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REHOVOT RADIOCARBON MEASUREMENTS III

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This list contains results obtained between 1981 and 1985. Since the first description of the laboratory (Carmi, Noter & Schlesinger, 1971) the following changes were made. Two proportional counters are now used: 1) 0.5L volume, 0.865 ± 0.023 cpm background, 12.830 ± .134 cpm NBS oxalic acid standard (old); 2) 0.25L volume, 0.484 ± 0.023 cpm background, 6.185 ± .123 cpm NBS oxalic acid standard (old). The passive shield has been increased by 2cm of mercury next to the counters. For anticoincidence, a modular, hand-made gas counter is used. The laboratory was transferred to the ground floor of a 7-storey building. Data acquisition and processing are done with a scaler/buffer built at the Institute and an IBM PC computer. Samples are filled into the counters and counted for ca 1000min at least twice. The sample preparation method and counter filling pressure have not been changed.

ACKNOWLEDGMENT

Thanks are due S Kazes for technical help in the lab.

ARCHAEOLOGIC SAMPLES

Marine Samples

Israel

Kfar Samir series

Prehistoric submerged settlement 2km S of Haifa, 50m offshore (Natl Grid ref 1461-2441).

RT-598B. **4800 ± 70**
$\delta^{13}C = -26.4‰$

Oak tree excavated 1m below sea level (bsl). Coll 1981 by M Evron, Lab Prehist, Univ Haifa.

RT-682A. **6470 ± 130**

Wood from construction #5, 4.5m bsl. Coll 1984 by A Raban, Center for Marine Studies, Univ Haifa.

RT-682B. **6670 ± 140**
$\delta^{13}C = -26.4‰$

Wood from construction #3. 4.5m bsl. Coll 1984 by A Raban.

CAHEP series

Samples coll during Cesarea Ancient Harbor Excavation Proj by A Raban and N Karmon.

RT-609. Harbor **1470 ± 50**

Coll 1981 (Natl Grid Ref 1397-2124). *Comment* (AR): wood from cradle, used to lower construction stones during attempt by Emperor Anastasius to rebuild harbor.

RT-631A. Harbor/ship **2210 ± 190**
$\delta^{13}C = -26.4‰$

Coll 1983 from 9m bsl (Natl Grid Ref 1398-2124). *Comment* (AR): beam from entrance to harbor in Herodian period. Sample is from quay or ship.

RT-631B. Harbor **1970 ± 70**
$\delta^{13}C = -25.8‰$

Coll 1983 from 6m bsl (Natl Grid Ref 1398-2124). *Comment* (AR): wood from frames used in construction of harbor.

RT-645. Side plate **1870 ± 60**

RT-653B. Rib I **1990 ± 140**
$\delta^{13}C = -28.0‰$

RT-653C. Rib II **1990 ± 150**
$\delta^{13}C = -26.6‰$

RT-680A. Tenon I **1930 ± 220**
$\delta^{13}C = -27.1‰$

RT-680B. Tenon II **1990 ± 100**

Coll 1983 from 2.5m bsl (Natl Grid Ref 1403-2127). *Comment* (AR): parts recovered from sunken ship from 1st century AD.

RT-652. Acre **2310 ± 50**

Wood from sideplate of ship brought up by dredger during deepening of harbor (Natl Grid Ref 1569-2583). Coll 1983 and subm by N Karmon.

RT-684. Dor ship I **100 ± 100**
$\delta^{13}C = -25.1‰$

Wood from unid. sunken ship at Dor, 27km S of Haifa (Natl Grid Ref 1424-2237). Coll 1983 by S Wachsmann, Dept Antiquities, Ministry Educ, from 2 to 3m bsl. *Comment* (SW): possibly from ship that sank in 1664.

RT-686A. Dor ship II **1590 ± 110**
$\delta^{13}C = -28.2‰$

Wood from Byzantine ship at Dor (Natl Grid Ref 1422-2238). Coll 1983 by S Wachsmann, from 2 to 3m bsl (Wachsmann & Raveh, 1984). *Comment* (SW): ceramics suggest that ship is from 6th–7th century AD.

990 ± 100

RT-686B. Atlit ship $\delta^{13}C = -28.8‰$

Wood from sunken ship in Atlit (Natl Grid Ref 1449-2346). Coll 1982 by S Wachsmann, from 2 to 3m bsl.

1800 ± 100

RT-710. Hahotrim ship $\delta^{13}C = -25.4‰$

Wood from sunken ship in Hahotrin (Natl Grid Ref 1456-2400). Coll 1984 by S Wachsmann from 2 to 3m bsl.

2100 ± 110

RT-681. Ram $\delta^{13}C = -27.6‰$

Wood from bronze ram. Coll 1980 offshore of Atlit (Natl Grid Ref 1445-2348). Subm by N Karmon.

8140 ± 130

RT-707. Nahal Oren $\delta^{13}C = -26.4‰$

Charcoal from prehistoric site presently 300m offshore of Nahal Oren. Coll 1984 from 1m bsl by E Galilee, Center for Marine Studies, Univ Haifa.

Italy

RT-705. Oristano **100 ± 100**

Wood from sunken ship, 20km N of Oristano, Sardinia, 2m bsl. Coll 1984 by E Galilee.

Terrestrial Samples

Israel

RT-611. Olive seeds **320 ± 70**

Charred olive (*Olea europea*) from old agric terrace in Jerusalem. Coll 1982 by G Edelstein, Dept Antiquities, Ministry Educ. *Comment* (GE): Canaanite pottery was found in terrace but sample is probably of secondary origin.

RT-614. Kaukab **700 ± 70**

Olive tree (*Olea europea*) from Kaukab in lower Galilee (Natl Grid Ref 1735-2496). Coll 1982 by Y Sela, Jewish Natl Fund. *Comment* (YS): part of tree exposed by erosion.

Uvda Valley series

Archaeol excavation in Arava valley 40km N of Eilat.

a) Loc 906 (Natl Grid Ref 1468-9297). Charcoal from stone bowl 0.5m below ground surface. Coll 1980 by O Yogev, Dept Antiquities, Ministry Educ (Yogev, 1984).

6560 ± 90
RT-628A. $\delta^{13}C = -10.9‰$

RT-628B. **6400 ± 200**

Comment (OY): open sanctuary. Sites with similar stereographic plans have not been previously known before 3rd-4th millennium BC.

b) Loc 916 (Natl Grid Ref 1465-9287). Samples from residential site. Coll 1980 by O Yogev.

4800 ± 70
RT-640A. $\delta^{13}C = -24.6‰$

Charcoal from stone cache 1.5m below ground surface.

4400 ± 60
RT-640B. $\delta^{13}C = -23.9‰$

Charcoal from under secondary wall.

4280 ± 80
RT-640C. $\delta^{13}C = -22.7‰$

Charcoal from implement 0.7m below ground surface. *Comment* (OY): residential sites are known in region from 3rd millennium BC.

RT-648A. Shrine **5670 ± 90**

Charcoal from massebot shrine (Natl Grid Ref 1495-9255). Coll 1982 by U Avner, Dept Antiquities, Ministry Educ. *Comment* (UA): evidence for early desert habitation and cult sites (Henry, 1982; Rosen, 1984).

RT-648B. Threshing floor **4250 ± 50**

Charcoal from threshing floor (Natl Grid Ref 1495-9255). Coll 1982 by U Avner. *Comment* (UA): date suggests MBI period but find points to EBII, 400 yr earlier. This date, together with those of samples 714A and 714B point to longer duration of EBII culture in desert compared to more humid regions.

4070 ± 100
RT-714A. Site 9 $\delta^{13}C = -13.7‰$

Charcoal from residential site (Natl Grid Ref 9683-1462) 0.6m below ground surface. Coll 1980 by U Avner and O Ilan (Dept of Antiquities, Ministry Educ).

3850 ± 100
RT-714B. Site 166 $\delta^{13}C = -18.2‰$

Charcoal from residential site (Natl Grid Ref 9277-1459) 0.7m below ground surface. Coll 1980 by U Avner.

Dor series

Ancient harbor 24km S of Haifa (Natl Grid Ref 1425-2247).

2830 ± 70
RT-630. Floor 1 $\delta^{13}C = -23.4‰$
Coll 1981 by A Raban.

3640 ± 200
RT-685. Locus 101 $\delta^{13}C = -25.1‰$
Coll 1984 by A Raban.

Zalaka series

Tumuli tombs field in Wadi Zalaka, E Sinai (Natl Grid Ref 0884-8239) (Avner, 1984). All samples are charcoal, coll 1983 by U Avner. *Comment* (UA):date supports idea that appearance of tumuli should be moved back to 4th or 5th millennium BC.

5440 ± 80
RT-648E. $\delta^{13}C = -23.9‰$

Har Shani series

Charcoal from open shrine 18km NW of Eilat (Natl Grid Ref 1360-9000). Coll 1981 by U Avner. *Comment* (UA):evidence suggests that shrine had been in intermittent use between 4th millennium BC and Byzantine times. Date suggests that shrine had been in use by the Nabatean as late as 6th century AD.

1470 ± 60
RT-648F. $\delta^{13}C = -22.6‰$

RT-648G. 1500 ± 170

Shiqmim series

Charcoal from Chalcolithic village near Beer Sheva (Natl Grid Ref 1170-0689). Coll 1982 by T E Levy, Negev Mus, Beer Sheva (Levy, 1983).

5750 ± 180
RT-649B. $\delta^{13}C = -22.1‰$

6150 ± 180
RT-649D. Locus 412 $\delta^{13}C = -17.7‰$

8100 ± 150
RT-650. Nahal Hemar $\delta^{13}C = -23.7‰$

Charcoal from cave in Judean Desert (Natl Grid Ref 1675-0645), from Neolithic pre-ceramic B layer which contains intact artifacts. Coll by O Bar-Yosef, Inst Archeol, Hebrew Univ. *Comment* (IC): measurements in other

labs gave following results: 6230 ± 80 BC (PTA-3650) and 6300 ± 70 BC (BM-2298).

RT-656. Kasr El Yahud **1380 ± 180**
$\delta^{13}C = -20.2‰$

Wood from common burial ground at Kasr El Yahud in Lower Jordan R, (Natl Grid Ref 2012-1386). Coll 1983 by J Zias, Dept Antiquities, Ministry Educ.

Yiftahel series

Burned bricks from excavation at Yiftahel in lower Galilee (Natl Grid Ref 1710-2405). Coll 1984 by E Brown, Dept Antiquities, Ministry Educ.

RT-702A. **5570 ± 220**

Sample from EBI layer.

RT-702B. **7460 ± 210**

Sample from Neolithic pre-ceramic layer.

RT-718. Silo site **5540 ± 110**
$\delta^{13}C = -22.0‰$

Triticum diococcum from silo in Chalcolithic site, Golan Heights (Natl Grid Ref 2234-2564). Coll 1981 by C Epstein, Dept Antiquities, Ministry Educ.

Other Countries

RT-612A. Honduras del Oeste **3540 ± 70**

Shells (*Caracolus excellens*) from Santo Domingo. Coll from ancient refuse dump in 1981. Subm by M Vellos Magiolo.

RT-612B. Cacoq **3090 ± 50**

Shells (*Arca occidentalis*) from Ihle a Vache, Haiti. Coll 1982, subm by Clark Moore.

CARBONATE SAMPLES OF BIOGENIC ORIGIN

Tiran series

Samples from Favel Bay, Straights of Tiran (Natl Grid Ref 1100-0735). Coll 1981 by E Spanier, Center Marine Studies, Univ Haifa.

RT-601A. **1570 ± 80**

Chicoreus ramosus (gastropod).

RT-601B. **> 30,000**

Fossilized sample of echinoid (sand dollar).

Achziv series

Samples from Achziv, 26km N of Haifa (Natl Grid Ref 1596-2718). Coll 1981 by Z Levy and D Neev, Geol Survey Israel, from terrace 7m above sea level.

RT-660A. **3240 ± 180**
$\delta^{13}C = -4.5‰$

Cerastoderma glaucum.

RT-660B. **6000 ± 170**
$\delta^{13}C = -8.9‰$

Unio sp.

RT-660C. **3640 ± 160**
$\delta^{13}C = -0.9‰$

Euthria cornea.

RT-683A. Acre **PMC = 82.0 ± 2.2**

Aragonitic shell (*Euthria cornea*). Coll ca 1935 from beach at Acre, 30km N of Haifa (prebomb sample). Subm 1984 by D Neev.

RT-683B. Tel Aviv **PMC = 89.0 ± 2.0**

Aragonite shell (*Euthria cornea*) coll ca 1960, from beach at Tel Aviv (prebomb sample). Subm 1984 by D Neev.

Land snail series

Land snails were coll by A Karnieli (AK), Desert Research Inst, Sde Boqer, and G A Goodfriend (GG), Weizmann Inst. All samples are from Negev Desert except for RT-674 which is from Jamaica. Data is given in Table 1. Results for live samples are given in percent modern corrected for ^{13}C fractionation, in italics. Natl Grid Refs are given where available; for Jamaican sample, international grid is given. $\delta^{13}C$ values in parenthesis were estimates by GG. Arad snails (sample RT-746A) were excavated by R Amiran, Hebrew Univ. H Meinis, Zoology Mus Hebrew Univ (HUZM) provided live-collected prebomb land snail shells. Samples RT-732, -741, -744 are from rodent middens. *Comment* (GG): most fossil snail material was excavated from loessial sediments. Specimens were thoroughly cleaned of all secondary deposits inside and outside. Ages are reported uncorrected for anomalies to which land snails from carbonate substrates are subject (Goodfriend & Stipp, 1983) which are due to incorporation of carbonate carbon into shell (Goodfriend & Hood, 1983). Reported ages are thus ca 1000–2000 yr too old.

HYDROLOGIC SAMPLES

The Arava samples were coll by R Nativ, Desert Research Inst, Sde Boqer. Galilee and Golan Heights samples were coll by M Stiller, Weizmann Inst, and I Carmi (Carmi, Stiller & Kaufman, 1985), except for Lake Kin-

TABLE 1
^{14}C in land snails

Sample no.	Colln date	Natl Grid Ref E N	Subm by	Species	$\delta^{13}C$ (‰)	Yr BP or PMC	Comments
RT-626A	1982	1325–0340	AK	*Trochoidea seetzeni* *Sphincterochila zonata*	−1.7	6740 ± 90	90cm in loess layer
-626B	1982	1325–0340	AK	*Trochoidea seetzeni* *Sphincterochila zonata*	−2.4	6460 ± 70	130cm in loess layer
-632A	1983	1310–0299	AK	*Sphincterochila zonata*	−4.5	*92.2 ± .5*	Live coll
-632B	1983	1310–0299	AK	*Sphincterochila zonata*	−1.4	*100 ± .6*	Live coll
-655A	1983	1310–0299	AK	*Sphincterochila zonata*	−4.3	7900 ± 180	240cm in loess layer
-655B	1983	1310–0299	AK	*Sphincterochila zonata*	−2.9	6050 ± 160	200cm in loess layer
-671B	1984	1905–1340	GG	*Sphincterochila fimbriata*	(−1)	6230 ± 170	Is-30
-674	1981	420–566	GG	*Pleurodonte lucerna*	−9	31,400 ± 2300	SN-37-Br2 Jamaica
-675	1984	1325–0340	GG	*Trochoidea seetzeni*	−5.5	*93.1 ± 2.5*	Is-46, live coll
-679	1984	1325–0340	GG	*Trochoidea seetzeni*	−4.5	6260 ± 240	Is-45
-687	1984	1858–1381	GG	*Sphincterochila fimbriata*	−2.9	4090 ± 180	Is-69
-693	1942		GG	*Sphincterochila zonata*	−2.4	*76.7 ± 1.7*	HUZM-1, live coll
-712A	1949		GG	*Levantina caesareana*	−3.1	*88.4 ± 2.3*	HUZM-WN, Live coll
-712B	1952		GG	*Sphincterochila fimbriata*	−3.6	*78.3 ± 1.9*	HUZM-21, Live coll
-712C	1949		GG	*Trochoidea seetzeni*	−4.4	*81.9 ± 2.6*	HUZM-RR, Live coll
-712D	1955		GG	*Trochoidea seetzeni*	−5.2	*82.8 ± 1.7*	HUZM-BL, live coll
-712E	1941		GG	*Sphincterochila zonata*	−1.9	*79.0 ± 1.4*	HUZM-EG, Live coll
-721	1985	1400–0418	GG	*Trochoidea seetzeni*	(−3)	6170 ± 240	175cm depth Is-168
-722	1985	1400–0418	GG	*Trochoidea seetzeni*	(−3)	6340 ± 240	287cm depth Is-168

TABLE 1 (continued)

Sample no.	Colln date	Natl Grid Ref E N	Subm by	Species	$\delta^{13}C$ (‰)	Yr BP or PMC	Comments
-725	1985	1932–1276	GG	*Trochoidea seetzeni*	−4.5	8300 ± 260	Is-84
-726	1984	1556–0742	GG	*Trochoidea seetzeni*	−5.3	7250 ± 180	Is-111
-727	1985	1325–0513	GG	*Trochoidea seetzeni*	−2.9	8270 ± 180	Is-190
-729A	1985	1427–0751	GG	*Trochoidea seetzeni*	−5.4	4330 ± 170	Is-202
-729B	1985	1558–0642	GG	*Trochoidea seetzeni*	−4.6	6000 ± 180	Is-174
-731	1985	1312–0630	GG	*Trochoidea seetzeni*	−4.5	8120 ± 120	Is-215
-732	1985	1311–0636	GG	*Trochoidea seetzeni*	−5.3	16160 ± 530	Is-213
-733	1985	1316–0649	GG	*Trochoidea seetzeni*	−4.8	7860 ± 260	Is-211
-738	1985	1492–0510	GG	*Trochoidea seetzeni*	−2.2	11140 ± 310	Is-263
-739	1985	1275–0441	GG	*Trochoidea seetzeni*	(−4.0)	9190 ± 220	Is-258
-740	1985	1316–0641	GG	*Trochoidea seetzeni*	(−4.0)	10500 ± 420	Is-280
-741	1985	1441–0664	GG	*Trochoidea seetzeni*	(−3.4)	11230 ± 140	Is-291
-742	1985	1395–0688	GG	*Trochoidea seetzeni*	(−4.0)	11150 ± 250	Is-281
-743	1985	1297–0616	GG	*Trochoidea seetzeni*	−4.5	7700 ± 190	Is-277
-744	1985	1316–0642	GG	*Trochoidea seetzeni*	−4.0	4690 ± 190	Is-279
-745	1985	1500–0518	GG	*Trochoidea seetzeni*	−3.1	5230 ± 120	Is-301
-746A	1970	1620–0765	GG	*Trochoidea seetzeni*	−4.9	5500 ± 120	Arad-4570, EBII layer 2
-746B	1985	1303–0713	GG	*Trochoidea seetzeni*	−6.5	1930 ± 180	Is-267
-749	1985	1378–0499	GG	*Trochoidea seetzeni*	−3.4	13,200 ± 170	Is-274
-750	1985	1481–0633	GG	*Trochoidea seetzeni*	−3.3	10,170 ± 240	Is-29
-751A	1946		GG	*Sphincterochila zonata*	0	*80.7 ± 1.0*	HUZ-SZ-WA, Live coll
-751B	1985	1558–0642	GG	*Trochoidea seetzeni*	−4.5	6400 ± 200	Is-318

* AK = Arnon Karnieli; GG = Glenn Goodfriend.

neret samples which were coll by A Kaufman, Weizmann Inst. Mezar samples were coll by G Shaliv TAHAL, Water Planning for Israel Ltd. Dead Sea flood samples were coll by M Stiller. Lowland, Judean Mts and Judean Desert samples were coll by L Kroiteru, Weizmann Inst. Data is given in Table 2.

TABLE 2
^{14}C in hydrologic samples

Sample no.	Name	Type	Natl Grid Ref E N	Colln date	$\delta^{13}C$ ‰	^{14}C PMC
			Arava Valley			
RT-600C	Barbur 2	Well	1608–0603	5/82		0.6 ± 0.1
-615A	Zuk Tamrur	Well	1746–0748	6/82	−7.1	0.6 ± 0.2
-615B	Zuk Tamrur	Well	1746–0748	6/82	−9.3	0.5 ± 0.2
-615C	Zuk Tamrur	Well	1746–0748	6/82	+9.4	1.9 ± 0.2
-615D	Zuk Tamrur	Well	1746–0748	6/82	−2.7	1.0 ± 0.2
-615E	Barbur 2	Well	1608–0603	6/82		3.6 ± 0.3
-615F	Ein Saharonim	Spring	1430–0040	7/82	−7.6	51.7 ± 0.5
-621	Beer Mashchur	Well	1430–0080	10/82	−8.7	54.6 ± 0.5
-624A	Neot Hakikar	Spring	1852–0388	10/82	−10.1	44.6 ± 0.5
-624B	Ein Amatzia	Spring	1760–0343	10/82	−9.0	26.5 ± 0.4
-624C	Ein Ofarim	Well	1675–0275	11/82	−9.9	2.8 ± 0.2
-633B	Tamar 11	Well	1800–0450	1/83	−9.3	0.2 ± 0.2
-697A	Nevatim	Well	1400–0700	3/84	−6.7	6.4 ± 0.3
-697B	Nevatim	Well	1400–0700	3/84	−6.9	5.5 ± 0.3
			Galilee and Golan Heights			
-643A	Dan	Spring	2111–2946	2/83	−10.7	58.3 ± 1.3
-643B	Snir	River	2151–2949	2/83	−10.0	82.4 ± 0.5
-643C	Hermon	Spring	2087–2922	2/83	−11.2	51.3 ± 0.5
-661A	Dan	Spring	2111–2946	10/83	−10.1	55.5 ± 1.3
-661B	Hermon	Spring	2087–2922	10/83	−9.5	54.7 ± 1.2
-661C	Snir	River	2151–2949	10/83	−10.0	81.5 ± 1.7
-661D	Jordan	River	2079–2563	10/83	−7.4	83.5 ± 1.7
-662	Mezar 2	Well	2156–2355	12/83	−9.8	0.9 ± 0.6
-664	Mezar 3	Well	2160–2355	12/83	−15.2	13.5 ± 0.7
-729A	Kinneret	Lake	2035–2350	4/85	−5.5	105.9 ± 2.6
-729B	Kinneret	Lake	2035–2350	4/85	−5.6	102.5 ± 1.2
			Dead Sea Floods			
-639A	Zohar	Flood (inorganic)	1849–0620	11/82	−1.6	16.6 ± 0.4
-639B	Zohar	Flood (organic)	1849–0620	11/82		109.3 ± 1.3
			Lowland, Judea Mountains, and Judea Desert			
-694	Ein Hemed	Spring	1620–1337	4/84	−13.8	90.4 ± 1.2
-698	Ein Hemed	Spring	1620–1337	1/84	−12.8	94.8 ± 1.1
-700	Ein Hemed	Spring	1620–1337	8/84		78.7 ± 1.9
-701	Ein Sultan	Spring	1923–1419	8/84	−13.1	78.1 ± 1.9
-703A	Ein Farah	Spring	1787–1378	9/84	−10.5	57.7 ± 0.8
-703B	Ein Al Fauar	Spring	1832–1356	9/84	−10.2	68.0 ± 0.9
-703C	Ein Qelt	Spring	1856–1382	9/84	−11.4	72.1 ± 1.0
-703D	Ein Sultan	Spring	1923–1419	9/84	−11.9	84.2 ± 1.0
-703E	Lod 4A	Well	1408–1533	10/84	−11.4	40.6 ± 0.6
-703F	Lod 26	Well	1415–1591	10/84	−10.7	38.8 ± 0.6
-703G	Rosh Ha'ain 3	Well	1428–1681	10/84	−11.0	42.7 ± 0.6
-703H	Gimzu	Well	1450–1494	10/84	−12.4	65.5 ± 1.8
-703I	Kfar Uria 3	Well	1461–1342	10/84	−12.0	22.7 ± 0.5
-703J	Eshtaol 2A	Well	1513–1316	10/84	−11.5	44.5 ± 0.7
-703K	Eshtaol 5	Well	1525–1316	10/84	−12.4	73.8 ± 1.9
-703L	Modi'in 2	Well	1542–1397	10/84	−12.4	62.0 ± 0.9

TABLE 2 (continued)

Sample no.	Name	Type	Natl Grid Ref E N	Colln date	$\delta^{13}C$ ‰	^{14}C PMC
-706A	Agur 1	Well	1422–1254	10/84	−10.9	22.7 ± 0.5
-706B	Agur 4	Well	1482–1213	10/84	−11.8	24.8 ± 0.4
-706C	Hartuv 4	Well	1501–1287	10/84	−12.5	49.4 ± 0.7
-706D	Eshtaol 7	Well	1513–1307	10/84	−12.5	56.8 ± 1.4
-706E	Ayalon 3	Well	1454–1422	10/84	−11.9	32.6 ± 0.6
-706G	Ein Karem 6	Well	1622–1300	10/84	−11.6	86.8 ± 2.0
-706H	Ein Karem 1	Well	1649–1319	10/84	−11.5	83.1 ± 1.1
-706I	Jerusalem 6	Well	1721–1255	10/84	−12.0	48.4 ± 0.7
-706J	Ein Karem 9	Well	1664–1347	10/84	−13.0	71.2 ± 0.9
-708B	Jerusalem 4	Well	1717–1307	11/84	−10.0	41.9 ± 0.6
-708C	Azariyah	Well	1766–1320	11/84	−10.0	46.4 ± 0.8
-709D	Jericho 5	Well	1882–1468	11/84	−12.6	37.0 ± 0.6
-709F	Jericho 1	Well	1909–1408	11/84	−13.9	53.0 ± 0.8
-709G	Jericho 2	Well	1907–1394	11/84	−11.5	44.2 ± 0.6
-713A	Ein Farah	Spring	1787–1378	1/85	−11.4	62.0 ± 1.7
-713B	Ein Al Fauar	Spring	1832–1356	1/85	−12.9	69.0 ± 0.9
-713C	Ein Qelt	Spring	1856–1382	1/85	−13.4	79.8 ± 1.1

GREENHOUSE SAMPLES

Samples measured in experiment to estimate incorporation of added CO_2 by greenhouse-grown tomato plants. Coll 1983 by Z Enoch, Dept Agric Meteorol, Agric Research Center, Bet Dagan, Israel. Results are given in percent modern carbon (PMC) (Enoch *et al*, 1984).

RT-637AG. **PMC = 115.2 ± 2.7**
$\delta^{13}C = -25.2‰$

Tomato plant from unenriched greenhouse.

RT-637AE. **PMC = 66.7 ± 1.5**
$\delta^{13}C = -37.0‰$

Tomato plant from greenhouse enriched with tank CO_2.

RT-637AG. **PMC = 68.6 ± 0.5**
$\delta^{13}C = -37.1‰$

Tomato plant from greenhouse enriched with CO_2 from burned propane-butane.

DEAD SEA WOOD SAMPLES

RT-625. Bottom wood **PMC = 116.9 ± 2.5**

Piece of wood coated with salt crystals, brought up from bottom of Dead Sea at 100m bsl (Natl Grid Ref 1890-0960) by mud dredger. Coll 1982 by Y Levy, Geol Survey Israel.

RT-663A. Driftwood **320 ± 80**
$\delta^{13}C = -12.0‰$

Driftwood heavily coated with precipitates and held in place by boul-

ders, exposed when Dead Sea receded to −404.5m below msl (Natl Grid Ref 1891-1136). Coll 1983 by Z Klein, Hydrol Service Israel.

RT-683A. Dead Sea Works (30cm) **PMC = 100.0 ± 1.2**
$\delta^{13}C = -22.3‰$

RT-683B. Dead Sea Works (80cm) **PMC = 103.8 ± 1.6**

Wood exposed by channel in sediment created by overflow of brine from evaporation ponds of Dead Sea Works (Natl Grid Ref 1905-0507). Coll 1984 by M Magaritz.

RHIZOFOSSIL SAMPLES

Carbonate filling of root-grooves in Judean Desert. Coll 1983–4 by A Danin, Dept Botany, Hebrew Univ, Jerusalem (Danin, Wieder & Magaritz, in press). $\delta^{13}C$ values in parentheses were estimated by M Magaritz.

RT-646A. Maaleh Adumim **30,500 ± 900**
$\delta^{13}C = -11.5‰$

(Natl Grid Ref 1700-1325) from depth 2m.

RT-646B. Anatot **29,800 ± 800**
$\delta^{13}C = -10.8‰$

(Natl Grid Ref 1767-1369).

RT-678A. Maaleh Adumim **31,400 ± 1200**
$\delta^{13}C = -11.0‰$

(Natl Grid Ref 1700-1325) from depth 2m.

RT-678C. **> 44,000**
($\delta^{13}C = -11‰$)

(Natl Grid Ref 1767-1369) from depth 2 to 3m.

LISAN SAMPLES

Lisan series

Samples coll near boundaries of late Pleistocene Lisan Lake, precursor of present Dead Sea. Coll 1982 by B Buchbinder, Geol Survey Israel (Buchbinder, 1981).

RT-613A. Hirbet Samra **23,800 ± 400**
$\delta^{13}C = -0.72‰$

Lisan stromatolite from near Jericho (Natl Grid Ref 1950-1460).

RT-613B. Nahal Mor **17,600 ± 500**
$\delta^{13}C = -2.26‰$

Lisan stromatolite (Natl Grid Ref 1850-990).

RT-613C. Zohar **> 40,000**
$\delta^{13}C = +0.8‰$

Laminar tufa (Natl Grid Ref 1843-0630).

RT-613D. Zohar **> 40,000**
$\delta^{13}C = +0.9‰$

Postular tufa (Natl Grid Ref 1845-0630).

Nahal Amatzyah series

Oolite samples consisting of calcite and aragonite. Ages are given in Druckman, Magaritz & Sneh (in press).

RT-620A. **PMC = 8.50 ± .25**
$\delta^{13}C = -4.1‰$

Oolite (Natl Grid Ref 1765-0353). Coll 1982 by M Magaritz.

RT-620B. **PMC = 5.6 ± .27**
$\delta^{13}C = +1.5‰$

Oolite (Natl Grid Ref 1776-0378). Coll 1982 by M Magaritz.

RT-635. **14,600 ± 200**
$\delta^{13}C = -25.6‰$

Organic matter in clay matrix (Natl Grid Ref 1768-0367). Coll 1982 by M Magaritz.

HULA CORE SAMPLES

Dates from core coll in drilling operation at Hula Basin, N Israel (Natl Grid Ref 1264-0614). Subm 1980 by M Magaritz. In age calculation, $\delta^{13}C = -25‰$ was assumed (Kafri, Kaufman & Magaritz, 1983).

RT-610A. **20,940 ± 390**

Depth 46.5m.

RT-610B. **34,000 ± 1700**

Depth 55.0m.

CALCITE NODULES SAMPLES

Calcite nodules from loess sections, Negev, measured to date environmental changes in upper Pleistocene along desert boundary (Magaritz, in press).

Netivot series

Section at Netivot, Negev near Beer Sheba (Natl Grid Ref 1110-0930). Coll 1982 by M Magaritz.

RT-604C. **7240 ± 90**
$\delta^{13}C = -5.5‰$

Depth 80cm.

RT-604D. **13,630 ± 100** $\delta^{13}C = -3.8‰$
Depth 1m.

RT-619B. **27,900 ± 660** $\delta^{13}C = -11.9‰$
Depth 7m.

RT-629A. **35,000 ± 1500** $\delta^{13}C = -9.3‰$
Depth 5.5m.

RT-629B. **24,400 ± 450** $\delta^{13}C = -11.1‰$
Depth 7.5m.

Ramat Hovav series

Coll 1982 by M Magaritz, from 7 loci along Nahal Sekher, 34km SE of Netivot sec.

RT-604A. **10,500 ± 130** $\delta^{13}C = -3.2‰$
Lacustrine sediment (Natl Grid Ref 1316-0577) from depth 7m.

RT-604B. **11,680 ± 140** $\delta^{13}C = -4.1‰$
Lacustrine sediment (Natl Grid Ref 1316-0577) from depth 6m.

RT-606A. **25,900 ± 400** $\delta^{13}C = -1.7‰$
Calcite nodules (Natl Grid Ref 1308-0575) from depth 4.8m.

RT-606B. **30,000 ± 800** $\delta^{13}C = -3.9‰$
Calcite nodules (Natl Grid Ref 1301-0577) from depth ca 1m.

RT-606D. **29,000 ± 700** $\delta^{13}C = -2.8‰$
Calcite nodules (Natl Grid Ref 1284-0591).

RT-607A. **25,900 ± 500** $\delta^{13}C = -3.2‰$
Calcite nodules (Natl Grid Ref 1286-0591).

RT-607B. **21,900 ± 300** $\delta^{13}C = -3.3‰$
Calcite nodules (Natl Grid Ref 1286-0591).

16,100 ± 270
RT-607D. $\delta^{13}C = -1‰$

Calcite nodules (Natl Grid Ref 1308-0575).

> 35,000
RT-608A. $\delta^{13}C = -1.0‰$

Calcite nodules (Natl Grid Ref 1264-0614).

> 35,000
RT-608B. $\delta^{13}C = -0.7‰$

Calcite nodules (Natl Grid Ref 1264-0614).

9300 ± 100
RT-608C. $\delta^{13}C = -2.4‰$

Calcite nodules (Natl Grid Ref 1264-0614).

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