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A Radiocarbon Sequence for Samoan Prehistory and the Pulemelei Mound

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Abstract

We examine radiocarbon dates from Samoan archaeological sites using the fourfold division of Samoan prehistory established by Green (2002). The context of dating samples was assessed to recognize potentially "reliable" determinations in the Samoan ^{14}C corpus. Radiocarbon dates associated with earth and stone structures were identified to one of four phases of construction/use to develop a chronology for the emergence and use of domestic and monumental architecture. The 17 radiocarbon determinations from the Pulemelei mound site were used to generate a local prehistoric sequence for the Letolo area. In general the results parallel the prehistoric sequence for Samoa, but the chronology of the Pulemelei mound demonstrates that monumental architecture in West Polynesia can have a complicated developmental history spanning several centuries.

The first radiocarbon dates from the Central Pacific were obtained from Fiji by Edward Gifford (1951), and it was not until the 1960s that the first ^{14}C determinations from Samoa, on archaeological samples collected by Golson in 1957 (Golson 1969a), showed that Polynesian pottery had an antiquity of at least 2000 years (Grant Taylor and Rafter 1963; Green and Davidson 1965). Subsequent archaeological work resulted in radiocarbon dates from significant investigations published by Green and Davidson (1969, 1974a), and Jennings and colleagues (1976, 1980).

From 2002 to 2004 excavations by the authors at the Pulemelei mound site on Savai'i provided new radiocarbon dates relating to the extensive prehistoric structures and features that had been mapped in the Letolo Plantation in the 1970s (Jennings *et al.* 1982). The radiocarbon results from earlier and recent archaeological projects provide the data to construct a prehistoric sequence, particularly of the last 1000 years when large mounds emerged. We have not included determinations from American Samoa as the prehistoric sequence of the small islands appears to differ from that of Samoa, particularly the absence of monumental mounds, and possibility that pottery manufacture lasted longer in American Samoa than it did in Samoa (Clark 1996; Green 2002).

In previous research Samoan prehistory has been viewed as an aperiodic cultural succession (Green and Davidson 1974a). However, the development of the settlement pattern in prehistoric Samoa, which has chronological connotations, has recently been suggested by Green (2002:134-146).

1. Initial settlement represented by distinctive Lapita ceramics;
2. Settlement patterns during the period when Polynesian plainware was produced;
3. The interval when evidence of the settlement pattern is extremely limited (the so called 'Dark Age');
4. Late prehistoric settlement patterns marked by the construction of earth and stone structures.

Green's settlement sequencing is based on evidence of the use of pottery with patterns/no patterns, use of pottery/no pottery, the apparent absence of settlements activities, and the use of large stone and earth mounds. Tied to the discussion are various dates presented for the changes in the settlement pattern.

To date 89 ^{14}C determinations (Table 1) have been reported for Samoa by Green and Davidson (1974b:214-5), Jennings and Holmer (1980:7-10), and from our investigations at the Pulemelei mound (Martinsson-Wallin *et al.* 2003, 2005; see Martinsson-Wallin *et al.*, this publication). In this paper we outline the Samoan radiocarbon sequence. Following the discussion of radiocarbon dates for Samoa as a whole, we discuss the dated samples from the Pulemelei mound site to construct a detailed chronology for the Letolo Plantation.

Site Location

Radiocarbon assays have been obtained for archaeological sites on Upolu, Savai'i, and Manono. The excavated sites are listed (see Martinsson-Wallin this publication, Table 2). Many additional sites are known, but have yet to receive archaeological excavation (e.g. Green and Davidson 1969, 1974a). The intention of archaeological programs in the 1960s and 1970s was to investigate a range of coastal and inland sites (Green 1969a:3-11). The investigation of inland sites include prehistoric deposits and structures from the Falefa Valley on Upolu, and the Letolo area on Savai'i, in addition to prehistoric and historic settlements at Mt Olo and Luatuanu'u on Upolu. Coastal sites have been investigated at Vailele, Faleasi'u and Lotufaga on Upolu, and on Manono and Apolima (Green and Davidson 1969, 1974a; Jennings *et al.* 1976, 1980).

Methodology

All charcoal samples reported here have been calibrated using CALIB (Version 5.0.1, 1986-2005 based on Stuiver and Reimer 1993), with the Southern hemisphere correction

Table 1. Samoan Radiocarbon dates

Site	Lab. No.	Age B.P.	Age (1 SIGMA)	Age (2 SIGMA)	Find Context	Material
SU-Fo-2	GaK-1197	180±70	AD 1672-1713, 1717-1745, 1830-1891, 1921-1951	AD 1654-1952	Oven in corner of square house on terrace	Charcoal
SU-Le-12	NZ-1430	184±75	AD 1670-1712, 1718-1749, 1751-1782, 1835-1950	AD 1644-1953	Posthole 2, perimeter house 1, sq G-5	Charcoal
SU-Le-12	NZ-1432	188±54	AD 1670-1710, 1720-1783, 1854-1880, 1924-1950	AD 1658-1819, 1823-1900, 1904-1951	Posthole 2, perimeter house 1, sq D-6	Charcoal
SU-Vg-1	GaK-499	200±100	AD 1654-1713, 1718-1814, 1835-1951	AD 1509-1580, 1620-1954	Inside umuti, age uncertainty estimated to ±100	Charcoal
SS-01-B-16	GaK-1201	210±100	AD 1648-1712, 1718-1814, 1835-1891, 1922-1951	AD 1507-1586, 1618-1954	Oven 2, house site 1, sq B-5	Charcoal
SU-Fo-1	GaK-1436	210±70	AD 1651-1708, 1721-1810, 1837-1950	AD 1626-1953	Rectangular pit on platform	Charcoal
SU-Va-1	GaK-501	220±70	AD 1646-1701, 1721-1810, 1837-1950	AD 1513-1545, 1623-1952	Firepit on platform lyer 1b	Charcoal
SU-Lu-21	GaK-498	230±70	AD 1640-1706, 1721-1810, 1837-1950	AD 1511-1572, 1622-1952	Oven off terrace	Charcoal
SU-Se-1	NZ-360	240±50	AD 1640-1690, 1727-1805	AD 1513-1544, 1623-1817, 1827-1893, 1916-1951	Charcoal from fire lens on platform	Charcoal
SuMu-165	RL-460	270±110	AD 1502-1593, 1613-1699, 1723-1809, 1838-1950	AD 1477-1819, 1823-1900, 1903-1951	Within stone fill of Cog mound	Charcoal
SU-128	UGa-1988	285±55	AD 1511-1549, 1622-1674, 174-1797	AD 1478-1699, 1722-1809	Ma'a Ti, earliest of 4 ovens at site	Charcoal
SU-Le-12	NZ-1434	286±91	AD 1499-1598, 1610-1685, 1729-1803	AD 1459-1815, 1829-1892, 1920-1951	Large post, layer 3 sq F-6	Charcoal
SuMu-48	RL-458	290±70	AD 1507-1586, 1618-1674, 1739-1798	AD 1460-1709, 1720-1811, 1837-1951	From bottom of earth oven, Janet's Oven	Charcoal
SS-Le-1	ANU-11890	310±90	AD 1495-1672, 1743-1797	AD 1449-1712, 1718-1813, 1836-1884, 1888-1951	Pulemelei mound, top platform	Charcoal
SU-Lam-1	GaK-1437	350±100	AD 1457-1655	AD 1421-1709, 1720-1811, 1837-1879, 1924-1951	Layer 1, pit or posthole sq B, Subsq H-5	Charcoal
SU17-484	UGa-1992	365±70	AD 1494-1633	AD 1441-1671, 1746-1796	Apulu HHU. From posthole in platform 4	Charcoal
SuMu-188	RL-462	370±110	AD 1450-1652	AD 1404-1710, 1720-1811, 1854-1880, 1924-1951	Earth oven fill, 60 cm from surface, Green Ti	Charcoal
SS-Le-1	Wk-13866	372±43	AD 1496-1521, 1536-1626	AD 1462-1637	Pulemelei, Umu Ti	Charcoal
SU-Le-12	NZ-1428	401±104	AD 1452-1629	AD 1391-1697, 1724-1808	Posthole in west baulk layer 3 sq F-6	Charcoal
SuMu-128	UGa-1987	440±60	AD 1438-1509, 1580-1620	AD 1425-1630	Ma'a Ti, latest of 4 earth oven at site	Charcoal
SuMu-165	RL-461	440±100	AD 1431-1515, 1540-1625	AD 1321-1348, 1387-1672	Within stone rubble fill of Cog mound	Charcoal (palm)
SS-Le-1	Wk-13867	454±46	AD 1437-1500, 1597-1611	AD 1418-1514, 1542-1624	Pulemelei	Charcoal
SU-Fo-1	GaK-1434	470±180	AD 1315-1356, 1381-1656	AD 1270-1817, 1827-1894, 1910-1951	Posthole 87, house II, house site 1, sq D-5	Charcoal
ss13-91	UGa-1672	485±125	AD 1395-1519, 1537-1625	AD 1285-1673, 1743-1797	Earth oven from Sapapali'i	Charcoal
ss13127	UGa-1673	510±60	AD 1402-1476	AD 1321-1348, 1387-1511, 1573-1621	Earth oven from Sapapali'i	Charcoal
SU17-193	Uga-1487	565±60	AD 1329-1336, 1391-1447	AD 1300-1368, 1373-1463	Earth oven, Cog Mound complex	Charcoal
SS-Le-1	Wk-15503	657±34	AD 1313-1358, 1380-1395	AD 1298-1401	Pulemelei, Under N-Mound	Charcoal
SS-Le-1	Beta-177607	680±80	AD 1294-1392	AD 1229-1250, 1260-1434	Pulemelei, Scattered in TP	Charcoal
SU-Va-1	GaK-500	680±80	AD 1294-1392	AD 1229-1250, 1260-1434	Oven, base layer Ivb step 1 (north)	Charcoal
SU-Lo-1	GaK-497	735±85	AD 1235-1328, 1338-1390	AD 1184-1415	Oven, layer V sq B-2, excavation B	Charcoal
SU-Fo-2	GaK-1196	740±100	AD 1229-1251, 1260-1328, 1338-1390	AD 1152-1435	Umu Ti at rear of terrace	Charcoal
SM17-2	UGa-2209	805±65	AD 1501-1633	AD 1453-1680	Falemoa, Stratum IV, below platform comp Uga-2211	Charcoal
SS-Sp-15	GaK-1202	750±80	AD 1229-1251, 1260-1320, 1350-1386	AD 1182-1405	Umu Ti in association with house platform	Charcoal
SS-Le-1	Wk-13865	754±59	AD 1233-1245, 1264-1316, 1355-1382	AD 1219-1391	Pulemelei, Charcoal cons. N-side	Charcoal
SU-Vam-3	GaK-1195	760±100	AD 1219-1323, 1346-1388	AD 1051-1077, 1147-1423	Oven associated with house site	Charcoal

Site	Lab. No.	Age B.P.	Age (1 SIGMA)	Age (2 SIGMA)	Find Context	Material
SS-Le-1	ANU-11891	780±120	AD 1184-1324, 1344-1389	AD 1042-1092, 1099-1419	Pulemelei, Umu at E-side	Charcoal
SU-Va-2	GaK-502	850±70	AD 1164-1280	AD 1044-1089, 1104-1304	Lens on surface of layer 2, sq B-6	Charcoal
SS-Le-1	Beta-172927	850±50	AD 1190-1273	AD 1053-1072, 1149-1291	Pulemelei, Charcoal conc.SW side	Charcoal
SU-Va-3	GaK-503	865±70	AD 1160-1274	AD 1042-1093, 1098-1294	Firepit at base of layer 5a, Sq C-5	Charcoal
SU-Le-12	NZ-1429	881±120	AD 1046-1086, 1109-1282	AD 988-1326, 1341-1390	Charcoal on interface layer 4 and natural sq C-3	Charcoal
SU-Le-12	GaK-1442	890±80	AD 1052-1076, 1148-1270	AD 1028-1288	Layer 1, sq F-5	Charcoal
SS-01-C-1	GaK-1200	890±70	AD 1053-1072, 1149-1269	AD 1040-1281	Firepit in houseplatform	Charcoal
SS-Le-1	Wk-13864	900±43	AD 1054-1060, 1150-1228	AD 1046-1085, 1110-1272	Pulemelei, Charcoal scatter on original surface S-side	Charcoal
SU-Va-4	NZ-855	927±241	AD 899-1316, 1355-1382	AD 656-1462	Fire hearth sealed under clay band on top of layer F-1a	Charcoal
SU17-483	UGa-1986	945±60	AD 1046-1086, 1109-1208	AD 1023-1230, 1249-1261	Apulu, from fill of shallow basin beneath stone piles	Charcoal
SS-Le-1	Wk-16642	955±44	AD 1045-1086, 1108-1121, 1128-1182	AD 1033-1211	Pulemelei, umu at S-side	Charcoal
SS-Le-PT	Wk-15504	992±34	AD 1036-1052, 1076-1148	AD 1023-1162, 1170-1175	Pa Tonga, Letolo plantation Original surface	Charcoal
SU-Lam-1	GaK-1438	1050±80	AD 983-1054, 1061-1150	AD 890-1209	Layer II, level 3 sq C subsq G-3	Charcoal
SU17-130	UGa-1985	1115±75	AD 887-1040	AD 779-793, 802-1053, 1062-1149	Tulaga Fale, from fire basin under platform?	Charcoal
SS-Le-1	Wk-15502	1134±37	AD 898-921, 944-994, 1009-1011	AD 891-1021	Pulemelei, scattered at original surface W-entrance	Charcoal
SS-Le-1	Wk-16640	1135±34	AD 898-920, 945-994	AD 894-1018	Pulemelei, Umu under Pulemelei mound	Charcoal
SuMu-165	RL-459	1150±110	AD 780-793, 803-1029	AD 688-1152	Bottom of fire basin beside Cog mound	Charcoal
SS-Le-1	Wk-13869	1157±44	AD 895-927, 934-987	AD 783-788, 814-843, 860-1022	Pulemelei, Umu, W-side	Charcoal
SU17-483	UGa-1990	1205±70	AD 782-848, 853-975	AD 694-748, 765-1017	From bottom of storage pit, Apulu platform	Charcoal
SS-Le-1	Beta-172928	1250±100	AD 709-747, 766-900, 918-961	AD 659-1016	Pulemelei, Umu at S-side	Charcoal
SU-Fo-1	GaK-1435	1410±100	AD 569-780, 793-803	AD 434-523, 526-898, 921-943	Brown layer under terrace sq D-11, house site 2	Charcoal
SU-Le-12	GaK-1443	1410±80	AD 608-725, 738-771	AD 549-875	Surface of layer 7, sq F-6	Charcoal
SU-Lu-41	GaK-799	1500±80	AD 537-666	AD 424-711, 746-766	Layer, cutting VIII	Charcoal
SM17-2	UGa-2210	1565±60	AD 816-972	AD 737-1026	Falemoa, Stratum II (probably too young)	Shell
SU-Va-38	GaK-1439	1550±80	AD 441-485, 532-644	AD 397-671	Firepit under mound layer 14	Charcoal
SU-Va-4	GaK-1693	1600±350	AD 88-829, 837-865	BC 356-286, BC 253-1179 AD	Oven toward base layer E, sq A-1	Charcoal
SU17-552	UGa-1991	1620±65	AD 424-560	AD 349-368, 379-637	From base of star mound	Charcoal
SU-Lu-53	GaK-1340	1660±80	AD 358-365, 381-556	AD 255-610	Agricultural activity layer 2, rectangle A-2	Charcoal
SU-Va-4	GaK-1198	1660±80	AD 358-365, 381-556	AD 255-610	Lens at base of layer F-1	Charcoal
SU-Va-4	GaK-1199	1680±80	AD 345-372, 376-539	AD 243-600	Cooking pit, Hearth Horizon	Charcoal
SM17-1	NZ-4342B/ UGa-1485	1752±37	AD 655-740	AD 613-792	Potusa, Stratum II, Pooled sample with UGa-1485	Shell
SU-Sa-3	GaK-1341	1800±80	AD 179-188, 213-404	AD 81-437, 488-512, 516-529	Layer 4, level 2, sq F-6	Charcoal
SU-Sa-3	GaK-1441	1840±100	AD 128-352, 367-380	AD 5-13, 16-439, 486-531	Layer 5, sq I-6	Charcoal
SU-Va-1	NZ-362	1850±50	AD 134-259, 297-320	AD 87-105, 121-360, 363-381	Bottom part of layer V	Charcoal
SU-Va-1	NZ-361	1880±60	AD 89-101, 123-255, 305-313	AD 58-349, 368-378	Top part of layer V	Charcoal
SU-Va-1	NZ-363	1950±120	BC 39-7, BC 5-251 AD	BC 175-406 AD	Pit sealed by layer V	Charcoal
SM17-2	UGa-2208	2020±55	AD 360-521	AD 272-578	Falemoa, Stratum III	Shell
SM17-2	UGa-2211	2030±60	AD 341-515	AD 259-580	Falemoa, Stratum IV, surface of platform	Shell
SS-Le-1	Wk-13868	1993±55	AD 1-129	BC 51-227 AD	Pulemelei, Umu at plain ware site	Charcoal
SS-Le-1	Wk-15501	2058±38	BC 45-32 AD, AD 36-52	BC 156-138, BC 113-82 AD	Pulemelei, Umu at plain ware site	Charcoal

Site	Lab. No.	Age B.P.	Age (1 SIGMA)	Age (2 SIGMA)	Find Context	Material
SU18-1	RL-478	2130±130	AD 138-477	AD 4-608	Janes Camp, Stratum III, Test 1	Shell
SU-Va-4	GaK-1194	2150±100	BC 349-314, BC 208-17 AD	BC 385-80 AD	Hearth Horizon sq N-2	Charcoal
SU18-1	RL-481	2220±120	AD 58-351	BC 108-492 AD	Janes Camp, Stratum IV, Test 2	Shell
SU18-1	RL-464	2220±110	AD 69-340	BC 84-463 AD	Janes Camp, Stratum II, probably too young	Tridacna shell
SU-Lu-53	GaK-1339	2170±100	BC 353-293, 230-218, 214-37, 28-2	BC 387-64 AD	Firepit on surface layer 1, under terrace	Charcoal
SM17-2	UGa-1484	2260±65	AD 72-240	BC 20-332 AD	Falemoa, Stratum II, Same as NZ-4343	Tridacna shell
SU-Le-12	GaK-1444	2210±100	BC 358-277, 258-242, 238-90, 71-59	BC 398-28 AD, AD 39-49	Pit, layer 5b, sq F-7	Charcoal
SU-Mf	NZ-1959	2475±63	BC 192-11	BC 314-60 AD	Lapita site Mulifanua, Latest phase	Marine
SU18-1	RL-477	2510±120	BC 324-21	BC 440-152 AD	Janes Camp, Stratum IV, "unacceptable old"	Shell
SM17-2	NZ-4343B	2540±40	BC 285-277, 270-116	BC 339-60	Falemoa, Stratum II, same sample as UGa-1484	Tridacna shell
SU18-1	NZ-2726/ 7/8B	2561±28	BC 298-167	BC 343-112	Janes Camp, Stratum II, Interpolated, 3 from same shell	Tridacna shell
SU-Mf	NZA-4780	2788±67	BC 597-383	BC 727-351	Lapita site Mulifanua	Marine turtle
SU-Mf	NZA-5800	3062±66	BC 901-764	BC 1018-699, 677-665	Lapita site Mulifanua	Shell
SU-Mf	NZ-1958	3251±155	BC 1252-870	BC 1448-730	Lapita site Mulifanua, Base of coquina layer sealing deposit	Shell/ coral

data set (SHCal04, McCormac *et al.* 2004). Marine shell determinations were calibrated with the marine correction data of Hughen *et al.* (2004). The local marine reservoir value (Delta R) was set at 57 ± 23 years. This value was calculated on a marine shell collected from Upolu (Phelan 1999), and was also used by Petchey (2001) when calibrating marine shell dates from the Mulifanua Lapita site. A recent examination of selected Samoan marine shell samples by Smith (2002:93-125) employed a slightly lower Delta R value of 45 ± 30 years. Although neither Delta R value makes much difference to the calibrated results, there are also a few inconsistencies in the conventional radiocarbon ages (CRA) values from Samoa reported by Smith (2002:110), which affect the interpretation and discussion of radiocarbon results from the Jane's Camp site (see below). All calibrated dates are reported at two standard deviations.

Determinations on marine shell samples (NZ-4342B/ UGa-1485 and NZ-2726/7/8B) have been pooled when dating of the same marine shell gave similar CRAs. Some radiocarbon ages which do not appear to convincingly date prehistoric cultural activity have been excluded from Table 1, as have dates with modern calibrated ages. From the determinations reported by Jennings and Holmer (1980: 7-10), we reject UGa-1671 (14920 ± 175 BP), which is too old considering the generally accepted chronology of human entry to West Polynesia at 900 BC (Burley and Dickinson 2001), and RL-479 (3220 ± 130 BP), as it is not convincingly associated with prehistoric cultural activity, along with a modern result UGa-1486 (35 ± 70 BP). Among the dates reported by Green and Davidson (1974b) the following modern results (no CRAs reported) were excluded: GaK-1342, which was a contaminated charcoal sample, while NZ-1427 and NZ-1431 were on post wood from a recent house. NZ-854 has a reported CRA of 352 BP, but no standard errors were given and it was excluded from our analysis.

A problem with some of the Samoan radiocarbon samples are that 31 samples were carried out by the Gakushuin Laboratory in Tokyo. It has been argued that dates up to c. GaK-4500 may be erroneous (Spriggs and Anderson 1993:207). However, these dates are included here, since they seem to give similar dates to other laboratories concerning what they are expected to date.

Radiocarbon dating of settlements and stone/earth structures

Prehistoric settlements consisting of structures built in earth and stone can be difficult to date accurately with radiocarbon, and ^{14}C samples were evaluated according to whether or not they had a clearly identified archaeological context.

In situ fireplaces and earth ovens are prehistoric features that should provide relatively reliable radiocarbon determinations on wood charcoal. In both cases the burned wood derives from a localized feature that was constructed by prehistoric people, which links the sample to a specific action taking place over a short timeframe. The reuse of ovens and burning of old wood can result in CRA ages that are too early, but the multiple use of fireplaces and ovens can often be detected during excavation, as can the burning of old wood from charcoal identification, as well as the

submission of several ^{14}C samples from different parts of the same fire place/earth oven.

In Samoa, earth ovens (*umu*) and fireplaces provide charcoal and radiocarbon results that should accurately date prehistoric activity. Archaeological excavations, though, often recover ^{14}C samples from scattered charcoal or thin charcoal lenses. Radiocarbon dates on scattered charcoal and charcoal obtained from fill material should always be viewed with scepticism, which makes the dating of structures made from earth and stone fill particularly difficult.

Food remains, such as bone and marine shell, found within sealed contexts can provide accurate radiocarbon ages, when the remains were recovered from a clearly defined cultural layer. However, old marine shells, that would supply earlier dates than the cultural activity they were associated with, may be introduced from the selection of old shells for tool manufacture, or the incorporation of old shell in beach fill used for structure construction. Introduction of modern and ancient gastropod shell to Pacific archaeological sites from hermit crab (genus *Coenobita*) activity can be identified from characteristic aperture damage, so that crab-transported marine shell is not selected as a dating sample (e.g. Carucci 1992).

When dating stone structures the context of the sample is of central importance, and it is necessary to evaluate whether a sample relates to one of four temporally distinct phases of activity during the life-history of a structure. A radiocarbon dating sample associated with a prehistoric structure may have been deposited:

1. prior to structure construction;
2. during building of a structure;
3. from structure use;
4. after a structure ceased to be used for its original purpose.

Phase 1 samples might be a cultural layer or feature sealed found beneath a built structure, and could include evidence for prehistoric activity that predated structure construction, such as low-density scatters of material culture and dispersed charcoal from vegetation burning prior to building. Phase 2 samples could result from ritual activity such as fires and sacrifices made during construction, which have been preserved within the matrix of a structure (Martinsson-Wallin *et al.* 1998:6). Phase 3 samples, depending on structure function, could be residential or ritual debris including, ovens, middens, caches and fireplaces that were deposited after structure completion, or from subsequent episodes of structure rebuilding/refurbishing/elaboration. In West Polynesia the majority of archaeological structures are building foundations, and the insertion of posts and other structural elements into a foundation (Phase 2) could introduce materials that could be difficult to identify from Phase 3 remains. Phase 4 samples could consist of dateable materials found in surface and near surface contexts, including modern graves, fireplaces and remains introduced by visitors and from recent ceremonies, archaeological restoration and other heritage/scientific work (Wallin and Solsvik 2006).

The Samoan radiocarbon samples were identified to a particular context, with 26 dates from earth ovens (*umu* and *umu tī*), seven dates from fireplaces/fire pits, nine dates from charcoal lenses/concentrations, six dates on dateable material found in postholes, and five dates from samples found in several types of pit (Table 1). There were 36 determinations on samples of dispersed charcoal, or on marine shell, coralline crust and bone recovered from a defined cultural layer. By material type, 74 radiocarbon dates were on charcoal, 13 results on marine shell, with one determination each on turtle bone and on coralline crust. None of the charcoal samples has been identified to species, and some samples may carry inbuilt age from the burning of wood from long-lived tree species.

Initial Lapita settlement – the Mulifanua site

The Samoan landscape has been radically transformed since initial human arrival and the changes have had a significant impact on the visibility and survival of the oldest archaeological sites. In 1973 the first, and so far only, Lapita site was found underwater during dredging at the Mulifanua Ferry Berth at the northwest point of Upolu. Characteristic Lapita dentate-stamped pottery was found underneath a cemented coralline crust about 2.2 m below current mean sea level. The depth below sea level of the Lapita remains suggests that the earliest coastal sites have now been submerged as a result of island subsidence (Dickinson and Green 1998). Another factor affecting the visibility of the earliest human activity was the relatively continuous volcanic activity during the late Holocene that in some areas had covered large areas of terrain with lava. Not only have lava flows destroyed prehistoric sites or placed them beyond the reach of conventional archaeological techniques, but Green (2002:132) also notes that widespread volcanism has probably affected the coastal and inland settlement pattern on Savai'i.

The fortuitous discovery of dentate pottery at Mulifanua showed that Lapita groups had managed to cross the 850 km sea gap separating Fiji from the island groups of the West Pacific, and also settled Tonga and Samoa, but not islands further east. As the Mulifanua site was underwater and radiocarbon samples came from marine material collected by the dredge, the cultural association of the samples and their ^{14}C ages has been queried (Green 1974; Green and Richards 1975; Poulsen 1987; Kirch and Hunt 1988; Leach and Green 1989; Petchey 1995; Clark 1996; Dickinson and Green 1998; Petchey 2001).

Four marine samples from Mulifanua have been dated, with one date on coralline crust, two dates on marine shell, and one date on turtle bone. The sample of the coralline crust gave a CRA of 2475 ± 63 BP (NZ-1959 BP) and it has a calibrated age of 314BC–60AD. The age of the underlying Lapita deposit must be earlier than the crust. Two determinations on marine shell are both thought to be from a midden deposit beneath the coralline crust, but they do not overlap at two standard deviations. The oldest determination

(NZ-1958) has a CRA of 3251 ± 155 BP, and a calibrated age of 1448-730BC, while NZA-4780 has a CRA of 2788 ± 67 BP and a calibrated age of 727-351BC (Petchey 2001). The fourth sample NZA-5800 (3062 ± 66 BP) on turtle bone has an age of 1018-665BC, which fits well with the Lapita radiocarbon chronology for Tonga (Steadman *et al.* 2002), and with the estimated age of the site from the stylistic affinities of the Mulifanua Lapita pottery (Petchey 1995; Summerhayes 2001). However, dates on turtle bone protein might incorporate an unknown marine contribution and the accuracy of NZA-5800 is uncertain. The precise age of the Mulifanua site and the antiquity of Lapita occupation in Samoa have yet to be definitively established.

Plainware Deposits: Coastal and Inland

Plainware pottery sites represent the success of Lapita settlers in colonizing Samoa, and in all probability the rapid growth of the human population. The decorated and shaped pots of the Lapita era quickly gave way to undecorated (plainware) ceramics with a simple vessel shape, indicating a move toward the manufacture of utilitarian containers (Holmer 1980; Smith 1976a). Currently, sites containing plainware pottery appear to date to 300-400BC, implying that Lapita vessels could have been made for about 400 years in Samoa, if colonization of the archipelago took place at 850BC (Petchey 2001). Since there are few sites dating to the first millennium BC the decline of the Lapita pottery tradition cannot be reliably dated, but it is possible that the transition from classic Lapita pottery to characteristic Samoan plainware ceramics was underway, and possibly almost complete, by 600-500BC.

There are 14 dates from coastal sites on Upolu containing undecorated ceramics that suggest a Plainware phase dating from 350BC–500AD. At several sites the age determinations cover a relatively wide interval considering site stratigraphy. At Jane's Camp RL-477 on marine shell (unidentified to species) is dated to 324-21BC (2510 ± 120 BP), while RL-464, also on marine shell (*Tridacna* sp.) has a calibrated age of 84BC-463AD (2220 ± 110 BP). The age difference may be due to post-depositional movement of midden shell between layers. A marine shell date (RL-479, 3220 ± 130 BP) from Stratum I/II returned a calibrated age of 3689-3005 BP, which is too early, and might indicate the incorporation of sub-fossil shell into the cultural deposit. The determination has been excluded from our analysis.

Two stratigraphic units can be distinguished in the Jane's Camp site from the available ^{14}C dates and layer descriptions given in Smith (1976b:62-64). Stratum I/II is dated to about 300BC-0AD, and Stratum III/IV has an approximate age of 0-500AD. Smith (2002) also distinguished the same two stratigraphic units, but her analysis of the radiocarbon dates gave calibrated ages that are several hundred years older than those suggested here. The reason for this appears to be that Smith (2002:110) included the early date (RL-479), in her analysis of ^{14}C dates, but excluded RL-464. Unfortunately, there is also some confusion between sample details given in her text, for example, the details for RL-478 and RL-477.

The Falemoa site on Manono (Lohse 1980, Jennings 1980) has a similar age distribution to Jane's Camp, with an early unit (Stratum I/II), dated to 200BC-200AD, and a late unit (Stratum III/IV) dated to 200-AD600. These two sites reveal a continuous occupation or possibly a series of repeated occupations interspersed by short periods of site abandonment. At the coastal sites of the Vailele area, SU-Va 1 (Golson 1969b) and SU-Va 4 (Terrell 1969) only one premound phase of occupation was present. At SU-Va-1 the premound occupation is dated to 50BC-350AD, and at SU-Va-4 the premound phase containing ceramics is dated to 250BC-50AD. These sites are quite close to one another in age, and they could indicate an early settlement in the area at 250BC-350AD, which covers the time when the two stratigraphic units identified at Jane's Camp and Falemoa were deposited.

Inland plainware sites or locations containing plain pottery have been recorded on Upolu and on Savai'i. The earliest inland site with pottery on Savai'i was found at Pulemelei, which dates to c. 100BC-AD200 (see below). On Upolu the earliest inland site is SU-Le-12 dated to 400BC-30AD, and another Upolu site (SU-Sa-3) is dated by two ^{14}C samples to 80-440AD. This might indicate that most inland sites represent a relatively limited phase of occupation when populations initially expanded and moved inland. However, the stratigraphic evidence from SU-Sa-3 on Upolu persuaded Green (1974:111-115) that there were probably four successive prehistoric occupations of plainware age.

Overall, radiocarbon ages indicate that plainware sites from coastal and inland areas were used for a period of 800-900 years from 350BC-500AD (Figure 1).

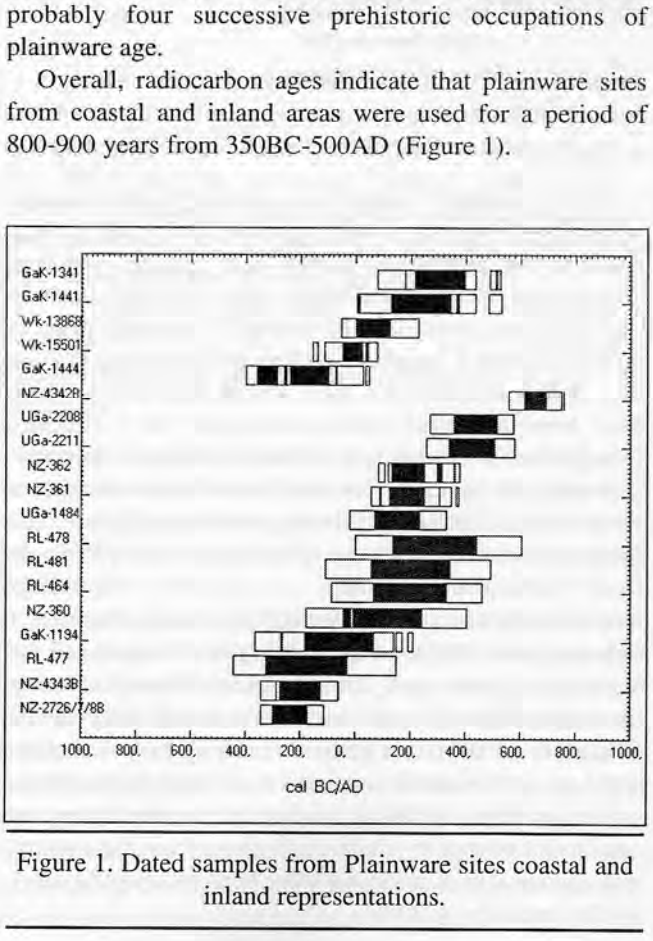

Figure 1. Dated samples from Plainware sites coastal and inland representations.

The "Dark Age" of Samoan Prehistory

The period 400-1000AD has been called the "Dark Age" of Samoan prehistory, from the limited archaeological evidence for prehistoric activity (Davidson 1979:94; Green 2002:140). It is an important period because it covers the span during which a distinctive Polynesian culture developed in Samoa. Near the beginning of the "Dark Age" pottery manufacture was abandoned in Samoa, and toward the end of the "Dark Age" West Polynesians began to move eastward into the uninhabited islands of East Polynesia. Furthermore, around 1000AD monumental architecture, comprising of raised platforms of stone and earth as well as walls, pavements and raised walkways, appear in West Polynesia representing the emergence of complex societies in the region.

With the end of pottery making and the absence of structures built in permanent materials that developed later, archaeological sites from the "Dark Age" are difficult to identify except from the results of radiocarbon dating. The ^{14}C dates for this period suggest it was far from being an archaeological "Dark Age", since there are 19 assays (Figure 2). By scrutinizing the archaeological remains found in association with the ^{14}C determinations we can extend our understanding of the prehistory of the "Dark Age".

Of the 19 radiocarbon determinations, seven were on samples derived from earth ovens and fireplaces, which we consider to be relatively reliable dating samples (GaK-1199, GaK-1439, Beta-172928, Wk-13869, RL-459, Wk-16640 and UGa-1985). One sample (UGa-1990) was from a storage pit, and seven samples (GaK-1198, GaK-1340, UGa-1991, GaK-799, GaK-1443, GaK-1435 and Wk-15502) are from more uncertain activities or possible clearing or agriculture etc.

We argue that the provenance of these samples is typical of the features and activities recorded from aceramic Polynesian sites in both West and East Polynesia. For example, dated samples from similar contexts have been recorded in East Polynesian settlements and agricultural features, and they also occur under *marae* structures (Wallin and Solsvik 2005). In these excavations prehistoric remains largely consist of earth ovens, 'storage pits', and scattered charcoal/lenses that are likely to originate from garden clearing, oven rake-out, and the burning of household debris (Wallin *et al.* 2004). In fact the context of dating samples reveals that the Samoan "Dark Age" may represent a typical Polynesian life style tied to domestic and horticultural activities.

Burley (1998:365) considers the term "Dark Age" to be misleading for Tonga, and has instead characterised the "Dark Age" as a formative stage prior to the emergence of the classical Tongan chiefdom. We believe the same also holds true on Samoa where the absence of pottery and the continued use of earth ovens and storage features signifies continuity in settlement, rather than social decline, as might be inferred from the term "Dark Age". The loss of pottery in Samoa and other parts of the Pacific has been extensively discussed, but there is little reason to assume that a decline in the manufacture of a utilitarian container represents a radical technological event that correlates with substantial change to the prehistoric economy or transformation of social relations. An alternative explanation is that the labour expended on domestic pottery manufacture was gradually transferred to the production of commodities, like mats and *tapa* cloth, used in economic and ceremonial exchange (see also Crown and Wills 1995).

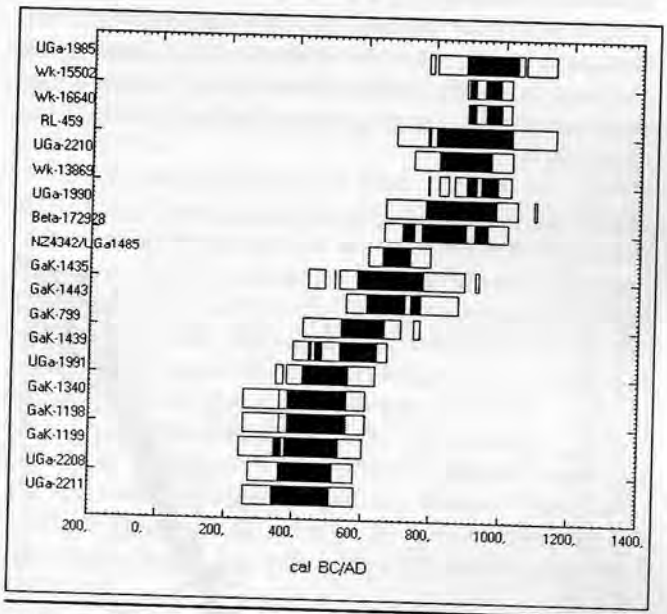

Figure 2. Dated samples from the Samoan "Dark Ages".

Late Prehistoric Settlement

There are 32 ^{14}C determinations associated with the remains of built structures such as terraces, pavements and mounds. The dating samples were recovered from beneath a structure, on the ground surface over which a structure was built, and inside the matrix of a structure, as well as from the surface of built features (Figure 3).

One result with an early CRA of 2170 ± 100 BP (GaK-1339 BP) has a calibrated age of 387BC–AD64. However, the sample was from a fire pit found under a terrace and clearly predates terrace construction. Ten samples have calibrated ages that fall within the span AD350-1050 (UGa-1991, GaK-1439, GaK-1435, Beta-172928, UGa-1990, Wk-13869, RL-459, Wk-16640, Wk-15502, UGa-1985) and belong to the "Dark Age", and are described in that section. The context of these samples is from beneath platforms/mounds, which shows that the structures must have been constructed after the feature was used, but the important question about the amount of time separating the two construction events cannot be answered.

Eleven samples are linked to monuments/monumental architecture. These samples were collected from the palaeoground surface close to stone foundations, and in one case from a fire pit under a mound. The samples have calibrated ages ranging from AD1025-1400 (Wk-15504, Wk-16642, Wk-13864, GaK-1200, Beta-172927, ANU-

11891, UGa-2209, Wk-13865, Beta-177607, Wk-15503, UGa-1487). It is probable that monumental structures in Samoa were first constructed within this temporal range as Davidson (1979:94) has previously suggested. Ten additional samples appear to date the construction, use and reuse of prehistoric structures, and were collected from within the stone fill, from postholes in platforms/mounds, and from fire pits and ovens dug into, or found on the surface of platforms/mounds (Wk-13867, RL-461, UGa-1992, ANU-11890, RL-460, NZ-360, GaK-498, GaK-501, GaK-1436, GaK-1197). The ^{14}C dates indicate ongoing use and reuse of structures from 1400-1800AD, which is also when star mounds appear to have been built (Herdrich and Clark 1993).

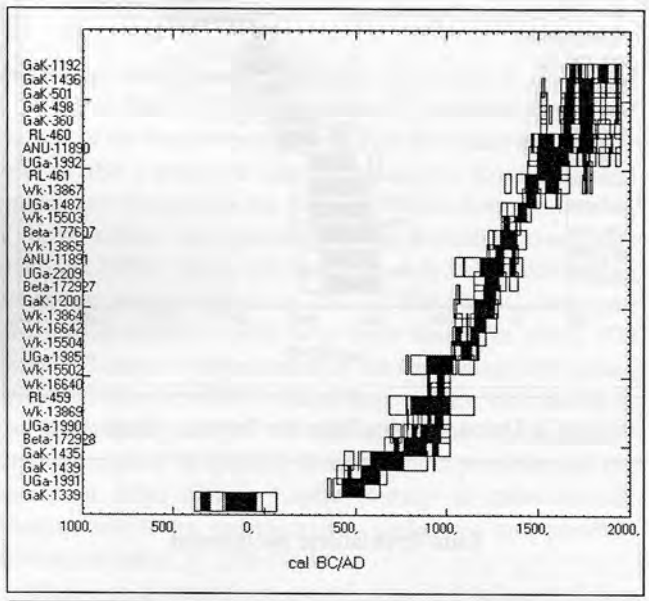

Figure 3. Dated samples from the Late prehistoric settlement and dates associated to stone structures.

Umu tī

Large raised-rim ovens with a diameter between 3 m and 15 m have been recorded in several prehistoric settlements in Samoa. The ovens are usually interpreted by local informants as *umu tī*, and according to tradition, were used for cooking the root of the *tī* plant (*Cordyline fruticosa*). Cooked at a high temperature, the root transforms from something inedible to edible and through this metamorphosis it may have contributed to ritual ceremonies (Carson 2002:347, Buck 1930:136 and Ehrlich 2000:371-400).

Seven structures interpreted as *umu tī* have been excavated in Samoa, and they have been dated with ten radiocarbon determinations (Figure 4). An *umu tī* from Mt Olo (*called Ma'a ti*) showed several phases of use (Jackmond 1980:51). A sample from the earliest phase produced a CRA of 285 ± 55 BP (UGa-1988) and a sample from the most recent phase had a CRA of 440 ± 100 BP (UGa-1987). The inversion of the dates may indicate that UGa-1987 was on old wood, or perhaps that prior to dating the sample/provenance information for the two samples was switched by accident in the field or laboratory. If old wood is responsible for the inversion then the age of the *umu tī* is likely to be closer to the calibrated UGa-1988 determination of 1478-1699AD.

Two determinations have a relatively early age indicating construction of *umu tī* in the period 1200-1400AD (GaK-1196, BP 740 ± 100 and GaK-1202, 750 ± 80 BP), while remaining ages for *umu tī* are later around 1400-1800AD (Figure 4).

Umu tī are clearly associated with late prehistoric settlement in Samoa. The location of *umu tī* indicates an association with platform features, such as large-to-medium sized mounds, walls and walkways, as seen for example in the Letolo plantation, and sometimes occur within household units (Jackmond 1977-78; Jennings *et al.* 1982).

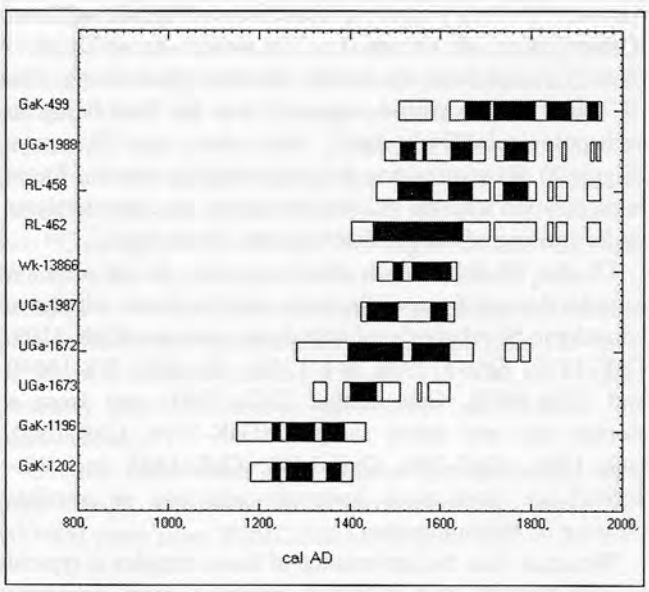

Figure 4. Dated samples from *Umu tī* ovens.

Defence structures

There are only two ^{14}C dates on samples found in possible association with defensive structures. One sample came from charcoal found under a wall at the inland fortification of Luatuanu'u on Upolu. The result has a calibrated age of 550-750AD (GaK-799, 1500 ± 80 BP), and may derive from earlier activity that was not associated with the fortification. The other sample is from scattered charcoal found 90 cm below the current ground surface at the base of the stone wall known as the "Pa Tonga" in the Letolo Plantation, north of the Pulemelei mound (Brødholt and Vuijsters 2004). The sample, Wk-15504 (992 ± 39 BP) gave a calibrated age of 1025-1175AD. The stone wall is aligned east-west and extends between two river streams. The wall was 2.44 m high in the 1960s and may have been for defence (Scott 1969:77), but could be a boundary marker dividing coastal from inland districts (Green 2002). The ^{14}C sample collected from the base of the wall might derive

from vegetation burning during clearing of the area prior to settlement. If so, the wall could have been built soon after 1023-1175AD.

Although the association of both radiocarbon results with a defensive structure is problematic, as is the identification of a structure as serving a defensive function, the construction of fortifications and the "Pa Tonga" wall indicate that changes to Samoan society were taking place that required the creation of new types of built structure. Further dating of these "defensive" structures is required to establish if defensive/boundary structures were made soon after the "Dark Age" or were a more recent phenomenon.

Pulemelei Radiocarbon Chronology

A fundamental aim of our archaeological investigations at the Pulemelei mound site was to obtain radiocarbon dates for an absolute chronology for the emergence of monumental architecture in Samoa, as none of the largest mounds on Upolu and Savai'i had ever been ^{14}C dated. A total of 17 ^{14}C determinations on charcoal samples have been obtained for the Pulemelei site. Individual age results have been mentioned, when relevant, in the chronological outline of the Samoan sequence presented above, but here we use the dates to construct a local sequence for prehistoric human activity in the Letolo Plantation that begins around 2000 years ago, and ends with the final event associated with the construction of the Pulemelei mound in the 17th century AD (Figure 5).

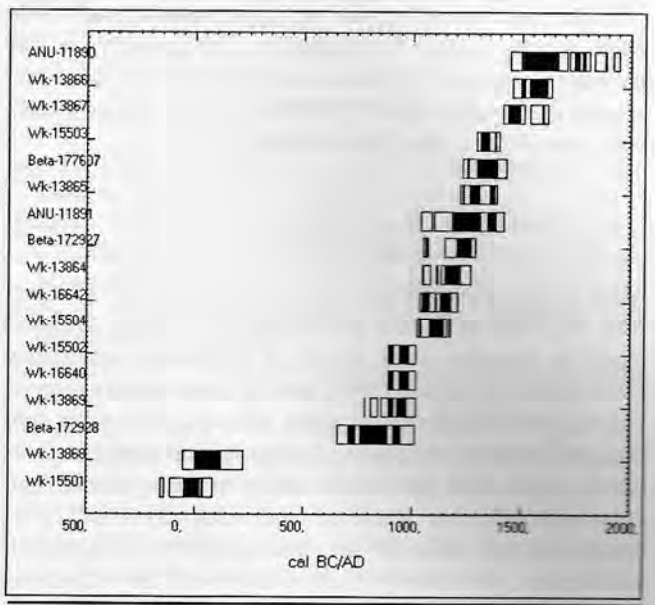

Figure 5. Multiplot of the radiocarbon assays from the Pulemelei site.

Initial settlement and abandonment

The two earliest dates of 1993 ± 55 BP (Wk-13868) and 2058 ± 38 BP (Wk-15501) are from the earliest settlement/horticulture activity in the area that involved the use of plainware pottery. The dates are not associated with the construction of mounds, platforms, or pavements. Both samples derive from the base of a large earth oven that also contained pottery and non-pottery artefacts (Clark and Martinsson-Wallin this publication). The oven was located on the south side of the Pulemelei mound on a natural terrace formed by the accumulation of clayey soil lying against and over a low volcanic outcrop. The two calibrated dates indicate inland settlement in the period 150BC-200AD. A few small plainware sherds were also found in test pits and trenches with ovens/scattered charcoal dated to c. 1150AD, but we believe the pottery from these contexts to be intrusive.

No ^{14}C determinations are from the 500-year period 200-700AD, despite numerous investigations in the vicinity of the mound. The absence of dates suggests there may have been limited use or abandonment of the inland Letolo area during this time. Large-scale archaeological investigations and more ^{14}C dates are required to determine whether the absence of human settlement at Letolo in the "Dark Age" is genuine. Another way to find out more about this would be with a palaeoenvironmental study. For example, palaeoecological investigation has shown that human impact on the vegetation continued through the Tongan "Dark Ages" (Fall 2005), despite the relative absence of archaeological sites dating to the first millennium AD (Burley and Clark 2003:246).

The apparent temporal cessation in human activity of the Pulemelei area from 200-700AD is similar to that noted at Vailele on Upolu, where pottery and other occupation debris predated the construction of several earth mounds by several centuries (Green 1969b). Elsewhere in Samoa there are only two ^{14}C dates from Vailele that might connect premound settlement with mound construction (Table 1, and see also Terrell 1969:165, Figure 69), but the dates have large standard errors (NZ-855, 927 ± 241 BP and Gak 1693, 1600 ± 350 BP), and they do not constitute secure evidence for continuity between premound occupation and the late prehistoric settlements constructed with durable materials. As yet there is no archaeological site in Samoa which has a continuous prehistoric sequence illustrating the development of the "traditional" Samoan settlement pattern from a cultural precursor.

Renewed activity

During the second half of the Samoan "Dark Age" (700-1000AD) there is stronger evidence for human activity in the Pulemelei area. Three ^{14}C charcoal determinations (Beta-172928, 1250 ± 100 BP, Wk-13869, 1157 ± 44 BP, and Wk-16640, 1135 ± 34 BP) were from earth ovens containing abundant charcoal and fire-damaged fist-sized stones. A fourth result (Wk-15502, 1134 ± 37 BP) was collected from a scatter of charcoal found on the west side of the mound at the same level as the earth oven dated by Wk-13869, which has a similar CRA of 1157 ± 44 BP.

The sample dated by Wk-16640 has a calibrated age of 894-1021AD and was from an earth oven found under the

Pulemelei mound. The earth oven had been dug into the ground surface prior to construction of the base platform. The major platform components of the Pulemelei mound cannot have been built, therefore, earlier than about 1000AD, although the small mound identified in the geophysical survey might be older, if it is anthropic and not a natural feature (see Chapter 4).

Initial mound building

There are six determinations from the Pulemelei mound and nearby structures and features that are interpreted as dating phases of construction/use. The dates fall within the period 1030-1440AD, and demonstrate activity on all four sides of the mound. Two of the charcoal samples were from earth ovens (ANU-11891, 780 ± 120 BP and Wk-16642, 955 ± 44 BP), and two were on charcoal concentrations found close to the base of the large upright foundation stones that form the perimeter of the base platform (Wk-13865, 754 ± 59 BP and Wk-13864, 900 ± 43 BP). The fifth determination was on a charcoal concentration recorded at 40 cm depth below ground surface (Beta-172927, 850 ± 50 BP).

The sixth date was on scattered charcoal from only 10-20 cm depth, which gave a more recent CRA of 660 ± 80 BP (Beta-177607). However, the calibrated age range for the determination is 1230-1440AD, which falls within the upper age distribution of the five ^{14}C results that have relatively secure contexts. So, by this time (1230-1440AD) the Pulemelei mound, at least the base platform, had probably already been built. However, since the dating samples that falls in the time frame 1030-1440AD were carried out on unidentified charcoal they might include an inbuilt age component. To account for that possibility we suggest that initial building of the Pulemelei mound could be dated to c. 1100-1300AD.

Another indication that stone structures, including the monumental Pulemelei mound, began to be constructed in the Letolo area around 1100AD is a radiocarbon date from the "Pa Tonga" wall located 1.3 km to the north of the Pulemelei mound as referred to above (Brødholt and Vuijsters 2004). However, since the dated sample was on scattered charcoal the result provides only tentative support for the construction of large stone structures at 1100AD.

Rebuilding and elaboration

Four ^{14}C dates from the Pulemelei site indicate ongoing use of the area after initial mound construction. A charcoal lens from under the foundation fill of the North mound had a CRA of 657 ± 54 BP (Wk-15503), similar to Beta-177607 on scattered charcoal from 10-20 cm depth from near the northwest corner of the Pulemelei mound. The charcoal lens was not disturbed, which suggests the North mound was built around 1230-1440AD. It was observed in 2002 that vegetation cleared from around the Pulemelei mound was often mounded down slope on a suitable rock outcrop or small promontory and burned when dry. The thick charcoal lens under the North mound might result from similar activity prior to construction of the foundation.

Three other radiocarbon results indicate further developments. The first date Wk-13867 (454 ± 46 BP) on a charcoal concentration found below a pavement/house platform on the south side of the Pulemelei mound had a calibrated age of AD1418-1514. If the determination dates a structural timber from a house, then the result may predate house construction by a small interval. An alternative is that the charcoal concentration came from a burning event prior to placement of a stone pavement on the south side of the mound, in which case the pavement may post-date c. 1500AD. The second date was on a sample from inside the large *umu tī* located just west of the North, and returned a CRA of 372 ± 43 BP (Wk-13866), which has a calibrated age of 1462-1637AD. The third sample was on charcoal found during the removal of tree stumps on the top platform of the Pulemelei mound at a depth of 60-70 cm. The sample gave an age of 1449-1712AD (ANU-11890, 310 ± 90 BP).

The presence of buried charcoal below the top platform in association with a thin lens of clay and pebbles recorded in the tree-stump hole suggests that the top platform was built in several stages rather than as a single addition to the base platform. Reinforcing this view is the stratigraphy from Trench 13 where there was also a thin lens of small-rounded river stones, like those used to pave the top platform. Whether the clay and pebble lens correlates with the top of the base platform or represents a distinct building event associated with the construction of the top platform is currently unclear. Ground penetrating radar identified a reflector layer at 2.0 m depth below the top platform, which is inferred to be closer to the top of the base platform than the clay and pebble lens found at 70 cm depth.

In any case the addition of the top platform is likely to be contemporary with the construction of the *umu tī* and the pavement/house on the south side of the Pulemelei mound. During this period 1450-1700AD the sunken entrance ways were also likely to have been built/rebuilt.

Conclusion

Most radiocarbon results from Samoa are on charcoal reflecting the loss of early coastal deposits holding abundant shellfish remains as a result of Holocene subsidence (Dickinson and Green 1998), and the poor preservation of cultural remains interred in young volcanic soils, other than charcoal, pottery and stone. Archaeological charcoal from earth ovens and fireplaces can provide reliable age determinations, but scattered and relatively small concentrations of charcoal are commonly encountered in excavations, particularly in association with the remains of built structures, where they frequently constitute the only dateable materials. A radiocarbon chronology for Samoa that includes the development of late prehistoric settlements marked by a variety of permanent structures must take into account the significant difficulty of obtaining accurate ^{14}C dates for mounds, walls, pavements, roads and walkways made in earth and stone.

Our approach focused, like other reviews of radiocarbon dates from the Pacific (e.g. Anderson 1991; Liston 2005), on

the archaeological context of a sample, with determinations associated with prehistoric structures identified to a particular phase of construction/use. When applied to the Samoa sequence the ^{14}C results are similar to those of previous studies regarding the timing of colonization, production and decline of plainware, and the emergence of "traditional" Samoan society (Green and Davidson 1974a; Clark 1996; Green 2002).

Radiocarbon determinations from the Pulemelei mound site indicate, however, that the development of monumental architecture, and of the Letolo settlement pattern, could have begun as early as 1100-1300AD rather than in the 17th century as suggested by Jennings *et al.* (1982). There were probably several additions to the Pulemelei mound before the top platform reached its current size and height, and new structures such as the North mound, *umu tī* and a pavement/house platform were constructed, possibly in response to rebuilding/elaboration of the Pulemelei mound. Thus, the Letolo settlement pattern recorded by Jackmond (Jennings *et al.* 1982) is a palimpsest in which older features and structures can only be distinguished from those of more recent origin by radiocarbon dating and archaeological investigation. The Pulemelei dates suggest that settlement pattern studies, which frequently lack chronological control, are capable of conflating archaeological remains from, in the case of Letolo, some 500 years of prehistoric occupation. While it is unrealistic to radiocarbon date every prehistoric structure, our investigations at the Pulemelei mound site suggest that it is feasible to obtain a localized ^{14}C chronology for a range of structures, which more accurately portrays architectonic changes in the late-prehistoric settlement pattern.

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