

*Edited by*

Emiliano Gallaga M. and Marc G. Blainey

# **MANUFACTURED LIGHT**

**MIRRORS IN THE  
MESOAMERICAN REALM**

COPYRIGHTED MATERIAL  
NOT FOR DISTRIBUTION

**UNIVERSITY PRESS OF COLORADO**

*Boulder*

*Contents*

<i>List of Figures</i>	vii
<i>List of Tables</i>	xiii
Chapter 1: Introduction	
<i>Emiliano Gallaga M.</i>	3
Chapter 2: How to Make a Pyrite Mirror: An Experimental Archaeology Project	
<i>Emiliano Gallaga M.</i>	25
Chapter 3: Manufacturing Techniques of Pyrite Inlays in Mesoamerica	
<i>Emiliano Melgar, Emiliano Gallaga M.,     and Reyna Solis</i>	51
Chapter 4: Domestic Production of Pyrite Mirrors at Cancuén, Guatemala	
<i>Brigitte Kovacevich</i>	73
Chapter 5: Identification and Use of Pyrite and Hematite at Teotihuacan	
<i>Julie Gazzola, Sergio Gómez Chávez,     and Thomas Calligaro</i>	107
Chapter 6: On How Mirrors Would Have Been Employed in the Ancient Americas	
<i>José J. Lunazzi</i>	125

Chapter 7: Iron Pyrite Ornaments from Middle Formative Contexts in the Mascota Valley of Jalisco, Mexico: Description, Mesoamerican Relationships, and Probable Symbolic Significance	
<i>Joseph B. Mountjoy</i>	143
Chapter 8: Pre-Hispanic Iron-Ore Mirrors and Mosaics from Zacatecas	
<i>Achim Lelgemann</i>	161
Chapter 9: Techniques of Luminosity: Iron-Ore Mirrors and Entheogenic Shamanism among the Ancient Maya	
<i>Marc G. Blainey</i>	179
Chapter 10: Stones of Light: The Use of Crystals in Maya Divination	
<i>John J. McGraw</i>	207
Chapter 11: Reflecting on Exchange: Ancient Maya Mirrors beyond the Southeast Periphery	
<i>Carrie L. Dennett and Marc G. Blainey</i>	229
Chapter 12: Ritual Uses of Mirrors by the Wixaritari (Huichol Indians): Instruments of Reflexivity in Creative Processes	
<i>Olivia Kindl</i>	255
Chapter 13: Through a Glass, Brightly: Recent Investigations Concerning Mirrors and Srying in Ancient and Contemporary Mesoamerica	
<i>Karl Taube</i>	285
<i>List of Contributors</i>	315
<i>Index</i>	317

“Here is the Mirror of Galadriel,” she said. . . .

. . . “What shall we look for, and what shall we see?” asked Frodo. . . .

. . . “[T]he mirror will also show things unbidden, and those are often stranger and more profitable than things which we wish to behold. What you will see, if you leave the Mirror free to work, I cannot tell. For it shows things that were, and things that are, and things that yet may be. But which it is that he sees, even the wisest cannot always tell. Do you wish to look?”

(TOLKIEN 1991: 381)

In our daily life, it is not a surprise to see our reflection in a mirror early in the morning and identify that it is our image reproduced by this solid, reflective surface. For most people, one’s reflection in a mirror is unremarkable, as we do not attribute a divine quality to seeing our double image. However, while this daily act is mundane for most of us today, reflected images were viewed as quite profound by many ancient humans around the globe, and by pre-Hispanic indigenous people in particular.

Since the beginning of time, humans have been so mesmerized and/or challenged by their physical environment that there has always been a need to understand it, to own it, and to transform it. This need applies not only to our surroundings but to ourselves as well. We like to know who and what we are, change the way

---

## *Introduction*

EMILIANO GALLAGA M.

we look and the things we own, and to make or acquire things that say something about us and about the community to which we belong. This need for knowledge and transformation is an essential spark for the cultural development of the human animal, creating a universe of objects that help us understand and change our environment into a familiar landscape. Among that great universe of items, mirrors or reflecting surfaces have occupied an important place in the human mind. Pendergrast (2003: 13) states that “the ability to recognize themselves in the mirror seems peculiar to superior primates.” Humans are likewise captivated by the reproduction of one’s own image in a mirror or other reflecting surface. Accordingly, the ancient Indus, Chinese, Egyptian, Greek, Roman, Inca, Aztec, and Maya civilizations created objects that fulfill the need to have and control reflective surfaces (Albenda 1985; Baboula 2000; Beasley 1949; Bulling 1960; Cameron 1979; Cammann 1949; Lilyquist 1979; Pendergrast 2003). Of course, only the gods would know exactly what the ancients would think about the parallel worlds glimpsed through the shiny surfaces of mirrors, an archaeological mystery about which we can now only make educated guesses.

Complex and time-consuming to produce, mirrors and other reflective objects made of hematite, obsidian, or pyrite material stand out within the universe of pre-Hispanic artifacts for their aesthetics, their beauty, and their complexity of production (Blainey 2007; Gallaga 2001, 2009; Healy and Blainey 2011; Pereira 2008; Salinas 1995). Yes, these artifacts were probably also used for vanity purposes in domestic contexts, to see the perfection or imperfections of the onlooker’s facial features or to see what cosmetic or jewelry to use. But this was not the only purpose or objective to create and own a mirror. Due to their capacity for projecting an inverse reflection of the spectator’s reality (where right becomes left and vice versa), mirrors were used as divinatory or magical portals to communicate between parallel dimensions, worlds, or realities (figure 1.1). With this idea in mind, mirrors were also endowed with the capacity to be a means of contact with the ancestors and more importantly with the gods. It is not hard to imagine complex ceremonial procedures accompanied by chants and dances in secluded locations, perhaps involving fasting and/or the ingestion of psychoactive substances. Such rituals might have been required in order to prepare and train the body and mind to be in contact with the spirits; with the help of the mirror, one presumes that such spirits’ advice, guidance, or support was sought out when making important decisions about a course of action to follow. Whether as a ruler, adviser, priest, shaman, or just a *brujo* or *curandero*, the individual or group of individuals who performed these types of actions, envisioned as necessary tasks for the common good of the community, would thereby have acquired great prestige or social position.



FIGURE 1.1. *Reflection from the Bonampak pyrite mirror (photo by Emiliano Gallaga).*

Although past studies have acknowledged the difficulty of manufacturing these mirrors as well as their importance as objects of prestige and magical-religious worldview, very little research has been carried out concerning how ancient iron-ore mirrors were constructed. Dealing with the issue of mirror production, Emiliano Gallaga (chapter 2, this volume) presents preliminary results of an experimental archaeological project that has the aim of reproducing the operative chain of pyrite mirror manufacture using possible pre-Hispanic tools and techniques. Preliminary results illustrate that this process could take an average of 800–1200 person-hours, representing between 100 and 150 working days for a single person to make an encrusted pyrite mirror. Melgar, Gallaga, and Solis (chapter 3, this volume) also tackle this important question, and present a technological analysis of the manufacturing traces that were applied on

different pyrite inlays, using experimental archaeology and scanning electron microscopy (SEM). This methodology allows the authors to identify the lithic tools employed in the production of mirrors with great accuracy and to distinguish different technological styles—fundamental advancements for the study of mirrors, their uses, and the definition of Mesoamerica’s artifact assemblage.

In the social realm the possession of iron-ore items would most certainly bestow a high status or social distinction on the owner, not only due to the object’s magical-religious connotations, but also for their rarity and cost of manufacturing (Blainey 2007; Gallaga 2001; Pereira 2008; Sugiyama 1992; Taube 1992). In general, items that provide a reflection of an image were not a common thing in ancient times, and yet they were conspicuously present among pre-Hispanic elites. Although pre-Hispanic artisans knew about and used metals, the use of metals was not as vital as that of other materials. Thus, the recognition of mirror craftsmanship is greater if we note the fact that the makers of mirrors almost completely lacked metal tools to fashion the finished mirrors. Due to both their highly symbolic/religious meaning/use and the cost of manufacture, we can infer that mirrors were not a common item to be found on the local markets at the plazas of pre-Hispanic communities. On the contrary, the production of mirrors was most likely restricted and controlled by elites. The craftspeople who made the mirrors would equally enjoy some prestige or recognition not only among the pre-Hispanic elites, but also among fellow artisans as well. As an example, regarding pyrite production at the site of Cancuén, Guatemala, Brigitte Kovacevich (chapter 4, this volume) addresses the techniques and social implications of producing pyrite artifacts. Kovacevich make the case that these objects could have represented high-status goods, ritual paraphernalia, gifts, inalienable possessions, and symbols of individual and collective identities among Cancuén Maya elites. A similar approach is followed by Gazzola, Gómez Chávez, and Calligaro (chapter 5, this volume) for the majestic site of Teotihuacan. The authors describe the archaeological context of thousands of objects, some of them pyrite items, deposited as apparent offerings through the ritual closure of a tunnel under the Feathered Snake Temple, the most important building in the site’s Ciudadela Complex. In addition to the lack of prior research on mirror manufacture, other general problems such as lack of archaeological work in various cultural areas of ancient Mexico, lack of information about workshops for mirror production, the incorrect identification of these objects, the looting of sites, and the lack of reporting and publication of archaeological projects, makes for a very poor scholarly record of such materials. Some of these issues are addressed by Gazzola et al. (chapter 5, this volume) with their description

of lapidary workshops at La Ventilla, located to the south of the old city. The remains of these workshops enable the study of raw materials, cut waste, stone and bone tools, a few finishing objects, and abrasives for understanding and interpreting the techniques employed in the manufacture of pyrite and hematite mirrors at Teotihuacan.

As a child, I remember a scene from a “western” film I saw in which Apache Indians used mirrors to communicate the arrival of the cavalry in the desert landscape of Arizona. This capacity for reflection, whereby sunlight can be caught or reflected, makes mirrors appear as an evocation of divine or diabolic qualities; in fact, as acknowledged by Lunazzi (chapter 6, this volume), some researchers claim that ancient iron-ore mirrors can set fires if one knows how to use them (see also Ekholm 1972, 1973). One can imagine the effect that the sudden appearance of a fire with the use of a mirror would have among an astonished audience: is the supernatural spirit of the sun trapped in the mirror? Is it the power of the mirror’s holder that commands the sun to shine inside the mirror? Although these are not the questions Lunazzi addresses, he does present his experimental results on the reflective capacity of pre-Hispanic mirrors, the real possibility of using mirrors as communication devices, and the renowned ability of these objects to ignite fires. In a somewhat different approach to the concept of lustrous items as solar reflectors, Joseph Mountjoy presents the description of 49 iron-pyrite ornaments. Recovered from his excavations made between 2001 and 2005 in three Middle Pre-Classic period cemeteries in the Mascota valley of Jalisco, Mexico, Mountjoy dates these objects in the range of 1000 to 700 BC, among the oldest such items yet found in Mesoamerica (chapter 7, this volume). Mountjoy contends that these artifacts played a symbolic role in early agricultural societies that were ritually focused on three interrelated factors for survival: sun, water, and fertility, factors that are also symbolized in ornaments of emerald green jadeite and transparent quartz. In chapter 8 (this volume), Achim Lelgemann presents material, technical, and morphological aspects of archaeological mirror remains recovered from an elite burial inside the pyramid of the Citadel patio compound at the site of La Quemada, Zacatecas, dating to the Late or Terminal Classic period (eighth and ninth centuries AD). Lelgemann discusses these mirrors’ mortuary-ceremonial contexts, as well as both their functions (as status markers, divinatory devices, lighters) and their socio-ideological dimensions (cosmograms, sun-fire cult, and shamanism) as compared to similar finds in Mesoamerica and the Greater Southwest.

But how did the peoples of the ancient New World actually conceptualize iron-ore artifacts we now call “mirrors”? As presented by Marc Blainey (chapter

9, this volume), it is reasonable to construe these iron-ore mirrors as evidence for shamanistic practices in ancient Maya society. Blainey uses archaeological and iconographic data, as well as ethnographic information from the modern Maya, to illustrate what he calls the “reflective surface complex” in Maya ritual. Similarly, John J. McGraw (chapter 10, this volume) follows Blainey’s research path, but with the little twist of focusing on crystals as reflective surfaces that are important to the modern Maya. As we know, crystals have long played a role in Maya ritual. In particular, McGraw demonstrates how divination makes use of crystals to render a series of visual signs that can be interpreted by the diviner as communications from supernatural beings.

Concerning research from areas outside Mesoamerica, Carrie Dennett and Marc Blainey (chapter 11, this volume) address the issue of iron-ore “mirrors” found in Lower Central America, most likely of Maya origin, and how these prestige items arrived at such distant locales. The authors argue for a concept of developing “peer elite” relationships and reciprocity in the form of “gifting,” instead of a focus on economic trade factors, which appears to parallel more general sociopolitical and socioeconomic restructuring occurring simultaneously in both areas. Of course, the Maya are not the only people known to use reflective objects as a means of seeing or communicating with other realms, but, unfortunately, there is not much research about the magic/ritual use of reflective surfaces among other Mexican Indian communities. In addressing this gap in the literature, Olivia Kindl’s contribution on the ritual use of mirrors among the Huichol Indians of Mexico’s West Sierra Madre (chapter 12, this volume) allows the reader to gain a different perspective on the use of these items by a living Indian group outside the Mesoamerican realm. The fact that Kindl had the luxury of speaking with shamans or curanderos who still use mirrors for their ceremonies today, and that she could actually see and participate in those celebrations, provides an intimate perspective full of ethnographic information that can inform the otherwise indirect evidence analyzed by archaeologists. For example, in examining encrypted phrases on pots and stelae, Blainey (chapter 9, this volume) goes to great lengths to identify possible candidates for the Maya glyphs that were in some way associated with mirrors (e.g., T<sub>24</sub>/T<sub>617</sub> “reflective stone” or *ilaj* “was seen”). In a more contemporary mode, Kindl (chapter 12, this volume) obtains similar results from the direct quotes of a present-day Huichol curandero who still uses mirrors for divinatory activities (*xikiri* “things that shine,” *nierika* “gift of seeing”).

In closing, Karl Taube (chapter 13, this volume) applies his considerable expertise in a critical summary of mirror objects found among ancient and modern Mesoamericans. As Taube makes plain, these objects provide

archaeologists and anthropologists with an exceptional opportunity for understanding broader norms of past and present-day Mesoamerican culture, an opportunity that has been overlooked for too long.

## MIRRORS AND THE MESOAMERICA CONCEPT

In 1943, a publication shook the minds of all the archaeologists who worked in what at that time was known as “Middle America.” That publication was *Mesoamerica: Its Geographical Limits, Ethnic Composition, and Cultural Character* by Paul Kirchhoff (1967), based on a series of investigations undertaken by the International Committee for the Cultural Distribution in America Studies created by the XXVII International Congress of Americanists. Through this delineation of a new region called “Mesoamerica,” Kirchhoff’s intention was to note what the communities and cultures of a specific area of the American continent share in common and what they do not share (Kirchhoff 1967: 1). Decades later, it is now clear that this work not only achieved its original objective, but it also coined a new term that fills a previous gap in the research areas of Mexico, Central America, and parts of the United States.

The novelty of this proposal was the creation of a term that was not based solely on geographical data, as was common in those days, but on three cultural trait groups: those exclusively for Mesoamerica, those that were present in and outside Mesoamerica, and those that were not present in Mesoamerica. For the first group, 43 traits were considered, such as hieroglyphic writing; use of chinampas (i.e., “floating gardens”); tiered temples; cultivation of maguey, corn, beans, and cacao; and pyrite mirrors. It is interesting to note that from these 43 traits, only 12 were movable artifacts, while the rest are concepts, foods, or architectural structures. Among the diverse array of objects created by pre-Hispanic artisans, it is notable that mirrors (especially iron-ore mirrors) were among the few objects that Kirchhoff selected as archetypes of Mesoamerican culture. I think that this is due to the fact that he considered that mirrors effectively represent the advanced cultural development of ancient Mesoamerican society.

Although Kirchhoff’s proposal defines a new cultural region (Mesoamerica), this was not his real intention. He really intended to present a proposal that had to be analyzed, criticized, and/or supplemented by other researchers, preferably archaeologists. However, for the most part that input did not materialize as researchers adopted the term without much hesitation. Indeed, some revisions on Kirchhoff’s proposal did appear, such as the critiques by Litvak (1992) and Matos (1994), which focused on the spatiotemporal

distribution of the cultural traits Kirchhoff defined and the sources where those traits were obtained. Although it is not the purpose of this volume to tackle the validation of the Mesoamerica concept, it is necessary that we make mention of Kirchhoff's reference to mirrors as illustrating the social complexity of ancient Mesoamerica.

In his publication, Kirchhoff (1967) provided a series of cultural traits that according to him define what Mesoamerica is and what it is not. The critiques leveled by Litvak and Matos are not about the list per se, but more about the origin and the organization of the list. These critical reviewers said that Mesoamerican traits came from different sources, such as ethnography, linguistics, ethnohistory, and archaeology, but not from the material culture context alone (Litvak 1992: 82). Moreover, Matos (1994: 56) stated that there is not a ranking system on Kirchhoff's (1967: 55) trait list to provide a sense of which traits are more Mesoamerican than others. Neither was there an explanation nor a description of what Kirchhoff understood as a cultural trait. Such delimitations could help clarify the geographical range of the trait or the cultural expansion of it. Matos makes an interesting case about this point with the example of the chinampas trait: considering that in the 1940s the chinampas could be found only in the Mesoamerica region, but that later on in the 1990s these agricultural systems were found at Lake Titicaca in Bolivia, does this finding mean that the Lake Titicaca region is part of Mesoamerica? It is understandable that more traits would have to be found in order to make that claim, but the point is that most of Kirchhoff's cultural traits can and are found in other regions and cultures that do not have anything to do with Mesoamerican culture. So, where is the borderline of the Mesoamerica region? A ranking of the traits could help, but that is apparently still in the making. Suffice it to say that Kirchhoff's traits refer to a specific pre-Hispanic society that is not described, but is presumed to be a complex one (Litvak 1992; Matos 1994). Yet Mesoamerica is anything but a uniform region, culturally speaking. In Mesoamerica there have always been complex societies living or interacting side by side with less complex communities. This is especially true in the northern areas where interaction and exchange between hunter-gatherer groups was essential for the development of cultural and economic exchange in the region.

A second major critique of Kirchhoff's proposal is the analysis of the spatiotemporal distribution of traits that define Mesoamerica, which is geared toward the time that the pre-Hispanic world came to an end, that is to say the contact period (Kirchhoff 1967: 3). All the traits used by Kirchhoff came from Spanish descriptions and accounts of the pre-Hispanic communities that the

Spanish encountered, as well as ethnographic and some archaeological data, but all of this from the contact period. In Kirchhoff's original proposal there is not an analysis of the cultural development of the Mesoamerican concept through time, that is to say for the Preclassic, Classic, and Postclassic periods. It is important to clarify that this omission or oversight is not imputable to Kirchhoff. As I mentioned before, he made a proposal that had to be built upon and refined by others. In this regard, Litvak (1992) and Matos (1994) make a preliminary analysis of how Mesoamerica should look through time, understanding that Mesoamerica is a cultural and not a geographical area. Just to mention an example, during the Preclassic period Mesoamerica is constrained to the Olmec communities of Tabasco (Litvak 1992) and Guerrero (Matos 1994), and involved in interaction with other soon-to-be Mesoamerican areas. This continues until we reach the Mesoamerica map that we recognize today for the contact period. Litvak clearly summarized this position: "a region identified as Mesoamerican for one phase, could be left out in another" (1992: 89).

I concur with both Litvak and Matos that these critiques do not diminish Kirchhoff's Mesoamerica concept, but rather they serve to strengthen it by providing new elements to see the Mesoamerican area developing through time and space. As a final remark, Litvak concluded his 1992 article, stating that "future work and now non-existent data can modify the concept of Mesoamerica's physical size and shape and even extend it in time, in any direction, without altering the definition" (1992: 102).

For the particular case of this volume's focus on iron-ore mirrors, and the above discussion about the Mesoamerican realm, I will provide a description of what a pyrite mirror represented for ancient Mesoamerican peoples, the elements of which it is composed, and how it is distinguished from other reflective surfaces in other cultural regions, such as that of the Incas. Furthermore, I will present the cultural development of mirrors through the pre-Hispanic periods. This temporal analysis represents ongoing research performed not only by me but by other colleagues as well. As with the case of Kirchhoff's chinampas trait, such ongoing and future research will most likely improve upon the results here presented.

## COMPOSITION OF A PYRITE MIRROR

In general, a pyrite-encrusted mirror consisted of four basic elements or characteristics: a base, an adhesive layer, pyrite plaques, and perforations (figure 1.2A).

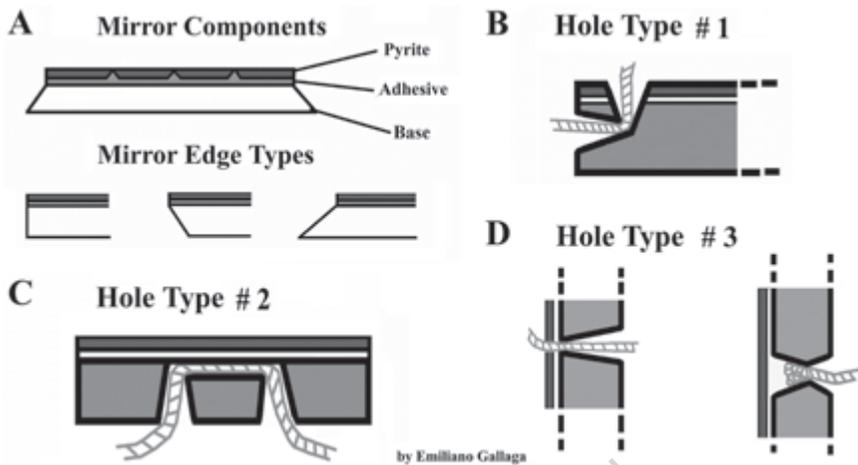


FIGURE 1.2. *Mirror components and hole types (drawing by Emiliano Gallaga).*

## BASE

Pyrite mirrors usually consist of pyrite plaques that are adhered to a solid base that is commonly made of stone, like sandstone, mud rock, or slate. There are reports of wood and ceramic bases but, for their lack of preservation, these are not common in the archaeological record of Mesoamerica and the American Southwest/Northwest Mexico (Gladwin et al. 1938; Kelley 1971; Kidder et al. 1946). Often circular or rectangular bases are the norm, but some (very uncommon) triangular bases do exist (Gladwin et al. 1938: plate CIX *e* and *f*). Dimensions of circular bases may range from 7 to 30 cm in diameter with an average of 8–10 mm in thickness. The edges can be perpendicular; beveled inside; and/or beveled outside. The beveled edge can face the front or back of the mirror (see Figure 1.2.A). On some occasions, this area is decorated with painted stucco or with pseudo-cloisonné technique, like those found in Snaketown, Arizona (Gladwin et al. 1938, plate CXI). The backs of mirrors can be decorated with painted stucco and/or direct carving (Blainey 2007; Di Peso 1956, 1974; Ekholm 1945; Furst 1966; Gallaga 2001, 2009; Gladwin et al. 1938; Kelley 1971; Kidder et al. 1946; Smith and Kidder 1951). During the early Postclassic (AD 900–1200), pyrite mirrors were encrusted or framed on a wooden base, which was then decorated with other materials such as jade, turquoise, gold, copper, cotton, or even feathers, like those mirrors found at Chichén Itza, Yucatan, commonly mistaken or described as mosaic disks (Blainey 2007; Coggins 1989; Gallaga 2001, 2009; Taube 1992, Pereira 2008).

## ADHESIVE LAYER

Chemical compositional analyses of adhesives have been performed only recently. Most descriptions of how the plaques were attached to their bases are from researchers' guesswork. In general, the description by Kidder et al. (1946) offers the most accepted explanation: the adhesive layer was "a very fine clay, which presumably had been bound and rendered strongly adhesive by mixing it with some organic glue" (Kidder et al. 1946: 126). However, recent conservation efforts regarding a pyrite mirror that was found with turquoise decoration at the center of the Palacio Quemado at Tula, Hidalgo, Mexico, provided one of the first chemical descriptions of an adhesive layer (Magar and Meehan 1995). The researchers mention that "the adhesive used for the turquoise tesserae was composed by a mixture of wax, a [type of] resin, and calcium sulfate" (Magar and Meehan 1995: 7; author's translation). They state further that "an adhesive composed of tar" was employed for the pyrite plaques (Magar and Meehan 2001: 7). In addition, a chemical compositional analysis of adhesive samples from two pyrite mirrors found at the site of Aguateca, Guatemala, showed that lime plaster or stucco was used as an adhesive<sup>1</sup> as well (Keochakian 2001; Takeshi Inomata, personal communication 2004). Keochakian (2001: 11) states that in terms of the adhesive's chemical composition at Copan (Honduras) "a pair of ear flares found in the Subjaguar tomb had jade inlays set into white stucco plaster-like material." Another artifact, found in the Margarita tomb, was interpreted as a possible wooden (?) cup with jade inlays and evidence of white stucco plaster-like "adhesive" (Keochakian 2001: 11).

Some mirrors exhibit an adhesive layer that is yellowish in color. This leads one to suspect that artisans used tree resin as organic glue. This hypothesis has been confirmed by recent analysis made on the pre-Hispanic turquoise-mosaic items mostly from the British Museum (McEwan et al. 2006). Other recent studies on pre-Hispanic mural painting confirm the same, as researchers found that pre-Hispanic artisans used the secretion from orchids (specifically *Cyrtopodium macrobulbun* and *Catasetum maculatum*, known as *ch'it ku'uk* among the Mayas) as organic glue, support, or adhesive for the paintings and in other crafts as well, such as mirror manufacture (Vázquez de Ágredos Pascual 2010: 128). Sometimes the yellowish layer is mistaken for pigment and several mirrors have been misidentified as pigment mortars (Kelley 1971). Depending on the mirror, the adhesive layer can be 1–3 mm thick.

## PYRITE PLAQUES OR TESSERAE

Pyrite is a yellowish mineral made of iron and sulfur or iron sulfide ( $\text{FeS}_2$ ). The common shape of pyrite is cubic but it can appear in other polygonal shapes (Lagomarsino 2008: 121). Due to the material's characteristics, the shaping of iron pyrite pieces is a time-consuming and very skill-demanding task—the greatest of the entire mirror-production process (Gallaga 2009) (figure 1.3). As Kidder et al. (1946) state:

Pyrite, with a hardness of 6.5 and with no natural cleavage planes to facilitate subdivision of the crystals, could not have been other than most difficult to work. Yet every plaque was mounted with dozens or scores of plates cut precisely the same thickness and shaped to fit exactly. The polygons seldom had less than four and some possessed as many as nine sides, each so beveled that only the very edge came into contact with that of its neighbor (Kidder et al. 1946: 131).

Due to its instability, water action and oxygen can transform the pyrite into other minerals like iron oxide (limonite and siderite). Because of that, it is difficult to recover this material in good condition within archaeological contexts (Zamora 2002a, 2002b: 695).

The number of pyrite plaques used for a single mirror varies from specimen to specimen and is thought to range from one to as many as 40 or 50 pieces (Furst 1966; Taube 1992; Turner 1992). The dimensions of the plaques may vary from one to four square inches, with an average thickness of between 2 and 4 mm. Also, dimensions probably depended on the availability and type of raw material, as well as on the intended size and design of the mirror. Some mirrors have been reportedly made with a single piece of pyrite. Apparently, there is a source where the vein of pyrite is attached to a layer of sandstone, so a block was removed, giving it the shape and polish of a mirror without using adhesive (Mata Amado 2003, Mike Jacobs personal communication 2001).

The face where the pyrite plaques were applied could cover the entire front surface of the stone base, but also could leave free a surface of 1 or 2 cm wide at the edge of the mirror. Sometimes this edge could be beveled and on some occasions they were decorated, as discussed above. Pyrite plaques become hematite if exposed to fire and on many occasions they might have been mistaken as pigment (Gladwin et al. 1938; Smith and Kidder 1951, Woodbury and Trik 1953).

## HOLES OR PERFORATIONS

An important characteristic of pyrite-encrusted mirrors is the hole that is made to wear or suspend the object in some way. Generally, researchers



**FIGURE 1.3.** Sample of pyrite plaques or tesserae from a mirror found at tomb 10 of building 21, from the site of Tenam Puente, Chiapas, dated to the Late Classic period (Martínez del Campo Lanz 2010: 76–77) (photo by Emiliano Gallaga).

describe two locations for the holes: at the edge and at the center. A combination of both is common and may have held some decorative or other functions (Kidder et al. 1946; Smith and Kidder 1951; Taube 1992). Currently, there is no standardized typology for classifying these perforations; however, researchers commonly comment on the presence/absence of holes. For instance, in order to provide a more effective description for the pyrite mirrors of Snaketown, a typology for holes and perforations was made, based upon their manufacture and existing hole descriptions from other sites and research projects. Three types of holes constitute this typology (Gallaga 2001, 2009):

*Type 1* consists of a pair of perpendicular interconnected holes made at the edge of the mirror. Generally, there are two pairs of holes at the opposite edge, but it is possible to have one pair of holes per side. Also, depending on the function of the mirror one pair of holes may be found at the upper portion of the mirror (figure 1.2.B).

*Type 2* corresponds to “a pair of holes near the center of the backing, connected by a shallow groove which allowed the cord to pass beneath and be hidden by the encrustation” (Smith and Kidder 1951: 48). In this type, a cord has to be strung through the perforations before the pyrite encrustation process begins (figure 1.2.C).

*Type 3* is commonly known as suspension holes. These are perforations that go straight through. Those can be at the center, at opposite edges, or both. In single-hole mirrors, the end of each cord must be secured by a knot or toggle (figure 1.2.D) (Smith and Kidder 1951).

None of these perforation types are exclusive, and combinations of types in one single mirror are common. Combinations may be the result of function and/or decoration/adornment of the mirrors themselves. This last feature could be the result of the different forms of use, or combinations of functions and/or the type of decoration found on the mirror. For example, the perforations of types 1 or 2 could be associated with the mirrors used in the occipital portion of the lower human back that are known as *tezcacuitlapilli* (Gallaga 2001) and generally associated with warriors, members of the elite, high ranking priests, and ambassadors (see Blainey 2007; Kidder, et al. 1946; Sugiyama 1992; Taube 1992).

## MESOAMERICAN MIRRORS THROUGH TIME

Although studies concerning these materials are relatively new, we have already begun to establish a historical development of these devices, which can be coupled to the standard Mesoamerican periods (Ekholm 1973; Gallaga 2001, 2009; Pereira 2008):

### MIDDLE PRECLASSIC PERIOD (1200–400 BC)

The first mirrors recorded in archaeological context are those located in the Olmec region, particularly at the site of La Venta (Heizer and Gullberg 1981; Pires-Ferreira and Evans 1978). Such mirrors are characterized by being manufactured with metallic minerals (magnetite, hematite, and ilmenite) in one piece with a finely polished concave surface, and in some cases with holes, quite possibly for use in hanging. Generally it is considered that this type of concave mirror was used for the diffraction of sunlight and to light a fire (Ekholm 1973). Regardless of how these objects came to form part of the Olmec magical-religious structure, their appearance and use eventually spread throughout the rest of Mesoamerica and beyond (Blainey 2007; Clark and Hansen 2001; Grove 1977; Pereira 2008).

### EARLY CLASSIC PERIOD (AD 150/200–600)

In this phase, the mirrors' manufacture underwent a radical transformation: they begin to have a flat surface, rather than concave, and they are not made in one piece, but instead feature a stone base, upon which polygonal pyrite plaques are arranged in a mosaic. This change represents a technological breakthrough and innovation, since the manufacture of mirrors allowed more aesthetic freedom to play with the designs of the mosaic tiles of pyrite and in some cases decorations on the posterior base of stone. From the archaeological evidence collected so far, it is inferred that most of the mirrors for this phase were made in Teotihuacan or made to imitate this style (Ekholm 1973; Pereira 2008; Taube 1992). However, we cannot rule out that other major manufacturing centers existed, such as in the Oaxaca region (Pires-Ferreira 1975; Pires-Ferreira and Evans 1978; Mohar 1997). This interest in pyrite by the Teotihuacan people is also seen in other reflective materials such as mica, used to make mirrors or adornments.

In a recent discovery in a royal tomb at Chiapa de Corzo, Chiapas, archaeologists found two square mirrors, each with a flat surface composed of several thick plates of pyrite fitted with a thick stucco layer over a decomposed organic base (probably wood) and approximately 2,700 years old (700–500 BC). This find indicates that mirrors made with several pieces of plaques were already being constructed somewhere in Mesoamerica much earlier than originally thought. However, these pyrite plaques from Chiapa de Corzo are rectangular in shape and very thick, much different from the thin polygonal plaques conventionally used on the mirrors identified for the Early Classic period. Also, this is the earliest report for this type of pyrite plaque on a mirror, so the working hypothesis is that we have encountered a transitional mirror specimen, in between the Preclassic- and Classic-period styles (Gallaga and Lowe 2012). In other words, somebody somewhere started a new way to make mirrors with pyrite plates instead of single pieces of magnetite, hematite, or ilmenite (Olmec style), and probably that is why the pyrite plates are somewhat less elaborate on this Chiapa de Corzo mirror.

### EARLY POSTCLASSIC PERIOD (AD 900–1200)

After several centuries without significant changes, mirrors underwent another radical transformation: the mirror of the previous phase was incorporated into a larger base, usually of wood, which was decorated with intricate baroque mosaics of different materials like turquoise, obsidian, shell, copper, and gold. The most notable example of this phase is the disk located at

Chichen Itza (Blainey 2007; Gallaga 2001; Pereira 2008). In parallel, we find in the Tarascan region a mimicry of these mirrors, but instead of wooden bases with mosaics, Tarascan wooden bases are covered with a sheet of copper or bronze, on which the tiles were incorporated (Pereira 2008; Di Peso 1974). Some examples of this variation have been found in northern Mexico, particularly at the site of Paquimé, Chihuahua (Di Peso 1974). In general, the encounter with these innovations intensifies the idea of the magical-religious messages encoded in these mirrors, with more surface area to decorate and enhance the aesthetic value and status of the object.

#### LATE POSTCLASSIC PERIOD (AD 1200–1521)

In the process of incorporation of metal, there was a gradual replacement of pyrite mosaic mirrors, in exchange for gold and copper discs with intricate turquoise tiles (Pereira 2008). In this regard, it is interesting to note the absence of pyrite mirrors alongside the presence of gold disks with turquoise mosaics, in the relationship of objects rendered to the Triple Alliance (Sepúlveda y Herrera 2003). However, pyrite mirrors are present in the *Codex Kingsborough*, as a tribute from the Oaxacan region (Mohar 1997). Similarly, Sahagún (1989) mentions the presence of mirrors in Aztec markets, which denotes a more popular use, probably for more domestic vanity purposes, with the implication that these objects had acquired a less exclusive status by the time of European contact.

#### CLOSING REMARKS

As I have illustrated here and as will be found throughout this volume, iron-ore mirrors are among the most sophisticated items produced by pre-Hispanic artisans or craftspeople. These mirrors were made in a time before a glass was coated with a tin-mercury amalgam process,<sup>2</sup> which had to be imported later from Europe. If one is to follow Kirchhoff (1967), iron-ore “mirrors” are among a specific list of artifacts that characterize or even define the Mesoamerican region. Even though researchers long ago recognized the complexity and symbolism implied in the use of these intriguing items, little research exists regarding their social significance, function, or the precise steps in the manufacturing process that produced them. Lately, the importance of pre-Hispanic mirrors as prestige and/or magical-ritualistic items has been coming under increased discussion, as have the more technological aspects of mirror manufacture (Blainey 2007; Gallaga 2001, 2009; Healy and Blainey 2011; Pereira 2008; Salinas 1995). The advancement of the current research

makes the present volume a timely venture, as it provides a more comprehensive analysis of these shiny objects, integrating different aspects of mirror manufacture, use, and symbolism, as well as conducting a reexamination of the question as to what extent such “mirrors” define and/or characterize the Mesoamerican region (figure 1.4).

In order to arrange the great variety of contributions, the volume is divided into three main sections. The first section (chapters 1–5) focuses on the production aspects of mirrors, with chapters ranging from experimental archaeology projects to discussions of workshops in archaeological contexts in the Maya, Central Mexico, and Northwest Mexico regions. The second section (chapters 6–9 and chapter 11) concentrates on the question of the use and meaning of mirrors during pre-Hispanic times. Special attention is given to the use of such items as both sacred and luxury artifacts. The last section (chapter 10 and chapters 12–13) centers on the use of mirrors leading into modern times by contemporary indigenous communities, with emphasis on examining and stressing the relationship between ethnographic reality and archaeological interpretation.

Owing to the multidimensional importance of mirrors in ancient and present-day Mesoamerican societies, any scholarly study of these objects requires an interdisciplinary approach. Hence, although this volume commences to analyze iron-ore mirrors according to their technical aspects, the chapters proceed from experimental results to the social domains of archaeology, anthropology, and iconography. In this way, one witnesses how these mirror objects reflect the social scientific study of indigenous Mesoamericans more broadly. As scholars continue to elucidate the significance of these objects for the human groups who made and used them, we encounter foreign worldviews and ways of life that are just as complexly human as our own.

## NOTES

1. At least for one of the mirrors. The analysis for the second mirror was inconclusive, suggesting it might have been organic resin (Takeshi Inomata personal communication 2004; Keochakian 2001).

2. The use of silver-mercury amalgams to make mirrors started as far back as AD 500 in China. However, it was not until the fourteenth century that the process to coat a glass with a tin-mercury amalgam was perfected by European manufacturers (Pendergrast 2003: 14, 31).

Site:		State:		Country:	
Period:					
Context:					
Item #		Edge Type:	# 1 	# 2 	# 3 
Object		Holes?		Number:	
Material		Type of Holes:	# 1	# 2	# 3
Shape		Pyrite Present?			
Diameter (cm)		Burned?			
Thickness (cm)		Decorated?			
Dimention		# of fragments			
Condition		% Present			
Decoration					
		Location	Condition		
Cloisone					
Paint					
Carved					
Other					
Description/comments					

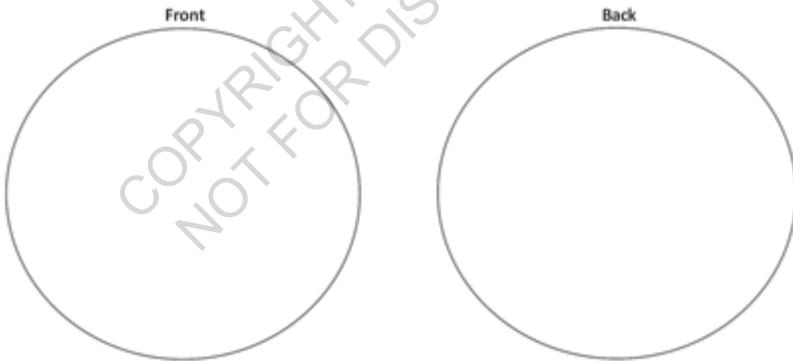


FIGURE I.4. Proposed registration sheet for pyrite mirrors (made by Emiliano Gallaga).

## REFERENCES

- Albenda, Pauline. 1985. "Mirrors in the Ancient Near East." *Notes in the History of Art* 4 (2-3): 2-9.
- Baboula, Evanthia. 2000. *Bronze Age Mirrors: A Mediterranean Commodity in the Aegean*. Nicosia, Cyprus.
- Beasley, J. D. 1949. "The World of the Etruscan Mirror." *Journal of Hellenic Studies* 69: 1-17. <http://dx.doi.org/10.2307/629458>.
- Blainey, Marc. 2007. "Surfaces and Beyond: The Political, Ideological, and Economic Significance of Ancient Maya Iron-Ore Mirrors." MA thesis, Department of Anthropology, Trent University. Peterborough, Ontario: The European Association of Mayanists; [http://www.wayeb.org/download/theses/blainey\\_2007.pdf](http://www.wayeb.org/download/theses/blainey_2007.pdf).
- Bulling, A. 1960. *The Decoration of Mirrors of the Han Period*. Ascona, Switzerland: Artibus Asiae Publishers.
- Cameron, Fiona. 1979. *Greek Bronze Hand-Mirrors in South Italy*. BAR International Series 58. Oxford: British Archaeological Reports.
- Cammann, Schuyler. 1949. "Chinese Mirrors and Chinese Civilization." *Archaeology* (2): 114-120.
- Clark, John E., and Richard D. Hansen. 2001. "The Architecture of Early Kingship: Comparative Perspectives on the Origins of the Maya Royal Court." In *Royal Courts of the Ancient Maya, Volume 2: Data and Case Studies*, edited by Takeshi Inomata and Stephen D. Houston, 1-45. Boulder, CO: Westview Press.
- Coggins, Clemency, and Orrin C. Shane. 1989. *El Cenote de los sacrificios: tesoros mayas extraídos del cenote sagrado de Chichen Itzá*. Mexico: Fondo de Cultura Económica.
- Di Peso, Charles C. 1974. *Casas Grandes: A Fallen Trading Center of the Grand Chichimeca*. Vol. 1. Dragoon, AZ: Amerind Foundation.
- Di Peso, Charles C. 1956. *The Upper Pima of San Cayetana del Tumacacari: An Archaeological Reconstruction of the Ootol of Pimeria Alta*. Dragoon, AZ: Amerind Foundation Publication 7.
- Eckholm, Gordon F. 1945. "A Pyrite Mirror from Queretaro, México." Carnegie Institute of Washington Notes for Middle American Archaeology and Ethnology, no. 53. Washington, DC: Carnegie Institute of Washington.
- Eckholm, Gordon F. 1972. "The Archaeological Significance of Mirrors in the New World." Paper presented at the Atti del XL Congresso Internazionale degli Americanisti, Roma-Genova.
- Eckholm, Gordon F. 1973. *Abstractos de la 40vo Congreso Internacional de Americanistas, Rome-Genoa*. vol. 1., 133-135. Genova, Italy: Casa Editrice Tilgher.

- Furst, Peter T. 1966. "Shaft Tombs, Shell Trumpets and Shamanism: A Culture-Historical Approach to Problems in West Mexican Archaeology." PhD Dissertation, Department of Anthropology University of California, Los Angeles.
- Gallaga M., Emiliano. 2001. "Descripción y análisis de los espejos de pirita del sitio de Snaketown, AZ, EU y su relación con Mesoamérica." Paper presented at the XXVI Mesa Redonda de Antropología, Zacatecas, Zacatecas, México.
- Gallaga M., Emiliano. 2009. "La manufactura de los espejos de pirita: Una experimentación." Paper presented at the 33rd Congreso Internacional de Americanistas, Mexico City, July.
- Gallaga, Emiliano, and Lynnet Lowe. 2012. "Cuentas, Ollas y Espejos: El Recinto Funerario de uno de los Señores de Yoquí (Chiapa de Corzo), Chiapas." Paper presented at the XVIII Congreso Internacional de Antropología Iberoamericana, San Luis Potosí, March 29–31.
- Gladwin, H. S., E. W. Haury, E. B. Sayles, and N. Gladwin. (Original work published 1938) 1965. *Excavation at Snaketown: Material Culture*. Medallion Papers no. 25. 2nd ed. Tucson, AZ: University of Arizona Press.
- Grove, David C. 1977. "Olmec Archaeology: A Half Century of Research and Its Accomplishment." *Journal of World Prehistory* (11): 51–101.
- Healy, Paul F., and Marc G. Blainey. 2011. "Ancient Maya Mosaic Mirrors: Function, Symbolism, and Meaning." *Ancient Mesoamerica* 22 (2): 229–244. <http://dx.doi.org/10.1017/S0956536111000241>.
- Heizer, Robert F., and Jonas E. Gullberg. 1981. "Concave Mirrors from the Site of La Venta, Tabasco: Their Occurrence, Mineralogy, Optical Description, and Function." In *The Olmec and Their Neighbors*, ed. Elizabeth P. Benson, 109–116. Washington, DC: Dumbarton Oaks Research Library and Collections.
- Kelley, J. Charles. 1971. "Archaeology of the Northern Frontier: Zacatecas and Durango." In *Handbook of Middle American Indians: Archaeology of Northern Mesoamerica*, Part two, edited by Robert Wauchope, vol. 11: 768–801. Austin: University of Texas Press.
- Keochakian, Sylvia. 2001. "Technical Study: Adhesive Material Used on Pyrite Mirrors from Aguateca." Unpublished technical report from the Smithsonian Center for Materials Research and Education, Suitland, MD.
- Kidder, Alfred V., Jesse D. Jennings, and Edwin M. Shook. 1946. *Excavation at Kaminaljuyu, Guatemala*. Publication 561. Washington, DC: Carnegie Institution of Washington.
- Kirchhoff, Paul. 1967. *Mesoamerica: Sus límites geográficos, composición étnica y caracteres culturales*. Mexico: suplemento de la revista Tlatoani.
- Lagomarsino, James. 2008. *A Pocket Guide to Rocks and Minerals*. Bath: Parragon.

- Lilyquist, Christine. 1979. *Ancient Egyptian Mirrors*. Munich: Deutscher Kunstverlag.
- Litvak, Jaime. 1992. "En torno al problema de la definición de mesoamerica." In *Una definición de Mesoamerica*, ed. Jaime Litvak, 74–105. Mexico: UNAM.
- Magar, Valerie, and Patricia Meehan. 1995. "Investigación para la interpretación y la conservación de un disco de mosaico de turquesa." Licenciatura thesis, Departament of Restauración de Bienes Muebles, ENR-Churubusco, México.
- Magar, Valerie, and Patricia Meehan. 2001. "Consideration on the Conservation and Investigation of the Turquoise Mosaic Disk from the Palacio Quemado, Tula, México." Paper presented at the 66th SAA Annual Reunion, New Orleans, LA.
- Martínez del Campo Lanz, Sofía. 2010. *Rostros de la divinidad: Los mosaicos mayas de piedra verde*. México: INAH.
- Mata Amado, Guillermo. 2003. "Espejo de pirita y pizarra de Amatitlán." In *XVI Simposio de Investigaciones Arqueológicas en Guatemala, 2002*, edited by J. P. Laporte, B. Arroyo, H. Escobedo, and H. Mejía, 831–839. Guatemala: Museo Nacional de Arqueología y Etnología.
- Matos, Eduardo. 1994. "Mesoamerica." In *Historia Antigua de Mexico, Vol. 1*, edited by Linda Manzanilla and Leonardo López Luján, 49–74. Mexico: INAH, UNAM, Ed. Porrúa.
- McEwan, Colin, Andrew Middleton, Caroline Cartwright, and Rebecca Stacey. 2006. *Turquoise Mosaics from Mexico*. London: The British Museum Press.
- Mohar, Luz María. 1997. *Manos Artesanas del México Antiguo*. México: SEP, CONACYT.
- Pendergrast, Mark. 2003. *Historia de los Espejos*. España: Ediciones B.
- Pereira, Gregory. 2008. "La Materia de las Visiones: Consideraciones acerca de los espejos de pirita prehispánicos." *Diario de Campo*, mayo/junio (48): 123–136.
- Pires-Ferreira, Jane W. 1975. "Formative Mesoamerican Exchange Networks with Special Reference to the Valley of Oaxaca." In *Prehistory and Human Ecology of the Valley of Oaxaca*, vol. 3, edited by Kent. V. Flannery. Museum of Anthropology Memoirs No. 7. Ann Arbor, MI: University of Michigan.
- Pires-Ferreira, Jane W., and Billy Joe Evans. 1978. "Mössbauer Spectral Analysis of Olmec Iron Ore Mirrors: New Evidence of Formative Period Exchange Networks." In *Cultural Continuity in Mesoamerica*, ed. David L. Browman, 101–154. The Hague, Netherlands: Mouton. <http://dx.doi.org/10.1515/9783110807776.101>.
- Sahagún, Fray Bernardino de. 1989. *Historia General de la Cosas de la Nueva España*. México: Alianza Editorial Mexicana, Fondo de Cultura Económica.
- Salinas, Flores. 1995. *Tecnología y Diseño en el México Prehispánico*. Facultad de Arquitectura, Centro de Investigaciones de Diseño Industrial. México: UNAM.

- Sepúlveda y Herrera, María Teresa. 2003. "La Matrícula de Tributos." *Arqueología Mexicana* (14): 1–85.
- Smith, A. Ledyard, and Alfred V. Kidder. 1951. *Excavations at Nebaj, Guatemala*. Publication 594. Washington, DC: Carnegie Institution of Washington.
- Sugiyama, Saburo. 1992. "Warfare, and Human Sacrifice at the Ciudadela: An Iconography Study of the Feathered Serpent Representation." In *Art, Ideology, and the City of Teotihuacan*, ed. Janet Berlo, 205–230. Washington, DC: Dumbarton Oaks Research Library and Collection.
- Taube, Karl A. 1992. "The Iconography of Mirrors at Teotihuacan." In *Art, Ideology, and the City of Teotihuacan*, ed. Janet Berlo, 169–204. Washington, DC: Dumbarton Oaks Research Library and Collection.
- Turner, Margaret H. 1992. "Style in Lapidary Technology: Identifying the Teotihuacan Lapidary Industry." In *Art, Ideology, and the City of Teotihuacan*, ed. Janet Berlo, 89–112. Washington, DC: Dumbarton Oaks Research Library and Collection.
- Tolkien, John Ronald Reuel. 1991. *The Lord of the Rings*. London: BCA.
- Vázquez de Ágredos Pascual, María Luisa. 2010. *La Pintura Mural Maya: Materiales y Técnicas Artísticas*. Mexico: UNAM.
- Woodbury, Richard B., and Aubrey S. Trik. 1953. *The Ruins of Zaculeu, Guatemala*. vol. 1–2. Richmond, VA: William Byrd Press.
- Zamora, Fabian Marcelo. 2002a. "La industria de la pirita en el sitio de Aguateca durante el periodo Clásico Tardío." Licenciatura thesis, Department of Archaeology, Universidad del Valle de Guatemala, Guatemala.
- Zamora, Fabian Marcelo. 2002b. "La industria de la pirita en el sitio Clásico Tardío de Aguateca." In *XV Simposio de Investigaciones Arqueológicas en Guatemala 2001*, ed. J. P. Laporte, H. Escobedo, and B. Arroyo, 695–708. Guatemala: Museo Nacional de Arqueología y Etnología.