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EGYPTOLOGICAL INFORMATION FROM CHEMICAL ANALYSES: THE PROVENANCE OF OBSIDIAN AND GLASS

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Some materials found in archaeological sites have chemical or mineralogical characteristics which differ from one geological site to another. Comparing the characteristics of the archaeological artifact with the characteristics of different geological environments might allow the identification of the original source of the material. This work presents chemical composition provenance studies on glass (natural and artificial) based on trace elements concentration and lead isotope composition.

On the one hand, obsidian—a natural volcanic vitreous material—found in some Upper Egyptian tombs from the Naqada period seems to originate from the oriental African volcanos, probably from Ethiopia, or from the Arabian volcanos (in western Yemen), according to the uranium, thorium and tantalum concentrations.

On the other hand, the chemical analysis of some Egyptian glasses indicates that, during the 18th dynasty, glass was manufactured in Egypt with Egyptian materials (instead of being a Mesopotamian import) and some of them were colored also with Egyptian materials (e.g. galena from the Gebel Zeit mines). The lanthanum and chrome concentrations clearly differ between glasses made in Egypt and in Mesopotamia, allowing the determination of the Egyptian provenance of glasses used in the Mycenaean world.

1. Introduction

The chemical analyses of different ancient materials might provide information on their provenance (Pollard et al. 2007). In these cases, the comparison between the chemical compositions of the material from a quarry or a mine and the material from an archaeological site allows the identification of the most likely sources of the archaeological material. Provenance studies provide knowledge on the size of territories, interactions between different cultures or civilizations and likely commercial routes in antiquity (Tykot 2004).

The provenance methods that use the analysis of the chemical composition are based on the existence of chemical or mineralogical characteristics which depend on the original geographical location of the material, that is to say, they differ from one geological site to another. The chemical characteristics might be the concentration of major and minor components of the material but also of trace components. In the case of rocks, what might change from one location to another is the mineralogical composition, i.e. the proportion of different minerals which compose the rock. In some cases, the total concentration of one element in a material is independent of the geological site but its isotopic composition depends on the location. In this sense, the determination of the lead isotopes ratios (LIA, Lead Isotope Analysis) has been profusely applied for the provenance of a number of archaeological objects (Stos-Gale 1992).

The main procedure to carry out provenance studies based on chemical analyses might be summarized in the following steps:

1st: Chemical or mineralogical analysis of the material extracted from different ancient geological sources.

2nd: Determination of the chemical or mineralogical parameters (elements, isotopes or minerals) that characterize each geological source.

3rd: Chemical or mineralogical analysis of the material found in an archaeological site.

4th: Mathematical or statistical comparison between the characteristics of the different sources and the characteristics of the archaeological object, and elucidation of the likely source(s) of the material.

Provenance studies based on the determination of the chemical composition of the materials have also been carried out for materials used in ancient Egypt. In the present work,

two materials have been chosen because of their different nature (both are glasses but one is natural and the other synthetic), the different methodologies used for the determination of their provenance, and the Egyptological information obtained from their provenance. The main objectives of this work are: (1) to show the different methodologies employed for provenance studies of Egyptian obsidian and glass; (2) to describe the Egyptological information that might be obtained from provenance studies; and (3) to highlight the advantages of determining the chemical composition of the materials used by the ancient Egyptians.

2. Contacts with the South: The Provenance of Predynastic Egyptian Obsidian

Obsidian is a volcanic rock with a relatively high content of silicon which has some advantageous characteristics for provenance studies. On the one hand, it was widely used in antiquity and there are many archaeological samples. Data from Table I show the distance between archaeological sites and likely sources of obsidian around the world and illustrate the unquestionable interest in antiquity for obsidian. On the other hand, there is a limited number of obsidian mines worked in antiquity, very localized geographically, so that a priori there must not be a high scattering of the chemical data, favoring the delimitation of the chemical values which define each mine. The high number of archaeological obsidian artifacts and the low number of likely mines generated in the last century the development of chemical methods to determine the provenance of the obsidian samples, the first methods being

based on the concentration of barium and zirconium (Renfrew et al. 1966), where different Ba-Zr ratios corresponded to different sources.

However, the classification of the obsidians based on barium and zirconium concentrations did not allow distinguishing between some sources with similar Ba-Zr ratios. In particular, more studies were necessary to establish the provenance of obsidian samples of different volcanos in Eastern Africa (especially the obsidians from Ethiopia, Kenya and Eritrea) and in the south of the Arabian Peninsula (Yemen and Saudi Arabia). For this reason, provenance studies based on the chemical analysis of obsidian have been extended to include other elements that could distinguish between the two volcanic systems that dominate the obsidian availability in the ancient Near East. The first volcanic system corresponds to the volcanos in Cappadocia, Anatolia and Armenia, and the second one corresponds to the volcanos of the Rift Valley, from Ethiopia to Saudi Arabia. Obsidians from both systems have chemical differences because they are the result of different geological processes: tectonic subduction in the 'Anatolian' system, and intraplate eruption in the Rift Valley. The different processes of formation induced differences in some chemical elements such as thorium, uranium, tantalum and niobium. For this reason, the Th/Ta and U/Ta ratios might be used as an indicator of the provenance of obsidians from Anatolia-Armenia or East Africa-Arabian Peninsula (Bavay et al. 2000).

In ancient Egypt, the use of obsidian during the Predynastic and the first dynasties is very rare (much rarer than in Mesopotamia) and was mostly used as a precious stone in some objects, mainly jewelry, found in high-status tombs. For example, from the

Site (Eastern Mediterranean)	Distance site-source (km)
Nahal Lavan (Israel)	800
Ali Kosh (Iran)	900
Çatal Höyük (Turkey)	200
Beidha (Turkey)	900
Tel e-Malyan (Syria)	1300
Site (other regions of the world)	Distance site-source (km)
Primorye (Russia)	200-700
Korea	400
Arizona (USA)	200
Malaysia	3500
Fiji Islands	3300
Transylvania (Romania)	> 1500

Table 1. Some examples of distances between Neolithic archaeological sites and likely sources of obsidian. Data from Moutsiou 2011.

2200 tombs excavated in Naqada, only five tombs contained obsidian (Bavay et al. 2000). Probably due to this scarcity, there were almost no studies of Egyptian obsidian composition before the study carried out by Bavay et al. (2000), who analyzed different Upper Egypt obsidians, namely:

- Fragments of vessels in Djer's tomb in Umm el-Qaab, Abydos (Naqada IIC1 period).
- Fragments of vessels in the U-j tomb in Umm el-Qaab, Abydos (Naqada IIIA1 period).
- Obsidian bladelet in a necklace found in tomb 1629, cemetery 23, in Qaw el-Kebir (Naqada IIC period).
- Obsidian necklace from tomb 499 and knife blade from tomb 743 in Naqada (Naqada IID2 period).
- Obsidian beads found in the beads workshop in Nekhen, Hierakonpolis (Early Dynastic period).

The laser ablation inductively coupled plasma mass spectrometry (LA-ICPMS) technique was used by Bavay et al. to determine the concentration of different elements such as thorium, uranium and tantalum in the Egyptian obsidians and in different geological samples from Anatolia, Ethiopia and Yemen. The results obtained in terms of the Th/Ta and U/Ta ratios are shown in Fig. 1. As it can be seen, Anatolian obsidians have Th/Ta ratios much higher and much more variable than Egyptian obsidians. Yemen obsidians have Th/Ta ratios higher than the Egyptians obsidians while Ethiopian and Egyptian obsidians seem to have very similar

ratios. The main conclusion drawn from these data is that the Predynastic or Early Dynastic obsidian used in Upper Egypt comes from Ethiopia, although it should be noted that only a small number of Egyptian obsidians were analyzed.

Some authors claim that the Ethiopian obsidian could have arrived to Egypt via a maritime route through the Red Sea, and that the obsidian commerce or transport could be related with the commerce with Punt, although there is no textual reference to this rock in the Egyptian lists of products from Punt (Zarins 1996). The traffic of obsidian in the south of the Red Sea is attested at least from the 5th millennium BC, and African obsidian was found in different archaeological sites in the Tihamah coast in Yemen (Khalidi et al. 2010). The path that obsidian followed between the Ethiopian volcanos and the Red Sea is not known yet. One of the potential ports where obsidian could have been shipped is located in the Buri Peninsula and the Gulf of Zula (in Eritrea), where obsidian samples were found in different archaeological sites from the Neolithic to the 4th millennium BC (Beyin 2011). In addition, one of the volcanos known as Kusrale was mined in antiquity for obsidian. Samples from the sites and from the volcano were analyzed by Beyin (2009), including thorium, uranium and tantalum. Fig. 2 shows the Th/Ta and U/Ta for these samples together with the values determined for Egyptian archaeological obsidians and Ethiopian geological obsidians.

As it can be seen, Eritrean samples show relatively low Th/Ta ratios, characteristic of the Rift Valley obsidians, but their Th/U ratios are always lower than the ones corres-

Fig 1.

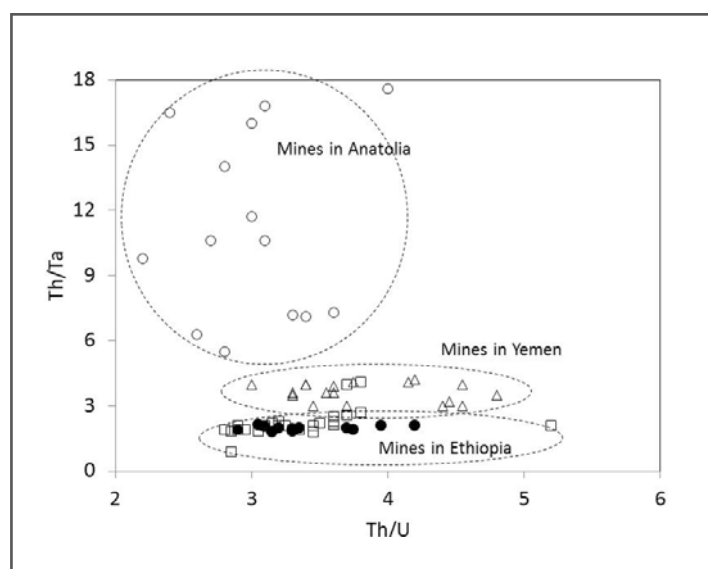


Figure 1. Experimental ratios obtained from different obsidian samples: ○ Mines from Anatolia; △ Mines from West Yemen; □ Mines from Ethiopia; ● Predynastic obsidians. Data from Bavay et al. 2000.

Fig 2.

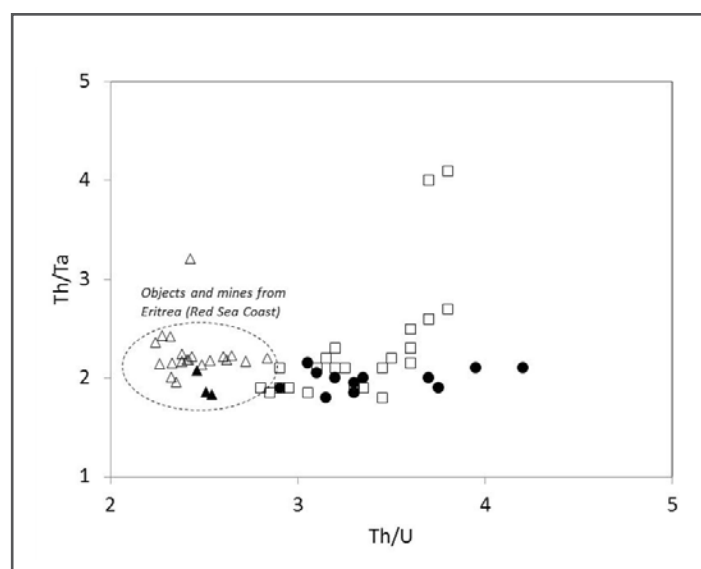


Figure 2. Th/Ta and Th/U ratios from different obsidians: △ Archaeological objects from the Gulf of Zula; ▲ Geological samples from Kusrale volcano; □ Geological samples from Ethiopia; ● Archaeological samples from Upper Egypt. Data from Bavay et al. 2000; Beyin 2009; 2011.

ponding to the Egyptian archaeological samples, suggesting that Egyptian obsidian did not come from this region of Eritrea. These results do not preclude a maritime route through the Red Sea, but indicate that the Gulf of Zula was probably not a part of this route. Even though the route through the Red Sea is generally accepted (Zarins 1989; 1996; Tykot 1996), the possibility of a terrestrial/riverine route should not be precluded. In the Mahal Teglinos settlement from the Gush culture, near the modern city of Kasala in inland Sudan, a number of objects made of Ethiopian obsidian were found together with Egyptian objects (Fattovich 1997). These findings could indicate that Mahal Teglinos was one station in a commercial route that transported obsidian from Ethiopia to the Nile River and through the Nile River to the settlements in Upper Egypt. Mahal Teglinos is currently only an indicator of a possible 'second' obsidian route to Egypt and more data are necessary to confirm or preclude its existence.

Unfortunately, the number of analyzed Predynastic obsidian samples from Lower Egypt is still lower than those from Upper Egypt and only the chemical composition of two samples was published: one sample from Tell el-Fara'in-Buto and another from el-Tell el-Iswid (Bavay et al. 2004). The chemical composition of the samples was determined by LA-ICPMS and the concentration of thorium, uranium and tantalum resulted in Th/Ta ratios of 7.10 and 6.38 for the Tell el-Fara'in-Buto and el-Tell el-Iswid samples, respectively. As it can be seen in Fig. 2, these relatively high ratios would correspond to the chemical composition of the obsidian from Anatolia and are very far from the results that characterize African obsidian sources.

If these results are considered significant, in spite of the very low number of samples analyzed, the main conclusion is that obsidian used in Upper and Lower Egypt came during the Predynastic from different sources. Although no obsidian was found in Predynastic times in Syria-Palestine, commercial routes that connected Lower Egypt with distant zones as Mesopotamia or Anatolia existed. For example, already in Naqada II lapis lazuli arrived to Lower Egypt (and also to Upper Egypt) from Afghanistan through Mesopotamia and was shipped in one of the Mediterranean ports in the Levantine coast, probably Ras Shamra or Byblos (Aubert 2013).

Although in this work the provenance of the obsidian is only based on the concentration of trace elements such as Th, Ta and U, other chemical elements could indicate the provenance of the obsidian samples. Actually, a statistical study of the concentrations of trace elements in obsidians from different volcanic regions conducted at the Universitat Politècnica de Catalunya showed that other discriminating elements could be zirconium, niobium and zinc (Alva Howes 2014).

3. Contacts with the North: The Provenance of Egyptian Glass during the 18th Dynasty

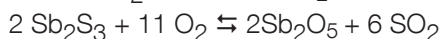
Vitreous synthetic materials were first used in Egypt probably in the Badarian period, when glazed steatite was prepared for the fabrication of necklace beads (Tite and Bimson 1989). During the Predynastic, the synthesis of faience was developed in Egypt and differed from glazed steatite in the nucleus of the object (steatite in glazed steatite and quartz or sand in faience). Glass technology started during the 15th century BC in Mesopotamia and Egypt, perhaps some years earlier in Mesopotamia than in Egypt. Recent studies on the localization of the glassmaking workshops in the Near East showed that secondary glass manufacture workshops existed in Amarna and probably the most ancient primary glass workshop discovered (Smirniou and Rehren 2011). For this reason, the provenance of glass objects from Amarna and from the reigns of the pharaohs before Akhenaten is of interest in order to establish when Egyptians started to fabricate glass in Egypt and what was the provenance of the raw materials.

Glass was fabricated by fusing together three different compounds and cooling slowly the product in order to create a supercooled liquid insoluble in water, transparent, translucent and bright. The three reactants were: (1) the principal component of the glass (quartz or sand), (2) the flux (usually plant ashes or natron), and (3) the stabilizer, which increases the durability of the glass (calcite, CaCO_3). As it can be seen, glass is a synthetic material obtained from a mixture of other materials; as a consequence, provenance studies might give inconclusive results especially if they are based on chemical compositions. The chemical composition of the glass will be the consequence of the different chemical compositions of the reactants (which might have different provenances) but also of the different quantities of each reactant added to the mixture. There are two different fields of glass provenance studies that are yielding robust results on the difference between Egyptian and Mesopotamian glasses: LIA and La-Cr plots.

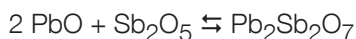
3.1. The First Manufacture of Glass in Egypt: LIA Analyses

As it was mentioned above, one of the most applied methodologies for the determination of the provenance of Pb-containing materials is LIA. This procedure can be applied to the study of the provenance of some Egyptian glasses because they were colored by using a lead compound, lead antimonate ($\text{Pb}_2\text{Sb}_2\text{O}_7$), which was employed in ancient Egypt in the fabrication of yellow or green glasses (Duckworth et al. 2012). Although there is not a general agreement on the process of lead antimonate incorporation to the glass (an *ex situ* or an *in situ* synthesis), it seems that a mixture of two minerals was used: galena (PbS) and stibnite (Sb_2S_3) (Mass et al. 2002), which provided lead and antimony, respectively. The mixture of the minerals was heated to 800°C in open furnaces to obtain the antimonate through a two-step mechanism:

1st step - Sulfides oxidation by the oxygen of the air:



2nd step - Antimonate formation:



While stibnite is believed not to come from Egypt (or at least there are not known stibnite mines in Egypt), there are different mines of galena that were known in antiquity. Shortland et al. (2000) determined the lead isotopic composition of different glasses and other lead-containing Egyptian objects and compared the results obtained with the isotopic compositions of the Egyptian galena mines and of the Mesopotamian galena mines also known in antiquity.

The results of the isotopic compositions of the mines and glasses are shown in Fig. 3. As it can be seen in this figure, there is a difference between the isotopic composition of the glasses from Amarna and the glasses from Thutmose III's reign. Actually, Amarna glasses have isotopic compositions similar to the ones determined for the galena mines in Gebel Zeit, which were mined by the ancient Egyptians at least from the Middle Kingdom onward (Castel and Soukiassian 1985; 1988). On the contrary, the glasses from Thutmose III's reign (from his tomb in the Valley of the Kings and from the tomb of

his 'Syrian' wives in the Wadi Qubbanet el-Qirud) have isotopic compositions similar to the lead of the Mesopotamian galena mines.

Therefore, it is probable that the glasses found in Amarna were fabricated in Amarna using Egyptian materials. During the 19th dynasty, in Qantir Piramesses, glass was made from Egyptian raw materials in workshops that were different from the workshops where glass objects were manufactured (Rehren and Pusch 2005). The existence of separated workshops in Amarna for the synthesis of glass and the manufacture of glass objects was postulated recently (Smirniou and Rehren 2011); this would indicate that during Akhenaten's reign glass was already synthesized and fabricated in Egypt. However, the primary synthesis of glass in Egypt does not imply that the import of Mesopotamian glass had ceased. Mesopotamian glass still arrived to Egypt as it is said in some of the Amarna letters (Shortland 2007), perhaps because it was a product that the king requested as a high-level tribute or simply because it was considered as a glass of better quality.

3.2. The Import of Glass from Egypt: La-Cr Analyses of the Uluburun Cargo

The Uluburun ship sunk in the south coast of Turkey in the 13th century BC (Pulak 2008). The ship carried different materials such as unworked blue glass, blocks of "Egyptian Blue" pigment and ox-hide copper ingots (Gestoso Singer

Fig 3.

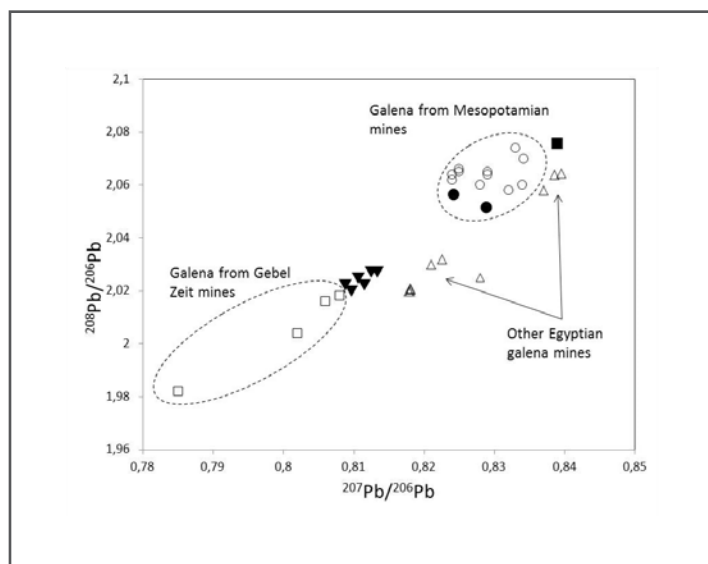


Figure 3. Lead isotopic composition of geological samples from galena mines in Egypt (\square and \triangle) and in Mesopotamia (\circ) together with the values of the New Kingdom glasses: \blacktriangledown Amarna glasses; \bullet Thutmose III's reign glasses (Wadi Qubbanet el-Qirud); \blacksquare Thutmose III's reign glasses (Tomb of Thutmose III, KV34, Valley of the Kings). Data from Shortland et al. 2000.

Fig 4.

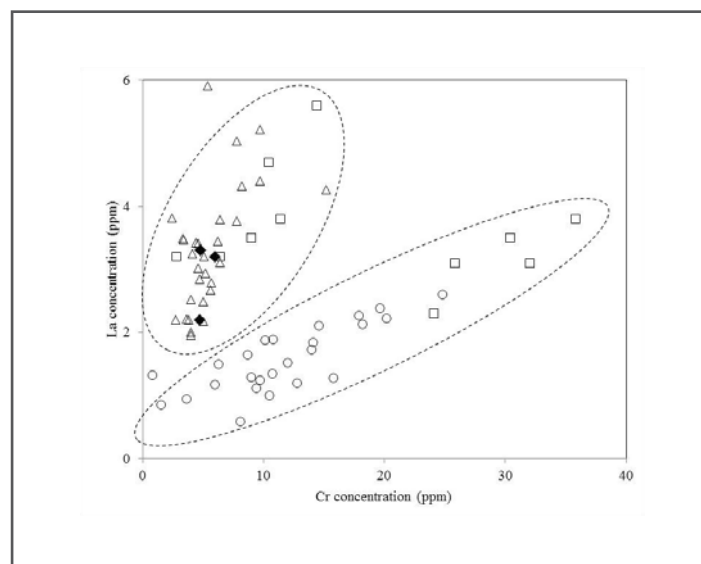


Figure 4. Cr and La concentration in different glass samples: \circ Mesopotamian glasses (Shortland et al. 2007); \triangle Egyptian glasses (Shortland et al. 2007); \square Mycenaean glasses (Walton et al. 2009); \blacklozenge Glass ingots from the Uluburun ship (Jackson and Nicholson 2010).

2011). The glass from the Uluburun shipwreck was chemically analyzed in order to establish if it came from Mesopotamia or Egypt. The provenance methodology used was not based on the colorants but on the differences in the concentration of some trace elements. Shortland et al. (2007) investigated different trace elements as potential discriminants in the provenance of the glasses and concluded that Mesopotamian glasses had relatively high Cr concentrations while Egyptian glasses had higher concentrations of La, Ti and Zr.

Fig. 4 shows a plot of La and Cr concentrations determined for Mesopotamian glasses (from Nuzi and Tell Brak); Egyptian glasses (from Malkata and Amarna); Mycenaean glasses (Walton et al. 2009) and glasses found in the Uluburun shipwreck (Jackson and Nicholson 2010). As it can be seen in the figure, there are two main areas of concentration which correspond to the composition of the Egyptian glasses and the Mesopotamian glasses, respectively. Mycenaean glasses fall into the 'Egyptian composition area', probably indicating that they came from Egypt. The composition of three glass ingots found in the Uluburun shipwreck is included in the figure and falls into the 'Egyptian' area of concentration, once more pointing to an Egyptian origin of such glasses which could be corroborated by other materials found in the shipwreck such as Egyptian Blue and objects from the Amarna period (Gestoso Singer 2008). These results indicate that during the New Kingdom glass was not only fabricated in Egypt but also exported to Mycenae through a maritime commercial route which traversed the Mediterranean.

4. Conclusions

The main objective of this work was to illustrate how the application of analytical chemistry techniques to archaeological objects might provide Egyptological information. This was done through the description of the results on the provenance determination of the natural volcanic glass obsidian and the synthetic glass used in ancient Egypt.

The determination of the chemical composition of the obsidian used in the Predynastic helps locating the connecting routes between Upper Egypt and some regions of Ethiopia. It is probable that a maritime route through the Red Sea existed already during the Predynastic period, although it is possible that an additional terrestrial/fluvial route operated as well. On the other hand, in Predynastic Lower Egypt the obsidian supply seems to depend on connections with Mesopotamia and the Levantine coast (with the primary source located in the Anatolian volcanos), although the number of obsidian samples analyzed is admittedly small.

The results obtained using different glass provenance chemical procedures (isotopes or trace elements) point to the development of glass technology in Egypt between the reigns of Thutmose III and Akhenaten. At that time, the primary manu-

facture of glass from raw materials (and not only the fabrication of glass objects from glass ingots) seems to be already established. Raw materials such as galena are demonstrated to be of Egyptian origin and Egyptian glasses were later exported to the Mycenaean world.

The data and the conclusions presented in this work highlight the importance of the chemical analyses of Egyptian archaeological materials, because they provide information on the provenance of the materials and on ancient Egyptian interconnections. Obsidian and glass chemical studies are only two examples of the potential role of chemistry in Egyptology, and there are other materials such as basalt (Greenough et al. 2001), granite (Williams-Thorpe 1996), pottery (Tite 2008), turquoise (Hull et al. 2008) and lapis lazuli (Re et al. 2011) that are being chemically—or even geochemically and mineralogically—analyzed in order to acquire provenance information ■

5. Acknowledgments

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THE DIRECTOR OF THE CEHAO IN AUSTRALIA

Dr Juan Manuel Tebes spent three weeks in Australia doing research as Academic Visitant at the University of Sydney. Tebes carried out his research at the Centre for Classical and Near Eastern Studies of Australia (CCANESA) of the University of Sydney, thanks to an Apollo Visiting Fellowship awarded by the Near Eastern Archaeology Foundation (NEAF), in July and August 2014.

Tebes presented a few seminars and conferences in Australia. On August 4th he gave a seminar to postgraduate students in Sydney, in the context of CCANESA's Near Eastern Seminar Series. The topic of the seminar was "Iconographies of Power in the Pottery and Rock Art of the Late Bronze/Iron Age Southern Levant and Northwestern Arabia." It was focused on the study of the human and animal (especially the avian) iconography in the pottery, rock art and reliefs of the Southern Levant and Northwestern Arabia during the very Late Bronze Age

and the Iron Age (ca. 1300-550 BCE). Special attention was paid to its social and symbolic meaning, particularly in relation with the socio-economic background of the tribal societies settling and moving around the Negev, Edom and Hejaz at this time, and the external influences on the local cultural substratum, above all material culture coming from the Levant and the Aegean.

On August 6th Tebes delivered a public lecture at the NEAF, entitled "The Archaeology of the Desert Cults and the Origins of Israel's God." In this lecture he discussed the idea that the origins of ancient Israel's god, Yahweh, can be found in the arid southern margins south and south-east of Palestine, known as the "Midianite-Kenite hypothesis." Instead of looking to the (mostly biblical) evidence of the origins of Yahwism and assuming its origin lies in movements of people from the southern regions to Canaan in the Early Iron Age, Tebes focused attention on the archaeology of the cultic practices in the Negev, southern Transjordan, and northern Hejaz during the entire Iron Age, and how this information is related to the religious practices known in Judah and Israel during the biblical period, providing new light on the prehistory of the cult of Yahweh. The evidence was evaluated not as a single, exceptional event, but as long-term process within the several-millennia history of cultic practices and beliefs of the local peoples.

Tebes was invited to give the same presentations in Melbourne, Australia's second most important city, thanks to the generosity of Dr Christopher Davey, Director of the Australian Institute of Archaeology. On August 7th he gave a seminar in the Archaeology Program, Faculty of Humanities and Social Sciences, of La Trobe University. The same day, he delivered a public lecture at the Australian Institute of Archaeology.



RECENT EGYPTIAN CARBON DATING PROJECTS AND DENDROCHRONOLOGY

Robert M. Porter | Independent Scholar

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I. Introduction

In the early days of radiocarbon dating, Egyptian samples were used to check the method. Carbon dating has now improved to the point that the situation is reversed and carbon dates are beginning to fix the dates of Egyptian dynastic history. A recent international carbon dating project, based at Oxford, dated about 200 museum specimens and then worked out a chronology for Egyptian history (details below under heading The Oxford Project). The museum specimens were historically or archaeologically attributable to particular pharaohs or sometimes to one of several pharaohs. In addition to the carbon dates, the computer model took into account the known sequence of pharaohs and their approximately known reign lengths, in a system called Bayesian Sequencing (details below under heading Bayesian Sequencing). The results came out close to standard Egyptian chronology and particularly close to one version of it. This review outlines the method and its results, offers some comments, and notes a serious problem with the inter-related subject of dendrochronology.

II. Carbon Dating and Its Calibration by Dendrochronology

This section gives a brief outline for those unfamiliar with the subjects. Calculation of the age of an organic sample by carbon dating requires three things: the proportion of radiocarbon (^{14}C) to ordinary carbon (^{12}C) at the time of death of the specimen, the rate at which ^{14}C decays, and the present day proportion of radiocarbon in the sample being tested. The decay rate has been established, and the current proportion of ^{14}C can be approximately measured in a complicated process, but the initial proportion is rather uncertain because the amount of radiocarbon in the atmosphere has varied over time, particularly in the BC period, and consequently the proportion in the organism when it died is uncertain. This last point is un-

fortunate because, if the proportion of ^{14}C in the atmosphere had always been constant, then carbon dates and true dates would be the same. Consequently, a measured carbon date which is based on a typical assumed past level of ^{14}C in the atmosphere, is not a true date but it needs calibrating, i.e. correcting by comparison to something of known date. Calibration curves (graphs) have been produced using measured ^{14}C values from tree rings of known age.

The science of dendrochronology (tree ring dating) is a few decades older than carbon dating and it depends on the varying widths of tree rings due to changing annual growth conditions. Long sequences of rings from living and dead trees (or archaeological timbers) have been positioned in time so that patterns of wide and narrow rings match, visually and/or statistically, from one tree (or group of trees) to the next. Rings from such sequences have been carbon dated at 10 year intervals, going back for thousands of years, to produce the calibration curve. A measured carbon date from an archaeological sample can be positioned in time by comparison to known values from the calibration curve. The current calibration curve is IntCal13, the 2013 International Calibration curve (Reimer et al. 2013a: especially 1881, fig. 5). Graphs are provided but it is normal nowadays to use a computer to calibrate carbon dates. A laboratory, having tested a small sample, will supply the measured carbon date in BP years (Before Present, where 'Present' is AD 1950 which was the approximate date of the introduction of the carbon dating method) and the calibrated date BC.

As an example, Fig. 1 shows the calibration of a radiocarbon date of 2300 BP using the OxCal programme (Oxford Calibration, available free at the Oxford Radiocarbon Accelerator Unit [ORAU] but requires on-line registration; some straight lines have been added to Fig. 1). The wide wiggly line is the relevant part of the calibration curve and the measured date of 2300 BP is entered on the vertical axis. Drawing across from

this axis to the calibration curve and then down to the horizontal axis gives a calibrated date of about 390 BC. However, a radiocarbon date does not come as a single value but as a probability distribution (due to the random nature of the radioactive decay of ^{14}C), a so-called normal distribution, peaking at 2300 but distributed above and below as shown (the hump shape from the vertical axis towards the right). A normal distribution can be defined by its peak (2300) and its standard deviation, in this case ± 30 years, hence "R_Date(2300,30)" in Fig. 1. One standard deviation should give confidence that the resulting range has a 68% chance of the result being correct. However, it is preferable to give the result to two standard deviations, here ± 60 years, giving a 95% probability that the result is correct. Drawing horizontal lines from 60 above and below 2300 BP, then down to the BC axis, gives the two standard deviation results stated on the print-out. Note that in this case, due to the wiggles of the calibration curve, the true date range BC is split into two separate parts. The resulting probability distributions with 95% confidence are the upward pointing black humps or, numerically, the ranges 407-356 BC and 287-234 BC.

III. Bayesian Sequencing

Named after a Mr Bayes who lived in the 18th century, Bayesian Sequencing is a means of narrowing down the wide ranges of individual dates in sets of calibrated dates, by using additional information. The method, as applied here, combines carbon dating with historical or stratigraphic information such as a known sequence of rulers or a known sequence of strata. These additional pieces of information are called the prior probability distributions or just 'priors'. The probability of the kings or strata being in the correct sequence is here assumed to be 100% but it is also possible to add into the model less certain probability distributions for lengths of reign or du-

ration of strata. All this requires complicated mathematical models incorporating the uncertainties of radiocarbon disintegrations, the peculiarities of the calibration curve and additional information on the sequence of kings' reigns and their probable reign lengths. A word of caution; if the priors are wrong, the results may be wrong, or less certain than the desired 95% probability.

As an example of the power of the method, a set of 40 carbon dates from various strata at Tell el-Daba were Bayesian sequenced (Kutschera et al. 2012: especially 415, 418). Individual dates usually had calibrations extending over several centuries, as in the example in Fig. 1 above, but when combined with Bayesian sequencing (here, dates from one stratum must be later than those from the stratum below) the ranges were typically reduced to well under a century. Unlike the Oxford dating project (below), the Daba results do not agree with Egyptian history, being well over a century too old. This is not the fault of the Bayesian sequencing but may relate to the similarly early carbon dating of the Thera volcano, and both are perhaps due to some effect from the Mediterranean Sea. The problem was the subject of several papers at The 6th Radiocarbon and Archaeology International Symposium (2011, Paphos, Cyprus), and is also the subject of two articles in the publication of the Oxford project (Shortland and Bronk Ramsey 2013), one of them by Daba's excavator (Bietak 2013).

IV. The Oxford Project

The results of this project (see above in the Introduction) were originally presented at a symposium in Oxford in March 2010, and then published in June 2010 in a short article in *Science* (Bronk Ramsey et al. 2010) but with a lot of free on-line supplementary material. Final publication in book form, including a number of papers related to the symposium but not directly part of the Oxford project, came in 2013 as *Radiocarbon and the Chronologies of Ancient Egypt* (Shortland and Bronk Ramsey 2013).

The article in *Science* shows summary dating charts for pharaohs of the Old, Middle and New Kingdoms. These plus additional charts showing several variations, based on slightly different prior assumptions, are included in the book in articles by Dee (2013a; 2013b; 2013c). The charts show grey humps indicating the Bayesian sequenced carbon dating probability distributions for the beginning of each reign (Fig. 2; but preferably refer to one of the published charts in colour, e.g. fig. S2 in the free on-line material). Note that a hump does not show the whole reign but a probability distribution for the start date of the reign. The horizontal brackets under the carbon date distributions show the two standard deviation ranges giving 95% probability of being correct (assuming no errors in the priors, etc). Also shown are red and blue markers which indicate start dates for

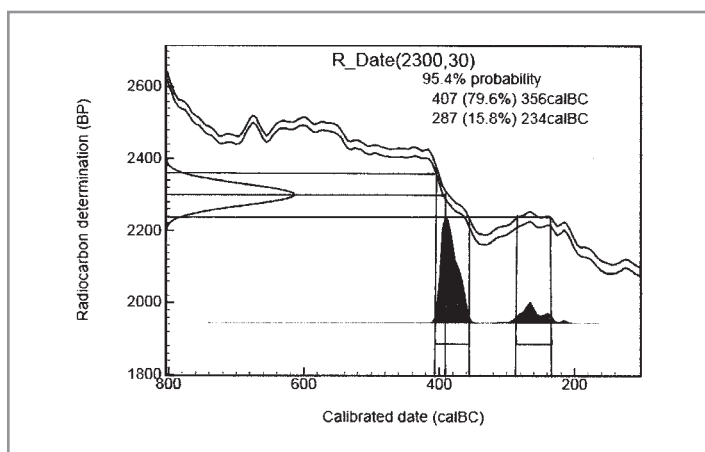


Figure 1. Calibration of a radiocarbon date of 2300 BP \pm 30 (see text for explanation).

the reigns in equivalent historical dating systems. The red marks represent the slightly high chronology used by Shaw (2000) in the *Oxford History of Ancient Egypt* and the blue marks are from the low chronology of Hornung et al. (2006), *Ancient Egyptian Chronology*. The red marks of Shaw's high chronology are in reasonable agreement with the carbon dates throughout. The blue marks are usually later than the carbon dates, less so for the later Middle Kingdom and New Kingdom, but this is slightly unfair to the low chronology system because reign lengths are taken from the high chronology in the *Science* article. However, Dee gives additional charts using low chronology reign lengths (2013a; 2013b; 2013c, or see fig. S3 in the supplementary on-line material). The low chronology values are again clearly later than the carbon dates but this time they are more consistently later, although by different amounts for each Kingdom. It is important to note that the charts do not prove the reign lengths because they were entered in the model as priors. What the charts are mainly doing is positioning in time each entire Kingdom.

Taking the New Kingdom as an example, the project ran six different models (NKM1-6), each trying slightly different priors. NKM1 (Dee 2013a: 72, fig. 7.4) has reign lengths based on the high chronology, and NKM2 (Dee 2013a: 73, fig. 7.5) has the sometimes shorter reign lengths from the low chronology. For example, only 3 years is given to Thutmose II in the low chronology compared to 13 years in the high. For Model 1 most red marks (the appropriate ones for this model) are within the 2 standard deviation boundary, whereas for Model 2 the blue marks are mostly just outside it. This is disturbing because the low chronology was, or still is, the consensus historical chronology. In Model 2 the blue marks show a fairly consistent offset from the grey humps, which may perhaps be indicating that the reign lengths in this model are mostly about right but that the Third Intermediate Period needs lengthening by a decade or two in order to move the blue marks so as to coincide with the grey humps. During the course of the Oxford project the reign of Horemheb has been drastically shortened from 28 years to about 14 due to year dates found on wine jars from his tomb, as is now quite widely accepted. Aston discusses this question, partly in the context of the Oxford project (2012-2013: for Horemheb see 292, 296, 306, 309 and 310). NKM4 takes this shorter reign into account but otherwise uses reign lengths from the high chronology system (Dee 2013a: 71 and 271). The distance between the grey humps marking the start of the reign of Horemheb and the start of Ramesses I are now about 14 years apart. However, rather inconsistently, the red marks still show the 28 year reign from the historical scheme. It would be interesting to see what would happen if the short reign for Horemheb were to be combined with the low chronology adjusted for the shorter reign. As an example of the repercussions that can

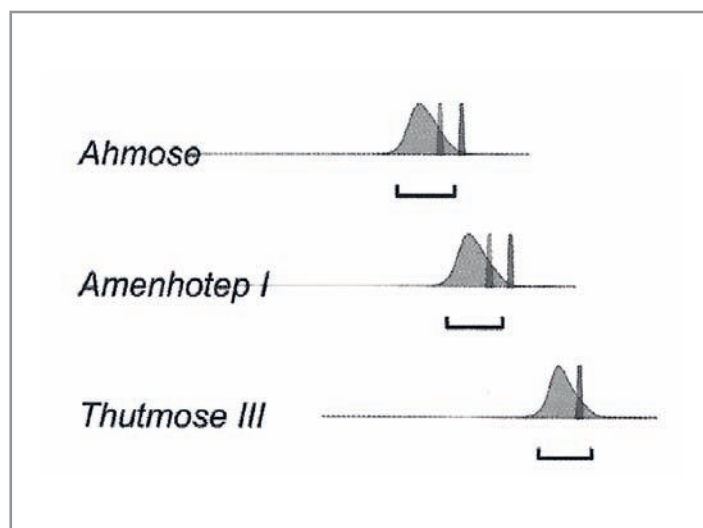


Figure 2. Example of a small part of a sample chart from the Oxford project (date scale not shown). Humps indicate the carbon date probability distributions for the start of the reigns, after Bayesian sequencing. The left vertical markers give high chronology historical dates for the start of reigns and they are coloured red in the publications. The right markers indicate equivalent low chronology dates and are coloured blue. For Thutmose III there is a single marker as both historical systems agree.

result from changing a prior, note the strange double humped distributions that appear in Model 4's 20th dynasty.

In the back of *Radiocarbon and the Chronologies of Ancient Egypt* (Shortland and Bronk Ramsey 2013: 256-267) and in the supplementary material on-line, there are tables of the specimens tested. It would have been desirable to have Egyptological references for the specimens, where available, but only the museum numbers are given together with the nature of the samples (mostly short lived plant material) and the relevant historical reigns and carbon dates. Brown shading indicates samples whose results were rejected. Some of the rejects gave dates in the recent AD period, perhaps modern plants that had been used to enhance museum displays or material that was gathered unintentionally. One batch, thought to date to Seti I, had to be rejected because they were much too old for Seti. Despite such problems and criticisms, this major project seems to have been carried out correctly by experts to the best of their ability.

V. Problems with Dendrochronology

Carbon dating has its problems and the complicated mathematical models require careful application, and the discrepancy at Tell el-Daba remains unresolved, but the method mostly gives fairly consistent results. However, carbon dating is based on the calibration curve which is based on dendro-

chronology. Accepting the carbon dates in preference to historical estimates means relying on dendrochronology. The problem with long dendrochronologies going back into the BC period is that the dendrochronologists refuse to publish them or to release the data, except in two cases. First, the only long dendrochronology that reached final publication in book form was Hollstein's German oak dendrochronology in 1980. It was subsequently found to have a 71 year error at 550 BC (Pilcher et al. 1984: 152). I don't think the calibration curve is based on Hollstein's timbers nowadays, but on other trees from Germany, and also from America and Ireland.

Second, in 2010, after a battle lasting several years, Queen's University Belfast was forced by the British Freedom of Information Act to make available their mainly Irish tree-ring data. It has been published on the internet as a huge mass of raw data (http://www.chrono.qub.ac.uk/bennett/dendro_data/dendro.html). Clicking on a particular timber produces a long list of numbers giving the sequence of ring thicknesses. A small Swedish group called Cybis Dendrochronology have managed to analyse this data. Their slightly chaotic web-site is at <http://www.cybis.se/forfun/dendro/> (click on 'The European Oak Chronology' and then go to 'The Belfast data'). Having originally become interested in dendrochronology for dating log cabins, they subsequently developed sophisticated statistical programs for analysing ring data. They were quickly able to rebuild and confirm most of the Irish dendrochronology but this chronology is actually in three parts, a long BC chronology ending about 950 BC, then most of the 1st millennium BC, then the AD period. Belfast used English dendrochronologies to bridge the two gaps but Cybis found that neither of these bridges actually stood up statistically. Cybis were refused access to the German and American data which is only shared between a few dendrochronology labs and is otherwise

unavailable. This is despite the radiocarbon/dendro fraternity's top scientists stating that "it is imperative for calibration curve samples that the dendrochronology is well established and fully published" (Reimer et al. 2013b: 1934). That is certainly not the case, and even at Reimer's own university (Queen's, Belfast) the dendro raw data was only extracted by legal means (see above) and is still far from fully published.

Belfast University's dendrochronology work was outlined by Baillie in his 1995 book *A Slice Through Time*, and Fig. 3 here shows his BC to AD linkage, then recently "reinforced". In Fig. 3 the upper four names are local area dendrochronologies, covering the periods indicated by the length of their bars, each made up of an internally matching group of trees from a site in Ireland. The lower two names are from England—Roman period timbers from Carlisle in the northwest, and from Southwark in London (where the climate is rather different). The numerals are values from the *t*-test, a statistical test which compares long series of numbers (in this case tree ring widths) to see if there is a significant correlation. Normally a *t*-test result over 3 would indicate an almost certain match but tree rings do not properly obey the requirements of the *t*-test because they are serially correlated (each ring width is partly dependent on growth in the previous year or two). Nevertheless, dendrochronologists have found the *t*-test valuable and use it together with a degree of judgement, but *t*-values in the 3 to 4 range, as in Fig. 3, are far from certain. More importantly, Cybis were not able to confirm any significant link from Southwark to Teeshan, certainly not a *t*-value of 6.5 as shown in the diagram—"So far we have not seen [i.e. found] any replication of Mike Baillie's zero solution [i.e. the orthodox dating]" (<http://www.cybis.se/forfun/dendro/hollstein/index.php>, about two thirds down the long page).

Since 1995 more trees have been added and the gap has been bridged with Irish trees alone, as stated in a recent article (Brown and Baillie 2012: fig. 3, 88). But, there is no match! The article attributes this to there only being two trees with enough overlap on the BC side (Brown and Baillie 2012: 90). It is certainly true that many trees do not give a match at their true position (their own growing conditions may have been in some way unusual) but where does that leave the BC to AD linkage? Have Belfast got it wrong, and if so, by a large amount or a small amount? Unless the German dendrochronologists (or possibly the Americans) make their data available, there is no way to check. The low Egyptian historical chronology should not be ruled out until dendrochronologists, particularly German dendrochronologists, provide some evidence that their work is correct back to the second millennium BC.

In an indirect attempt to check a part of the calibration curve that could be sensitive to a large error in the dendrochronology, I arranged carbon dating tests on linen wrappings of a Theban mummy from a coffin which was stylistically dateable to the first half of the 7th century BC (Porter and Dee 2013).

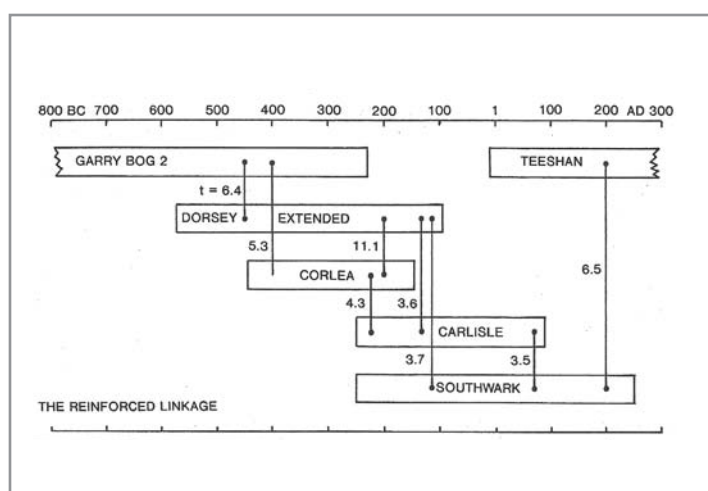


Figure 3. Belfast's BC to AD linkage (adapted from Baillie 1995: 40, fig. 2.5).

However, the range of the results did include the 7th century and therefore did not offer any support for a large error in the calibration curve from the present back to that time. A smaller dendro error, or a larger error at an earlier time, remain possible because at present all BC carbon dates are based on unpublished and unavailable German and American dendro-chronologies ■

Acknowledgements

My thanks to P. James and S. Porter for proof reading of earlier versions and helpful suggestions.

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2015 SBL INTERNATIONAL MEETING
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EGYPTIAN OBJECTS IN BUENOS AIRES

AMALIA LACROZE DE FORTABAT ART COLLECTION

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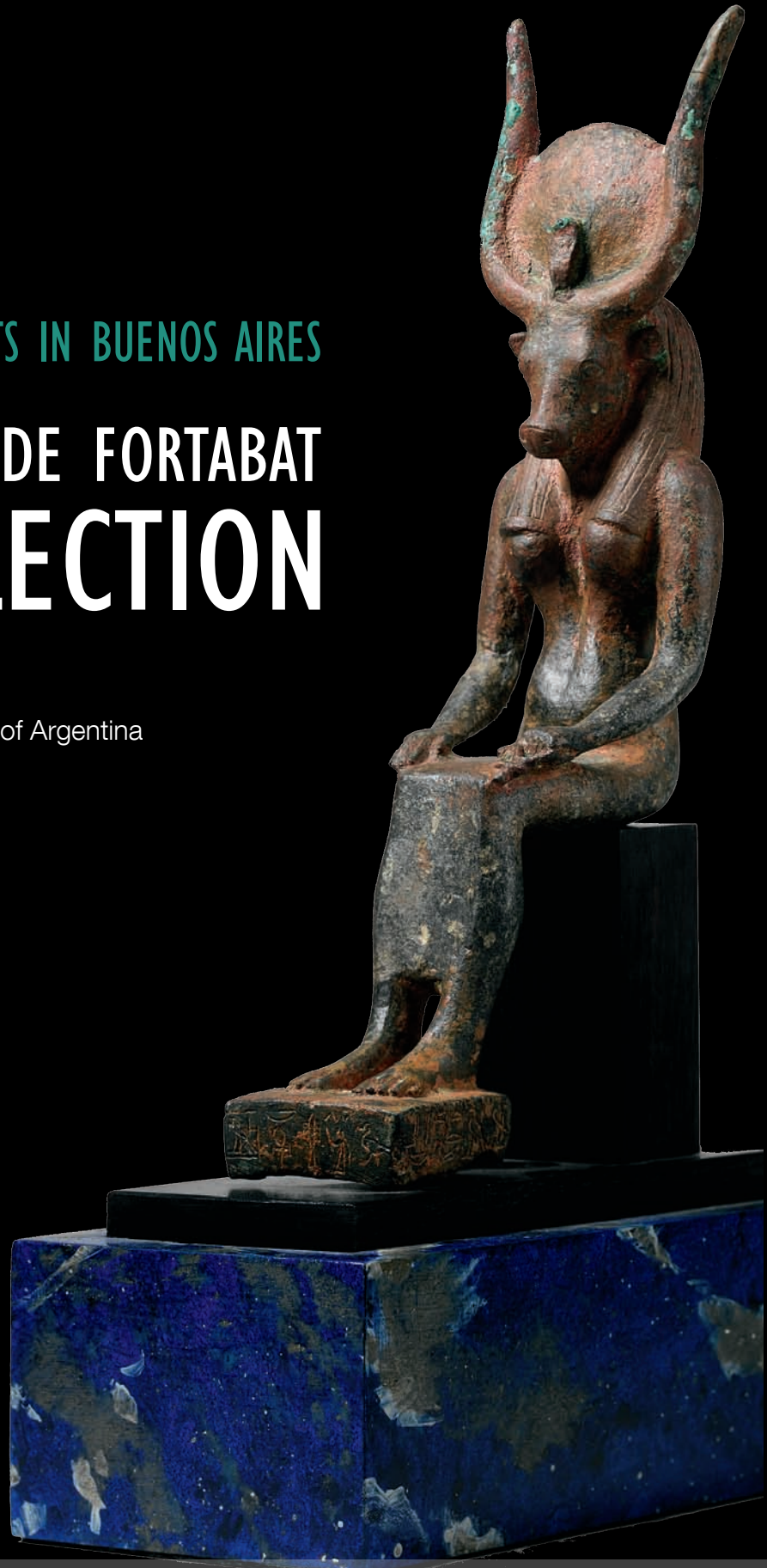
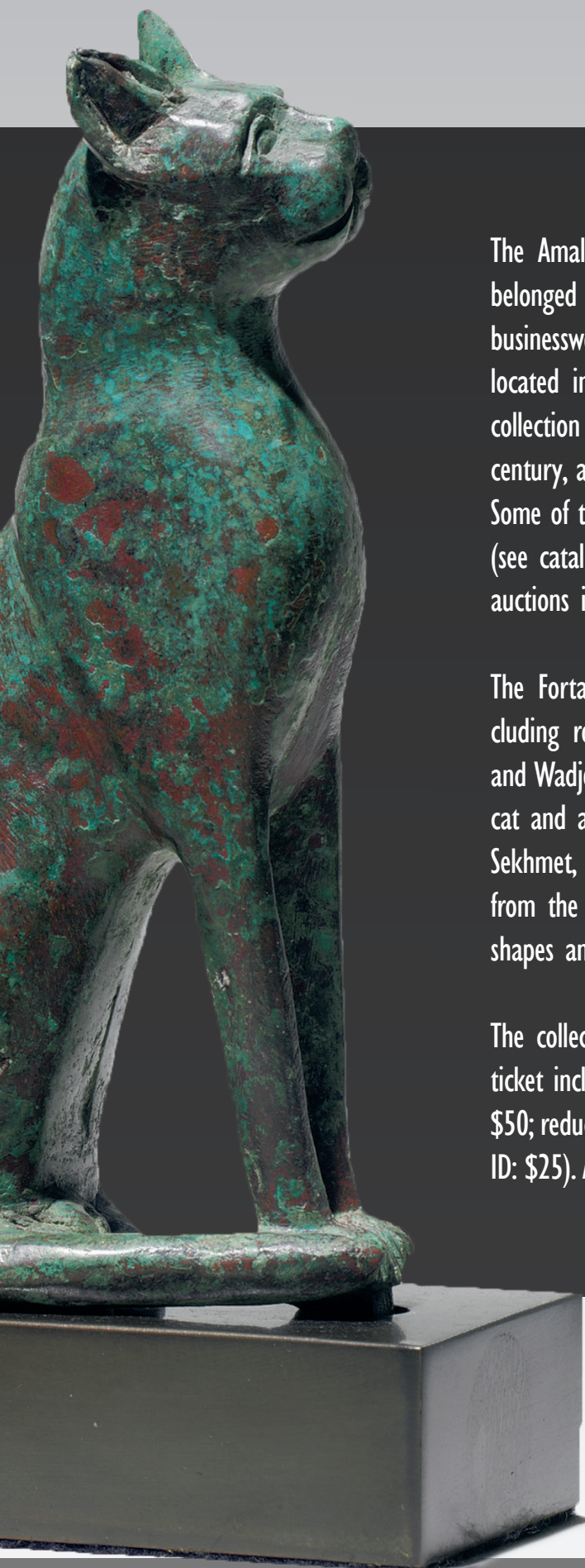


Figure 1. Bronze figure of Hathor (probably Late Period, c. 716-730 BC).



The Amalia Lacroze de Fortabat Art Collection is a private art collection that belonged to the late María Amalia Lacroze de Fortabat, a prominent Argentinean businesswoman and art collector. It is open to the general public in a museum located in Puerto Madero, one of the most modern areas of Buenos Aires. This collection houses more than 200 objects, mostly paintings from the 19th and 20th century, as well as a small permanent exhibition with artifacts of Egyptian origin. Some of the Egyptian items from the collection are presented briefly in this dossier (see catalogue information below); they were legally acquired in 2008 at different auctions in New York and are exhibited under proper conditions.

The Fortabat Art Collection contains Egyptian objects from different periods, including royal inscriptions, anthropomorphic statues of goddesses such as Hathor and Wadjet, as well as several representations of deified animals: an ibis, a lion, a cat and a bull, each of which might be associated with different gods (e.g. Thoth, Sekhmet, Bakhtet and Apis). Among the exhibited artifacts there is also a mask from the Ptolemaic period, with typical Egyptian stylistic traits influenced by the shapes and colors employed by Greek artisans.

The collection is open from 12 to 8 p.m., Tuesday to Sunday, and the admission ticket includes a guided tour available both in English and in Spanish (normal fee: \$50; reduced fee for children under 12, senior citizens, students and educators with ID: \$25). Address: Olga Cossettini 141, Puerto Madero Este (1107), Buenos Aires.

Figure 2. Bronze figure of a cat (probably Late Period, c. 716-730 BC).

Catalogue Information

Figure 1

Bronze figure of Hathor (probably Late Period, c. 716-730 BC). Height: 23.8 cm. Acquired at Sotheby's. Previous owner: Royal-Athenea Galleries, New York.

Published in: Eisenberg, J.M. 1985. *Art of the Ancient World. A Guide for the Collector and Investor*, vol. IV, n. 444; Malek, J., D. Magee and E. Miles. 1999. *Topographical Bibliography of Ancient Egyptian Hieroglyphic Texts, Statues, Reliefs and Paintings VIII. Objects of Provenance Not Known. Part 2*. Oxford, Griffith Institute, n. 802-098-750.

Figure 2

Bronze figure of a cat (probably Late Period, c. 716-730 BC). Height (without tenon): 15.6 cm. Acquired at Sotheby's (property from the collection of Peter V. Guarisco). Previous owner: European private collection, acquired prior to the late 1970s / Phillips, London / Sotheby's, New York, June 5th 1999, no. 50.

Figure 3

Bronze figure of an Ibis (probably Late Period, c. 664-630 BC). Length: 22.5 cm. Acquired at Sotheby's. Previous owner: Swedish private collection / Sotheby's 1989, New York, June 23, no. 86.

Figure 4

Polychrome cartonnage mummy mask (probably Late Ptolemaic Period, c. 100-30 BC). Height: 47 cm. Acquired at Sotheby's. Previous owner: Lenore Wexler (1928-2004), Chicago, Illinois (acquired between 1972 and 1979).

Figure 5

Limestone relief fragment (probably 30th dynasty / Early Ptolemaic Period, c. 380-200 BC). Height: 9.8 cm; length: 16.9 cm. Acquired at Sotheby's. Previous owner: European private collection formed in the late 19th and early 20th century / Christie's, London, October 5th 2000, no. 122.



Figure 3. Bronze figure of an Ibis (probably Late Period, c. 664-630 BC).



Figure 4. Polychrome cartonnage mummy mask (probably Late Ptolemaic Period, c. 100-30 BC).



Figure 5. Limestone relief fragment (probably 30th dynasty / Early Ptolemaic Period, c. 380-200 BC).

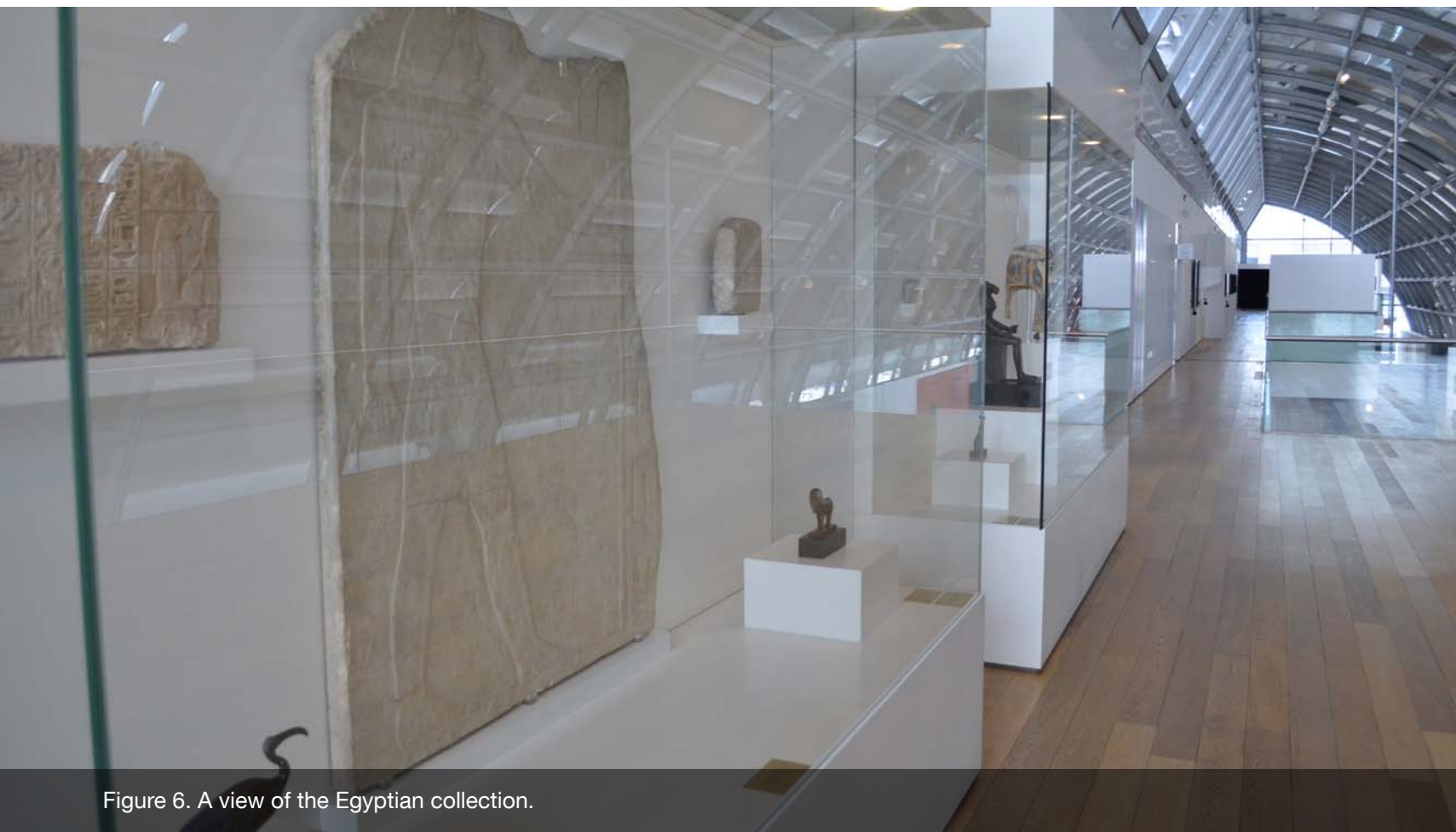


Figure 6. A view of the Egyptian collection.

ANEM/MACO NEWS

The editorial leadership of the Ancient Near East Monograph Series / Monografías sobre el Antiguo Cercano Oriente, an open-access, online (with print on demand) monograph series, is transitioning.

Ehud ben Zvi (University of Alberta) and Roxana Flammini (Universidad Católica Argentina, CONICET) are handing over editorial oversight to Alan Lenzi (University of the Pacific) and Juan Manuel Tebes (Universidad Católica Argentina, Universidad de Buenos Aires, CONICET).

The focus of the ANEM/MACO series is on the ancient Near East broadly construed from the early Neolithic to the Hellenistic eras. Studies that are heavily philological or archaeological are both suited to this series and can take full advantage of the hypertext capabilities of “born digital” publication. Monographs as well as multiple author and edited volumes are accepted. Proposals and manuscripts may be submitted in either English or Spanish.

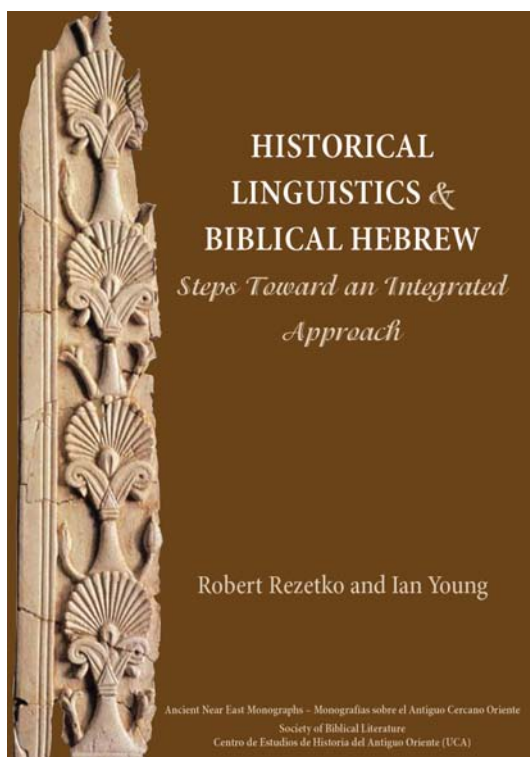
Manuscript proposals are peer reviewed by at least two scholars in the relevant area before acceptance. Publication of the finished manuscript is contingent on a second round of peer review.

Monographs that are entirely Assyriological, Hittitological, or Egyptological are as appropriate to this series as are monographs in North West Semitics or Biblical Studies.

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Deuteronomy-Kings as Emerging Authoritative Books: A Conversation
Edited by Diana V. Edelman

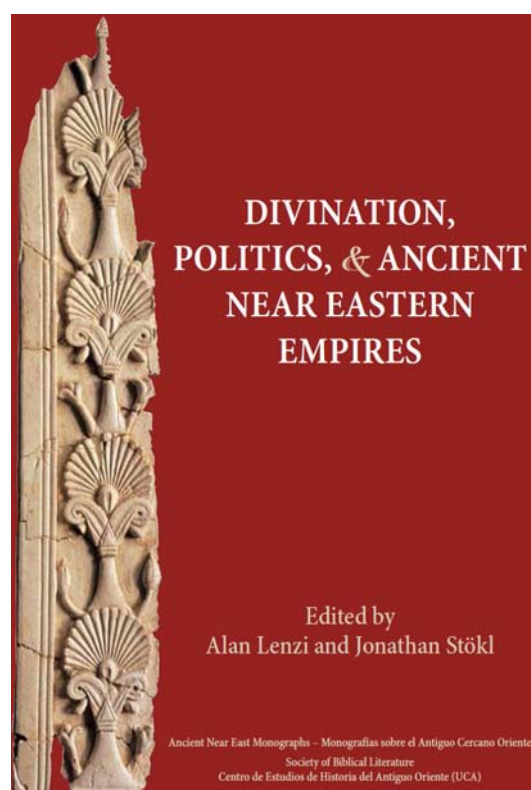
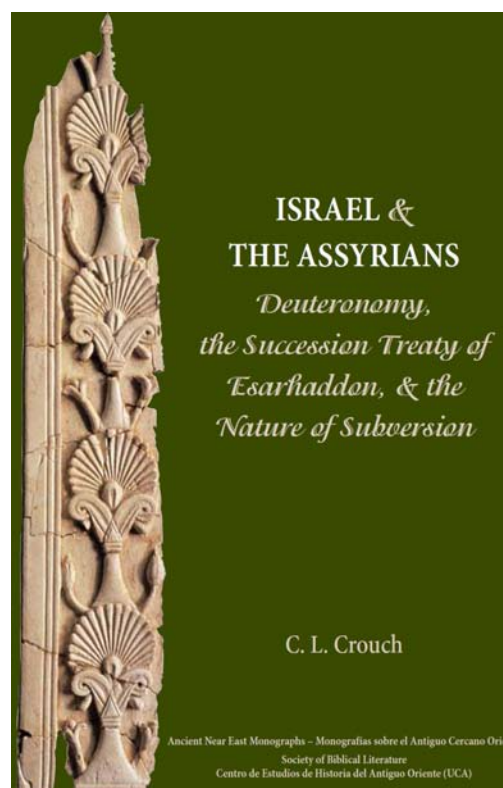
Ancient Near East Monographs (Vol. 6). 2014.
ISBN 978-1-58983-739-3

Why did the books of Deuteronomy, Joshua, Judges, Samuel, and Kings grow in authority during the Persian and Hellenistic periods and begin to be collected and read in sequence? In this collection of essays, each of the five books is addressed by two established scholars who explore themes and topics that made that book a candidate to be read and reread in the specified periods in which most scholars would agree the book was gaining authority. The focus is not on when each book was written or the historicity of the material contained in it but on the larger impact the book might have had on primary or secondary audiences as part of emerging Torah. The volume focuses uniquely on why readers and rereaders in the Persian and Hellenistic periods found these books to encapsulate emerging Jewish identity and how they used the past to address the present and the future.

Divination, Politics, and Ancient Near Eastern Empires
 Edited by Alan Lenzi and Jonathan Stökl

Ancient Near East Monographs (Vol. 7).
 2014. ISBN 978-1-58983-998-4

The essays in this volume consider how the ancient imperial setting of the Hebrew Bible influenced prophetic and divinatory communication between the divine and human realms and how this was put to use as and influenced by propaganda from those in power. Drawing upon diplomatic correspondence in second millennium B.C.E. Mari to the eschatological hopes expressed in the Dead Sea Scrolls, the contributions indicate that all forms of prophetic and divinatory communication were used to both uphold and undermine their respective empires. The analyses of the Hebrew Bible show that, while Israelite/Judahite texts attempt to undermine the Neo-Babylonian and Neo-Assyrian Empires, they never openly attack the Persian Empire. Further, the Israelite/Judahite thinkers never criticize empire as such; to the contrary, they paint a picture in which a Jerusalem empire will replace foreign ones.



Israel and the Assyrians: Deuteronomy, the Succession Treaty of Esarhaddon, and the Nature of Subversion
 C. L. Crouch

Ancient Near East Monographs (Vol. 8).
 2014. ISBN 978-1-62837-026-3

Israel and the Assyrians undermines the popular interpretation of Deuteronomy as an anti-imperial, subversive tract. The book draws on theories of adaptation and allusion to provide the theoretical foundation for a discussion of subversion and its detection and thereby tests the idea of subversive intent against the social context in which it would have functioned. It contains detailed textual analyses of Deuteronomy 13 and 28 in relation to the Succession Treaty of Esarhaddon and other ancient Near Eastern curse and treaty traditions. It also reflects on the historical circumstances of the seventh century BCE, with particular attention to questions of bilingualism of authors and audiences. The book's argument challenges the preexilic dating of Deuteronomy and problematizes the Israelites' wider relationship with the Assyrian Empire.

CEHAO SCHOLARLY PARTICIPATION

2014

Beer Sheva, January 16.

**POTTERY WORKSHOPS AND CERAMIC INDUSTRY: AR-
CHAEOLOGICAL, ANTHROPOLOGICAL AND TECHNOLOGI-
CAL ASPECTS. IAA SOUTHERN DISTRICT CONGRESS.**

Ben-Gurion University of the Negev.

Paper by Amir Gorzalczy: "Industry and Urban Planning in the Early Islamic Period: Ramla as a Case Study in the Light of the Excavations Close to Moshav Matzliah."

Villahermosa, January 27-28.

**MAESTRÍA EN MÉTODOS EXEGÉTICOS
EN EL NUEVO TESTAMENTO.**

Seminario Teológico Presbiteriano del Sureste.

Lectures by René Krüger: "Mateo 28,16-20" / "La Reforma del siglo XVI. Lutero, Zuinglio y Calvino."

Mexico City, February 1-2.

PUBLIC LECTURES.

Maná Museo de la Biblia.

Lectures by René Krüger: "Una larga caminata transformadora (Lc 24,13-35)" / "Un encuentro transformador en un jardín (Jn 20,1-18)" / "El desafío de los textos de Resurrección."

Istanbul, March 28.

RCAC FELLOWS' MINI SYMPOSIA.

Koç University.

Paper by Romina Della Casa: "From the Fruitful Field to the Dark Earth: An Approach to Landscape across Hittite Myths."

Istanbul, April 16.

RCAC BRONZE AGE WORKSHOP.

Koç University.

Paper by Romina Della Casa: "Myth and Ritual in Hittite Religion: From Theory to Practice."

Basel, June 9.

**9TH INTERNATIONAL CONGRESS ON THE ARCHAEOLOGY
OF THE ANCIENT NEAR EAST.**

Universität Basel.

Paper by Amir Gorzalczy: "Early Islamic Industry and Urbanism – Rescue Excavations at Matzliah (Ramla South) and the Surroundings."

Berlin, June 26.

**TOPOI WORKSHOP: ECONOMIC AND POLITICAL INTER-
ACTION ON THE EDGES OF THE ANCIENT EMPIRES.**

Humboldt-Universität zu Berlin.

Paper by Roxana Flammini: "Economics, Political Practices and Identities on the Nile: Convergence and Conflicts at the End of the Second Intermediate Period Economic and Political Interaction on the Edges of Ancient Empires."; "World-Systems. From 'Theory' to the 'Analysis'."

Landau, July 11-12.

MA EV. RELIGIONSLEHRE.

Universität Koblenz-Landau.

Lectures by René Krüger: "Evangelisch im Urwald, auf der Pampa und in der Millionenstadt. Die Evangelische Kirche am La Plata" / "Aussaat auf Hoffnung. Evangelische Bauernfamilien am La Plata."

Warsaw, July 21-25.

60TH RENCONTRE ASSYRIOLOGIQUE INTERNATIONALE.

University of Warsaw.

Paper by Graciela Gestoso Singer: "Fortunes and Misfortunes of Messengers and Merchants in the Amarna Letters."

Buenos Aires, August 4-6.

**II JORNADAS INTERDISCIPLINARIAS DE JÓVENES IN-
VESTIGADORES DEL CERCANO ORIENTE ANTIGUO.**

Universidad de Buenos Aires.

Paper by Jorge Cano Moreno: "Los bienes de prestigio y los grupos de elite en Creta Neopalacial."

Sydney, August 6 / Melbourne, August 7.

PUBLIC LECTURE.

The Near Eastern Archaeology Foundation, University of Sydney / Australian Institute of Archaeology.

Lecture by Juan Manuel Tebes: "Archaeology of the Desert Cults and Origins of Israel's God."

Buenos Aires, August 7-8.

CONGRESO NACIONAL ALADAA DE ARGENTINA.

Centro Cultural de la Cooperación.

Paper by Jorge Cano Moreno: "El rey ha muerto ¿viva el rey? (Repensar la realeza y el poder en Creta durante el período Neopalacial)."

Çorum, September 2.

9TH INTERNATIONAL CONGRESS OF HITTITOLOGY.

Hitit University.

Paper by Romina Della Casa: "Hittite Symbolic Landscapes: An Analysis from the Standing Point of Myths."

Buenos Aires, September 3.

CÁTEDRA DE HISTORIA DE ROMA (PROF. LORENA ESTELLER).

Instituto Superior del Profesorado 'Joaquín V. González'.

Lecture by Virginia Laporta: "Cleopatra: una reina de dos mundos."

Buenos Aires, September 8.

II SEMANA DE LA HISTORIA.

Universidad Católica Argentina.

Paper by Virginia Laporta: "Cosas de mujeres: la reina en el Antiguo Egipto."

Prague, September 15-18.

THE CROSSROADS II, OR THERE AND BACK AGAIN.

Charles University in Prague.

Paper by Graciela Gestoso Singer: "Small Ingots and Scrap Metal in the Eastern Mediterranean during the Late Bronze Age."

Mendoza, November 9-11.

VII SIMPOSIO DE ADEISE.

Facultad de Filosofía y Letras, Universidad Nacional de Cuyo.

Paper by Roxana Flammini: "¿Patronazgo en el Cercano Oriente antiguo durante el Bronce Medio? Una propuesta basada en la ponderación de distintos tipos de evidencia."

Paper by Virginia Laporta: "Repensar el arquetipo de la reina egipcia durante la dinastía XVIII (Reino Nuevo): Ahmosis-Nefertari y Hatshepsut. Una interpretación comparativa entre la inscripción de Maasara y la expedición al Punt."

San Diego, November 22-25.

ASOR ANNUAL MEETING.

The Westin San Diego Hotel.

Paper by Juan Manuel Tebes: "Interconnections between the Arabian Peninsula and the Southern Levant in the Late Bronze and Iron Ages: the Ceramic Evidence."

Paris, December 11-12.

THE INFLUENCE OF THE SEA ON HISTORY: A VOYAGE TO THE HEART OF ANTIQUITY & THE MIDDLE-AGES.

Amphithéâtre du Campus Paris Eiffel.

Paper by Graciela Gestoso Singer: "Development of Maritime Trade in the Egyptian World during the Late Bronze Age."

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Juan Manuel Tebes

BOOK REVIEWS

- Amnon Altman, Tracing the Earliest Recorded Concepts of International Law: The Ancient Near East (2500-330 BCE), 2012
Emanuel Pfoh

- Hayim Tawil, An Akkadian Lexical Companion for Biblical Hebrew: Etymological-Semantic and Idiomatic Equivalents with Supplement on Biblical Aramaic, 2009

Santiago Rostom Maderna

- Juan Manuel Tebes, Nómadas en la encrucijada: Sociedad, ideología y poder en los márgenes áridos del Levante meridional durante el primer milenio a.C., 2013

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