

## Special Section: Recent Research on Iron Ore Mirrors in Mesoamerica and Central America

# Introduction: Recent research on iron-ore mirrors in Mesoamerica and Central America

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### Abstract

This Special Section focuses on recent research centered on iron-ore mirrors in Mesoamerica and Central America. Iron-ore mirrors are rare and esoteric artifacts, mainly crafted by specialized centers in the Maya, central Mexico, and Zapotec areas from the Early Preclassic to the Postclassic. They were found in numerous archaeological sites and cultures, from the Gila River in the United States to the isthmus of Panama.

In this introduction, we present a temporal, geographical, and contextual framework for the actual knowledge on mirrors, in order to fully understand the complexity and importance of the research on these prestigious artifacts. Indeed, the mirrors combine spiritual and political power in a portable and material way, giving a great insight into Mesoamerican beliefs and leading to important information on the relation between rulers of different political centers from different cultural areas.

Finally, we present the articles of the Special Section and give an overview of their content and relevance to the topic.

### Resumen

Esta sección especial presenta la investigación reciente sobre los espejos de mineral de hierro en Mesoamérica y Centroamérica. Los espejos de mineral de hierro son artefactos raros y esotéricos, los cuales fueron elaborados a partir del preclásico temprano hasta el posclásico, principalmente en centros especializados en el área maya, zapoteca y en el centro de México. Estos espejos se encontraron en numerosos sitios arqueológicos, desde el Río Gila en Estados Unidos hasta el istmo de Panamá.

En esta introducción, presentamos un marco temporal, geográfico y contextual sobre el conocimiento actual de los espejos, con el fin de comprender la complejidad e importancia de la investigación sobre estos prestigiosos artefactos. En efecto, los espejos combinan el poder espiritual y político de manera portátil y material, mostrando elementos de la visión de las creencias mesoamericanas y aportando información importante sobre la relación entre los gobernantes de centros políticos de diferentes áreas culturales.

Finalmente, nos referimos a los artículos de la sección especial y damos una visión general sobre sus contenidos y relevancias en relación con el tema.

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Iron-ore mirrors are rare and esoteric artifacts mainly crafted by specialized centers in the Maya, central Mexico and Zapotec areas, from the Early Preclassic to the Postclassic. They were found in numerous archaeological sites and cultures from the Gila River in the United States to the Panama isthmus. Regardless of the sociocultural

and linguistic differences that shaped the Amerindian peoples, these artifacts were used and exchanged in a wide range of human societies (Maya, Veracruz, Teotihuacan, Zapotec, Chibcha, Tlatilco, Mokaya, Hohokam, etc.) for religious, political, and cultural practices (Gallaga M. and Blainey 2016). In the Mesoamerican cosmology, mirrors were often associated with palpable and portable portals, allowing people to enter the Otherworld. They were used for shamanistic purposes of divination and prognostication (Freidel et al. 2000:240; Harrison-Buck and Freidel 2021; Taube 2018), as shown by the numerous representations

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on fine ceramics, mural paintings, and statues (Blainey 2007). An important example of the signification of such a mirror for a Maya ruler is presented by Freidel and colleagues in this Special Section (Freidel et al. 2024).

### Iron-ore mirrors through time and space

The oldest mirrors found in Mesoamerica were discovered in the region of Soconusco and date from the Locona and Ocos phases (1400–1100 B.C.) in the Early Preclassic (Lesure and Blake 2002). Most of them were described as mica mirrors found in Mokaya tombs in Paso de la Amada (Ceja Tenorio 1985), Mazatán (Macías 1989), Vivero I (Clark 2012), Chilo (Clark and Blake 1994), and in the Olmec enclave of Cantón Corralito (Pool 2007). We can also note the presence of many stones figurines showing the use of pectoral or forehead potential mirrors (Ceja Tenorio 1985).

In Mesoamerica, the first iron-ore mirrors were most probably crafted in the Zapotec area around the Valley of Oaxaca (Carlson 1981; Flannery 1976) during the Middle and Early Preclassic (1200–850 B.C.; Pires-Ferreira 1975). These flat or concave mirrors were composed of a single iron-ore polished stone. The iron ore was most probably mined from at least seven deposits of magnetite, ilmenite, mixed magnetite/ilmenite, and hematite. The main deposits were located around the Oaxaca Valley, as proposed by Flannery (1976) and Pires-Ferreira (1975), on the basis of Mossbauer spectroscopy analysis, with the notable exception of the ilmenite ore, potentially coming from a deposit in Veracruz near the Olmec center of La Venta (Di Castro Stringher 1997). Mirrors were evidently part of an elite exchange in Preclassic times (Flannery 1968) between Oaxaca and other regions of Mexico (Olmec, Mixtec, Veracruz, etc.). Notably, such mirrors could be used as forehead diadems or pectoral ornaments, as depicted by Olmec and Tlatilco sculptures (Carlson 1981).

The earliest mosaic mirrors to date are from the Middle Preclassic and were found at the sites of Chiapa de Corzo (700–500 B.C.), Tak'alik Ab'aj (500 B.C.), and Cahal Pech (600–300 B.C.; Atwood 2013; Awe 1992; Bachand 2013). In the Middle, Late, and Terminal Preclassic, we can distinguish two important types of fabrication, based on tesserae shape: (1) mirrors crafted using rectangular and quadratic tesserae, pasted using stucco or a hybrid organic-inorganic material (see Gallaga et al. 2024; Schieber de Lavaderra et al. 2024); and (2) mirrors crafted using tesserae in the form of Voronoi polygons pasted on stone, ceramic, or wooden bases, using an adhesive (see Arroyo 2024; Freidel et al. 2024; López Juárez et al. 2024; Salgado et al. 2024). The tesserae in published literature were mainly reported to be made from pyrite or hematite minerals, according to the few physicochemical analyses reported. However, such identifications are subject to caution and materials need a rigorous scientific approach, as presented by Barrientos Q. and coauthors (2024).

The beginning of the Classic showed a strong increase in mirror production, with exclusive use of Voronoi polygon tesserae. Such mosaic mirrors were the most elaborate, as tesserae were cut to the same thickness and beveled in

order to achieve a perfect jointing and level surface after the assembly of the different components (Gallaga 2014a). In this way, these artifacts required great skills and time investment, and were therefore produced by specialized craftsmen working under the tutelage of elites. In recent years, experimental archaeology projects have been carried out by Emiliano Gallaga, Emiliano Melgar, and Reyna Solís Ciriaco (Gallaga 2014b; Melgar et al. 2014), showing that the manufacturing time of a mosaic mirror of 9 cm in diameter is between 110 and 160 days with a single artisan—that is, between 3.5 and a little more than 5 months. For Classic times, the only centers of production (Gallaga M. and Blainey 2016) found were: (1) for the Maya area, in Aguateca (Zamora 2002), Cancuén (see Andrieu and Cadalen 2024), and Pacbitun (Healy et al. 1995); and (2) in Teotihuacan, with a strong slate lapidary tradition (López Juárez et al. 2024).

### Mosaic mirrors: Important artifacts in trade, gifting, and exchange between elites

Mirrors were prestigious artifacts, mainly traded as gifts between elite members inside Mesoamerica and the Teotihuacan interaction sphere (Hirth et al. 2020). Many scholars point out the influence of Teotihuacan in the dramatic increase of mirror production beginning in the Classic era (Taube 2018). Many mirrors showed Teotihuacan deity representations (Taube 1983) or a typical Veracruz style (Kidder 1945). Moreover, mirrors were clearly used as royal gifts between Maya kings and elites. Both interpretations converge in the analysis of the Bagaces mirrors, found in Costa Rica, presented by Salgado and colleagues (2024).

In the Classic and Postclassic periods, iron-ore mirrors were traded all over the continent (Dennett and Blainey 2016), as far as the distant Hohokam societies on the Gila River in the American Southwest, and Honduras and Costa Rica in Central America. In the Late Classic and Postclassic periods, they are also found in many sites of the Pacific region of Panama (Mayo Torné 2020). The mirror exchange with Costa Rica is one of the most important and is studied in detail by Salgado and colleagues (2024).

### The Reflejos network

The Reflejos research network aims to study the production, distribution, and exchange of iron-ore mirrors in Mesoamerica and Central America. It was coordinated by Silvia Salgado and Matthieu Ménager, founded by the Universidad de Costa Rica, and supported by the Service de Coopération et d'Action Culturelle pour l'Amérique Centrale (French Embassy, San José, Costa Rica). It has brought together French, Costa Rican, Mexican, Guatemalan, Honduran, and American researchers from different disciplinary fields, such as archaeology, restoration, conservation, traceology, and physical chemistry. The network allowed the extensive registration of more than 700 mirrors for the whole area, with more than 500 just from the Maya Highlands (at the sites of Nebaj, Zaculeu, Chama,

and Kaminaljuyu), showing the crucial importance of this region in their crafting, production, and trade. The research of this network facilitated the preparation of this Special Section.

### Presentation of the Special Section

**Emiliano Gallaga, Emiliano Melgar, and Lynneth Lowe** present a description of two important pyrite mirrors found at the site of Chiapa de Corzo, Chiapas, Mexico, dated around 700–500 B.C. Such mirrors are presented as possible examples of the transition between the two iron-ore mirror types described above—the single stone and mosaic tesserae. The authors show the traceological analysis of their manufacturing process through experimental archaeology and scanning electron microscopy. Based on that, the publication presents the identification of the materials and techniques employed to craft these mirrors. The different technological patterns found could be the result of the development of specialized artisans at distinct workshops, increasing the complexity and labor investment in the lapidary artifacts as prestige goods.

**Christa Schieber de Lavarreda, Emiliano Ricardo Melgar Tísoc, Reyna Beatriz Solís Ciriaco, Miguel Orrego Corzo, and Jeremías Claudio** present the study of reflector mirrors found in the site of Tak'alik Ab'aj, located in the southwestern *bocacosta* in Guatemala. Indeed, during the excavations of Burial 1 of Structure 7A, dated to the end of the Late Preclassic, rich goods were recovered from a grave, composed of dozens of pieces of jadeite, hematite, iron pyrite, and four reflector mirrors of the same material—each one carved with the same manufacturing technology and “flexible” ceramic mosaic support, documented for the first time. This article includes the traceological-technological study of these mosaics through the characterization of their manufacturing traces with experimental archaeology and optical and scanning electron microscopy. In this way, a highly standardized crafting elaboration was detected in which instruments made from local volcanic rocks, such as dacite, whose technological characteristics have not been reported in any other Maya lapidary collection, were used.

**Chloé Andrieu and Naya Cadalan** synthesize all the available data on pyrite crafting in the Late Classic lowland Maya city of Cancuen, in the light of recent excavations. By combining spatial and technological analysis, the authors propose to shed new light on the spatial organization of this production. Indeed, although iron-ore mirrors are commonly found in the Mayan area, very few workshops are known to date. Cancuen, Guatemala, is one of the few sites to show evidence of iron-ore production during the Late Classic (A.D. 600–800). By comparing the composition and the social context of production in Cancuen with that of Aguateca, the authors suggest that there was a division of tasks between sites in which Cancuen's artisans were involved in the first stage of the production of luxury goods, whereas other stages, such as the arrangement of the tesserae on the supports and their repolishing, were more socially invested and made by elite artists at the recipient sites.

**Tomás Barrientos Q., Andrea Sandoval, Yoshiyuki Iizuka, and Tanya Carías P.** present preliminary results of the identification of the raw materials used in the manufacture of different reflective objects from the sites of La Corona and Cancuen, located in Guatemala, through the use of scanning electron microscopy with EDS detectors (SEM-EDS), energy-dispersive X-ray fluorescence (EDXRF), X-ray diffraction (XRD), and Raman spectroscopy. Indeed, different types of iron ore and pyrite were used to craft a wide variety of reflective artifacts in pre-Columbian Mesoamerica, including “mirrors,” pectorals, necklaces, and dental inlays, among others. In the Maya region, most of these have only been visually assessed, without using analytical techniques. Although further analyses are needed to confirm the representativeness of the sample, these results indicate the use of hematite and goethite (iron oxides), but not pyrite (iron sulfide). This study also shows how improved knowledge of raw-material use can elicit previously unknown patterns of distribution and exchange, and it highlights patterns of inter- and intrasite variability in the production, use, and exchange of reflective objects over time in the Maya region throughout the Classic period.

**Julieta M. López Juárez, José Luis Ruvalcaba Sil, Marina Vega González, and Manuel Aguilar Franco** present a major study on the characterization and provenance of the slate discs found in Teotihuacan. Indeed, since ancient times, slate artifacts have been used by societies settled in various parts of the Americas. Geographically, artifacts are reported from Greenland, Alaska, northern Canada, the southwestern United States, Mesoamerica, and South America. In the particular case of Teotihuacan, the artifacts were reported inside and outside this city, deposited as offerings and directly associated with fire, water, and the underworld. Slate was a raw material with a constant presence in Teotihuacan, even after its decline (approximately 700 years). In this respect, the authors point out its social importance by outlining the variety of artifact forms that appeared at Teotihuacan, their chronology, and their context. They also present the results of the characterization of the Teotihuacan slate artifacts and of 10 geological sources that allowed them to identify the areas of extraction of the raw material. The archaeological, geological, and archaeometric results presented in this study allow us to make inferences about the ritual, symbolic, and hierarchical functions of this raw material within the Teotihuacan metropolis.

**David A. Freidel, Olivia C. Navarro-Farr, Michele E. Rich, Juan Carlos Meléndez, Juan Carlos Pérez, Griselda Pérez Robles, and Mary Kate Kelly** place a Classic Maya royal conjuring mirror owned by a great queen, K'abel of Waka', in archaeological and historical context, following its laboratory conservation and their study of the painted scene on its slate support. The mirror support depicts a conjurer they identify as the god Akan Yaxil, by his extruded eyeball vomit bib, bringing forth the giant centipede Wak, battle demon and namesake of the kingdom, from the golden iron-ore surface of a mirror. Queen K'abel, they propose, royal princess of the house of Kaan

and Stranger Ruler, emulated and embodied the Moon Goddess of the fire shrine. By means of her mirror and other enchanted artifacts, she conjured and birthed the gods of Waka' on behalf of her people.

**Silvia Salgado, Matthieu Ménager, Bárbara Arroyo, and David E. Freidel** present the first publication on the critical analysis of nearly 60 slate bases of iron-ore mirrors that have been found in northern Costa Rica, in pre-Columbian funerary contexts. These artifacts were found in contexts that range from 300 B.C. to A.D. 500–600, but mostly between A.D. 300 and 500–600, including a couple of mirrors that bear Maya hieroglyphic inscriptions. Recent geochemical analyses of the mirrors found in a burial ground in Costa Rica indicated foreign production, most probably in the Maya area, where, particularly during the Classic period, these artifacts were related to power, shamanism, and divination, and manufactured by highly specialized artisans working under the patronage of members of the elite. This article addresses the question of when, how, and why mirrors from Mesoamerica made their way to Costa Rica. To that end, the regions, contexts, style, and chronology of the mirrors are analyzed and compared with the styles and contexts of the Maya area, including the interpretation of one of the mirrors with hieroglyphic inscriptions. The article explores the distribution routes and the mechanisms of exchange between these distant but somehow related areas.

**Bárbara Arroyo** presents the slate disks reported at various excavations in the Maya Highlands. Such artifacts have been described as the backing for iron-ore and pyrite mirrors. A number of these objects have been recovered in tombs from Mounds A and B at Kaminaljuyu. Whenever objects with reflective surfaces are identified in the field, they tend to be interpreted as mirrors, but they were also worn as insignia on clothing. Recent findings at Kaminaljuyu include special deposits associated with Ballcourt B, suggesting the use of reflective objects as part of the ballgame players' paraphernalia. The archaeological evidence for this finding is presented, and other examples excavated throughout the highlands are discussed to explore the exchange networks connected to the trade of these exotic goods in the region.

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