

Harmony and Symmetry

Celestial regularities shaping human culture

Proceedings of the SEAC 2018 Conference in Graz

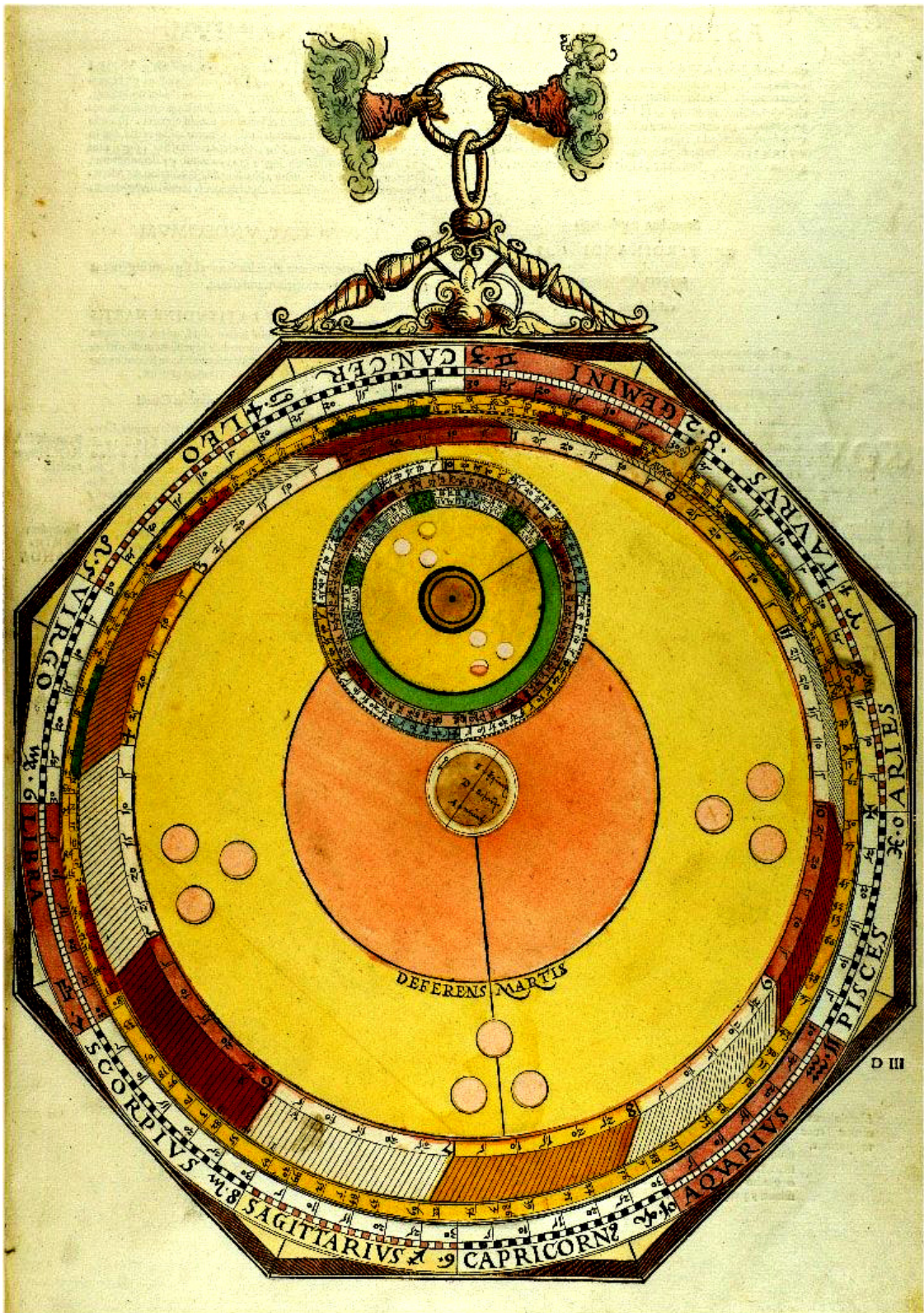


Figure 0.1:

Apian's *Astronomicum Caesareum*, Deferens Martis

(UB Graz)

European Society for Astronomy in Culture
SEAC Publications; Vol. 01

**Sonja Draxler, Max E. Lippitsch
& Gudrun Wolfschmidt**

Harmony and Symmetry

Celestial regularities shaping human culture

Proceedings of the SEAC 2018 Conference in Graz



Hamburg: tredition 2020

European Society for Astronomy in Culture
SEAC Publications (ISSN 2701-889X),
ed. by Gudrun Wolfschmidt, University of Hamburg

Harmony and Symmetry. Celestial regularities shaping human culture.
Proceedings of the SEAC 2018 Conference in Graz. Edited by
Sonja Draxler, Max E. Lippitsch & Gudrun Wolfschmidt.
Hamburg: tredition (SEAC Publications; Vol. 01) 2020.

Front Cover: Johannes Kepler: Mysterium Cosmographicum (Tübingen 1596).

Frontispice: Apian's Astronomicum Caesareum, Deferens Martis (UB Graz)

Title Page: Logo SEAC

*Back Cover: Calendar Table with gods of the day and Zodiac in Cistercian monastery Stift Rein,
Zodiac sign Capricorn, Andreas Pleninger, 1607 (Photo: Kurt Roth)*

SEAC Publications (ISSN 2701-889X), ed. by Gudrun Wolfschmidt,
Center for History of Science and Technology, Hamburg Observatory, University of Hamburg
<https://www.fhsev.de/Wolfschmidt/GNT/research/nuncius.php#SEAC>

The publication including all its parts is protected by copyright. Any exploitation is not permitted without the consent of the publisher and the author. This is especially true for reproductions, translations, microfilming as well as storage and processing in electronic systems.

Verlag und Druck: tredition GmbH, Halenreihe 40–44, 22359 Hamburg, Germany
ISBN – 978-3-347-14632-7 (Paperback), 978-3-347-14633-4 (Hardcover),
978-3-347-14634-1 (e-Book), © 2020 Gudrun Wolfschmidt.

Table of Contents

Preface: Harmony and Symmetry –

Celestial regularities shaping human culture

Sonja Draxler, Max E. Lippitsch & Gudrun Wolfschmidt 17

0.1.1 References 19

0.1.2 Sponsoring 20

1 Prehistoric Times 21

Common features of megalithic stone rows in western Switzerland

Rita Gautschy 22

1.1.1 Introduction 22

1.1.2 Method 22

1.1.3 Site 1: Yverdon-les-Bains Clendy 23

1.1.4 Site 2: Lutry La Possession 25

1.1.5 Site 3: Sion Chemin des Collines 26

1.1.6 Conclusion 28

1.1.7 Appendix 29

1.1.8 Bibliography 29

The summer solstice sun at Lepenski Vir

Aleksandra Bajić & Hristivoje Pavlović 31

1.2.1 Introduction 31

1.2.2 Methodology 31

1.2.3 Results 34

1.2.4 Observation 36

1.2.5 Archaeological Findings, which reinforce the Assumption that Lepinski Vir was the Place where the Sun was Observed 37

1.2.6 Conclusions 38

1.2.7 References 38

Structure of the sacred space, astronomical orientation and functional evolution of the rock-cut monument near the village of Lilyach, Kyustendil region, Bulgaria

Alexey Stoev, Penka Maglova, Vassil Markov, Dimitriya Spasova & Anton Genov 39

1.3.1 Introduction 39

1.3.2 Methodology 41

1.3.3	Archaeoastronomical research	41
1.3.4	Conclusion	44
1.3.5	References	44

Eneolithic Calendar in the Magura Cave, Bulgaria

<i>Penka Maglova, Alexey Stoev & Mina Spasova</i>		45
1.4.1	Introduction	45
1.4.2	Eneolithic monochrome paintings of the Magura cave	46
1.4.3	Methods of research	48
1.4.4	Results – Analysis of the Solar Hall paintings	49
1.4.5	Reading the Eneolithic calendar	50
1.4.6	Discussion	52
1.4.7	References	53

Calendrical Interpretation of Spirals in Irish Megalithic Art

<i>Marc Türler</i>		54
1.5.1	Introduction	54
1.5.2	A dynamic approach of the art	56
1.5.3	Observable properties of astronomical cycles	57
1.5.4	Calendrical interpretation of five spiral motifs	60
1.5.5	Discussion	63
1.5.6	Conclusion	65
1.5.7	References	65

Vršac Circles a possible archaeoastronomy related site celebrating the rebirth and life in the South Banat district of Serbia

<i>Marc Frîncu, Aleksandra Bajić, Leonard Dorogostaisky & Tamaš Fodor</i>		67
1.6.1	Introduction	67
1.6.2	Overview of the area	68
1.6.3	Research methodology	68
1.6.4	Archaeoastronomical analysis	70
1.6.5	Discussion	74
1.6.6	Bibliography	75

2 Bronze Age and Iron Age 77

The Orientations of the Chamber-Tombs at Mavro Spelio, Crete: a clue to their historical significance

<i>Göran Henriksson & Mary Blomberg (1934–2020)</i>		78
2.1.1	Introduction	78
2.1.2	Methods	79
2.1.3	Chamber tombs	79
2.1.4	Cults rooms	80
2.1.5	Chamber tombs at Mavro Spelio	81

2.1.6	Bibliography	83
Games for Cosmos – How the Minoan elite ruled their people by mastering ritual performance and the cycles of time		
	<i>Marianna P. Ridderstad</i>	84
2.2.1	Introduction	84
2.2.2	Outline of the Minoan culture	85
2.2.3	3. Games in the Minoan culture – Minoan gameboards	87
2.2.4	Games in the Minoan culture – Representations of games and sports in art	91
2.2.5	‘Games for cosmos’: the meaning of games in Minoan ritual life	92
2.2.6	Conclusions	96
2.2.7	Bibliography	96
The Hittite Rock Sanctuary of Yazılıkaya: A Time-Keeping Device from ca. 1230 B.C.		
	<i>Eberhard Zangger & Rita Gautschy</i>	98
2.3.1	The Sanctuary	98
2.3.2	Indications for a Technical Function of Yazılıkaya	99
2.3.3	Astronomical Calculations to Determine Horizon Profiles	101
2.3.4	Chamber A: Keeping Track of Days, Months, and Years	102
2.3.5	Conclusions	104
2.3.6	Bibliography	105
A Statistical Analysis of the Motifs on Bronze Age Golden Hats		
	<i>Marc Thuillard</i>	107
2.4.1	Introduction	107
2.4.2	Method	109
2.4.3	Results	111
2.4.4	Discussion	112
2.4.5	Conclusion	113
2.4.6	Bibliography	113
2.4.7	Annex: Software Program	114
Exceptional evidence of a prehistoric meteorite impact at the archaeological site of Stöttham (Chiemgau, SE-Germany)		
	<i>Barbara Rappenglück, Michael Hiltl & Kord Ernstson</i>	116
2.5.1	Introduction	117
2.5.2	The archaeological site of Chieming-Stöttham	117
2.5.3	A sample of ‘slag’ containing non-ferrous metal	119
2.5.4	Results	119
2.5.5	A more accurate dating of the Chiemgau meteorite impact	122
2.5.6	Summary	124
2.5.7	Bibliography	124

Archaeoastronomical “Stratigraphy”: Investigations on a Cisalpine Celtic Enclosure

<i>Stefano Spagocci & Adriano Gaspani</i>	126
2.6.1 Introduction	126
2.6.2 Site Alignments	126
2.6.3 The Dating Algorithm	128
2.6.4 Site Dating	130
2.6.5 Built by a Priestess?	131
2.6.6 Final Remarks	133
2.6.7 Bibliography	133

3 Mythology and Ethnoastronomy 135

A Catchy World Model:

The Concept(s) of Cosmic Mountain(s) Used by Ancient Cultures

<i>Michael A. Rappenglück</i>	136
3.1.1 Mountains – General Remarks	136
3.1.2 Cosmogony: The Primordial Hill, the Womb of the World, the World Cave	137
3.1.3 World Mountain, Water Cycle, Milky Way, and the Four Rivers	139
3.1.4 Cosmology: The 3D-shape of the World Mountain	140
3.1.5 The World Mountain as a spatial-temporal structure	140
3.1.6 The World Mountain: transcendence and the beyond	142
3.1.7 Conclusion	143
3.1.8 Bibliography	144

Skyscape as a Cultural Fulfilment of a Cognitive Task

<i>Jadran Kale</i>	146
3.2.1 Introduction	146
3.2.2 The Ethnography of a Socially ‘Small’ Sky	146
3.2.3 Cognitive Foundations of ‘Small’ and ‘Large’ Skies	148
3.2.4 Travelling with Mentalscapes	149
3.2.5 Conclusion	152
3.2.6 Bibliography	153

4 Babylonian Astronomy 155

Babylonian Constellations in Stellarium 0.19.*

<i>Susanne M. Hoffmann</i>	156
4.1.1 Introduction	156
4.1.2 MUL.APIN Sky Culture – the -2^{nd} millennium	156
4.1.3 Seleucid Sky Culture – the -1^{st} millennium	160
4.1.4 Method	161
4.1.5 Result and Uncertainties	161
4.1.6 Conclusion	161

4.1.7	References	162
4.1.8	Appendix 1 (Pictures)	162
4.1.9	Appendix 2	163

Celestial regularity as a basis of time-reckoning

Hermann Hunger 172

4.2.1	Introduction – calendar and time	172
4.2.2	Subdivision of day and night	174
4.2.3	Measuring devices	174
4.2.4	Bibliography	178

Ziggurats: An Astro-Archaeological Analysis

Vance Tiede 179

4.3.1	Introduction	179
4.3.2	Historical Evidence	179
4.3.3	Research Objectives	180
4.3.4	Research Significance	180
4.3.5	Limitations	180
4.3.6	Methodology	181
4.3.7	Analysis	182
4.3.8	Conclusion	184
4.3.9	Bibliography	186

5 Greek and Roman Astronomy 189

Where does astronomy sit? Astronomy in some of its contexts

Liba Taub 190

5.1.1	Introduction	190
5.1.2	Sensible Models	191
5.1.3	Theoretical and practical astronomy	192
5.1.4	Astronomy and philosophy: the astronomer as philosopher	193
5.1.5	Bibliography	194

On the Orientation of Roman Cities in the Illyrian Coast: a Statistical and Comparative Study

Juan Antonio Belmonte, Andrea Rodríguez-Antón &

A. César González-García 196

5.2.1	Introduction	196
5.2.2	Data on Illyrian cities and discussion	198
5.2.3	Appendix: Data on ancient Roman cities of Histria and Dalmatia	201
5.2.4	Conclusion	201
5.2.5	References	203

Archeoastronomical research in Felix Romuliana

(The palace, neither on Heaven nor on the Earth)

<i>Aleksandra Bajić & Milan S. Dimitrijević</i>	204
5.3.1 Introduction	204
5.3.2 Where is that Groma (or Umblicus)?	205
5.3.3 The Temples	207
5.3.4 Magura, the Sacred Hill	209
5.3.5 Conclusions	211
5.3.6 Bibliography	212

6 The Middle Ages and beyond

213

Diachronic evolution of the orientation of early Christian and medieval churches of Rome

Isabella Leone, S. Gaudenzi, Franco Meddi, Vito Francesco Polcaro (1945–2018) & F. Carnevale

214

6.1.1 Introduction	214
6.1.2 Measurement methodology	215
6.1.3 Results	216
6.1.4 Data Analysis	216
6.1.5 Discussion and conclusion	220
6.1.6 Acknowledgements	222
6.1.7 Bibliography	222

The orientation of Early Christian and medieval churches inside and next to the Roman centuria of northern and central Italy

Eva Spinazzè

223

6.2.1 Introduction	223
6.2.2 Methodology	223
6.2.3 Calendars	224
6.2.4 Analysis and Results	225
6.2.5 Conclusion	229
6.2.6 References	230

The astrological cycle of Schifanoia: a digital representation

Manuela Incerti

233

6.3.1 Museums and digital	233
6.3.2 Historical notes on the Palace, the frescoes and its patrons	233
6.3.3 Multimedia tools and the renovation of the museum	235
6.3.4 The 3D model, information and interactive storytelling	236
6.3.5 Digital technologies for Astronomical Heritage: the lines of development for the near future	240
6.3.6 Project contributors	240
6.3.7 Bibliography	241

Astronomical Treasures in Stift Rein

<i>Sonja Draxler & Max E. Lippitsch</i>	242
6.4.1 Introduction	242
6.4.2 Motus astrorum	242
6.4.3 Wurmprecht Calendar	244
6.4.4 Sacrobosco's <i>De sphaera</i>	244
6.4.5 Apian's <i>Astronomicum Caesareum</i>	245
6.4.6 Great Comet of 1577	246
6.4.7 Calendar table	248
6.4.8 Representative rooms of the monastery	250
6.4.9 References	251

The change of worldview during Renaissance and its impacts on the architecture in the Czech lands during 16th and early 17th century

<i>Nikolaos Ragkos</i>	252
6.5.1 Introduction	252
6.5.2 The cultural movement of Renaissance – Its origin, ambience and changes	252
6.5.3 Renaissance beyond the Italian Alps	253
6.5.4 The evolution of the science of astronomy during the Renaissance	254
6.5.5 Renaissance architecture in the Czech Lands	255
6.5.6 Precedent case studies – Methods and Data	255
6.5.7 Results and discussion	257
6.5.8 Conclusion	259
6.5.9 References	260

A 17th century “Mountain Calendar” from Żywiec (Poland): an erudite's invention or a local Mountaineers' tradition?

<i>Mariusz Ziółkowski, Maciej Sobczyk, Bartłomiej Ćmielewski & Wojciech Mirocha</i>	262
6.6.1 The factographical basis of the study	262
6.6.2 Analysis	265
6.6.3 Interpretation	266
6.6.4 Bibliography	268

Schloss Eggenberg – A Symbolic World

<i>Barbara Kaiser</i>	269
6.7.1 Introduction	269
6.7.2 Prince Eggenberg	271
6.7.3 The new residence	272
6.7.4 Utopia	273
6.7.5 The private universe	273
6.7.6 The architectural calendar	275
6.7.7 Coincidentia Oppositorum – The Uniting of Opposites	277
6.7.8 Sunt Coelo Digni – The Planetary Room	278
6.7.9 <i>Saturn</i>	280

6.7.10	<i>Mercury</i>	280
6.7.11	Bibliography	282

7 Johannes Kepler 283

Johannes' Kepler's Political Cosmology, Psychological Astrology and the Archaeology of Knowledge in the Seventeenth Century

<i>Nicholas Campion</i>		284
7.1.1	Introduction	284
7.1.2	The Cosmos as a State	285
7.1.3	Conclusion	287
7.1.4	Bibliography	287

Meteorological astrology by Johannes Kepler and Georg Krafft's prediction for ice drift on the Neva River in 1732

<i>Karine Dilanian</i>		289
7.2.1	Introduction	289
7.2.2	Methodology	289
7.2.3	The author of the calendar	290
7.2.4	The content and the structure of Krafft's article	290
7.2.5	Interrelation of Krafft's text with the other texts and philosophical concepts: Kepler, Pico and Ptolemy	292
7.2.6	Musical harmony, human soul and astrology	294
7.2.7	Methodology of astrological meteorological prediction: Kepler and Krafft	294
7.2.8	Conclusion	298
7.2.9	Bibliography	298

The ancient doctrine of the Great Year and its possible influence on Johannes Kepler and Dionysius Exiguus

<i>Sepp Rothwangl</i>		299
7.3.1	Introduction	299
7.3.2	The ancient doctrine of a Great Planetary Year	300
7.3.3	Epochs based upon planetary massing in other cultures	300
7.3.4	Johannes Kepler and chronology	301
7.3.5	Kepler's own search for a date of the creation with the Great Year doctrine	302
7.3.6	Early Christian dissemination of the Great Year	303
7.3.7	Dionysius Exiguus inventing Anno Domini	304
7.3.8	Comparison and conclusion	305
7.3.9	Bibliography	306

The harmony of Johannes Kepler: Elliptical form in geometry and music

<i>Uliva Velo</i>		308
7.4.1	Kepler and his "Harmonies of the World"	308

7.4.2	Interconnections	312
7.4.3	The ellipse and its composition	312
7.4.4	Conclusion	315
7.4.5	Bibliography	315

Graz and Kepler – working, living, and commemoration

Bruno P. Besser, Mohammed Y. Boudjada, Max E. Lippitsch & Sonja

<i>Draxler</i>		316
7.5.1	Kepler's commemoration	316
7.5.2	Plaques for Johannes Kepler	317
7.5.3	Monuments at public places	317
7.5.4	Educational institutes named after Kepler	319
7.5.5	Buildings remembering Kepler	320
7.5.6	Artwork remembering Johannes Kepler	320
7.5.7	Further memorials	320
7.5.8	Bibliography	321
7.5.9	Original Documents from Johannes Kepler in Graz	321

8 Meso- and South America 323

TOLUPAN Universe: A Mesoamerican Cosmivision

<i>Javier Mejuto & Eduardo Rodas-Quito</i>		324
8.1.1	Introduction	324
8.1.2	Tomam Family	325
8.1.3	The Moons and the Suns	326
8.1.4	The Eclipses	326
8.1.5	The Stars	327
8.1.6	Discussion	328
8.1.7	Conclusions	328
8.1.8	References	328

Identification of Seri's Constellations from Memory and Experience

Arturo Morales Blanco, Alejandro Aguilar Zeleny, Julio Saucedo

<i>Morales & Raul Perez-Enriquez</i>		330
8.2.1	Introduction	331
8.2.2	Memory and tradition	332
8.2.3	Family of Morales Colosio	333
8.2.4	Experiences	333
8.2.5	Seri's Constellations and stars	333
8.2.6	Ethnographical relations	334
8.2.7	Zaamth or Crab	334
8.2.8	Haapjc or Deer hunter	334
8.2.9	<i>Caamoilcoj</i> or Wheel game	335
8.2.10	Coohamc or Women and their Husband	335
8.2.11	Stories in coiqui hitom	335

8.2.12	Conclusions	337
8.2.13	Bibliography	337

The calendrical period of 13 days as a basis to explain the solar orientation of architectural structures in Mesoamerica

<i>Jesús Galindo Trejo</i>		338
8.3.1	Introduction	338
8.3.2	Calendric-astronomical orientation	339
8.3.3	A general pattern of solar orientations in Mesoamerica	343
8.3.4	Observational proposal of the origin of trecena in the Mesoamerican calendrical system	345
8.3.5	Conclusions	347
8.3.6	References	347

Significant orientations of structures in Copán, Honduras

<i>Hasso Hohmann</i>		349
8.4.1	Introduction	349
8.4.2	Alignment of the Structures of Courtyard A	352
8.4.3	Creating a Hypothesis	354
8.4.4	One Possibility of How to Construct the Observation Point	355
8.4.5	Bibliography	357

The use of the Palenque ratio in the Lunar Series as a means to perform long-time calculations linking the ruling dynasty with its patron deities

<i>Stanisław Iwaniszewski</i>		358
8.5.1	Introduction	358
8.5.2	The use of the Lunar Series at Palenque	359
8.5.3	11960-day intervals at Palenque	360
8.5.4	Conclusions	362
8.5.5	References	363

Solar alignments and observational techniques in Mesoamerica

<i>Ivan Šprajc</i>		365
8.6.1	Introduction	365
8.6.2	Methodology	368
8.6.3	Results and Discussion	369
8.6.4	Conclusion	374
8.6.5	References	375

Meaning and Coincidences. A study into the archeoastronomy of Inka structures and their ritual significance

<i>José Nicolás Balbi</i>		377
8.7.1	Presentation	378

8.7.2	Conclusions	383
8.7.3	Bibliography	383

The Ceremonial Centre of Llactapata and the Coricancha of Cusco:

A Comparison

<i>John McKim Malville & Gery R. Ziegler</i>		385
8.8.1	History and Observations	385
8.8.2	Llactapata's Sector I	387
8.8.3	State Organized Pilgrimage	390
8.8.4	The Michihuayunca Ushnu	392
8.8.5	Conclusions	392
8.8.6	Bibliography	393

The "Intihuatana" of Saywite (Perú): an archaeoastronomical investigation on the role of time marker of the gnomon

Silvia Motta, Adriano Gaspani, Nicolas Balbi, Gustavo Manuel

<i>Corrado, Sixto Giménez Benítez & José Luis Pino Matos</i>		394
8.9.1	Introduction	395
8.9.2	Conclusion	401
8.9.3	Bibliography	402

9 Middle East and Eastern Asia 403

Kaaba a house built under the Sun

<i>Reza Assasi</i>		404
9.1.1	Kaaba a house built under the Sun	404
9.1.2	Bibliography	409

A Short History of Archeoastronomy in Japan: With focus on alignment studies of stone circle, settlement and burials

<i>Akira Goto</i>		410
9.2.1	Introduction	410
9.2.2	Pioneer Studies by the British	411
9.2.3	Burials and Stone Circles of the Jomon Period	412
9.2.4	Yayoi Settlement Studies	414
9.2.5	Kofun Orientation Revisited	415
9.2.6	The Recent Situation in Japan	416
9.2.7	Conclusion	417
9.2.8	Bibliography	417

10 Computational Astronomy	419
A Virtual Park of Astronomical Instruments	
<i>Georg Zotti</i>	420
10.1.1 Introduction	420
10.1.2 Software Components for Interactive Simulation in Historical Astronomy	421
10.1.3 Serious Gaming under <i>Stellarium</i> 's Skies	422
10.1.4 Three Modes of Program Connection	424
10.1.5 Discussion and conclusions	427
10.1.6 Bibliography	428
 11 Appendix	 431
SEAC Conference in Graz – Information	432
11.1.1 SEAC 26 th Scientific Committee	433
11.1.2 SEAC 26 th Local Organizig Committee	433
 SEAC 2018 in Graz: List of Participants	 434
 Index	 435