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UNIVERSITY OF TOKYO RADIOCARBON MEASUREMENTS I

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The University of Tokyo Carbon Dating Laboratory was established to meet the requirements for dating materials from various fields of science at the university. Installation and testing of the apparatus as well as routine assays have been carried out with counsel of Dr. Nobufusa Saito, Professor of Chemistry, and Dr. Yozo Nogami, Professor of Physics, the University of Tokyo. Management of the laboratory is undertaken by the Carbon Dating Committee of he University of Tokyo. The laboratory has actually been working for a year. This article reports the radiocarbon age measurements made from September 1966 to July 1967, together with a brief description of the measuring system.

Our laboratory uses a proportional gas counter made by M.B.L.E., Belgium (Type RNR 054) with an actual volume of 1 L. A ring guard counter of 1.2 L surrounding the central counter is arranged in anticoincidence. The central counter and the guard counter are separated by a thin plastic screen (styloflex metalized on both sides, 60 μ thick) to reduce background counts attributed to gamma-ray components in the natural background. The counter is shielded with 5-10 cm thick iron and lead. Special precaution was taken to avoid spurious counts, and noise from electronic circuits were completely eliminated. Background is reduced to 1.5-2.0 cpm and the counting rate of the oxalic acid standard from NBS is 12-13 cpm at the normal counting pressures. Counting gas is introduced into the counter as purified acetylene at a pressure of 1 atm at room temperature (23°C).

Prior to sample preparation, rootlets and other contaminating foreign materials in charcoal and wood samples are removed by handpicking. Wood samples are then charred. Samples are boiled in 1% NaOH solution for a few hours to solubilize lignin and humic acid. Samples are then boiled in dil. HCl solution to remove carbonates. CO_2 is produced by combustion in the oxygen stream.

Marble as the dead carbon material and corals are broken into small pieces, and contaminating materials, if any, are handpicked. Crushed samples are pretreated with dil. HCl solution to dissolve the outer layer. Then they are treated with 6M HCl solution to release CO_2.

The NBS oxalic acid standard, modern carbon standard material, is treated either by direct combustion in oxygen or oxidation by $KMnO_4$ in H_2SO_4 solution.

Samples are converted into acetylene by the method of Suess (Suess, 1954) using $CO_2 \rightarrow CaCO_3 \rightarrow SrCO_3 \rightarrow SrC_2 \rightarrow C_2H_2$ reaction. The chem-

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ical yield in the conversion of $CO_2 \rightarrow C_2H_2$ is about 70%. When a sample is limited, it is diluted with dead carbon in carbonate form at the $CaCO_3$ stage, for the chemical yield of purified $CaCO_3 \rightarrow SrCO_3$ reaction is almost 100% in this system.

Counting gas is purified with a small amount of active charcoal cooled at dry ice-ethanol temperature. Its purity is qualitatively checked by mass spectrometry.

The plateau curve was checked by the internal modern standard sample. The plateau curve of each counting gas is checked by an external ^{137}Cs radiation source. It ranges about 600 V and the slope is about 2% / 100 V. The range and slope are almost the same as those of the former. The plateau curve is measured for each sample at the beginning and end of counting. It verifies absence of variation in counting gas. The activitiy of each sample is counted for 24 hrs at least twice, several days apart, replacing the modern standard and background measurement in rotation.

Contemporary value for all dates is 95% of the activity of oxalic acid standard from the U.S. National Bureau of Standards, as recommended at the 1959 Groningen Radiocarbon Conference. The value of 5570 $\pm$ 30 yr is used as the half-life of C^{14}. The results are expressed in years before 1950, denoted by years B.P.

Ages reported here are the average values of dates which agree with each other within 2σ. The errors given include the standard deviation of the counting rate of unknown samples, of the NBS standard, and of the background.

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SAMPLE DESCRIPTIONS

I. GEOLOGIC SAMPLES

Japan

Numa series

Samples from Numa coral bed at Kōyatsu, Tateyama city, Chiba pref. (34° 57′ N Lat, 139° 50′ E Long). The bed indicates postglacial climatic optimum. Coll. 1966 by Y. Hamada and subm. 1966 N. Katayama. Univ. of Tokyo.

7870 ± 70

TK-7. Numa **5920 B.C.**

Coral (Favia specieosa). *Comment* (N.K.): same sample measured by $^{234}U - ^{230}Th$ method at Kanazawa Univ. with result 7100 ± 300 yr (personal commun.).

4700 ± 500

TK-8. Numa **2750 B.C.**

Coral (Stylocoemiella hanzawai). *Comment* (N.K.): same sample measured by $^{234}U - ^{230}Th$ method at Kanazawa Univ. with result 7400 ± 400 yr (personal commun.).

4120 ± 100

TK-15. Satte **2170 B.C.**

Peat from borehole at natural levee formed by Furu-Tone River, depth 10.85 to 11.70m (alt 11.0m), Satte, Saitama pref. (36° 03′ N Lat, 139° 42′ E Long). Sample from black peaty bed on marine deposits overlain by fluvial deposits. Coll. 1964 by Y. Sakaguchi, Dept. of Geog., Univ. of Tokyo; subm. 1966 by S. Iwatsuka, Dept. of Geog., Univ. of Tokyo.

13,900 ± 200

TK-16. Shirane **11,950 B.C.**

Peat from borehole in alluvial plain, depth 112 to 125m (alt 2m), Shrane, Niigata pref. (37° 46′ N Lat, 139° 01′ E Long). Coll. 1962 by Y. Sakaguchi; subm. 1966 by S. Iwatsuka. *Comment* (S.I.): stratigraphy indicates dated layer probably accumulated at middle of Würm Ice age.

Asama Volcano series

Sample from charred stems of wood destroyed by volcanic eruptions of Mt. Asama, Nagano pref. Coll. 1966 by I. Murai *et al.*, Univ. of Tokyo.

870 ± 80

TK-21. Amaike **A.D. 1080**

Charcoal from deposit on Oiwake pyroclastic flow at Amaike, Komoro city, on SW foot of Mt. Asama (30° 21′ N Lat, 138° 27.5′ E Long). Subm. 1967 by N. Saito, Univ. of Tokyo. Flow is interpreted to have erupted in 1281 A.D., forming the most voluminous deposit among recent pyroclastic formations at Asama Volcano.

433 ± 70

TK-22a. Onioshidashi **A.D. 1517**

Check sample. Charcoal from deposits of Agatsuma pyroclastic flow at Onioshidashi (30° 26.3′ N Lat, 138° 32.3′ E Long). Subm. by J. Sato. From inner part of wood stem charred by volcanic eruption in 1783 A.D. *Comment* (J.S.): this sample provides historical check of our radiocarbon dating method. Validity of age calculations for Japanese samples based on NBS oxalic acid standard can also be checked.

194 ± 60

TK-22b. Onioshidashi **A.D. 1756**

From bark of charred wood.

II. ARCHAEOLOGIC SAMPLES

A. Japan

4970 ± 80

TK-1. Minamihori **3020 B.C.**

Charred timber from floor of dwelling pit No. 10 of Early Jomon period at Minamihori shell-mound, Minami-Yamadacho, Kita-ku, Yokohama city, Kanagawa pref. (35° 32′ N Lat, 139° 37′ E Long). Excavation 1955 by S. Wajima (1958), Research Institute for Natural Resources. Pottery is Moroiso A type. Coll. 1955 and subm. 1963 by N. Watanabe, Univ. of Tokyo. *Comment* (N.W.): date comparable to 5230 ± 100 (TK-3, this list), 5290 ± 140 (N-38, Riken II) and 5100 ± 400 (M-240, Michigan I) associated with same type pottery.

5230 ± 100

TK-3. Kamo **3280 B.C.**

Wood from peat formation which yielded dug-out canoe of Early Jomon period at Kamo, Toyota-mura, Awa-gun, Chiba pref. (35° 01′ N Lat, 139° 50′ E Long). Excavation Dec. 1948 by R. Fujita and N. Matsumoto, Keio Univ. (Matsumoto *et al.*, 1952). Pottery is Moroiso A type. Coll. 1948 by J. Shimizu, Keio Univ.; subm. 1966 by N. Watanabe. *Comment* (N.W.): wood from same peat layer gave 5290 ± 140 (N-38, Riken II) and 5100 ± 400 (M-240, Michigan I). See also TK-1, this list.

Tokoro Chashi series

Charcoal from pit houses at Tokoro Chashi (fort), Tokoro-machi, Tokoro-gun, Hokkaido (44° 06′ N Lat, 144° 06′ E Long). Excavation 1960 by K. Komai (1964), Dept. of Archaeology, Univ. of Tokyo. Pottery is of Okhotsk type. Coll. 1960 and subm. 1966 by K. Komai.

1230 ± 100

TK-2. Pit House No. 1 **A.D. 720**

Comment (K.K.): same sample gave 990 ± 140 (Gak-190, Gakushuin II).

1180 ± 100

TK-9. Pit House in Trench T **A.D. 770**

Gifu II site series

Charcoal from pit house at Gifu II site, Tokoro-machi, Tokoro-gun, Hokkaido (44° 07′ N Lat, 143° 59′ E Long). Excavation 1965 and 1966 by T. Mikami, Dept. of Archaeol. Univ. of Tokyo. Pottery is Satsumon type.

1140 ± 70

TK-4. Pit House No. 13 **A.D. 810**

Charcoal, coll. 1965 and subm. 1966 by T. Mikami.

1220 ± 60

TK-17. Pit House No. 10 **A.D. 730**

Charcoal, coll. 1966 and subm. by T. Mikami. *Comment* (T.M.): dates are a little older than expected.

B. Peru

Chavín de Huantar series

Chavín de Huantar, great ceremonial center, presumably of Formative period is on left bank of Mosna R., tributary of Marañón R., N highland of Peru (9° 25′ S Lat, 77° 05′ W Long). Coll. 1966 by Luis G. Lumbreras, San Marcos Univ.; subm. 1967 by S. Izumi, Univ of Tokyo.

3050 ± 120

TK-18. Temple of Chavín **1100 B.C.**

Charcoal from Section RCA, Galeriá de las Ofrendas, associated with Classic Chavín style pottery. *Comment* (S.I.): dates of parallel phase at Kotosh sites, Kotosh Chavín, are 3150 ± 150 (Gak-263, unpublished) and 2820 ± 120 (N-65-2, Riken II).

1820 ± 80

TK-19. Mosna phase **A.D. 130**

Charcoal from Section RC, 12A-B, Stratum 4, Mosna phase, last phase at site.

1780 ± 110

TK-20. Huarás phase **A.D. 170**

Charcoal from Section RC, 9D, Stratum 7, Huarás phase.

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