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# GAKUSHUIN NATURAL RADIOCARBON MEASUREMENTS II

KUNIHIKO KIGOSHI and KUNIHIKO ENDO

Department of Physics and Chemistry, Gakushuin University,
Mejiro Toshimaku, Tokyo, Japan

This date list covers many of the datings done from November 1961 to October 1962. Technique described in Gakushuin I (Gakushuin I) is virtually unchanged, using 900-ml acetylene-filled proportional counter (Counter 1) with multiple-anode anti-coincidence ring counter.

Two samples (GaK-223 and 224) are measured by a counter having an effective volume of 6.8 L (Counter 2) with the same counter arrangement as Counter 1. Samples are also filled as acetylene at pressure 400 to 760 mm Hg. The background counting rate of Counter 2 is 25 + 0.0021 P counts/min, where P is the pressure of acetylene in mm Hg. The NBS oxalic-acid standard gives 106.7 ± 0.3 counts/min above background at pressure 760 mm Hg and 0°C.

In order to attain accuracy with Counter 2, special care was taken in preparation of counting gas and determination of operating voltage. To avoid contamination by atmospheric $CO_2$ the preparation of acetylene was done in a $CO_2$-free atmosphere. There was contamination by tritium in appreciable amount when we used tap water for the preparation of acetylene. This source of error was eliminated by the use of water distilled from sea water. Details of experimental procedure and characteristics of Counter 2 will be published elsewhere.

Age calculations are based on the Libby half life of $C^{14}$, 5570 ± 30 yr. As a modern-carbon standard we used 95% of the NBS oxalic acid instead of the wood standard used in Gakushuin I. The change of modern carbon standard involves no numerical change in dates measured in Counter 1.

Dates on shell reported here were calculated with the same standard as for terrestrial samples. Errors on terrestrial samples include only the uncertainty calculated from the standard deviation of the counting rate. Errors on shell datings are those calculated from the standard deviation plus 300 yr. The latter number was introduced to cover the error derived from the fluctuations of $C^{14}$ concentration in the ocean surface or shallow water.

Grateful acknowledgment is made to many donors and collectors of samples for descriptions and comments.

## SAMPLE DESCRIPTIONS

### I. GEOLOGIC SAMPLES

**GaK-211. Furue, Kagoshima** — **22,000 ± 850 / 20,050 B.C.**

Carbonized humic sandy clay beneath pumice layer 8 m thick, Furue, Kanoya City, Kagoshima (31° 24′ N Lat, 130° 49′ E Long). Coll. 1961; subm. by Yasumasa Gohara, S. K. Kenkyu-sho, Tokyo. *Comment* (Y.G.): carbonization is supposed to have resulted from the fall of pumice from the volcano Mt.

Aira. The pumice, widely distributed, covers a marine layer supposed to be correlative with the Shimosueyoshi layer. Date indicates the time of formation of Aira Caldera, and does not conflict with known stratigraphic data.

**GaK-231. Kanoya, Kagoshima** **>30,000**

Humic volcanic clay from Kasanohara, Kanoya City, Kagoshima (31° 23′ N Lat, 130° 52′ E Long), overlain by pumice ca. 2.5 m thick. The pumice is allophane and supposed to be from eruption of Mt. Kirishima or Mt. Sakurajima. Coll. 1956; subm. by Shigenori Aomine, Kyushu Univ. *Comment* (S.A.): hydrated halloysite occurs in and below the layer in which sample was taken.

**GaK-230. Tochigi, Kumamoto** **8650 ± 200**
**6700 B.C.**

Humic volcanic clay from Tochigi Asogun, Kumamoto (32° 34′ N Lat, 132° 2′ E Long), overlain by pumice (allophane) ca. 1.5 m thick. Coll. 1956; subm. by S. Aomine. *Comment* (S.A.): hydrated halloysite occurs in and below the layer in which sample was taken. Date measures time for the change of allophane to hydrated halloysite.

**GaK-213. Kita-ku, Osaka** **2270 ± 100**
**320 B.C.**

Humic sand from Minamimori-machi Kita-ku, Osaka (34° 41′ 40″ N Lat, 135° 30′ 50″ E Long, alt 4.9 m), imbedded in sand, 3.5 m below surface. Top of Temma gravel is 4 m below surface here. Coll. and subm. 1961 by Hikotaro Kajiyama, Juso Post Office, Osaka. *Comment*: consistent with GaK-169 (Gakushuin I).

**GaK-206. Teragawa, Nara** **24,200 ± 1100**
**22,250 B.C.**

Peat from Tawara-hommachi Nebutoguchi, Nara (34° 33′ N Lat, 135° 48′ E Long, alt 50 m). Peat layer, 50 cm thick, ca. 5 m below surface, contains *Menyanthes polygonum, Iris carex, Actinostemma phragmites*, fresh water diatoms and insects (Kokawa, 1961). *Picea* forms 10% of total pollen (Yamagata, 1958). Coll. 1960; subm. by Shohei Kokawa, Osaka City Univ. *Comment*: date and altitude agree with GaK-112 (Gakushuin I).

**GaK-225. Daisen, 2** **30,200 ± 3500**
**28,250 B.C.**

Wood (*Fagus crenata*) from N side of Mt. Daisen, Nawa-machi Mikuradani Tottori Prefecture (35° 27′ 49″ N Lat, 133° 30′ 26″ E Long), 5 m below surface. Sample was imbedded in volcanic mudflow with carbonized wood, overlain by volcanic clay 3 m thick. Coll. and subm. 1961 by Tsurunaga Kimachi. *Comment*: sample dates a major eruption of Mt. Daisen. See GaK-163 (Gakushuin I).

**GaK-240 a. Hiromi-machi, Kiso, 1** **26,600 ± 1600**
**24,650 B.C.**

Inner part of a log from Fushimi, Gifu Prefecture (35° 35′ N Lat, 135° 7′ 5″ E Long). Sample was imbedded in a volcanic mudflow 3.6 m below surface of Takabe Terrace. Coll. and subm. 1961 by Kunio Kobayashi, Shinshu Univ. *Comment* (K.K.): tree was probably killed during eruption of Mt. Ontake Volcano.

**GaK-204 b. Hiromi-machi, Kiso, 2** **27,800 ± 2000**
**25,850 B.C.**

Outer part of a log used for GaK-204 a.

**GaK-249. Kariya, Aichi** **5470 ± 450**
**3520 B.C.**

Shell (*Anadara granosa*) from site of new Tokaido Railway bridge at the Aizuma, Kariya, Aichi Prefecture (35° 0′ N Lat, 136° 59′ E Lat), 1.3 m below surface of river-bed. Associated shells include *Ostrea gigas, Rapana thomasiana, Meretrix lusoria, Cyclina sinensis* and *Corbicula japonica*. Coll. 1962 by Kazuo Harada; subm. by Masashi Sugiuura, Chiryu High School. *Comment*: two shell mounds of Jomon period are found 700 m S of this place.

**Mt. Fuji series**

**GaK-203. Rengeji, Gotemba** **3800 ± 130**
**1850 B.C.**

Wood from Rengeji, Gotemba (35° 19′ 12″ N Lat, 138° 57′ 30″ E Long), imbedded in peat 3.5 m below surface. Peat is underlain unconformably by Tachikawa Loam and overlain by volcanic mudflow of Mt. Fuji Volcano. Coll. and subm. 1961 by Kanto Loam Research Group. *Comment*: dates maximum age of Chankiri mudflow which covers wide area of this district.

**GaK-224. Oyama, Shizuoka** **24,100 ± 400**
**22,150 B.C.**

Wood from ca. 1.5 km W of Oyama Station, Shizuoka Prefecture (35° 21′ N Lat, 139° 1′ E Long), imbedded in the volcanic mudflow of Old Fuji Volcano. Coll. and subm. 1961 by Kanto Loam Research Group. *Comment*: consistent with GaK-255.

**GaK-255. Hakoarezawa, Mt. Fuji** **21,200 ± 950**
**19,250 B.C.**

Charcoal from Hakoarezawa tunnel (1950 m from entrance), S side of Mt. Fuji (35° 19′ N Lat, 138° 40′ E Long, alt 1050 m), imbedded in mudflow of Old Fuji Volcano. Coll. and subm. 1962 by Hiromichi Tsuya, Univ. of Tokyo.

**Mt. Amagi series, Shizuoka**

**GaK-207. Mitaka** **24,950 ± 1250**
**23,000 B.C.**

Wood from site of tunnel building, Kamogun, Mitaka, Shizuoka Prefecture (34° 45′ 13.2″ N Lat, 139° 0′ 58.1″ E Long), imbedded in Inatori volcanic mudflow, 33 m below surface. Coll. 1961; subm. by Yoshio Kasahara, Shimoda Kita High School. *Comment*: dates an early eruption of Mt. Amagi.

**GaK-253. Nakaizu** **2830 ± 120**
**880 B.C.**

Wood from Nakaizu-machi Shinden Shizuoka Prefecture (34° 54′ N Lat, 138° 58′ E Long). Tree trunk 10 m long, buried in pumice. Coll. 1961; subm. by Hisashi Kuno, Univ. of Tokyo. *Comment* (H.K.): on stratigraphic evidence the pumice probably corresponds to the last eruption of Amagi.

**GaK-252. Ito** **>30,000**

Wood from SW part of Ito City, Shizuoka Prefecture (34° 58′ N Lat, 139° 6′ E Long), imbedded in clay incorporated within Hachigakubo scoria. Coll. 1960; subm. by H. Kuno. *Comment*: dating failed to give maximum age of Omuroyama ejecta and lava which partly cover Hachigakubo scoria.

**GaK-246. Uotsu, Toyama** **1960 ± 70**
**10 B.C.**

Root of *Cryptomeria japonica* with 1000 growth rings, from peat, Uotsu, Toyama (36° 49′ N Lat, 137° 23′ E Long). Many buried trees of *Cryptomeria japonica* are found near sealevel along the shore line of Toyama Prefecture. Sample associated with late Jomon pottery. Coll. 1961; subm. by Saburo Fukai, Toyama Univ. *Comment*: date does not conflict with late Jomon period in view of age of tree. As *Cryptomeria japonica* usually occurs >100 m above sealevel, depression of land by more than 100 m during the last 2000 yr is implied.

**Niigata series**

Peat from borings on a line extending inland from a point near coast SW of Niigata City. Profiles show several wind-blown dunes parallel to coastline arranged on this line. Peat occurs between the dunes. Coll. and subm. by Kunio Suyama, Fukada Geol. Inst. *Comment*: dates are minimum for dune formation.

**GaK-236. Okura** **3000 ± 190**
**1050 B.C.**

Okura, Niigata (37° 48′ 0″ N Lat, 139° 0′ 10.4″ E Long, alt 2.8 m), 10.2 to 10.5 m below surface. Coll. 1961.

**GaK-235. Ajikata** **3930 ± 130**
**1980 B.C.**

Ajikata, Niigata (37° 47′ 12″ N Lat, 139° 0′ 38.4″ E Long, alt 2.8 m), 14.2 to 14.8 m below surface. Coll. 1961.

**GaK-233. Shirane** **2530 ± 130**
**580 B.C.**

Shirane City, Niigata (37° 46′ 30″ N Lat, 139° 1′ 17.4″ E Long, alt 2.8 m), 6.1 to 6.4 m below surface. Coll. 1960.

**GaK-237. Shoze Niigata, 1** **3350 ± 250**
**1400 B.C.**

Shoze, Shirane City, Niigata (37° 43′ 0″ N Lat, 139° 2′ 31.4″ E Long, alt 4.3 m), 4.15 to 4.32 m below surface. Coll. 1961.

**GaK-239. Shoze, Niigata, 2** **3900 ± 600**
**1950 B.C.**

Same boring as GaK-237, 14.15 to 14.45 m below surface.

**Kisarazu series, Tokyo Bay**

Peat from borings near Kisarazu City, ca. 1 km off the coast in Tokyo Bay. Depths indicated are measured from mean tide level of Tokyo Bay. Peat is underlain by Pleistocene sand and gravel. Coll. 1960; subm. by Gosaburo Miki, Univ. of Tokyo, Sohei Kaizuka, Tokyo Metropol. Univ. and Hiroshi

Naruse, Chiba Univ. *Comment*: depth/age relation does not agree with other ages of Tokyo Bay sediments. See GaK-137 to 146 (Gakushuin I) and GaK-181, 182, 184, this date list.

**GaK-179. Kisarazu, –5.10 to –5.20 m** **>30,000**
(35° 22′ 26″ N Lat, 139° 54′ 16″ E Long).

**GaK-180. Kisarazu, –5.30 to –5.80 m** **17,400 ± 900**
**15,450 B.C.**
(35° 20′ 55″ N Lat, 139° 51′ 22″ E Long).

**Goi series, Tokyo Bay**

Peat from borings near Goi-machi ca. 500 m off the coast. Depths indicated are mean tide level of Tokyo Bay. Coll. 1960; subm. by G. Miki, S. Kaizuka and H. Naruse. *Comment*: relation between age and depth agree with measured dates of Tokyo Bay series, GaK-137 to 146 (Gakushuin I).

**GaK-181. Goi, –22.23 to –22.51 m** **8930 ± 230**
**6980 B.C.**
(35° 30′ 23″ N Lat, 140° 3′ 44″ E Long). Silt overlain and underlain by marine sand.

**GaK-182. Goi, –32.14 to –32.44 m** **9450 ± 350**
**7500 B.C.**
(35° 30′ 11″ N Lat, 140° 2′ 57″ E Long). Silt overlain and underlain by marine silt and sand.

**GaK-184. Goi, –43.43 to –43.73 m** **10,400 ± 400**
**8450 B.C.**
(35° 30′ 36″ N Lat, 140° 38′ 23″ E Long). Silt overlain and underlain by marine sand.

**GaK-223. Kasaibashi, Tokyo** **9900 ± 600**
**7950 B.C.**
Shell (*Ostrea gigas*) from –37 m to –38 m in boring 300 m N of Kasaibashi, Tokyo (35° 40′ 0″ N Lat, 139° 50′ 10″ E Long). Date indicates rate of sedimentation and age of dark brown loam underlying the shell horizon. Coll. 1961; subm. by K. Suyama. *Comment*: rate of sedimentation agrees with Goi series, GaK-181, 182 and 184. Implies minimum age of Tachikawa Loam does not conflict with the maximum age given by GaK-171, 11,330 ± 260, and GaK-172, 11,840 ± 290 (Gakushuin I).

**Fukushima series**

Wood from alluvium in Fukushima Basin and related alluvial fans. Coll. and subm. by Keiji Suzuki, Fukushima Univ. Dates show simultaneous formation of Kuwaori and Otsuki alluvial fans, and rapid deposition of the sediments.

**GaK-208. Toyano** **6370 ± 110**
**4420 B.C.**
*Quercus styrax* from 500 m E of Toyano Fukushima (37° 43′ 55″ N Lat, 140° 29′ 6″ E Long). Coll. 1960. *Comment*: date suggests time of formation of main part of Fukushima Basin.

**GaK-209. Kuwaori-machi** **25,400 ± 1150**
**23,450 B.C.**

Carbonized wood from peaty clay of Kuwaori fan, Date-gun Kuwaori-machi Fukushima, W side of Fukushima Basin (37° 52′ 42″ N Lat, 140° 30′ 41″ E Long), associated with *Picia glehnii* and *Pinus koraiensis*. Coll. 1961.

**GaK-244. Katahira** **25,400 ± 600**
**23,450 B.C.**

Standing tree buried by Otsuki fan, Ouse-mura Katahira, Fukushima, W side of Kooriyama Basin (37° 24′ 30″ N Lat, 140° 18′ 10″ E Long, alt 270 m).

**GaK-245. Tadano** **23,800 ± 1100**
**21,850 B.C.**

Wood from peat near top of Otsuki fan, Ouse-mura Takano, Fukushima, W side of Kooriyama Basin (37° 23′ 30″ N Lat, 140° 14′ 40.4″ E Long). Peat contains *Picea, Tsuga, Pinus koraiensis* and *Abies sp.* Coll. 1961.

**Hachirogata series, Akita**

Shell and peat from borings at Hachirogata Akita. The profiles show peat and peaty silt 1 to 4 m thick, underlain by coarse sand and gravel and overlain by marine clay and silt. Dating provides information on the rate of sedimentation and compression of clay by pressure and age. Coll. 1961; subm. by Nobuyoshi Ushijima, Tohoku Univ. *Comment*: samples and profiles are described by N. Ushijima *et al.* (1962), and, using the dates, compression of clay and migration of petroleum are discussed by N. Ushijima (1962).

**GaK-219. Hachirogata, depth –37.0 m** **8060 ± 500**
**6110 B.C.**

Shell (*Ostrea gigas*) from middle of Hachirogata Lagoon (39° 57′ N Lat, 140° 1′ E Long).

**GaK-220. Hachirogata, depth –53.0 m** **24,300 ± 1150**
**22,350 B.C.**

Peat from NW side of lagoon (40° 2′ N Lat, 139° 57′ E Long).

**Jusanko series, Aomori**

Peat from borings 1 to 6 km S of the shore of Jusanko Lagoon. Dates rate of sedimentation and formation of alluvial plain near Jusanko. Coll. 1961; subm. by Y. Ushijima. Profiles are described by Y. Ushijima *et al.* (1962).

**GaK-221. Jusanko, depth –27.1 to –27.4 m** **4040 ± 180**
**2090 B.C.**

(41° 0′ N Lat, 140° 25′ E Long).

**GaK-222. Jusanko, depth –39.0 m** **9050 ± 250**
**7100 B.C.**

(41° 3′ N Lat, 140° 25′ E Long).

**Towada series, Aomori**

**GaK-205. Hodozawa** **12,700 ± 260**
**10,750 B.C.**

Carbonized wood from tuff, Hodozawa Itsunohe, Aomori, 30 km E of Lake

Towada (40° 31′ 26″ N Lat, 141° 19′ 34″ E Long). Coll. 1961; subm. by Shoji Oike, Hachinohe High School. *Comment*: sample tree thought to have been killed by the eruption which formed Towada Caldera, and which could correlate with the ash layer at Urami-machi Aomori dated 13,900 ± 330 (Gakushuin I).

**GaK-226. Kosaka, Akita, 1** **>30,000**

Wood from Kosaka, Akita, 20 km SW of Lake Towada (40° 19′ 50″ N Lat, 140° 46′ 1″ E Long), imbedded in clay overlain by welded tuff. Coll. 1961; subm. by Shouichiro Hayashi, Geol. Survey of Japan.

**GaK-227. Kosaka, Akita, 2** **>30,000**

Wood from almost the same position as GaK-226. Coll. 1961 by T. Hashimoto; subm. by S. Hayashi.

**Mashu Volcano series, Hokkaido**

Carbonized wood from mudflow, Mashu Volcano, Hokkaido, correlated with Mashu Caldera. Coll. 1960; subm. by Yoshio Katsui, Hokkaido Univ. *Comment*: Katsui found Jomon pottery on the pumice flow deposit at Wakin, shore of Lake Kutcharo. See GaK-188, this date list. Stratigraphic studies of volcanic ash and pumice layer are described by Y. Katsui (1961).

**GaK-247. Teshikaga-cho** **6460 ± 130**
**4510 B.C.**

Wood from Teshikaga-cho Kushiro, Hokkaido (43° 29′ N Lat, 144° 28′ E Long), imbedded in volcanic mudflow.

**GaK-248. Kiyosato-cho** **7190 ± 230**
**5240 B.C.**

Wood from Kiyosato-cho Kitami, Hokkaido (43° 45′ N Lat, 144° 31′ E Long), imbedded in same deposit as GaK-247.

## II. ARCHAEOLOGIC SAMPLES

### *A. Iran*

**Marv-Dasht series, Iran**

Soil containing small fragments of charcoal from Marv-Dasht Valley Tall-i-Gap, Iran (29° 55′ N Lat, 53° 0′ E Long). In 1959 the second Tokyo University Iraq-Iran Archaeol. Exped. excavated a big hill of remains at Tall-i-Gap which is a round hillock 5 m in height and ca. 120 m in diameter. Samples for $C^{14}$ dating were taken from layers corresponding to cultural epochs I and II at this site. Details of excavation and remains of building and pottery were described by N. Egami and T. Sono (1962). Subm. by Shinichi Izumi, Univ. of Tokyo.

**GaK-197. Tall-i-Gap, Iran, 1** **5870 ± 160**
**3920 B.C.**

Layer 17 in cultural epoch GAT-I.

**GaK-198. Tall-i-Gap, Iran, 2** **5440 ± 120**
**2490 B.C.**

Layer 6 in cultural epoch GAT-II.

*B. Andes*

**Kalasasaya series, Tiahuanaco**

Charcoal from Kalasasaya, Tiahuanaco (17° S Lat, 72° W Long) Bolivia. Coll. by Centro de Inv. Arqueológicas en Tiahuanaco; subm. by Shinichi Izumi. *Comment*: cultural descriptions published by Ishida *et al.* (1958). See also Kalasasaya series, Gakushuin I.

**GaK-192. Kalasasaya, 4** **1990 ± 110**
**40 B.C.**

Charcoal powder from upper part of Layer 7, (Epoch I), Pit D-14. Coll. 1958.

**GaK-193. Kalasasaya, 5** **1850 ± 90**
**A.D. 100**

Charcoal powder from lower part of Layer 7, (Epoch I), Pit D-14. Coll. 1958.

**GaK-194. Kalasasaya, 6** **3530 ± 120**
**1580 B.C.**

Charcoal powder from Layer 6, (Epoch I), Pit K-16. Coll. 1958. *Comment*: unexpectedly old compared with GaK-52 (Gakushuin I) and cultural epoch.

**GaK-195. Kalasasaya, 7** **1750 ± 100**
**A.D. 200**

Charcoal from Layer 5, (Epoch II), Pit D-14. Coll. 1958.

*C. Japan*

**Lake Saroma series, Hokkaido**

**GaK-186. Tofutsu** **1610 ± 110**
**A.D. 340**

Charcoal from Tofutsu, Hokkaido, 2.5 km E of shore of Lake Saroma (44° 20′ N Lat, 143° 31′ E Long). Sample is from remains of a shelter, 30 cm below surface. Coll. 1957 by Kazuchika Komai, Univ. of Tokyo; subm. by K. Komai and Takaji Sadasue, Univ. of Tokyo. *Comment* (K.K.): associated Satsumon pottery has an older style than that of pottery found with GaK-187.

**GaK-187. Sakaeura** **1070 ± 80**
**A.D. 880**

Charcoal from Sakaeura, Hokkaido, 5 km E of shore of Lake Saroma (44° 20′ N Lat, 143° 33′ E Long). Sample was taken near an oven at floor level of shelter, associated with Satsumon potteries. Coll. 1958 by K. Komai; subm. by K. Komai and T. Sadasue.

**GaK-188. Tokoro Shell Mound** **4150 ± 400**
**2200 B.C.**

Shell of oyster from Tokoro shell mound, Jomon pottery, 3 km SE of Tokoro, Hokkaido (44° 19′ N Lat, 143° 35′ E Long). Coll. 1958 by K. Komai; subm. by K. Komai and T. Sadasue. *Comment*: consistent with GaK-247 and 248, this date list.

**GaK-189. Utoro** **1420 ± 170**
**A.D. 530**

Charcoal from remains of dwelling, Utoro, Hokkaido (44° 10′ N Lat, 144° 30′ E Long). Associated with Okhotsk pottery. Coll. 1959 by K. Komai; subm. by K. Komai and T. Sadasue.

**GaK-190. Tokoro Chashi** **990 ± 140**
**A.D. 960**

Charcoal from Tokoro Chashi, Hokkaido (44° 19′ N Lat, 144° 35′ E Long). Sample is from remains of a dwelling with Okhotsk Culture pottery. The dwelling has form of a chashi (fort) indicating that the remains are younger than that of GaK-189. Coll. 1960 by Yoshiro Kurata, Univ. of Tokyo; subm. by K. Komai and T. Sadasue.

**GaK-191. Tobinitai** **1310 ± 120**
**A.D. 640**

Charcoal from Tobinitai, Hokkaido (44° 8′ N Lat, 144° 43′ E Long), associated with Okhotsk pottery. Coll. 1960 by Y. Kurata; subm. by K. Komai and T. Sadasue.

**Shirataki series, Hokkaido**

Wood and grass from Shirataki-mura Yubetsugun, Hokkaido (43° 53′ N Lat, 143° 8′ E Long). Sample was from Shirataki layer with Paleolithic culture. Coll. 1961; subm. by Yoshio Kitagawa, Hokkaido Univ. *Comment*: previously reported date, 15,800 ± 400 (GaK-160, Gakushuin I) was measured on a sample possibly contaminated by alcohol.

**GaK-210. Shirataki, –3.38 m** **14,800 ± 350**
**12,850 B.C.**

Soil containing many fragments of wood and grass.

**GaK-212. Shirataki, –3.77 m** **15,800 ± 380**
**13,850 B.C.**

Wood from the same layer as GaK-160 (Gakushuin I).

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