Venus (Morning Star phase) and the Zodiac constellations Aquarius-Pisces-Aries-Taurus-Gemini at dawn on the festival of *Parilia* (Pales, goddess of shepherds), 21 April 9 BC. This date coincides with the founding of Rome on 21 April 1 *ab urbe condita* (753 BC) recorded by Roman historian Marcus Terentius Varro. What could be a more fitting venue than the Museo dell'Ara Pacis for exhibiting a virtual 3D animation of the annual sacrifice connecting the Pax Augusta of the SPQR to the Cosmos of the Immortal Gods at dawn on the *Dies Natalis Romae*?

KEYWORDS: *Ara Pacis, archaeoastronomy, Augustus, Roman architecture, Roman religion, Venus, Vitruvius, Tellus.*

INTRODUCTION

Background

The Roman Senate voted on 4 July 13 BC to honor Emperor Gaius Julius Caesar Octavianus Augustus (b. Equinox, 23 September 63 BC, Emperor 31 BC, d. 19 August 14 AD) with the *Ara Pacis Augustae* (Altar of Augustan Peace) in recognition of his pacification of the enemies of Rome, legal reforms (*leges Iuliae*), and revival of traditional Roman religion (prompted by newly arrived Mystery Cults from the East).

“When I returned from Spain and Gaul after successfully settling the affairs of those provinces, in the consulship of Tiberius Nero and Publius Quintilius [13 BC], the Senate decreed that the Altar of Pax Augusta should be consecrated for my return near the Campus Martius, and ordered that the magistrates, priests, and the Vestal Virgins should there make an annual sacrifice.” (Augustus 14, II:37)

The *Ara Pacis Augustae* was dedicated on 30 January 9 BC, about 83m ($\approx$ 280 Roman Feet) northeast of the *Horologium Augusti* obelisk whose shadow is claimed to have pointed towards or even touched the *Ara Pacis* steps on the Equinox (Buchner 1982; 2007; IDIA Lab 2013; Frischer et al. 2014; cf. Heslin 2007, 10-15). Apart from the modern discussion regarding a *Horologium* – *Ara Pacis* alignment on the birthday of Augustus, Vitruvius (c. 75-15 BC) makes clear that he at least understood the geometry of gnomon shadow length at the Equinox:

“...we must ourselves explain the principles which govern the shortening and lengthening of the day. When the sun is at the equinoxes, that is, when passing through Aries and Libra, he makes the gnomon cast a shadow equal to eight ninths of its own length, in the latitude of Rome.” (Vitruvius, IX, vii, 1)

Italian archaeologists excavated (1937-38) the *Ara Pacis* buried some 10 meters under the *Via in Lucina* No. 16 and reassembled it 455 meters NW along the left bank of the Tiber River (Moretti 1947, 6; Andersen 2003, 5). Ignoring Vitruvius' astro-architectural principles, they rotated the altar 75° counter-clockwise from its original orientation. While the altar's marble sculpture, recently reconstructed in polychrome by art

historians (Foresta 2011; Rossini 2015) may be seen at the *Museo dell'Ara Pacis* in Rome, until now the significance of the altar's original astro-orientation has remained encoded on a paper map (Gatti 1938 in Stampini 1970, 36). However, Vitruvius makes clear that the astronomical orientation of Roman public architecture was intended as a metaphor written in stone linking the Emperor's civil authority on the Earth below with that of the eternal Cosmos in the Heavens above.

“But when I saw that you [Caesar Augustus] were giving your attention...to the providing of public buildings...so that the greatness of its [SPQR] power might likewise be attended with distinguished authority in its public buildings, I thought that I ought to take the first opportunity of lay before you my writings on this theme.” (Vitruvius, I.preface.2)

Not only does he write “that one who professes himself an architect should be ...acquainted with astronomy and the theory of the heavens” (Vitruvius, I:i:iii), but two of his astro-architectural principles were incorporated into the *Ara Pacis* design:

“Altars should face the east, and should always be placed on a lower level than are the statues in the temples, so that those who are praying and sacrificing may look upwards towards the divinity” (Vitruvius, IV.ix.1)

“The quarter toward which temples of the immortal gods ought to face is to be determined by the principle that....the temple and statute place in the cella should face the western quarter of the sky. This will enable those who approach the altar with offerings or sacrifices to face the direction of the sunrise in facing the statue in the temple, and thus those who are undertaking vows look toward the quarter from which the sun comes forth and likewise the statues themselves appear to be coming forth out of the east to look upon them as they pray and sacrifice.” (Vitruvius, IV.v.1)

Description

The marble altar of the *Ara Pacis* is located inside a relatively low rectangular walled enclosure (Figure 1). The architectural inspiration of twin opposing entrances of the *Ara Pacis* has been attributed to both the (as yet unlocated) Shrine of Janus Geminus (TPQ 753 BC) in Rome and to the Altar of the XII Gods (c. 450 BC) in the Agora of Athens (Müller 1943, 437; Thompson 1952, 79-82; Kleiner 1992, 90; Mauzy 2006, 9, 90-91). Archaeological excavation confirms that the opposing enclosure entrances of the Greek Altar of the XII Gods and of the Roman *Ara Pacis* are both oriented SW-NE (Figure 1; Tiede 2015, 36).

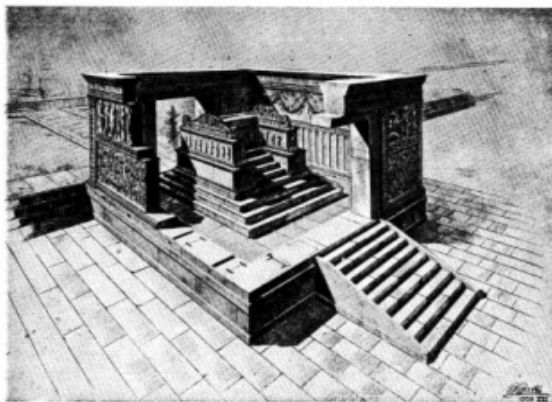
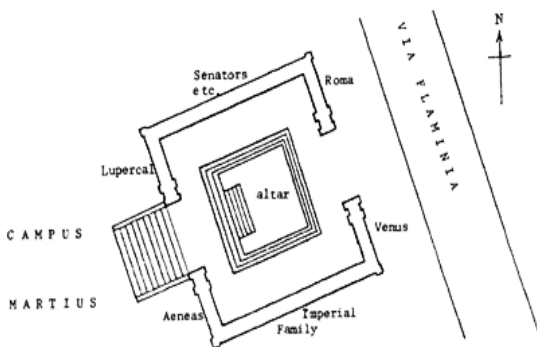


Figure 1. Original Orientation of the *Ara Pacis Augustae* (Toynbee 1953, 56; Gatti 1938 in Moretti 1947, 17)

Unlike its Athenian antecedent, the sculpture of Rome's *Ara Pacis* is remarkably well preserved. The exterior wall panels on the north face depict Roman senators in procession from the Via Flaminia (modern Via del Corso) to the western stairway, while the southern panel mirrors the processional motif with the imperial family and entourage. The southwest stairway is flanked by twin friezes of depicting scenes of the mythological founding of Rome. The

northeastern raised opening is flanked by twin friezes: the helmeted goddess Roma; and the altar's largest figure, a goddess variously identified as *Terra Mater*, *Italia*, *Pax Romana*, *Dea Tellus*, or *Venus Genetrix* (Figure 3 top, Figure 4 bottom).

Research Objective

Although scholarship on the *Ara Pacis Augustae* has focused primarily on its magnificent Luna marble sculpture, our research objective is to determine if the *Ara Pacis* itself functioned as a shrine of light lending "distinguished authority" by means of the astro-architectural principles of Vitruvius in homage to the greatness of Augustus and SPQR.

Methodology

The present investigation is grounded in the inter-discipline of Astro-Archaeology, a term coined by astronomer Gerald S. Hawkins, to describe the hybrid study of the prehistories of architecture and astronomy:

"...I wish that many, or all, of the hundreds of Neolithic and Bronze Age stone monuments still standing could be accurately surveyed and examined for astronomical orientation. Much information fruitful for archaeologists, anthropologists, historians and others might result. If any university or foundation is casting about for promising fields for exploration and research, let it consider astro-archaeology!" (Hawkins 1965, 121)

In order to discover any astronomical significance to the original orientation of the *Ara Pacis*, it was necessary to determine the True Azimuths of the sides of the structure while *in situ* under Via in Lucina No. 16. The site map by Guglielmo Gatti 1938 (in Stampini 1970, 36; cf. Buchner 1982, 338-341; Heslin 2007, 14) shows a 75° Azimuth for the SW to NE axis (Figure 2; Tiede 2015, 9).

The next step was to determine if the site plan were oriented to *Magnetic North* or *True North*, as the 1938 magnetic declination was 4° 27' West (NOAA). Although Gatti's map does not specify which North was used and his field notes remain unpublished at Rome's Archivio Centrale dello Stato, the issue was resolved by layering the Gatti map over a Google Earth (GE)

satellite image and using the 1938 map's street corners as Ground Control Points (GCPs) to orthorectify the GE image. Figure 2 (top) confirms the Gatti map to be oriented to True North (see Tiede 2015, 9–11 for larger images; cf. Ur 2009).



Figure 2. Gatti 1938 map layer (black) on 2013 Google Earth image and Elevation Profile Horizon for 75° True Azimuth

The remaining input data was entered into an Excel version of Program Stonehenge (Hawkins 1983, 328–330) to calculate the declination for the skyline intercept point of the 75° True Azimuth. The eye level of an observer over the *Ara Pacis* altar is estimated at 10 meters (m) Above Sea Level (ASL), based on Google Earth's 30m Digital Elevation Model (DEM) spot elevation for the Via in Lucina of 16m, less 10m soil below street level of the 1937–38 excavation (Moretti 1947, 6), and plus 4m for an observer standing on the altar podium (cf. Andersen 2003, 14). Google Earth locates the original position of the *Ara Pacis* at Latitude: 41° 54' 10.47" North, Longitude: 12° 28' 44.60" East. From there Google Earth's Elevation Profile tool shows the horizon (Elevation/Distance = 580m/30,100m) Altitude for a 75° True Azimuth is +0.13°. The modern rooftops may be ignored as they did not exist on the Campus Martius (Figure 2, bottom).

The *Ara Pacis Augustae* was dedicated on 30 January 9 BC (Moretti 1947, 7), i.e., the year to test for any hypothetical astro-target. Program STONEHENGE calculated the Horizon Declination for the SW-NE axis (75° True Azimuth) of the *Ara Pacis Augustae*.

Potential astro-target declinations were plotted with planetarium software "Starry Night Pro Plus6" and compared with the *Ara Pacis*' NE axis local horizon intercept point or skyline declination.

Findings

Program STONEHENGE shows that the original axis of the *Ara Pacis Augustae* NE enclosure opening (75° True Azimuth) intersected the local horizon at +11.3° declination. Starry Night Pro Plus6 shows that the first gleam of the rising Sun was +11.0° declination on both 21 April and 27 August 9 BC (Figure 3). Because the difference in declination between the Sun (+11.0° decl.) and the horizon vector (+11.3° decl.) is less than the diameter of the solar disk (0.5°), we infer that the Sun rose on the NE axis of the *Ara Pacis* on both dates.

Analysis

Vitruvius prescribed that Roman altars should face east towards sunrise, rather than west towards sunset. Figures 1, 2 and 3 show that the *Ara Pacis* conforms to Vitruvius' sunrise orientation principle.

To choose between the two solar alignment dates as either 21 April or 27 August, one needs either historical or archaeological confirmatory evidence. The *Res Gestae* is imprecise regarding the festival date; stating only that "the Vestal Virgins should there make an annual sacrifice" (Augustus 14, XII: ii). However, the marble iconography of the *Ara Pacis* contains motifs found in the literature of Art History (Gundel 1992; Galinsky 1992) and Classics (Herbert-Brown 2002, 79; Pasco-Pranger 2006, 141) that may independently resolve the choice of dates. For example, if the sculpted motifs on the much disputed "Tellus" frieze were to correspond to the astronomical constellations and planets appearing on the local horizon at dawn on 21 April but not 27 August 9 BC, then the iconography would simultaneously confirm both the (1) date of the annual sacrifice, and (2) that the altar's orientation was intentional rather than random.

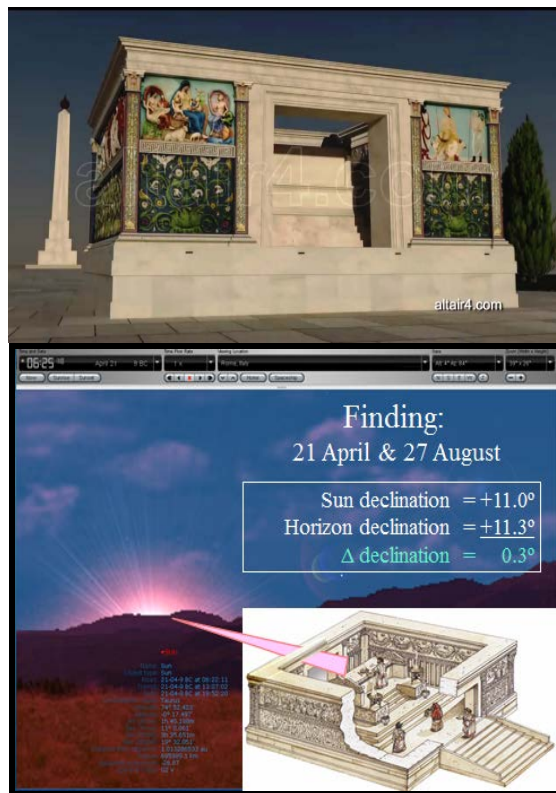


Figure 3. *Ara Pacis Augustae* at dawn on 21 April & 27 August 9 BC (Altair Multimedia 2014; Starry Night Pro Plus-6; <http://mappae-mundi.tumblr.com/post/87884514617/lara-pacis-augustae-ovvero-laltare-della-pace>)

Upon inspection, one sees twin *velificantes* – “typical of the deities of the atmosphere ‘over whom vaults the firmament’ (Galinsky 1966, 229) frame the polychrome iconography of the *Ara Pacis* NE “Tellus” frieze. Moreover, there are figures consistent with an astrological motif (cf. Gundel 1992), viz.: a swan (Cygnus); a jar with flowing water (Aquarius); a sea monster-whale (Cetus); a paired fish head and tail (Pisces); a ram (Aries); a bull (Taurus); twin infants (Gemini); a seated woman in blue with exposed right shoulder (Venus; Zanker 1988, 172-174), and all are placed above a tetra-gamma meander

(*Ursa minor* at the Four Seasons on solstices and equinoxes) serving as a horizon separating the verdant earthly lower panel from the upper celestial motifs (Figure 4 bottom; Tiede 2015, 33-34). Figure 4 (top) also shows the same Zodiac constellations (Aquarius-Pisces-Aries-Taurus-Gemini) appearing adjacent to the

to the helically rising Venus above the horizon at dawn on 21 April 9 BC. However, *none* of the Zodiac constellations (Cancer-Leo-Virgo) appearing *adjacent to the horizon* at dawn on 27 August 9 BC match the iconography of the northeast “Tellus” frieze of the *Ara Pacis*. Therefore, the sculpture on the “Tellus” panel supports an interpretation that the solar orientation was both intentional and culturally significant given that the alignment coincided with the festival of *Par ilia* (Pales, goddess of shepherds) on 21 April 9 BC. This day was the anniversary of the founding of Rome,

(*Dies Natalis Urbis*) in 1 *a.u.c.* (753 BC) according to the Roman historian Marcus Terentius Varro (cf. Hannah 2009, 23; 2005, 115-116). Moreover, this solar-calendric orientation of politico-religious importance is duplicated at noon on April 21st, i.e., the oculus-to-entrance meridian transit alignment of the Pantheon (completed under Emperor Hadrian c.125 AD) (Hannah & Magli 2011; cf. Bertarione and Magli 2015).

Art historians have long speculated on the identity of the seated lady in Figure 4. She has been interpreted variously as the goddess *Italia* (Van Buren 1913, 134 ff; Sellers-Strong 1937, 114 ff); *Terra Mater* or *Dea Tellus* (Momigliano 1942, 228-231; Moretti 1947,9); *Pax Romana* (Weinstock 1960); *Venus Genetrix* (Booth 1966; Galinsky 1966, 1992); or even as “a synthetic symbol of all of these personifications and divinities” (Kleiner 1992, 96). However, Astro-Archaeology provides new physical evidence supporting the identification of the goddess as *Venus Genetrix*, viz., the planet Venus *actually rose heliacally* at its maximum brightness as Morning Star (magnitude -4.4) on the *Ara Pacis* axis at dawn April 21st 9 BC, the year recorded in the *Res Gestae*. Moreover, because of Venus-Earth Synodic Cycle, Venus also appeared as Morning Star in Aries on the first *Dies Natalis Urbis Romae* of 21 April 753 BC (Tiede 2015, 22). Therefore, the dedication of the *Ara Pacis* in 9 BC coincided with the 93rd iteration of the eight year Earth-Venus Synodic period when Venus appeared as Morning Star at the founding of Rome (753– 9 BC = 744 years, and 744/8 = 93; cf. Fiorenza 2012).

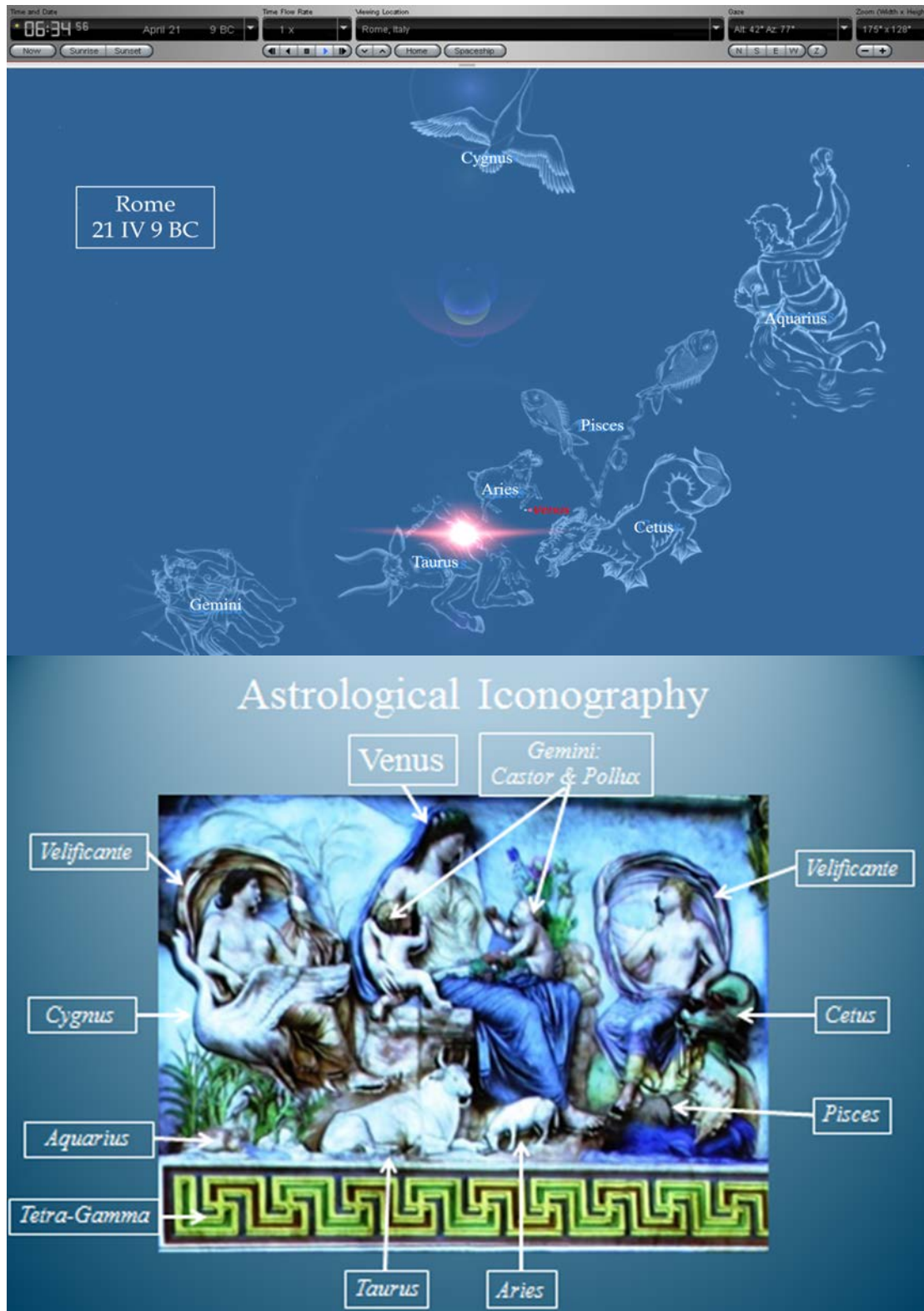


Figure 4. Sun, Venus (Morning Star phase) in Zodiac on 21 April 9 BC (top) and Astrological Iconography of the northeast "Tellus" frieze, *Ara Pacis Augustae* (bottom) (Starry Night Pro Plus6; after Rhyne 2011)

In any event, ancient Roman writers as well as modern scholars have remarked on the connection of April to Venus as Morning Star:

“The second was April: so called of the name Aphrodite, that is to say Venus, unto whom they make open sacrifice in this month. And the first day of the same, women do wash themselves, having a garland of myrtle upon their heads. (Plutarch, 262-3)

“This fact may best be recognized from Venus. When she is following the sun, she makes her appearance in the sky after his setting, and is then the Evening Star, shining most brilliantly. At other times she precedes him, rising before daybreak, and is named the Morning Star.” (Vitruvius, IX.i.7)

“...others have considered the swan as the personification of Venus, the morning star.⁸¹ The latter interpretation would give us, of course, an additional connection between scenes of the Primaporta armor and the Ara Pacis since the *Veneris astrum* on the armor is represented carrying off Aurora.” (Galinsky 1966, 230)

Recent digital reconstructions by art historians of the polychrome sculpture of the Ara Pacis (Foresta 2011; Rossini 2015, 134-141) offers another line of evidence for identifying Venus as the central figure in the NE frieze. Inspection of eight frescos from Pompeii (TAQ 79 AD) suggests that there was an artistic convention regarding the color of clothing for Mars and Venus in imperial Roman iconography such that Mars wore red, while Venus wore blue (Tiede 2015, 26-28).

The meander of the Ara Pacis is formed by 118 tetra-gamma girding the precinct enclosure wall exterior. The origin of the symbol is uncertain but is seen in Etruscan, Mycenaean and Greek iconography (D’Alviella 1894; Tiede 2015, 31). The tetra-gamma is formed by four Greek “gamma” (Γ) upper-case letters set at right angles. One suggestion is that the tetra-gamma is a solar symbol and therefore appropriate for an Augustan altar, as Augustus “envisioned ...Apollo as his personal protector.” (Green 1991, 46-49; Kleiner 1992, 62) An alternate interpretation is that the 118 tetra-gamma symbolize

the eternal order of the Cosmos by its depiction of the constellation *Ursa Minor* with the North Pole Star Polaris at the tip of its tail at midnight on each of the Four Seasons of the solar year (Tiede 2015, 32).

Either interpretation is consistent with iconography promoting the economic, political and social stability of the *Pax Augusta*.

Significance

Making explicit the astro-architectural principles of Vitruvius as seen in the *Ara Pacis Augustae* serves as a reminder of the limitations of scholarly interpretations limited to art motifs and mythology. One has only to invoke the Stoic philosophers to realize the significance of astronomy in Roman art and architecture, “*Omnis ars naturae imitatio est*” (“All Art is an imitation of Nature”) (Seneca 65). The juxtaposition of sculptures - Venus and Zodiac versus Roman Senators and Imperial family - is emblematic of the Stoic philosophy of the Augustan age, e.g.,

“The Stoic doctrine of universal ‘sympathy’ between the microcosm (man) and the macrocosm (the universe) - expressed in the dictum used later when Stoicism no longer existed, ‘as above, so below’ - and astrology seemed made for each other.” (Christie-Murray 1990, 115)

Conclusion

An analysis of the *Ara Pacis Augustae* demonstrates that astronomy played an integral part of the architectural design to memorialize the politico-religious bond between Imperium and Cosmos (cf. Rehak 2009). Therefore, what could be a more fitting venue than the *Museo dell’Ara Pacis* for exhibiting a virtual 3D animation (cf. Altair4 Multimedia 2014) depicting the annual sacrifice by the Vestal Virgins connecting the *Pax Augusta* of the SPQR to the Cosmos of the Immortal Gods at dawn on the *Dies Natalis Romae*?

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