



10.5281/zenodo.220946

ARA · PACIS · AVGVSTAE: AN ASTRO-ARCHAEOLOGICAL ANALYSIS

Vance R. Tiede

Astro-Archaeology Surveys

Received: 27/02/2016

Accepted: 20/04/2016

Corresponding author: vance.tiede@aya.yale.edu

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.25 BC). Italian archaeologists excavated (1937-38) and relocated the altar along Rome's Tiber River – rotating it 75° counter-clockwise from the original orientation. While its magnificent marble sculpture 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 site map. The author calculated the horizon declination (+11.3° decl.) of the altar's original northeast opening with Program STONEHENGE (Hawkins 1983, 328-330), Guglielmo Gatti's 1938 site map, and Google Earth satellite imagery: True Azimuth $\approx 75^\circ$; Latitude/Longitude = 41° 54' 10.47" N/12° 28' 44.60" E; Elevation ≈ 10 meters ASL; and Horizon Altitude $\approx +1.1^\circ$. The *Ara Pacis* was dedicated in 9 BC (Moretti 1947,7). Analysis shows 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 orientation was intended, because each sculptural element of the *Tellus* frieze (young woman, flowing amphora, pair of fishes, ram, bull, infant twins) 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 month and day coincide with the founding of Rome on 21 April 1 *ab urbe condita* (a.u.c) as recorded by Roman historian Marcus Terentius Varro. The dedication year of 9 BC coincides with the 93rd iteration of the eight-year Earth-Venus Synodic Period when Venus also appeared as Morning Star on the first *Dies Natalis Romae*, 21 April 753 BC.

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

1. INTRODUCTION

1.1 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 Quinctilius [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 AD, XII.ii)¹

The *Ara Pacis Augustae* was dedicated on 30 January 9 BC, about 83m (\approx 280 Roman Feet) north-east of the contemporary *Horologium Augusti* obelisk whose shadow is claimed to have pointed towards or even touched the *Ara Pacis* steps every Equinox (Buchner 1982; 2007; IDIA Lab 2013; Frischer et al. 2014; cf. Heslin 2007, 10-15). Apart from the modern discussion regarding an *Horologium* – *Ara Pacis* alignment on the birth date of Caesar Augustus, Vitruvius (c. 75-15 BC) makes clear what he understood as 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, De Architectura, IX. Vii. 1)

Italian archaeologists excavated (1937-38) the *Ara Pacis* buried some 10 meters under Rome's *Via in Lucina* no.16 and reassembled it 455 meters north-west along the left bank of the Tiber River (Moretti 1947, 6; Andersen 2003, 5). Ignoring Vitruvius' astro-orientation principles, they rotated the altar 75° counter-clockwise from its original orientation. While the altar's marble sculpture, digitally 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 orientation has remained encoded on a paper map (Gatti 1938). 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 Earth below with that of the universal order (*kosmos*) of the Immortal gods 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 did Vitruvius 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 which were incorporated into the design of the *Ara Pacis*:

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)

1.2 Description

The marble altar of the *Ara Pacis* is located inside a rectangular walled enclosure (Figure 1). The architectural inspiration of twin opposing openings 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 Twelve Gods (c. 450 BC) in the Agora of Athens (Müller 1943, 437; Thompson 1952, 79-82; Kleiner 1998, 90; Mauzy 2006, 9,90-91). Archaeological excavation confirms that the opposing enclosure openings of the Greek Altar of the Twelve Gods and of the Roman *Ara Pacis* are both oriented SW-NE (Figure 1; Tiede 2015, 36).

¹ Caesar Octavianus Augustus *Res Gestae Divi Augusti*, http://en.wikisource.org/wiki/Res_Gestae_%28Anon%29; Tiede 2015, 2.

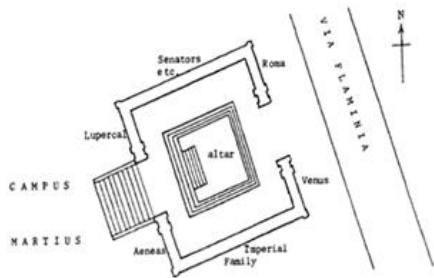


Figure 3. Ara Pacis: plan of reliefs on exterior walls (after Toynbee, "Ara Pacis Reconsidered," p. 76).



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

Unlike its Athenian antecedent, the sculpture of the Roman *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 depicting scenes of the mythological founding of Rome. The northeastern raised opening is flanked by twin friezes: the goddess *Roma*; and the altar's largest figure, a goddess variously identified as *Dea Tellus*, *Terra Mater*, *Italia*, *Pax Romana*, or *Venus Genetrix* (Figures: 1, 3 top, and 4 bottom).

2. METHODOLOGY

2.1 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" to the Emperor Augustus by means of the astro-architectural principles of Vitruvius.

2.2 Research Design

The present investigation is grounded in the interdisciplinary 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 when *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 azimuth 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 satellite image and using the 1938 map's street corners as Ground Control Points (GCPs). Figure 2 (top) confirms the Gatti map to be oriented to True North (cf. Tiede 2015,9-11 for larger images; Ur 2009).



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

The remaining input data was entered into an Excel version of Program STONEHENGE (Hawkins 1983, 328-330) to calculate the declination for the horizon 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. 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 that a 75° True Azimuth has a horizon Altitude of +0.13° (Elevation/Distance = 580m/30,100m). The modern rooftops may be ignored as they did not yet exist on the Campus Martius (Figure 2 bottom). The *Ara Pacis Augustae* was completed and dedicated in 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*. Solar declinations were generated with the planetarium software Starry Night Pro Plus 6 and compared with the *Ara Pacis*' northeast axis intercept point with the local horizon (skyline) expressed as declination.

2.3 Findings

Program STONEHENGE shows that the original axis of the *Ara Pacis Augustae* northeast enclosure opening (75° True Azimuth) met the local horizon at +11.3° declination. Starry Night Pro Plus 6 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 angular diameter of the solar disk (0.5°), we may infer that the sun rose on the northeast axis of the *Ara Pacis* on both dates.

2.3 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 April 21st or August 27th, one needs either historical or archaeological confirmatory evidence. Unfortunately, the *Res Gestae* is silent regarding the month and day; stating only that "the Vestal Virgins should there make an annual sacrifice." (Augustus, 14 AD, XII:ii) However, the marble iconography of the *Ara Pacis* contains clues in the motifs found in Art History, Astrology and Classics literature (Gundel 1992; Galinsky 1992; Herbert-Brown 2002, 79;

Pasco-Pranger 2006, 141) that may resolve the choice of date. For example, if the sculpted motifs on the much disputed *Tellus* frieze correspond to the respective Zodiac constellations and planets appearing on the local horizon at sunrise on 21 April versus 27 August 9 BC, then the iconography would confirm simultaneously both (1) the date of the annual sacrifice, and (2) that the altar's orientation was intentional rather than random.

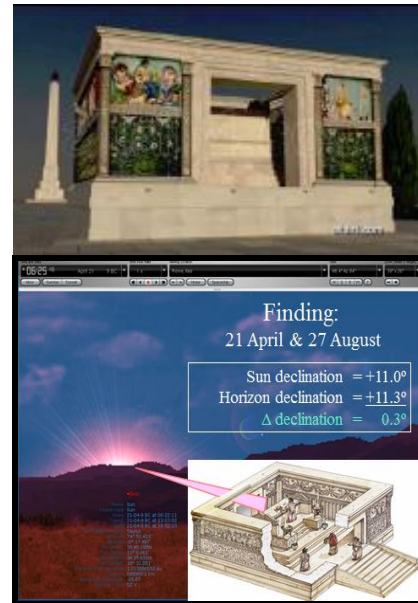


Figure 3. *Ara Pacis Augustae* at dawn 21 April & 27 August 9 BC (Altair Multimedia 2014; Starry Night Pro Plus 6; Tumbler)

Upon inspection of the *Tellus* frieze, one sees twin *velificantes* – "typical of the deities of the atmosphere 'over whom vaults the firmament' (Galinsky 1966, 229) framing the polychrome iconography. Moreover, all the other figures are consistent with an astrological motif (cf. Gundel 1992), viz.: swan (Cygnus); flowing amphora (Aquarius); sea monster (Cetus); fish head and tail (Pisces); ram (Aries); bull (Taurus); twin infants (Gemini); seated woman in blue with exposed right shoulder (Venus), and all above a tetra-gamma meander (*Ursa minor* at each of the Four Seasons at midnight) serving as a horizon separating the verdant earthly lower panel from the celestial motifs above (Figure 4 bottom; Tiede 2015, 33-34). Figure 4 (top) shows the same Zodiac constellations (Aquarius-Pisces-Aries-Taurus-Gemini) appearing adjacent to the helically rising Venus above the horizon on 21 April 9 BC.

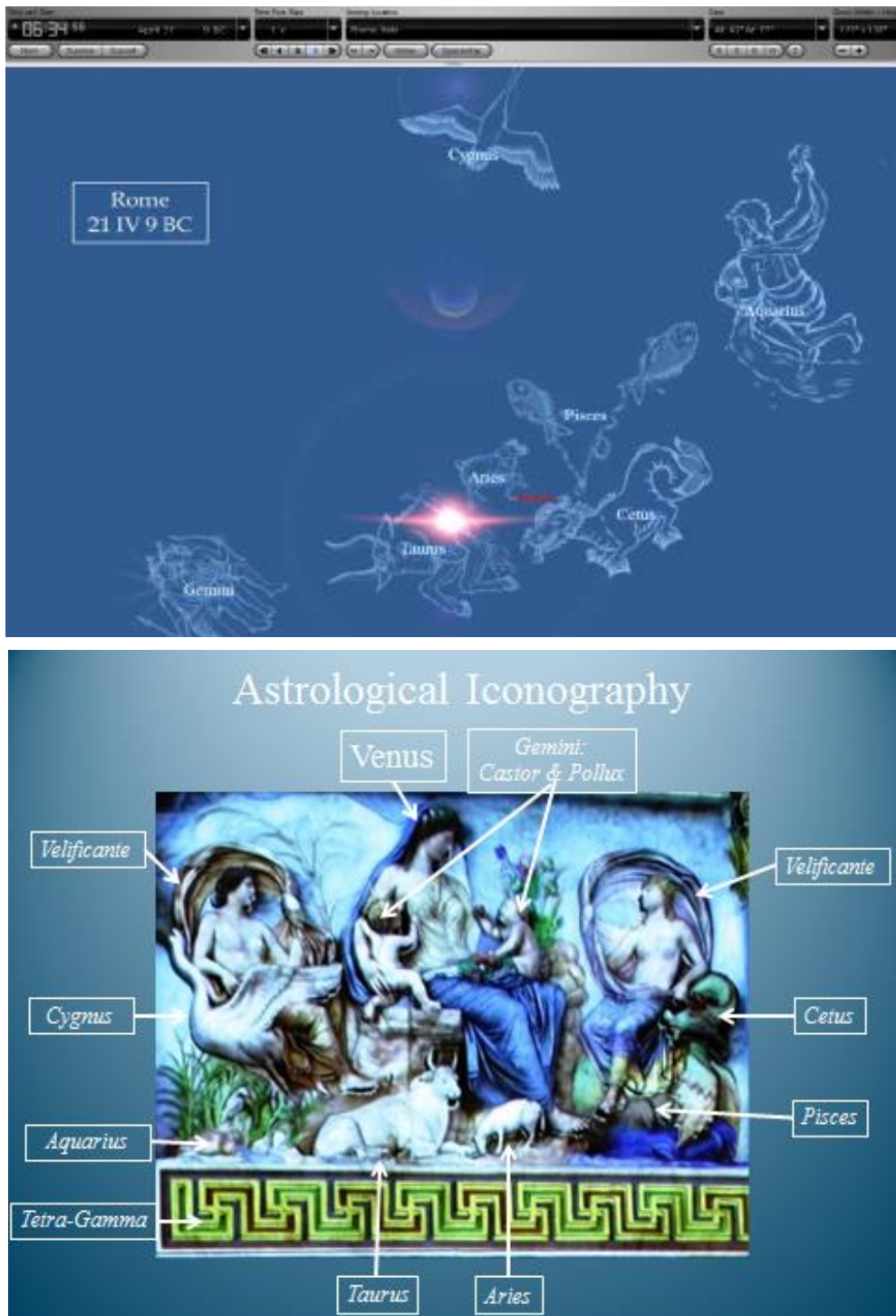


Figure 4. Sun, Venus (Morning Star) in Zodiac, 21 April 9 BC (top), and Astrological Iconography of the NE Frieze, Ara Pacis Augustae (bottom)

Conversely, Venus was invisible *below* the horizon when the Zodiac constellations Cancer-Leo-Virgo rose with the sun at dawn on 27 August 9 BC; i.e., *the astronomy does not match* the iconography of the *Tellus* frieze. Therefore, the sculptures on the *Tellus* frieze bear silent witness that they were intended to mirror their celestial counterparts at sunrise on the festival of *Parilia* (Pales, goddess of shepherds), 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. Moreover, another solar-calendric alignment of politico-religious significance occurs on April 21st, viz., the oculus-to-entrance solar-noon meridian transit alignment of the Pantheon (completed by Emperor Hadrian c.125 AD) (Hannah & Magli 2011).

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 direct 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 21 April 9 BC, the year recorded in *the Res Gestae*. Moreover, because of the eight-year Venus-Earth Synodic Period, Venus also appeared as Morning Star in Aries on the first *Dies Natalis Urbis Romae*, 21 April 753 BC (Tiede 2015, 22). Therefore, the dedication of the *Ara Pacis* in 9 BC coincided with the 93rd iteration of Venus appearing as Morning Star at the founding of Rome (753- 9 BC = 744 years, and 744/8 = 93; cf. Fiorenza 2012). Significantly, ancient Roman writers as well as modern scholars have remarked on the connection of April to Venus and 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 moneth. 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 day-break, 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 northeast 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). 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 symbolizes 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, 33-34). Either interpretation is consistent with astronomical iconography promoting the economic, political and social stability of the *Pax Augusta*.

3. CONCLUSIONS

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 informed solely by art motifs and mythology. One has only to cite Stoic philosophers to realize the significance of astronomy in Roman architecture, e.g., “*Omnis ars naturae imitatio est*” (“All art is but an imitation of nature”) (Seneca 65). The juxtaposition of the frieze pairs of the Imperial family and Roman Senate versus those the mythical past and Immortal gods 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)

Our analysis of the *Ara Pacis Augustae* demonstrates that astronomy played an integral role in the architectural design memorializing 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 an annual dawn sacrifice by Vestal Virgins which intertwined the *Pax Augusta* of the SPQR with the Cosmos of the Immortal Gods on April 21st, the *Dies Natalis Romae*?

ACKNOWLEDGEMENTS

We thank Orietta Rossini and the anonymous reviewer for their constructive comments.

REFERENCES

- Altair4 Multimedia (2014) Ara Pacis, <https://www.youtube.com/watch?v=xcnz3QQSaPo>
- Andersen, W. (2003), *The Ara Pacis of Augustus and Mussolini*, Boston: Editions Fabriart.
- Augustus (14) *Res Gestae Divi Augusti*, http://en.wikisource.org/wiki/Res_Gestae_%28Anon%29 .
- Bertarione, S. V. and G. Magli (2015) Under Augustus' sign: the role of Astronomy in the foundation of *Augusta Praetoria Salassorum*, *Cambridge Archaeological Journal*, Vol. 25, pp. 1-15.
https://www.academia.edu/5904495/Under_Augustus_sign_the_role_of_Astronomy_in_the_foundation_of_Augusta_Praetoria_Salassorum
- Buchner, E. (1982) *Sonnenuhr des Augustus: Nachdruck aus RM 1976 u.1980 u. Nachtrag über die Ausgrabung 1980/1981*, Mainz a. Rhein: Verlag Philipp von Zabner.
- Booth, A. (1966) Venus on the Ara Pacis, *Latomus*, Vol. 25, pp. 873-879.
- Christie-Murray, D. (1990) *The Practical Astrologer*, New York: St. Martin's Press.
- D'Alviella, G. (1894) *The Migration of Symbols*, London: A. Constable and Co.
- Fiorenza, N. A. (2012) <http://www.lunarplanner.com/HCPages/Venus.html>
- Foresta, S. (2011) La policromia dell'Ara Pacis e i colori del Campo Marzio settentrionale,
https://www.academia.edu/945654/La_policromia_dell_Ara_Pacis_e_i_colori_del_Campo_Marzio_settentrionale
- Frischer, B., P. A. Auber, and O. Rossini (2014) The Obelisk, Meridian, and Ara Pacis of Augustus,
<https://www.youtube.com/watch?v=GUXZ0d0sxp0>
- Galinsky, K. (1966) Venus in a Relief of the Ara Pacis Augustae, *American Journal of Archaeology*, Vol. 70, pp. 223-243.
 (1992) Venus, Polysemy, and the Ara Pacis Augustae," *American Journal of Archaeology*, Vol. 96, pp. 457-475.
- Green, M. (1991) *The Sun-Gods of Ancient Europe*, London: B.T. Batsford.
- Gundel, H. G. (1992) *Zodiakos : Tierkreisbilder im Altertum : kosmische Bezüge und Jenseitsvorstellungen im antiken Alltagsleben*, Mainz a. Rhein: Verlag Philipp von Zabern.
- Hannah, R. (2009) *Time in Antiquity*, London: Routledge.
 (2005) *Greek and Roman Calendars: Constructions of Time in the Classical World*, London: Duckworth.
- Hannah, R. and G. Magli (2011) The Role of the Sun in the Pantheon's Design & Meaning, *Numen* Vol. 58, pp. 4, 486-513.
- Hawkins, G. S. (1983) *Mindsteps to the Cosmos*, New York: Harper & Row.
 (1965) *Stonehenge Decoded*, New York: Doubleday.
- Herbert-Brown, G. (2002) *Ovid's 'Fasti': Historical Readings at its Bimillennium*, Oxford: Oxford University Press.
- Heslin, P. (2007) Augustus, Domitian and the So-called Horologium Augusti, *Journal of Roman Studies*, Vol. 97, pp. 1-20.
- IDIA Lab, Ball State University (2013)
<https://www.youtube.com/watch?list=UUtQrLF1JPprEvP4AO-iSNvw&v=-o2Crtam3R8#t=13> .
- Kleiner, D. E. E. (1992) *Roman Sculpture*, New Haven: Yale University Press.
- Moretti, G. (1947) *L'Ara Pacis Augustae*, Rome: Istituto Poligrafico dello Stato.
- Müller, V. (1943) The Shrine of Janus Geminus in Rome, *American Journal of Archaeology*, Vol. 47. pp.4, 437-440.
- National Oceanic and Atmospheric Administration (NOAA), <http://www.ngdc.noaa.gov/geomag-web/> .
- Pasco-Pranger, M. (2006) *Founding the Year: Ovid's 'Fasti' and the Poetics of the Roman Calendar*, Boston: Brill.
- Plutarch (c.100), Numa Pompilius, *Plutarch's Lives* (T. North, trans.), Vol. I, London: J. M. Dent & Co., 1898.
- Rehak, P. (2009) *Imperium and Cosmos: Augustus and the Northern Campus Martius*, Madison: University of Wisconsin Press.
- Rhyne, C. (2011) <http://cdm.reed.edu/ara-pacis/contents.php> .
- Rossini, O. (2015), *Ara Pacis guide*, Milan: Mondadori Eletta S.p.A.
- Seneca (65) L. ANNAEI SENECAE EPISTULARUM MORALIUM AD LUCILIUM LIBER SEPTIMUS LXV. SENECA LUCILIO SUO SALUTEM, 3, <http://www.thelatinlibrary.com/sen/seneca.ep7.shtml>.
- Stampini, P. (1970) Ara Pacis Augustae, *Dibattiti Rotariani*, III:5-6, Roma.

- Thompson, H. A. (1952) "The Altar of Pity in the Athenian Agora," *Hesperia: The Journal of the American School of Classical Studies at Athens*, Vol. 21, pp. 1, 47-82.
- Tiede, V. (2015), https://www.academia.edu/19159136/ARA_PACIS_AVGVSTAE_An_AstroArchaeological_Analysis_PPT_slides
- Toynbee, J.M.C. (1953) *Ara Pacis Reconsidered and Historical Art in Roman Italy*, London: Geoffrey Cumberledge.
- Tumblr, <http://mappaemundi.tumblr.com/post/87884514617/lara-pacis-augustae-ovvero-laltare-della-pace>
- Ur, J. (2009) Lab 4: Georeferencing Imagery, CPAS Archaeological GIS Workshop.
http://www.fas.harvard.edu/chinaarch/Downloads/gis/L04_images/L04%20Georef%20Imagery%20English.pdf
- Van Buren, A. W. (1913) "The Ara Pacis Augustae," *The Journal of Roman Studies*, Vol.3, pp. 1, 134-141.
- Vitruvius (c. 25 BC) *De Architectura Libri Decem* (M.H. Morgan, trans.), New York: Dover Press, 1960.
- Zanker, P. (1990) *The Power of Images in the Age of Augustus*, Ann Arbor: University of Michigan Press.