Maya Blue: A Fresh Look at an Old Controversy

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I t is extraordinary how two interpretations of the same evidence can lead to radically different conclusions. Beginning in 1962 an intellectual dispute arose over the composition of the pigment known as "Maya Blue" which caused and is still causing a great deal of confusion. The main argument is whether indigo can be detected in Maya Blue and, if present, was it the only colorant used to make the pigment. "Maya Blue" is the name given to a pigment of extraor-
dinary durability and richness of color which appears to have been widely used on murals, ceramics, and manuscripts in pre-Columbian America. The first examples date from the Maya Classic Period, and there is evidence to sug-
gest that it continued to be used into the twentieth century (Gettens 1962:563; Torres 1988:126).

The composition and method of manufacture of Maya Blue has confused and confounded scholars and scientists for more than sixty years. The bright blue color endures withstanding and harsh burial conditions. In the laboratory it resists solvent extraction and even boiling in concentrated nitric acid. Today, however, no historic or ethnomorphic data "proves" the pigment or its manufacture.

In 1962 R. J. Gettens published an article describing the properties of Maya Blue and the failed attempts to identify this component of the pigment. He reported that the main constituent was identified in the 1950s by Elizabeth West Fitzhugh as the rare clay mineral attapulgite, known in Europe as palygorskite. In its natural state, however, attap-
lugite is usually white in color, and one analysis after another failed to identify an additive which could be responsible for the blue color.

Gettens also recorded the analysis of a sample of blue pigment labeled Azul de Tejas which had been collected by A. Everett Austin in the 1930s at Chichén Itzá. Fitzhugh's analysis of this sample led Gettens to conclude that this clay-based pigment had been reinforced with an organic dye, perhaps indigo. The pigment's resistance to degrada-
tion, however, suggested to Gettens (1962:563) that the col-


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The work by Van Olphen and others shows that heat treatment of the clay-organic mixture causes indigo to become resistant to attack by solvents and acids while the color and overall molecular structure are preserved. Subsequent investigations into the mechanisms involved have thus far been inconclusive (Torres 1974), and this particular part of the mystery remains unsolved.

Nevertheless, pigment synthesis experiments, such as that of Kleber et al. (1967), clearly show how easily a stable, acid-resistant and solvent-resistant blue is prepared using only pure indigotin, indigo, and heat. This information, coupled with positive identifications of indigo in pigment samples from which the soluble indigo has already been extracted (Kleber et al. 1967), should lend to the logical conclusion that indigo is the coagent in Maya Blue.

This does not mean that the Maya were incapable of preparing stable, blue pigments from other raw materials. Several archaeological samples have been found to contain sepiolite as the main ingredient, a mineral very closely related to attapulgite. It is therefore possible that the Maya were able also to substitute other organic compounds for indigo, perhaps in order to obtain a range of blue colors. The data show, however, that indigo has been the only organic coagent identified to date in archaeological samples.

Conclusions

This paper began as a simple literature search on the subject of Maya pottery decoration. It unfolded as an incredibly complex story surrounding the early attempts of scientists and ethnohistorians to identify the components of the pigment known as Maya Blue. We present here a greatly simplified version of a story that continues to unfold.

Although the majority of analytical evidence points to indigo as the colorant, researchers have not agreed on the validity or interpretation of the data. During the past two decades, this has led to obfuscation, misinterpretation, and inadvertent suppression of valuable information. It is hoped that we have eliminated some of the confusion by this focused investigation of all sources, not only the work by Kleber et al. (1967).

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Notes

Additional bibliographic sources for this paper include Bicker (1976), Bradley (1945), Hadden et al. (1967), Lethbridge and Wolters (1974), Moore et al. (1971), Moors (1964), Prince (1964), and Ruppert et al. (1955).

An English translation of the article by Kleber et al. (1967) is available from Linda S. Broussard. The translation is entitled "Maya Blue: A New Explanation," and is available for the following account.

Littmann became convinced that Maya Blue was actually composed of a naturally blue montmorillonite clay, despite the evidence pointing to an indigotin-attapulgite complex. Littmann prepared an article explaining his theory, which was based upon very different studies. Professor Dean Arnold of Wheaton College was asked to review this article for American Archaeology because of his expertise in the ethnochemistry of the Americas. Arnold (1967) and Bicker (1976). For a number of very good reasons, Arnold suggested that Littmann's article should not be published. This opinion was corroborated by Arnold's colleague, Dr. Bruce Buhler, a geologist with the U.S. Department of the Interior Geological Survey. One of Arnold's criticisms was that Littmann appeared to be unaware of the extensive work performed on years earlier linking indigo and attapulgite to Maya Blue. More important, however, Arnold noted that there were "great problems" with this paper of a substantive and technical nature, not the least of which was that Littmann's interpretation of the data was flawed by his apparent lack of expertise in x-ray diffraction analysis.

As a result of the objections by Arnold (and presumably by others), Littmann's original article was not published. Littmann persevered in his efforts and obtained copies of the articles he had missed from Arnold (Kleber et al. 1967; Cabrera Gakido 1969; and Torres 1974). Littmann remained steadfast in his opinions, however, even after a number of communications with Arnold.

Curiously, Littmann's article appeared three years later in American Antiquity under a different title and included extensive criticism of all the studies which supported the theory of an indigo-attapulgite complex (Littmann 1980). Dean Arnold was not asked to review this second article.

The "seven reviewers" who continued to insist that indigo was the colorant in Maya Blue (Littmann 1980:404) have not yet been identified. It is clear, however, that Littmann had received enough criticism to cause him to at least acknowledge that the indigo-attapulgite complex was a valid theory, for he included his own indigo-attapulgite experiments in his 1982 article. It does not appear, however, that Littmann (1982:407) ever relinquished belief in his own theory of a blue montmorillonite.