COSMOLOGY ACROSS CULTURES

Proceedings of a workshop held at
Parque de las Ciencias, Granada, Spain
8–12 September 2008

Edited by

José Alberto Rubiño-Martín
Instituto de Astrofísica de Canarias, La Laguna, Tenerife, Spain

Juan Antonio Belmonte
Instituto de Astrofísica de Canarias, La Laguna, Tenerife, Spain

Francisco Prada
Instituto de Astrofísica de Andalucía, Granada, Spain

and

Antxon Alberdi
Instituto de Astrofísica de Andalucía, Granada, Spain
Contents

Preface ................................................................. xi

Participants .......................................................... xiii

Conference Photograph ............................................. xviii

Part 1. Cosmology for an Evolving World

Views from the Center of the Universe ........................... 3
N. E. Abrams and J. R. Primack (Invited Speakers)

Many Worlds in One ................................................ 14
A. Vilenkin (Invited Speaker)

Past, Present and Future of Cosmic Microwave Background Observations: Implications for Cosmology ..................... 19
J. A. Rubiño-Martín (Invited Speaker)

The Properties of Nearby Galaxy Structures ..................... 29
M. Biernacka, P. Flin, T. Juszczyk and E. Pankó

N-body Simulations of Galaxy Formation: Elliptical Galaxies .... 34
A. C. González-García (Invited Speaker)

Supernovae and Dark Energy ....................................... 42
I. Domínguez, E. Bravo, L. Piersanti, O. Straniero and A. Tornambé

Cosmologists in the Dark ........................................... 47
V. J. Martínez and V. Trimble (Invited Speaker)

A Conceptual and Cultural History of Gravitational Lensing .... 57
D. Valls-Gabaud (Invited Speaker)

Sociology of Modern Cosmology .................................... 66
M. López-Corredoira (Invited Speaker)

Some New Reflections on Mr. Palomar ........................... 74
O. Bertolami

Seeing the Universe: On the Cusp of Technology ............... 82
C. Impey
## Contents

A Timeline of Astronomers and Cosmologists ..................................................... 87  
*T. Hockey*

### Part 2. Drilling the Past

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Cosmology of William Herschel</td>
<td>91</td>
</tr>
<tr>
<td><em>M. Hoskin (Invited Speaker)</em></td>
<td></td>
</tr>
<tr>
<td>Did I Say Cosmology? On Modern Cosmologies and Ancient World-views</td>
<td>100</td>
</tr>
<tr>
<td><em>S. Iwaniszewski (Invited Speaker)</em></td>
<td></td>
</tr>
<tr>
<td>Constructing Worlds: Cosmovisions as Integral Parts of Human</td>
<td>107</td>
</tr>
<tr>
<td>Ecosystems</td>
<td></td>
</tr>
<tr>
<td><em>M. A. Rappenglück (Invited Speaker)</em></td>
<td></td>
</tr>
<tr>
<td>The Egyptian Civil Calendar: a Masterpiece to Organize the Cosmos</td>
<td>116</td>
</tr>
<tr>
<td><em>J. A. Belmonte (Invited Speaker)</em></td>
<td></td>
</tr>
<tr>
<td>Locating True North in Ancient China</td>
<td>128</td>
</tr>
<tr>
<td><em>D. W. Pankenier (Invited Speaker)</em></td>
<td></td>
</tr>
<tr>
<td>African Cosmology</td>
<td>138</td>
</tr>
<tr>
<td><em>J. C. Holbrook (Invited Speaker)</em></td>
<td></td>
</tr>
<tr>
<td>Heavenly Messengers: The Role of Birds in the Cosmographies and the</td>
<td>145</td>
</tr>
<tr>
<td>Cosmovisions of Ancient Cultures</td>
<td></td>
</tr>
<tr>
<td><em>M. A. Rappenglück</em></td>
<td></td>
</tr>
<tr>
<td>The Primeval Zodiac: Its Social, Religious, and Mythological Background</td>
<td>151</td>
</tr>
<tr>
<td><em>L. Verderame</em></td>
<td></td>
</tr>
<tr>
<td>Arcturus and the Bears</td>
<td>157</td>
</tr>
<tr>
<td><em>E. Antonello</em></td>
<td></td>
</tr>
<tr>
<td>The Antikythera Mechanism: An Archaeoastronomical Artefact in its</td>
<td>160</td>
</tr>
<tr>
<td>Literary and Religious Context</td>
<td></td>
</tr>
<tr>
<td><em>N. Campion</em></td>
<td></td>
</tr>
<tr>
<td>A New Test of Einstein’s Theory of Relativity by Ancient Solar</td>
<td>166</td>
</tr>
<tr>
<td>Eclipses</td>
<td></td>
</tr>
<tr>
<td><em>G. Henriksson</em></td>
<td></td>
</tr>
<tr>
<td>The Astral Curved Disc of Chevroches (France)</td>
<td>172</td>
</tr>
<tr>
<td><em>F. Devevey and A. Rosseau</em></td>
<td></td>
</tr>
<tr>
<td>Finding the Sacred Direction: Medieval Books on the Qibla</td>
<td>177</td>
</tr>
<tr>
<td><em>M. Rius</em></td>
<td></td>
</tr>
<tr>
<td>El libro del Relogio del Palacio de las Horas</td>
<td>183</td>
</tr>
<tr>
<td><em>J. D. Morales</em></td>
<td></td>
</tr>
<tr>
<td>Astronomy of Maimonides and Its Arabic Sources</td>
<td>188</td>
</tr>
<tr>
<td><em>A. Belenkiy</em></td>
<td></td>
</tr>
</tbody>
</table>
Bianchini's Patron: "El Rei D. João V de Portugal" ......................... 203

C. M. da Silva

Astronomical Orientations of Sacred Architecture during the Medieval Period in Slovenia ........................................... 209

S. Čaval

The Hall of the Months of the Palace Schifanoia (Ferrara 1469-70) .... 220

M. Incerti

Astronomies and Cosmologies in the Latin West .......................... 228

S. C. McCluskey (Invited Speaker)

The Milky Way through the Ages: An Iconographic Journey .......... 237

F. Bertola (Invited Speaker)

How Galileo and Kepler Countered Aristotle's Cosmological Errors 242

O. Gingerich (Invited Speaker)

Part 3. American Dreams

Mesoamerican Cosmology: Recent Finds ................................... 253

J. Galindo Trejo (Invited Speaker)

Animating the Inanimate: Camay and Astronomical Huacas of Peru ... 261

J. M. Malville

Lunar Standstill Markers at Preclassic Temples at the Buena Vista Site in Perú ......................................................... 267

L. R. Adkins and R. A. Benfer Jr

Archaeoastronomy in the Muisca Territory ................................ 272

J. D. Morales

A Comparison of Two Independent Models of the Solar System: Bode's Law and the 260 Day Mesoamerican Calendar ................. 277

R. R. Zito

A Single Mention of a Fourth Cosmological System in Mesoamerica 283

A. Lebeuf

Pueblo Folklore, Landscape Phenomenology and the Visual Poetics of Fajada Butte ...................................................... 289

C. Carey

A Remarkable Comet and Other Astronomical Objects in the Brazilian Art Rock ......................................................... 297

R. R. de F. Mourão

Astronomical and Cosmological Aspects of Maya Architecture and Urbanism ......................................................... 303

I. Šprajc (Invited Speaker)
Part 4. Stones and Stars

Orientation and Distribution of Various Dry Stone Monuments of the Sahara .................................................. 317
Y. Gauthier (Invited Speaker)

Gran Canaria Re-visited .................................................. 331
J. C. Gil and J. A. Belmonte

The Chiemgau Impact: An Extraordinary Case Study for the Question of Holocene Meteorite Impacts and their Cultural Implications .......... 338
B. Rappenglück, K. Ernstson, W. Mayer, A. Neumair, M. A. Rappenglück, D. Sudhaus and K. W. Zeller

Observations of Far-Southerly Moonrise from Hagar Qim, Ta’Hagrat, and Ggantija Temples from May 2005 to June 2007 .................. 344
J. Cox

Interdisciplinary Approach to Megalithic Tombs in Northern Iberia .... 349
R. Gil-Merino, M. A. Moreno Gallo, G. Delibes de Castro and A. C. González-García

Statistical Analysis of Iberian Peninsula Megaliths Orientations ........ 354
A. C. González-García

The Sky and the Landscape of Rock Art in the Ceira and Alva Basins .... 359
F. Pimenta, N. Ribeiro, A. Smith and L. Tirapicos

The Moon in the Perception and Measurement of Social and Ritual Time. Comments on the Pre-historic Record ......................... 364
C. Oliveira

The Megalithic Complex of the “Preta ‘ru Mulacchi” on the Monte della Stella .................................................. 370
V. F. Polcaro and D. Ienna

The “Madonna di Loreto” Bronze Age Sanctuary and its Stone Calendar 375
A. Tunzi, M. L. Zupone, E. Antonello, V. F. Polcaro and F. Ruggieri

Beyond the Cosmological: Numerical Scenarios underneath Ancient Annular Architectural Structures .................................. 380
M. Ranieri

First Solar and Stellar Paintings in the Epipaleolithic and Neolithic Rock Art of the Iberian Peninsula (II): new Shelters and Ceramic Pieces decorated with Astral Paintings .................................. 387
J. Fernández Quintano

Archaeoastronomical Information in the Study of Cremation Necropolis: Preliminary Study .................................................. 391
J. Mejuto, M. L. Cerdeño and C. Rodríguez

Review of Topo-astronomical Methods for the Precise Orientation in Archaeological Sites .................................................. 396
G. Rodríguez-Caderot, M. Folgueira, J. Mejuto and E. Pascual
Archaeoastronomical and Visibility Analysis of the "Acropolis" on the Cesi Hill, Umbria .................................................... 400
G. Magli and N. Schiavottiello

Astronomical Orientation in Ancient Dacian Sanctuaries of Piatra Carivii, Romania. Preliminary Results .................. 408
F. Stanescu

Prime Astroarchaeological Researches near Mountain-Monastyri in the Western Altai ............................................ 413
L. Marsadolov and N. Dmitrieva

Material Culture As Cosmological Marker ................................ 422
G. Dimitriades

Solar Orientations of Bronze Age Shrines in Gournia, Crete .......... 430
G. Henriksson and M. Blomberg

Were there Astronomical Rituals at the Minoan Peak Sanctuaries on Crete? .......................................................... 436
P. E. Blomberg

At the Dawn of Greek Astronomy: The Temple of Zagora on Andros .... 442
A. Coucouzeli and O. Avgouli

Cosmological Interpretation of Ethnological Artifacts – A Study of the Igbo People of Nigeria ............................ 450
B. Chukwuezi

Part 5. Methodologies

Prehistoric Cosmology. A Methodological Framework for an Attempt to Reconstruct Bronze Age Cosmologic Ideas in the Carpathian Basin 457
E. Pásztor

From Survey to Education: How Augmented Reality Can Contribute to the Study and Dissemination of Archaeoastronomy .......... 464
N. Schiavottiello

The General Technique of the Research of Historical Sites in the Astronomical Coordinates .................................. 469
O. Polyakova

Cosmic Symbolism in Cultures of the Epoch of Bronze .............. 475
D. Emchenko and O. Polyakova

Human Cognition in the Light of Astronomical Categories ............ 481
A. Matsyna and O. Polyakova

One Day Every 216 Years, Three Days Each Decan. Rebirth Cycle of Pythagoras, Phoenix, Hazon Gabriel, and Christian Dogma of Resurrection Can Be Explained by the Metonic Cycle .......... 487
S. Rothwangl
Contents

The Collaborations between the Italian Society for Archaeoastronomy and the Archaeological Superintendences 494

E. Antonello

Author Index 499