

## TATA INSTITUTE RADIOCARBON DATE LIST X

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In this date list we present dates from some very important archaeological and Quaternary sites. For the first time the temporal spread of the Neolithic cultures of Bihar and the transformation of the Harappa culture in Gujarat has been dated. Some of the sites of controversial antiquity in Pakistan and India also have now been unambiguously dated.

The  $C^{14}$  dates for archaeological and Quaternary samples are listed below separately. All B.P. dates were calculated by using  $\tau_{1/2} = 5568$  years; for converting them to A.D./B.C. scale, 1950 was used as the base year. The modern standard used was 95% activity of NBS oxalic acid.

The  $C^{14}$  activity was measured by converting the samples into methane in the reactor described earlier (R., 1971, v. 13, p. 442-449) and counting them in gas proportional counters. As the internal heaters of the methane reactor were cumbersome to change when blown off, we have now placed an external heater covering the Tube X (Fig. 1, *ibid.*, above, p. 443) connected to an automatic pyrometer to switch off at  $\sim 500^\circ\text{C}$ . The catalyst is placed inside the Tube X in a stainless steel mesh. The rest of the equipment is the same as before.

*General Comment\**: in Panjab, the Bara culture (TF-1204-1207) has now been dated to a post-Harappan period. In Bihar, Chirand shows a Neolithic phase for the first time, going back to ca. 1700 B.C. (TF-1031-1034, -1125). But in the Chhota Nagpur backwaters, the Neolithic continues into the 1st millennium B.C. (Barudih, TF-1099-1102). Inamgaon (TF-996) shows a late survival of the Jorwe culture. Surkotada and Prabhas Patan represent a phase of transformation of the Harappa culture in Gujarat and have been dated for the first time. The dating of Pirak (Pakistan) resolves the controversy in favor of Casal against the very early estimates of Raikes.

The Quaternary dates provide the outline of an eustatic curve for the W coast of India (Agrawal *et al.*, 1972; Gupta, 1972), the shape of which supports Fairbridge (1961).

All charcoal samples were given NaOH pretreatment. All bone dates are on their carbonate fractions.

### ACKNOWLEDGMENTS

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### SAMPLE DESCRIPTIONS

#### I. ARCHAEOLOGIC SAMPLES

##### A. India

**TF-1146. Armahalai, India, wall paintings** **2170  $\pm$  130**  
**220 B.C.**

Charcoal from mortar base of (mud) wall paintings from Armahalai

\* For these comments the dates are based on  $\tau_{1/2} = 5730$  yr.

(12° 46' N Lat, 78° 38' E Long), Dist. N Arcot; subm. by S. T. Baskaran, Vellore.

### Bara series, Panjab

Bara (30° 56' N Lat, 76° 32' E Long) Dist. Ropar, subm. by Dir. Gen. Archaeol., New Delhi-11.

*General Comment:* C<sup>14</sup> dates assign a post-Harappan period to Bara culture.

**3690 ± 150**  
**1740 B.C.**

**TF-1204. Bara culture**

Wood charcoal, Loc. Bara 6, Pit 2 sealed by Layer 3, depth 0.80m, Field No. Bara-6/2/1971. *Comment:* trench is on the slope of the mound.

**3730 ± 95**  
**1780 B.C.**

**TF-1205. Bara culture**

Wood charcoal, Loc. Bara 5, Layer 9, depth 2.20m. Field No. Bara-5/3/71.

**3135 ± 100**  
**1185 B.C.**

**TF-1206. Bara culture**

Wood charcoal, Loc. Bara 5, Layer 10, depth 2.50m. Field No. Bara-5/4/71.

**3490 ± 85**  
**1540 B.C.**

**TF-1207. Bara culture**

Wood charcoal, Loc. Bara 7, Pit 1 sealed by Layer 1, depth 1.20 to 1.40m, Field No. Bara-7/5/71. *Comment:* trend is on the slope of the mound.

### Barudih series, Bihar

Barudih (22° 45' N Lat, 85° 57' E Long), Dist. Singhbhum, is a Neolithic culture site. Samples subm. by A.K. Ghosh, Dept. Anthropol., 35, Ballygunge Circular Road, Calcutta-19.

*General Comment:* site appears to be a back-water of Neolithic culture of Bihar.

**2920 ± 200**  
**970 B.C.**

**TF-1100. Neolithic culture**

Carbonaceous clay from Loc. N-S 29.5 to 56cm, E-W 12.5 to 37.5cm, depth 91.3cm, sample No. 3 (Acc. No. 144).

**2625 ± 105**  
**675 B.C.**

**TF-1099. Neolithic culture**

Carbonaceous clay from Loc. N-S 68cm, E-W 44.5cm, depth 74cm, sample No. 2 (Acc. No. 141).

**2475 ± 85**  
**525 B.C.**

**TF-1101. Neolithic culture**

Carbonaceous clay from Loc. N-S 38cm, E-W 59.5cm, depth 104 to 144cm, sample No. 4 (Acc. No. 152).

- 2540 ± 90**  
**590 B.C.**
- TF-1102. Neolithic culture**  
Carbonaceous clay from Loc. N-S 31.5 to 57.5cm, E-W 62.0 to 98.5cm, depth 94.3cm, sample No. 5 (Acc. No. 147).
- Chirand series, Bihar**  
Chirand, (25° 45' N Lat, 84° 45' E Long), Dist. Saran, is a Black-and-Red ware site. Samples subm. by B. P. Sinha, Dir. Archaeol., Govt. Bihar. Patna-15.  
*General Comment:* C<sup>14</sup> dates push age of Neolithic-Chalcolithic period at Chirand back to ca. 1700 B.C. Samples below Layer 14 show mix-up, perhaps due to subsidence.
- 3390 ± 90**  
**1440 B.C.**
- TF-1028. Black-and-Red ware**  
Charcoal, Loc. CRD-XI, Layer 10, depth 6.5m.
- 3525 ± 135**  
**1575 B.C.**
- TF-1031. Neolithic culture**  
Charcoal, Loc. CRD-XI, Layer 12, depth 7.20m.
- 3600 ± 150**  
**1650 B.C.**
- TF-1032. Neolithic culture**  
Charcoal, Loc. CRD-XI, Layer 13, depth 7.5m.
- 3390 ± 110**  
**1440 B.C.**
- TF-1033. Neolithic culture**  
Charcoal, Loc. CRD-XI, Layer 14, depth 8.5m.
- 3420 ± 110**  
**1470 B.C.**
- TF-1034. Neolithic culture**  
Charcoal, Loc. CRD-XI, Layer 15, depth 9m.
- 3125 ± 100**  
**1175 B.C.**
- TF-1035. Neolithic culture**  
Charcoal, Loc. CRD-XI, Layer 16, depth 9.2m.
- 2485 ± 120**  
**535 B.C.**
- TF-1036. Neolithic culture (?)**  
Charcoal, Loc. CRD-XI, Layer 17, depth 10.1m.
- 3365 ± 150**  
**1415 B.C.**
- TF-1125. Neolithic culture**  
Charcoal, Loc. CRD-XI (Ext.), Layer 14, depth 7.5m.
- 2290 ± 120**  
**340 B.C.**
- TF-1126. Neolithic culture (?)**  
Charcoal, Loc. CRD-XI (Ext.), Layer 15, depth 8.1m.
- 3230 ± 95**  
**1280 B.C.**
- TF-1127. Neolithic culture**  
Charcoal, Loc. CRD-XI (Ext.), Layer 17, depth 10.3m.

- TF-1117. Dariba Mines, India, underground mines** **2245 ± 100**  
**295 B.C.**

Wood from Dariba (24° 56' N Lat, 74° 07' E Long) Dist. Udaipur, Rajpura Dariba I, depth 64m, subm. by Dy. Dir. Gen. WR, Geol. Survey India, Jaipur.

- TF-1182. Harutaru, India, Neolithic culture (?)** **Modern**

Burnt wood from Harutaru (26° N Lat, 91° 8' E Long) Dist. Kamrup, Loc. I, depth 0.56m. Subm. by R. P. Srivastava, Dept. Anthropol., Dibrugarh Univ., Dibrugarh.

**Inamgaon series, Maharashtra**

Inamgaon (18° 35' N Lat, 74° 32' E Long), Dist. Poona, a Chalcolithic site, giving a sequence from Malwa to late Jorwe culture. Sample was subm. by H. D. Sankalia, Deccan College, Poona.

- TF-996. Chalcolithic culture** **2930 ± 180**  
**980 B.C.**

Charcoal, Loc. INM-I, Tr. A 2, Layer 4, depth 1.55m, Field No. 388.

- TF-997. Chalcolithic culture** **1530 ± 105**  
**A.D. 420**

Charcoal, Loc. INM-I, Tr. D2, Layer 7, depth 2.8m, Field No. 441.

- TF-1000. Chalcolithic culture** **3230 ± 80**  
**1280 B.C.**

Charcoal, Loc. INM-I, Tr. D2, Layer 15, Field No. 274.

- TF-1001. Chalcolithic culture** **3415 ± 90**  
**1465 B.C.**

Charcoal, Loc. INM-I, Tr. A1-A2, Layer 16, Field No. 725.

- TF-1085. Chalcolithic culture** **3295 ± 105**  
**1345 B.C.**

Charcoal, Loc. INM-I, Tr. C2, Layer 6, depth 1.82m. Field No. 387.

- TF-1086. Chalcolithic culture** **3385 ± 150**  
**1435 B.C.**

Charcoal, Loc. INM-I, Tr. D1, Layer 8, Field No. 621.

- TF-1087. Chalcolithic culture** **3260 ± 105**  
**1310 B.C.**

Charcoal, Loc. INM-I, Tr. D 1, Layer 12, Field No. 642.

- TF-1235. Chalcolithic culture** **3135 ± 90**  
**1185 B.C.**

Charcoal, Loc. INM-I, Tr. C 6, Layer 3, 0.75m, Field No. 828.

- TF-1216. Kanchipuram, India, early historic** **2085 ± 90**  
**135 B.C.**

Charcoal from Kanchipuram (12° 50' N Lat, 79° 42' E Long), Dist.

Chingleput, an historic site, Loc. III-IV, Layer 13 A, depth 4.9m, Field No. KCM-4; subm. by T. V. Mahalingam, Univ. Madras, Madras.

**2480 ± 110**

**TF-1115. Kankarbag, India, Palisades (?)**

**530 B.C.**

Wood from Kankarbag, Dist. Patna, depth 6.24m, Sample 1; subm. by Dir. Gen. Archaeol., Delhi. *Comment:* sample dates famous early historic wooden fortification.

**2675 ± 90**

**TF-1084. Malvan, India, Chalcolithic culture**

**725 B.C.**

Charcoal from Malvan (21° 07' N Lat, 72° 42' E Long), Dist. Surat, a Chalcolithic site, Trench MVN-Ic, Layer 3 A, depth 1.0m subm. by F. R. Allchin, Cambridge Univ., Cambridge. *Comment:* appears to be a late Chalcolithic site.

**Noh series, Rajasthan**

Noh (27° 15' N Lat, 77° 30' E Long), Dist. Bharatpur. Site yielded Black and Red, Painted Grey, and Northern Black Polished wares.

**2600 ± 145**

**TF-993. Early Iron Age levels**

**650 B.C.**

Charcoal from Tr. G', Layer 20, depth 6.9m. *Comment:* layer yielded Painted Grey ware.

**2560 ± 100**

**TF-994. Early Iron Age levels**

**610 B.C.**

Charcoal, Loc. 5.90 x 1.80m, Layer 14, depth 4.67m.

**2370 ± 85**

**TF-1144. Early Iron Age levels**

**420 B.C.**

Charcoal, Loc. O-I, Tr. H, Layer 10.

**Peddabankur series, Andhra Pradesh**

Peddabankur (18° 35' N Lat, 79° 25' E Long), Dist. Karimnagar, is a historic site. Samples subm. by Dir. Archaeol. and Mus., Hyderabad.

**1930 ± 90**

**TF-1274. Historic levels**

**A.D. 20**

Wood charcoal from Sec. I, Div. 75, Layer 2, depth 3.18m.

**1905 ± 100**

**TF-1276. Historic levels**

**A.D. 45**

Wood charcoal from Sec. I, Div. 74, Tr. E 1, Well 9, Layer 2, depth 4.60m.

**Prabhas Patan series, Gujarat**

Prabhas Patan (20° 53' N Lat, 70° 24' E Long), Dist. Junagadh. Site belongs to Prabhas culture, and yields extensive remains of stone houses. Samples subm. by H. D. Sankalia.

- TF-1284. Chalcolithic culture** **3465 ± 95**  
**1515 B.C.**  
 Charcoal, Loc. D 6-7, Layer 12, depth 4.1m, Field No. 287.
- TF-1286. Chalcolithic culture** **3595 ± 90**  
**1645 B.C.**  
 Charcoal, Loc. D 6-7, Layer 13, depth 4.32m, Field No. 371.
- TF-1287. Chalcolithic culture** **4280 ± 105**  
**2330 B.C.**  
 Shells, Loc. B-5, Layer 15, depth 5.60m, Field No. 372.
- TF-1104. Sarai Nahar Rai, India, Microlithic culture** **10,050 ± 110**  
**8100 B.C.**  
 Human bones from Sarai Nahar Rai (25° 48' N Lat, 81° 50' E Long), Dist. Pratap Garh, a Microlithic site, Loc. Trench No. C-5, Qd. 3, Layer 1, depth 5cm. Subm. by K. C. Ojha, U. P. state, Archaeol. Dept., Banarasi Bagh, Lucknow. *Comment:* these uncharred bones are probably contaminated by ground water carbonates, as only carbonate fractions were dated.
- Surkotada series, Gujarat**  
 Surkotada (23° 37' N Lat, 70° 50' E Long), Dist. Kutch, represents a huge stone fortified site partly contemporary to Harappa culture. Samples subm. by J. P. Joshi, Archaeol. Survey India, Nagpur.
- TF-1294. Chalcolithic culture** **3620 ± 95**  
**1670 B.C.**  
 Charcoal, Loc. XC1, Qd. 3, Layer 3, depth 2.40 to 2.90m.
- TF-1295. Chalcolithic culture** **3780 ± 95**  
**1830 B.C.**  
 Charcoal, Loc. G1, Qd. 3, Layer 8, depth 1.90 to 2.05m.
- TF-1297. Chalcolithic culture** **3635 ± 95**  
**1685 B.C.**  
 Charcoal, Loc. C1, Qd. 4, Pit I sealed by Layer 3, depth 2.10m.
- TF-1304, 1309. Chalcolithic culture** **3645 ± 90**  
**1695 B.C.**  
 Charcoal, Loc. Za1, Qd. 2, Layer 18A and 20, depth 6.6 to 7.15m.
- TF-1305. Chalcolithic culture** **3890 ± 95**  
**1940 B.C.**  
 Charcoal, Loc. Za1, Qd. 2, Layer 19, depth 7.25m.
- TF-1307. Chalcolithic culture** **3510 ± 105**  
**1560 B.C.**  
 Charcoal, Loc. XA 4, Qd. 1, Layer 5, depth 1.6m.
- TF-1310. Chalcolithic culture** **3810 ± 95**  
**1860 B.C.**  
 Charcoal, Loc. Za1, Qd. 2, Layer 11, depth 4.6m.

- 3625 ± 90**  
**1675 B.C.**
- TF-1311. Chalcolithic culture**  
Charcoal, Loc. Za1, Qd. 2, Layer 4, depth 2.4m.
- B. West and South Asia*
- 2300 ± 85**  
**350 B.C.**
- TF-1224. Ai-Khanoum, Afghanistan, early historic**  
Wood from Ai-Khanoum (37° 10' N Lat, 69° 24' E Long), Dist. Takhar, an early historic site, Loc. Ai-Khanoum palace, Rm. 20, under wall N of *état* II, depth 2.5m. Sample subm. by French Archaeol. Delegation in Afghanistan. *Comment*: NaOH pretreatment was given.
- 1310 ± 115**  
**A.D. 640**
- TF-1160. Gharluli, Afghanistan, Chalcolithic culture(?)**  
Charcoal from Gharluli (35° 45' N Lat, 65° 00' E Long), Dist. Maimana, a Chalcolithic site, Trench I, Cut Ic -2.5m, Sample 12/Ic -250/7, 29.69. Subm. by L. Dupree, Pennsylvania State Univ., Philadelphia. *Comment* (L.D.): nomads dug pits at site during most periods and disturbed underlying material.
- 2000 ± 90**  
**50 B.C.**
- TF-1002. Masada, Israel, Roman structure**  
Wood from a Roman rampart, Masada (31° 15' N Lat, 35° 20' E Long), subm. by B.L.K. Somayajulu, Tata Inst. Fundamental Research (TIFR), Bombay.
- Mundigak series, Kandhar, Afghanistan**  
Mundigak (32° 30' N Lat, 65° 30' E Long), an important Chalcolithic site excavated by J. M. Casal and G. F. Dales, Univ. Mus., Philadelphia, Pennsylvania. Use of copper at site is shown from Period I.
- 4950 ± 105**  
**3000 B.C.**
- TF-1129. Period I**  
Wood charcoal from Mound A, depth. 0.90 to 1.2m, Sample 1.
- 4570 ± 100**  
**2670 B.C.**
- TF-1131. Period I**  
Wood charcoal from Mound A, Sample 3.
- 4805 ± 100**  
**2855 B.C.**
- TF-1132. Period II**  
Wood charcoal from Mound A, Sample 4. *Comment* (G.F.D.): period assignment is doubtful.
- Pirak series, Khuzdar Division, W. Pakistan**  
Pirak (29° 30' N Lat, 67° 54' E Long), Dist. Kanch. Samples subm. by J. M. Casal, Mus. Guimet, 6, Place d' Iéna, Paris.  
*General Comment*: dates support Casal's age estimates, as opposed to those of Raikes.

**TF-1108. Pirak complex** **2650 ± 100**  
**700 B.C.**  
Charcoal from Layer 10, depth 2m, Field id. PK-A-3J.

**TF-1109. Pirak complex** **2705 ± 120**  
**755 B.C.**  
Charcoal from Layer 11, depth 2.6m, Field id. PK-A.

**TF-1201. Pirak complex** **2650 ± 150**  
**700 B.C.**  
Charcoal from Layer 34, depth 4 to 5m, Field id. PK-A-3K.

**TF-1202. Pirak complex** **2940 ± 80**  
**990 B.C.**  
Charcoal from Layer 32 N, depth 4 to 5m. Field id. PK-A-3J.

#### **Tilaurakot series, Nepal**

Tailaurakot, Dist. Taulihawa, is a historical site. Samples subm. by N. R. Banerjee, c/o Dept. Archaeol., Kathmandu, Nepal.

**TF-985. Early historic** **2715 ± 140**  
**765 B.C.**  
Charcoal, Loc. A2-A3, Layer 9, depth 5.7m.

**TF-986. Historic** **1030 ± 90**  
**A.D. 920**  
Charcoal, Loc. V-VI, Tr. TLK-1-3, depth 0.8m.

#### **Tepe Yahya series, Kerman, Iran**

Tepe Yahya, Dist. Baft, important site of SE Iran with a sequence from Neolithic to Sassanian periods. Samples subm. by C.C. Lamberg-Karlovsky, Harvard Univ., Cambridge, Massachusetts.

*General Comment:* dates are younger than expected by excavator.

**TF-1136. Period VA, B** **4130 ± 85**  
**2180 B.C.**  
Charcoal from Trench XC, Test Trench 1, Stratum 5-1. *Comment:* sample found in rubble area beneath floor of Stratum 5 near S balk.

**TF-1139. Period VI** **4195 ± 110**  
**2245 B.C.**  
Charcoal from Trench C, Test Trench 6, Stratum 3.

**TF-1140. Period IV B** **3560 ± 110**  
**1610 B.C.**  
Charcoal from Trench B/BW, Test Trench 4, Stratum 1, Feature 4.

**TF-1143. Period IV B** **4150 ± 130**  
**2200 B.C.**  
Charcoal from Trench B, Stratum 8, Feature 1-1, from floor of room, 80cm beneath major Period IV A architecture.



## II. QUATERNARY SAMPLES

## India

Samples TF-967, -1111, -1177, -1178, and -1213 were dated to study the older alluvial deposits commonly assoc. with Middle Stone Age tools. Samples TF-970, -1047, -1079, -1082, -1089, -1147, -1149, -1150, -1186, -1192-1194, -1197, -1200, -1230, -1232 were measured to study eustatic changes and to date consolidation processes of various littoral sediments of the W coast.

- |   |                     |
|---|---------------------|
|   | <b>9750 ± 120</b>   |
| <b>TF-1178. Asla, Late Pleistocene</b>  | <b>7800 B.C.</b>    |
| Freshwater shells from Asla (17° 53' N Lat, 73° 59' E Long) Dist. Satara, 2.5m, above bed of R. Krishna. Subm. by S. N. Rajaguru. <i>Comment</i> : dates older alluvium in area.  |                     |
| <b>Bhatti-Mirya series, Maharashtra</b>   |                     |
| Bhatti-Mirya (17° 2' N Lat, 73° 17' E Long) Dist. Ratnagiri. Samples subm. by D. P. Agrawal.  |                     |
|   | <b>2240 ± 90</b>    |
| <b>TF-1079. Littoral sediment</b>   | <b>290 B.C.</b>     |
| Shells, 6m above high water level (hwl).  |                     |
|   | <b>2720 ± 105</b>   |
| <b>TF-1080. Littoral sediment</b>   | <b>770 B.C.</b>     |
| Shells, 5.9m above hwl.   |                     |
|   | <b>10,725 ± 400</b> |
| <b>TF-970. Continental shelf, off Bombay</b>  | <b>8775 B.C.</b>    |
| Coral from continental shelf off Bombay, depth 150m. Subm. by R. R. Nair, Natl. Inst. Oceanog., Panaji. <i>Comment</i> : date confirms a low sea level in early Holocene.   |                     |
|   | <b>2115 ± 90</b>    |
| <b>TF-1231. Chaul, littoral sediment</b>  | <b>165 B.C.</b>     |
| Shells from Chaul (18° 33' N Lat, 73° 00' E Long), Dist. Kolaba, depth 3m below hwl. Subm. by S. J. Guzder, Deccan Coll., Poona. <i>Comment</i> : TF-1230-1232 coll. to study nature, age, and history of consolidation of these sediments. Samples suggest that they probably derive from same deposit spread over ca. 25km. |                     |
|   | <b>8795 ± 115</b>   |
| <b>TF-1147. Cochin Harbour, coastal sediment</b>  | <b>6845 B.C.</b>    |
| Log wood from Cochin harbour (9° 57' N Lat, 76° 15' E Long), Dist. Ernakulam, depth 21m. Subm. by Coast Engineering Div., Kerala Engineering Inst., Peechi, Kerala.   |                     |
|   | <b>10,120 ± 250</b> |
| <b>TF-1200. Continental shelf, off Ratnagiri</b>  | <b>8170 B.C.</b>    |
| Coral from continental shelf, off Ratnagiri (17° N Lat, 72° E Long), depth, 160m. <i>Comment</i> : if sample was <i>in situ</i> , it dates a low sea-level stand.   |                     |

- TF-1111. Gargaon, India, Late Pleistocene** **10,020 ± 150**  
**8070 B.C.**  
Bone from Gargaon, Dist. Poona, right bank of river in silt, 12m above water level and immediately above boulder gravel. Subm. by G. Corvinus, Deccan Coll., Poona 6. *Comment*: uncharred bones are probably contaminated by surrounding ground-water carbonates.
- TF-1177. Inamgaon, Late Pleistocene** **18,750 ± 350**  
**16,800 B.C.**  
Freshwater shells from Inamgaon (18° 36' N Lat, 74° 32' E Long), Dist. Poona, 2m above bed of R. Ghod. Subm. by S. N. Rajaguru. *Comment*: also dates assoc. Middle Stone Age tools.
- TF-1232. Korlai-Borlai, littoral deposits** **2340 ± 90**  
**390 B.C.**  
Shells from Korlai-Borlai (18° 30' N Lat, 72° 50' E Long), Dist. Kolaba, 40 to 50 cm above hwl. Subm. by S. J. Guzder. *Comment*: see comment, TF-1231.
- TF-1186. Madh Point, unconsolidated shell** **2055 ± 90**  
**105 B.C.**  
Shells from Madh Point (19° 11' N Lat, 72° 47' E Long), Dist. Bombay, from 0.55m above hwl. Subm. by D. P. Agrawal.
- TF-1149. Mahim-Kelwa, consolidated beach rock** **35,030 + 1980**  
**33,080 B.C. - 1625**  
Beach rock from Mahim-Kelwa (19° 40' N Lat, 72° 30' E Long) Dist. Thana, from intertidal zone. Subm. by D. P. Agrawal.
- TF-1230. Mandawa, littoral sediment** **1990 ± 105**  
**40 B.C.**  
Shells from Mandawa (18° 35' N Lat, 72° 45' E Long), Dist. Kolaba, from 0.05m above hwl. Subm. by S. J. Guzder. *Comment*: see TF-1231.
- Manori series, Maharashtra**  
Manori (19° 12' N Lat, 72° 47' E Long), Dist. Bombay. Shells from obsolete well dug into littoral concrete. Rain water collects in it. From depth 5.25 to 6m, sides of the well are slightly damp. Samples subm. by D. P. Agrawal.
- TF-1192.** **4130 ± 85**  
**2180 B.C.**  
Shells, 1m below hwl.
- TF-1193.** **4415 ± 95**  
**2465 B.C.**  
Shells, 1m below hwl.
- TF-1194.** **4260 ± 110**  
**2310 B.C.**  
Shells, 3m above hwl.

- 2530 ± 105**  
**580 B.C.**
- TF-1150. Murud, littoral sediment**  
Shells from Murud (17° 40' N Lat, 73° E Long), Dist. Ratnagiri, from a well, 0.50m above hwl and 1 furlong inland from sea. Subm. by S. J. Guzder.
- 19,645 ± 315**  
**17,695 B.C.**
- TF-1047. Patan, coastal sediment**  
Shells from Patan, Dist. Junagad, Gujarat, from bed 0.5m thick. Subm. by S. K. Gupta, TIFR, Bombay. *Comment:* shell bed is very hard due to leaching of CaCO<sub>3</sub>, overlies soft deposit and underlies silt layer full of shells.
- +1770**  
**32,750**  
**-1580**  
**30,800 B.C.**
- TF-967. Rati Karar, India, Late Pleistocene sediment**  
Shells from Rati Karar, Dist. Narshinghpur at depth 11.0m, found with Middle Stone Age tools and a few animal bones. Subm. by S. N. Rajaguru, Deccan Coll., Poona-6. *Comment:* dates Middle Stone Age in India.
- 2720 ± 105**  
**770 B.C.**
- TF-1197. St. Xavier's College, Holocene sediment**  
Shells from St. Xavier's Coll. (18° 56' N Lat, 72° 50' E Long) Dist. Bombay, from 2.0m depth. Subm. by Dept. Geol., St. Xavier's Coll., Bombay.
- 4005 ± 100**  
**2055 B.C.**
- TF-1024. Surajbari, India, Quaternary sediment**  
Marine shells from Surajbari (23° 8' N Lat, 70° 42' E Long), Dist. Malia. Subm. by S. K. Gupta.
- 3745 ± 105**  
**1795 B.C.**
- TF-1213. Tasgaon, alluvial sediment**  
Wood from Tasgaon (17° 2' N Lat, 74° 39' E Long), Dist. Sangli in *in situ* position from a pebble conglomerate, depth 10m below terrace level, on left bank of R. Krishna. Subm. by S. N. Rajaguru.
- Vagator series, Union territory**  
Vagator (15° 36' N Lat, 73° 44' E Long), Dist. Goa. Samples subm. by D. P. Agrawal.
- 820 ± 90**  
**A.D. 1130**
- TF-1081. Littoral sediment**  
Shells from 1.0m depth.
- 955 ± 90**  
**A.D. 995**
- TF-1082. Littoral sediment**  
Shells from surface. *Comment:* TF-1081 came from stratified layer of shells and sand, only partly consolidated. TF-1082 was taken from a large but unstratified block of beach rock lying in intertidal zone. Samples were

coll. to ascertain relationship of these deposits with others of mid-Holocene age further N along W coast.

### Vembanad Lake series, Kerala

Samples were measured to date sedimentation rate in lake; subm. by P. S. N. Murty, NIO, Panaji.

#### TF-1091. Sediment shells

Shells from 1.8m below bottom of lake.

**3945 ± 140**

**1995 B.C.**

#### TF-1090. Sediment shells

Shells from 3.3m below bottom of lake.

**3625 ± 95**

**1675 B.C.**

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