



Computed tomography study of snuff trays from San Pedro de Atacama (Northern Chile)

Hermann M. Niemeyer^{a,*}, Víctor Zapata^b, Paulina Cantillana^c, Alejandra Missene^c, José Aguilera^b, Arturo Torres^d

^aDepartamento de Ciencias Ecológicas, Facultad de Ciencias, Universidad de Chile, Casilla 653, Santiago, Chile

^bCentro de Imagenología, Hospital Clínico Universidad de Chile, Av. Santos Dumont 999, Santiago, Chile

^cEscuela de Tecnología Médica, Universidad de Chile, Independencia 1027, Santiago, Chile

^dInstituto de Investigaciones Arqueológicas y Museo R.P. Gustavo Le Paige, Universidad Católica del Norte, 1410000 San Pedro de Atacama, Chile

ARTICLE INFO

Article history:

Received 24 September 2012

Received in revised form

11 December 2012

Accepted 14 December 2012

Keywords:

Snuff trays

San Pedro de Atacama

Wood provenience

Computed tomography (CT)

CT acquisition parameters

Tiwanaku

Northwestern Argentina

Wood density

Wood growth rings

ABSTRACT

Wooden snuff trays from San Pedro de Atacama (SPA) in northern Chile are objects of particular museological value. Computed tomography (CT), a non-destructive analytical technique useful in the analysis of archaeological objects in which physical tampering is not desirable, was used to study provenience of wood, quality of craftsmanship, taphonomic processes and nature of gemstone inlays in a group of snuff trays. While wood used in the manufacture of trays was mostly exogenous to SPA, gemstones used in inlays were likely of local origin. These findings support the active exchange of goods proposed for the south-central Andes region. Several features revealed in the trays support the view that craftsmen producing them were skillful artisans.

© 2012 Elsevier Ltd. All rights reserved.

1. Introduction

Consumption of hallucinogenic substances by smoking, ingesting, snuffing, chewing or through enemas is a long-standing tradition amongst native peoples of the Americas (Torres and Repke, 2006; Schultes et al., 1998). Smoking pipes, documented in San Pedro de Atacama (SPA) in Northern Chile in contexts before 400 A.D., are gradually replaced by snuffing implements which become predominant during the Middle period (400–1000 A.D.) (Torres, 1999). In fact, prehispanic archaeological sites in SPA show the highest incidence of snuffing implements in the world (Torres, 1999), the most conspicuous of which are wooden snuff trays (Torres, 1987). Many of these artifacts have been optimally preserved by the extreme aridity of the area (Blanchette et al., 1990).

Research on snuff trays has centered mainly on those ascribed to the period when the influence of the Altiplanic Tiwanaku state was

strongest. The studies have mainly addressed manufacturing technique and iconography, the most prominent feature in those trays (Llagostera, 1995, 2001, 2006; Llagostera et al., 1988; Núñez, 1963; Tarragó, 1989; Thomas et al., 1984; Torres, 1984, 1986, 1999). The study of non-Tiwanaku trays has received comparatively less attention (Llagostera, 2001; Llagostera et al., 1988; Torres, 1999) until the recent work of Horta Tricallotis (in press-a, in press-b). Among the long debated issues concerning snuff trays from SPA are their assignment to different styles and the correlation of these styles with styles prevailing in other types of archaeological objects – be them from SPA or from elsewhere in the south-central Andes, the relationship between style and cultural period, the societal status of tray users, the diachronic prevalence of tray use within society, the provenience of the materials employed in tray manufacture and of the tray itself, i.e., was it made with local or exogenous raw materials? and was it made by local or foreign artisans? Data pertaining to these issues, particularly the provenience of raw materials, would allow new insights into the circulation of these objects and associated snuffing practices. Given the importance of snuffing and hence snuffing paraphernalia in the

* Corresponding author. Tel.: +56 2 29787409; fax: +56 2 29787445.

E-mail address: niemeyer@abulafia.ciencias.uchile.cl (H.M. Niemeyer).

spiritual realm of prehispanic cultures of the south-central Andes (Torres, 1999), such provenience study seems a timely undertaking.

During the last couple of decades, numerous studies have addressed the provenience of materials used in the manufacture of objects of archaeological significance. An ample variety of physical and chemical analytical techniques have been used to compare features of the material constitutive of the object with those of similar materials from various geographical origins, thus establishing likely candidates as sources. The main conclusions arising from such studies are proposals of patterns of mobility and interaction of ancient human populations. Materials as different as clay (Ma et al., 2012; Neff, 2012), pigments (Beck et al., 2012), textile fibers (Frei et al., 2009), glass (Polikreti et al., 2012), obsidian (Vazquez et al., 2012), metals (Cattin et al., 2011), and wood (Allevato et al., 2010; Rich et al., 2012) have been recently the subject of such studies. Similar studies have also been reported on bioanthropological remains of ancient human populations (Vika, 2009).

Few provenience studies have been performed on archaeological materials from Northern Chile. A study using inductively coupled plasma – mass spectrometry combined with optical emission plasma – mass spectrometry and atomic absorption spectroscopy showed that local andesite was the primary source used in archaeological stone artifacts from the Formative Period of the upper Loa river basin neighboring SPA (Morales et al., 2007; Seelenfreund et al., 2009). Neutron activation analysis as well as scanning electron microscopy and energy dispersive X-ray fluorescence analysis on metal objects from the Middle Period at SPA showed that the origin of alloys employed in them was the Bolivian altipano region (Lechtman and Macfarlane, 2005; Maldonado et al., 2010). More recently, inductively coupled plasma – atomic emission spectrometry confirmed the previous results and further found that two metal objects from Middle Period contexts of SPA were made of unalloyed copper, attributed to local metallurgical activities (Salazar et al., 2011). Chemical, anthropological and cultural markers indicated the provenience of a Late Intermediate Period population from Caspana, in the middle Loa river basin in Northern Chile (Knudson and Torres-Rouff, 2009), and showed that a man from Middle Horizon SPA had lived his early life in the Bolivian altiplano (Torres-Rouff and Knudson, 2007), and that none of a group of individuals from the Middle Period in SPA had lived in the Titicaca basin in their youth (Knudson, 2007).

The provenience of the wood used in the manufacture of snuff trays from SPA was recently addressed by determining wood density, a parameter that can be used to demarcate the range of

possible woody species (Niemeyer, 2013). In that study, density was determined as the ratio between the weight of the tray and its volume. This type of measurement may be distorted in trays with gemstone inlays (amounting to one-sixth of the trays at the museum in SPA) because densities of gemstones are normally much higher than those of wood. Hence, an alternative method must be sought for determining densities of gemstone-containing trays, the subject of the present study.

X-ray computed tomography (CT) is a non-destructive analytical technique particularly suited to the analysis of sensitive archaeological objects in which physical tampering should be minimized (van Kaick and Delorme, 2005). It provides values of X-ray absorption by volume elements in the object analyzed which, upon suitable calibration, can be transformed into density data. In the present case, CT has the distinct advantages of simultaneously providing the densities of the two main raw materials of snuff trays, i.e. wood and gemstones, and also providing insights into the craftsmanship techniques employed in the manufacture of the trays. In this study, we address the question whether CT can be used to study provenience of wood, quality of craftsmanship, taphonomic processes and nature of gemstone inlays in a group of snuff trays from SPA.

2. Materials and methods

2.1. Objects and samples studied

At the time this study was initiated (November 2010), the Instituto de Investigaciones Arqueológicas y Museo at San Pedro de Atacama had included in its database 416 snuff trays in different states of preservation, 411 of which were made of wood, two of stone and three of stone; of the wooden trays, 69 had gemstones inlaid. In the present study, nine snuff trays were chosen which upon macroscopic examination were well preserved, with smooth surfaces and well-defined contours (Table 1, Fig. 1): six of the trays chosen contained a large number of inlaid gemstones while three others, used for comparison of conventional and CT methods for determining density, contained no gemstones. At the museum at SPA, trays are stored under low humidity conditions (ca. 10% RH), comparable to standard conditions for reporting wood densities (Chave et al., 2006; Lindgren, 1991a).

Reference wood samples for calibration purposes were obtained of native trees from SPA ($N = 3$, representing all tree species growing in the area), and from areas of western and southern Bolivia and northwestern Argentina with direct cultural links with

Table 1
Characteristics of the snuff trays studied.

IIAM number ^a	Mummy number	Site	Cultural phase ^b	Density (g/cm ³)	Distance between rings (mm)	Angle (°) ^c	Manufacturing technique ^g
4	5383	Coyo Oriente	Quitor/Coyo	1.13	2.0	2	HR
19	4040	Coyo Oriente	Quitor/Coyo	1.10	1.1	2	VC
75	2264–2267	Quitor 5	Quitor	0.41	3.0	nd ^f	VC
101	2145	Quitor 5	na ^c	0.48	nr ^d	3	WD
231	3935	Coyo Oriente	na ^c	0.57	3.0	10	VC
272	5369	Coyo Oriente	na ^c	0.69	2.4	2	LI
283	1483	Yaye 2	Yaye/Solor	0.96	1.1	0	WD
324	2702	Quitor 6	Sequitor/Quitor	0.73	10	6	VC
392	4850	Tchilimoya	Quitor/Coyo	0.86	1.4	nd ^f	VC

^a Catalog number at the Instituto de Investigaciones Arqueológicas y Museo at San Pedro de Atacama.

^b See text for references. More than one cultural phase is given when the context did not allow specific assignment.

^c Not available: the archaeological context of the mummy did not allow its assignment to a cultural phase.

^d No rings were observed in this tray (see text for possible explanations).

^e Mean angle between the direction of wood fibers and main axes of sagittal and coronal planes as depicted in Fig. 2.

^f Accurate measurements could not be taken due to the curved nature of the tray.

^g Manufacturing technique employed: HR = high reliefs on a planar tray appendix; VC = volumetrically carved appendix; WD = appendix without decoration; LI = linear incisions on the appendix.

Download English Version:

<https://daneshyari.com/en/article/10498958>

Download Persian Version:

<https://daneshyari.com/article/10498958>

[Daneshyari.com](https://daneshyari.com)