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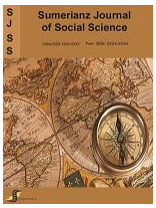

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An Application of Systems Science in Humanities: Investigating the Origins of the Minoan Civilization

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Abstract

The present preliminary study investigates the indirect evidences about the origins of the Minoan civilization and those settlers that initiated the relevant development process, based initially on linguistic evidences. According to the latter, it has been demonstrated in other studies that by using the rebus principle, every sign of the Aegean scripts of Bronze Age renders a phonetic value that corresponds to the equivalent (Archaic) Sumerian word for the depicted object by this sign. In many cases, this equivalence is also pictorial, related to the Sumerian pre-cuneiform writing. Thus, to demonstrate also that there is absolutely no reason for excluding the Sumerians from the overall debate about the origins of the Minoan civilization, indirect evidence other than linguistic are organized and presented in a systemic manner, by using the conceptual tool of the Organizational Method for Analyzing Systems. This approach is compatible to the comprehensive framework of Systems Science, called Systems Inquiry. The presentation includes socio-economic and anthropological aspects, chronological and geographical evidence, as well as the basic features of the contemporary maritime technology.

Keywords: Systems Science; Systems inquiry; Minoan civilization; Sumerian origins theory.

1. Introduction

Since Heinrich Schliemann took Homer literally to discover Troy in 1871 (Kyriakidis and Konstas, 1974a), an archaeological outburst led to the revelation of the Minoan and Mycenaean civilizations. After Minos Kalokairinos, who in 1878 had started excavating the place where the palace of Knossos is located, Sir Arthur Evans eventually revealed this "trade-mark" of the Minoan civilization in 1900 (Drakopoulos *et al.*, 2011). Nowadays, there are journals dedicated to the Minoan archaeology and literature, specific conferences and organization of studies and every journal of Archaeology, Historical Linguistics, Classics, Anthropology or any combination of them publish relevant articles. The related bibliography is vast and it is beyond the scope of this article to present a survey of it. We will only use a number of selective references herein, merely to clarify particular points about the origins of the Minoan civilization.

The Minoan civilization conventionally refers to the civilization that was developed mainly in Crete at the late Neolithic Age (from about the 30th century BCE), until the late Bronze Age (to about the 10th century BCE). The chronological classification that will be followed herein is the one according to the palaces' periods (Loizos, 2014) to:

- the Prepalatial, from the 30th to the 20th century BCE;
- the Protopalatial, from the 19th to the 17th century BCE;
- the Neopalatial, from the 16th to the 15th century BCE;
- the Postpalatial, from the 14th to the 10th century BCE.

It is regarded so far as the first European indigenous civilization (Chaniotis, 2004; Loizos, 2014), although the term "European" will be used herein in a merely geographical sense, as in other studies (Loizos, 2014). It is not regarded as a Greek civilization because the language that is conveyed by Linear A (or the Cretan Hieroglyphic) script had not been defined (Loizos, 2014). Anthropologically, the inhabitants of Minoan Crete have been defined as predominantly of Neolithic origin (Lazaridis *et al.*, 2017; Poulianos, 1968), as in the rest of Greece (Lazaridis *et al.*, 2017; Poulianos, 1968). Nevertheless culturally, the emergence of Bronze Age in Crete is mainly attributed to the arrival of settlers from East (i.e., supposingly Minor Asia, just because of the geographic proximity), during the 28th - 26th centuries BCE (Douvitsas, 2005; Kyriakidis, 1971). Although it is argued that these settlers of the "armenian-type" were eventually assimilated by the locals (Kyriakidis and Konstas, 1974b), their influence to the creation of the Minoan civilization seems to be profound.

1.1. Scope of Study

The present study investigates the indirect evidence about the origins of those Eastern settlers and consequently the origins of the Minoan civilization, based initially on linguistic evidence. Yet, it is recognized that a single type of evidence is not enough to come to conclusions about the origins of a population and of an associated civilization (Poulianos, 1968). Other types of evidence: anthropological, ethnographic and historical, have to be combined for this purpose, and even more. This combination is better achieved if conducted in a holistic manner, under a common conceptual framework that can be acquired from Systems Science (Binford and Binford, 1968; Flannery, 1968;

Trigger, 1989). In this respect, the methodology of Systems Inquiry (Banathy, 1995; Bánáthy, 1997) is utilized herein to achieve the required results (see: 2. Systemic Methodology).

1.2. Linguistic Evidence

As mentioned previously, the present study is initially based on recent linguistic evidence about the origins of the Aegean scripts, which are syllabaries, namely Linear-B (henceforth LB), Linear-A (henceforth LA), Cretan Hieroglyphic (henceforth CH), Cypro-Minoan and Cypriot Syllabary (Davis, 2010). The relevant results, regarding the first three syllabaries (i.e., LB, LA and CH), motivated a further investigation to reveal the origins of the mysterious Minoans and their civilization. The first syllabary to have been deciphered is LB that conveys the conventionally known as Mycenaean Greek (henceforth Achaean Greek, which is a more precise term considering the speakers of that Greek dialect). Besides that, all three syllabaries constitute herein a manifestation of the original and lost Cretan Protolinear script (henceforth CP), as it has been suggested in previous works (Kenanidis, 1992; Kenanidis and Papakitsos, 2013a;2015; Willetts, 1977), each one created for a different purpose (Papakitsos and Kenanidis, 2016). Finally, it is noted that the notion of the conveyed language of a syllabary is generally dissociated from the creating language of its signs. The three main linguistic points are presented next (see 1.2.1-3).

1.2.1. Linear B Syllabary

The presentation starts with the better studied LB, as the last derivative of CP in Crete. Until 1903, along with other kind of artifacts, a large number of clay-tablets were discovered in Knossos, bearing unknown then scripts named LA and LB by Evans (1909), Evans (1952). Besides Crete, such tablets of LB were discovered later on in southern mainland Greece (Pylos, Mycenae, Thebes), reaching a total of more than 4500 (Babiniotis, 2002). In the early 1950s, it became clear that LB conveys the Achaean Greek dialect (e.g., see the reprinted editions: (Chadwick, 1990; Ventris and Chadwick, 1973), which is the oldest-known form of written Greek so far. The script is not fitting to the phonotactic features of the Greek language at all, being very difficult and impractical for a native speaker (Kenanidis and Papakitsos, 2015). Occasionally, a phonological connection of isolated syllabograms with languages like Ugaritic or Egyptian has been proposed (Bibee and Wilson-Wright, 2015). Therefore based on universal principles of writing systems, it has been asserted that LB was not a Greek innovation (Stephens and Justeson, 1978), but that adhered to a foreign model of a donor language (Stephens and Justeson, 1978). Some scholars though have argued that LB was a Greek invention through the usage of the *acrophonic principle*. The acrophonic principle (*acrophony*) is overused in modern Greece. It has been also suggested as the method for creating the Aegean scripts, in order to prove them "Greek" (e.g. (Polygiannaki, 2000; Polymeros, 1998), see:, for the decipherment of Phaistos Disk), and the same was thought to apply in the case of LB (Makrygiannis, 2009). For example, take the Minoan sacred double axe (henceforth *Labrys*). Supposing that the Greeks wanted to invent a symbol for /a/, then according to acrophony as suggested by Makrygiannis (2009), Labrys would be recognized by a Greek as *aksinee* {= pickaxe}. Apart from the obvious difference between a double axe and a pickaxe, Labrys is not a tool but a religious symbol (Haarmann, 1996; Kenanidis and Papakitsos, 2015). The main source of the acrophony's advocates is the Hesychius' dictionary, which listed all the rare and strange words or *hapax legomena* that cannot be closely related to the Achaean Greek. Otherwise, the decipherment is almost complete, although there are still few dubious or unknown signs (Duhoux and Morpurgo Davies, 2014), the syllabograms being 90, and many unexplained or dubious words (Babiniotis, 2002; Davis, 2010; Hooker, 2011). The LB inscriptions roughly cover the Postpalatial period. By using the rebus principle, it has been demonstrated beyond statistical doubt that the creating language of LB signs (consisting of abstractly depicted objects) is a dialect close to but simpler than Archaic Sumerian (Kenanidis and Papakitsos, 2013a), since the phonetic value of every sign corresponds to the equivalent monosyllabic Sumerian word for the depicted object. According to Fischer (2004), the rebus principle that had been invented by the Sumerians is a gift of them to human kind, whose linguistic influence expanded to Iran, Nile, Indus Valley and (maybe) to Balkans (Kenanidis, 1992). In some occasions, the sign of the depicted object is identical to the equivalent Pre-cuneiform or Proto-cuneiform one (Kenanidis and Papakitsos, 2013a;2015; Papakitsos and Kenanidis, 2015).

1.2.2. Linear A Syllabary

The LA script has been found in inscriptions much less than those of LB (1427 so far), from Crete to Margiana (Central Asia) and from Italy to Israel (Kenanidis and Papakitsos, 2015). The discovered syllabic part consists of 75 signs (Olivier, 1986), with 62 of them being common to LB (Christidis, 2005). There are evidence indicating that it predates CH (see 1.2.3), since the middle of the 3rd millennium BCE, and that "It can be assumed that the hieroglyphic script was partly derived from the older repertory of linear signs …" (Haarmann, 1996). This is an indirect reference to CP through LA. Scholars have made long and laborious efforts to reveal the languages that have been conveyed by LA scripts. There are several proposals about the underlying languages (Papakitsos and Kenanidis, 2016), all of them reasonable considering that most of the suggested languages are very poorly known. Moreover, it is very probable that LA scripts had been used to express more than one spoken language of that era and area (Woudhuizen, 2008), just like the cuneiform script had been used as well to convey practically most of the languages of Near-East (Sumerian, Akkadian, Old Persian, Elamite, Hittite, Hurrian, etc.). Yet, the relevant proposals came to include even Proto-Kartvelian (Kvashilava, 2011;2016). A most recent study approaches the decipherment of LA as a cryptographic problem (Patria, 2016). The novel concept is that the signs of the script (being syllabograms, ideograms or even both) were placed in a mixed manner, since the writing system (i.e., patterns) of LA was different than that of LB. The conveyed language is considered near to the Dorian Greek, which

is a very early reference to Dorians. Nevertheless, the problem of identifying the origin of the LA script remains precisely the same: the CV-pattern of the syllabograms is incompatible to the phonotactic of the proposed languages, as thoroughly discussed in Kenanidis and Papakitsos (2015). CV-type phonotactic is usually found in agglutinative languages, a feature that in LA has been ignored although observed very early by Duhoux (1998) and recently by Davis (2014) as well. Such a well-studied nearby agglutinative language of the 3rd millennium BCE were the Sumerian. Thus, instead of claiming that a very complex writing system had been intentionally devised, we may adopt a simpler explanation, according to the *Ockham's Razor* principle (Rodríguez-Fernández, 1999), which is that LA (and LB) script is a typical case of *alloglottography* (Rubio, 2006). According to the CP theory, the Sumerian scribes, who invented the original script, had to write in languages other than their own mother tongue, which can deduce that all the "non-Minoan" languages being written with LA/LB are quite distorted. It may also easily explain the nature of the spelling differences in words common to LA and LB, like qa-qa-ru/qa-qa-ro (Patria, 2016), since different scribes understood differently the sounds of another tongue.

1.2.3. Cretan Hieroglyphics Syllabary

The conventional classification of the Aegean scripts includes CH as the earliest script, found on 360 objects mainly from Knossos and Malia (Duhoux, 1998; Younger, 1999), along with the scripts on Phaistos Disk, Arkalochori Axe (Owens, 2000;2007) and Malia Stone Block (Chapouthier, 1938). The relevant inscriptions roughly cover the Protopalatial and the Neopalatial periods. The CH script is related to LA (Owens, 1996), thus it is considered to be rather a syllabary because its signs are too many for an alphabet and too few for a logographic system (Davis, 2010; Fischer, 2004; Karali, 2007; Morpurgo and Olivier, 2012). Any attempt to associate CH with Egyptian Hieroglyphic has never been successful in deciphering any Aegean script. Some objects (e.g., the "libation vessel", the "hand" or the "bee"), depicted by both Egyptian Hieroglyphic and CH signs (Bengtson, 2002; Woudhuizen, 1997), do not necessarily show any similarity of phonetic values. The issue of the underlying languages remains the same as in LA (see 1.2.2), which is evident in the various attempts to decipher different parts of the CH inscriptions (Ridderstad, 2007; Rumpel, 2006;2009). Accordingly, the theory of the Sumerian origin of CP and consequently of CH is supported by 16 points of argument (Papakitsos and Kenanidis, 2016) plus one in subsection 1.2.2 (Haarmann, 1996). In addition, Filippou (2014) argues for the common origin of the linear scripts (LA and LB) and CH, although in a different direction regarding the nature of the syllabary and the conveyed language (i.e., Greek). The Sumerian Origin Theory (henceforth SOT) provides interpretations of various CH inscriptions so far (Papakitsos and Kenanidis, 2016), which are meaningful, coherent and of limited ambiguity.

1.3. Sumerian Origins Theory

To demonstrate that there is absolutely no reason for excluding the Sumerians from the overall debate about the origins of the Minoan civilization (SOT), indirect evidence other than linguistic will be presented in a systemic manner. Systems Science offers powerful conceptual tools that facilitate a holistic approach in the study of natural and social phenomena (Luhmann, 1995; Parsons, 1977). A brief presentation of the utilized systemic methodology precedes the rest of the supportive evidence.

2. Systemic Methodology

In order to connect the origins of the Minoan civilization to the Sumerian culture, linguistic evidence can be supplemented by a series of non-linguistic data that were gathered and organized, according to a particular systemic methodology originating from software engineering (Papakitsos, 2013), which is called Organizational Method for Analyzing Systems (OMAS-III). OMAS-III is compatible to the comprehensive methodology of Systems Inquiry (Banathy, 1995; Bánáthy, 1997) that has been utilized in social systems (Banathy and Jenlink, 2001). It consists of a modeling technique that has been used in a variety of social systems applications, especially in education (Papakitsos and Kenanidis, 2016).

Notably, the systemic modelling can provide a powerful tool that may also enhance the interdisciplinary approach to Archaeology (Johnson, 2010), as once perceived by Schiffer (1972). The original framework was restricted to artefacts and their usage, while more contemporary approaches are expanded to the application of digital technology in spatial aspects (Domșa, 2010). Yet, the coverage of aspects is still relatively limited, although the combination of them (e.g., archaeological, historical and linguistic) can be fruitful in similar occasions (Parker, 2008). Moreover, the systemic modelling can be proved indispensable for managing the huge quantity of data that are accessible from diverse digital sources, according to the trend of *Open Archaeology* (Landau, 2003).

Hence, regarding the SOT as a social system, the study of the supportive non-linguistic data follows the guidelines of systemic modelling, in relevant fields that are equivalent to the notion of inquiry. This notion is implemented through OMAS-III by answering the so-called *journalists questions* (What? Why? When? Where? How? Who? Which?). Once again, regarding the SOT as the answer to *What* (*/Output*) do we seek, the evidence are classified and presented considering the following aspects:

- the causal aspects (*Why*) as expressed by socio-economic evidence;
- the temporal aspects (*When*) as expressed by chronological evidence from the historical and literary sources;
- the spatial aspects (*Where*) as expressed by geographical evidence;
- the aspects of manner (*How*) as expressed by evidence of the contemporary maritime technology;
- the anthropological aspects (*Who*) as expressed by the related genetic evidence;

- the cultural aspects (*Which/Input*) as expressed by archaeological findings, discovered artefacts with their associated technology, religion and other cultural evidence.

These aspects are discussed in the corresponding sections below, arranged in the order just described, excluding the last ones. The cultural evidence are extended and direct, thus they deserve another exclusive presentation.

3. Results

3.1. Socio-Economic Evidence (Why)

There is always a causality that forces people to immigrate (Georgiadis, 2004). The crucial period of our approach in this aspect begins between 3000-2700 BCE (Jemdet Nasr – Early Dynastic I-II), as it will be investigated in the next points (see 3.1.1-4).

3.1.1. Overpopulation

In Sumer, there were a number of rival city-states, which were overpopulated for the standards of that era (Harmansah, 2007; McEvedy and Jones, 1978). Urbanization was intensively developed (Altaweel *et al.*, 2015) and cities were expanded (May, 2015). Immigration though is not a stabilizing factor just for urban populations but also for rural populations of Near East, to cope with food stress as it has been simulated by computing, even in a single century's time (Christiansen and Altaweel, 2005).

3.1.2. Strategic Raw Materials

The technology of the Sumerian society had well entered the Bronze Age. Copper was known since 4000 BCE (Clough and Rapp, 1979), while by 2300 BCE they also knew of iron too Keegan (1997). There were ploughs used, wheeled vehicles (chariots), pottery wheels, metallurgy furnaces, baked-clay products, sailing boats and of course skillful craftsmen (Clough and Rapp, 1979). Thus, there was already a great need for strategic raw materials that were absent from Mesopotamia and had to be imported from distant locations, like Cyprus (for copper), India (for gold), Anatolia and Central Asia (for tin as well as timber and many other materials), Afghanistan (for turquoise, lapis lazuli and other precious stones) and Europe (Keegan, 1997). This kind of transaction is much older as the gradually collected data suggest (Radivojević *et al.*, 2014).

3.1.3. Commerce

Otherwise, commerce (see 3.1.2) requires a producer who knows the needs of a potential purchaser and a consumer who knows where to find the desired goods of a certain quality. This is an information exchange process that was conducted through human communication, with all the associated implications of such activity (see also section: *3.3 Geographical Evidence*). Sumerians proved to be excellent traders and colonists throughout the entire Near-East, even at the end of the Uruk period (Algaze, 2005a), while the Bronze Age in Crete is supposed to have started in a significant scale at about 2700 BCE (Chaniotis, 2004; Roebuck, 1966).

3.1.4. Politics

The referred period (3000-2700 BCE) had also been a transitional one regarding the organization of the Sumerian society. Kingdoms had not been fully established yet. The city-states were ruled by a council of elders that included the participation of women (Gannett, 1992; Jacobsen, 1939), who had a high social status analogous to that of Minoan Crete, headed by a priest-king assisted by bureaucrats that had under their control large areas of fertile land (Keegan, 1997). Nevertheless, the lack of naturally protected borders (unlike Egypt) and the rise of the military power of city-states, like Uruk, led the Sumerian societies to a period of wars and to the substitution of priest-kings by military leaders (Keegan, 1997). Those socio-economic changes also resulted in the creation of a very wealthy class of officials (lords, priests, bureaucrats) and a very poor class of landless peasants (Clough and Rapp, 1979). Because of the transition to the reign of dynasties, this time would have been ideal for the dissenters to leave, as social crises lead to immigration, also observed in the case of the Grand Ancient Greek Colonization (Manfredi and Braccesi, 1997).

3.2. Chronological Evidence (When)

The name "Crete" is firstly found in Homeric Epics (e.g., *The Odyssey*: XIX, 172-177), although it seems that the name "Cretans" (ke-re-te) occurs on tablet PY An 128 of the Late Bronze Age (Driessen, 1998-1999). The name "Kaptara" is regarded as the most ancient reference to Crete (Strange, 1982), while there is an obvious similarity to the names of other nations mentioning the people of Crete, like Caphtor/Kaftor or Keftiu (Dickinson, 1994; Vandersleyen, 2003; Wainright, 1952). In more details:

3.2.1. The Tablets of Mari

On the tablets of Mari (18th century BCE) it is stated that "the hand of Sargon" had reached places beyond the "upper sea" (Mediterranean) as far as the island of copper (Cyprus) and "Kaptara" (Drandakis, 1956). Crete is the only island close to Levant that is worth mentioning for being comparable to Cyprus in terms of size and natural resources (in materials other than copper). Sargon-I (the Great) lived approximately between the 24th and the 23rd centuries BCE (Kramer, 1963). What could have been the "hand" of Sargon the Great other than merchant stations or garrisons and administrative echelons?

3.2.2. Earliest Reports

Even before the era of Sargon, the earliest reports extend the rule of Sumerian kingdoms to the Mediterranean coast of Levant since the 28th century BCE, during the reign of Meskiaggasher, king of Uruk (Jacobsen, 1939). The same wide regional coverage appears during the reign of Lugalanemundu (2525-2500 BCE), king of Adab (Guisepi and Willis, 2003).

3.3. Geographical Evidence (Where)

Immigration has been a phenomenon as ancient and wide as the human kind that deserves thorough study (Van Dommelen, 2014). It is conventionally observed through anthropological, materialistic, cultural and literate data. A most recent example of the first is the genomic origins of the European population from four initial groups: a North Eurasian, a Caucasian, a Western European and an Early European, the latter consisting of farmers coming from Near East during the Neolithic Age, 8000-9000 years ago (Slatkina and Racimo, 2016). The geographical dispersion of the usage of cannabis-made materials indicates at least a commercial connection between East Asia and Europe since the Neolithic Age Long *et al.* (2016), while the presence of cinnamaldehyde on Phoenician flasks of the early Iron Age (11th – 9th centuries BCE) indicate a long distance trade with South East Asia (Namdar *et al.*, 2013). Therefore, the commercial routes are prime elements of any relevant study (see 3.1.2). The following points (see 3.3.1-4) are indirect evidence that focus on areas, in general.

3.3.1. Migration Routes

The genomic analysis of the European populations and the associated development of dairying practices indicate that Middle Eastern farmers gradually immigrated into Europe during the Neolithic Age, through Anatolia and Greece (Curry, 2013). This route has always been the closest one to Europe in any instance of historical agitation in Middle East, evident nowadays as well (Foskolou and Kyrimi, 2016). Immigration of a female farmer from Mediterranean to Scandinavia is also detected in Early Bronze Age too Nicholls (2012). The entire pattern attests that, at least in prehistoric times, innovations were propagated not as information but through the presence of knowledgeable persons.

3.3.2. The Island of Crete

Crete is located on this route (see 3.3.1) that in the course of Bronze Age had been bidirectional (Barako, 2001; Landau, 2003; Sherratt, 1998; Thalassinos, 2004; Woudhuizen, 2006), while there is no particular reason to believe that this phenomenon had happened just once or twice per a few millennia. The island is fertile enough to sustain large populations and conveniently situated for international marine trade (Douvitsas, 2005), being the perfect destination not only for nearby settlers (Betancourt, 2003; Hayden, 2003; Pagkalou-Zervou, 1988) but also for persons of a most civilized nation of that era, like the Sumerians (Kenanidis and Papakitsos, 2013a). Moreover, it had been a relatively safe place for longer times in history, compared to the constant raids of other peoples in Mesopotamia (see 3.1.4). The flora of the island in Bronze Age had been much richer than nowadays Kenanidis and Papakitsos (2013a) and capable of sustaining various species. Notably in the broader region (Tilos Island), the skeletons of midget elephants ("Elephas tiliensis") have been discovered in 1971 by Prof. N. Symeonidis. These elephants were 1.5 meters tall, weighted 500-600 kilos and became extinct at about 1500 BCE (OnBlue, 2015).

3.3.3. Commercial Routes

The commercial dispersion of the Sumerian influence had been initially determined by Kramer (1963), "… so that by the third millennium BC, there is good reason to believe that Sumerian culture and civilization had penetrated, at least to some extent, as far East as India and as far West as the Mediterranean, as far South as Ancient Ethiopia and as far North as the Caspian". The discovery of clay tablets in Margiana of Central Asia (Sarianidi, 1998), bearing signs of remarkable resemblance to those of CP, rather supports this aspect. India is 2000 km by sea from the ancient estuaries of the Euphrates or Tigris Rivers to the estuary of Indus River. Ethiopia is about 3700 km from the same starting point to Aden Straights, sailing around the Arabic Peninsula. Especially for India, the influence of Sumerian pictography to Indus script is visible (Davis, 2011), whether this script is a true writing system (Fournet, 2012) or not (Farmer *et al.*, 2004). The distance from the northern Sumerian territories to the northern coast of the Levant, traveling upstream the Euphrates River, is just 800 km (the curious reader can easily verify these routes by using the distance-calculating facility of a relevant program like Google-Earth). This route had been well-known to Mesopotamians, not only since the Uruk period (Algaze, 2005b; Sundsdal, 2011) but even before that, during the Ubaid period (Carter and Graham, 2010). After all, the classification of the Sumerian language as an r-Altaic one of the Proto-Bolgar branch (Kenanidis and Papakitsos, 2013a) and the anthropological data for the very first Sumerians, denoting people from Central Asia (Kyriakidis and Konstas, 1974c), indicate that the Sumerians had immigrated to Mesopotamia through Iran. By 3000 BCE, Sumer had been the center of a "global" trading (Giorgetti, 1977). The most important trading for the technology of Bronze Age was that of tin. Extensive trading networks existed for this purpose (Maddin, 1998; Valera and Valera, 2003). Other minerals and materials like amber were also important and their trading routs expanded from Scandinavia to Cyprus (Flemming, 2015; Kalle, 2015; Ling and Stos-Gale, 2015). Notably, commercial activity doesn't include only an exchange of goods but also an exchange of information and potentially an exchange of delegations from experts or agents to evaluate the traded goods (see 3.1.3).

3.3.4. The Mythical Echo

Finally, the Ancient Greek oral heroic tradition can be used in an indirect manner to indicate the long connection of the Aegean area to the East, during the Bronze Age (Finkelberg, 2005). The notable relevant example is Kadmos from Phoenicia, the founder of Thebes (Paparrigopoulos, 2010). The mythical echo of this event well predates the Trojan War in the 13th century BCE (Dana, 2008; Papamarinopoulos *et al.*, 2014).

3.4. Maritime Technology (How)

Crete is an island and the first Neolithic inhabitants arrived only by sea. Although the first remnants of a boat are dated to about 6300 BCE (Keegan, 1997), the obsidian of Melos that has been found in Neolithic settlements of Crete (Douvitsas, 2005) had been extracted since the 10th-11th millennium BCE (Prehistoric Collection of the National Archaeological Museum of Athens). By the 3rd millennium BCE, there were seemingly sailing vessels around the Aegean and the Balkans, capable of covering long distances with relatively heavy loads (Maran, 2007). Could the Sumerians have traveled as far as Crete?

In the 1st millennium BCE, the Phoenicians traveled as far as Spain and beyond Gibraltar - they circled around the whole Africa (Manfredi, 2004), having a similar naval technology to the one that is discovered through the shipwrecks of Mediterranean (Panousi, 2003). The Greeks had colonized the coasts from the Crimean Sea to Gibraltar as well, within a 2-3 centuries time (Manfredi and Braccesi, 1997), while Enthymemes explored the coasts of West Africa as South as Senegal and Pytheus described glaciers as North as Northern Norway (Manfredi and Braccesi, 1997). It may be argued, however, that all the above happened later than the Sumerian era. Yet, the Austronesians inhabited the entire Pacific Ocean, sailing for thousands of miles between remote islands, since 5000-2500 BCE and onwards (Gray *et al.*, 2009; Pawley, 2002). Therefore more specifically:

3.4.1. Naval Vessels

Rowing boats are depicted on Cycladic terracotta "frying-pans", dated around 2800-2300 BCE, that their size was significant, judging from the number of rows, thus allowing the merchants to import copper from Sardinia (Cline, 1994) and Adriatic (Prehistoric Collection of the National Archaeological Museum of Athens). The absence of masts doesn't necessarily mean that those boats didn't have any, since similar depictions of sailing boats on Ancient Greek and Etruscan vases (Manfredi, 2004) lack sails for economy of drawing-space. Another indirect piece of evidence for such long sea-trips is the Cretan graves with parapet that have been discovered in southern Spain, dated around 2000 BCE (Lazos, 1985). Nevertheless, Sumerians had attained the similar naval technology of sailing ships to travel that distance from Levant to Crete, since the 35th century BCE (Guisepi and Willis, 2003). A sailing boat of those times could travel with an average speed of 8.5 km per hour (Johnstone, 1988; McGrail, 1981). In a day of sailing, a distance of 70-100 km could be covered (Manfredi and Braccesi, 1997). According to Homer (*The Odyssey*: XIV, 256-262), the trip from Crete to Egypt lasted five days. The distance from the northern Levant coast (e.g., Ugarit) to the eastern coast of Crete (e.g., Zakros) is about 880 km. With a favorable weather alongside the southern coastline of Anatolia, the Sumerian inhabitants of the Levantine communities (Rohl, 1999) could have arrived at Crete in just 9-13 days. The above estimated traveling times are precise if the supplies for such a journey are carried onboard. Otherwise, those supplies should have been gradually gathered from ashore: Cyprus, Southern Anatolia and Rhodes.

3.5. Anthropological Evidence (Who)

There have been various attempts from scientists of many disciplines (archaeology; linguistics; anthropology) to identify the Minoans' origins. Homer (*The Odyssey*: XIX, 172-180) mentions at least five ethnic groups (or sub-ethnic in the case of Achaeans and Dorians), each one speaking its own language or dialect respectively (namely, Achaeans, Eteocretans, Kydonians, Dorians and Pelasgians). Herodotus (I.173.1) mentions that in old times the entire Crete was inhabited by "barbaroi", clearly meaning "foreigners" (i.e., non-Greeks; not "barbarians" in the modern sense of "savages"). Owens (2000) argues for the single nationality descent of the Minoan population against Duhoux (1998), who mentions the above passage of Homer for justifying the multinational environment of prehistoric Crete. The debate of Owens is based on the population conditions of Crete at about the estimated time of having Odyssey written (800 BCE), which was indeed described as multinational. This debate, though, accounts only for the Doric groups, the last ones to inhabit the island in ancient times (11th century BCE). For the rest of them, Herodotus and Diodorus Siculus preserved ancient narrations of Eteocretans ("True Cretans"), stating that they were the oldest inhabitants of the island, besides a group of more ancient and primitive people ("Idaean Dactyls") and also mentioning those groups that inhabited the island after them (Driessen, 1998-1999; Kenanidis and Papakitsos, 2013b). suggests among other that Eteocretans were the Sumerian population, Kydonians were the Akkadian settlers and Idaean Dactyls were the previous Neolithic inhabitants of Crete. He also proposes a settlement of Sumerians in large numbers since 3000 BCE. The relevant anthropological data will be considered next (see 3.5.1-3), to examine in what extent they support or reject the SOT.

3.5.1. The Mediterranean Race

Bronze Age Crete had been inhabited by people of the Mediterranean race of Neolithic origin (Douvitsas, 2005; Kenanidis and Papakitsos, 2013a; Kyriakidis and Konstas, 1974a). The Mediterranean genotype is evident in the wider perimeter of the Aegean Sea: from Western Anatolia to Southern Italy and from the Central Balkan Mountains to Crete (Cavalli-Sforza, 1996). Two relevant versions have been recognized that can be roughly characterized as

"mainlanders" and "islanders" (the latter being found in coastal areas of the Aegean as well), which are both distinct from the "Armenian-type" (Poulianos, 1968).

3.5.2. DNA Comparisons

A recent study argues in favor of the Neolithic European origin of the Minoans, based on DNA comparisons taken from skeletal remains (Hughey *et al.*, 2013). These initial comparisons though concern the mitochondrial DNA that denotes the maternal lineage. The descent that is excluded for certain is the Northern African one, as argued by Evans (1925), since there is no anthropological evidence for this proposal (Lazaridis *et al.*, 2017; Poulianos, 1968).

3.5.3. Minoan Skeletons

Finally, the most recent relevant genomic study (Lazaridis *et al.*, 2017) reveals that the Minoan skeletons studied have an about 15% genetic part of "Iranian/Armenian" origin, which is exactly what we are looking for herein. It is socially interesting that, regarding the origins of the Minoan Civilization, the local (Greek) press focuses on the 85% instead (Drakopoulos, 2017).

4. Discussion

The entire linguistic context of Minoan (pre-Mycenaean) Crete seems to be closer to Near East than to mainland Greece, either in terms of the existence of multilingual societies (Morpurgo and Olivier, 2012) or regarding the influence on the creation of the scripts (Hood, 1971; Olivier, 1986). It is estimated that the beginning period of the creation of CH and LA lies somewhere between 3000-2600 BCE (Olivier, 1986). This is the exact crucial period of socio-economic changes in the Sumerian societies that has been estimated previously (see 3.1.4). Thus, we are looking for a period of the Sumerian (Proto-) literate history that their writing system had become largely phonetic (Guisepi and Willis, 2003) but it had not yet been developed into cuneiform (after 2600-2500 BCE), although the transition of the Sumerian script from curvilinear to proto-cuneiform had started since the 30th century BCE (Woods *et al.*, 2010). At this stage, their original phonetic signs (approximately 600) could have been developed to a more compact and easy syllabic system, like CP, still without any influence or trace of cuneiform. Moreover, the Sumerian people of that period wouldn't have been affected yet by the notorious *sprachbund* (Deutscher, 2007; Woods, 2006), namely the bilingualism with the Akkadian, since CP is simply an evolution of the Archaic Sumerian script (Kenanidis and Papakitsos, 2015), dating from 3100 to 2600 BCE (Kenanidis and Papakitsos, 2013a). Consequently, a suitable period of an arrival of the first Sumerian settlers at Crete can be defined between 2800-2600 BCE.

To summarize the presented socio-economic evidence, by the 26th and 27th centuries BCE the Sumerians had experienced:

- urbanization and overpopulation (see 3.1.1);
- the need for raw materials that were necessary for their advanced civilization but absent from Mesopotamia (see 3.1.2);
- (because of the previous need) the knowledge of an extended commercial network that was exploited, even well before this period (see 3.1.3);
- socio-economic changes accompanied by an increase of warfare and poverty for the lower classes (see 3.1.4).

Therefore by those times, the Sumerian socio-economic conditions were similar to those of the Greek city-states that triggered the Grand Ancient Greek Colonization of the 8th-6th centuries BCE (Manfredi and Braccesi, 1997).

To summarize the geographical evidence, it is exhibited that extended networks existed since Neolithic Age, particularly in Balkans as well (Maran, 2008), through which people (see 3.3.1, 3.3.4), strategic raw materials, other goods and information traveled from Scandinavia at North to Ethiopia at South and from the British Isles at West to India at East, having the center of this network at Mesopotamia (see 3.3.3). The oldest so far direct evidence of such travels by sea in the afore-mentioned commercial networks is approximately dated to 1300 BC, from the famous Ulu-burun shipwreck (Pulak, 2005) that contained 17 tons of materials from 11 different cultures (Marchant, 2012), including amber from Baltics and tin from Afghanistan (Manfredi and Braccesi, 1997). Crete had been a naturally and geographically privileged place on the center of the northwestern root of this network (see 3.3.2) that could be favorable for knowledgeable persons to settle.

5. Preliminary Conclusion

Considering the local (Mediterranean) origins of the Minoan inhabitants that have been found so far (see 3.5.1), the initial proposal about the settlement of Sumerian populations in large numbers (Kenanidis and Papakitsos, 2013a) is not anthropologically supported, at least not in the sense that entire families of Sumerians immigrated to Crete. What may have happened though is analogous to the Grand Ancient Greek Colonization, where the settlers were mostly unmarried men, getting brides from the local population after the settlement (Manfredi and Braccesi, 1997). This analogy justifies the anthropological evidence about the Minoans regarding both their maternal lineage of Neolithic European origin (see 3.5.2) and the observed assimilation by the locals of the settlers from the "Iranian/Armenian-type" (Kyriakidis and Konstas, 1974b). The Ancient Greek settlers, although less in number but bearing an advanced culture, influenced in many and different ways their neighboring Romans (Manfredi and Braccesi, 1997) and Etruscans (Laparidou, 2002), or other indigenous populations, from the Egyptians (Trianti *et al.*, 2011) to the remote culture of Gandara in Eastern Afghanistan (Grigorakou-Parnassou, 2004).

Therefore, the SOT as expressed herein argues that the settlers from East that arrived in Crete during the 28th – 26th centuries BCE (Douvitsas, 2005; Kyriakidis, 1971; Kyriakidis and Konstas, 1974b) were people of Sumerian cultural background: merchants (knowing the routes), craftsmen (carpenters, metal-workers, seals-makers, etc.) and scribes (actually accountants and administration clerks) in moderate numbers. The advanced level of their civilization compared to that of the local Neolithic population could have easily resulted in the complete adoption of their culture by the locals, during the eight-centuries long (2700-1900 BCE) Prepalatial era. In this respect, more direct evidence are being accumulated to be presented shortly.

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