Hadashot Arkeologiyot—
Excavations ans Surveys in Israel 125

Tel ʻAmal: Loomweights

Orit Shamir

The Loomweights

In two series of excavations undertaken at Tel ʻAmal (Levy and Edelstein 1972; Feig 2013) a total of 171 loomweights were found.[1] Except for one doughnut-shaped loomweight made of unfired clay, all are piriform with a slightly flattened base (Fig. 1; Feig 2013: Fig. 21:5–7). Of these, 169 are made of gypsum, and one is made of basalt.

Table 1 presents the weight and dimensions of 160 of the Tel ʻAmal loomweights; the remaining 11 loomweights, all from L16 (Levy and Edelstein 1972), were in too poor a state of preservation to be measured. The measurements

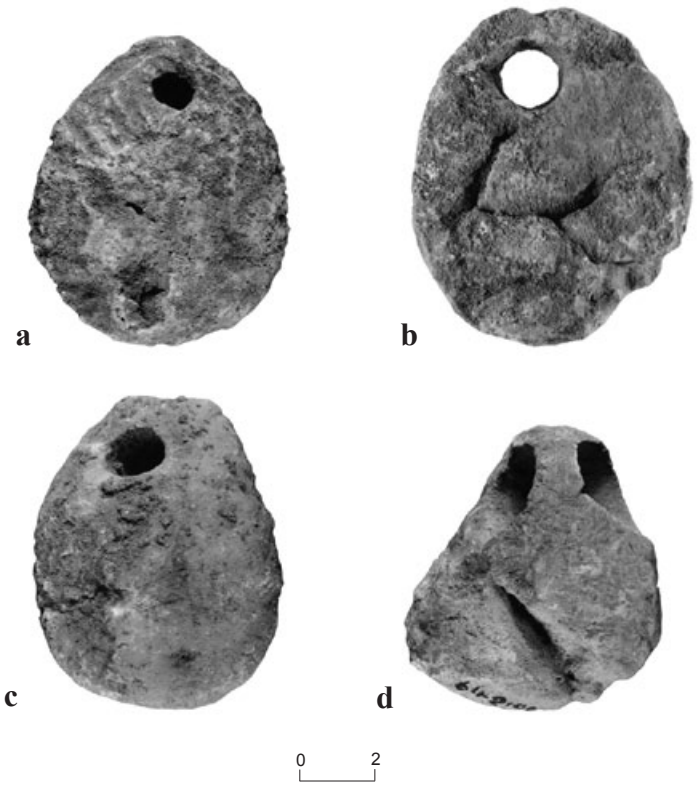

Fig. 1. Gypsum loomweights (Cat. Nos.): (a) 17; (b) 28; (c) 105; (d) 107.

Table 1. Loomweights from Tel ‘Amal

No.	Locus	Basket	Registration No.	Weight (g)	Height (cm)	Diam. 1 (cm)	Diam. 2 (cm)	Perforation			Comments
								Diam. 1 (cm)	Diam. 2 (cm)	Type	
1*			1964-2055	101.4	9.0	5.2	3.2	1.1		Ch	Basalt
2*			1964-2056	340.0	9.4	6.3	5.3	1.3		P	
3*			1964-2058	388.2	9.7	8.6	4.3	1.7		P	
4*			1964-2059	390.6	9.0	7.0	5.9	1.5		Ch	
5			1964-2060	355.6	9.3	7.7	5.6	1.3		P	
6			1964-2062	518.7	9.7	8.4	5.7	1.0	1.3	P	
7*			1964-2080	167.0	10.0	6.4	2.8	1.7		P	
8			1964-2083	90.4	6.7	6.6	2.0	1.8	2.0	SC	B
9*			1964-2084	321.5	10.2	6.3	5.5	1.4		Ch	
10			1964-2130/ 1	223.0	8.4	7.6	4.2	1.4	1.7	SC	
11			1964-2130/ 2	222.6	8.1	7.0	3.8	1.7	1.9	SC	
12			1964-2130/ 3								B
13			1964-2130/ 4	289.6	9.5	8.6	3.5	1.7	2.3	SC	
14			1964-2130/ 5	231.2	8.6	7.8	4.0	1.5		P	
15			1964-2130/ 6	169.4	6.2	6.8	4.7	2.5		Ch	
16			1964-2131/ 1	403.5	10.0	9.0	4.4	1.0	1.2	SC	
17			1964-2131/ 2	235.0	8.6	7.0	3.8	1.2		P	Fig. 1:a
18			1964-2131/ 3	183.1	8.4	6.8	3.0	1.5	1.7	Ch	
19			1964-2131/ 4	182.4	8.7		3.5	1.7		P	
20			1964-2131/ 5	138.7	6.9	7.0	3.3	1.9		P	
21			1964-2131/ 6	191.5	8.3	6.2	4.4	1.9		P	
22			1964-2133	105.8	2.2	4.9	3.6	2.4		SC	
23			1964-2134/14	213.0	6.0	4.8	2.8	1.8		P	B
24*			1964-2135/ 1	328.0		6.8	3.9	1.8		P	
25*			1964-2135/ 3	198.0	8.0	6.3	4.4	1.6		P	
26*			1964-2135/ 4		8.5	7.2	5.0	1.2		P	
27*			1964-2135/ 5	301.2	8.3	7.0	5.1	1.7	1.9	SC	
28*			1964-2135/ 7	338.8	9.3	6.4	6.2	1.5	2.1	SC	
29*			1964-2135/ 8	310.3	9.5	7.3	4.1	1.2		Ch	
30*			1964-2135/11	294.3	10.0	7.7	4.6	1.6	1.8	SC	
31			1964-2135/15					1.4		P	
32			1964-2136/ 3	301.1	8.5	7.1	6.3	1.4		P	
33			1964-2136/ 5	305.0	9.5	6.8	6.2	1.6		P	
34			1964-2136/ 6	140.7	8.8	5.7	3.5	1.5		P	
35			1964-2136/ 7	413.3	9.5	7.7	5.8	1.2		P	

Table 1. Loomweights from Tel ‘Amal

No.	Locus	Basket	Registration No.	Weight (g)	Height (cm)	Diam. 1 (cm)	Diam. 2 (cm)	Perforation			Comments
								Diam. 1 (cm)	Diam. 2 (cm)	Type	
36			1964-2136/ 8		6.6	6.5	5.4	1.4		P	
37			1964-2136/ 9	165.3							B
38			1964-2136/10	133.1	7.8	6.3	2.8	1.4	1.7	Ch	Fig. 1:b
39			1964-2136/11	249.3	7.5	6.3	4.2	1.3		SC	
40			1964-2136/12	215.4	8.5	6.6	3.8	1.5		SC	
41			1964-2136/14	308.6	9.6	6.7	5.0	1.4	1.7	SC	
42			1964-2136/15	216.3	8.5	5.8	4.7	1.2	1.4	SC	
43			1964-2137/ 2	377.0	9.2	7.4	6.1	1.7	1.9	SC	
44			1964-2137/ 3	325.4	8.0	6.7	6.6	1.8			B
45			1964-2137/ 4	277.0	8.3	7.4	5	2.5		P	
46			1964-2137/ 6	304.3	8.1					SC	
47			1964-2137/17	160.0	8.2	5.7	3.7	1.6	1.8	SC	
48*			1964-2138/ 1	306.3	9.7	7.2	5.3	1.5	1.7	Ch	
49			1964-2138/ 1	140.0	6.3	5.6	4.0	1.6		P	
50			1964-2138/ 2	263.0	7.8	6.5	5.4			Ch	B
51*			1964-2138/ 3	239.4	9.3	7.5	3.6	1.7		P	
52*			1964-2138/ 3	188.5	8.8	5.5	3.6	1.8	2.0	SC	
53*			1964-2138/ 5	313.8	9.6	6.3	5.2	1.2	1.4	SC	
54*			1964-2138/ 6	207.0	7.0	6.7	4.7	1.0	1.2	SC	
55			1964-2138/ 6	270.0	8.0	7.2	5.0			Ch	B
56*			1964-2138/ 7	252.6	9.1	5.8	4.3	1.3		Ch	
57			1964-2138/ 8	135.3	7.8	6.3	2.8	1.2	1.8	SC	
58*			1964-2138/ 9	224.8	9.1	5.2	4.2	1.4	1.8	SC	
59			1964-2138/ 9	191.3	7.5	7.5	5.5	1.5		P	
60*			1964-2138/10	256.8	9.4	6.5	4.7	1.4	1.9	SC	
61			1964-2138/12	365.3	8.9	7.5	5.7	2.0		Ch	
62			1964-2138/13	208.3	8.4	6.7	4.5				B
63			1964-2138/15	84.9	7.4	4.2	3.7	1.6		Ch	
64*			A7/1	220.3	8.0	5.7	4.5	1.1	1.6	SC	
65*			1	164.3	8.0	6.2	3.7	1.4	1.7	SC	
66*			2	298.1	8.8	8.0	4.5	1.7		Ch	
67*			3	277.7	9.0	6.7	5.2	1.0		P	
68*			4	404.0	10.8	7.7	4.5	1.1		P	
69*			5	295.3	9.3	8.3	3.4	1.5		Ch	
70*			6	294.8	9.1	7.5	4.6	0.9	1.2	SC	

Table 1. Loomweights from Tel ‘Amal

No.	Locus	Basket	Registration No.	Weight (g)	Height (cm)	Diam. 1 (cm)	Diam. 2 (cm)	Perforation			Comments
								Diam. 1 (cm)	Diam. 2 (cm)	Type	
71*			7			7.7	6.0				
72*			8	216.0	7.6	6.4	4.2	1.1		P	
73*			9	280.0	7.8	7.2	5.3	1.1		P	
74*			10	253.8	9.2	7.0	4.3	1.4		P	
75*			11	241.9	8.3	8.4	3.7	1.0	1.2	Ch	
76*			13			7.0	6.0	1.4		P	
77*			14	243.3	9.6	6.5	4.6	1.0		P	
78*			15	250.3	9.0	7.0	5.0	0.7	1.1	SC	
79*			16	275.6	8.3	7.5	4.8	1.0		P	
80*			17	184.5	8.8	7.7	3.7	1.4	1.7	SC	
81*			18	272.2	8.8	6.1	5.2	1.1	1.3	Ch	
82*			19								
83*			20								
84*			21								
85*			22					1.4	1.7	Ch	
86*			23								
87*			24								
88*			25	286.3	9.5	6.5	5.0	1.3		P	
89*			26	274.9	7.7	6.8	5.1	1.0		P	
90*			27	277.0	8.8	7.0	5.4	1.3	1.5	SC	
91*			28	170.6	7.7	6.2	3.8	0.9		P	
92*			29	221.9	8.0	7.3	4.6	1.0		P	
93*			30	256.5	8.4	6.8	4.7	1.0		Ch	
94*			31	218.0	8.3	5.2	5.0	1.3	1.6	Ch	
95*			33	282.8	8.7	6.8	4.8	1.0	1.2	Ch	
96*			35	341.8	11.0	7.0	3.6	1.2	1.4	SC	
97		172	11	143.0		5.7	4.7				
98		288	1	265.5	9.0	6.1	5.2	1.0		P	
99		288	2	207.1	8.3	6.2	4.4	1.4		P	
100		288	3	280.0	8.8	6.8	4.8	0.9		P	
101		309		241.0	7.8	6.5	4.5				B
102		336	6	396.0	9.5	7.6	5.3	1.4		P	
103		11/21		275.0	10.1	7.9	4.0	1.2		Ch	
104		45	2129/ 1	222.6	9.5	6.0	3.6	1.8		Ch	
105		45	2129/ 2	235.2	8.2	6.5	4.7	1.6	2.0	SC	Fig. 1:c

Table 1. Loomweights from Tel ‘Amal

No.	Locus	Basket	Registration No.	Weight (g)	Height (cm)	Diam. 1 (cm)	Diam. 2 (cm)	Perforation			Comments
								Diam. 1 (cm)	Diam. 2 (cm)	Type	
106		45	2129/ 3	191.1	8.3	6.0	4.0	2.0		P	
107		45	2129/ 4	155.0	7.0	6.5	4.0	2.4		P	Fig. 1:d
108		45	2129/ 5	191.6	9.0	6.0	4.2	1.7		P	
109		45	2129/ 6	84.4.0	7.1	4.2	3.0	1.5		Ch	
110**	102?	1177	107	145.2	8.0	5.4		0.8		SC	
111**	103?	1177	22A	366.4	9.3	7.0		1.1		Ch	
112*	56?	168		434.7	10.0	8.4	5.0	1.3		Ch	
113	NL		1	292.0	8.3	6.2		0.8		P	Doughnut-shaped; unfired clay
114	NL		2	150.1	7.8	6.0	3.4	1.3		P	
115	NL		3	100.0	7.8	5.4	3.5	1.0		P	
116	NL		4	168.0	9.0	6.2	3.9	1.5		P	
117	NL		5	184.3	8.1	6.0	4.1	1.1		P	
118	11	192	8	260.6	9.0	6.2	5.0	1.5		-	B
119*	13	138		235.2	7.9	5.5	5.2	1.5		P	
120	13	138	14	159.0	7.5	6.2	4.0	1.7		Ch	
121	16		1	234.0	8.5	7.0	4.8	1.4		P	
122	16		2	164.2	7.3	6.0	4.3	1.3		Ch	
123	16		3	131.0	7.5	5.4	3.8	1.8		Ch	
124	16		4	164.0	8.5	7.5		2.2		Ch	
125	16		4	243.0	10.0	6.8	5.8	1.0	1.3	SC	
126	16		5	120.0	7.0	5.0	3.8	1.6		Ch	
127	16		5	262.0	8.2	7.3	4.6	1.0		Ch	
128	16		6	208.4	7.5	6.5	4.0	1.2		P	
129	16		6	150.0	8.8	5.4		1.4		Ch	B
130	16		7	262.3	10.5	5.7	4.2	1.4		P	
131	16		7	252.1	11.1	7.0	4.5	1.2		P	
132	16		8	170.5	7.3	6.6	4.6	1.6		P	
133	16		8	231.4	9.1	7.1	4.0	1.0		P	
134	16		9	256.3	10	7.9	4.0	1.0		P	
135	16		9	212.0	9.5	7.0		1.0		SC	B
136	16		10	183.1	9.0	6.0	5.8	0.9		P	B
137	16	179	1	194.3	7.8	6.4	4.5	1.1		P	
138	16	179	2	242.0	8.1	6.0	5.8	1.1		SC	Possible grooves
139	16	179	3	182.7	7.0	6.7	4.6	1.3		SC	B

Table 1. Loomweights from Tel 'Amal

No.	Locus	Basket	Registration No.	Weight (g)	Height (cm)	Diam. 1 (cm)	Diam. 2 (cm)	Perforation			Comments
								Diam. 1 (cm)	Diam. 2 (cm)	Type	
140	16	179	4	168.0	7.5	6.7		0.9		P	
141	16	179	6	282.0	9.0	6.8	5.0	1.1		P	
142	16	179	7	292.0	8.1	6.8	5.2	1.3		P	
143	16	179	12	304.0	9.1	6.8	5.2	1.4		Ch	
144	16	179	13	270.0	8.0	6.6	5.7	1.0			B
145*	16	179	38	287.2	9.4	7.4	4.0	1.2		P	
146	21	140	3	135.1	7.8	5.5	3.7	1.4		P	
147	22	199	10	501.0	9.8	7.1	6.2	1.3		P	
148	22	209	1	260.0	7.6	6.7	5.4	1.3		P	
149	22	209	16	219.0	7.6	6.9	4.3	1.2		P	
150*	22	209	32	160.4	8.1	6.3	3.0	1.4		P	
151*	22	209	34	358.1	9.7	6.4	5.1	1.0	1.2	SC	
152*	24	209	37	244.0	8.8	6.8	3.7	1.2		Ch	
153	24	226	5	176.0	8.1	6.0	4.0	1.0		P	
154	24	226	9	260.3	8.7	6.5	5.0	1.2		Ch	
155*	24	226	12	255.0	7.0	7.0	5.0	0.8	1.1	SC	
156	24	226	19					1.0		P	
157*	24	226	36	273.0	9.3	6.1	4.4	1.1	1.3	SC	
158	25	175	15	326.9	10.2	7.0	5.3	1.5		P	
159	34	194	2	120.1	7.0	5.2	3.8	1.5	1.8	SC	
160	42	331	18	202.0	6.3	6.5	5.4	1.1		P	

B – Broken; Ch – Chamfered; P – Plain; SC – Single cone.
* In the collection of the Museum of Regional and Mediterranean Archaeology.
** Recorded finds from Nurit Fiag's excavation.

included maximum height, diameter at the widest point (Diam. 1), diameter at the narrowest point (Diam. 2), and one or two perforation diameter/s (measured with a digital caliper), depending on the type of perforation.

The 170 piriform loomweights' average diameter near the base (Diam. 1) ranges 4.2–9.0 cm, with an average of 6.2 ± 1.9 cm. Their upper diameter (Diam. 2) ranges 2.0–6.6 cm, with an average of 4.1 ± 1.6 cm. Their height ranges 6.0–11.1 cm, with one exception (2 cm) and an average of 8.5 ± 1 cm. One hundred and forty-five complete gypsum piriform loomweights were weighed. Their weight ranges 84.4–518.7 g, with an average of 242.9 ± 80.3 g; 69 of these loomweights (48%) fall between 200 and 300 g (Table 2). The one basalt piriform loomweight weighs 101.4 g (Table 1: No. 1).

Table 2. Weight Range of the Gypsum Piriform Loomweights

Weight range (g)	Number
84.4–100.0	4
105.5–198.0	42
202–298	69
301.1–396.0	24
403.5–518.7	6

These loomweights have horizontal perforations. Perforation diameters range 0.7–2.5 cm, with an average of 1.3 ± 0.5 cm. The larger the perforation, the more or the thicker the threads that could be passed through it, unless a loop was used as an intermediary device between the warp threads and the loomweights (Shamir 1994a; 1996:147). The different perforation shapes identified in the Tel ʻAmal loomweight assemblage reflect different manufacturing techniques. Following the perforation typology offered by Beck (1928), 71 of the loomweights have a plain perforation (P), which was drilled from one side of the weight at a constant diameter throughout; 40 have a single cone-like perforation (SC), in which one opening has a larger diameter than the other; and 36 have a chamfered perforation (Ch), which was perforated from opposite sides and thus is conical at both ends, although it is sometimes cylindrical in the middle. Clear proof that the loomweights were occasionally perforated from opposite sides comes from Tel Qasile (Shamir 1994b), where one of the unfired clay loomweights exhibits perforations from opposite sides that do not meet in the middle.

The doughnut-shaped loomweight is made of unfired clay, and weighs 292 g (Table 1: No. 113). This type has a diameter that is larger than its height, and has a vertical perforation.

Provenance

The loomweights found in both excavations undertaken at Tel ʻAmal are claimed to have come from the rooms and courtyards of buildings dated to the ninth and tenth centuries BCE (Fig. 2). However, the exact provenance of 116 of the 171 loomweights could not be determined as a result of recording problem. Due to this unfortunate situation, it is unclear whether the locus numbers indicated for the rest of the loomweights (as seen in Table 3) are correct. According to the excavators, many of the loomweights were found in rows near the walls. This is not surprising, since the loomweights were most likely to have been used in warp-weighted looms, which must be set leaning against a wall in order to be used (Shamir 2006).

Fig. 2. Loomweights *in situ* in L16 in the Levy and Edelstein excavation.

Table 3. Number and Weight of Loomweights According to Recorded Loci

Locus	Number	Weight range (g)	References and comments
11	1		Edelstein and Levy 1972:329, Pl. XIX
13	2		Edelstein and Levy 1972:329, Pl. XIX
16	36	120–304 218.7 ± 68.9 (for 25 measured)	Fig 1; Edelstein and Levy 1972:329, Pl. XIX; field notes refer to 43 loomweights found in L16, B191, although only 36 were examined
21	1		
22	5	160.4–501.0 299.7 ± 132.8	Edelstein and Levy 1972:330, Pls. XXIV:1; XXVIII:11
23	?		Edelstein and Levy 1972:330
24	6	176.0–299.7 251.3 ± 111.2	Edelstein and Levy 1972:330
25	1		Edelstein and Levy 1972:330
34	1		Edelstein and Levy 1972:331, Pl. XX; they mention 45 loomweights from this locus, although only one was clearly recorded
42	1		
102	1		Feig 2013; according to field notes, about ten additional broken loomweights were found at the excavations, but these were not clearly recorded
103	1		Feig 2013

Discussion

All of the loomweights found at the site are large enough to have been used in a warp-weighted loom. A loomweight's weight is an important functional parameter in operating a warp-weighted loom (Mårtensson, Nosch and Anderson Strand 2009:382). Indeed, it is the most critical parameter affecting performance. The level of tension applied to the warp threads is particularly decisive in determining the quality of the woven textile. It is directly related to the properties of the thread, to the weave pattern and to the desired result of textile form, density and strength (Papadopoulou 2012:60).

The loomweights from Tel ʻAmal are lighter (of 242.9 ± 80.3 g) than the typical loomweights found at Iron Age sites, which usually weigh between 200 and 500 g, and most frequently c. 350 g. The heavier variety of piriform gypsum loomweights was found at Bet She'an (James 1966:118, 124, Figs. 110:18, 22; 114:14, 16; 118:14, 17; 119:13, 15) and in the tenth-century BCE stratum at Tell el-Ḥamma (Shamir 1996:142). At the latter, only three loomweights of this type were found, weighing 495.6 g, 471.4 g and 385.9 g. The rest (158) are unfired clay doughnut-shaped loomweights that weigh in average 286.4 ± 81.7 g, much like the loomweights from Tel ʻAmal. The doughnut-shaped type, which is usually made of unfired clay, is characteristic of the Iron Age, and has been found at many sites (Sheffer 1981; Browning 1988; Shamir 1996:140–143).

The low-weight loomweights from Tel ʻAmal indicate that its inhabitants specialized in the weaving of linen, as at several other sites in the Bet She'an and Jordan Valleys (Shamir 1992; 1996:142). The production of linen textiles in this region is attested to by a spindle with linen threads wrapped around it that was found at near-by Tell el-Ḥamma (Shamir 1996:142) and a linen textile from Bet She'an (Shamir 2009). This specialization of the Bet She'an region stands in contrast to the Shephelah, a region that seems to have specialized in the production of wool textiles (Shamir 1992; 1996:142; Browning 2001).

Interestingly, although the weight of the loomweights from Tel ʻAmal is considerably low, the range of weights is nevertheless quite wide (see Table 2). Furthermore, the number and weight of the loomweights found in each locus (building) at Tel ʻAmal vary greatly (Table 3; Edelstein and Feig 1992:1448). It thus seems that loomweights of different weights were found in hoards, set in rows, indicating that they were used together in one loom. The same case is true for Tell es-Saʻidiyeh, where the common provenance of loomweights exhibiting a range of sizes is certain (Pritchard 1985:36–38), as well as at several other sites (Hoffmann 1974:311–12; Zimmerman 1982; Shierer 1987; Shamir 1996:143). This raises the question as to how loomweights of different weights could have been used together in the same looms. It is possible that the number of threads tied through each loomweight was not identical, or that a loop was used as an intermediary device between the warp threads and the loomweights (Shamir 1996:137). In such cases, it would be unnecessary for all the loomweights to be identical in weight, as more warp threads could have been tied through the heavier looomweights, and fewer though the lighter ones (Hoffmann 1974:314; Broudy 1979:26). On the other hand, different weights may indicate the production of textiles of varying thickness and density.

Edelstein and Feig (1992:1448; Edelstein 1971) identified the work areas where loomweights were found as workshops. However, they were found near domestic artifacts, such as cooking pots, jugs, juglets and storage jars, which indicate that these spaces served as private dwellings (Cassuto 2008:67, 73). According to Cassuto (2008:76), when concentrations of loomweights are found within dwellings, they are consistently found in proximity to implements used for the preparation of food. It would be reasonable, then, to assume that the weavers were women, who produced textiles for family use (Cassuto 2008:69). It is also possible that even though produced did not take place in workshops, surplus textiles were sold or exchanged in the marketplace.

Notes

[1] My sincere thanks are due to Gershon Edelstein and Nurit Feig for their help and support in undertaking this project, as well as for their helpful comments on an early version of this article. The loomweight photos were taken by Mariana Salzberger.

References

Beck H.C. 1928. *Classification and Nomenclature of Beads and Pendants*. Oxford.

Broudy E. 1979. *The Book of Looms*. New York.

Browning D.C. 1988. *The Textile Industry of Iron Age Timmnah and Its Regional and Socoieconomic Contexts: Literary and Artifactual Analysis*. Ph.D. Diss. Southwestern Baptist Theological Seminary. Fort Worth, Texas.

Browning D.C. 2001. Loomweights. In A. Mazar and N. Panitz-Cohen eds. *Timnah (Tel Batash)* II: *The Finds from the First Millennium BCE* (Qedem 42). Jerusalem. Pp. 248–258.

Cassuto D. 2008. Bringing Home the Artifacts: A Social Interpretation of Loom Weights in Context. In Beth Alpert Nakhai ed. *The World of Women in the Ancient and Classical Near East*. Newcastle-upon-Tyne. Pp. 63–77.

Edelstein G. 1971. *A Weavers Settlement from the Time of the United Kingdom*. Nir David (Hebrew).

Edelstein G. and Feig N. 1992. Tel ‘Amal. *NEAEHL* 3. Pp.1447–1450.

Feig N. 2013. Tel ‘Amal: An Iron Age IIA Settlement and Remains from the Bronze Age and the Ottoman Period. *HA–ESI* 125 (29/12/2013). http://www.hadashot-esi.org.il/report_detail.aspx?id=5412&mag_id=120&previewit=TrUe (accessed 29/12/2013).

James F.W. 1966. *The Iron Age at Beth Shan: A Study of Levels VI–IV*. Philadelphia.

Levy S. and Edelstein G. 1972. Cinq années de fouilles a Tel ‘Amal (Nir David). *RB* 79:325–367.

Mårtensson L., Nosch, M.L. and Anderson Strand E. 2009. Shape of Things: Understanding a Loom Weigth. *OJA* 28:373–398.

Papadopoulou E. 2012. Textile Technology in Northern Greece: Evidence for a Domestic Craft Industry from Early Bronze Age Archontiko. In M.-L. Nosch and R. Laffineur eds. *Kosmos: Jewellery, Adornment and Textiles in the Aegean Bronze Age (Proceedings of the 13th International Aegean Conference, University of Copenhagen, Danish National Research Foundation’s Centre for Textile Research, 21–26 April 2010)*. Leuven–Liege. Pp. 57–63.

Shamir O. 1992. A Twelfth-Century BCE Linen Textile Fragment from Beth Shean. *ATN* 14:4.

Shamir O. 1994a. Loomweights from Masada. In Y. Aviram, G. Foerster and E. Netzer eds. *Masada* IV: *The Yigael Yadin Excavations, 1963–1965, Final Reports*. Jerusalem. Pp. 265–282.

Shamir O. 1994b. Loomweights from Tell Qasile. *Israel – People and Land* 7–8 (25–26):35–42 (Hebrew; English Summary, p. 9*).

Shamir O. 1996. Loomweights and Whorls. In D.T. Ariel and A. de Groot eds. *Excavations at The City of David 1978–1985, Directed by Yigal Shiloh* IV: *Various Reports* (Qedem 35). Jerusalem. Pp. 135–170.

Shamir O. 2006. Objects Associated with the Weaving Industry (Beth Shean, Area P). In A. Mazar ed. *Excavations at Tel Beth-Shean 1989–1996* 1: *From the Late Bronze Age IIB to the Medieval Period.* Jerusalem. Pp. 474–483.

Shamir O. 2009. A Linen Textile. In N. Panitz-Cohen and A. Mazar eds. *Excavations at Tel Beth-Shean, 1989–1996* 3: *The 13th–11th Century BCE Strata in Areas N and S*. Jerusalem. Pp. 474–483.

Sheffer A. 1981. The Use of Perforated Clay Balls on the Warp-Weighted Loom. *TA* 8:81–83.