Radiocarbon, Vol 57, Nr 2, 2015, p 265–283 DOI: 10.2458/azu_rc.57.18562

ON THE BEGINNINGS OF SOUTH ASIAN SPICE TRADE WITH THE MEDITERRANEAN REGION: A REVIEW

Ayelet Gilboa

Zinman Institute of Archaeology, University of Haifa, Israel. Corresponding author. Email: gilboaaa@zahav.net.il.

Dvory Namdar

Institute of Earth Sciences, Hebrew University, Jerusalem.

ABSTRACT. When did the trade in lucrative spices from South Asia to the West commence? Recent organic residue analyses performed on small early Iron Age (11th–late 10th century BCE) Phoenician clay flasks provide the first concrete archaeological evidence that such sustainable trade took place much earlier than hitherto suspected. The analysis shows that several of the flasks contained cinnamon, which in this period could only have originated in South/Southeast Asia. Here, we first summarize the rationale and results of that study. Subsequently, we provide an updated review of all sources of data relevant to the question at hand—archaeological, analytical, and textual. Finally, we offer suggestions for future research on the Asian spice trade with the West.

INTRODUCTION: SOUTH ASIAN SPICE TRADE WITH THE WEST

South/Southeast Asian spices have fired the imaginations of European historians, poets, and travelers, and whetted the appetites of elites and rulers ever since the "West" became aware of their existence (Keay 2006). Starting in the 16th century, the quest to dominate the spice trade became a major factor in European colonialism, the development of maritime technologies, and more, and dictated the fate of many of the spice-producing regions and societies (e.g. Corn 1998). But when did the spice trade begin?

Based on Greek literary evidence, discussions of the South Asian (mostly Indian) spice trade to the West usually begin with the late 6th/5th centuries BCE, when European acquaintance with cinnamon and cassia was recorded by Herodotus (3.107–111; 5th century BCE) and by his more-or-less contemporary Melannipides of Melos (Athenaus 14.561F; e.g. Barnstone 2010:157).[1] Herodotus' fanciful account (3.107–111) demonstrates that even in this period Europeans had only a vague idea regarding the origin of these spices; cassia and cinnamon were said to be procured by the Arabs (alongside myrrh and frankincense). On the other hand, Herodotus proclaimed that the origin of cinnamon is in fact unknown and that it was brought from Nysa "where Dionysus was reared." For him, this probably meant Ethiopia (2. 146).[2] Per Herodotus (2.86), cassia was used by the Egyptians, alongside myrrh, for embalming.[3]

The association of cinnamon/cassia with Arabia suggested by Herodotus (and later writers), and their affiliation with Trogodytica or Somalia in East Africa by Pliny the Elder (*NH* XII, 42.19; 1st century CE) led some scholars to suggest that these terms, rather than referring to South Asian spices, denote African or Arabian plants, yet unidentified botanically [esp. De Romanis 1996; Crone 2004:36–7 and Appendix I (first published in 1987)]. These suggestions, however, did not gain much support (for critiques, e.g. Amigues 1996; Goyon 1996; additional endorsements of the South

1. Other commodities traveling between South Asia and the Mediterranean in the Persian period are summarized in Salles 1996:257; Van Alfen 2002:299–300, Table 2A and passim (for cinnamon and cassia, see pp. 47–53).
2. And that Greek tradition variously identified in the Aegean, Africa, or Asia (from Hellenistic times this was specifically India; see Herrmann 1937 and references in Amigues 1996:660). For Herodotus' quite fuzzy acquaintance with both Arabia and India, see e.g. Dihle (1990) and Casevitz (1995). The notion that Indian spices actually originated in Africa remained widespread in Europe until early modern times, for example in Garcia de Orta's famed *Colóquios* (16th century; Pearson 1996:1–50 for an English version).
3. This brings to mind 19th century Egyptologists, including the famous Thomas ("Mummy") Pettigrew, who strangely reported encountering cinnamon, or its odor, when treating New Kingdom mummies (Lucas and Harris 1989:354).

The Iron Age in Israel: The Exact and Life Sciences Perspective
Edited by Israel Finkelstein, Steve Weiner, and Elisabetta Boaretto

Asian hypothesis are cited further below). As pointedly noted by Van Alfen (2002:50): "…those arguing for non-Far Eastern origins [are in] the unenviable position of first trying to find an African or Arabian species to label 'cinnamon' and 'cassia,' and then to explain the shift in meaning to the Far Eastern species later on."

By the Hellenistic period and more so in the Roman era, the Asian spice trade with the West was well under way and is well attested historically and to a certain extent also archaeologically (Miller 1969; Salles 1993; Reade 1996; Thapar 1997; Burstein 2002; Pearson 2003; Ray 2003; Bellina and Glover 2004; McPherson 2004; Tomber 2008; Sidebotham 2011).[4]

Pearson (2003), however, suggested that Greeks and Romans tapped into age-old trade networks that endured for millennia, and some "prehistory" of exchange was also advocated by others (a partial list: Reade 1996; Salles 1996; Weinstein 2000; Burstein 2002:129; Ray 2003:277–8; Gupta 2004, 2005 and see more below). In support of such hypotheses, however, scholars either did not cite any evidence at all, or only parts of the relevant data. In this paper, we build upon those earlier discussions, and add hitherto unnoticed or new data in order to provide a critical, up-to-date summary of all the evidence that to our minds bears on the question of spice trade between South Asia and the Mediterranean prior to the 5th century BCE.

CINNAMON IN EARLY IRON AGE PHOENICIAN FLASKS, 11TH–10TH CENTURIES BCE

The details of our residue analysis of Phoenician flasks were presented in Namdar et al. (2013), where we focused on the analytical protocol and described in detail the chemical results. Here, we summarize the main points of that paper only briefly and concentrate on two other aspects of this research: its historical/archaeological background (the reason why we chose to analyze the contents of these specific vessels) and the contexts in which the flasks "operated" in the Levant. In the Future Prospects section, we claim that following a similar rationale might be instrumental in uncovering further evidence for trade in South Asian (and other) spices.

Background: Levantine Involvement in Inter-Regional Trade in the Early Iron Age and the Rationale of the Study

The last centuries of the Bronze Age (the 14th–13th centuries BCE) signal a peak in Mediterranean (including Levantine) commercial and political interconnections, well attested both by archaeological finds and by extensive ancient documentation (Liverani 2001). The downfall of all Late Bronze Age (LBA) political/economic regimes around the eastern and central Mediterranean, roughly in the course of the mid-13th to mid 12th centuries BCE, brought about the disappearance of these networks and concomitantly a drastic decline in inter-regional exchange. Traffic and the movement of goods, however, did not stop. Abundant archaeological data attest mainly to continuous maritime activities linking the Levant with termini and ports-of-call farther west—in Cyprus, the Aegean, and as far as the Iberian Peninsula, though certainly on a smaller scale than in the Late Bronze Age. Early Iron Age Mediterranean trade is attested mainly by "luxury" items such as metal objects, jewelry, and other trinkets of various materials; it most probably also involved the metals themselves (e.g. Gilboa et al. 2008 with references; Nijboer 2008; Thompson and Skaggs 2013). Since the administrations that controlled much of the Late Bronze Age interconnections have disappeared, many scholars perceive the LBA/Iron Age transition as accelerating a realignment of exchange modes from largely elite "state-administered" exchanges along substantivist lines, to less centralized, market/profit-oriented endeavors, propagated *inter alia* by lower echelons of society (Sherratt and Sherratt 1991, 1993; Liverani 2003; Bell 2006; Beaujard 2011).

4. The best archaeological examples are the large quantities of black peppercorns unearthed at the spice emporioum of Berenike in Egypt's Eastern Desert (Sidebotham 2011:224–6).

Within the Levant, Phoenicia in particular[5] provides a wealth of data regarding inter-regional exchanges in the early Iron Age. Beyond its participation in the aforementioned Mediterranean networks, it produced evidence for extensive maritime connections with Cyprus (e.g. Bikai 1987; Gilboa 1999b, 2012 with references; Gilboa and Goren, in press) and Egypt (Gilboa and Sharon 2008:156, figure on p. 169; Raban-Gerstel et al. 2008; Ben Dor Evian 2011; Waiman-Barak et al. 2014a). Possible Phoenician (and generally Levantine) contacts with regions farther to the south/southeast are still vague. The emergence of the renowned "Frankincense Route(s)" from Arabia may be assigned to the early Iron Age, or even to the Late Bronze Age (respectively, Finkelstein 1988:247; Kitchen 1997:136; vs. Liverani 1992; Artzy 1994; Jasmin 2005, 2006; cf. summary in Knauf et al. 2010). Admittedly, however, the evidence is still rather circumstantial.[6]

The Flasks

As opposed to the Late Bronze Age, in the early Iron Age ceramic containers hardly moved about the Mediterranean. The most notable exceptions are various small decorated containers shipped from Phoenicia to various adjacent regions, especially to Cyprus. Among them the "Phoenician Bichrome"containers have received much scholarly attention and are usually taken as the best proxy for early Iron Age Phoenician commercial enterprise (Bikai 1987). We, however, chose to focus on another group of containers—various small clay flasks— since they are by far the best attested Phoenician import found on the island (Karageorghis and Iacovou 1990:90; Gilboa et al. 2008).

The flasks (Figure 1) have relatively thick walls (usually ~1 cm, sometimes as thick as 2 cm; nr 5 in Figure 1). This indicates a special effort to prevent their breakage. They are of restricted capacity, ~50 mL, and equipped with very narrow necks/apertures (usually ~0.5 cm at the narrowest point), fit for slow pouring of liquid. The flasks are usually decorated with concentric circles in one or two colors. Although simple, the systematic embellishment of these flasks stands out against a background of mostly undecorated early Iron Age Phoenician ceramics, indicating that the decorations not merely exemplify some Phoenician ceramic *habitus*, but had a specific purpose/function. Rarely were these flasks left undecorated.[7]

All these characteristics, in conjunction with the vessels' circulation and find contexts (see below)—suggested to us that they must have been manufactured for the export of some precious liquid. Fabric analysis of such vessels demonstrates that the flasks we identified stylistically as Phoenician—both in Cyprus and in various regions in the southern Levant—were indeed manufactured there (in different locales; Gilboa and Goren, in press: Appendix 2, e.g. Amathus 11–15, Kouklia 1, 31, 34; and preliminarily Waiman-Barak et al. 2014b).Thus, we began this study as an attempt to understand this quite unusual Phoenician export by analyzing the contents of the flasks.

Regarding chronology: in Phoenicia, such flasks are known from the Late Bronze Age/Iron Age transition. They are especially common during Ir1a and Ir1b and then start to dwindle in numbers during the Ir1/2 transitional period and vanish in the course of Ir2a.[8] In Cyprus, the flasks are attested contemporaneously: from Late Cypriot IIIA, and then through LC IIIB and the entire Cy-

5. We use the term "Phoenicia" in the early Iron Age as denoting not only Lebanon, but also the coastal areas south of it, down to the Carmel coast in Israel; for the arguments, see e.g. Gilboa (2005, 2012) and Gilboa and Goren (in press).
6. And is inextricably connected to the question of the domestication of the dromedary and its dispersal in the Levant—an issue we do not pursue here.
7. We have some indications that on the undecorated examples the paint is simply not preserved.
8. We employ here the chronological terminology proposed in Gilboa and Sharon (2003) for Phoenicia, which corresponds to the one employed in Israel (Herzog and Singer-Avitz 2006, 2011; Mazar 2011:107; Arie 2013) as follows: Ir Ia = early Iron I; Ir1b = late Iron I; Ir1/2 = early Iron IIA; Ir2a = late Iron IIA.

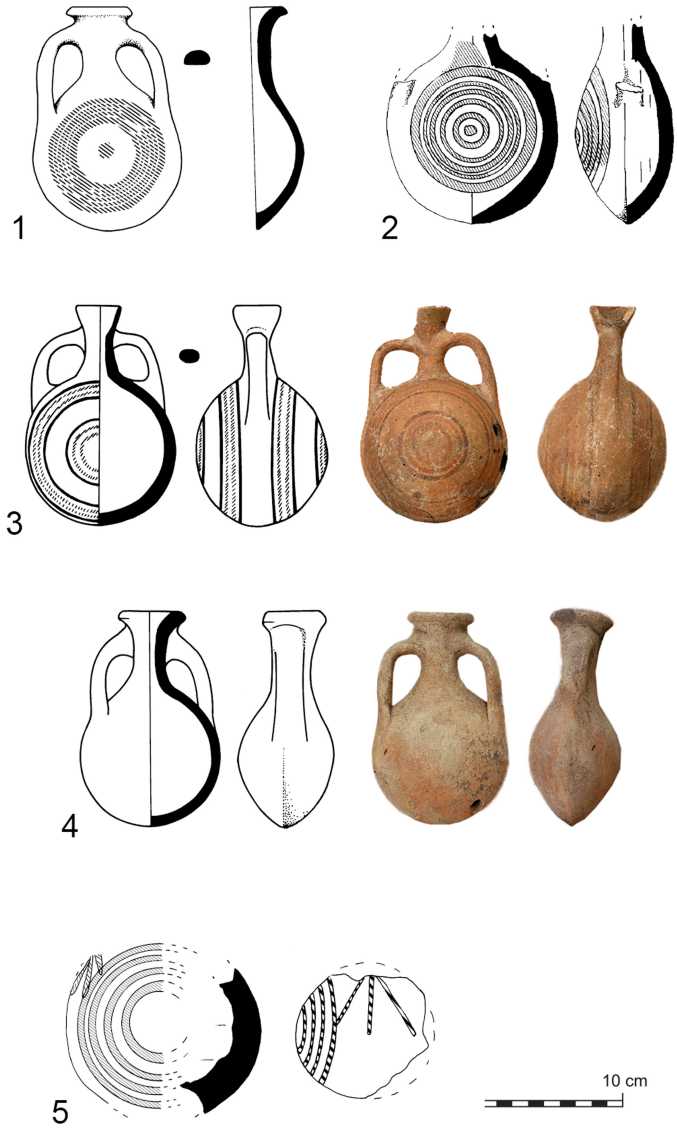

Figure 1 Examples of flasks containing cinnamon. 1. No. 2019, Tell Qasile; 2. No. 2279, Dor; 3. No. 2271, Tell Qasile; 4. No. 2269, Tell Qasile; 5. No. 2192, Dor.

pro-Geometric period (CG I–III; for the relative chronology and terminology in Phoenicia and the correlation to Cypriot horizons, see Gilboa and Sharon 2003). This means roughly the early 12th to mid-9th centuries BCE, a long-lasting phenomenon. However, the specific flasks that produced well-preserved organic residues (Table 1) date only to the Ir1a, Ir1b, and Ir1/2 horizons, the 11th to the mid- or late 10th century BCE.[9]

Results of the Residue Analysis

Selection of samples was dictated mainly by considerations of preservation and accessibility. We chose not to sample flasks in Cyprus since they have routinely been treated with acid and thus the organics absorbed in them may have been washed away. Flasks from Lebanon were inaccessible to

9. When exactly the Ir1/2 transition should be placed in absolute terms depends on one's stance in the debate regarding the ^{14}C chronology of the Iron Age in Israel—a dispute we cannot enter here.

Table 1 Details of flasks containing cinnamon. For a full molecular inventory of their extracts see Namdar et al. 2013, Table 2.

Lab nr.	Site, stratigraphy, registration details	Date and context	Illustration/reference
2019	Tell Qasile Str. XI #3066/ L227	Iron 1a, Temple 200 store-room	Figure 1:1; Mazar 1985:71, photo 73, Figure 20:12
2269	Tell Qasile Str. X #2120/L188	Iron 1b, Temple 131 store-room	Figure 1:4; Mazar 1985: Figure 37:10
2271	Tell Qasile Str. X #2126/L188	Iron 1b, Temple 131 store-room	Figure 1:3; Mazar 1985: Figure 37:7
2272	Tell Qasile Str. X #2133/L188	Iron 1b, Temple 131 store-room	Mazar 1985: Figure 37:15
2275	Dor Phase G/7b-a #99379/W9140	Iron 1|2, in domestic courtyard house	Unpublished
2278	Dor Phase D2/13 #09D2-7885/ L09D2-386	Iron 1a, store-room on lower floor of elite dwelling	Unpublished
2279	Dor Phase B/11 #71272-1/L7138	Iron 1a|b, domestic context	Figure 1:2
2281	Dor Phase D2/13 #10D2-5170/ L10D2-516	Iron 1a, room in elite dwelling, upper floor	Unpublished
2192	Dor Phase G/8 #98627/L9861	Iron 1a|b, cult room in domestic courtyard house	Figure 1:5; Gilboa 1999a: Figure 1:7
2194	Kinneret Str. V #10799/1/L4328	Iron 1b, Area U domestic context	Unpublished

us. Therefore, we only sampled vessels from sites in present-day Israel (Figure 2). We focused on vessels found in primary contexts. In 10 out of the 27 flasks analyzed, high amounts of cinnamaldehyde were detected, among many other molecules (for a detailed inventory of items analyzed and compounds detected, see Namdar et al. 2013:Tables 1, 2).[10]

Cinnamaldehyde is one of the three major components of cinnamon (Tomaino et al. 2005). It is a direct biomarker for cinnamon, since *Cinnamomum* is the only plant group that accumulates large quantities of cinnamaldehyde. This is due to a malfunction in its shikimic pathway, which in other plants produces lignin from cinnamic acid (Clark 1991; Whetten and Sederoff 1995). Cinnamaldehyde is a relatively unstable molecule, and its survival in the 10 flasks is attributed to an organic-inorganic binding, stabilizing the adsorbed molecules in the ceramic matrix. Other than the cinnamaldehyde itself, one of its degraded byproducts (benzoic acid) was also found in the extracts of these 10 items.

In addition, relatively small amounts of tartaric acid were detected in some of the flasks. Tartaric acid is often considered a marker for wine (Michel et al. 1993; Guasche-Jané et al. 2004, 2006; McGovern 2009), but this has recently been convincingly debated (DeBolt et al. 2006; Isaksson et al. 2010; Barnard et al. 2011). Therefore, based on the molecular assemblages detected in the flasks we cannot determine the type of liquid in which the cinnamon was immersed.

10. Among the other molecules, various myristate derivatives possibly point to another South Asian spice, nutmeg in this case, but this identification is not conclusive enough at this point; see the discussion in Namdar et al. (2010) and Gadot et al. (2014) for the problems in identifying the origin of a similar molecular assemblage in early Iron Age Philistine cultic chalices.

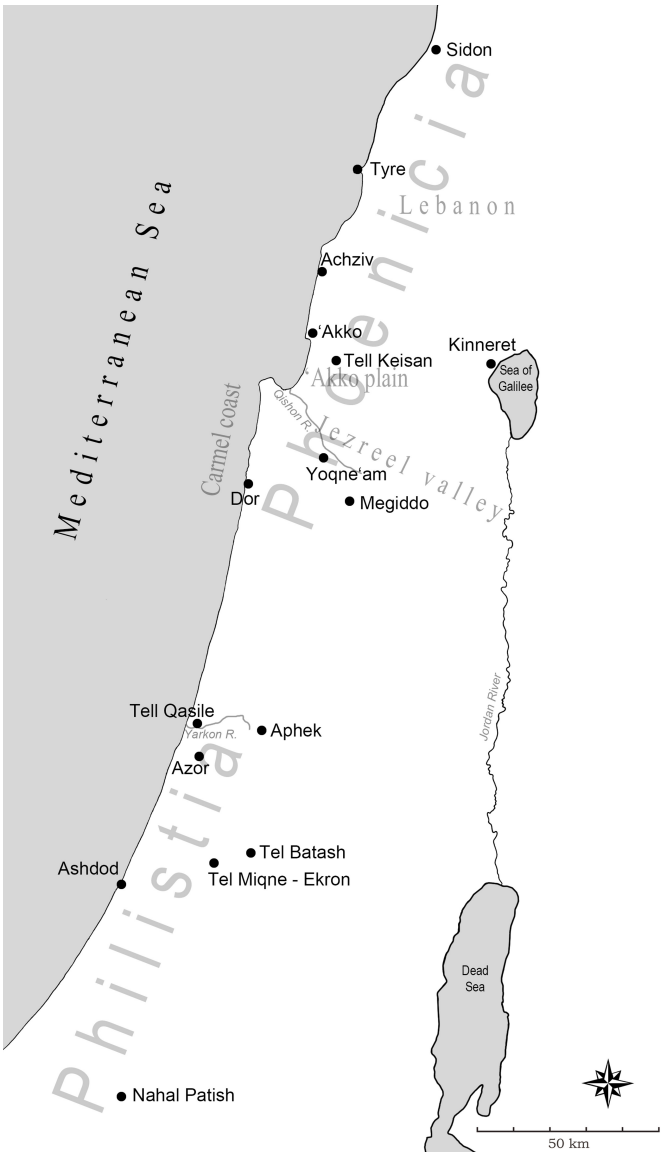

Figure 2 Map of the Levant with main sites mentioned in text.

The *Cinnamomum* family has more than 100 species, all native to South and Southeast Asia. *Cinnamomum verum* (*C. zeylanicum* Nees) occurs naturally mainly in Sri Lanka, southern India, and Myanmar (Ravindran and Babu 2004). *C. cassia* Blume (Chinese cassia/Vietnam cassia) is native mainly to southeast China and Vietnam, also to Laos and Myanmar (Kim Dao 2004; Ravindran et al. 2004; Senanayake and Wijeskera 2004). Currently, we cannot identify the exact cinnamon species present in the flasks. However, since none of the cinnamon species grew naturally (or were cultivated) anywhere else before early modern times (e.g. De Silva 1996:26), the cinnamon in the early Iron Age Levant could only have originated from the aforementioned regions. Since the flasks range in date from the 11th to at least the late 10th century BCE, they comprise the first attestation that the legendary trade of South Asian spices to the West was already underway at such an early period and that there was some durability to this export.

FIND CONTEXTS AND CIRCULATION

The 10 flasks that produced the traces of cinnamon originated from three sites in Israel—Tell Qasile, Tel Dor, and Kinneret—and are from both ritual and more mundane settings (Table 1, Figure 2). Four (nos. 2019, 2269, 2272, and 2275) are from the back storage room of the small Philistine temple at Tell Qasile. One (no. 2192 from Dor) is from a domestic building, found in a room that held various ceremonial paraphernalia (for the assemblage, see Stern 2000:Figure 47). The remaining five originated in various domestic contexts at Kinneret and Dor (nos. 2194, 2275, 2278, 2279, and 2281).

These contexts faithfully reflect the distribution of other Phoenician flasks in the southern Levant—mainly cultic/ceremonial contexts and various special caches, but also more "ordinary" contexts.[11] The largest assemblage known—more than 20 such flasks—is associated with the Tell Qasile Philistine temple, in Strata XII–X, spanning Ir1a–Ir1b (Mazar 1985:71–3; type FL 1). The four Tell Qasile flasks in our sample (Table 1) belong to this assemblage. Following the Tell Qasile case, our search for small flasks in temples and other cultic installations was rewarding. Still in Philistia, two such flasks were found in the newly discovered temple at Nahal Patish in southern Philistia (the northern Negev; Nahshoni 2009); another one, at Ashdod, lay just in front of the "apsis" of the apsidal structure in Stratum XII, commonly understood as having some cultic function (Dothan and Ben-Shlomo 2005:Figure 3.32:6). Another, at Tel Mikne-Ekron, was situated on a plastered stepped platform—unanimously associated with ceremonial activity—in one of the small side rooms of the early Iron Age monumental Building 350/351 (Dothan 2003; Mazow 2005:145, 248, 358). Hardly any temples are known from early Iron Age Phoenicia, but at Megiddo in the western Jezreel Valley, four small flasks were found in Temple 2048 (Stratum VIA, Ir1b; see Arie 2006:239 with reference to previous publications).

Beyond formal temples, such flasks are known from specific contexts associated with ceremony in domestic settings. At Dor, for example, one flask originated in a room where some conspicuous consumption of liquids took place, and which was understood (on other grounds), as a place for the gathering of men—a *marzeah* (Gilboa et al. 2014). At Kinneret, a flask in a room of a courtyard house accompanied a shrine model and an elaborate kernos bowl (Ir1b; Nissinen and Münger 2009:Figure 4). The Phoenician flasks were clearly cached with other precious objects/commodities. The best examples are from Ashdod. In Area H, Stratum XII (Ir1a), two flasks originated in small rooms in the undoubtedly "elite" structure there. These small rooms could only have been storage spaces and indeed were defined as "treasuries" (Dothan and Ben-Shlomo 2005:25, 29, Figure 32.2, 5; Plan 2.5). They held objects of gold, ivory, and more (Dothan and Ben-Shlomo 2005:Plan 2.7 upper) but the possible meaning of the small, crude flasks in them has not been addressed. In Area G at Ashdod, a cache of four such flasks was found in another small storage space, accompanied by a female figurine and an ivory cosmetics box (Dothan and Porath 1993:Figure 32: 10, 12, 13, 15; Plan 10: Room 4117). At the major tell of Jatt on the eastern fringes of Israel's Sharon coastal plain, two such flasks were part of an extraordinary cache composed mainly of elaborate metal objects (Ir1b; Artzy 2006:Pl. 25:2, 3).

Beyond "special" contexts, such flasks are common in domestic and domestic-cum-industrial areas, especially in Phoenicia and its immediate environs (at Dor: Gilboa et al. 2014; at Tell Keisan: Briend and Humbert 1980:Pl. 76; at Yoqneʻam: Ben Tor et al. 2005:22–9; at Kinneret: S. Münger, personal communication; and at Megiddo: Arie 2006:208–10, esp. F1a, F1b, F5). In Philistia, flasks in such contexts are less frequent (e.g. at Tel Batash: Panitz Cohen and Mazar 2006:116).

11. The discussion refers only to vessels found in primary deposits in the Levant. In Cyprus, most of the known flasks are from tombs.

To sum up, the Phoenician flasks are especially common in ritual and elite contexts, but not confined to them. Because we did not identify the flavored substance in the flasks, we cannot deduce their exact function. Such small flasks could have held a variety of precious substances, not necessarily mulled with Far Eastern spices. We submit, however, that the occurrence of cinnamon in nearly 40% of our samples indicates that many of them did. Cinnamon, therefore, was not a rarity in the early Iron Age Levant.

Regarding circulation: Asian spices traded to the West traveled in dry form, as they have throughout history (e.g. Casson 1984:232; Keay 2006:116, 187, 227–9). Cinnamon was usually transported as quills made from the dried inner stem-bark of this species. The cinnamon in the flasks, therefore, represents a *secondary industry* related to the spice trade. Namely, in some centers in Phoenicia, cinnamon (and most probably other fragrant substances) was immersed in as yet unidentified liquids and then distributed in locally made flasks within Phoenicia and its environs, and also to other neighboring regions, such as Philistia and Cyprus.

BROADENING THE PERSPECTIVE

Since it has generally been accepted that cinnamon and cassia reached Europe already in the 5th century BCE,[12] here we are interested in further attestations of Asian spices in the West in earlier periods—in the Bronze and Iron Ages.

Botanical Evidence

Direct Evidence

The earliest clear evidence of spices from South Asia comes from the mummy of Ramesses II (reign ~1279–1213 BCE). Grains of *Piper nigrum* (black pepper) were found in his abdomen and nasal cavities, apparently part of the spices used in the mummification process. They were identified by both radiography and botanical analysis (Lichtenberg and Thuilliez 1981; Plu 1985:174, Figures 100:1d; 101:1, 3, 5). Black pepper in this period could only have originated in southern India (Fuller et al. 2011:547). The only other unequivocal botanical attestation of a South Asian spice in the West dates to the 7th century BCE—a flower of *C. cassia* in the sacred precinct of Hera at Samos (Kučan 1995:52–3, Figure 36b).

Other attestations are for the time being ambiguous. In the early 20th century, Edouard Naville reported on actual nutmeg remains at Deir el-Bahari in Egypt, in an 18th Dynasty context (16th–14th centuries BCE). He associated it with Hatshepsut's expedition to Punt depicted at that site (Naville et al. 1913:18). This find, however, has never been fully published. Similarly, Buccelati and Kelly-Buccelati (1983:54) claimed to have found cloves—another Southeast Asian spice—at Terqa on the middle Euphrates, in a context dated ~1600 BCE, but this identification too has never been substantiated.

Indirect Evidence

Beyond the direct identification of South Asian spices in the West, evidence for other botanical (and faunal) translocations between South Asia, China, and Africa provide the wider context against which the early spice trade may be understood. These have recently been summarized in the framework of the Oxford-based Sealinks Project, investigating contacts across the Indian Ocean from an interdisciplinary and *longue durée* perspective (e.g. Boivin and Fuller 2009; Fuller et al. 2011, with references to earlier studies). These scholars convincingly argue that the movements of various

12. For the possibility that *komakon* mentioned by Theophrastus of Lesbos (late 4th century BCE) should be read as nutmeg, see Van Alfen (2002:59 with references).

Asian and African cultivars should be attributed to maritime agency, and point to systematic trade across the Indian Ocean starting no later than the 2nd millennium BCE. Other than the two extremes—India and northeast Africa—it also involved sites in southwestern Arabia (within present-day Yemen). For example, starting in the 2nd millennium BCE at the latest, African crops are attested at various sites in western and northern India. In an east-to-west direction, Chinese *Panicum* (millet) is present in Nubia and southwest Arabia (Fuller et al. 2011:Figure 1). Indeed, it has been argued that this "corridor"—connecting East Africa, Arabia, South Asia, and Southeast Asia—is the context against which the emergence of the spice trade should be understood. Its beginning has been attributed to the early Iron Age (Boivin et al. 2009:265). A similar conclusion was reached by Gupta (2004) in a study investigating the development of maritime activity across the Indian Ocean vis-à-vis the harnessing of the monsoonal winds. Further to the west, in Hala Sultan Tekke in southeast Cyprus, citrus seeds (identified as citron, *C. medica*) have been found in a late 13th century BCE context (Hjelmqvist 1979:113, 125, n. 1). The date has been questioned by Zohary et al. (2012:146) because the seeds have not been ^{14}C dated. But since there are several of them, in secure archaeological contexts (Hunt 1978:18–9; F1159 and F1160), we see no reason for these doubts.

It is widely accepted that citrus originated in South/Southeast Asia (Webber et al. 1967; Dugo and Di Giacomo 2002; Pagnoux et al. 2013 with references). Recently, however, Langgut et al. (2013) demonstrated that citron was transferred to the Levant and cultivated there in the 5th/4th centuries BCE. Since it is unclear how early this practice may have started, citrus seeds in Cyprus may have arrived from nearby regions (or even been cultivated locally).[13] Whatever the case, they attest to some sort of botanical transfer between South/Southeast Asia and the Mediterranean during or prior to the 13th century BCE.

Lastly, another possible example of an "early" Asiatic cultivar in the west is rice (*Oryza sativa* L.), identified in Tiryns in the Greek Argolid in a Late Bronze Age context (Kroll 1982:469, Figure 1:2; cf. Sallares 1991:23). Rice originated in Southeast Asia, from where it spread to India and other regions, but it is not attested as a crop in the Near East nor farther to the west before Hellenistic times, at the earliest (Zohary et al. 2012:73–5 with references). Since, however, only one grain was identified, this unusual discovery will have to be corroborated by future finds (cf. Muthukumaran 2014).

Textual Possibilities

Egyptian Texts

Various Egyptian documents of the 2nd millennium BCE mention the botanical term *ti-spš*, translated by several Egyptologists as cinnamon (e.g. Beaux 1990:130; cf. Nunn 1996:152, Table 7.4; Breasted 2001 IV:§§234, 240, 286, 344). This translation has been extensively cited (e.g. Darby et al. 1976:797; Manniche 1999:17; Kiple and Ornelas 2000 II:160; Toussaint-Samat 2009:437; Broodbank 2013:360). *Ti-spš* was a prestigious substance, offered by kings to temples and deities (e.g. Grandet 1994 II:70). It was frequently used in medicinal concoctions, other unguents, and perfumed oils, and mentioned in love songs (Bardinet 1995; Manniche 1999:39, 44, 54). Other scholars, however, have rejected or doubted the translation of *ti-spš* as cinnamon [e.g. Caminos 1954:209, 468; Erman and Grapow 1971 V:243; Altenmüller and Moussa 1991:15, 42; Faulkner 1991:294 ("tree and its spice"); Grandet 1994 II:83 ("aromatic tree"); Bardinet 1995; implicitly also Kitchen 1999].[14]

13. For the possibility that citrus may already have been acclimatized in Egypt in the 15th century BCE, see Amigues (2005:367–8 with references).

14. For some other views, see Janssen (1966:86–7). Several Egyptian documents allude to *ti-spš* wood, *ti-spš* sticks (reeds? quills?), *ti-spš* root, and possibly *ti-spš* "sawdust" (see listing in Bardinet 1995:583; Breasted 2001 IV: §286).

The *ti-spš* case, for the time being, remains unresolved. It is clear, however, that this was no Egyptian spice. New Kingdom documents record *ti-spš* as reaching Egypt from the south—from Punt [Breasted 2001 II:109, §265; III:57, §116; for the location of Punt along the east African coast, or in western Arabia (or even in Syria) see summary in Meeks 2002]. On the other hand, the Mit Rahina inscription, dating to Amenemhet II's reign in the 19th century BCE, mentions 217 sacks of *ti-šps* brought by an Egyptian maritime expedition returning from Asia, most probably from the north Levantine coast (Marcus 2007:144 and references; the term was indeed understood by him as denoting cinnamon, or alternatively camphor).

Hebrew Bible

Potentially Far Eastern spices are alluded to in the Hebrew Bible. Hebrew *qinman*/*qinnamon* is mentioned three times (Exodus 30:23; Proverbs 7:17; Song of Songs 4:14), alongside other precious fragrant spices. In Exodus, it is one of the ingredients prescribed by God to Moses for the holy anointing oil in the tabernacle. The identification of this substance as one of the *Cinnamomum* species of South Asia is widely accepted (Olck 1899; Moldenke and Moldenke 1952:76; Zohary 1982:202; Casson 1984; Keel 1994:180; Brown 1995:42; Amigues 1996; Goyon 1996:653; Amar 2002:123, 125: nn. 538, 539; Jacob 2011:11–2; Hurowitz 2012:241). Conversely, as mentioned, De Romanis (1996) and Crone (2004) suggest that this is a yet unidentified African or Arabian plant.

Hebrew *qeẓiot* (in plural) and *qeẓia*h (singular, as a personal name) is usually taken to refer to *C. cassia* (Zohary 1982:203). They appear respectively in Psalms 45:9 and Job 42:14 and are translated as "cassia" in the Vulgate (Kraus 1993; Brown 1995:71–2; Amar 2002:104, n. 369; Wilson 2007:476). Hebrew *qiddah* (Exodus 30:24; Ezekiel 27:19) is usually also identified with cassia (cf. Zohary 1982:203; Ammar 2002:104–5).[15] In Ezekiel, it is listed among the merchandise passing through Phoenician Tyre.

In the framework of this paper, it is impossible to consider the extremely complex issue of the dates of composition, transmission, and redaction of all these biblical texts. Generally speaking, though several of them may include "early" (10th–8th century) references, they cannot be evoked to demonstrate the presence of Asian spices in the Levant before the late Iron Age (8th/7th centuries BCE) and most of these texts were extensively edited in exilic and post-exilic times (6th/5th centuries BCE).[16]

Other Texts

In other textual corpora of the Near East and the Mediterranean, South Asian spices have rarely been identified. Bottéro (1957:341), Potts (1997:65–66), and Jursa (2009) describe the difficulties in identifying specific spices in general and the scarcity of such identifications, contra to the variety of spices that had been in use. In cuneiform texts, we are aware of two such instances. Ginger (*Zingiber officinale*), which is native to South Asia (Bentley and Trimen 1880; Purseglove et al. 1981), is listed in one of Esarhaddon's succession treaties (7th century BCE), in a medical context

15. And see nn. 538, 539 for references to scholars who claim that before the 13th century CE only *C. cassia* was known in the Near East (similarly Sima 2000:277, n. 83; vs. Zohari 1982:202–3). In this case too, De Romanis and Crone propose unspecified plants were of African origin.

16. For Exodus 30 in particular and the Priestly corpus (P) in the Pentateuch in general, e.g. Kaufmann 1972; Hurvitz 1982 ("early views"); vs. Schmid 1999; Houtman 1993 I:2; Blenkinsopp 1996; Albertz 2011; Baden 2012:173–4; 247–8 ("late views"); for Proverbs, e.g. Clifford 1999:3–6; Hurowitz 2012 I:10–17; for Song of Songs, see summaries in Keel 1994:4–5; Stoop-van Paridon 2005:11–3; for Psalms in general and Psalm 45 in particular, e.g. Kraus 1993:452; Goldingay 2006–2008 I:30; for Job, e.g. Hurvitz 1974; Wilson 2007:1–2, 6; for Ezekiel, see summary in Liverani 1991:66, 71, 79; all with references to earlier literature.

(Parpola and Watanabe 1988:56, line 644). In a Neo-Babylonian letter (6th century BCE), cinnamon was identified (Jursa 1997:30, 2009:165; Sima 2000:277).[17] The same letter also lists *ka-ṣi-'a-tu*, possibly to be read as cassia (Zadok 1997).

The earliest allusion to an Asian spice in European literature belongs to the 7th or early 6th century BCE. The renowned Lesbian poet Sappho mentions cassia (mingled with myrrh and frankincense), among other eastern luxurious objects and substances, when describing the nuptials of Hector of Troy and Andromache (Fragment 44; e.g. Carson 2002). This precedes Herodotus' and Melanippides' accounts by at least a century and has been frequently overlooked (but see Crone 2004:254; Amigues 2005:373).

SUMMARY AND DISCUSSION

The cinnamon in the 11th–10th century flasks is of special significance since it demonstrates that in the early Iron Age this particular spice was rather widespread in the southern Levant, and to a certain extent was consumed down the social ladder. This is not an anecdotic find. Since the flasks that produced the cinnamaldehyde extend *grosso modo* over 150 yr, it also suggests an export of some regularity, at least in that period. This discovery, alongside Ramesses II's earlier black pepper (13th century BCE), and the later cinnamon flower at Samos (7th century BCE), demonstrates unequivocally that South Asian spices reached the Mediterranean long before the 5th century BCE, at least from the Late Bronze Age. From the 7th century BCE, South Asian spices start to be identified in the written record as well (Esarhaddon, Sappho, and possibly some of the biblical texts). Textual evidence regarding earlier periods is not conclusive, but we submit that current readings of the Egyptian and biblical references should be reconsidered in light of the botanical and residue analysis information summarized herein. As mentioned, spices are only part of a larger array of vegetal commodities that were transferred from South Asia westward over vast distances, at least from the 2nd millennium BCE.

Concomitant questions, of course, must concern the trade routes and modes of trade.[18] *A priori*, however, we admit that there in not much we can say in this regard. Extrapolating from the better-known later periods, when trade was conducted *inter alia* (though not only) through established *emporia* and trading diasporas, facilitated by diplomacy and to a significant extent manipulated by rulers/administrations (e.g. Sidebotham 2011:34, 37, 253–4 for the Hellenistic and Roman periods), would be totally speculative and ahistoric. Specifically for "our" cinnamon, the problem of routes is exacerbated by our inability to determine its geographical origin(s)—anywhere in the vast expanse from south China to south India/Sri Lanka and further east.

The Sealinks researchers, for example, argue that the specific plants they discuss (above) were distributed via a circuitous sea route around the Arabian Peninsula (Figure 3), in part exploiting the monsoon system (similarly Gupta 2004 and implicitly Beaujard 2011:Figures 3.3–3.8). According to them, these exchanges involved societies in southern Arabia and/or the agency of Gujarati (northwest Indian) seafarers (Boivin et al. 2009; Fuller et al. 2011:546–7). Gupta (2004:148–9, with references) suggests that at least from the second half of the 2nd millennium BCE Austronesian seafarers/traders sailed from Southeast Asia as far west as the Gulf of Aden.

The maritime circum-Arabia route (with possible Arabian intermediacy) is only one of several options (and from Arabia/East Africa northward to Egypt and the Levant there are several alternatives).

17. Sima (2000:277 and nn. 82, 83) discusses the specific species of cinnamon which may have been referred to.

18. We reiterate that the routes through which the dry spices reached the Mediterranean sphere, and the subsequent circulation of some spiced commodities in Phoenician flasks as discussed above, are two separate issues.

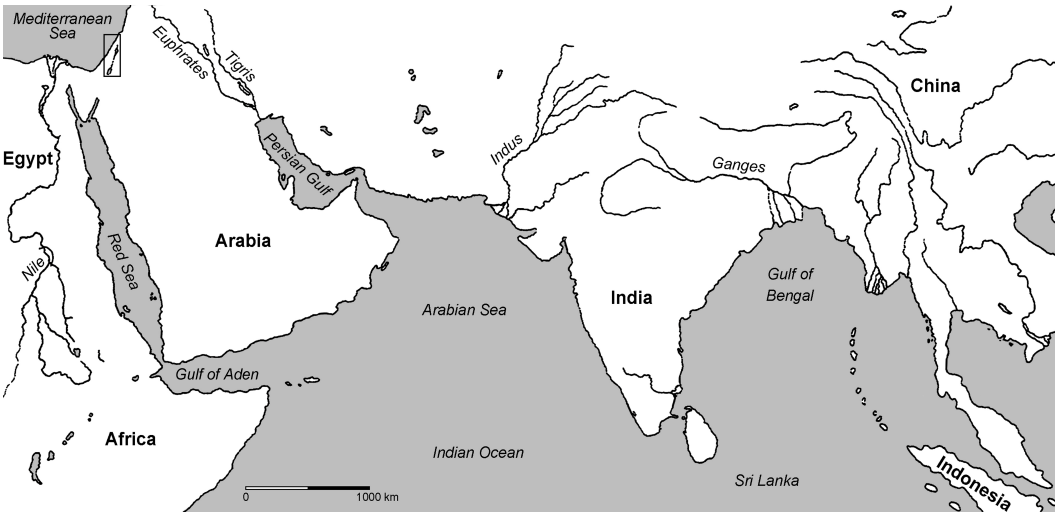

Figure 3 Map of South Asia, Arabia, East Africa, and the Near East

Even the ever-accumulating evidence for thriving Bronze and Iron Age communities in various parts of Arabia (Magee and Carter 1999; Edens at al. 2000; Magee 2004; Hausleiter 2011) does not necessarily promote the Arabian option. Another main route linking South Asia to the West ran through the Mesopotamian river system (Potts 1995:1459) and cinnamon from China would probably have had a different itinerary altogether (Christian 2000; Kuzmina 2008).[19] Moreover, multiple routes and competing networks and agents are also likely. Regarding spices specifically, in the present state of research we cannot even assess if later spice trade—of the Persian period and onward—was indeed "tapping" into age-old networks, or if trade routes fluctuated with time and political setting.[20]

All this notwithstanding, it is highly probable that spices that traveled all the way to the Levant did not halt there and were marketed farther west to Cyprus and to more remote Mediterranean destinations, comprising one of the invisible commodities in Mediterranean commerce.

The early Iron Age cinnamon also demonstrates that spices from the east continued to be traded westward and were in demand even after the Bronze Age collapse and the downfall of most of its elites. Access to such commodities must have played some part in shaping early Iron Age social identities. However, during the 11th to early 9th centuries BCE, between the fall of Hatti and imperial Egypt and the ascendancy of the Neo-Assyrian apparatus, in all regions in Asia, Arabia, and Africa who possibly partook in these endeavors, there were no "great powers." It was an age of small-scale fragmented polities, none of which could have orchestrated or controlled any considerable part of this sequence. This was no *hochkommerz.* Therefore, in line with the Sealinks researchers (and with Horton 1997), we argue that at least in the early Iron Age this trade and the cultural contacts it generated involved entrepreneurs in small-scale societies, and undoubtedly some down-the-line mechanism.[21]

19. For potential routes, see also Astour 1995:1403, 1411–2, figure on p. 1404; Reade 1996:15–6; Chakrabarti 1998:305, 307–9; Hoyland 2001:14; Burstein 2002. The question of whether the reported cinnamon originated in even more distant regions in Southeast Asia is moot at present. For trade networks operating between India and maritime Southeast Asia at least from the 2nd/1st millennia BCE—*inter alia* involving various botanical substances—see e.g. Gupta 2005; Zumbroich 2007–2008; Fuller et al. 2011:548–9, Figure 2.

20. For example, Darius I's conquest of the Indus Valley, and his propagation of maritime exploration—as known from Herodotus's (3.44) account of the expedition led by Scylax of Caria (Panchenko 1998, 2003)—may have impacted trade routes significantly.

21. Boivin et al. (2009:262) argue the same regarding a significant part of Egypt's Punt trade.

FUTURE PROSPECTS

Identifying further evidence for "early" Asian spice trade to the West may revolutionize our perceptions of the development of long-range trade in the Old World and possibly also of Eurasian–African world systems (Gills and Gundar Frank 1993; Gupta 2004; Sherratt 2006; Beaujard 2011; Fuller et al. 2011). This merits concerted effort. One line of investigation is the re-examination of texts from the relevant regions, with the specific Asian spices question in mind. The apparent near absence of such substances in the large body of 2nd and 1st millennia texts in various parts of the Mediterranean/Near East looms large, especially in those extensively preoccupied with commodities, such as the el-Amarna corpus or Neo-Assyrian tribute and booty texts.

Botanical analyses of well-sifted assemblages in the target regions comprise another obvious avenue (and perhaps more mummies need to be looked at), in order to move beyond serendipitous discoveries such as those listed above. It remains to be seen to what extent such spices have survived and may be detected in the archaeological record beyond arid regions, and at complex sites such as the stratified Near Eastern tells.

Here, therefore, we would like to underscore the option of residue analysis as a promising avenue. Mulled beverages (especially wine, e.g. McGovern 2009) and a large variety of drugs, unguents, and aromatics—which comprised extracts of spices and other plants—were an integral part of daily life in the Old World, of commerce, ritual, and of the afterlife (Merrillees 1962; Knapp 1991; Jacob 2011; for Egypt, Lucas and Harris 1989; Bardinet 1995; Manniche 1999). Occasionally, indeed, this has been demonstrated by residue analysis (Serpico et al. 2003; McGovern 2007; Stern et al. 2008). Therefore, a very good chance to detect archaeologically (any) spice is by investigating chemically the contents of vessels in which such commodities may have been stored, transported, or used.[22]

Finally, deciphering exchanges over such immense distances will require the input of scholars dealing with an extensive geographical spectrum—far beyond our areas of expertise. We can only hope that this paper will indeed encourage such cooperation and new ways of linking the histories of the Indian Ocean and the Mediterranean.

ACKNOWLEDGMENTS

This study was supported by the European Research Council Advanced Grant no. 229418, titled: Reconstructing Ancient Israel: The Exact and Life Sciences Perspective (RAIELSP), directed by Israel Finkelstein and Steve Weiner; and by the Tel Dor Project, codirected by Ilan Sharon and Gilboa and supported by the Goldhirsh-Yellin Foundation, California. We are indebted to many scholars for fruitful discussions in their various domains of expertise: Peter Bellwood, Peter Bernhardt, Yoram Cohen, Sarah Culpepper Stroup, Dorian Q Fuller, Gershon Galil, Ian C Glover, Danel Kahn, Michael Jursa, Nadav Na'aman, Daniel T Potts, Mark S Smith, Deborah Sweeney, and Nathan Wasserman. We owe the references to ginger in Esarhaddon's text and rice in Tiryns to Sureshkumar Muthukumaran; they are part of his current PhD research at University College, London, entitled *An Ecology of Trade: Tropical Cultivars, Commensals and Fauna between the Mediterranean, the Near East and South Asia in the 1st Millennium BC*. Stefan Münger kindly allowed us to sample vessels from Kinneret, Amihai Mazar from his excavation at Tell Qasile, and all the sampling was sanctioned by the Israel Antiquities Authority. Finally, we thank the reviewers of this paper for their comments.

22. Recent residue analysis of cultic receptacles of the Middle Bronze II in Israel also identified botanical substances that originated in South Asia, suggesting that such trade may be of even greater antiquity; see preliminarily Zuckerman et al. (2014).

REFERENCES

Albertz R. 2011. The late exilic book of Exodus (Exodus 1–34*): a contribution to the Pentateuchal discussion. In: Dozeman TB, Schmid K, Schwartz BJ, editors. *The Pentateuch. International Perspectives on Current Research*. Forschungen zum Alten Testament 78. Tubingen: Mohr Siebeck. p 243–56.

Altenmüller H, Moussa AM. 1991. Die inschrift Amenemhets II aus dem Ptah-tempel von Memphis, ein vorbericht. *Studien zur Altägyptischen Kultur* 18:1–48.

Amar Z. 2002. *The Book of Incense*. Tel Aviv: Eretz. In Hebrew.

Amigues S. 1996. Un cinnamome fantomatique. *Topoi* 6:657–64.

Amigues S. 2005. Végétaux et aromates de l'Orient dans le monde antique. *Topoi* 15:75–125.

Arie E. 2006. The Iron Age I pottery: Levels K-5 and K-4 and an intra-spatial analysis of the pottery from Stratum VIA. In: Finkelstein I, Ussishkin D, Halpern B, editors. *Megiddo IV: The 1998–2002 Seasons*. Monograph Series of the Institute of Archaeology, Tel Aviv University 24. Tel Aviv: Emery and Claire-Yass Publications in Archaeology. p 191–298.

Arie E. 2013. The Late Bronze III and Iron I pottery: Levels K-6, M-6, M-5, M-4 and H-9. In: Finkelstein I, Ussishkin D, Cline EH, editors. *Megiddo V: The 2004–2008 Seasons*. Monograph Series of the Institute of Archaeology, Tel Aviv University. Tel Aviv: Emery and Claire-Yass Publications in Archaeology. p 475–667.

Artzy M. 1994. Incense, camels and collared rim jars: desert trade routes and maritime outlets in the second millennium. *Oxford Journal of Archaeology* 13(2):121–47.

Artzy M. 2006. *The Jatt Metal 'Hoard' in Northern Canaanite/Phoenician and Cypriot Context*. Cuadernos de Arqueología Mediterránea 10. Barcelona: Universidad Pompeu Fabra.

Astour MC. 1995. Overland trade routes in ancient western Asia. In: Sasson JM, editor. *Civilizations of the Ancient Near East III*. New York: Simon & Schuster. p 1401–20.

Baden JS. 2012. *The Composition of the Pentateuch*. New Haven: Yale University Press.

Bardinet T. 1995. *Les Papyrus médicaux de l'Egypt Pharaonique*. Paris: Fayard.

Barnard H, Dooley AN, Areshian G, Gasparyan B, Faull KF. 2011. Chemical evidence for wine production around 4000 BCE in the late Chalcolithic Near Eastern highlands. *Journal of Archaeological Science* 38(5):977–84.

Barnstone W. 2010. *Ancient Greek Lyrics*. Chicago: University of Chicago Press.

Beaujard P. 2011. Evolutions and temporal delimitations of Bronze Age world-systems in western Asia and the Mediterranean. In: Wilikinson T, Sherratt S, Bennet J, editors. *Interweaving Worlds: Systemic Interactions in Eurasia, 7th to the 1st Millennia BC*. Oxford: Oxbow. p 7–27.

Beaux N. 1990. *Le cabinet de curiosités des Thoutmosis III. Plantes et animeaux*. Leuven: Peeters.

Bell C. 2006. *The Evolution of Long Distance Trading Relationships across the LBA/Iron Age Transition on the Northern Levantine Coast: Crisis, Continuity and Change*. British Archaeological Reports International Series 1574. Oxford: Archaeopress.

Bellina B, Glover I. 2004. The archaeology of early contact with India and the Mediterranean world, from the fourth century BC to the fourth century AD. In: Glover I, Bellwood P, editors. *Southeast Asia: From Prehistory to History*: London: Routledge. p 68–88.

Ben Dor Evian S. 2011. Egypt and the Levant in the Iron Age I–IIA: the ceramic evidence. *Tel Aviv* 38:94–119.

Ben Tor A, Zarzecky-Peleg A, Cohen-Anidjar S. 2005. *Yoqne'am II: The Iron Age and the Persian Period*. Qedem Reports 6. Jerusalem: Israel Exploration Society and Hebrew University.

Bentley R, Trimen H. 1880. *Medicinal Plants; Being Descriptions with Original Figures of the Principal Plants Employed in Medicine and an Account of the Characters, Properties, and Uses of Their Parts and Products of Medicinal Value*. London: Churchill.

Bikai P. 1987. *The Phoenician Pottery of Cyprus*. Nicosia: Leventis Foundation.

Blenkinsopp J. 1996. An assessment of the alleged pre-exilic date of the Priestly material in the Pentateuch. *Zeitschrift für die Alttestamentliche Wissenschaft* 108: 495–518.

Boivin N, Fuller DQ. 2009. Shell middens, ships and seeds: exploring coastal subsistence, maritime trade and the dispersal of domesticates in and around the ancient Arabian peninsula. *Journal of World Prehistory* 22(2):113–80.

Boivin N, Blench R, Fuller DQ. 2009. Archaeological, linguistic and historical sources on ancient seafaring: a multidisciplinary approach to the study of early maritime contact and exchange in the Arabian peninsula. In: Petraglia MD, Rose JI, editors. *The Evolution of Human Populations in Arabia (Vertebrate Paleobiology and Paleoanthropology)*. Dodrecht: Springer. p 251–78.

Bottéro J. 1957. Gewürze. In: Ebeling E, Meissner B, editors. *Reallexikon der Assyriologie* 3. Berlin: W. de Gruyter. p 340–3.

Breasted JH. 2001. *Ancient Records of Egypt*. Urbana: University of Illinois Press.

Briend J, Humbert JB. 1980. *Tell Keisan (1971–1976) — une cité phénicienne en Galilée*. Paris: Éditions Universitaires.

Broodbank C. 2013. *The Making of the Middle Sea*. Oxford: University Press.

Brown JP. 1995. *Israel and Hellas* I. New York: W. de Gruyter.

Buccellati G, Kelly-Buccellati M. 1983. Terqa: the first eight seasons. *Les Annales Archéologiques Arabes Syriennes* 33:47–67.

Burstein SM. 2002. Kush, Axum and the ancient Indian Ocean trade. In: Bács TA, editor. *A Tribute to Excellence: Studies Offered in Honor of Ernö Gaál, Ulrich Luft, and Lásló Török*. Studia Aegyptiaca XVII. p 127–37.

Caminos AR. 1954. *Late Egyptian Miscellanies*. London: Oxford University Press.

Carson A. 2002. *If Not, Winter: Fragments of Sappho*. New York: Vintage Books.

Casevitz M. 1995. L'Inde de poètes grecs, d'Eschyle à Nonnos. In: Carrière JC, Geny E, Matoux MM, Paul-Lèvy F, editors. *Inde, Grèce ancienne: regards croisés en anthropologie de l'espace*. Paris: Annales littéraires de l'Université de Besançon. p 9–19.

Casson L. 1984. Cinnamon and cassia in the ancient world. In: *Ancient Trade and Society*. Detroit: Wayne State University Press. p 224–46.

Chakrabarti DK. 1998. The Indus civilization and the Arabian Gulf: an Indian point of view. In: Phillips CS, Potts DT, Searight S, editors. *Arabia and Its Neighbors: Essays on Prehistorical and Historical Developments Presented in Honor of Beatrice de Cardi*. Brussels: Brepols. p 303–14.

Christian D. 2000. Silk roads or steppe roads? The silk roads in world history. *Journal of World History* 11(1):1–26.

Clark GS. 1991. Cinnamic aldehyde. *Perfumer and Flavorist* 16:25–30.

Clifford RJ. 1999. *Proverbs: A Commentary*. Louisville: Westminster John Knox Press.

Corn C. 1998. *The Scents of Eden: A Narrative of the Spice Trade*. New York: Kodansha International.

Crone P. 2004. *Meccan Trade and the Rise of Islam*. Piscataway: Gorgias Press.

Darby JW, Ghalioungui P, Grivetti L. 1976. *Food: The Gift of Osiris*. London: Academic Press.

De Romanis F. 1996. *Cassia, cinnamomo, ossidiana: uomini e merci tra oceano indiano e Mediterraneo*. Rome: "L'Erma" di Bretschneider.

De Silva CR. 1996. The Portuguese impact on the production and trade in Sri Lanka cinnamon in Asia in the sixteenth and seventeenth centuries. In: Pearson MN, editor. *Spices in the Indian Ocean World*. Aldershot: Variorum. p 245–58.

DeBolt S, Cook DR, Ford CM. 2006. L-tartaric acid synthesis from vitamin C in higher plants. *Proceedings of the National Academy of Science of the USA* 103(14):5608–13.

Dihle A. 1990. Arabien und Indien. In: *Hérodote et les peuples non Grecs. Neuf exposés suivis de discussions*. Entretiens sur l'Antiquité classique XXV. Geneva: Fondation Hardt. p 41–67.

Dothan M, Ben-Shlomo D. 2005. *Ashdod VI: The Excavations of Areas H and K (1968–1969)*. Report 24. Jerusalem: Israel Antiquities Authority.

Dothan M, Porath Y. 1993. *Ashdod V: Excavations of Area G. The Fourth-Sixth Seasons of Excavations 1968–1970*. *'Atiqot* 23. Jerusalem: Israel Antiquities Authority.

Dothan T. 2003. The Aegean and the Orient: cultic interactions. In: Dever WG, Gitin S, editors. *Symbiosis, Symbolism and the Power of the Past: Canaan, Israel and Their Neighbors from the Late Bronze Age through Roman Palestine*. Winona Lake: Eisenbrauns. p 189–213.

Dugo G, Di Giacomo A. 2002. *Citrus. The Genus Citrus*. London: Taylor & Francis.

Edens C, Wilkinson TJ, Barratt G. 2000. Hammat al-Qa and the roots of urbanism in southwestern Arabia. *Antiquity* 74(286):854–62.

Erman A, Grapow H. 1971. *Wörterbuch der Ägyptischen Sprache* V. 4th edition. Berlin: Akademie-Verlag.

Faulkner RO. 1991. *A Concise Dictionary of Middle Egyptian*. Oxford: Griffith Institute.

Finkelstein I. 1988. Arabian trade and socio-political conditions in the Negev in the twelfth-eleventh centuries B.C.E. *Journal of Near Eastern Studies* 47(4):241–52.

Fuller DQ, Boivin N, Hoogervorst T, Allaby R. 2011. Across the Indian Ocean: the prehistoric movement of plants and animals. *Antiquity* 85(328):544–58.

Gadot Y, Finkelstein I, Iserlis M, Maeir AM, Nahshoni P, Namdar D. 2014. Tracking down cult: production, function and content of chalices in Iron Age Philistia. *Tel Aviv* 41:54–75.

Gilboa A. 1999a. The dynamics of Phoenician Bichrome pottery: a view from Tel Dor. *Bulletin of the American Schools of Oriental Research* 316:1–22.

Gilboa A. 1999b. The view from the east: Tel Dor and the earliest Cypro-Geometric exports to the Levant. In: Iacovou M, Michaelides D, editors. *Cyprus: The Historicity of the Geometric Horizon*. Nicosia: University of Cyprus. p 119–39.

Gilboa A. 2005. Sea Peoples and Phoenicians along the southern Phoenician coast—a reconciliation: an interpretation of Šikila (SKL) material culture. *Bulletin of the American Schools of Oriental Research* 337:47–78.

Gilboa A. 2012. Cypriot barrel juglets at Khirbet Qeiyafa and in the Levant: cultural aspects and chronological implications. *Tel Aviv* 39:5–21.

Gilboa A, Goren Y. In press. Early Iron Age Phoenician networks: an optical mineralogy study of Phoenician Bichrome and related wares in Cyprus. *Ancient West and East*.

Gilboa A, Sharon I. 2003. An archaeological contribution to the early Iron Age chronological debate: alternative chronologies for Phoenicia and their effects on the Levant, Cyprus and Greece. *Bulletin of the American Schools of Oriental Research* 332:7–80.

Gilboa A, Sharon I. 2008. Between the Carmel and the Sea: Dor's Iron Age reconsidered. *Near Eastern Archaeology* 71(3):146–70.

Gilboa A, Sharon I, Boaretto E. 2008. Tel Dor and the chronology of Phoenician "pre-colonization" stages. In: Sagona C, editor. *Beyond the Homeland: Markers in Phoenician Chronology*. Monograph Series of Ancient Near Eastern Studies. Louvain: Peeters. p 113–204.

Gilboa A, Sharon I, Zorn JR. 2014. An Iron Age I Canaanite/Phoenician courtyard house at Tel Dor: a comparative architectural and functional analysis. *Bulletin of the American Schools of Oriental Research* 372:39–80.

Gills B, Gundar Frank A. 1993. The cumulation of accumulation. In: Gunder Frank A, Gills B, editors. *The World System: Five Hundred Years or Five Thousand?* London: Routledge. p 81–114.

Goldingay J. 2006–2008. *Psalms I–III*. Grand Rapids: Baker Academic.

Goyon JC. 1996. Remarques sur l'ouvrage de F. de Romanis Cassia, cinnamomo, ossidiana. *Topoi* 6:651–65.

Grandet P. 1994. *Le Papyrus Harris I (BM 9999)*. Cairo: Institut francais d'archéologie orientale.

Guasche-Jané MR, Ibern-Gomez M, Andrés-Lacueva C, Jáuregui O, Lamuela-Raventós RM. 2004. Liquid chromatography with mass spectrometry in tandem mode applied for the identification of wine markers in residues from ancient Egyptian vessels. *Analytical Chemistry* 76(6):1672–7.

Guasche-Jané MR, Andrés-Lacueva C, Jáuregui O, Lamuela-Raventós RM. 2006. First evidence of white wine in ancient Egypt from Tutankhamun's tomb. *Journal of Archaeological Science* 33(8):1075–80.

Gupta S. 2004. Monsoon environment and the Indian Ocean interaction sphere in antiquity. In: Yasuda Y, Shinde V, editors. *Monsoon and Civilization*. Kyoto: International Research Center for Japanese Studies. p 133–60.

Gupta S. 2005. The Bay of Bengal interaction sphere (1000 BC–AD 500). *Bulletin of the Indo-Pacific Prehistory Association* 25:21–30.

Hausleiter A. 2011. Ancient Tayma': an oasis at the interface between cultures. New research at a key location on the caravan road. In: Franke U, Gierlichs J, editors. *Roads of Arabia: The Archaeological Treasures from Saudi Arabia*. Tübingen: Wasmuth Verlag. p 102–20.

Herrmann A. 1937. Nysa. In: *Paulys Real-Encyclopaedie der klassischen Altertumswissenschaft*. Series I, Volume 17. Stuttgart: Alfred Druckenmüller Verlag. p 1628–9.

Herzog Z, Singer-Avitz L. 2006. Sub-dividing the Iron Age IIA in northern Israel: a suggested solution to the chronological debate. *Tel Aviv* 33(2):163–95.

Herzog Z, Singer-Avitz L. 2011. Iron Age IIA occupational phases in the coastal plain of Israel. In: Finkelstein I, Na'aman N, editors. *The Fire Signals of Lachish. Studies in the Archaeology and History of Israel in the Late Bronze Age, Iron Age, and Persian Period in Honor of David Ussishkin*. Winona Lake: Eisenbrauns. p 159–74.

Hjelmqvist H. 1979. Some economics plants and weeds from the Bronze Age of Cyprus. In: Öbrink U, editor. Hala Sultan Tekke 5. *Studies in Mediterranean Archaeology* XLV:5. Göteborg: Paul Åströms Förlag. p 110–33.

Horton MC. 1997. Mare nostrum—a new archaeology in the Indian Ocean? *Antiquity* 71(273):753–55.

Houtman C. 1993. *Exodus*. Kampen: Kok Publishing.

Hoyland RG. 2001. *Arabia and the Arabs: From the Bronze Age to the Coming of Islam*. London: Routledge.

Hunt G. 1978. Excavations in area 8 in 1974 and 1975. In: Hult G, McCaslin D. *Hala Sultan Tekke* 4. Studies in Mediterranean Archaeology XLV:4. Göteborg: Paul Åströms Förlag. p 16–94.

Hurowitz A. 2012. *Proverbs: Introduction and Commentary*. Tel Aviv: Am Oved. In Hebrew.

Hurvitz A. 1974. The date of the prose-tale of Job linguistically reconsidered. *Harvard Theological Review* 67(1):17–34.

Hurvitz A. 1982. *A Linguistic Study of the Relationship between the Priestly Source and the Book of Ezekiel: A New Approach to an Old Problem*. Paris: J. Gabalda.

Isaksson S, Karlsson C, Eriksson T. 2010. Ergosterol (5,7,22-ergostatrien-3β-ol) as a potential biomarker for alcohol fermentation in lipid residues from prehistoric pottery. *Journal of Archaeological Science* 37(12):3263–8.

Jacob R. 2011. *Kosmetik im antiken Palästina*. Alter Orient und Altes Testament 389. Münster: Ugarit-Verlag.

Janssen JJ. 1966. A twentieth-dynasty account papyrus (pap. Turin no. cat. 1907/8). *Journal of Egyptian Archaeology* 52:81–94.

Jasmin M. 2005. Les conditions d'émergence de la route de l'encens à la fin du IIème millénaire avant notre ère. *Syria* 82:49–62.

Jasmin M. 2006. The emergence and first development of the Arabian trade across the Wadi Arabah. In: Bienkowski P, Galor K, editors. *Crossing the Rift. Resources, Routes, Settlement Patterns and Interaction in the Wadi Arabah*. Levant Supplementary Series 3. Oxford: Oxbow. p 143–50.

Jursa M. 1997. Aromatika. *Nouvelles assyriologiques brèves et utilitaires* 34.

Jursa M. 2009. Die Kralle des meeres und andere aromata. In: Arnold W, Jursa M, Müller WW, Procházka S, editors. *Philologisches und Historisches zwischen Anatolien und Sokotra*. Analecta Semitica in Memoriam Alexander Sima. Wiesbaden: Harrassowitz. p 147–80.

Karageorghis V, Iacovou M. 1990. *Amathus tomb 521: A Cypro-Geometric I group*. Report of the Department of Antiquities of Cyprus. Nicosia. p 75–100.

Kaufmann Y. 1972. *The Religion of Israel: From Its Beginnings to the Babylonia Exile*. Translated and abridged by Moshe Greenberg. New York: Schocken Books.

Keay J. 2006. *The Spice Route: A History*. Berkeley: University of California Press.

Keel O. 1994. *The Song of Songs: A Continental Commentary*. Translated by FJ Gaiser. Minneapolis: Fortress Press.

Kim Dao N. 2004. Chapter 6: Chinese cassia. In: Ravindran PN, Babu KN, Shylaja M, editors. *Cinnamon and Cassia: The Genus Cinnamomum*. Boca Raton: CRC Press. p 156–84.

Kiple KF, Ornelas KC. 2000. *The Cambridge World History of Food*. Cambridge: Cambridge University Press.

Kitchen KA. 1997. Sheba and Arabia. In: Handy LK, editor. *The Age of Solomon. Scholarship at the Turn of the Millennium*. Studies in the History and Culture of the Ancient Near East 11. Leiden: Brill. p 127–53.

Kitchen KA. 1999. Further thoughts on Punt and its neighbours. In: Leahy A, Tait J, editors. *Studies on Ancient Egypt in Honour of H.S. Smith*. London: Egypt Exploration Society. p 173–8.

Knapp AB. 1991. Spice, drugs, grain and grog: organic goods in Bronze Age east Mediterranean trade. In: Gale NH, editor. *Bronze Age Trade in the Mediterranean*. Studies in Mediterranean Archaeology 90. Jonsered: Åström. p 21–68.

Knauf EA, Lemaire A, Lipinski E, van der Steen E, Thareani Y, Valdez A, van der Veen P. 2010. Arabian trade in the Iron Age. In: Augusto J, Davies P, Valdez A, editors. *From Antiquity to the Present. The 2008 European Association of Biblical Studies Lisbon Meeting*. Porto: Centro de História da Universidade de Lisboa. p 39–54.

Kraus HJ. 1993. *Psalms 1–59: A Continental Commentary*. Minneapolis: Fortress Press.

Kroll H. 1982. Kulturpflanzen von Tiryns. *Archäologischer Anzeiger* 97:467–85.

Kučan D. 1995. Zur Ernährung und dem Gebrauch von Pflanzen im Heraion von Samos im 7. Jahrhundert v.Chr. *Jahrbuch des Deutschen Archäologischen Instituts* 110:1–64.

Kuzmina EE. 2008. *The Prehistory of the Silk Road*. Philadelphia: University of Pennsylvania Press.

Langgut D, Gadot Y, Porat N, Lipschits O. 2013. Fossil pollen reveals the secrets of the Royal Persian Garden at Ramat Rahel, Jerusalem. *Palynology* 37(1):115–29.

Lichtenberg RJ, Thuilliez AC. 1981. Sur quelques aspects insolites de la radiologie de Ramsès II. *Bulletins et Mémoires de la Société d'anthropologie de Paris*. XIII° Série, tome 8 fascicule. p 323–30.

Liverani M. 1991. The trade network of Tyre according to Ezek. 27. In: Cogan M, Ephal I, editors. *Ah, Assyria: Studies in Assyrian History and Ancient Near Eastern Historiography Presented to Hayim Tadmor*. Jerusalem: Magnes Press. p 65–79.

Liverani M. 1992. Early caravan trade between South Arabia and Mesopotamia. *Yemen* 1:111–5.

Liverani M. 2001. *International Relations in the Ancient Near East 1600–1100 B.C*. Basingstoke: Palgrave Macmillan.

Liverani M. 2003. The influence of political institutions on trade in the Ancient Near East (Late Bronze to Early Iron Age). In: Zaccagnini C, editor. *Mercanti e politica nel Mondo Antico*. Rome: "L'Erma" di Bretschneider. p 119–38.

Lucas A, Harris JR. 1989. *Ancient Egyptian Materials and Industries*: London: Histories & Mysteries of Man.

Magee P. 2004. The impact of southeast Arabian intra-regional trade on settlement location and organization during the Iron Age II period. *Arabian Archaeology and Epigraphy* 15:24–42.

Magee P, Carter R. 1999. Agglomeration and regionalism: southeastern Arabia between 1400 and 1100 BC. *Arabian Archaeology and Epigraphy* 10:161–79.

Manniche L. 1999. *Sacred Luxuries: Fragrance, Aromatherapy, and Cosmetics in Ancient Egypt*. New York: Cornell University Press.

Marcus ES. 2007. Amenemhet II and the sea: maritime aspects of the Mit Rahina (Memphis) inscription. *Egypt and the Levant* XVII:138–90.

Mazar A. 1985. *Excavations at Tell Qasile Part 2: The Philistine Sanctuary: Various Finds, The Pottery, Conclusions, Appendixes*. Qedem 20. Jerusalem: Hebrew University.

Mazar A. 2011. The Iron Age chronology debate: is the gap narrowing? Another viewpoint. *Near Eastern Archaeology* 74(2):105–11.

Mazow LB. 2005. Competing material culture: Philistine settlement at Tel Miqne-Ekron in the Early Iron Age [PhD dissertation]. Tucson: University of Arizona.

McGovern PE. 2007. *Ancient Wine: The Search for the Origins of Viniculture*. Princeton: Princeton University Press.

McGovern PE. 2009. *Uncorking the Past: The Quest for Wine, Beer and Other Alcoholic Beverages*. Berkeley: University of California Press.

McPherson K. 2004. The Indian Ocean. In: Furber H, Arasaratnam S, McPherson K. *Maritime India*. New Delhi: Oxford University Press. p 295–327.

Meeks D. 2002. Coptos et les chemins de Pount. *Topoi Supplement* 3:267–331.

Merrillees RS. 1962. Opium trade in the Bronze Age Levant. *Antiquity* 36(144):287–92.

Michel RH, McGovern PE, Badler VR. 1993. The first wine and beer. Chemical detection of ancient fermented beverages. *Analytical Chemistry* 65(8):408–13.

Miller JI. 1969. *The Spice Trade of the Roman Empire*. Oxford: Clarendon Press.

Moldenke HN, Moldenke AL. 1952. *Plants of the Bible*. Waltham: Chronica Botanica.

Muthukumaran S. 2014. Between archaeology and text: the origins of rice consumption and cultivation in the Middle East and the Mediterranean. *Papers from the Institute of Archaeology* 24(1): 14: 1–7.

Nahshoni P. 2009. Nahal Patish: preliminary report. excavations and surveys in Israel [Internet] [cited 1 April 2014]; 121. http://www.hadashot-esi.org.il/report_detail_eng.asp?id=1272&mag_id=115.

Namdar D, Neumann R, Weiner S. 2010. Residue analysis of chalices from the repository pit. In: Kletter R, Ziffer I, Zwickel W, editors. *Yavneh I - The Excavation of the 'Temple Hill' Repository Pit and the Cult Stands*. Fribourg: Orbis Biblicus et Orientalis Series Archaeologica 30. p 167–73.

Namdar D, Gilboa A, Neumann R, Finkelstein I, Weiner S. 2013. Cinnamaldehyde in early Iron Age Phoenician flasks raises the possibility of Levantine trade with Southeast Asia. *Mediterranean Archaeology and Archaeometry* 13(2):1–19.

Naville E, Hall HR, Currelly CT. 1913. *The XIth dynasty Temple at Deir al-Bahari, Part III*. London: Egypt Exploration Fund.

Nijboer AJ. 2008. A Phoenician family tomb, Lefkandi, Huelva and the tenth century BC in the Mediterranean. In: Sagona C, editor. *Beyond the Homeland: Markers in Phoenician Chronology*. Monograph Series of Ancient Near Eastern Studies. Louvain: Peeters. p 365–77.

Nissinen M, Münger S. 2009. Down the river…: a shrine model from Tel Kinrot in its context. In: Kaptijn E, Petit LP, editors. *A Timeless Vale. Archaeological and Related Essays on the Jordan Valley in Honour of Gerrit van der Kooij on the Occasion of his Sixty-fifth Birthday*. Archaeological Studies Leiden University 19. Leiden: Leiden University Press. p 129–44.

Nunn JF. 1996. *Ancient Egyptian Medicine*. Norman: University of Oklahoma Press.

Olck F. 1899. Cassia. In: *Paulys Real-Encyclopaedie der klassischen Altertumswissenschaft*. Series 1, Volume 6. Stuttgart: Alfred Druckenmüller Verlag. p 1638–51.

Panchenko DV. 1998. 'Scylax' circumnavigation of India and its interpretation in early Greek geography, ethnography and cosmography, I. *Hyperboreus* 4(2):211–42.

Panchenko DV. 2003. 'Scylax' circumnavigation of India and its interpretation in early Greek geography, ethnography and cosmography, II. *Hyperboreus* 9(2):274–94.

Panitz-Cohen N, Mazar A. 2006. *Timnah (Tel Batash) III: Finds from the Second Millennium BCE*. Qedem 45. Jerusalem: Hebrew University.

Pagnoux C, Celant A, Coubray S, Fiorentino G, Zech-Matterne V. 2013. The introduction of *Citrus* to Italy, with reference to the identification problems of seed remains. *Vegetation History and Archaeobotany* 22:421–38.

Parpola S, Watanabe K. 1988. *Neo-Assyrian Treaties and Loyalty Oaths*. State Archives of Assyria 2. Helsinki: Helsinki University Press.

Pearson MN. 1996. Introduction. In: *Spices in the Indian Ocean World*. Aldershot: Variorum. p xv–xxxvii.

Pearson MN. 2003. *The Indian Ocean*. London: Routledge.

Plu A. 1985. Bois et graines. In: Balout L, Roubet C, editors. *La Momie de Ramsès II: Contribution Scientifique à l'Égyptologie Paris*. Editions Recherches sur les Civilisations. p 166–74.

Potts DT. 1993. Rethinking some aspects of trade in the Arabian Gulf. *World Archaeology* 24(3):423–40.

Potts DT. 1995. Distant shores: ancient Near Eastern trade with south Asia and northeast Africa In: Sasson JM, editor. *Civilizations of the Ancient Near East* III. New York: Scribner. p 1451–63.

Potts DT. 1997. *Mesopotamian Civilization, The Material Foundations*. London: Athlone Press.

Purseglove JS, Brown EG, Green CL, Robbins SRJ. 1981. *Spices, Volume 2*. Longman Tropical Agriculture Series. New York: Longman.

Raban-Gerstel N, Bar-Oz G, Zohar I, Sharon I, Gilboa A. 2008. Early Iron Age Dor (Israel): a faunal perspective. *Bulletin of the American Schools of Oriental Research* 349:25–59.

Ravindran PN, Nirmal-Babu K. 2004. Chapter 1: Introduction. In: Ravindran PN, Nirmal-Babu K, Shylaja M, editors. *Cinnamon and Cassia: The Genus Cinnamomum*. Boca Raton: CRC Press. p 1–13.

Ravindran PN, Nirmal Babu K, Shylaja M. 2004. *Cinnamon and Cassia: The Genus Cinnamomum*. Boca Raton: CRC Press.

Ray HP. 2003. *The Archaeology of Seafaring in Ancient South Asia*. Cambridge: Cambridge University Press.

Reade J. 1996. Evolution in Indian Ocean studies. In: Reade J, editor. *The Indian Ocean in Antiquity*. London: Kegan Paul International and the British Museum. p 13–20.

Sallares R. 1991. *The Ecology of the Ancient Greek World*. Ithaca: Cornell University Press.

Salles JF. 1993. Dossier Inde, Arabie et Méditerranée orientale. *Topoi* 3:389–623.

Salles JF. 1996. Achaemenid and Hellenistic trade in the Indian Ocean. In: Reade J, editor. *The Indian Ocean in Antiquity*. London: Kegan Paul International and the British Museum. p 251–68.

Schmid K. 1999. *Erzväter und Exodus: Untersuchungen zur doppelten Begründung der Ursprünge Israels innerhalb der Geschichtsbücher des Alten Testaments*. Neukirchen-Vluyn: Neukirchener Verlag.

Senanayake UM, Wijeskera ROB. 2004. Chapter 3: Chemistry of Cinnamon and Cassia. In: Ravindran PN, Babu KN, Shylaja M, editors. *Cinnamon and Cassia: The Genus Cinnamomum*. Boca Raton: CRC Press. p 80–120.

Serpico M, Bourriau J, Smith L, Goren Y, Stern B, Heron C. 2003. Commodities and containers: a project to study Canaanite amphorae imported into Egypt during the New Kingdom. In: Bietak M, editor. *The Synchronisation of Civilizations in the Eastern Mediterranean in the Second Millennium BC II. Proceedings of the SCIEM2000 Euro-Conference, Haindorf, May 2001*. Vienna: Austrian Academy of Sciences. p 365–75.

Sherratt A. 2006. The Trans-Eurasian exchange: the prehistory of Chinese relations with the west. In: Mair VH, editor. *Contact and Exchange in the Ancient World*. Honolulu: Hawaii University Press. p 30–61.

Sherratt A, Sherratt S. 1991. From luxuries to commodities: the nature of Mediterranean Bronze Age trading systems. In: Gale NH, editor. *Bronze Age Trade in the Mediterranean*. Studies in Mediterranean Archaeology 90. Jonsered: Åström. p 351–86.

Sherratt A, Sherratt S. 1993. The growth of the Mediterranean economy in the early first millennium BC. *World Archaeology* 24:361–78.

Sidebotham SE. 2011. *Berenike and the Ancient Maritime Spice Route*. Berkeley: University of California Press.

Sima A. 2000. *Tiere, Pflanzen, Steine und Metalle in den altsudarabischen Inschriften*. Wiesbaden: Harrassowitz.

Stern B, Heron C, Tellefsen T, Serpico M. 2008. New investigations into the Uluburun resin cargo. *Journal of Archaeological Science* 35:2188–203.

Stern E. 2000. *Dor: Ruler of the Seas*. Jerusalem: Israel Exploration Society.

Stoop-van Paridon PWTh. 2005. *The Song of Songs: A Philological Analysis of the Hebrew Book*. Louvain: Peeters.

Thapar R. 1997. Early Mediterranean contacts with India: an overview. In: De Romanis F, Tchernia A, editors. *Crossings: Early Mediterranean Contacts with India*. New Delhi: MANOHAR. p 11–40.

Thompson C, Skaggs S. 2013. King Solomon's silver? Southern Phoenician hacksilber hoards and the location of Tarshish. *Internet Archaeology* 35. doi:10.11141/ia.35.6.

Tomaino A, Cimino F, Zimbalatti V, Venuti V, Sulfaro V, De Pasquale A, Saija A. 2005. Influence of heating on antioxidant activity and the chemical composition of some spice essential oils. *Food Chemistry* 89(4):549–54.

Tomber R. 2008. *Indo-Roman Trade: From Pots to Pepper*. London: Duckworth.

Toussaint-Samat M. 2009. *A History of Food*. Chichester: Wiley-Blackwell.

Van Alfen PG. 2002. Pant'agatha: commodities in Levantine-Aegean trade during the Persian period, 6th–4th c. B.C. [PhD dissertation]. Austin: University of Texas.

Waiman-Barak P, Gilboa A, Goren Y. 2014a. A stratified sequence of Early Iron Age Egyptian ceramics at Tel Dor, Israel. *Egypt and the Levant* 24:317–41.

Waiman-Barak P, Gilboa A, Goren Y. 2014b. Phoenician flasks from selected early Iron Sites in Israel—a petro-fabric perspective. Paper presented at the Levantine Ceramic Project 2014 Mini-Workshop 1. AIAR, Albright Institute of Archaeological Research. Jerusalem, 10 March 2014.

Webber HJ, Reuther W, Lawton HW. 1967. History and development of the citrus industry. In: Reuther W, Webber HJ, Batchelor LD, editors. *The Citrus Industry Volume 1*. Berkeley: University of California. p 1–39.

Weinstein B. 2000. Biblical evidence of spice trade between India and the land of Israel: a historical analysis. *Indian Historical Review* 27:12–28.

Whetten R, Sederoff R. 1995. Lignin biosynthesis. *American Society of Plant Physiologists* 7:1001–13.

Wilson GH. 2007. *Job*. Peabody: Hendrickson.

Zadok R. 1997. On aromatics and reeds. *Nouvelles assyriologiques brèves et utilitaires* 55.

Zohary D, Hopf M, Weiss E. 2012. *Domestication of Plants in the Old World*. Oxford: Oxford University Press.

Zohary M. 1982. *Plants of the Bible*. Cambridge: Cambridge University Press.

Zuckerman S, Namdar, D, Cohen-Weinberger A. 2014. Residues of cult in the Middle Bronze Age ritual precinct of Nahariya, northern Israel. Paper presented at the ASOR Annual Meeting, San Diego, November 2014.

Zumbroich TJ. 2007–2008. The origin and diffusion of betel chewing: a synthesis of evidence from South Asia, Southeast Asia and beyond. *eJournal of Indian Medicine* 1(3):87–140.