VOLUME 23 / NUMBER 3 / 1981

Radiocarbon

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ELEVENTH INTERNATIONAL RADIOCARBON CONFERENCE

June 20-26, 1982

Seattle, Washington, USA

The Eleventh International Radiocarbon Conference will be held from June 20 to 26, 1982 on the campus of the University of Washington in Seattle.

PROGRAM

The scientific program includes the following topics:

- ^{14}C and archaeology
- Mass spectrometric dating with accelerators and enrichment of ^{14}C samples. We invite also the discussion of other radioisotopes
- Natural ^{14}C variations, with special consideration of the influence of climate change on past atmospheric ^{14}C and CO_2 levels
- General technique
- The influence of man on ^{14}C levels in our environment
- ^{14}C and overlapping dating methods
- Special topics: to be announced

PAPERS

Acceptance of papers will be decided on the basis of extended summaries (about 2 pages). Depending on the number of papers accepted, parallel sessions and/or poster sessions may be scheduled. Apart from the paper presentations one or more working sessions may be planned during the conference. The conference proceedings will be published in RADIOCARBON.

AMQUA

A meeting of AMQUA, the American Quaternary Association, has been scheduled in Seattle following the Radiocarbon Conference (June 28-30). It may be possible to take part in the AMQUA preconference field trips on June 26 and 27.

Write for more information to:

Quaternary Isotope Laboratory, AK-60
University of Washington
Seattle, Washington 98195

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EDITORIAL STATEMENT TO CONTRIBUTORS

Since its inception, the basic purpose of Radiocarbon has been the publication of compilations of ^{14}C dates produced by various laboratories. These lists are extremely useful for the dissemination of basic ^{14}C information.

In recent years, Radiocarbon has also been publishing technical and interpretative articles on all aspects of ^{14}C. The editors and readers agree that this expansion is broadening the scope of the Journal. Last year, the editors published the Proceedings of the Tenth International Radiocarbon Conference that was held at Bern and Heidelberg, August 19-26,1979. Volume 22, Nos. 2 and 3, 1980 contained these proceedings. Volume 23, 1981 now returns to its usual format of three numbers per volume.

As a result of publishing the proceedings, another section is added to our regular issues, "Notes and Comments". Authors are invited to extend discussions or raise pertinent questions to the results of scientific investigations that have appeared on our pages. The section will include short, technical notes to relay information concerning innovative sample preparation procedures. Laboratories may also seek assistance in technical aspects of radiocarbon dating.

All correspondence, manuscripts and orders should be sent to the Managing Editor, Radiocarbon, Kline Geology Laboratory, Yale University, 210 Whitney Ave, PO Box 6666, New Haven, Connecticut 06511.

The Editors

NOTICE TO READERS

Half life of ^{14}C. In accordance with the decision of the Fifth Radiocarbon Dating Conference, Cambridge, 1962, **all dates published in this volume (as in previous volumes) are based on the Libby value, 5570 ± 30 yr,** for the half life. This decision was reaffirmed at the 9th International Conference on Radiocarbon Dating, Los Angeles/La Jolla, 1976. Because of various uncertainties, when ^{14}C measurements are expressed as dates in years BP the accuracy of the dates is limited, and refinements that take some but not all uncertainties into account may be misleading. The mean of three recent determinations of the half life, 5730 ± 40 yr, (**Nature, v** 195, no. 4845, p 984, 1962), is regarded as the best value presently available. Published dates in years BP, can be converted to this basis by multiplying them by 1.03.

AD/BC Dates. In accordance with the decision of the Ninth International Radiocarbon Conference, Los Angeles and San Diego, 1976, the designation of AD/BC, obtained by subtracting AD 1950 from conventional BP determinations is discontinued in Radiocarbon.

Authors or submitters may include calendar estimates as a comment, and report these estimates as AD/BC, citing the specific calibration curve used to obtain the estimate.

Meaning of $\delta^{14}C$. In Volume 3, 1961, we endorsed the notation Δ (Lamont VIII, 1961) for geochemical measurements of ^{14}C activity, corrected for isotopic fractionation in samples and in the NBS oxalic-acid standard. The value of $\delta^{14}C$ that entered the calculation of Δ was defined by reference to Lamont VI, 1959, and **was corrected for age.** This fact has been lost sight of, by editors as well as by authors, and recent papers have used $\delta^{14}C$ as the **observed** deviation from the standard. At the New Zealand Radiocarbon Dating Conference it was recommended to use $\delta^{14}C$ only for age-corrected samples. Without an age correction, the value should then be reported as percent of modern relative to 0.95 NBS oxalic acid. (Proceedings 8th Conference on Radiocarbon Dating, Wellington, New Zealand, 1972). The Ninth International Radiocarbon Conference, Los Angeles and San Diego, 1976, recommended that the reference standard, 0.95 times NBS oxalic acid activity, be normalized to $\delta^{13}C = -19‰$.

In several fields, however, age corrections are not possible. $\delta^{14}C$ and Δ, uncorrected for age, have been used extensively in oceanography, and are an integral part of models and theories. For the present, therefore, we continue the editorial policy of using Δ notations for samples not corrected for age.

Citations. A number of radiocarbon dates appear in publications without laboratory citation or reference to published date lists. We ask that laboratories remind submitters and users of radiocarbon dates to include proper citation (laboratory number and date-list citation) in all publications in which radiocarbon dates appear.

Radiocarbon Measurements: Comprehensive Index, 1950-1965. This index, covering all published ^{14}C measurements through Volume 7 of RADIOCARBON, and incorporating revisions made by all laboratories has been published. It is available to all subscribers to RADIOCARBON at $20.00 US per copy.

Publication schedule. Beginning with Volume 15, RADIOCARBON has been published in three issues: Winter, Spring, and Summer. Contributors who meet our deadlines will be given priority but publication is not guaranteed in the following issue.

List of laboratories. The comprehensive list of laboratories at the end of each volume appears in the third number of each volume. Changes in names or addresses should be reported to the Managing Editor by May 1.

Index. All dates appear in index form at the end of the third number of each volume. Starting with Volume 22, RADIOCARBON published a new type of index, organized in chronologic order, according to sample type and by geographic distribution. Authors of date lists are requested to prepare index tables following the format shown in volume 22, no. 4, 1980 and volume 23, no. 3, 1981. The editors of RADIOCARBON believe that this practice serves a more useful function. Our readers are encouraged to make further suggestions.

RADIOCARBON

Editor: Minze Stuiver

Managing Editor: Renee S Kra

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Subscription rate $60.00 (for institutions), $40.00 (for individuals), available only in whole volumes. The Proceedings of the Tenth International Radiocarbon Conference, vol 22, nos. 2 and 3, are available for $60.00. The price of the full volume 22, nos. 1-4, is $60.00 for individuals and $80.00 for institutions.

All correspondence and manuscripts should be addressed to the Managing Editor, RADIOCARBON, Kline Geology Laboratory, Yale University, 210 Whitney Ave, PO Box 6666, New Haven, Connecticut 06511.

INSTRUCTIONS TO CONTRIBUTORS

Manuscripts of radiocarbon papers should follow the recommendations in *Suggestions to Authors*, 5th ed.* All copy (including the bibliography) must be typewritten in *double space*. Our deadline schedule is:

For	*Date*
Vol 24, No. 2, 1982	Jan. 1, 1982
Vol 24, No. 3, 1982	May 1, 1982
Vol 25, No. 1, 1983	Sept. 1, 1982

General or technical articles should follow the recommendations above and the editorial style of the *American Journal of Science* or the Proceedings of the Tenth International Radiocarbon Conference. Date lists should follow the format shown in the most recent issue of RADIOCARBON. More detailed instructions are available upon request. Separate mailings have been discontinued.

Illustrations should include explanation of symbols used. Copy that cannot be reproduced cannot be accepted; it should be capable of reduction to not more than 10 by 17.5, all lettering being at least 1/16 inch high after reduction. When necessary, one large map or table can be accepted, if it will not exceed 17.5 inches in width after reduction. Line drawings should be in black India ink on white drawing board, tracing cloth, or coordinate paper printed in blue and should be accompanied by clear ozalids or reduced photographs for use by the reviewers. Photographs should be positive prints. Photostatic and typewritten material cannot be accepted as copy for illustrations. *Plates* (photographs) and *figures* (line drawings) should each be numbered consecutively through each article, using arabic numerals. If two photographs form one plate, they are figures A and B of that plate. **All measurements should be given in SI (metric units).**

Reprints. Thirty separate copies of each article will be furnished to the author free of cost and without previous notice from him; these will be without a cover. The cost of additional copies will, of course, be greater if the article is accompanied by plates involving unusual expense. Copies will be furnished with a printed cover giving the title, author, volume, page, and year, when specially ordered.

Page charges. Each institution sponsoring research reported in a technical paper, not a date list, will be asked to pay a charge of $80.00 per printed page, due when galley proof is returned. Institutions or authors paying such charges will be entitled to 100 free reprints without covers (over and above the 30 free reprints furnished the author.) No charge will be made if the author indicates that his institution is unable to pay them, and payment of page charges on an article will *not* in any case be a condition for its acceptance.

Back issues and price lists may be obtained from the office of RADIOCARBON.

* Suggestions to authors of the reports of the United States Geological Survey, 5th ed, Washington, DC, 1958 (Government Printing Office, $1.75).

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US NATIONAL COMMITTEE FOR INQUA ANNOUNCES TRAVEL SUPPORT PROGRAM FOR XI INQUA CONGRESS IN USSR

The US National Committee of the International Union for Quaternary Research (INQUA) is seeking funding for a travel support program to ensure that the United States will be represented by an adequate number of qualified scientists at the XI International Congress of INQUA, to meet in Moscow, USSR, August 1-9, 1982. Funds for this purpose, now being solicited from a number of government agencies and private institutions, will be coordinated by the US National Committee for INQUA. Applications from younger scientists are encouraged.

Applicants for travel grant support should request application forms from Mr W L Petrie, USNC/INQUA, National Academy of Sciences, 2101 Constitution Ave, NW, Washington, DC 20418. Four completed application forms, together with four copies of the abstract of the paper submitted to INQUA must be received by the Academy Office no later than January 15, 1982. Grant awards may be made as late as July 15, 1982, depending on funds received. If possible, some advance indication of tentative selections will be communicated earlier.

The purpose of the International Union for Quaternary Research (INQUA) is to bring together, on a world-wide basis, scientists in all disciplines concerned with the history of man's environment, and with the processes by which environment and man's relation to it have evolved. Included among these disciplines are: archaeology, botany, climatology, ecology, geochemistry, geography, geomorphology, geophysics, hydrology, paleontology, limnology, oceanography, palynology, physical anthropology, soil science, tectonophysics, and zoology.

The National Academy of Sciences is the adhering body to INQUA on behalf of the American scientists. The US National Committee, under the chairmanship of Dr R S Hoffmann, University of Kansas, plans US participation in INQUA activities. One of the functions of the Committee is to arrange for travel support of US scientists attending the international congresses of INQUA held at four-year intervals. Further information about the XIth Congress may be obtained by writing to Dr Ismail P Kartashov, Secretary-General, XI INQUA Congress, Geological Institute, USSR Academy of Sciences, Pyzhevsky 7, Moscow 109017, USSR.

[RADIOCARBON, VOL. 23, No. 3, 1981, P 329-344]

Radiocarbon

1981

TELEDYNE ISOTOPES RADIOCARBON MEASUREMENTS XII

JAMES BUCKLEY and CYNTHIA VALDES-PAGES

Teledyne Isotopes
Westwood, New Jersey 07675

This date list reports samples completed before 1979. Methods, equipment, and techniques were reported previously (R, 1968, v 10, p 246; R, 1970, v 12, p 87). Age calculations are based on the conventional ^{14}C half-life of 5568 years. The working laboratory standard is 95% of the NBS oxalic acid standard (SRM 4990). Results are reported in years before 1950 and the standard deviation is based on counting statistics of sample, background, and modern standard. Corrections for $\delta^{13}C$ are not included.

We gratefully acknowledge the administrative support of Donald F Schutz, Teledyne Isotopes' president, and the careful manuscript preparation of Marie Mandel and Barbara Mancuso.

I. GEOLOGIC SAMPLES

United States

Alaska

Beaufort and Chukchi Sea Coast series

Samples from coastal areas of Beaufort and Chukchi Seas dated as contribution to Outer Continental Shelf Environmental Assessment Program. Coll and subm 1978 by D M Hopkins, USGS, Menlo Park, California (Hopkins and Robinson, 1979).

I-10,328. 76 Ahp 47a **9130 ± 150**

Basal peat from older of two successive thaw lakes, Wainwright Quad, 1.1km SW Nokotlek Pt (70° 18′ 45″ N, 161° 03′ 00″ W). *Comment*: with I-10,329 shows two lakes existed at same site, older lake for <3000 yr.

I-10,329. 76 Ahp 47b **6240 ± 120**

From basal 10cm of 60cm detrital peat representing younger thaw lake.

I-10,330. 76 Ahp 60a **8280 ± 140**

From basal 5cm of deposit 1.9m thick representing peat accumulated in low-center ice-wedge polygons. *Comment*: date is min for inception of low-center polygons and provides estimated rate of peat accumulation at Nokotlek Pt.

I-10,331. 76 Ahp 60b **9540 ± 150**

Fine-grained cryoturbated peat stringers in colluvium 25cm below base of low-center polygon peat (I-10,330).

I-10,332. 76 Ahp 62 **8440 ± 160**

Twigs in basal 10cm of thaw-lake deposit 1.5cm thick, Wainwright Quad, 0.2km SW Nokotlek Pt (70° 19′ 42″ N, 161° 01′ 00″ W). Coll within 50m of former lake margin and thought to have been deposited shortly before lake was drained.

I-10,368. 76 Ahp 82 **9180 ± 150**

Basal peat of an older thaw-lake, Wainwright Quad, 10km SW of Wainwright Inlet (70° 31′ 30″ N, 160° 17′ 00″ W).

I-10,369. 77 Ahp 35b **3950 ± 120**

Detrital peat 1cm below white ash layer in windblown sand sequence derived from Canning R bars. Mainland shore of Canning Lagoon, 0.4km W of mouth of E branch of Canning R (70° 04′ 42″ N, 145° 35′ 00″ W). *Comment*: age is min for accumulation of windblown sand; with I-10,370, brackets age of ash.

I-10,370. 77 Ahp 35c **3320 ± 100**

Twigs and detrital peat 5cm above white ash layer.

I-10,371. 77 Ahp 40a **4890 ± 230**

Detrital peat at depth 3.6m in 4m layer windblown sand from river bars, E end of Flaxman I. (70° 10′ 35″ N, 145° 56′ 48″ W). *Comment*: sample from 5cm above ash layer thought to be same as ash bracketed by I-10,369 and -10,370.

I-10,372. 77 Ahp 40z **2380 ± 180**

Detrital peat at depth 0.45m in 4m layer windblown sand. *Comment*: date is max for drowning of Leffingwell Channel by rising sea level.

Indiana

I-9635. Patoka damsite **7670 ± 130**

Sycamore wood *(Platanus occidentalis)* from Dubois Co (38° 26′ 00″ N, 86° 42′ 25″ W). At base of alluvial silt and sand overlying Illinoian age sediments, 10m below ground surface. Coll 1976 by H Gray, J Bassett, and R Powell; subm 1976 by N Bleuer, Indiana Geol Survey, Bloomington. *Comment*: dates base of postglacial alluvial backfill on Patoka R and agrees with dates for similar positions in Indiana (Gray, 1963).

I-9636. Briggs Bros Catfish Farm **13,600 ± 210**

Spruce wood (*Picea* sp) from Jasper Co (40° 56′ 10″ N, 87° 56′ 18″ W). From 2.3m depth in basin of marly loam and beneath 15cm muck which yielded mastodon remains. Basin lies within elongate crisscrossing troughs S of Iroquois Moraine (Bleuer, 1974). Coll 1975; subm 1976 by N Bleuer.

I-9637. Cates Strip Pit **24,070 ± 570**

Peaty silt from Fountain Co (39° 59′ 43″ N, 87° 21′ 48″ W). Exposed on E wall of small coal strip pit within single till unit at depth 3.7m. Till is considered equivalent of Glenburn Till on basis of mineralogy (Johnson, 1972). Coll and subm 1976 by N Bleuer. *Comment*: date is Farmdalian and appropriate for inclusion in basal Wisconsin till.

I-9634. Putnam Section 128 **20,100 ± 400**

Organic silt from Putnam Co (39° 41′ 16″ N, 86° 45′ 15″ W). Strat sec from top: upper till, sand, woody till with basal ice shearing, clay, sample silt. Coll 1976 by M Moore and N Bleuer, subm 1976 by N Bleuer. *Comment*: dates base of Trafalgar fm, is similar to other dates in this position.

I-10,075. Fort Wayne Admore Rd, Quarry-2 **22,340 ± 520**

Wood from thin discontinous outwash bed above weathered sand, below loamy till (Bleuer and Moore, 1971; Moore and Bleuer, 1973). SENENW sec 29, T 30 N, R 12 E, Fort Wayne (41° 01′ 36″ N, 85° 11′ 58″ W). Coll 1977 by M Moore; subm 1978 by N Bleuer. *Comment*: dates outwash at base of Trafalgar fm stratigraphically below woody silt dated 21,310 ± 350 (ISGS-382) suggesting rigid advance of Huron Erie Lobe across Indiana.

Russellville series

Silt and woody debris SWSENW sec 8 T 16 N R 5 W and S of Russellville (39° 50′ 44″ N, 86° 59′ 14″ W). Coll 1977 by N Bleuer and J Hill; subm 1977 by N Bleuer.

I-10,073. Russellville silt-lower **21,830 ± 510**

From organic bed *in situ* below two loams till of Trafalgar fm (Wayne, 1965).

I-10,074. Russellville wood-top **20,100 ± 400**

Occurs as woody debris mat. *Comment*: date is in range of those between Center Grove (lower) and Cartersburg (upper) members of Trafalgar fm. Site is beyond Crawfordsville Moraine, assumed to be outer limit of Cartersburg member.

California

I-9706. No. 2 Van Duzen River **1600 ± 80**

Wood *(Pseudotsuga menziesii)*, Douglas fir in growth position on South Fork Van Duzen R, Blocksburg (40° 19′ N, 123° 33′ 30″ W). Coll and subm 1978 by H M Kelsey, US Geol Survey, Menlo Park. *Comment*: dates episode of landslide fill.

I-9731. Tomasini Point **>40,000**

Peat interbedded with estuary-type sediments on N facing cliffs of Tomasini Pt, Tomales Bay, Marin Co (38° 07′ 06″ N, 122° 50′ 36″ W). Coll and subm 1976 by D L Wagner, California Div Mines & Geol, San Francisco. *Comment*: dates outcropping of Millerton fm and dated to help determine age of trace of San Andreas fault. Richards and Thurber (1966) dated mollusks at apparent age, 35,000 yr BP, but felt true age is >55,000 yr. Date supports that conclusion.

Minnesota

I-8533. Squaw Lake **790 ± 90**

Gyttja from 50 to 60cm in 24m water, Squaw L, Clearwater Co (47° 14′ N, 95° 16′ W). Coll 1973; subm 1975 by W A Patterson, III, Coll Forestry, Univ Minn, St Paul. *Comment*: sediment accumulation rate for Squaw L is estimated at 0.7mm/yr. Pollen profiles show shift from white to red/jackpine pollen in upper 0.5m sediment. Based on inferred sedimentation rate, shift in pine species representation occurred between AD 1650 and 1850 and appears correlated with increasing occurrences of fire (Patterson, ms).

Portage Lake series

Marl samples from lake sediment core in Cass Co(47° 05′ N, 79° 22′ W). Coll 1970, subm 1973 by J H McAndrews.

I-7270. 300 to 310cm **3690 ± 120**

Dates basal *Pinus strobus* pollen zone. *Comment*: date for similar zone boundary in Bog D Pond is 2730 BP (McAndrews, 1966) is possibly due to metachronous east-west migration of *Pinus strobus*.

I-7271. 690 to 700cm **7320 ± 120**

Dates top of *Pinus banksiana/resinosa* zone. *Comment*: date is young compared to same boundary in Bog D but correlates well with Shay's date of ca 7500 BP for same boundary (Shay, 1971).

I-7272. 780 to 792cm **9780 ± 140**

Dates *Picea* decline and pollen zone boundary. *Comment*: date seems young for this zone boundary compared to Bog D Pond but correlates well with Shay's date of ca 9500 BP (Shay, 1971).

Lake Minnie series

Gyttja samples from lake sediment core, Hubbard Co (47° 15′ N, 95° 00′ W). Coll and subm 1974 by J H McAndrews.

I-8458. 400 to 410cm **3400 ± 110**

Dates bottom of *Pinus strobus* pollen zone. Significantly older than similar horizon at Bog D Pond (McAndrews, 1966).

I-8459. 810 to 820cm **10,730 ± 150**

Dates pollen zone boundary characterized by decline in *Picea* and rise in *Pinus*. Date is older than similar zone at Itasca Bison site (Shay, 1971) but compares well with Bog D Pond.

North Dakota

Spiritwood Lake series

Gyttja samples from lake sediment core in Stutsman Co (47° 05′ N, 98° 35′ 30″ W). Coll 1970 by J H McAndrews and R Loeffler; subm 1974 by J H McAndrews.

I-8479. 580 to 600cm **2830 ± 90**

Dates slight rise in *Pinus* and *Graminae*. *Fraxinus,* although not continuous, is more common above this level. Date correlates with boundary of pollen zones 3/4 at Pickerel L, South Dakota (Watts and Bright, 1968).

I-8480. 1350 to 1370cm **8300 ± 140**

Level correlates with boundary of pollen zone 2/3 at Pickerel L.

I-8481. 1430 to 1450cm **10,970 ± 160**

Dates pollen zone boundary noted by decline of *Picea* and rise of *Pinus*. *Comment*: correlates with end of *Picea/Populus* zone (McAndrews, 1966) and older than *Picea* decline at Seibold site (Cvancara *et al,* 1971) but correlates with *Picea* decline at Pickerel L.

Canada

Van Nostrand Lake series

Marl samples from lake sediment core in Whitechurch twp, 20mi N of Toronto, Ontario (44° 00′ N, 79° 22′ W). Coll 1968 and subm 1971 by John H McAndrews, The Royal Ontario Mus, Toronto.

I-5785. 480 to 490cm **5710 ± 140**

Comment: dates pollen zone boundary 4/5, beginning of Tsuga min. However, dates based on carbonate carbon may be too old. Same boundary at Found L, Ontario dates 4640 ± 95 (I-7987).

I-5786. 930 to 940cm **9750 ± 140**

Comment: dates pollen zone between *Pinus banksiana/resinosa* and *P strobus* (McAndrews, 1972).

I-7741. Sawlog Bay **6220 ± 110**

Gymnosperm wood embedded in marl horizon in L Nipissing beach, Simcoe Co, Ontario (44° 52′ N, 79° 57′ W). Coll 1973 and subm 1974 by J H McAndrews. *Comment*: dates early stage in building L Nipissing beach (Lewis, 1970). Pollen analysis of marl indicates pollen zone 3 (McAndrews, 1972).

Pass Lake series

Gyttja samples from lake sediment core in Thunder Bay Dist, Ontario (48° 33′ 40″ N, 88° 44′ 20″ W). Coll and subm 1975 by J H McAndrews.

I-8691. 195 to 205cm **5070 ± 100**

I-8692. 230 to 240cm **5300 ± 100**

I-8879. 210 to 220cm **7280 ± 120**

General Comment: all dates too young. Pollen study indicates approx age of 9500 BP. Geologic evidence (Saarnisto, 1974; 1975; Mothersill, 1971) indicates age should be contemporary with L Minong Beach. Brohn site (MacNeish, 1952) of Paleo-Indian period is also contemporaneous with formation of Minong beach and supports earlier date.

I-8879C. 210 to 220cm **7460 ± 280**

Duplicate of sample I-8879.

Lac Roche Moutonee series

Gyttja samples from lake sediment core 2.5mi E Indian House Lake, Quebec (56° 47′ N, 64° 48′ W). Alt 443m. Coll and subm 1975 by J H McAndrews.

I-9064. 0 to 20cm **510 ± 150**

I-9065. 100 to 115cm **2660 ± 170**

I-9066. 200 to 215cm **3510 ± 180**

I-9067. 250 to 260cm **4090 ± 250**

Dates beginning of *Betula/Alnus* decline and gyttja-clay transition interpreted as retreat of N2 phase of L Naskapi (Ives, 1960).

ELA (Hayes) Lake 240 series

Gyttja from lake sediment core in Experimental Lakes Area, Kenora Dist, Ontario (49° 35′ N, 93° 45′ W). Coll 1969; subm 1973 by J H McAndrews.

I-7267. 220 to 230cm **4690 ± 130**

Correlates with pollen zone boundary LC 5/6 with varve date, 3000 BP (Craig, 1972).

I-7268. 410 to 420cm **6970 ± 120**

Dates beginning of *Pinus strobus* pollen rise that correlates with Lake of the Clouds varve date, 7000 BP (Craig, 1972).

I-7269. 560 to 570cm **10,800 ± 160**

Dates pollen zone boundary defined by decline of *Picea* and rise of *Pinus banksiana/resinosa*. Varve date for same pollen zone boundary is 9200 BP (Craig, 1972).

Georgian Bay series

Peat samples from layer in gray silty clay in lake sediment core. From W coast of Georgian Bay, Bruce Co, Ontario (44° 55′ 05″ N, 81° 07′ 10″ W). Coll 1973 by T W Anderson; subm 1974 by J T McAndrews.

I-7857. P2A **8790 ± 150**

From top of peat layer, at 292cm depth. *Comment*: pollen analysis by TWA indicates peat accumulated during early Holocene pine period and contains pollen of rooted aquatic plants. Date is min for end of low-water L Hough Stage (Sly and Lewis, 1972).

I-7858. P2B **9930 ± 250**

Bottom of peat layer, 330cm depth, water depth, 25.6m.

Rice Lake series

Sediment samples from core 7, Rice L, Peterborough Co, Ontario (44° 10′ N, 78° 15′ W). Coll and subm 1973 by J H McAndrews.

I-7222. 140 to 150cm **3890 ± 130**

Gyttja in pollen zone 6 (McAndrews, 1972).

I-7223. 183 to 200cm **6560 ± 120**

Marl from top of pollen zone 3.

I-7274. 440 to 450cm **8210 ± 160**

Gyttja at top of *Picea* pollen zone. *Comment*: date is too young for this boundary (Karrow *et al,* 1975).

I-9772. Port McNeill, British Columbia (PM8) **>38,000**

Wood fragments from glacially overridden beds of fine sand and silt. Overlain by massive till and weathered marine silts and clay. NTS sheet 92 L/11 Port McNeill (50° 31′ 30″ N, 127° 02′ 30″ W). Coll 1976 by D Howes, A Catteron, and B Smith; subm 1976 by D Howes, Environment and Land Use Comm, Victoria, British Columbia. *Comment* (DH): first known interglacial date on N Vancouver I. and may allow for possible correlation with lower marine unit of quadrasediments recorded by Fyles (1963) on S Vancouver I.

Greenland

I-10,433. GGU 215942/5+9 **6630 ± 110**

Moss peat from loc 77/320, Natarnivinngup qaqa, Holsteinsborg Kommune, W Greenland (67° 09′ N, 53° 32′ W). From basal 1.5cm of 0.95m terrestrial peats overlying fluvioglacial sands on distal side of lateral moraine. Coll and subm 1977 by M Kelly, Univ Lancaster, Lancaster, England. *Comment*: date is min for series of moraines of local glaciers.

Pacific Islands

Tonga Islands series

Coral *(Porites lobata),* 100% aragonite from Tongatapu I. Coll and subm 1976 by F W Taylor, Dept Geol Sci, Cornell Univ, Ithaca, New York for study of Pacific geodynamics.

I-9819. TPU-AN-1 **6240 ± 110**

From 2m sea cliff N of Kolonga Village (21° 7′ 18″ S, 175° 4′ 48″ W) 0.7m above high tide level.

I-9820. TPU-AT-1 **6120 ± 110**

From excavation in third street downtown Nuku'alofa (21° 7′ 42″ S, 175° 12′ W) 0.5m above high tide level. *Comment*: other dates from nearby equivalent exposures using $^{230}Th/^{234}U$ method are: *Porites lobata* 5900 ± 900, *Porites* sp 6200 ± 300 and 7600 ± 800, *Acropora* sp 6200 ± 300 (Taylor and Bloom, 1977; Bourrouilh and Hoang, 1976).

I-9818. EUA-AV-1 **6360 ± 110**

Coral *(Acropora humilis),* 100% aragonite, in growth position on surface of emerged reef 0.5m above mean high tide. From W coast of Eva I., 100m N of Ohonua Village (21° 20′ 18″ S, 174° 57′ 12″ W). Coll and subm 1976 by F W Taylor. *Comment*: a $^{230}Th/^{234}U$ date obtained on coral at this locality is 5700 ± 500 (Taylor and Bloom, 1977). Location is considered equivalent to TPU-AT and TPU-AN, this date list. Mean daily tidal range of 1.2m indicates 2.2m of Holocene emergence (Hoffmeister, 1932; Ladd and Hoffmeister, 1927).

Malaysia

I-10,183. Serdang Ash Deposit, YCP-14/31 **>40,000**

Wood and sieved peat from Selangor Brickworks clay pit. From thin discontinous peat horizon underlying 90cm gray-yellow ash deposit 39m above MSL. Pit located at mile 12 Serdang, 0.7km S of Serdang Lama, Selangor. On 1: 63360 Kuala Lumpur topographic map, sheet 94, new series, grid ref 664804 (3° 00′ 41″ N, 101° 43′ 25″ E). Coll 1977 by P H Stauffer and B C Batchelor, Dept Geol, Univ Malaya, Kuala Lumpur. *Comment*: (BCB): ash and peat deposited in open water lacustrine environment. Ash probably originated from volcanic eruptions at L Toba, Sumatra, Indonesia (Stauffer, 1973 a,b; Stauffer and Batchelor, 1978).

Australia

Wonnerup series

Samples from beach ridges SE shore of Deadwater, Wonnerup Inlet, SW Australia (33° 35′ S, 115° 28′ E). Coll 1977 by J Searle; subm 1977 by B Logan, U Western Australia, Nedlands.

I-10,195. Wonnerup 2 **4600 ± 120**

Shell (*Katelysia scalarina* [Lamark] and *K rhtiphora* [Lamy]) at alt 1.2m representing basal part of Late Holocene beach and ridge sequence. *Comment*: indicates period when Holocene to modern beach ridges formed and sea level regressed due to tectonic or eustatic adjustment.

I-10,196. Wonnerup 1 **205 ± 75**

Peat from former beach face deposit within prograding sequence of Late Holocene sediments. *Comment*: dates time plane within Late

Holocene sequence and indicates coastal accretion of ca 170mi in last 200 yr.

Africa

South Basin, Lake Tanganyika series

Diatom-rich gyttja from 10.74m core in L Tanganyika in 440m water, near Mpulungu, Zambia (8° 30′ S, 30° 50′ E). Coll 1960 by D A Livingstone and R A Kendall and subm 1978 by D A Livingstone, Dept Zool, Duke Univ, Durham, North Carolina.

I-10,490. Tang 2-3 **15,900 ± 600**

Lowermost 0.49m of core.

I-10,491. Tang 2-1 **1380 ± 190**

Uppermost meter of core.

General Comment: core provides estimate of min time since level of L Tanganyika could have been 440m below modern level. Livingstone (1965) estimated time at 22,000 yr by extrapolation. Hecky and Degens (1973) challenged this estimate and suggested hydrologic budget in which water level fell at least 500m during late-Pleistocene interpluvial. Dates show that lake level was above −440m during driest part of late Pleistocene interpluvial and deny suggestion of Hecky and Degens that flocks of endemic sp in L Tanganyika evolved while lake was separated into two basins.

II. ARCHAEOLOGIC SAMPLES

United States

Palomar College Campus series

Charcoal from Hearths Site PC-3 on ridge above cactus garden SE edge Palomar Coll campus, San Marco, California (33° 08′ 50″ N, 117° 11′ 06″ W). Coll 1977 by S Murray and T Thurber and subm 1977 by D O'Neill, Palomar Coll.

I-10,626. F C 406 **290 ± 110**

Level V, 40 to 50cm in Pit S24W4.

I-10,627. F C 255 **390 ± 80**

Level II, 10 to 20cm, S wall Pit S18 EO. *Comment*: site attributed to San Luis Ray II cultural period. Dates agree and narrow period to prehistoric Luiseño.

Dead River series

Charcoal from N shore Ottertail L near mouth of Dead R, E of Co Hwy 1, Ottertail Co, Minnesota (46° 25′ 40″ N, 95° 40′ 20″ W). Coll 1977 and subm 1978 by M G Michlovic, Moorhead State Univ, Moorhead, Minnesota.

I-10,140. Dead River Site A **1070 ± 120**

From hearth extending 20cm below 15cm thickness of humus. Assoc with Blackduck pottery.

I-10,475. Dead River Site B **1170 ± 120**

Feature 9, assoc with Blackduck ceramics and burned turtle carapace at depth 10cm in sandy soil. *Comment*: date corroborates suggestion that pottery is derived from early Blackduck time range.

Bull Run Site series

Charred wood from Bull Run site (36LY119) 1mi above confluence of Loyalsock Creek and Susquehanna R on Bull Run in Loyalsock, Pennsylvania (41° 14′ N, 76° 56′ 30″ W). Coll and subm 1977 by J P Bressler, Williamsport, Pennsylvania.

I-10,165. Pit SW-21, Feature A **3170 ± 250**

From hearthlike pit 10 to 18cm below plow zone assoc with Marcey Creek Plain pottery, red ocher inclusions, Orient Fishtail points, and chipping debris. *Comment*: similar pits nearby contained burials without grave goods but heavily treated with red pigment (Kraft, 1970).

I-10,166. Pit NW-16B **720 ± 100**

From stockade postmold, 18cm diam, of single-row stockade that encircled this Shenks Ferry village. *Comment*: pioneer site for Stewart Phase of Shenks Ferry (Heisey and Witmer, 1972) id. by Shenks Ferry rim sherd and lumps of raw pottery clay.

I-10,167. Pit SE69, Feature A **470 ± 100**

Twigs with small diams taken from ovate, basin-shaped hearth, 61cm in diam, 10cm deep. Assoc with Stewart Phase Shenks Ferry body and rim sherds.

Canada

Pearl Beach series

Samples from Pearl Beach (Da Gv-1) on central N shore Larder L, Kirkland Lake Dist, Ontario (48° 06′ 04″ N, 79° 39′ 35″ W). Coll and subm 1977 by W C Noble, McMaster Univ, Dept Anthropol, Hamilton, Ontario.

I-10,261. No. 2 **220 ± 80**

Charred jackpine *(Pinus banksiana)* at 33cm depth, in small gray ash pit, Area B, Unit 1.

I-10,262. No. 11 **230 ± 80**

Charcoal, mostly cedar, from large hearth, 8cm deep, Area B, Unit 5A. *Comment*: dates late historic occupation by Ojibwa beaver hunters during early 1700's (Pollock, 1976).

I-10,651. Wyoming Rapids site **2480 ± 90**

Charcoal from site (AgHk-4) on Ausable R, W Williams twp, Middlesex Co, Ontario (43° 06′ 49″ N, 81° 48′ 12″ W). Coll and subm 1978 by I Kenyon, Min Culture and Recreation, London Court House, London, Ontario. From occupation zone 2m deep and 50cm below

Middle Woodland zone that yielded Saugeen ceramics. *Comment*: sample dates assoc Vinette I vessel of Early Woodland provenience.

I-10,313. George Davidson site **3780 ± 90**

Charcoal from site (AhHk-54) on Ausable R, SW Ontario (43° 11′ N, 81° 49′ W). Coll 1977 by I Kenyon and subm 1978 by W Fox. From small pit, Feature 3, in occupation horizon capped by riverine silt. *Comment*: dates Late Archaic Genesee component including stemmed Satchell complex bifaces.

Force Village series

Charcoal from Force Village (AgHd-1) Burford twp, Brant Co, Ontario (43° 08′ 15″ N, 80° 31′ 19″ W). Recovered by flotation of fill from storage pits in Glen Meyer longhouse. Coll and subm 1978 by W A Fox, Min Culture Hist Planning Research.

I-10,628. Feature 39 **625 ± 75**

From Feature 39, dates late Glen Meyer longhouse.

I-10,629. Feature 104 **715 ± 75**

From Feature 104, late Glen Meyer longhouse.

I-10,630. Feature 111 **1070 ± 80**

From Feature 111, dates Glen Meyer longhouse.

I-10,631. Feature 122 **705 ± 75**

From Feature 122 containing two Iroquois linear vessels.

Dawson Creek site series

Charcoal from Dawson Creek site (BaGn-16) Hamilton twp, Northumberland Co, Ontario (44° 06′ 56″ N, 78° 19′ 29″ W). Site is on wooded peninsula, N shore of Rice L. Coll and subm 1976 by L J Jackson, Dept Anthropol, Trent Univ, Peterborough, Ontario.

I-9862. Feature 1 **2550 ± 90**

From fire hearth containing tip of bifacial chert knife, ceramic sherds, red ocher fragments, chert flakes, and charred seeds. Hearth depth, 27 to 54cm, volume, 0.14 cu m.

I-9861. Feature 2 **2420 ± 90**

From fire hearth containing ceramics diagnostic of Early Woodland period. Hearth depth, 17 to 65cm, volume, 0.13 cu m.

I-9565. Feature 2-1 **2430 ± 90**

From same feature as I-9861. *Comment*: dates agree with Early Woodland ceramic assoc. Ceramic analysis indicates affinities with Vinette I sites in central New York State (Jackson, 1980).

Mexico

Chicanna series

Wood lintels from above doorways of Rio Bec structures in Late Classic Bejuco phase from Rio Bec zone, S Campeche (18° 30′ 48″ N, 89°

28′ 24″ W). Coll 1971 by A P Andrews; subm 1977 by E W Andrews V, Middle Am Research Inst, Tulane Univ, New Orleans, Louisiana.

I-10,086. Chicanna, Structure I **1270 ± 80**

From between Rms 7 and 8, S end of structure (Ball, 1977; Potter, 1977; Eaton, 1974). *Comment*: sample from twin-tower Rio Bec structure; provides first ^{14}C date from this type of structure. Ceramics suggest date, AD 600 to 730.

I-10,087. Chicanna, Structure VI **1210 ± 80**

From between Rms 1 and 2. *Comment*: Structure VI dated by ceramics to AD 600 to 730; two-room building supporting high narrow roof-comb perforated by rectangular slots.

I-10,085. Payan, standing structure **1420 ± 80**

Wood lintel over main doorway, W facade entrance to Rm 3 from Rio Bec zone, S Campeche (18° 32′ N, 89° 18′ W). Coll 1971 by A P Andrews; subm 1977 by E W Andrews, V. *Comment*: W facade of standing building at Payan carries Rio Bec style relief carving (Ruppert and Denison, 1943).

Los Grifos series

Charcoal fragments in sediment from Los Grifos rock shelter, 7km NW of Ocozocoautla, Chiapas (16° 50′ N, 93° 25′ W). Coll 1977 and subm 1978 by J Garcia-Barcena, Inst Nac Anthropol, Dept Prehist, Mexico City.

I-10,760. L G VI c/e **8930 ± 150**

Sample dates three closely spaced preceramic occupation floors, Strata 27 to 29. *Comment*: two series of occupations are separated by erosional discordance. Late series corresponds to ceramic occupations (Classic and Postclassic). This data corresponds to upper part of earlier series of preceramic occupations. Lithic materials closely resemble earliest dated occupation at Santa Marta (9280 ± 290, I-9259 and 9330 ± 290, I-9260).

I-10,761. L G VII/VIII **9460 ± 150**

From hearth underlying occupation floor with assoc lithic materials and food remains, Strata 34 to 38. *Comment*: lithic material included fluted points resembling Clovis wasted points reported from several Central American countries and Durango, Mexico (Garcia-Barcena, 1979).

I-10,762. L G IX **9540 ± 150**

From hearth assoc with second earliest occupation floor, Stratum 46, containing lithic artifacts and food remains (Garcia-Barcena *et al*, 1976; MacNeish and Peterson, 1962).

San Martin Huamelulpan series

Charcoal from Mixteca Highlands, San Martin Huamelulpan, Tlaxiaco Oaxaca (17° 21′ N, 97° 41′ W). Coll 1974 by M Gaxiola and A Alaniz; subm 1975 by M Winter, INAH Centro Reg Oaxaca.

I-8614. No. 6, C-J Feature 8 **2260 ± 80**

From Level 8 at base of building assoc with primary deposit of ceramic vessels belonging to earliest period, Huamelulpan I from 400 to 100 BC.

I-8615. No. 7, A-6 Feature 27 **1980 ± 80**

From Level 2 assoc with Period II of Huamelulpan, dated 100 BC to AD 200.

I-9155. Rancho Dolores Ortiz, S-1 **2590 ± 90**

Charcoal and soil combining two samples from Sq 49GG, 2.17m deep, and Sq 50GG, 2.15m deep, Mun San Pedro Chicozapotes, Dist Cuicatlan, Oaxaca (17° 44′ N, 96° 57′ W). Coll 1975 by A Alaniz and subm 1975 by M Winter. *Comment*: assoc ceramics similar to Tierras Largas phase in Valley of Oaxaca, Early Cruz phase in Nochixtlan Valley, and Early Ajalpan phase in Tehuacan Valley, all dating ca 1300 BC. Date is too recent.

I-10,460. Rancho Dolores Ortiz, S-2 **3250 ± 100**

Combines three samples from Capa VI-A: Sqs 50HH at 2.50m, 46DD, and 45BB. Details same as I-9155. *Comment*: date acceptable; subm as check on I-9155.

I-10,458. Yucuita 1977, Elemento K12 **1690 ± 90**

Charcoal from base of E part of circular hearth, San Juan Yucuita, Oaxaca (17° 30′ N, 97° 16′ W). Opening to hearth contained ceramics of Las Flores phase. Coll 1977 by D Deraga and subm 1978 by M Winter. *Comment*: date slightly earlier than expected (Spores 1972; 1974). However, date may mark beginning of Las Flores phase.

I-10,459. Monte Alban Elemento 75-1,S2 **1620 ± 90**

Charcoal sealed in circular hearth intrusive into W wall of Edificio 75-1, sq sunken tank on E side of Main Plaza and surrounding structure known as Adoratorio, Monte Alban, Oaxaca (17° 02′ N, 96° 46′ W). Coll 1975 and subm 1978 by M Winter. *Comment*: ceramics found in feature are characteristic of Monte Alban II. Feature was used after construction of Edificio 75-1 and either before or after another related reservoir that dates from Monte Alban II.

I-7859. JUI-CS/CT **3100 ± 140**

Charcoal assoc with potsherds, shell, bones, and worked obsidian from 5.4 to 5.5m level at Laguna Zope (JUI) 2km WSW of Juchitan, Oaxaca (16° 25′ N, 95° 03′ W). Coll 1972; subm 1974 by R N Zeitlin, Depth Anthropol, Yale Univ, New Haven, Connecticut. *Comment*: date agrees with cultural material attributed to early Preclassic Lagunita phase.

South America

CAM-14 series

Charcoal from CAM-14 site, shell mound on marine terrace on S mouth of Quebrada Camarones, Tarapaca Prov, Chile (19° 10′ S, 70° 18′ W). Coll and subm 1976 by H Niemeyer and V Schiappacasse, Univ Norte, Casilla, Chile.

I-9816. CAM-14-B-2 **6620 ± 390**

From 75cm beneath floor of Level d, Sq B.

I-9817. CAM-14-F-4 **6650 ± 160**

From 75cm beneath floor of Level c, Sq F. *Comment* (HN): disregarding late intrusive occupation during Inca period, site is considered single component belonging to Early Archaic of N coast or Shell Fish Hook culture (Bird, 1943; Mostny, 1964). Date agrees with another date of same culture at Quiani site, 6170 ± 220: I-1384 (R, v 11, 1969, p 102).

I-10,097. OGSE-80, Santa Elena **8810 ± 400**

Charcoal composite from unmixed Vegas complex levels of midden between 100 to 140cm in cut F-H/8-11 and 90 to 110cm in adjacent cut G-H/1-5, 1km SW of Santa Elena, Ecuador (2° 13′ S, 80° 52′ W). Coll and subm by K E Stothert, Dept Anthropol, Fordham Univ, New York. *Comment*: date agrees with 1 of 2 previous dates from Vegas type site: L-1042A, 6650 ± 200 BC, and L-1042F, 5650 ± 100 BC. Vegas midden began to develop in mid–7th millennium BC, but it is unkown how long people continued to use site (Stothert, 1976; 1977).

Malaysia

Jenderam Hilir series

Wooden artifacts from Jenderam Hilir, Sepang, Selangor, W Malaysia (2° 53′ 25″ N, 101° 43′ 51″ E). Coll 1977 and subm 1978 by Leong Sau Heng, History Dept, Univ Malaysia, Kuala Lumpur.

I-10,756. Boat paddle-1 **1560 ± 90**

From E cutting at 4.7m depth in river alluvium taken during 1977 Nat Mus excavation.

I-10,757. Boat fragment-2 **1470 ± 90**

Recovered during hydraulic tin mining of river alluvium. *Comment*: wood of non-Malaysian origin. First date related to first millennium AD.

I-10,758. Wooden artifact-3 **2490 ± 90**

Possibily part of wheel, recovered during tin mining of river alluvium.

Pacific Islands

Futuna Island series

Charcoal from Sigave Dist Futuna I. (14° 17′ 55″ S, 178° 09′ 47″ W). Coll and subm 1974 by P V Kirch, Bernice P Bishop Mus, Honolulu, Hawaii (Kirch, 1976).

I-8354. Site WF-FU-4 Lotuma **185 ± 80**

Trench T6 in buried agricultural soil horizon. *Comment*: dates buried pondfield agricultural horizon later sealed by flood-deposited clay and gravel.

I-8355. Site WF-FU-11 Tavai **2120 ± 80**

Layer IX at Loc A. *Comment*: dates village site to Late Eastern Lapita ceramic horizon.

I-8356. Site WF-FU-21 Maunga **<180**

Test Pit 1, late prehistoric fortified terrace.

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INSTITUT ROYAL DU PATRIMOINE ARTISTIQUE RADIOCARBON DATES VIII

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This list contains most of the measurements made during 1980, since our last list (R, 1981, v 23, p 33-37). A second methane synthesis unit became operational (Dauchot-Dehon and Van Strydonck, 1979) at the end of 1979. Basically, this unit is the same as the one built earlier (Klebert and Heylen, 1966).

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The assistance of M Dupas in analyzing the mortar sample is gratefully acknowledged.

I. GEOLOGIC SAMPLES

A. Belgium

Mark series

Peat, clayey peat, and wood samples from alluvial plain of Mark R in W Vlaanderen. Coll 1978-1979 by W Huybrechts and F Bogemans; subm by W Huybrechts and L Peeters, Geol Inst, Vrije Univ, Brussels.

IRPA-347. Halle-B.I **1180 ± 80**

Base of peat layer, 40cm thick, at 65cm below surface (50° 42′ N, 4° 18′ 49″ E).

IRPA-348. Halle-B.IV **660 ± 50**

Base of layer, 60cm thick, at 120cm below surface (50° 42′ 30″ N, 4° 17′ E).

IRPA-349. Galmaarden GEM I **1440 ± 90**

Wood at 250cm below surface (50° 45′ N, 3° 57′ E).

IRPA-350. Moerbeke B78/7/3 **8700 ± 370**

Peat from layer, 435 to 480cm below surface (50° 44′ 41″ N, 3° 55′ E).

IRPA-351. Moerbeke B79/3/7 **5720 ± 270**

Peat from layer, 295 to 325cm below surface (50° 44′ 51″ N, 3° 54′ E).

IRPA-352. Moerbeke B78/6/18 **7500 ± 340**

Peat from layer, 400 to 520cm below surface, at 455cm depth (50° 44′ 41″ N, 3° 55′ E).

IRPA-353. Moerbeke B78/10/5 **7790 ± 330**

Peat from layer, 160 to 195cm below surface (50° 44′ 51″ N, 3° 54′ E).

IRPA-354. Galmaarden GEM II **1380 ± 100**

Wood at 250cm below surface (50° 45′N, 3° 57′ E).

IRPA-355. Moerbeke B78/7/8 **7830 ± 330**

Peat from layer, 350 to 400cm below surface (50° 45′ N, 3° 54′ E).

IRPA-356. Galmaarden B78/7/4 **5350 ± 290**

Peat at 500cm below surface (50° 45′ N, 3° 57′ E).

General Comment (WH): dates reveal two periods of peat accumulation: Boreal-beginning of Atlanticum (8700 to 7500 BP) and end of Altanticum (5500 BP). Peat growth may have continued between these periods. Two wood samples are historical as expected from their stratigraphic position.

Moeren series

Peat from remains of excavated layers at Moeren in W Belgian coastal plain. Coll July 1980 by C Verbruggen, D Bruneel, and M Van Strydonck; subm July 1980 by C Verbruggen, Univ Gent, Belgium.

IRPA-386. Houtem **3440 ± 190**

Base of peat layer, 139 to 152cm below surface (51° 00′ 42″ N, 2° 34′ 43″ E).

IRPA-387. Bulskamp-Veurne 2 **4330 ± 230**

Upper part of remaining peat layer, 188 to 195cm below surface (51° 02′ 45″ N, 2° 36′ 57″ E).

IRPA-388. Bulskamp-Veurne 1 **4480 ± 240**

Base of remaining peat layer, 203 to 208cm below surface (51° 02′ 45″ N, 2° 36′ 57″ E).

General Comment (CV): peat was presumed to be younger in Bulskamp-Veurne based on pollen diagram (*Fagus*) and higher stratigraphic level. Relatively younger onset of peat growth could indicate lasting tidal-flat conditions (Baeteman and Verbruggen, 1980).

Booitshoeke series

The following results complete previously pub list (R, 1981, v 23, p 33-37) from peat layer, 55cm thick, in W Belgian coastal plain (51° 05′ 38″ N, 2° 44′ 05″ E). Coll 1978 and subm 1980 by C Baeteman, Geol Service, Belgium.

IRPA-344. Booitshoeke Zeedijk 1-A **2890 ± 150**

Top of layer, at 100cm below surface.

IRPA-345. Booitshoeke Zeedijk 2-A **3200 ± 200**

Base of layer, at 155cm below surface.

General Comment (CB): top of layer agrees well; base is too young (Baeteman *et al*, 1979).

B. Scotland

Cairngorm Estate series

The following series completes previously pub lists (R, 1976, v 18, p 158; R, 1977, v 19, p 385-387; R, 1981, v 23, p 33-37). Coll 1975-1978 by L Beyens and DK Ferguson; subm 1980 by DK Ferguson, Univ Antwerp, Belgium.

IRPA-358. Inverton 2A, Sample 23 **5070 ± 260**

Wood, 2.5km SW of Kingussie, Inverness-shire; alt + 230m (57° 03′ 42″ N, 4° 04′ 18″ W).

IRPA-359. Inverton 6, Sample 24 **3720 ± 200**

Wood from trunk, 2.5km SW of Kingussie, Inverness-shire, alt + 230m (57° 03′ 42″ N, 4° 04′ 18″ W).

IRPA-360. Site 19, Sample 25 **4140 ± 210**

Wood from trunk found between Allt Ban and Allt na Ciste, alt + 485m (57° 09′ 12″ N, 3° 39′ 15″ W).

IRPA-361. a. Site 2, Sample 26 **5230 ± 260**
b. Sample 27 **5160 ± 240**

Base of peat layer, 81 to 84cm below surface, alt + 600m (57° 08′ 50″ N, 3° 38′ 40″ W).

IRPA-362. Site 12, Sample 28 **6090 ± 300**

Base of peat layer, 203 to 210cm below surface, N of Caochan Dubh à Chadha, alt + 560m (57° 08′ 23″ N, 3° 41′ 11″ W).

IRPA-363. Site 19, Sample 29 **4200 ± 230**

Wood from root found between Allt Ban and Allt na Ciste, alt + 485m (57° 09′ 12″ N, 3° 39′ 15″ W).

IRPA-364. Site 18, Sample 30 **4660 ± 240**

Wood from root found between Allt Ban and Allt na Ciste, alt + 515m (57° 09′ 03″ N, 3° 39′ 03″ W).

IRPA-365. Site 21, Sample 31 **4350 ± 240**

Wood from Allt Creag and Leth-chan, alt + 515m (57° 09′ 03″ N, 3° 39′ 03″ W).

IRPA-366. Site 7, Sample 32 **5670 ± 250**

Base of peat layer, 110 to 114cm below surface, alt + 640m (57° 07′ 58″ N, 3° 40′ 17″ W).

General Comment (DKF): pine *(Pinus sylvestris)* appeared at 7500 BP. Ca 6000 BP blanket bog started to develop followed by disappearance of pine ca 5000 BP. Ca 4000 BP, blanket bog was recolonized by pine for a few hundred yr. However, after 3000 BP, pine was only found in sheltered spots. Age of most of the stumps indicates that climatic rather than human factors were responsible for disappearance of pine.

II. ARCHAEOLOGIC SAMPLES

A. Belgium

Pommeroeul series

Wood from Roman vessels and landing stage at Pommeroeul, Hainaut, found 300 to 400cm below surface (50° 27′ 30″ N, 0′ 40″ E). Coll

1975 and subm 1980 by G Deboe, Nat Service Excavations, Brussels. Before dating, wood was stored under water for 5 yr.

IRPA-368. Pommeroeul III-1A **1960 ± 50**
Wood from Vessel III, Plank 1A.

IRPA-369. Pommeroeul III-65 **1930 ± 50**
Wood from Vessel III, Plank 65.

IRPA-370. Pommeroeul III-75 **2000 ± 70**
Wood from Vessel III, Plank 75.

IRPA-371. Pommeroeul III-12 **2030 ± 60**
Wood from Vessel III, Plank 12.

IRPA-372. Pommeroeul III-3 E **1830 ± 50**
Wood from Vessel III, Plank 3E.

IRPA-373. Pommeroeul Landing Stage I **1660 ± 50**
Wood from Landing Stage I.

IRPA-374. Pommeroeul Landing Stage II **1750 ± 50**
Wood from Landing Stage II.

IRPA-375. Pommeroeul Landing Stage III **1760 ± 50**
Wood from Landing Stage III.

IRPA-383. Pommeroeul II-30 K **1730 ± 50**
Wood from Vessel II, Plank 30 K.

IRPA-384. Pommeroeul IV B-11 **1730 ± 50**
Wood from Vessel IV B, Plank 11.

General Comment: dates agree with archaeol data.

Bredene series

Study on human occupation during Roman period in Belgian coastal plain at Bredene (51° 14′ 24″ N, 2° 57′ 33″ E). Coll and subm 1979-1980 by H Thoen and C Baeteman in collaboration with Vereniging voor Oudheidkundig Bodemonderzoek in W Vlaanderen.

IRPA-342. Br 79/1/12 **2060 ± 130**
Organic material from Layer 19 K at 140cm below surface.

IRPA-376. Br 79/1/15 **1440 ± 40**
Clayey peat at 195cm below surface.

IRPA-377. Br 79/1/18 **2200 ± 60**
Top of black peat layer at 150cm below surface.

IRPA-379. Br 79/1/20 **1920 ± 50**

Base of brownish peat at 175cm below surface.

IRPA-381. Br 79/2/2 **630 ± 50**

Base of peat layer, 20cm thick, at 205cm below surface.

IRPA-382. Br 79/2/4 **1540 ± 40**

Top of peat layer, 20cm thick, at 185cm below surface.

IRPA-389. Br 80/5/80 **1050 ± 50**

Peat at 160cm below surface. Dilution: 51% sample.

IRPA-390. Br 80/5/81 **1490 ± 150**

Peat at 220 to 230cm below surface. Dilution: 49% sample.

Leffinge series

The following results complete previously pub list (R, 1981, v 23, p 33-37). Clayey peat underlying Furnaces XI and XXVI at Leffinge (51° 08′ 40″ N, 2° 52′ 13″ E). Coll and subm 1980 by H Thoen, Univ Gent, Belgium.

IRPA-339. LFZ 78/17a **2490 ± 130**

1% NaOH soluble fraction.

IRPA-340. LFZ 78/17b **2490 ± 140**

1% NaOH insoluble fraction.

General Comment (HT and CV): pollen diagram confirmed end of peat growth at ca 3000 BP (IRPA-337, -338, -283). Clayey organic deposit intercalated between peat layer and Roman surface was dated to 2500 BP.

IRPA-367. Jandrain-Jandrenouille **5450 ± 260**

Mixture of charcoal and clay charged with chalk pit at 600cm below surface in Brabant (50° 41′ 30″ N, 0° 36′ 20″ E). Coll 1972 and subm 1980 by F Hubert, Nat Service Excavations, Brussels. Sample not treated with alkali. *Comment* (FH): age determination of Neolithic pit of Mickelsberg culture.

St Lambert series

Samples from archaeol excavation at Place St-Lambert (Danthine, 1980; Alenus-Lecerf, 1980), Liège (50° 38′ 45″ N, 5° 34′ 30″ E). Coll 1979 by M Dauchot and M Otte; subm 1979 by M Otte, Serv Archaeol Prehist, Univ Liège, Belgium. *Comment*: studied to compare radiocarbon dates of charcoal with dates obtained of mortar carbonate (Table 1). Mortar samples were first examined to separate fractions containing chalk carbonate from those containing carbonate formed after mortar preparation. Two types of charcoal were examined: charcoal incorporated in mortar (*) and charcoal found separately.

Table 1

St Lambert radiocarbon dates

IRPA no.	Reference	Material	Depth (cm)	Radiocarbon age	Expected age (century AD)
296 A	PSL-78-E2/A	charcoal*	180	modern	7th-13th
B	PSL-78-E2/B	charcoal*	180	modern	7th-13th
C	PSL-78-E2/C	mortar	180	4000 ± 210	7th-13th
D	PSL-78-E2/D	mortar	180	3940 ± 210	7th-13th
298	PSL-78-E6	charcoal*	250	310 ± 40	4th-11th
303 A	PSL-78-E3	charcoal	180	modern	7th-13th
311	L 498	charcoal	100	30,000	12th-15th
312	L 556	charcoal	330	1500 ± 80	3rd-7th
313	L 624	charcoal	220	30,000	1st-4th
314	L 631	charcoal	250	30,000	9th-11th
315	L 634	charcoal	250	30,000	8th-9th
316	L 667	charcoal	300	2110 ± 130	1st-4th
317	L 679	charcoal	300	9540 ± 330	1st-4th
318	L 751	charcoal	300	9920 ± 390	1st-4th
319	L 794	charcoal	225	990 ± 80	3rd-8th
320	L 798	charcoal	250	8330 ± 350	1st-5th
322	L 852	charcoal	250	3410 ± 200	1st-4th

General Comment: charcoal gives three groups of dates: a) dates that are too old are caused by mixture of wood and coal in furnaces. This is quite possible since coal was outcropping (Lecouturier, 1930); b) samples not polluted by coal yield dates that agree well; c) excess radiocarbon in (*) charcoal has not been explained yet. High ages obtained from mortar carbonate are probably caused by infiltration due to several inundations and small underground brook with high content of chalk carbonate (Lecouturier, 1930) rather than to insufficient separation of chalk and mortar carbonate. The study is being continued.

B. Italy

Artena series

Charcoal with soil and roots from occupation layer 30cm below surface at Artena, Prov Rome (41° 43′ N, 12° 57′ E). Coll Aug 1979 and subm 1980 by R Lambrechts, Univ Louvain, Belgium.

IRPA-341. Sample 1 **2310 ± 140**

IRPA-407. Sample 2 **2290 ± 60**

IRPA-408. Sample 3 **2320 ± 60**

General Comment: dates agree with archaeol age: 3rd to 4th century BC.

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ERRATUM. Please note an error in Volume 22, Number 4 that has been brought to our attention by Nikolaas J van der Merwe, Department of Archaeology, University of Cape Town, South Africa. In the obituary for Willard F Libby, we commented that Melvin Calvin received a Nobel Prize in 1950. Actually, he received his prize in 1961, a year after Libby received his Nobel Prize.

[RADIOCARBON, VOL. 23, No. 3, 1981, P 352-383]

ILLINOIS STATE GEOLOGICAL SURVEY RADIOCARBON DATES VII

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The following list contains samples of geologic interest that were processed from February 1974 through May 1980 at the Illinois State Geological Survey (ISGS) Radiocarbon Dating Laboratory. The archaeologic samples processed during the same period will be published in our next date list. The benzene liquid scintillation technique was used following laboratory procedures previously reported by Coleman (1973; 1974).

All ages were calculated on the basis of a ^{14}C half-life of 5568 yr, using the NBS oxalic acid standard as reference. Errors (1σ) reported account only for uncertainties in activity measurements of the sample, standard, and backgrounds. All age calculations have been computerized with the assignment of modern and minimum ages based on the 4σ criteria as previously reported (Coleman, 1973). Activities of "modern" samples are given as % of modern. Corrections for isotopic fractionation have been included for samples dated since December 1979.

SAMPLE DESCRIPTIONS

A. Lake Michigan shoreland

Samples are from SE Wisconsin and NE Illinois. Unless otherwise noted samples were coll 1974 by C E Larsen; subm by C E Larsen and Charles Collinson, ISGS.

North Shore Channel, Chicago River series

Site in Cook Co, Chicago, Illinois (41° 58′ 29″ N, 87° 42′ 15″ W).

ISGS-266. **4300 ± 80**

Unios shell from gravelly sand near base of sand-silt sequence. Coll 1914 by F C Baker. *Comment* (CEL): presence of *Elliptio crassidens* in faunal assemblage from which sample was taken indicates water depth of at least 1.8m at time of deposition. Date marks peak of Lake Nippissing stage of Great Lakes, which attained at least 183m elev based on faunal assemblage.

ISGS-286. **4190 ± 80**

Peat from unit 12cm thick, 2m above water level. *Comment* (CEL): peat deposit was formed on marsh silts and clays overlying faunal assemblage assoc with Lake Nippissing stage and dated by ISGS-266. Date marks relatively rapid drop in lake level below 179m prior to 4190 ± 80 BP. Date is significant in that it shows rapid termination of Lake Nippissing, and drop in lake level below Lake Algoma stand at 180 to 181m.

ISGS-356. Bull Creek **1750 ± 80**

Organic silt from Lake Co, 1.8km S of Central School, Zion, Illinois (42° 25′ 51″ N, 87° 50′ 10″ W). From organic silt zone, 15cm thick, 1m below top of bank. *Comment* (CEL): dates paleosol that marks period of nondesposition during formation of 2m alluvial terrace along Bull Creek. Alluviation may be due to fluctuations in runoff, or changes in lake level.

Kellogg Creek series

Site in Lake Co, 1.3km S of Winthrop Harbor, Illinois (42° 28′ 04″ N, 87° 49′ 25″ W).

ISGS-278. **1580 ± 80**

Wood from base of terrace. *Comment* (CEL): date provides limit for 2.4m sedimentation along Kellogg Creek. Alluvial fill is thought to relate to series of fluctuations higher than present lake levels between 1750 ± 80 BP, (ISGS-356) and present.

ISGS-279. **790 ± 80**

Organic silt from 0.5m below top of dissected terrace. *Comment* (CEL): dates soil development during upward growth of alluvial fill. Organic zone may be related to Late Woodland archaeol site later covered by further sedimentation. Alluvial fill is thought related to higher than present lake level between 1165 ± 75 BP, (ISGS-169) and 715 ± 75 BP, (ISGS-186; R, 1975, v 17, p 161).

ISGS-284. **1110 ± 80**

ISGS-285. **1200 ± 80**

From organic silt layer exposed in creek bank, 1.2 to 1.3m above water level. *Comment* (CEL): samples from black silt unit that defines W margin of buried marsh. Marsh now covered by 74cm layered fine sands and sandy silts of probable alluvial origin from Kellogg Creek. Dates provide limit for onset of alluviation in this portion of creek.

ISGS-351. **390 ± 80**

Wood from silty sand near water level 1.75m below top of bank. *Comment* (CEL): date indicates that 2m terrace at this site is recent landform caused by increased sedimentation and changes in runoff, or more likely, fluctuation in Lake Michigan water level.

Fossland Park, Winthrop Harbor series

Organic silt from Lake Co, 0.6km NE of Winthrop Harbor, Illinois (42° 29′ 08″ N, 87° 49′ 20″ W).

ISGS-333. **1320 ± 80**

Organic silt from unit, 5cm thick, 105cm below top of terrace. *Comment* (CC): dates paleosol that probably represents period of base level stabilization.

ISGS-350. **1020 ± 80**

Organic silt from paleosol, 5cm thick, 45cm below top of terrace. *Comment* (CEL): paleosol marks period of nondeposition during formation of terrace 2m high along small stream; 50cm silty, fine sand deposited on unit due to fluctuation in runoff or changes in level of Lake Michigan.

ISGS-367. **440 ± 80**

Wood from clayey-silty sand just above water level, ca 100cm below top of stream bank. *Comment* (CC): sample may have been contaminated by plant rootlets. Date, >4300 BP, was expected based on nearby dates of related features.

Carol Beach series

Organic sandy silt from Kenosha Co, 3.2km SSE of S Kenosha, Wisconsin (42° 30′ 30″ N, 87° 48′ 30″ W), from Grayslake Peat.

ISGS-253. 55 to 64cm depth **770 ± 80**

From base of gray sandy silt unit underlain by black silty sand, 51cm thick.

ISGS-265. 95 to 110cm depth **3280 ± 80**

From base of black silty sand.

General Comment (CEL): date is min for beach sands on which organic deposits were developed.

Barnes Creek series

Site in Kenosha Co, 3.3km S of Kenosha, Wisconsin (42° 31′ 52″ N, 87° 49′ 00″ W).

ISGS-259. 170 to 175cm depth **4740 ± 80**

ISGS-260. 210 to 215cm depth **4890 ± 80**

Wood fragments in silt from zones containing branches and roots.

General Comment (CEL): dates show upward growth of marsh sediments in relation to rising level of Lake Michigan. Nearshore sands assoc with Lake Nippissing stage of Great Lakes overlie these marsh deposits.

ISGS-263. **560 ± 80**

Organic sand from paleosol at depth 65 to 90cm. *Comment* (CC): paleosol developed on nearshore sand, buried by eolian sand which overlies deposits presumably from Lake Nippissing stage.

ISGS-288. **3950 ± 120**

Organic sand from unit, 26cm thick, 1m above water level. *Comment* (CEL): black organic sand is found directly overlying erosion surface on clayey till or compact lacustrine clayey silt. Erosion surface probably indicates incision of Barnes Creek, whereas organic sand may show ponding and marsh formation. Ponding may have resulted from temporary obstruction by formation of beach features such as dunes, or from base level change influenced by rise in level of Lake Michigan. Date may indicate lake level no higher than 179m elev.

ISGS-289. **500 ± 80**

Organic sand from unit, 5cm thick, 225cm above water level. *Comment* (CEL): sample from organic sand at elev 180.5m. Organic sand

and underlying nearshore sand have been exposed by lateral erosion and incision of Barnes Creek, at elev 178m at this site. Organic sand may represent higher water table than at present, which gave rise to isolated pockets of vegetation and soil formation in low places. Date agrees well with ISGS-263: 560 ± 80 BP, 11m S of this exposure.

ISGS-297. **1450 ± 80**

Organic silt from peat, 76cm thick, filling abandoned channel incised into nearshore and beach sands at surface elev 180.5m. *Comment* (CEL): date limits time of abandonment of channel, and may indicate ponding in channel caused by fluctuation in level of Lake Michigan.

ISGS-313. **5500 ± 80**

Wood from gray gravelly sand, 270 to 275cm below top of bank. *Comment* (CEL): date marks active stream flow prior to deposition of 1.5m marsh sediments. Also conceivably marks period of lake level similar to or below present level when incision into underlying Pleistocene sediments was occurring.

ISGS-318. **3800 ± 80**

Organic sand from dark brown unit (paleosol), ca 30cm below present A horizon. *Comment* (CC): dates discontinuous organic layer in upper portion of nearshore sand body that limits upper date on lake transgression at ca 3800 BP.

ISGS-325. **880 ± 80**

Organic sand from unit 15cm below top of bank. *Comment* (CEL): date represents mean residence time for organic soil horizon. Sample overlies ISGS-318.

ISGS-332. Tobin Road Crossing **580 ± 80**

Organic sand from Kenosha Co, Wisconsin, 1.8km E of Tobin, Wisconsin (42° 30′ 24″ N, 87° 49′ 05″ W). From black organic sand, 40cm below top of terrace.

B. Illinois

ISGS-241. Drainage Ditch Section **>50,000**

Wood from Vermilion Co, 3.2km W of Danville (40° 08′ 29″ N, 87° 40′ 42″ W). From questionable early Wisconsinan or Illinoian till. Coll 1954 by G E Ekblaw and H B Willman; subm by H B Willman, ISGS. *Comment* (HBW): wood coll from "Farmdale till" of early Wisconsinan age by Ekblaw and Willman (1955). Date does not disprove this but later correlations of till with other exposures favor interpretation of till as Illinoian (Johnson *et al*, 1972).

Higginsville Section series

Sec in Vermilion Co, 1.6km NW of Higginsville (40° 14′ 45″ N, 87° 46′ 30″ W). Samples from unnamed silt occurring between Radnor and Glenburn Till Members.

ISGS-242A. Split 1 **>47,800**

ISGS-242B. Split 2 **>48,500**

Organic silt. Coll 1973 and subm by D D Coleman.

ISGS-430. **>50,000**

Wood from organic silt. Coll 1976 and subm by W H Johnson, Univ of Illinois.

General Comment (WHJ): dates confirm that silt is not Robein Silt; it is either of early Altonian or Sangamonian age. Bald cypress wood fragments in deposit are more suggestive of Sangamonian climate, but earlier date, 48,100 ± 1700 BP, (ISGS-63; R, 1973, v 15, p 79) suggested Altonian age.

Pontiac Stone Quarry series

Site in Iroquois Co, 11.8km WNW of Ashkum (40° 54′ 11″ N, 88° 05′ 08″ W). Coll 1974 and subm by D W Moore, Univ Illinois.

ISGS-254. **>29,100**

Organic material in <2μ clay fraction of till from Chatsworth Drift, 0.7 to 0.8m above bedrock.

ISGS-255. **>38,700**

Organic material in <2μ clay fraction of lacustrine clay from Carmi Member of Equality Formation overlying till dated by ISGS-254.

General Comment (DWM): based on stratigraphy and other reliable Woodfordian dates, the two dates obtained from these samples do not approximate true age of sampled stratigraphic units. Dates probably resulted from overwhelming predominance of "dead" organic carbon derived from Paleozoic shales and dolomite that comprise local bedrock.

ISGS-261. Lomax section **21,250 ± 220**

Organic silt from Henderson Co, 2.8km NE of Lomax (40° 41′ 32″ N, 91° 02′ 30″ W). From organic silt unit above thick gleyed silt that overlies Illinoian till. Coll 1972 by A B Leonard, H B Willman, and J C Frye; subm by J C Frye, ISGS. *Comment* (HBW): dates beginning of Wisconsinan sedimentation at this site and indicates snail faunas from overlying silt are Wisconsinan rather than Yarmouthian as previously described.

ISGS-277. Cache River-Heron Pond **910 ± 80**

Wood from Johnson Co, 2.2km SW of Forman, (37° 20′ 05″ N, 88° 55′ 14″ W). From organic debris underlying terrace on E Bank of Cache R, 0.7m below terrace surface. Coll 1974 by L R Follmer and P B DuMontelle; subm by L R Follmer, ISGS. *Comment* (LRF): date indicates that erosion surface on weathered alluvium 1.5m above present Cache R was active ca 900 yr BP. Aggradation with organic debris and silt commenced at about this time and continued up to present. Construction of Post Creek Cutoff ca AD 1910 apparently initiated present down-cutting in upper Cache R Basin.

ISGS-271. SE Kankakee Co Dune Field **12,990 ± 120**

Sandy peat from Kankakee Co, 12km E of St Anne (41° 01′ 22″ N, 87° 35′ 08″ W). From sandy peat unit 10 to 15cm thick and 13.7m below crest of dune. Coll 1974 and subm by J M Masters, ISGS. *Comment* (JMM): first date on period of sand dune formation (Parkland Sand) related to Lake Wauponsee area of Kankakee Flood during Woodfordian Substage. At this location, underlying main sand body was probably deposited under fluviatile-lacustrine conditions (Equality Formation), and at certain periods, sand from marginal bars and beach ridges was blown by prevailing winds eastward over adjacent peat (Grayslake Peat) that was accumulating on main sand body.

ISGS-331. Clores Bridge Section **15,330 ± 170**

Wood fragments from Randolph Co, 4km E of Chester (37° 53′ 50″ N, 89° 45′ 37″ W). From woody zone, 2cm thick, in silty clay bed of high terrace cutbank on Mary's R. Coll 1974 and subm by F L Fiene, ISGS. *Comment* (FLF): date verifies Woodfordian age for terraces.

ISGS-334. Rhoads site **13,440 ± 250**

Organic silt from Logan Co, 3km W of Lincoln (40° 10′ N, 89° 25′ W). From 2.2 to 2.3m depth in C3 soil horizon. Coll 1973 and subm by L R Follmer. *Comment* (LRF): date is max for Sawmill profile (Cumulic Haplaquoll) developed in alluvium, and also approximates end of outwash deposition and beginning of alluviation in Kickapoo Creek valley.

ISGS-358. Byron Nuclear Power Plant Section **5840 ± 90**

Organic clay from Ogle Co, 5.6km SW of Byron (42° 04′ 26″ N, 89° 16′ 42″ W). From lens of black clay resting on dolomite and overlain by 3m gray, sandy, pebbly clay with modern soil developed at top. Coll 1975 by H B Willman and D R Kolata; subm by H B Willman. *Comment* (HBW): organic material was apparently carried down from modern soil and does not date red residual clay, which fills solution channels in top of Galena dolomite.

ISGS-378. Byron Cooling Tower Trench **>36,500**

Snail shells, (predominately *Lymnaea)* from Ogle Co, 6km SSW of Byron (42° 04′ 26″ N, 89° 16′ 42″ W) from silt unit, 1.2m thick overlain and underlain by till. Coll 1975 by L R Follmer, R H Gilkeson, and T M Johnson; subm by L R Follmer. *Comment* (LRF): date on shell from silt and correlation of paleosol remnant on overlying till with complete Sangamon soil profile in same locality identifies silt (unnamed) and till (Sterling) as Illinoian.

ISGS-374. Mt Morris Core **35,600 ± 1000**

Organic silt from Ogle Co, 1.5km S of Mount Morris (42° 01′ 40″ N, 89° 25′ 53″ W). From organic silt unit overlying Ogle Till Member. Coll 1975 by L R Follmer and R H Gilkeson; subm by L R Follmer. *Comment* (LRF): date correlates with age of Plano Silt Member. This material represents A horizon of unnamed soil, superimposed on Sangamon soil.

ISGS-401. Mobile-23 Core **18,910 ± 200**

Organic clay (<4μ fraction) from Ogle Co, 8km S of Byron (42° 02′ 30″ N, 89° 14′ 16″ W). From A horizon of buried soil. Coll 1975 by R H Gilkeson and T M Johnson; subm by L R Follmer. *Comment* (LRF): sample taken from same stratigraphic position as ISGS-374: 35,600 ± 1000. Younger than expected date. Leached condition of overlying loess suggests that sample was contaminated by humic materials translocated from modern soil.

Airport West Section series

Organic silt from Rock Island Co, 3km E of Milan, (41° 26′ 12″ N, 90° 31′ 37″ W). From organic silt, 0.9m thick, overlain by 12m loess and underlain by silty clay. Coll 1975 by R C Anderson and L P Fay; subm by R C Anderson, Augustana Coll, Rock Island, Illinois.

ISGS-476. **26,180 ± 760**

From upper 4cm of organic silt unit, directly below Peoria Loess.

ISGS-375. **41,200 ± 1600**

From lower 5cm of organic silt unit.

General Comment (RCA): dates bracket interval when small pond existed on Illinoian till plain. ISGS-476 suggests that loess deposition may have begun during Farmdalian time.

Fox Chain of Lakes Sediment series

Marl, peaty muck, and organic clayey silts from cores in Fox Chain of Lakes sediment series. Coll by J A Lineback, D L Gross, and J T Wickham; subm by D L Gross, ISGS.

ISGS-379. 40 to 50cm, peat **1270 ± 80**

ISGS-383. 80 to 90cm, marl **7810 ± 100**

From Nippersink Lake, Lake Co, 0.7km NE of McHenry (42° 24′ 30″ N, 88° 11′ 25″ W). From 94cm core in channel of lake. Marl is overlain by 56cm peat.

ISGS-380. 25 to 35cm **700 ± 80**

ISGS-394. 60 to 70cm **860 ± 100**

From Lake Marie, Lake Co, 3.2km SW of Antioch (40° 27′ 40″ N, 88° 08′ 15″ W). From 84cm core of silt and clayey silt.

ISGS-381. 25 to 35cm **1230 ± 80**

ISGS-396. 54 to 64cm **1240 ± 80**

From Pistakee Bay, McHenry Co, 2.7km SW of Fox Lake (42° 22′ 20″ N, 88° 13′ 05″ W). From 78cm core of silts.

ISGS-391. 25 to 35cm **1770 ± 130**

ISGS-390. 65 to 75cm **1600 ± 100**

From Lake Catherine, Lake Co, 1.3km W of Antioch (42° 29′ 10″ N, 88° 07′ 40″ W). From 78cm core of silt and silty clay.

ISGS-395. 13 to 23cm **4250 ± 120**

ISGS-397. 45 to 55cm **5680 ± 120**

From Lake Marie, Lake Co, 3km SW of Antioch (42° 27′ 31″ N, 88° 07′ 55″ W). From 56cm core of marl.

General Comment (DLG): dates indicate rapid sedimentation rate for silty clay, 2 or more mm/yr, and much slower rate for marl, ca 0.2mm/yr. In areas where peaty muck overlay marl, contact between two materials may represent gap of several thousand yr. Geology of lakes is described by Kothandaraman *et al* (1977).

Ruby Lane Section series

Wood from St Clair Co, 8.7km N of Belleville (38° 35′ 55″ N, 89° 59′ 45″ W). From organic silt, 1m thick, overlain and underlain by loess. Coll 1974 and subm by E D McKay, ISGS.

ISGS-294. Upper 15cm **21,910 ± 270**

ISGS-307. Lower 30cm **23,930 ± 280**

General Comment (EDM): organic silt from which samples were taken contains sediment mineralogically and sedimentalogically similar to overlying Peoria Loess and unlike underlying Roxana Silt. Thus, horizon is interpreted as early stage accumulation of loess related to later widespread Woodfordian loess deposition. ISGS-307, from lower portion of horizon, gives new min for initiation of Peoria Loess accumulation on bluffs of Mississippi Valley in SW Illinois.

Canteen Creek Section series

Site in St Clair Co, on N edge of Caseyville (38° 38′ 30″ N, 90° 01′ 30″ W). Coll 1975 and subm by E D McKay.

ISGS-392. **36,100 ± 550**

Organic silt from organic zone, 0.75m thick, within Roxana Silt.

ISGS-393. **40,200 ± 1500**

Wood from organic zone, 0.75m thick, within Roxana silt.

ISGS-421. **16,020 ± 260**

Clay fraction ($<4\mu$) of loess from dark band at 4 to 5.7m below top of Peoria Loess.

General Comment (EDM): ISGS-392 and -393 date lower portion of Zone III of Roxana Silt (Frye, Glass, and Willman, 1962). Previous age determinations on this horizon were made on gastropod shells, yielding dates between 35,000 to 37,000 BP, (W-729: 35,200 ± 1000, and W-869: 37,000 ± 1500, R, 1960, v 2, p 137-139; and ISGS-157: 35,750 ± 760, R, 1974, v

16, p 112). Younger than expected age for ISGS-392 may be due to post-burial contamination and omission of base leach of sample to preserve enough datable material. ISGS-421 dates clay fraction of incipient soil (dark band) in Peoria Loess. Dated horizon may correlate with Jules Soil (Willman and Frye, 1970).

ISGS-400. Bunkum Borrow Pit Section 30,980 ± 400

Gastropod shells from St Clair Co, 0.25km E of Bunkum (38° 37′ 08″ N, 90° 02′ 17″ W). From Meadow Loess Member of Roxana Silt. Coll 1975 and subm by E D McKay. *Comment* (EDM): gastropod shells coll from zone 0.75m below top of Zone III of Roxana Silt (Frye, Glass, and Willman, 1968) yielded youngest available date on Roxana Silt. Previous age determinations on Roxana sediments were from stratigraphically lower horizons, usually in excess of 35,000 BP (ISGS-157, 1974, v 16, p 112). At this site, ca 25% of Roxana overlies dated horizon.

Sugarloaf Road Core series

Wood fragments and organic silt from Madison Co, 2.7km N of Collinsville (38° 42′ 58″ N, 89° 59′ 49″ W). Coll 1974 and subm by E D McKay.

ISGS-412. #21.16 20,910 ± 520

From interval 6.45 to 6.70m below top of Peoria Loess, 9.6m thick.

ISGS-413. #27.25 23,110 ± 800

From interval 8.35 to 8.50cm below top of Peoria Loess, 9.6m thick.

General Comment (EDM): ISGS-412 dates loess horizon ca 1.2m below top of clay mineral Zone II (Frye, Glass, and Willman, 1968) of Peoria Loess. ISGS-413 dates loess horizon ca 0.2m above base of Zone II, and confirms that age of base of Peoria Loess in SW Illinois exceeds 23,000 BP, as previously suggested by ISGS-307: 23,900 ± 280.

Volo Bog Peat Core series

Peat from Lake Co, 3.2km N of Volo (42° 21′ 05″ N, 88° 11′ 04″ W), from core taken in bog. Coll 1976 and subm by J B Risatti and J E King.

ISGS-462. 100 to 105cm depth 1050 ± 100

ISGS-460. 265 to 272cm depth 2330 ± 170

ISGS-461. 480 to 490cm depth 4680 ± 150

ISGS-459. 600 to 610cm depth 6090 ± 100

ISGS-451. 800 to 806cm depth 10,590 ± 250

ISGS-463. 852 to 858cm depth 11,070 ± 210

General Comment (JBR): dates helped determine when Volo Bog basin began to accumulate organic sediments. Dates, when related to pollen data, helped to establish climatologic events in bog's history and allowed determination of sedimentation rates from first accumulation of organic sediments to present (Risatti, 1977).

Chatsworth (Strawn) Bog series

Marly lake sediments from Livingston Co, 6.5km SW of Chatsworth (40° 40′ 32″ N, 88° 20′ 34″ W), from 12.8m core of lake sediment. Coll 1975 and 1977 by J E King and L R Follmer; subm by J E King, Illinois State Mus, Springfield.

ISGS-516. 105 to 110cm depth **3370 ± 80**

ISGS-517. 203 to 210cm depth **4160 ± 90**

ISGS-416. 395 to 400cm depth **5330 ± 100**

ISGS-417. 695 to 700cm depth **7680 ± 100**

ISGS-519. 962 to 968cm depth **8300 ± 100**

ISGS-526. 1111 to 1119cm depth **10,860 ± 80**

ISGS-528. 1151 to 1159cm depth **11,280 ± 110**

ISGS-527. 1250 to 1260cm depth **14,380 ± 150**

General Comment (JEK): dates indicate that spruce woodland and tundra occurred in area until ca 14,000 BP and that deciduous forest was established by 10,500 BP. Prairie vegetation first developed ca 8300 BP, and has persisted to present. Radiocarbon dates of Chatsworth pollen assemblage zones agree with those from other Illinois sites.

Monticello Borrow Pit Section series

Organic silt from Piatt Co, 3km N of Monticello (40° 02′ 19″ N, 88° 34′ 56″ W). Coll 1975 by W H Johnson and J E King; subm by W H Johnson.

ISGS-408. **28,970 ± 290**

Bulk sample from 40cm below top of Robein Silt. *Comment* (WHJ): date and well-preserved pollen from 1.3m organic deposit indicate presence of pollen record for substantial interval prior to Woodfordian glaciation.

ISGS-422. Core WHJ-76-1 **22,850 ± 290**

From upper 10cm of 55cm thick Robein Silt.

ISGS-490. Core WHJ-77-16 **34,290 ± 840**

From 26 to 30cm below top of Robein Silt.

ISGS-447. Core WHJ-77-13 **>34,200**

From upper 5cm of 110cm thick Roxana Silt(?).

ISGS-423. Core WHJ-76-2 **37,950 ± 700**

From lower 20cm of 110cm thick Roxana Silt(?).

General Comment (WHJ): sequence of dates is not compatible with conformable sedimentation record. Upper (ISGS-422) and lower (ISGS-423) dates are considered most accurate and will be utilized in interpretation of pollen record. Middle two dates (ISGS-490 and -447) appear to be too old and probably contain detrital organic material derived from Paleozoic bedrock.

ISGS-426. Geneseo Landfill Core **13,300 ± 240**

Wood fragments from Henry Co, 1.8km N of Geneseo (41° 28′ 41″ N, 90° 09′ 21″ W). From organic silt unit 6.1 to 6.5m from top of core. Unit is overlain by dune sand and underlain by outwash sand. Coll 1976 and subm by T M Johnson, ISGS. *Comment* (TMJ): only known date immediately beneath sand dunes in Green River Lowland. Site underlain by Sterling Till Member.

Anna-Jonesboro Test Site series

Carbonized wood from Union Co, 0.8km N of Pottsville (37° 25′ 45″ N, 89° 21′ 31″ W). Coll 1976 by J T Ruester; subm by P C Reed, ISGS.

ISGS-453. **1970 ± 80**

From log buried in valley train sand and gravel at depth 13.7m.

ISGS-454. **2060 ± 90**

From depth 23m below surface.

General Comment (PCR): dates give information on rate of sedimentation and agree with other Holocene data, IJ-281: 6600 ± 200 (Willman and Frye, 1970). Nearly identical dates on ISGS-453 and -454 suggest that latter may have been carried down to deeper location during drilling.

ISGS-521. Inlet Swamp **6460 ± 110**

Wood from Lee Co, 3.2km S of Rochelle (41° 46′ 47″ N, 89° 04′ 08″ W). From top of gray sandy silt, 1.47 to 1.63m depth. Coll 1976 and subm by S E Zwicker, Soil Conservation Service, Amboy, Illinois. *Comment* (SEZ): site is in ancient glacial lake. Sediments are younger than expected. Date helps to establish age relationship of outwash of Tiskilwa Till Member E of lake bed and serves as benchmark for degree of soil development.

Stubbe Farm series

Peat from Stephenson Co, 2.7km SSE of Winslow (42° 28′ 15″ N, 89° 46′ 47″ W). Coll 1977 and 1978 by G R Whittecar and L R Follmer; subm by G R Whittecar, Univ Wisconsin, Madison.

ISGS-561. **26,820 ± 200**

From 5.01 to 5.17m below surface, at top of peat unit 1.8m thick. *Comment* (GRW): peat is in high-level terrace that contains stony silty diamicton believed to be periglacial solifluction deposit. Date indicates time that peat growth stopped.

ISGS-479. **31,400 ± 740**

From 4.5m below surface, near base of peat bed, 1.5m thick. *Comment* (GRW): date is max for overlying glaciolacustrine sediments and loess in terraces along this reach of Pecatonica R.

ISGS-562. **40,500 ± 1700**

From base of peat unit, 6.98 to 7.04m below surface. *Comment* (GRW): date indicates end of diamicton deposition.

Gardena series

Site in Tazewell Co, 1km S of Sunnyland (40° 40′ 15″ N, 89° 28′ 53″ W). Coll 1978 by E D McKay and L R Follmer; subm by L R Follmer.

ISGS-532. **19,680 ± 460**

Wood from top of Morton Loess.

ISGS-530. **25,680 ± 1000**

Wood from Morton Loess.

ISGS-531. **25,370 ± 310**

Wood from base of Morton Loess.

ISGS-529. **25,960 ± 280**

Organic silt with wood chips from upper 10cm Roxana Silt.

General Comment (LRF): series of dates reconfirms previous interpretations of classic Farm Creek Section with adjustment in chronologic interpretation. The mid-Wisconsinan interstadial, the Farmdalian Substage, was terminated at ca 25,000 BP by first deposition of Morton Loess. Morton is loess that was generated in response to advance of Woodfordian glaciers and subsequently buried by Woodfordian till at ca 20,000 BP at this locality and other areas along Woodfordian glacial margin in Midwest (Follmer *et al,* 1979).

Farm Creek-East series

Organic silt with wood fragments from Tazewell Co, Farmdale Park, S of Sunnyland (40° 40′ 43″ N, 89° 29′ 18″ W). Coll 1978 by L R Follmer and E D McKay; subm by L R Follmer.

ISGS-533. **26,680 ± 380**

From near top of Robein Silt.

ISGS-535. **27,700 ± 770**

From base of Robein Silt.

General Comment (LRF): samples are from type sec of Robein Silt. Previous dates from nearby exposures are younger (W-68: 22,900 ± 900; W-69: 25,100 ± 800). Here, Robein represents organic matter accumulation during mid-Wisconsinan time, named from this exposure, Farmdalian Substage (Follmer *et al,* 1979).

Athens North Quarry series

Site in Menard Co, 6.5km NNE of Athens (40° 00′ 44″ N, 89° 42′ 16″ W). Coll 1978 and 1979 by L R Follmer and E D McKay; subm by L R Follmer.

ISGS-534. **22,170 ± 450**

Wood from top of basal third of Peoria Loess, approx in middle of dolomite zone P-3 (Follmer *et al,* 1979). Wood and needles preserved below this level. *Comment* (LRF): stratigraphy indicates that Farmdale Soil environment continued into Peoria Loess depositional event.

ISGS-536. **25,170 ± 200**

Spruce wood and organic silt from wood and needle litter horizon described as Robein Silt. Underlies Peoria Loess and overlies Roxana Silt. *Comment* (LRF): date agrees reasonably well with dates from type sec (ISGS-533) and other locations (ISGS-529, -531, -575, -653, and -656). Indicates that Robein Silt was buried ca 25,000 BP.

ISGS-654. Pit 3E 6-6.2m **38,920 ± 1100**

Organic silt ($<5\mu$ fraction) from near middle of Roxana Silt. *Comment* (LRF): sample dates soil-forming event within Roxana deposition.

ISGS-546. Amos Edwards Farm Section **21,460 ± 210**

Organic silty clay from Gallatin Co, 7.4km NW of Ridgeway (37° 51′ 01″ N, 88° 18′ 24″ W). From depth 8m in borehole from Unit 30b, Equality Formation. Coll 1978 and subm by P V Heinrich, Univ Illinois. *Comment* (PVH): date indicates that brown, moderate illite content (50 to 52%) sediments at base of Unit 30b are earliest Woodfordian; dates beginning of transition from massive to laminated sediments in sec.

ISGS-547. Mitchell Farm Section **20,510 ± 170**

Organic clayey silt from Hamilton Co, 2.6km NE of Broughton (37° 57′ 29″ N, 88° 26′ 02″ W). From top of Unit 30a, Equality Formation, at depth 5.7m in borehole. Coll and subm by P V Heinrich. *Comment* (PVH): this date, with ISGS-546, demonstrates that contact between Unit 30a and 30b is time-transgressive along North Fork R. Time-transgressive nature of contact explains why color and mineralogic zone in Unit 30b in Amos Edwards Farm Section is missing in this sec.

ISGS-548. Sadler Farm Section **3940 ± 80**

Pelecypod shell fragments from Saline Co, 3.4km E of Harrisburg (37° 44′ 18″ N, 88° 29′ 54″ W), from shell lens in silty clay of Unit 30b, Equality Formation. Coll 1978 and subm by P V Heinrich. *Comment* (PVH): date is too young for stratigraphic position in Unit 30b of Equality Formation. Sediments of overlying Unit 50 of Equality Formation have been dated ca 13,000 BP (ISGS-101 and -103: R, 1973, v 15, p 81). Also, base of Unit 30b along Middle Fork R dates ca 21,000 BP: (ISGS-84 and -87: R, 1973, v 15, p 80).

ISGS-549. Barnes Farm Section **21,780 ± 410**

Organic silt from Saline Co, 1.4km N of Dorris Heights (88° 33′ 45″ N, 37° 47′ 00″ W), from Unit 30a ca 0.75m below Unit 30a-30b contact, Equality Formation. Coll 1978 and subm by P V Heinrich. *Comment* (PVH): date, with ISGS-84 and -87, demonstrates that Unit 30a and 30b contact is not noticeably time-transgressive along Middle Fork R. Date suggests that circulation from valley train into upper reaches of Middle Fork R was established at earlier date and faster rate than along North Fork R.

Big Rock Creek series

Organic silt from Kendall Co, 8.9km NW of Yorkville (88° 29′ 30″ N, 41° 42′ 45″W). Coll 1978 by S S Wickham and M M Killey; subm by S S Wickham, ISGS.

ISGS-557. 40,500 ± 1100

From Plano Silt Member, 4.5 to 4.95m below surface.

ISGS-559. 40,400 ± 1400

From base of Plano Silt Member, 4.95 to 6.4m below surface.

General Comment (SSW): dates confirm Altonian age for Plano Silt Member of Winnebago Formation.

ISGS-560. Zip Profile #23 20,830 ± 160

Soil (<4μ fraction) from Hamilton Co, 2km NE of Broughton (37° 57′ 21″ N, 88° 26′ 57″ W). From organic silt zone within Equality Formation. Coll 1977 by L R Follmer and B Currie; subm by L R Follmer. *Comment* (LRF): sample dates low-water stage in Lake Saline, glacial slack water lake of Woodfordian age.

Horseshoe Lake series

Silty clay lake sediment from Madison Co, 5km SW of Granite City (38° 41′ 43″ N, 90° 04′ 12″ W). Coll 1977 and subm by D L Gross.

ISGS-574. Core depth, 6.25 to 6.5m 3010 ± 100

ISGS-563. Core depth, 9 to 9.3m 3270 ± 80

General Comment (DLG): Horseshoe Lake is oxbow meander of Mississippi R. Dates provide time of cutoff from Mississippi R and allow calculation of long-term average sedimentation rate of ca 2mm/yr.

ISGS-575. Troy Auger-12.0 26,050 ± 330

Muck and wood from Madison Co, 1km SW of Troy (38° 41′ 36″ N, 89° 54′ 06″ W), from top of Roxana Silt. Coll 1979 and subm by E D McKay. *Comment* (EDM): dates upper 15cm of Farmdale Soil developed in Roxana Silt. Date is max at this site for burial of Roxana Silt with Peoria Loess, and agrees with dates of surface horizon of Farmdale Soil from its type area, (ISGS-529 and -533).

ISGS-594. Pleasant Grove School 26,050 ± 370

Organic component of clay (<4μ fraction) extracted from loess from Madison Co, 1.7km N of Collinsville (38° 41′ 34″ N, 90° 00′ 26″ W). From 0.7 to 1.1m below top of "zone r-2" (McKay, 1979a) in lower part of Roxana Silt. Coll 1979 by E D McKay and L R Follmer; subm by E D McKay. *Comment* (EDM): approx same horizon as dated by W-729:

35,200 ± 1000, at this location. "Zone r-2" in Canteen Creek Section, 6km to S is overlain by peat bed dated by ISGS-393: 40,200 ± 1500, and ISGS-392: 36,100 ± 550. Serious disparity among these dates and ISGS-594 suggest sample was contaminated with younger carbon.

ISGS-614. Malden South II **27,300 ± 540**

Wood from Bureau Co, 3.2km S of Malden (41° 23′ 35″ N, 89° 21′ 30″ W). From Robein Silt, 0.6m from top. Coll 1979 by S S Wickham and Inez Kettles; subm by S S Wickham. *Comment* (SSW): date agrees well with other dates of Robein in N Illinois: (I-1625, I-2220, and W-333; Willman and Frye, 1970).

ISGS-624. Amboy West **37,290 ± 790**

Organic silt from Lee Co, 4.7km WSW of Amboy (41° 43′ 27″ N, 89° 24′ 10″ W), from soil developed in silt. Coll 1979 and subm by S E Zwicker. *Comment* (SEZ): sediments encountered are older than previously correlated. Date verifies pre-Woodfordian age of soils developed in Lee Center Till Member.

ISGS-649. Miller's Farm **20,160 ± 250**
$\delta^{13}C = -25.1‰$

Wood fragments from Union Co, 4km E of Wolf Lake (37° 30′ 15″ N, 89° 26′ 10″ W), from blue-gray silty clay lacustrine deposit. Coll 1979 and subm by D R Fraser, Southern Illinois Univ. *Comment* (DRF): date is from near base of mid-Woodfordian slackwater lake deposits in Hutchins Creek-Clear Creek valley; agrees well with dates from similar lake deposits in Saline R Valley (Frye *et al,* 1972).

ISGS-650. Rhodes Farm **270 ± 80**
$\delta^{13}C = -27.2‰$

Wood fragments from Union Co, 4km E of Wolf Lake (37° 30′ 15″ N, 89° 26′ 10″W), from cut bank on Clear Creek, in gray sandy loam with lacustrine structures. Coll 1979 and subm by D R Fraser. *Comment* (DRF): date provides information on rate of floodplain deposition; change in sediment characteristics just above dated horizon may be result of frontier settlement.

Pekin Sewer Site series

Wood chips and silty muck from Tazewell Co, at E edge of Pekin (40° 32′ 59″ N, 89° 35′ 36″ W). Coll 1979 by L R Follmer and E D McKay; subm by L R Follmer.

ISGS-662. **26,100 ± 170**
$\delta^{13}C = -25.6‰$

From uppermost wood-rich zone, 6.3m below surface.

ISGS-661. **27,230 ± 420**
$\delta^{13}C = -25.8‰$

From lowermost wood-rich zone, 6.75 to 6.85m below surface.

General Comment (LRF): dates agree with dates of ISGS-533 and -535 determined on Robein Silt at its type sec, 16km NNE of this site. Interval sampled represents time of organic soil formation between depositional events. Based on youthful profile characteristics of Farmdale Soil developed in and through Robein Silt, it is believed that dates give a reasonable estimate of beginning and end of soil formation at this site.

C. Iowa

Chapel Hill Section series

Peat from Scott Co, on W edge of Davenport (41° 29, 30″ N, 90° 39′ 00″ W). From silty peat channel-fill lying unconformably on materials as old as Glasford Formation; peat is overlain by Robein Silt, continuous across and beyond limits of channel. Coll 1970 and subm by R C Anderson.

ISGS-243. **27,500 ± 800**

Peat from near top of peaty channel fill. *Comment* (RCA): date is early Farmdalian, and together with ISGS-244 (>39,300 BP) from near base of channel-fill, indicates that channel-fill began to accumulate prior to Farmdalian time, probably in broad, open valley that was later occupied and enlarged by Mississippi R.

ISGS-244. **>39,300**

From lower portion of channel-fill, 1.2m below peat dated by ISGS-243. *Comment* (RCA): date indicates that channel was cut and began to be filled before 39,300 BP. Sample might be as old as Sangamonian or even Illinoian and suggests that topographic sag, perhaps in form of an abandoned channel, existed prior to establishment of present course of Mississippi R during Woodfordian time.

ISGS-503. Sheldon Transect **31,100 ± 2000**

Silt from O'Brien Co, 2.9km SE of Sheldon (43° 09′ 30″ N, 95° 48′ 45″ W). From oxidized and unleached organic band overlying Wisconsinan loess and underlying Tazewell till and outwash. Coll 1976 and subm by G R Hallberg, Iowa Geol Survey, Iowa City. *Comment* (GRH): radiocarbon dates from this area are problematic: date is split of sample dated at 4090 ± 120 (I-9895; Ruhe, 1969). Both samples are from similar stratigraphic position as sample dated at 20,500 ± 400 (I-1864A; Ruhe, 1969).

ISGS-512. Garnavillo **25,300 ± 650**

Loess from Clayton Co, 0.4km NE of Garnavillo (42° 51′ 45″ N, 91° 13′ 45″ W). From depth 5 to 5.4m in "basal Wisconsinan" loess paleosol. Coll 1977 and subm by G R Hallberg. *Comment* (GRH): data from basal loess paleosol mark beginning of deposition of Wisconsinan loess in NE Iowa, near Mississippi R.

ISGS-552. Cook's Quarry **13,680 ± 80**

Wood from Story Co, 3km NE of Ames (42° 03′ 56″ N, 93° 35′ 48″ W), from depth 10.4m in unoxidized, jointed, unleached "Cary" till. Coll 1978 by G R Hallberg, T J Kemmis, and A Lutenegger; subm by

G R Hallberg. *Comment* (GRH): wood is from base of late Wisconsinan till, and is from same stratigraphic horizon as some earlier, questionable carbon-black dates; C-596: 11,952 ± 500 and C-653: 12,200 ± 500 (Ruhe, 1969). Date fits chronology established by other recent dates.

ISGS-553. LeGrand-Anderson Quarry **24,500 ± 820**

Organic loess from Tama Co, 3km NE of LeGrand (42° 01′ 05″ N, 92° 43′ 32″ W), from paleosol in basal Wisconsinan loess. Coll 1978 by G R Hallberg, A Lutenegger, and T J Kemmis; subm by G R Hallberg. *Comment* (GRH): date marks beginning of significant Wisconsinan loess deposition in area and agrees with other basal loess dates in area around Iowa R.

ISGS-641. Algona **12,610 ± 250**

Wood fragment from Kossuth Co, Algona (43° 05′ N, 94° 14′ W). From unoxidized, unleached jointed loam till (Algona Moraine). Coll 1978 by T J Kemmis and R Jones; subm by G R Hallberg. *Comment* (GRH): date, with other recent dates from deposits of Algona Moraine, are all in range of ca 12,000 to 12,600 BP. Dates place deposits of Algona Moraine of Des Moines Lobe at younger age than previously assumed (Ruhe, 1969).

D. Wisconsin

Schelke Bog series

Organic silt from Lincoln Co, 0.5km E of Doering (45° 14′ 10″ N, 89° 26′ 55″ W). Coll 1973 and subm by D M Mickelson, Univ Wisconsin, Madison.

ISGS-262. **>36,500**

Silt from beneath Woodfordian drift, 12.07 to 12.23m below surface. Marks change from high *Pinus* pollen below to high *Picea* pollen above.

ISGS-256. **40,800 ± 2000**

Silt from depth 12.32 to 12.39m in organic sand and silt zone overlying Merrill Till.

General Comment (DMM): dates are min for Merrill Till. Outwash above dated horizons is probably Woodfordian but could, at least in part, be late Altonion. Because Merrill Till is surficial till in this area, dates suggest that late Altonion advance (Rockian) did not extend as far as Woodfordian end moraines 10km to N.

Two Creeks series

Wood from Kewaunee Co, 3.3km NNE of Two Creeks (44° 19′ 38″ N, 87° 32′ 15″ W), from Two Creeks forest bed. Sample from part of stump *in situ* with roots penetrating into underlying sediments. Coll 1973 and subm by D D Coleman.

ISGS-264A. Split 1 **11,790 ± 80**

ISGS-264B. Split 2 **11,640 ± 90**

General Comment: dates agree well with each other and with average for this site determined by various laboratories.

ISGS-480. DePere Forest Bed **11,980 ± 100**

Wood from Brown Co, 6.9km SE of DePere (44° 24′ 40″ N, 88° 00′ 17″ W), from forest bed overlain by red clayey till and underlain by stratified sand and red clayey till. Coll 1977 and subm by T A Kessenich, Univ Wisconsin, Madison. *Comment* (TAK): Twocreekan age of sample demonstrates at least two episodes of red till deposition in Green Bay lowland; one pre-Twocreekan and one post-Twocreekan. Stratigraphic relationship of tills and age of sample agrees with similar deposits near Appleton, Wisconsin, (L-698-B) (Black, 1976).

New Denmark series

Wood from Brown Co. Coll 1979 by R D Steiglitz, J Moran, and D Quigley; subm by R D Steiglitz, Univ Wisconsin-Green Bay.

ISGS-659. **10,920 ± 90**
$\delta^{13}C = -25.6‰$

ISGS-666. **11,640 ± 80**
$\delta^{13}C = -26.1‰$

Wood from 5km NW of Denmark (44° 22′ 45″ N, 87° 51′ 30″ W), from forest bed in red till, 4.6 to 4.7m below surface.

ISGS-660. **11,630 ± 80**
$\delta^{13}C = -25.5‰$

Wood from 3.5km NW of Denmark (44° 21′ 50″ N, 87° 51′ 10″ W), from thin bed containing wood and fine organic silt, 4.5 to 4.6m below surface.

General Comment (RDS): samples from topographically high site NW of intersection of Denmark and Interlobate Moraines of late Wisconsinan age. Dates may be at contact of older Chilton or Branch River Tills and younger Glenmore till and may help establish time of last advance of Green Bay Lobe ice into area.

ISGS-558. Bollant Site **20,270 ± 650**

Organic materials (peat-like) from Grant Co, 8km WNW of Livingstone (42° 56′ N, 90° 30′ W), from lower portion of sandy silt zone, 8.8 to 10.4m below surface in alluvial fan. Coll 1978 and subm by J C Knox, Univ Wisconsin, Madison. *Comment* (JCK): date supports hypothesis that present alluvial fans in Driftless Area have developed since early Woodfordian time. Alluvial fan deposits at dated site and in other Driftless Area alluvial fans imply that intense surface runoff and related large floods probably were extremely rare during Woodfordian time.

E. Indiana

Lake Turman series

Wood fragments from Sullivan Co, 4.8km SSE of Fairbanks (39° 10′ 42″ N, 87° 30′ 16″ W), from drill core 12.6m long. Coll 1973 by L E Hall; subm by R V Ruhe, Indiana Univ.

ISGS-247. Core depth, 5.2 to 5.5m **9220 ± 210**

ISGS-248. Core depth, 11.5 to 11.6m **9010 ± 190**

General Comment (RVR): dates show that Lake Turman deposits are of Holocene age, not Wisconsinan or "Upper Pleistocene," as previously believed.

ISGS-382. Ardmore Road Quarry **21,310 ± 350**

Plant debris in silty sand from Allen Co, SW of Ft Wayne (41° 01′ 30″ N, 87° 12′ 00″ W). Coll 1974 and subm by M C Moore, Indiana Geol Survey, Bloomington. *Comment* (MCM): dates are max for re-advance of ice that deposited till of Trafalgar Fm (Wayne, 1963) in NE Indiana. Detailed stratigraphy of site has been discussed by Bleuer and Moore (1971; 1972) and Moore and Bleuer (1972).

ISGS-386. Middle Prairie Creek **36,380 ± 800**

Wood from Fountain Co, 10km SW of Veedersburg (40° 01′ 44″ N, 87° 19′ 20″ W), from within Glenburn (?) Till. Coll 1974 and subm by N K Bleuer, Indiana Geol Survey, Bloomington. *Comment* (NKB): dates are max for this surface till of Lake Michigan Lobe source, in area apparently not reached by E ice. Till is probably correlative with Glenburn Till Member of Wedron Fm, as mapped in Illinois.

ISGS-378. Russellville Section **21,100 ± 200**

Organic debris in silt from Putnam Co, 0.8km SSW of Russellville (39° 50′ 44″ N, 86° 59′ 14″ W), from loamy silt overlain and underlain by till. Coll 1975 by N K Bleuer, D L Eggert, and M C Moore; subm by N K Bleuer. *Comment* (NKB): dates are max for base of Trafalgar Fm in this area, and complement dates derived much earlier from similar sites in region as tabulated by Wayne (1965).

Russellville Quarry series

Wood from Putnam Co, 0.8km S of Russellville (39° 51′ 37″ N, 86° 58′ 30″ W). Sec is 5.9m of till over organic silt, 15m thick, which overlies Sangamon Soil, 1.8m thick, in lower Illinois till. Coll 1977 by R V Ruhe and C G Olson; subm by R V Ruhe.

ISGS-475. Depth 5.1m **20,110 ± 360**

ISGS-477. Depth 6.9m **21,010 ± 350**

General Comment (RVR): dates confirm upper till as Tazewell and organic silt as representative of time-transgressive Farmdale Soil.

ISGS-388. Hillsdale North **>40,000**

Wood and plant fragments from Vermillion Co, 1km NNW of Hillsdale (39° 47′ 28″ N, 87° 23′ 44″ W). From silt unit, 0.4m thick, overlain and underlain by till. Coll 1975 and subm by N K Bleuer. *Comment* (NKB): date tends to verify conclusion based on petrography that near-surface tills in area are pre-Wisconsinan. Dated silt occurs between tills that are probably Kansan.

ISGS-431. American Aggregates **>50,000**

Wood from Wayne Co, at NE edge of Richmond (39° 47′ N, 84° 46′ 30″ W), from silt and fine sand zone ca 0.6m thick. Coll 1972 and subm by R P Goldthwait, Ohio State Univ.

ISGS-455. Cass Co, Well #108 **21,610 ± 310**

Wood fragments *(Picea),* from Cass Co, 6km NNW of Logansport (40° 47′ 35″ N, 86° 27′ 00″ W), from log penetrated by rotary drill bit at depth 52.5m, within till. Coll 1976 and subm by M C Moore. *Comment* (NKB): all overlying tills appear to be E-source Trafalgar Till. Extreme thickness (52m) of overlying till must be valley fill of proto-Wabash R (pre-Trafalgar valley cut into older glacial materials). Together with ISGS-382: 21,310 ± 350 BP, date suggests very rapid advance of initial Trafalgar ice, which reached points near its outer margin at roughly the same time.

Christensen Bog series

Site in Hancock Co, 9.6km N of Greenfield (39° 52′ 00″ N, 85° 49′ 30″ W). Coll 1977 and subm by R W Graham, Indiana Univ-Purdue Univ, Indianapolis.

ISGS-501. **12,060 ± 100**

From upper part of shell zone, 32.5cm from surface datum. *Comment* (RWG): date is min for mastodon horizon.

ISGS-610. Soil 1 **13,070 ± 90**

Bog soil from 80 to 90cm below surface datum in shell zone.

ISGS-492. **13,220 ± 100**

Wood from organic bog sediments containing mollusks and vertebrates, 94cm below datum. *Comment* (RWG): dates lower half of shell zone; with date of upper part of shell zone (ISGS-501), indicates fossiliferous deposits accumulated in slightly more than 1000 yr but probably less than 1500 yr.

ISGS-505. **13,360 ± 100**

Wood from lacustrine sediments, 100cm below datum, just below contact with shell zone.

ISGS-504. **13,820 ± 80**

From lacustrine deposits, 115cm below datum.

ISGS-502. **14,080 ± 150**

From lacustrine deposits, 125cm below datum. *Comment* (RWG): date agrees with dates from outwash below (ISGS-491) and shell zone above (ISGS-492 and -501) and establishes correlation between strata from N and S ends of excavation.

ISGS-491. **14,550 ± 80**

Wood from glacial outwash deposits 40cm thick, below lacustrine sediments and above till. *Comment* (RWG): date is max for formation of Christensen Bog and dates outwash sediments to last glaciation of central Indiana.

Brazil, Indiana series

Site in Clay Co, 3.8km SE of Brazil (39° 30′ N, 87° 04′ W). Coll 1977 by R V Ruhe and C G Olson; subm by R V Ruhe.

ISGS-523. **25,480 ± 420**

Insoluble humin fraction from Alb horizon of Farmdale Soil.

ISGS-524. **23,690 ± 980**

Humic acids extracted from ISGS-523.

General Comment (RVR): agreement of humin and humic acid dates precludes significant contamination by "younger" carbon.

ISGS-541. Fillmore Section **20,660 ± 180**

Coniferous wood from Putnam Co, 4.2km N of school in Fillmore (39° 42′ 30″ N, 85° 45′ W), from basal 15cm of calcareous Wisconsinan till in stream cut at junction of Miller and Clear Creeks. Coll 1977 by C G Olson, M C Moore, and R V Ruhe; subm by R V Ruhe. *Comment* (RVR): date correlates well with ISGS-475: 20,110 ± 360 BP, and helps determine correlation of tills in N Indiana to loess in SW part of state.

Northwest Rockville series

Organic silt from Parke Co, 4km NW of Rockville (47° 30′ 08″ N, 87° 16′ 08″ W). Coll 1978 and subm by N K Bleuer.

ISGS-567. 7.3 to 7.45m depth **22,080 ± 220**

From upper organic zone. *Comment* (NKB): date most probably is of shear-sliced equivalent of lower silt in same hole (ISGS-568).

ISGS-568. 15.2 to 15.5m depth **22,960 ± 200**

From lower organic zone. *Comment* (NKB): date is max for Lake Michigan Lobe Wisconsinan margin.

West-Central Indiana series

Samples from auger holes. Coll 1978 and subm by N K Bleuer.

ISGS-582. 30-14-8 **20,990 ± 160**

Organic silt from Parke Co, 4.5m WNW of Rosedale (39° 38′ 15″ N, 87° 20′ 00″ W), from gray to black silt zone, 7.6 to 7.8m below surface.

Comment (NKB): dates Lake Michigan Lobe Wisconsinan margin near SE-most extent (16km S of ISGS-567 and -568).

ISGS-583. Parke Co, 29-14-8 **24,790 ± 230**

Mucky silt from Parke Co, 3.5km WNW of Rosedale (39° 38′ 15″ N, 87° 20′ 00″ W), from mucky black clay zone, 2.7 to 2.9m below surface. *Comment* (NKB): date is max for loess and extraglacial flow deposition just beyond Lake Michigan Lobe Wisconsinan margin. Indicates poorly drained bog condition several thousand yr before main Wisconsinan advance.

ISGS-598. Park Co **25,480 ± 400**

Organic silt from Park Co, 6km WNW of Rosedale (39° 37′ 45″ N, 87° 21′ 06″ W), from organic silt zone, 3.05 to 3.35m below surface. *Comment* (NKB): date is anomalously old, older than date of base of underlying unit, ISGS-582: 20,990 ± 160 BP. Conceivably, unit is old organic material derived from dirty surface of ice margin.

ISGS-597. Vigo Co **21,580 ± 180**

Woody silt from Vigo Co, 2km W of W Terre Haute (39° 30′ 10″ N, 87° 30′ 30″ W), from silt zone assoc with wood fragments, 8.53 to 8.69m below surface. *Comment* (NKB): date is max for Lake Michigan Lobe advance of Wedron Formation, and verifies W-668 date nearby, and ISGS-582 to NE in Parke Co.

Vanderburgh Co series

Fibrous organic material from Vanderburgh Co. Coll 1979 and subm by G S Fraser, Indiana Geol Survey.

ISGS-617. **3980 ± 80**

Sample from 8.3km SSW of Evansville (37° 52′ 55″ N, 87° 38′ 20″ W), from organic zone near base of Ohio R alluvium. *Comment* (GSF): sample was taken near scarp of "Cary" Terrace. Date suggests that nearly all of this extensive flood plain accumulated in a very short time.

ISGS-640. **2140 ± 100**
$\delta^{13}C = -28.6‰$

Sample from 12.5km SSW of Evansville (37° 50′ 30″ N, 87° 38′ 20″ W), from organic zone near base of alluvium similar to deposits of overbank material from modern Ohio R. *Comment* (GSF): sample was taken near middle of Holocene flood plain. Coupled with ISGS-617, date suggests that meander loop prograded at constant rate since it began to form.

F. Ohio

Battaglia Bog series

Site in Portage Co, 2.4km SE of Kent. Coll 1973 by L C Shane and Alan Black; subm by L C Shane, Kent State Univ.

ISGS-249. **10,060 ± 160**

Sphagnum from filled kettle hole at core depth 209 to 214cm, Pollen Zone II (Shane, 1972). *Comment* (LCS): dates initiation of *Pinus* max. Age ca 500 yr younger than expected; other dates from NE United States place shift "away" from *Pinus* dominance to *Quercus* dominance at ca 10,000 BP (Ogden, 1967).

ISGS-250. **13,640 ± 210**

Gyttja from core depth 350 to 360cm, coorelates with top of pollen Zone I-A (Shane, 1972). *Comment* (LCS): agrees with ISGS-249 and is also slightly younger than expected.

ISGS-252. **15,570 ± 340**

Gyttja mixed with marl from core depth 466 to 486cm, near base of Pollen Zone I-A (Shane, 1972). *Comment* (LCS): since basin deposition does not usually begin for 1000 to 3000 yr after ice retreat (Mickelson and Borns, 1972; Shane, 1972) and there are ca 25 to 35cm more of marly gyttja below sample and above sand base, date supports concept that interlobate area is several thousand yr older than most of late Wisconsinan glaciated Ohio and is consistent with predicted basal date of 17,000 to 19,000 BP. This estimated basal date is min for retreat of Kent ice from Portage Co, Ohio.

Quillin Brother Gravel Pit series

Site in Medina Co, 3.9km SE of Lodi Square (41° 00′ 39″ N, 81° 58′ 38″ W). Coll 1975 and 1978 by S M Totten and G W White; subm by G W White, Univ Illinois.

ISGS-348. **14,050 ± 80**

Wood from base of organic sand and silt unit, 2.4m thick, overlying gravel and sand, and underlying peat. *Comment* (GWW): dates first appearance of vegetation after retreat of Hiram (late Woodfordian) ice from area, 7.1km N of Hiram boundary.

ISGS-618. **9320 ± 90**

Peat from large block of flattened dense peat that slid several ft from main peat face. *Comment* (SMT): agrees well with ISGS-410: 8150 ± 120 BP from *in situ* peat layer, and with ISGS-409: 10,470 ± 100 from gyttja directly beneath peat. Date determines age of vole skull and sparrow (?) skeleton.

Quillin Site series

Site in Medina Co, 4.8km SE of Lodi (41° 00′ 37″ N, 81° 58′ 35″ W). Coll 1975 by L C Shane and T L Kinch; subm by L C Shane.

ISGS-411. **4690 ± 100**

Peat from 0.3 to 0.4m below top of deposit.

ISGS-410. **8150 ± 120**

Peat from 0.9 to1m.

ISGS-658. **8790 ± 180**
$\delta^{13}C = -26.8‰$

Peat from cut face 1.32m below defined surface.

ISGS-407. **10,430 ± 90**

Small *Abies* log from 2m depth, assoc with *Populus* and *Salix* wood; 0.5m below pine needle layer. *Comment* (LCS): dates "pine max" pollen zone.

ISGS-409. **10,470 ± 100**

Matrix gyttja from 2m depth. *Comment* (LCS): material directly surrounding *Abies* sample (ISGS-407). Similarity of dates rules out biologically incorporated Paleozoic carbon at this level.

ISGS-621. **12,550 ± 230**
$\delta^{13}C = -26.1‰$

Wood fragments from cut face 3.25m below defined surface. Below this level, pollen is generally >50% spruce, whereas below, spruce drops to ca 20% and ironwood and oak increase. Date correlates well with other dates for this shift in W Ohio.

ISGS-622. **12,470 ± 140**

Wood fragments from cut face 4.47m below defined surface.

ISGS-403. **12,260 ± 90**

Picea log from 5.08m depth.

ISGS-405. **13,400 ± 140**

Gyttja from near basal deposit at depth 5.6m.

ISGS-402. **14,500 ± 150**

Organic material mixed with lake clay from dark "litter layer" at contact between glacial sand and basal lake sediments *Comment* (LCS): date represents minimal ice-free date for area unless "litter" zone was formed on top of melting ice block (Florin and Wright, 1969).

ISGS-432. Rock Fork **>44,600**

Wood from Franklin Co, 2km E of Gahanna (40° 01′ 05″ N, 82° 51′ 05″ W), from coarse boulder gravel at base of Lockbourne Formation. Coll 1972 and subm by R P Goldthwait, Ohio State Univ.

ISGS-433. Executive Estates **42,220 ± 850**

Wood chips from Licking Co, 4.7km SSW of Etna (39° 55′ 00″ N, 82° 41′ 41″ W), from drill hole 62m deep to just above shale bed rock. Coll 1973 by J R Snavely and M J Quinn; subm by R P Goldthwait.

ISGS-437. Avon-North Ridge Gravel Pit **13,050 ± 100**

Wood from Lorain Co, Ohio, 0.3km E of Sheffield (41° 25′ 33″ N, 82° 03′ 52″ W), from organic layer over sand and gray till, overlain by sand and gravel. Coll 1976 and subm by S M Totten, Hanover Coll, Hanover, Indiana. *Comment* (SMT): site is shoreline of earliest Lake Warren I in Erie Basin. Date agrees well with interpretation of Warren I originating soon after Arkona III, dated to 13,600 ± 500.

ISGS-590. Somers Farm North **>45,160**

Wood from Preble Co, 3.1km N of Fairhaven (39° 37′ 40″ N, 84° 45′ 50″ W), from 1.68m above base of Whitewater Till. Coll 1978 and subm by D P Stewart, Miami Univ, Oxford, Ohio. *Comment* (DPS): date confirms correlation of till with Whitewater and terminus of Whitewater in region.

ISGS-604. Doty's Highbank **21,070 ± 100**

Wood from Butler Co, 4km N of Oxford (85° 43′ 55″ N, 39° 33′ 05″ W), from contact between units that were allegedly New Paris Interstadial deposits (below) and Middle Wisconsinan till (above). Coll 1978 and subm by D P Stewart. *Comment* (DPS): date proves that whole sec at Doty's Highbank (22.9m) is Late Wisconsinan. Former dates on "Stump Zone", 6.1m above, are incorrect.

ISGS-639. Alden Lower Pit **(128.9 ± 1.2) % modern**

Wood from Summit Co, 2km WNW of Cuyahoga Falls (41° 08′ 32″ N, 81° 32′ 28″ W), from gray leached clayey silt, 1.5 to 2.25m below surface. Coll 1978 and subm by J P Szabo, Univ Akron, Ohio. *Comment* (JPS): date implies severe erosion of slopes in Mud Brook drainage. Human activity on upper slopes freed much sediment for transport to lower slopes, where it is deposited as gully fill or alluvial fans.

G. California

Arlington Canyon, Santa Rosa Island series

Site in Santa Barbara Co, 60km WSW of Santa Barbara (33° 59′ N, 120° 09′ W). Coll 1978 and subm by D L Johnson, Univ Illinois.

ISGS-602. **1890 ± 80**

Buried organic soil. *Comment* (DLJ): date indicates that alluviation in Arlington Canyon ceased at some point later than 1885 BP, followed by entrenchment and stream-downcutting of alluvial fill.

ISGS-609. **(99.3 ± 0.1) % modern**

Wood from 2.1m below surface of alluvial fill. *Comment* (DLJ): because ISGS-602 overlies this sample and is older, it is most probably rootwood of shrub that grew on surface of sec within historic time.

ISGS-580. **10,800 ± 80**

Wood from peaty muck (8.1 to 8.9m below alluvial fill surface) that outcrops along floor of canyon intermittently along 0.25km. *Comment* (DLJ): wood id. by R C Koeppen as "*Pinus,* of yellow pine group" most probably *Pinus torreyana,* which is still present as relict stand on this island.

ISGS-543. **11,330 ± 150**

Charcoal from peaty muck outcrop occurring on floor of canyon. *Comment* (DLJ): date complements ISGS-580 obtained on wood *(Pinus)*, and indicates that coniferous elements and fires were present on this part of Santa Rosa Island during period 11,300 to 10,800 BP.

ISGS-542. Tecolote Canyon, Santa Rosa Island **34,550 ± 490**

Charcoal from Santa Barbara Co, 60km WSW of Santa Barbara (33° 59′ 39″ N, 120° 10′ 23″ W). From lower concave upward interface of classic "fire area." Coll 1978 and subm by D L Johnson. *Comment* (DLJ): red, highly oxidized "fire area" contains exposed fused rock rendered to pumicelike character, which reflects intense heat. Feature has no apparent anthropic implications, and may have been formed by burning roots of wind-or age-toppled tree; soil and stones adhering to roots would have been oxidized and fused.

Christy Alluvium, Santa Cruz Island series

Site in Santa Barbara Co, 40km SW of Santa Barbara (34° 01′ N, 119° 52′ W). Coll 1978 and subm by D L Johnson.

ISGS-544. **4840 ± 80**

Abalone shell from midden, 1.6m below surface of alluvial terrace. *Comment* (DLJ): date is consistent with stratigraphy and insular archaeology.

ISGS-578. **43,200 ± 1100**

"Fire area" from *in situ* growth position at lower interface of area and subjacent alluvium. *Comment* (DLJ): greater than expected age of "fire area" sheds new light on age of this part of Christy Alluvium. Abundance of "fire areas" in alluvium suggests that many trees were growing on ancient alluvial flats during Wisconsinan stage of Pleistocene. "Fire areas" probably represent forest fires where wind-thrown and age-toppled trees, and soil adhering to their upthrown roots were burned and oxidized.

Running Springs, San Miguel Island series

Site in Santa Barbara Co, 56km WSW of Santa Barbara (34° 02′ 44″ N, 122° 25′ 34″ W). Coll 1978 by D L Johnson and M L Barnhardt; subm by D L Johnson.

ISGS-518. **16,520 ± 150**

Charcoal from buried colluvial soil, 1.7m below surface, in direct assoc with burned and calcined pygmy mammoth bones.

ISGS-525. **15,630 ± 460**

Same sample as ISGS-518, but charcoal briefly leached with cold 0.1N NaOH.

General Comment (DLJ): dates indicate that both mammoth and cypress were living on island at ca 16,000 BP.

H. New Mexico

ISGS-343. Gallegos North Section **7830 ± 90**

Mollusk shells from Harding Co, 1.6km N of Gallegos (35° 36′ 45″ N, 103° 44′ 15″ W), from 3m above creek channel and 4.6m below top of terrace in basin fill. Coll 1974 by J C Frye and A B Leonard; subm by J C Frye. *Comment* (JCF): dates molluscan fauna and basin fill, now dissected by Ute Creek. Extensive terrace level is at top of basin deposits. Date is consistent with terrace date upstream in tributary (ISGS-347), but is older than terrace date 40km upstream along Ute Creek (ISGS-373).

ISGS-344. Miera Section **27,500 ± 1300**

Unionid shells from Union Co, 29km SE of Pasamonte (36° 05′ 20″ N, 103° 31′ 15″ W), from Wisconsinan terrace deposit of tributary to Canadian R. Coll 1974 by J C Frye and A B Leonard; subm by H D Glass, ISGS. *Comment* (JCF): dates major terrace with abundant molluscan fauna of Tramperos Creek. Contrasts strongly with age of terraces of comparable height in Ute Creek drainage; this drainage enters Canadian R ca 120km downstream from mouth of Ute Creek, and has a lower gradient than Ute Creek.

ISGS-346. McCarty Ranch SW Section **21,180 ± 560**

Gastropod shells from Harding Co, 24.5km NNW of Logan (35° 31′ 15″ N, 103° 29′ 45″ W), from fossiliferous sand and silt unit, 0.3 to 0.8m thick, within sequence of lake beds. Coll 1973 by J C Frye and A B Leonard; subm by H D Glass. *Comment* (JCF): dates fauna and deposits in large undrained basin fill below Kansan surface N of Logan. Area adjacent to basin is ca 61m below Ogallala Formation upland to N.

ISGS-347. Tequesquite Creek Section **8860 ± 230**

Organic silt from Harding Co, 18.5km SSW of Bueveros (35° 49′ 30″ N, 103° 45′ 40″ W), from lens of organic silt, 1.5m above creek bed and 3m below terrace surface. Coll 1974 by J C Frye and A B Leonard; subm by H D Glass. *Comment* (JCF): dates extensive low terrace and molluscan fauna along Tequesquite Creek. This valley joins that of Ute Creek NW of Logan, New Mexico. Date agrees with those of two samples on Ute Creek, above (ISGS-373), and below (ISGS-343) mouth of Tequesquite Creek. Ute Creek is tributary to Canadian R, W of Logan; dates also indicate young age of low terrace of Canadian R.

Cimmaron Valley series

Site in Union Co, 13km NE of Folsom (36° 55′ 30″ N, 103° 43′ 50″ W). Coll 1975 by J C Frye and H D Glass; subm by J C Frye.

ISGS-369. **990 ± 80**

Clam shells from above basalt flow at base of Cimmaron R Valley, 0.6 to 1.2m below top of young terrace. *Comment* (JCF): dates lowest terrace deposits and molluscan fauna in Cimmaron R Valley.

ISGS-389. **1690 ± 100**

Charcoal mixed with silt and sand from fire pit in middle of very young terrace, above basalt. *Comment* (JCF): date indicates basalt flow is older than 1690 BP and Indian habitation of valley E of Folsom lasted much later than at Folsom sites.

ISGS-370. **840 ± 80**

Clam shells from Union Co, 18.5km NNE of Guy (36° 57′ 36″ N, 103° 21′ 44″ W), from main terrace of Cimmaron R Valley. *Comment* (JCF): dates younger terrace of Cimmaron R Valley in NE New Mexico. Date compares with date from comparable terrace deposit (ISGS-369), 48km upstream to W and demonstrates young age of incision of Cimmaron R Valley.

ISGS-372. Trementina Creek **1650 ± 80**

Clam shells from San Miguel Co, 1.5km NNW of Trementina (35° 28′ 46″ N, 104° 25′ 54″ W). From 0.9m below top of terrace, 1.8m high, of Trementina Creek. Coll 1975 by A B Leonard and J C Frye; subm by J C Frye. *Comment* (JCF): dates minor young terrace and molluscan fauna of Trementina Creek, tributary to Conchos R, which enters Canadian R a few km downstream. Along with dates from Tequesquite Creek and Ute Creek, confirms young active incision of Canadian R system.

ISGS-373. S Bueyeros **2960 ± 80**

Clam shells from Harding Co, 3km SSW Wof Bueyeros (35° 58′ 23″ N, 103° 41′ 36″ W), from lower part of terrace of Ute Creek, ca 4.5m high. Coll 1975 by A B Leonard and J C Frye; subm by J C Frye. *Comment* (JCF): dates youngest terrace and molluscan fauna of Ute Creek. Major terrace ca 40km downstream was dated as older (ISGS-343), and terrace dated here is probably equivalent in age to minor (undated) floodplain terrace downstream.

ISGS-458. Yeso North Site **20,500 ± 600**

Gastropod shells from De Baca Co, 4.8km of Yeso (34° 28′ 01″ N, 104° 34′ 41″ W), from fossiliferous sand at apparent periphery of saline basin on surface of Ogallala Fm. Coll 1975 by A B Leonard and J C Frye; subm by A B Leonard, Univ Kansa, Lawrence. *Comment* (ABL): gastropod shells represent sp characteristic of cooler and more humid climate that occurred 15,000 to 20,000 BP in New Mexico.

ISGS-607. Pecos Crossing **5200 ± 150**

Unionid shell fragments from Eddy Co, 2.4km SE of Malaga (32° 10′ 20″ N, 104° 05′ W), from sandy silt terrace of Late Pleistocene (Wisconsinan). Coll 1978 by A B Leonard and J C Frye; subm by A B Leonard. *Comment* (ABL): date agrees with other dates from 6 to 8m terrace deposited by Pecos R below abandoned Portales drainage, and provides important information on study of Pleistocene history of Pecos R in New Mexico.

Hagerman North series

Site in Chaves Co, 3.2km N of Hagerman (33° 08′ 30″ N, 104° 30′ W). Coll 1978 by A B Leonard and J C Frye; subm by A B Leonard.

ISGS-585. **400 ± 100**

Carbon from hearth in exposure of sandy terrace above Rio Felix, tributary to Peco R, 30.5cm below present surface.

ISGS-608. **6390 ± 120**

Unionid shells from exposed vertical face of terrace above Rio Felix, 1.83 to 2.44m below present surface. Date agrees with other dates from 6 to 8m terrace on Pecos R below abandoned Portales drainage.

ISGS-615. Las Vegas East **1300 ± 80**

Sphaeriid clam shell from San Miguel Co, 3.2km E of Jct US Hwy 65 and New Mexico Hwy 104 in Las Vegas (35° 30′ 40″ N, 105° 13′ W), from yellowish clayey silt containing Sphaeriid clams and gastropods on terrace, 18.3m alt, 180m from Gallinas R. Coll 1978 by A B Leonard and J C Frye; subm by A B Leonard. *Comment* (ABL): date is only clue to age of Gallinas R in vicinity of Las Vegas, New Mexico.

I. Other Localities

Matanuska Glacier series, Alaska

Wood from Matanuska-Susitna Borough, 147km ENE of Anchorage (62° 47′ 08″ N, 147° 45′ 05″ W). Coll 1974 and subm by D E Lawson, Univ Illinois.

ISGS-296. **520 ± 80**

From basal ice of Matanuska Glacier, 4m below present ice surface, 0.5m below boundary between basal ice and white ice, and 1m above sediment cover.

ISGS-312. **350 ± 80**

From basal ice zone of glacier, 1.1m below present ice surface and 0.5m above sediment cover.

General Comment (DEL): dates incorporation of materials in basal ice after ca 600 BP. Although exact age of overlying white ice is unknown, it is estimated as much older (perhaps 1000 to 2000 BP). Thus, dates imply materials were incorporated into base of ice sheet rather than from surface in accumulation zone.

ISGS-327. Spencer Glacier, Alaska **(163.4 ± 0.4) % modern**

Wood from ice cave, 17km S of Anchorage (60° 41′ 00″ N, 149° 00′ 45″ W), from white ice, 38.9m from surface, 2.1m above ice-bedrock interface and 2m above floor of cave. Coll 1974 and subm by D E Lawson. *Comment* (DEL): dates incorporation into ice sheet to modern times, but method of incorporation cannot be determined. Wood may have fallen into crevasse near ice margin or was carried into basal portions of glacier by supra- and englacial streams.

ISGS-612. Greenwood E Section, Mississippi 19,310 ± 460

Shell from Carroll Co, 12km E of Greenwood (33° 30′ 06″ N, 90° 02′ 28″ W). From interval of Peoria Loess, 1.5m thick, 1m above base. Coll 1978 by J C Frye and H B Willman; subm by H B Willman. *Comment* (HBW): date is comparable to dates from this strat position elsewhere in Illinois, and indicates no significant change in age of Peoria Loess down Mississippi Valley.

ISGS-613. Yazoo City, Mississippi 18,400 ± 400

Shell from Yazoo Co, 5km SE of Yazoo City (32° 17′ 55″ N, 90° 22′ 26″ W), from calcareous zone in lower part of Peoria Loess. Coll 1978 by J C Frye and H B Willman; subm by H B Willman. *Comment* (HBW): date is comparable to dates of shells from approx same strat position in Upper Mississippi Valley.

ISGS-326. Old Field, Advance Lowland, Missouri 8810 ± 90

Peat from Stoddard Co, 7km E of Advance (37° 06′ 14″ N, 89° 04′ 31″ W), from base of peat deposit, 2.3m thick, which covers ca $8km^2$ in closed basin. Coll 1974 by J E King and W H Allen, Jr; subm by J E King. *Comment* (JEK): dates beginning of peat development in large swamp in Mississippi R Valley and min age of last river occupation of W side of its valley.

Porter Gap Section series, Tennessee

Site in Lauderdale Co, 10.5km WNW of Halls (35° 52′ 30″ N, 89° 30′ 00″ W). Coll 1979 by E D McKay, J A Lineback, and H B Willman; subm by E D McKay.

ISGS-652. 23,390 ± 200
$\delta^{13}C = -25.0‰$

Wood (conifer) from upper 0.2m of silty muck, 1.4m thick, that extends from 0.5 to 1.9m above base of section of Peoria Loess, 7 to 9m thick, at top of E bluff of Mississippi Valley. *Comment* (EDM): date approximates occurrence of change in valley train composition from higher to lower dolomite, transition from loess zone P-2 to P-3 (McKay, 1979a; 1979b), and agrees with dates of same horizon in Peoria Loess of SW Illinois (ISGS-307, -413).

ISGS-653. 24,990 ± 270

Wood in muck from lower 0.1m of same muck bed dated by ISGS-652. *Comment* (EDM): date is approx for base of Peoria Loess at this locality and agrees well with basal Peoria dates from several sites along Mississippi and Illinois Valleys in Illinois.

ISGS-656. 25,320 ± 170
$\delta^{13}C = -26.0‰$

Wood in muck from upper 0.2m of Farmdale Soil in Robein Silt. *Comment* (EDM): date is approx for burial of Farmdalian landscape adjacent to Mississippi Valley by first increments of Peoria Loess derived from valley following mid-Wisconsinan (Farmdalian) ice retreat. Agrees with date of Farmdale Soil in its type region.

Spear Lake Bog series, Wyoming

Organic silt from Johnson Co, 39.4km WNW of Bussalo (44° 25′ 26″ N, 107° 11′ 15″ W). Coll 1977 and subm by M L Barnhardt, Illinois State Univ, Normal, from bog below two hanging cirques, one of which contains three well-defined moraines and sufficient evidence to suggest additional fourth advance. Oldest moraine possesses moderately well-developed soil and is probably of very late Pinedale (Pinedale IV) age; other moraines are Neoglacial.

ISGS-515. 106 to 136cm depth **8000 ± 110**

ISGS-514. 136 to 166cm depth **7000 ± 140**

ISGS-520. 121 to 166cm depth **4960 ± 80**

ISGS-513. 200cm depth **8200 ± 80**

From basal unit of bog overlying bedrock ca 200cm below surface.

General Comment (MLB): dates period after which glacial ice was restricted to long, hanging cirques in which two and possibly three episodes of Neoglacial ice advance are recorded by moraines, rock glaciers, and pro-talus ramparts.

Gladstone Lobe series, Canada

Peat from Yukon Terr (61° 01′ 10″ N, 138° 20′ 00″ W). Coll 1972 by C S Alexander and L W Price; subm by C S Alexander, Univ Illinois.

ISGS-442. **900 ± 100**

Peat from basal organic layer 3m from front of solifluction lobe, ca 15cm below top of permaforst.

ISGS-441. **1480 ± 80**

Peat from basal organic layer 7m from front of solifluction lobe, ca 35cm below top of permafrost.

ISGS-435. **1620 ± 80**

Peat from basal organic layer 10m from front of solifluction lobe, ca 30cm below top of permafrost.

ISGS-443. **1800 ± 100**

Peat from basal organic layer 11m from front of solifluction lobe, ca 35cm below top of permafrost.

ISGS-436. **2100 ± 80**

Peat from upper organic layer 8m from front of solifluction lobe, just above permafrost.

General Comment (CSA): dates and field evidence suggest that lobe moved along at least two shear planes at differential rate, moving faster along basal plane.

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[RADIOCARBON, VOL. 23, No. 3, 1981, P 384-403]

UNIVERSITY OF LUND RADIOCARBON DATES XIV

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INTRODUCTION

Most of the ^{14}C measurements reported here were made between October 1979 and October 1980. Equipment, measurement, and treatment of samples are as reported previously (R, 1968, v 10, p 36-37; 1976, v 18, p 290; 1980, v 22, p 1045).

Age calculations are based on a contemporary value equal to 95% of the activity of NBS oxalic acid standard and on the conventional half-life for ^{14}C of 5568 yr. Results are reported in years before 1950 (years BP). Errors quoted ($\pm 1\sigma$) include standard deviations of count rates for the unknown sample, contemporary standard, and background.

Corrections for deviations from $\delta^{13}C = -25.0‰$ in the PDB scale are applied for all samples; also for marine shells and other carbonate samples. The apparent age for marine material due to the reservoir effect must be subtracted from our dates on such samples.

The remark "undersized; diluted", in *Comments* means the sample did not produce enough CO_2 to fill the counter to normal pressure and "dead" CO_2 from anthracite was introduced to make up the pressure. "% sample" indicates amount of CO_2 derived from the sample present in the diluted counting gas; the rest is "dead" CO_2. Organic carbon content reported for bone samples is calculated from yield of CO_2 by combustion of gelatine remaining after treatment. Organic carbon lost during treatment is not included in calculated percentage.

The description of each sample is based on information provided by the submitter.

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SAMPLE DESCRIPTIONS

I. GEOLOGIC SAMPLES

A. Sweden

Abisko series (II)

Sediment from Lake Tjåutjanjaure (68° 15′ N, 18° 33′ E) and from nameless small lake at 458m alt (68° 29′ N, 18° 17′ E) in Abisko area, N Sweden. Coll 1978 by M Hjelmroos and G Digerfeldt; subm by M Hjelmroos, Dept Quaternary Geol, Univ Lund. Dating is part of palaeoecologic study, belonging to IGCP Subproject 158B (Berglund, 1979), of postglacial vegetational history in area. For other dates from area, see Abisko series (I) (R, 1980, v 22, p 1045-1047). Depths given are below water surface. All samples pretreated with HCl.

8840 ± 85
Lu-1657. Tjåutjanjaure 1, 720 to 725cm $\delta^{13}C = -24.6‰$
Algal gyttja.

7710 ± 75
Lu-1658. Tjåutjanjaure 2, 670 to 675cm $\delta^{13}C = -20.7‰$
Algal gyttja.

6650 ± 70
Lu-1659. Tjåutjanjaure 3, 620 to 625cm $\delta^{13}C = -24.3‰$
Algal gyttja.

5390 ± 65
Lu-1660. Tjåutjanjaure 4, 570 to 575cm $\delta^{13}C = -20.2‰$
Algal gyttja.

4500 ± 60
Lu-1661. Tjåutjanjaure 5, 520 to 525cm $\delta^{13}C = -23.8‰$
Algal gyttja.

4010 ± 60
Lu-1662. Tjåutjanjaure 6, 470 to 475cm $\delta^{13}C = -23.1‰$
Algal gyttja.

3300 ± 55
Lu-1663. Tjåutjanjaure 7, 420 to 425cm $\delta^{13}C = -21.9‰$
Algal gyttja.

1550 ± 50
Lu-1664. Tjåutjanjaure 8, 370 to 375cm $\delta^{13}C = -21.3‰$
Loose sediment.

860 ± 50
Lu-1665. Tjåutjanjaure 9, 320 to 325cm $\delta^{13}C = -22.0‰$
Loose surface sediment.

7880 ± 100
Lu-1666. Lake 458:1, 1175 to 1180cm $\delta^{13}C = -24.3‰$
Clayey and sandy fine detritus gyttja. *Comment*: sample undersized; diluted; 73% sample.

5640 ± 65
Lu-1667. Lake 458:2, 1160 to 1165cm $\delta^{13}C = -25.5‰$
Sandy fine detritus gyttja.

2980 ± 55
Lu-1668. Lake 458:3, 1125 to 1130cm $\delta^{13}C = -25.5‰$
Silty fine detritus gyttja.

Olsäng series (II)

Peat from area with beach ridges (Mikaelsson, 1978) at Olsäng, SE Blekinge (56° 12′ N, 15° 59′ E). Coll 1979 by Jan Mikaelsson and C G Holdar; subm by Jan Mikaelsson, Dept Quaternary Geol, Univ Lund. Dated as complement to Olsäng series (R, 1979, v 21, p 386). All samples pretreated with HCl.

Lu-1736. Olsäng 1979:1 **5030 ± 65** $\delta^{13}C = -25.5‰$

Sandy peat.

Lu-1737. Olsäng 1979:2 **160 ± 45** $\delta^{13}C = -24.6‰$

Peat mixed with eolian sand 1m below surface.

Lu-1738. Olsäng 1979:3 **5220 ± 65** $\delta^{13}C = -25.1‰$

Lowest part of brushwood peat underlain by eolian sand 90cm below surface.

Hunneberg series (II)

Sediment from lakes Bergsjön (58° 18′ N, 12° 26′ E), Långvattnet (58° 20′ N, 12° 27′ E), Svartevattnet (58° 18′ N, 12° 29′ E), Kroppsjön (58° 19′ N, 12° 26′ E), Alsjön (58° 18′ N, 12° 30′ E), Ekelunds Gransjö (58° 19′ N, 12° 26′ E), Grinnsjön (58° 18′ N, 12° 27′ E), and Stubbsjön (58° 21′ N, 12° 26′ E) on hill Hunneberg, NW Västergötland. Coll 1977 and subm by G Digerfeldt, Dept Quaternary Geol, Univ Lund. Dating is part of study of Late Weichselian shore-line displacement in area. Isolation of lakes established by diatom analysis. For other dates from area, see Hunneberg series (R, 1977, v 19, p 425-427). Depths refer to sediment surface. All samples pretreated with HCl.

Bergsjön

Lu-1763. Bergsjön, 485 to 490cm **9910 ± 90** $\delta^{13}C = -25.0‰$

Clay gyttja 15 to 20cm above isolation level.

Långvattnet

Lu-1764. Långvattnet, Core I, 275 to 280cm **9740 ± 90** $\delta^{13}C = -24.7‰$

Clay gyttja 20 to 25cm above isolation level.

Lu-1765. Långvattnet, Core II, 280 to 285cm **10,020 ± 95** $\delta^{13}C = -23.2‰$

Clay gyttja just above isolation level.

Svartevattnet

Lu-1766. Svartevattnet, 427 to 432cm **10,730 ± 100** $\delta^{13}C = -20.6‰$

Clay gyttja just above isolation level.

Kroppsjön

Lu-1767. Kroppsjön, 634 to 639cm **11,390 ± 105** $\delta^{13}C = -18.3‰$

Clay gyttja just above isolation level.

Alsjön

Lu-1768. Alsjön, 245 to 250cm **10,790 ± 100** $\delta^{13}C = -20.0‰$

Clay gyttja just above isolation level.

Ekelunds Gransjö

Lu-1769. Ekelunds Gransjö, Core I, 365 to 370cm **10,900 ± 100** $\delta^{13}C = -13.7‰$

Clay gyttja just above isolation level.

Lu-1770. Ekelunds Gransjö, Core II, 610 to 615cm **10,830 ± 100** $\delta^{13}C = -18.1‰$

Clay gyttja just above isolation level.

Grinnsjön

Lu-1771. Grinnsjön, 305 to 310cm **10,040 ± 95** $\delta^{13}C = -18.1‰$

Clay gyttja 10 to 15cm above isolation level.

Stubbsjön

Lu-1772. Stubbsjön, Core I, 592 to 596.5cm **9630 ± 90** $\delta^{13}C = -26.1‰$

Clay gyttja just above isolation level.

Lu-1773. Stubbsjön, Core II, 564 to 567cm **10,290 ± 135** $\delta^{13}C = -23.7‰$

Muddy clay 5 to 10cm above isolation level. *Comment*: sample undersized; diluted; 61% sample.

Billingen series

Sediment from Lake Vallersjön (58° 28′ N, 13° 48′ E) on hill Billingen, E Västergötland. Coll 1977 and subm by G Digerfeldt. Deglaciation of area was studied. Depths refer to sediment surface. For other dates from Billingen, see Bjärsjön series (R, 1980, v 22, p 1047-1048).

Lu-1774. Vallersjön, Core I, 462 to 466cm **9150 ± 90** $\delta^{13}C = -28.8‰$

Clay gyttja. *Comment*: pretreated with HCl.

Lu-1775. Vallersjön, Core II, 448 to 452cm **8450 ± 85** $\delta^{13}C = -29.0‰$

Gyttja. *Comment*: no pretreatment; small sample; burned at $< 650°C$ to avoid pyrolysis of carbonate.

Lu-1706. Rörerum, Balanids, inner fraction **8390 ± 80** $\delta^{13}C = -3.6‰$

Small balanid shells found *in situ* on large boulder at surface of glacio-fluvial deposit at Rörerum, Dalsland (58° 37′ 20″ N, 12° 04′ 40″ E). Coll 1979 and subm by Å Hillefors, Dept Phys Geog, Univ Lund. *Comments*: inner fraction (71% of shells) was used. (ÅH): date younger than expected.

10,420 ± 90

Lu-1707. Rörerum, Balanids, outer fraction *$\delta^{13}C = -2.3‰$*

Outer fraction of shells used for Lu-1706. *Comment*: outer fraction was 21% of sample. Shells contained some silt firmly connected with inner shell surfaces. Silt was slightly calcareous which was probably reason for higher age of outer fraction.

Lummelunda Cave series (II)

Precipitated calcite from Lummelunda Cave, N Gotland (57° 44′ 13″ N, 18° 24′ 45″ E). Coll 1978 and subm by L Engh, Dept Phys Geog, Univ Lund. Dated as part of study of chronology of cave deposits. For other dates from this cave, see R, 1979, v 21, p 392.

3040 ± 55

Lu-1700. Lummelunda Cave, Sample 1:1978 *$\delta^{13}C = -5.0‰$*

Porous calcite precipitated on cave ceiling.

1300 ± 50

Lu-1701. Lummelunda Cave, Sample 2:1978 *$\delta^{13}C = -7.1‰$*

Horizontal travertine layer from Mailbox Hall, overlain by gyttja and fine-grained sediments, and underlain by fine-grained sediments alternating with travertine layers.

3570 ± 55

Lu-1702. Lummelunda Cave, Sample 3:1978 *$\delta^{13}C = -6.9‰$*

Horizontal travertine layer from Mailbox Hall, overlain by 5 other travertine layers alternating with fine-grained sediments.

General Comment: radiocarbon ages for calcite samples are calculated in same way as for organic samples since initial activity at time of precipitation is unknown.

Labyrint Cave series

Travertine from Labyrint Cave on V slope of Mt Miesket, S of Lake Över-Uman in Tärnaby Mt area (66° 04′ 10″ N, 14° 04′ E). Dated as part of same study as Lummelunda Cave series, above. Coll 1977-1978 and subm by L Engh.

18,480 ± 220

Lu-1704. Labyrint Cave, Sample 5:1977 *$\delta^{13}C = +1.2‰$*

Upper part of travertine layer. *Comment*: sample undersized; diluted; 85% sample.

11,810 ± 160

Lu-1705. Labyrint Cave, Sample 6:1977 *$\delta^{13}C = -7.9‰$*

Lower part of travertine layer. *Comment*: sample undersized; diluted; 55% sample.

17,600 ± 160

Lu-1836. Labyrint Cave, Sample A:1978 *$\delta^{13}C = -5.8‰$*

Upper part of travertine layer. *Comment*: (3 1-day counts.)

11,410 ± 105

Lu-1837. Labyrint Cave, Sample B:1978 $\delta^{13}C = -9.0‰$

Lower part of travertine layer.

General Comment: radiocarbon ages are calculated in same way as Lummelunda Cave series, above.

2140 ± 50

Lu-1703. Helgeandsholmen, stalagmite $\delta^{13}C = -2.0‰$

Lowest 3 to 5mm of stalagmite precipitated on wooden plank at bottom of sewer canal (Flemmings kanal) built ca AD 1650 on Helgeandsholmen, Central Stockholm (59° 25′ N, 18° 00′ E). Coll 1978 by L E Åström; subm by L Engh. *Comment*: according to measurements by Stuiver (1978, p 271), a sample from AD 1650 will give a radiocarbon age of between 225 and 255 yr BP. Calculation based on 240 yr gives, as a result, that 2140 BP corresponds to an initial activity at time of precipitation of ca 79% modern (modern activity = 95% of NBS oxalic acid standard activity in 1950).

Kärkevagge series

Grass and moss turf from solifluction lobe at Kärkevagge (ca 68° 23′ N, 18° 21′ E), N Sweden. Coll 1978 by J Åkerman; subm by A Rapp and J Åkerman, Dept Phys Geog, Univ Lund.

760 ± 50

Lu-1719. Kärkevagge, Sample I $\delta^{13}C = -24.4‰$

Grass and moss turf, 1m below lobe surface.

830 ± 50

Lu-1720. Kärkevagge, Sample II $\delta^{13}C = -23.4‰$

Grass and moss turf, 1m below lobe surface.

790 ± 50

Lu-1721. Kärkevagge, Sample III $\delta^{13}C = -22.9‰$

Moss turf, 0.5m below lobe surface.

B. Norway

Holmfjeldvand series

Sediment from Lake Holmfjeldvand, Varanger Peninsula, N Norway (70° 13′ 45″ N, 30° 18′ E). Dated as complement to Varanger Peninsula series (R, 1974, v 16, p 317-318; 1978, v 20, p 422-423). Coll 1976 and subm by B Malmström and O Palmér, Dept Phys Geog, Univ Lund. No pretreatment; small samples; burned at < 650°C to avoid carbonate pyrolysis and graphite oxidation. Depths are below sediment surface.

10,240 ± 95

Lu-1727. Holmfjeldvand IVa, 295 to 300cm $\delta^{13}C = -19.9‰$

Muddy clay.

8120 ± 80

Lu-1728. Holmfjeldvand IVa, 236 to 241cm $\delta^{13}C = -23.8‰$

Clayey gyttja.

C. Spitsbergen

7540 ± 80

Lu-1722. Kapp Linné $\delta^{13}C = -20.1‰$

Grass and moss turf, 40cm below surface of small palsa at Kapp Linné, Spitsbergen (78° 03′ N, 14° 35′ E). Coll 1972 by J Åkerman; subm by A Rapp and J Åkerman. Pretreated with HCl. Burned at $<$ 650°C to avoid graphite oxidation.

D. Iceland

6870 ± 95

Lu-1735. Nykurtjörn $\delta^{13}C = -17.9‰$

Silty fine detritus gyttja from 388 to 393cm below sediment surface in Nykurtjörn, Í Fjördum, Central N Iceland (66° 10′ 41″ N, 18° 05′ 53″ W). Alt ca 140m. Coll 1978 by M Hallsdóttir and H Nordahl; subm by H Nordahl, Dept Quaternary Geol, Univ Lund. Pretreated with HCl. Sample undersized; diluted; 64% sample.

E. Greenland

North Greenland Series I

Bivalve shells from emerged marine sediments coll by S Funder and C Hjort during Greenland Geol Survey (GGU) N Greenland Expedition of 1979; subm by C Hjort, Dept Quaternary Geol, Univ Lund. Samples are related to study of glacial history of northeasternmost part of Greenland (Funder and Hjort, 1980). Other samples in series dated in Denmark (Tauber, ms) and UK (AERE Harwell, ms).

39,300 +2600 −2000

Lu-1785. Constable Bugt $\delta^{13}C = +1.2‰$

Shells and fragments *(Hiatella arctica)* (Sample GGU 223222) from stony silt bed under- and overlain by till, alt 8m, at Constable Bugt, Johs V Jensen Land (ca 83° 36′ N, 32° 00′ W). *Comment*: outer 46% removed by acid leaching. (3 1-day counts.)

35,400 +1650 −1350

Lu-1786. Herlufsholm strand $\delta^{13}C = +0.9‰$

Shell fragments *(Hiatella arctica)* (GGU 223261) from silt surface, alt 75m, at Herlufsholm strand, Peary Land (ca 82° 41′ N, 22° 50′ W). *Comment*: outer 25% removed by acid leaching. (3 1-day counts.)

38,400 +2250 −1750

Lu-1787. Krogerup Bugt $\delta^{13}C = +0.5‰$

Shells and fragments *(Astarte borealis* and *Mya truncata)* (GGU 223263) from bedded sand containing stones, alt 48 to 58m, at Krogerup

Bugt, Peary Land (ca 82° 34′ N, 20° 27′ W). *Comment*: outer 48% removed by acid leaching.

33,700 + 1200 − 1050

Lu-1788. Kap Köbenhavn $\delta^{13}C = -0.4‰$

Shell fragments *(Hiatella arctica* and *Mya truncata)* (GGU 223267) from till bed (Funder and Hjort, 1980, Fig 2, Unit 12) on top of interglacial sequence at Kap Köbenhavn, Peary Land (ca 82° 25′ N, 20° 57′ W). *Comment*: outer 10% removed by acid leaching. Innermost 47% lost during processing.

General Comment: corrections for deviations from $\delta^{13}C = -25‰$ PDB are applied also for shell samples. No corrections are made for apparent age of shells of living marine mollusks. Apparent age of recent shells from East Greenland is reported by Hjort (1973) but value given there may now need some revision because of better knowledge of ^{14}C activity during last centuries (Stuiver, 1978, p 271; Olsson, 1980).

S Hochstetter Forland series

Sediment from lakes at Peters Bugt (75° 19′ N, 20° 03′ W) and 3km W of Ailsa hill (75° 19′ N, 19° 40′ W), S Hochstetter Forland, NE Greenland. Coll by Swedish-Danish Expedition of 1976; subm by S Björck and T Persson, Dept Quaternary Geol, Univ Lund. Bio- and chronostratigraphy described by Björck and Persson (ms). Depths given are below sediment surface. No pretreatment; all samples undersized; diluted. Amount of CO_2 from sample is given in *Comment* below as "% sample". Burned at < 650°C to avoid carbonate pyrolysis.

Peters Bugt Sø

Alt ca 16m; size 700×300m.

7440 ± 95

Lu-1741. Peters Bugt Sø, 118 to 123cm $\delta^{13}C = -24.1‰$

Clay gyttja. Level corresponds to lower part of *Salix herbacea – S arctica – Cassiope – Dryas – Betula nana* + exotic pollen local pollen assemblage zone (p.a.z.) (P2). *Comment*: 71% sample.

5140 ± 130

Lu-1742. Peters Bugt Sø, 95 to 100cm $\delta^{13}C = -21.6‰$

Clay gyttja with moss remains. Level corresponds to boundary between Zone P2 and *Salix herbacea – Dryas* local p.a.z. (P3). *Comment*: 35% sample.

4530 ± 130

Lu-1743. Peters Bugt Sø, 70 to 75cm $\delta^{13}C = -22.6‰$

Clay gyttja. Level corresponds to uppermost part of Zone P3. *Comment*: 31% sample.

3670 ± 150

Lu-1744. Peters Bugt Sø, 45 to 50cm $\delta^{13}C = -22.4‰$

Clay gyttja with moss remains. Level corresponds to lower part of upper half of *Salix herbacea — Vaccinium — Cassiope — Oxyria* — Caryophyllaceae local p.a.z. (P4). *Comment*: 19% sample. (3 1-day counts.)

2390 ± 120

Lu-1745. Peters Bugt Sø, 20 to 25cm $\delta^{13}C = -23.5‰$

Clay gyttja with moss remains. Level corresponds to lower part of *Salix herbacea — S arctica* — Cyperaceae — Gramineae local p.a.z. (P5). *Comment*: 20% sample. (3 1-day counts.)

Ailsa Sø

Estimated alt between 75 and 100m; size 800×500m.

11,540 ± 135

Lu-1746. Ailsa Sø, 58.5 to 63.5cm $\delta^{13}C = -23.2‰$

Clay with lamina of clay gyttja and moss remains. Level corresponds to lower part of Gramineae — *Saxifraga* — Caryophyllaceae local p.a.z. (A1a). *Comment*: 73% sample.

9330 ± 145

Lu-1747. Ailsa Sø, 46 to 48cm $\delta^{13}C = -25.0‰$

Clay gyttja with thin clay lamina. Level corresponds to upper part of Ailsa Sø Barren Interzone. *Comment*: 50% sample.

9540 ± 115

Lu-1748. Ailsa Sø, 31 to 37cm $\delta^{13}C = -24.2‰$

Muddy clay. Level corresponds to boundary between Gramineae — Caryophyllaceae — *Saxifraga* — Polypodiaceae local p.a.z. (A1b) and *Salix herbacea — S arctica — Cassiope* local p.a.z. (A2a). *Comment*: 71% sample.

6120 ± 90

Lu-1749. Ailsa Sø, 9 to 15cm $\delta^{13}C = -28.1‰$

Muddy clay and clay gyttja with moss remains. Level corresponds to lower half of *Salix herbacea — S arctia — Cassiope — Dryas — Betula nana* local p.a.z. (A2b). *Comment*: 65% sample.

F. Poland

Woryty series

Wood and peat from cores in ancient lake, now overgrown with *Carex*-fen, at Woryty near Gietrzwałd, Olsztyn Lakeland, NE Poland (53° 45′ N, 20° 10′ E). Coll 1979 by G Digerfeldt and M Ralska-Jasiewiczowa; subm by M Ralska-Jasiewiczowa, Inst Botany, Polish Acad Sci, Kraków. Lu-1789 received mild pretreatment with NaOH and HCl; all other samples only pretreated with HCl.

10,850 ± 100

Lu-1789. Woryty 80s/IV +80s/IX $\delta^{13}C = -27.0‰$

Wood from 9.77 to 9.82m in Core IV and wood and peat from 9.825 to 9.86m in Core IX. Both sub-samples are from same stratigraphic position in bottom part of peat layer underlain by sand with gravel and overlain by gyttja.

11,290 ± 105

Lu-1790. Woryty 80s/IV +80s/VII $\delta^{13}C = -28.5‰$

Swamp peat from upper part of same peat layer as Lu-1789; from 9.71 to 9.76m in Core IV and from 9.6 to 9.85m in Core VII.

10,770 ± 100

Lu-1791. Woryty 80s/VI +80s/VIII $\delta^{13}C = -25.2‰$

Small pieces of wood from gyttja with high iron sulphide content ca 10 to 15cm above transition peat/gyttja. Sub-samples are from 9.62 to 9.68m in Core VI and from 9.6 to 9.65m in Core VIII.

11,020 ± 110

Lu-1792. Woryty 80s/IX, Sample 1 $\delta^{13}C = -27.3‰$

Small pieces of wood from transition peat/gyttja in four different cores and peat from same transition at 9.64 to 9.67m in Core IX.

10,900 ± 120

Lu-1793. Woryty 80s/IX, Sample 2 $\delta^{13}C = -26.5‰$

Peat and few small wood fragments from 9.94 to 10m in Core IX. Sample is from peat layer not found in other cores and separated from peat/gyttja transition dated as Lu-1792 by another gyttja layer with iron sulphide at 9.86 to 9.94m. *Comment*: sample undersized; diluted; 76% sample.

G. Switzerland

13,000 ± 120

Lu-1723. Veyrier $\delta^{13}C = -26.3‰$

Wood from landslide material below Salève Mt near Veyrier, Geneva Basin (46° 09′ N, 6° 12′ E). Coll 1979 and subm by C Reynaud, Inst Geol, Geneva. Landslide material underlain by lacustrine deposits rich in pollen. Assoc with mammoth bone and reindeer antler artifacts, indicating Magdalenian culture.

6650 ± 65

Lu-1761. Lully $\delta^{13}C = -25.0‰$

Wood from old fluvial meander at Lully, Geneva Basin (ca 46° 10′ N, 6° 04′ E). Coll 1979 by G F Amberger, Geol Survey, Canton Geneva; subm by G F Amberger and C Reynaud. *Comment*: mild pretreatment with NaOH and HCl. A second preparation including complete removal of lignin fraction was dated at 6590 ± 90 in agreement with 1st result.

H. Mexico

Lagunillas San Pedro series

Sediment from Lagunillas San Pedro, S of Tepic, Prov Nayarit, NW Mexico (21° 10′ N, 104° 40′ W). Coll 1979 and subm by R B Brown and V Markgraf, Dept Geosci, Univ Arizona, Tucson. Pretreated with HCl. Burned at $< 650°C$ to avoid oxidation of graphite.

360 ± 50
Lu-1729. San Pedro, 101 to 102cm $\delta^{13}C = -18.3‰$

Brown silt. *Comment*: sample undersized; diluted; 84% sample.

720 ± 50
Lu-1730. San Pedro, 150 to 151cm $\delta^{13}C = -17.9‰$

Brown silt.

1820 ± 60
Lu-1731. San Pedro, 250 to 251cm $\delta^{13}C = -18.4‰$

Dark brown sandy clay. *Comment*: sample undersized; diluted; 68% sample.

San Nicolas de Parangeo series

Soil samples from San Nicolas de Parangeo, Valle de Santiago, Guanajuato, NW Mexico (ca 21° N, 101° 15′ W). Coll Aug 1978 by R B Brown; subm by R B Brown and V Markgraf. No pretreatment because of low organic carbon content. Burned at < 650°C to avoid pyrolysis of carbonate and oxidation of graphite.

310 ± 75
Lu-1733. San Nicolas, Samples 25A-467 $\delta^{13}C = -26.2‰$

Lake bottom soil from 467 to 469cm. *Comment*: sample undersized; diluted; 43% sample.

3360 ± 175
Lu-1733C. San Nicolas (25A-467), carbonate $\delta^{13}C = +3.5‰$

Carbonate fraction extracted from ash residue of Sample Lu-1733 after burning. *Comment*: undersized; diluted; 28% sample. (1 1-day count.)

2700 ± 80
Lu-1734. San Nicolas, Sample 25B-489 $\delta^{13}C = -16.5‰$

Soil from 489 to 491cm. *Comment*: undersized; diluted; 50% sample.

4360 ± 150
Lu-1734C. San Nicolas (25B-489), carbonate $\delta^{13}C = +3.8‰$

Carbonate fraction extracted from ash residue of Sample Lu-1734 after burning. *Comment*: undersized; diluted; 25% sample.

II. PLANT ECOLOGY SAMPLES

For some samples, results are given as difference, Δ, from our radiocarbon standard (95% activity of NBS oxalic acid standard, age corrected to 1950):

$$\Delta = \delta^{14}C - (2\,\delta^{13}C + 50)\left(1 + \frac{\delta^{14}C}{1000}\right)$$

where $\delta^{14}C$ is observed deviation from radiocarbon standard in per mil and $\delta^{13}C$ deviation from PDB standard in per mil.

Stordalenmyren series

Peat and wood from peat bog Stordalenmyren, 1.5km NNW of Stordalen RR Sta, N Sweden (68° 22′ N, 19° 03′ E). Coll Aug 1979 and subm by N Malmer, Dept Plant Ecology, Univ Lund. Depths given refer to bog surface.

50 ± 45
Lu-1816. Stordalenmyren I, 38 to 43cm **$\Delta = -5.8 \pm 5.5‰$**
$\delta^{13}C = -25.8‰$

Slightly humified *Sphagnum* peat from 38 to 43cm, Profile I, without admixture of mineral soil and underlain by peat with such admixture. *Comment*: normal pretreatment with HCl and NaOH.

170 ± 45
Lu-1817. Stordalenmyren I, 43 to 45cm **$\Delta = -21.3 \pm 5.4‰$**
$\delta^{13}C = -26.6‰$

Slightly humified *Sphagnum* peat from 43 to 45cm, Profile I, with admixture of mineral soil, underlain by slightly humified *Sphagnum balticum* peat. *Comment*: mild pretreatment with HCl and NaOH.

$\Delta = +31.0 \pm 8.1‰$
Lu-1818. Stordalenmyren II, wood *$\delta^{13}C = -28.3‰$*

Wood (*Betula nana,* id by N Malmer) in horizontal position, depth 20cm, Profile II, ca 300m W of Profile I, in slightly humified peat with *Sphagnum* and *Dicranum elongatum*. *Comment*: no pretreatment; small sample; diluted; 50% sample. Δ value corresponds approx to increase in activity of annual plants grown in summer of 1956.

900 ± 50
Lu-1820. Stordalenmyren II, 50 to 54cm *$\delta^{13}C = -24.8‰$*

Slightly humified *Sphagnum* peat with some *Carex* remains, from 50 to 54cm, Profile II, directly above perma-frost. *Comment*: normal pretreatment with HCl and NaOH.

Getamossen, Roshult series

Peat and other plant remains from peat bog Getamossen, 1km SSW of Roshult, Breared parish, Halland (56° 41′ N, 13° 13′ E). Coll Oct 1979 and subm by N Malmer. Geology, botany, and hydrology of bog described by Olausson (1957). Depths refer to bog surface. Lu-1821 received mild pretreatment with NaOH and HCl. Two other samples were too small to allow pretreatment.

800 ± 50
Lu-1821. Getamossen VI, Roshult, 60 to 62cm *$\delta^{13}C = -25.6‰$*

Moderately humified *Sphagnum* peat from 60 to 62cm, Profile VI.

70 ± 45
Lu-1822. Getamossen VI, Roshult, 37cm **$\Delta = -8.9 \pm 5.5‰$**
$\delta^{13}C = -24.5‰$

Basal sheaths of *Eriophorum vaginatum,* depth 37cm in slightly humified *Sphagnum* peat, Profile VI.

540 ± 55

Lu-1823. Getamossen VII, Roshult, 58cm $\delta^{13}C = -22.1‰$

Basal sheaths of *Eriophorum vaginatum*, depth 58cm in slightly humified *Sphagnum* peat, Profile VII. *Comment*: sample undersized; diluted; 78% sample.

Δ = +70.3 ± 7.1‰

Lu-1824. Åkhultmyren $\delta^{13}C = -23.4‰$

Basal sheaths of *Eriophorum vaginatum*, depth 40 to 44cm in *Sphagnum* peat, Profile IX from bog Åkhultmyren, 0.9km NNE of Åkhult village, Moheda parish, Småland (57° 06′ N, 14° 33′ E). Coll Oct 1979 and subm by N Malmer. *Comment*: no pretreatment; small sample; diluted; 65% sample. Δ value corresponds approx to increase in activity of annual plants grown in spring of 1957.

III. ARCHAEOLOGIC SAMPLES

A. Sweden

Hötofta series

Charcoal from Iron age settlement area at Hötofta 2[1], S Åkarp parish, SW Scania (55° 30′ N, 13° 05′ E). Coll 1977-1978 by A Nilsson; subm by B Stjernquist, Hist Mus, Univ Lund. Dated as complement to earlier study by submitter (Stjernquist, 1969). Pretreated with HCl and NaOH.

990 ± 50

Lu-1687. Hötofta 2[1], Sample 1 $\delta^{13}C = -24.2‰$

Charcoal from cultural layer. Assoc with potsherds.

1030 ± 50

Lu-1688. Hötofta 2[1], Sample 2 $\delta^{13}C = -24.0‰$

Charcoal from oven in remnants of pit-house. Assoc with potsherds.

1180 ± 50

Lu-1689. Hötofta 2[1], Sample 3 $\delta^{13}C = -24.7‰$

Charcoal from hearth at base of remnants of Pit-house 1:1977.

1200 ± 50

Lu-1690. Hötofta 2[1], Sample 4 $\delta^{13}C = -24.8‰$

Charcoal from Hearth A assoc with remnants of Pit-house 3:1977.

1100 ± 50

Lu-1691. Hötofta 2[1], Sample 5 $\delta^{13}C = -24.0‰$

Charcoal from clay layer in burned house. Position 36-37.

General Comment (BS): dates of importance for settlement chronology in area.

4920 ± 60

Lu-1828. Näbbe mosse $\delta^{13}C = -20.8‰$

Collagen from fragmentary human ulna and humerus (No. LUHM 28787) from Näbbe mosse, Ö Wemmerlöv parish, Scania (55° 36′ N, 14° 36′ E). Coll 1948 and subm by B Stjernquist. Assoc with upper part of human skull and 2 worked implements of red deer bone. Site and finds described by Stjernquist, Nilsson, and Nybelin (1953). *Comment*: organic carbon content: 6.8%. Date somewhat later than expected. In same areas several artifacts from early Neolithic period were found.

Ingelstorp series

Charcoal from Early Iron age grave field at Ingelstorp, Scania. Coll 1975-1977 and subm by M Strömberg, Hist Mus, Univ Lund. Preliminary report pub by submitter (Strömberg, 1977). For other dates from Ingelstorp, see R, 1976, v 18, p 314; 1977, v 19, p 435-436; 1978, v 20, p 430-432; 1980, v 22, p 1061. Lu-1710 received mild pretreatment with NaOH and HCl; all other samples were too small to allow pretreatment.

1890 ± 55

Lu-1709. Ingelstorp 31:6, Sample 7:78-79 $\delta^{13}C = -24.2‰$

Charcoal from fire pit, Grave 23, Field 1, Ingelstorp 31:6 (55° 25′ N, 14° 03′ E). Assoc with burned bones and potsherds. *Comment*: sample undersized; diluted; 91% sample.

1770 ± 65

Lu-1711. Ingelstorp 31:6, Sample 9:78-79 $\delta^{13}C = -24.5‰$

Charcoal from fire pit, Grave 24, Field 1. Assoc with pottery and burned bones. *Comment*: sample undersized; diluted; 60% sample.

2770 ± 55

Lu-1708. Ingelstorp 32, Sample 6:78-79 $\delta^{13}C = -23.8‰$

Charcoal from fire pit, Grave 44, Field 4, Ingelstorp 32 (55° 25′ N, 14° 04′ E). Assoc with burned bones and potsherds. *Comment*: sample undersized; diluted; 91% sample.

2560 ± 55

Lu-1710. Ingelstorp 32, Sample 8:78-79 $\delta^{13}C = -23.9‰$

Charcoal from fire pit, Grave 30, Field 4. Assoc with burned bones.

2710 ± 85

Lu-1713. Ingelstorp 32, Sample 11:78-79 $\delta^{13}C = -24.6‰$

Charcoal from fire pit, Grave 55, Field 4. Assoc with 2 flint objects and burned bones of human male and dog. *Comment*: sample undersized; diluted; 46% sample.

2150 ± 50

Lu-1714. Valleberga 194:1, Sample 12:78-79 $\delta^{13}C = -22.7‰$

Charcoal from hearth in House 1:1979 in settlement area at Valleberga 194:1, Scania (55° 24′ N, 14° 05′ E). Property designation is 4:2A on older map. Coll 1979 and subm by M Strömberg. Assoc with pottery, spindle whorls, and iron objects indicating Late Iron age. Mild pretreatment with NaOH and HCl.

2290 ± 55

Lu-1715. Ageröds mosse, human skull $\delta^{13}C = -19.1‰$

Collagen from human skull found by peat-cutting at raised bog Ageröds mosse, Munkarp parish, Scania (ca 55° 56.5′ N, 13° 25′ E). Coll

1918; subm by L Larsson, Hist Mus, Univ Lund. Collagen extracted as described previously (R, 1976, v 18, p 290), including NaOH treatment. Organic carbon content: 4.2%.

Ängdala series (II)

Charcoal from Neolithic flint mines in Senonian chalk at Ängdala, S Sallerup parish, Scania (55° 35′ 20″ N, 13° 07′ 20″ E). Coll 1979 by U Säfvestad; subm by B Salomonsson, Malmö Mus. Dated as complement to Ängdala series (R, 1980, v 22, p 1058).

4970 ± 65

Lu-1779. Ängdala 1979, Structures 15 and 23 $\delta^{13}C = -23.3‰$

Charcoal from flint mines. *Comment*: pretreated with HCl.

4940 ± 110

Lu-1780. Ängdala 1979, Structure 21 $\delta^{13}C = -24.6‰$

Charcoal from test trench. *Comment*: pretreated with HCl and NaOH. Sample undersized; diluted; 42% sample.

Yngsjö Series I

Charcoal samples from coastal settlement area at Yngsjö 1:167, Åhus parish, Scania (55° 54′ 44″ N, 14° 16′ 29″ E). Alt 3.4 to 3.8m. Coll 1979 and subm by J Callmer, Hist Mus, Univ Lund.

2500 ± 55

Lu-1803. Yngsjö 1:167, Sample 1:79 $\delta^{13}C = -26.1‰$

Charcoal from hearth (120-134) below thin cultural layer containing mixed material from Middle Neolithic, Late Neolithic, and 8th century AD. *Comment*: pretreated with NaOH and HCl.

2670 ± 55

Lu-1804. Yngsjö 1:167, Sample 2:79 $\delta^{13}C = -23.6‰$

Charcoal from hearth (124/125-140) in about same stratigraphic position as Lu-1803, below thin cultural layer. *Comment*: pretreated with NaOH and HCl.

1690 ± 55

Lu-1805. Yngsjö 1:167, Sample 3:79 $\delta^{13}C = -24.8‰$

Charcoal from Structure 3, Surface 2 (141-160). Assoc with debris from glass workshop indicating Late Iron age. *Comment*: pretreated with NaOH and HCl. Sample undersized; diluted; 87% sample.

1600 ± 85

Lu-1806. Yngsjö 1:167, Sample 4:79 $\delta^{13}C = -23.7‰$

Charcoal from Structure 5 (140-175). Assoc with debris from glass workshop. *Comment*: no pretreatment; undersized; diluted; 42% sample. Burned at $< 650°C$ to avoid pyrolysis of carbonate.

2420 ± 65

Lu-1807. Yngsjö 1:167, Sample 5:79 $\delta^{13}C = -26.2‰$

Charcoal from hearth (140-200) in about same stratigraphic position as Lu-1803 and Lu-1804, below thin cultural layer. *Comment*: no pretreatment; undersized; diluted; 52% sample. Burned at < 650°C to avoid pyrolysis of carbonate.

B. Ireland

Carrowmore Series I

Charcoal, soot, peat, wood, and mollusk shells from Megalithic cemetery (54° 15′ N, 8° 32′ W) and settlement remains at the Carrowmore area, Co Sligo, Ireland. Coll 1977-80 and subm by G Burenhult, Hist Mus, Univ Lund and Inst Archaeol, Univ Stockholm. Results of 3 excavation seasons reported by submitter (Burenhult, 1980).

5240 ± 80

Lu-1441. Carrowmore, Grave 7 $\delta^{13}C = -26.2‰$

Charcoal from intact basal layer in central chamber, Grave 7 (Burenhult, 1980, p 19-32). Coll Aug 1977. *Comment*: mild pretreatment with NaOH and HCl.

600 ± 45

Lu-1442. Carrowmore, Test-hole 88 $\delta^{13}C = +1.3‰$

Two upper shells of *Ostrea edulis* from bottom of Test-hole 88 assoc with Grave 7. *Comment*: correction for deviation from $\delta^{13}C$ = –25‰ PDB is applied also for this sample. No correction is made for apparent age of living marine mollusks.

2480 ± 55

Lu-1584. Carrowmore, Grave 26, Sample A $\delta^{13}C = -24.8‰$

Charcoal from bottom of ritual Pit 3, Grave 26 (Burenhult, 1980, fig 9, p 41; fig 10, p 42). *Comment*: pretreated with HCl and NaOH.

2490 ± 55

Lu-1585. Carrowmore, Grave 26, Sample B $\delta^{13}C = -26.3‰$

Charcoal from ritual Pit 5, Grave 26 (Burenhult, 1980, fig 10, p 42; fig 13, p 46). *Comment*: pretreated with HCl and NaOH.

2440 ± 55

Lu-1586. Carrowmore, Grave 26, Sample C $\delta^{13}C = -26.2‰$

Charcoal from bottom of inner part of ritual Pit 5, under ditch, Grave 26 (Burenhult, 1980, fig 10, p 42; fig 13, p 46). *Comment*: pretreated with HCl and NaOH.

2480 ± 55

Lu-1624. Carrowmore, Grave 26, Sample 2:A $\delta^{13}C = -24.6‰$

Charcoal from bottom of ditch, Grave 26 (Burenhult, 1980, fig 10, p 42; fig 15, p 49). *Comment*: mild pretreatment with NaOH and HCl.

2540 ± 60

Lu-1625. Carrowmore, Grave 26, Sample 3 $\delta^{13}C = -25.4‰$

Charcoal from stone-packing at entrance of Grave 26 (Burenhult, 1980, fig 10, p 42). *Comment*: mild pretreatment with NaOH and HCl. Sample undersized; diluted; 87% sample.

2510 ± 55

Lu-1626. Carrowmore, Grave 26, Sample 1:A² $\delta^{13}C = -23.0‰$

Charcoal from burned post, ritual Pit 2, Grave 26 (Burenhult, 1980, fig 10, p 42; fig 12, p 45). *Comment*: pretreated with HCl and NaOH.

2630 ± 55

Lu-1627. Carrowmore, Grave 26, Sample 1:B $\delta^{13}C = -23.6‰$

Charcoal from ritual Pit 1, Post-hole 2, Grave 26 (Burenhult, 1980, fig 10, p 42; fig 12, p 45). *Comment*: mild pretreatment with NaOH and HCl.

1860 ± 110

Lu-1628. Carrowmore, Grave 26, Sample 5 $\delta^{13}C = -23.8‰$

Charcoal from Pit 4, Grave 26. *Comment*: no pretreatment; small sample; diluted; 30% sample.

1730 ± 70

Lu-1630. Carrowmore, Grave 27, Sample A-78 $\delta^{13}C = -23.8‰$

Charcoal from intrusion in chamber, Grave 27 (Burenhult, 1980, fig 23, p 62) *Comment*: no pretreatment; small sample; diluted; 55% sample.

2260 ± 80

Lu-1631. Carrowmore, Grave 27, Sample B-78 $\delta^{13}C = -24.8‰$

Charcoal from intrusion in chamber, Grave 27 (Burenhult, 1980, fig 20, p 60). *Comment*: no pretreatment; small sample; diluted; 49% sample.

5040 ± 60

Lu-1698. Carrowmore, Grave 27, Sample 4-79 $\delta^{13}C = -22.9‰$

Charcoal from inner stone-packing, Grave 27 (Burenhult, 1980, fig 20, p 60). *Comment*: pretreated with HCl and NaOH.

4320 ± 75

Lu-1750. Carrowmore, Grave 4, Sample 2 $\delta^{13}C = -24.3‰$

Charcoal from inner stone-packing, Grave 4. *Comment*: no pretreatment; small sample; diluted; 50% sample. (3 1-day counts.)

1520 ± 50

Lu-1752. Carrowmore, Structure 2, Sample L $\delta^{13}C = -23.8‰$

Charcoal from lower layer, Structure 2, phosphate Test 36a, Carrowmore (Burenhult, 1980, p 105). *Comment*: mild pretreatment with NaOH and HCl.

1830 ± 50

Lu-1699. Grange West, Settlement 2, Sample B $\delta^{13}C = -24.1‰$

Charcoal from Settlement 2 (Burenhult, 1980, p 100), phosphate Test 21, Grange West (54° 15′ N, 8° 35′ W). *Comment*: no pretreatment; small sample.

1160 ± 50

Lu-1753. Grange West, Settlement 1, Sample A $\delta^{13}C = -24.5‰$

Charcoal from Settlement 1 (Burenhult, 1980, p 100), phosphate Test 24. *Comment*: mild pretreatment with HCl and NaOH.

Lu-1754. Grange West, Settlement 1, Sample A1 **1010 ± 50**
$\delta^{13}C = -24.4‰$

Charcoal from Settlement 1, phosphate Test 23. *Comment*: small sample; diluted; 88% sample. No pretreatment.

1990 ± 50
Lu-1755. Grange West, Settlement 3, Sample C $\delta^{13}C = -23.7‰$

Charcoal from Settlement 3, phosphate Test 3B. *Comment*: no pretreatment; small sample.

1260 ± 50
Lu-1756. Grange West, Settlement 8, Sample D $\delta^{13}C = -24.1‰$

Charcoal from Settlement 8, phosphate Test 16. *Comment*: pretreated with HCl and NaOH.

Lu-1757. Grange West, Settlement 11, Sample E **1310 ± 50**
$\delta^{13}C = -24.5‰$

Charcoal from Settlement 11, phosphate Test 11B. *Comment*: mild pretreatment with HCl and NaOH.

1230 ± 50
Lu-1758. Grange West, Settlement 6, Sample G $\delta^{13}C = -24.4‰$

Charcoal from Settlement 6, phosphate Test 3. *Comment*: mild pretreatment with HCl and NaOH.

Lu-1759. Culleenamore, Settlement 15, Sample H **3780 ± 60**
$\delta^{13}C = -24.8‰$

Charcoal from lower layer of kitchen midden, Settlement 15, Culleenamore (Burenhult, 1980, p 91). *Comment*: pretreated with HCl and NaOH.

5000 ± 65
Lu-1808. Carrowmore, Grave 27, Sample 1-79 $\delta^{13}C = -23.7‰$

Charcoal from inner stone-packing, Grave 27 (Burenhult, 1980, fig 20, p 60; p 67). *Comment*: mild pretreatment with NaOH and HCl.

4940 ± 85
Lu-1810. Carrowmore, Grave 27, Sample 3-79 $\delta^{13}C = -23.4‰$

Charcoal from inner stone-packing, Grave 27. *Comment*: no pretreatment; small sample; diluted; 48% sample. (3 1-day counts.)

1690 ± 55
Lu-1811. Carrowmore, Grave 4, Sample 1 $\delta^{13}C = -24.7‰$

Burned animal bones from central chamber, Grave 4 (Burenhult, 1980, fig 27, p 80). *Comment*: no pretreatment.

9440 ± 100
Lu-1809. Luffertan, Field IX $\delta^{13}C = -22.2‰$

Charcoal from Luffertan (54° 15′ N, 8° 32′ W), Field IX, phosphate Test 97 (Burenhult, 1980, p 102; map 17, p 105). *Comment*: no pretreatment: small sample; diluted; 86% sample.

Lu-1838. Grange West 1980, Settlement 2 **1320 ± 70** $\delta^{13}C = -26.5‰$

Charcoal from under original stone-packing, Settlement 2, phosphate Test 5. *Comment*: mild pretreatment with NaOH and HCl. Small sample; diluted; 56% sample.

Lu-1839. Knocknarea 1980, Hut Site 2 **2770 ± 55** $\delta^{13}C = -28.0‰$

Highly humified peat with soot and small charcoal fragments from hearth at Knocknarea (54° 15′ N, 8° 35′ W), Hut Site 2, Test 1. *Comment*: pretreated with HCl.

Lu-1840. Carrowmore, Grave 4, Sample 4-79 **5750 ± 85** $\delta^{13}C = -30.2‰$

Sooty mineral soil from basal layer, central chamber, Grave 4, x −1.25; y ±0.00. *Comment*: pretreated with HCl and NaOH. Sample undersized; diulted; 71% sample.

Lu-1841. Cloverhill Lough 1980, Sample 5 **1120 ± 50** $\delta^{13}C = -26.2‰$

Small wood pieces from floor of crannog, Layer VIIIA, phosphate Test 26, Cloverhill Lough (54° 15′ N, 8° 32′ W). *Comment*: no pretreatment; small sample.

General Comment: eight samples, too small to allow pretreatment, were burned at < 650°C in order to avoid pyrolysis of carbonates (Lu-1628, -1630, -1631, -1699, -1754, -1809 to -1811).

C. Cyprus

Ambelikou series

Charcoal from Ambelikou, Aletri, Cyprus (35° 12′ N, 32° 45′ E). Coll 1942 by P Dikaios; subm by E Gjerstad, Dept of Classical Studies, Univ Lund. Pretreated with HCl and NaOH.

Lu-1694. Ambelikou, Sample 1 **3660 ± 55** $\delta^{13}C = -24.4‰$

Charcoal from Area 2. Assoc with pottery from Early Cypriote III of Bronze age and copper slag.

Lu-1726. Ambelikou, Sample 2 **3630 ± 55** $\delta^{13}C = -22.9‰$

Charcoal from mine gallery.

Lu-1695. Kythrea, Cyprus **4410 ± 60** $\delta^{13}C = -22.4‰$

Charcoal from Level IV, Δ 12, Kythrea, Cyprus (ca 35° 20′ N, 33° 30′ E). Coll 1930 by A Westholm; subm by E Gjerstad. Assoc with pottery, flint tools, stone axes, mortars, and grinding stones, and deer horn fragments, indicating Late Stone age. *Comment*: pretreated with HCl.

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[RADIOCARBON, VOL. 23, No. 3, 1981, P 404-409]

UNIVERSITY OF MIAMI RADIOCARBON DATES XXI

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The following radiocarbon dates are a partial list of samples measured for a variety of projects and materials since August 1980. Chemical and counting procedures remain the same as indicated in R, v 20, p 274-282.

Calculations are based on the 5568-year Libby ^{14}C half-life. Precision is reported as one-standard deviation based only on statistical counting uncertainties in the measurement of the background, NBS modern standard and sample activities. ^{13}C values are measured relative to PDB and reported ages are corrected for isotopic fractionation by normalizing to −25‰.

SAMPLE DESCRIPTIONS

I. GEOLOGIC SAMPLES

United States

Florida

Ten Thousand Islands series

Marine shells coll from flood delta of Ten Thousand Islands Bay (22° 55′ N, 81° 40′ W). These samples are second set coll from site and agree stratigraphically with first sample-set dated. Coll and subm 1980 by M Perlmutter, Rosenstiel School Marine and Atmos Sci, Univ Miami, Virginia Key, Florida.

UM-2223. 3-19-2, 50-53cm **990 ± 80**

Sample from shelly and sandy coarse layer, 50cm deep in flood delta.

UM-2224. 3-19-4, 12-24cm **920 ± 110**

Sample taken from coarse layer, 12 to 24cm deep in flood delta.

UM-2278. 11-17-8, 0-4cm **490 ± 110**

Sample from surface of flood delta, 0 to 4cm deep.

Indian River series

Shell and organic core samples from shallow marine lagoon, Indian R, Florida E coast (27° 17′ 8″ N, 80° 16′ 7″ W). Samples dated to measure rate of Holocene sediment accumulation. Coll 1979 by M Almosi, Rosenstiel School Marine and Atmos Sci, Univ Miami.

UM-2194. 1 **3710 ± 80**

Bivalve shell coll 100 to 110cm deep.

UM-2195. 2 **3870 ± 220**

Large clam shell coll 190 to 195cm deep.

UM-2196. 3 **2070 ± 190**

Oyster shell coll 400 to 405cm deep.

UM-2197. 4 **3030 ± 90**

Bivalve shell coll 40 to 50cm deep.

UM-2198. 5 **6570 ± 160**

Organic material coll 85 to 100cm deep.

Republic Groves series

Two pine-wood samples found assoc with human skeletal remains from Site 8HrR, Republic Groves, E Hardee Co (27° 27′ 16″ N, 81° 43′ 37″ W). Dates will be used in preliminary report on Site 8Hr4 on wet sites in the state. Coll 1980 by M Hope; subm 1981 by M Hope and B R Wharton.

UM-2259. R G - 417 **2480 ± 80**

Sample taken from upper peat muck from 0.9m to 1.2m depth (Holocene), underlain by gray sandy clay (Pleistocene fossil-bearing) zone. Stake was recovered from a 1.5m × 1.5m excavation square (Sq 5R, Quad 2) in oblique vertical position *in situ* from 34.3cm to 64.8cm below surface.

UM-2260. R G - 409 **5750 ± 110**

Sample taken from upper peat muck from 0.9m to 1.2m depth (Holocene), underlain by gray sandy clay (Pleistocene fossil-bearing) zone. Sample stake was recovered from 1.5m × 1.5m excavation square (Sq A, Quad 1) *in situ* from 1m to 0.7m below surface. Stake was found in oblique vertical position, with distal end driven into underlying sandy clay zone, 5.7cm below peat muck/sandy clay contact.

California

La Liebre Ranch series

Peat from lower canyon de la Lecheria, Western Antelope Valley. Samples probably assoc with fluctuating climate between longer glacial periods. Dates are needed for chronology of alluvial episodes in Quaternary period. Samples from medium-to-thin-bedded moderately sorted gravel, sand, and silt with dark organic horizons and other peat layers. Coll 1980 by D B Burke; subm 1980 by J S Tinsley, USGS, Menlo Park, California.

UM-2115. 6-80-3 **3950 ± 100**

Shallow excavation in arroyo wall ca 3m below eroded ground surface, ca 3.5m below former depositional surface (34° 52′ 37.2″ N, 118° 39′ 40″ W). UM-2157 is 1m higher and 10m downstream from UM-2155.

UM-2157. 6-80-5 **2720 ± 110**

Shallow excavation in arroyo wall ca 2m below eroded ground surface (34° 52′ 37.1″ N, 118° 39′ 40″ W).

Iran

Gheshm Island series

Shells from marine beds overlying Plio-Pleistocene rocks on Gheshm I. Samples dated to calibrate Quaternary stratigraphy and tectonic history of area. Coll and subm 1980 by M R Samadian, Univ Coll, London. Sample levels are relative to sea level.

8960 ± 120
UM-2115. 836-1 A $\delta^{13}C = +1.10‰$

Meretrix sp coll at +17.6m (26° 50′ N, 56° 08′ E).

5850 ± 90
UM-2116. 813-7 A $\delta^{13}C = +0.87‰$

Cardium sp coll at +11m (26° 50′ N, 6° 08′ E).

32,300 ± 1320
UM-2117. 819-3a A $\delta^{13}C = +2.15‰$

Drosina sp coll at +22m (26° 43′ N, 55° 58′ E).

29,800 ± 1100
UM-2165. Sd2 $\delta^{13}C = +1.63‰$

Kodakia tigrina coll at +18m (26° 42′ N, 55° 55′ E).

23,000 ± 660
UM-2166. Sg6a, Sg6B $\delta^{13}C = +0.86‰$

Paphia gallus coll at +17.5m (26° 41′ N, 55° 40′ E).

16,000 ± 250
UM-2167. 8 12-2A $\delta^{13}C = +1.9‰$

Circe arabia coll at +14.5m in coral reef deposit overlying Khark Limestone (26° 46′ N, 55° 50′ E).

4080 ± 140
UM-2168. Gh3 $\delta^{13}C = +0.15‰$

Oliva bulbosa coll at +20m (27° 05′ N, 55° 15′ E).

Turkey

Konya series

Shells dated to establish chronology for limnologic history of Konya basin, Konya vilayet. Coll 1977-1980 and subm 1979-1980 by N Roberts, Univ Coll, London.

14,700 ± 160
UM-1577. 10.a.i $\delta^{13}C = -2.03‰$

Shell (mainly *Dreissena polymorpha*) from Kilbasan fossil shoreline at 1005.1m above msl (37° 21′ N, 33° 13′ E).

19,000 ± 330
UM-1578. a.b.ii $\delta^{13}C = -2.07‰$

Shell (mainly *Dreissena polymorpha*) from Kilbasan fossil shoreline at 1004.9m above msl (37° 21′ N, 33° 31′ E).

UM-1579. 8.b.i **19,500 ± 440**
$\delta^{13}C = -1.62‰$

Shell (mainly *Dreissena polymorpha*) from Beydili fossil shoreline at 1010.6m above msl (37° 23′ N, 33° 22′ E).

UM-1637. 2.a.i outer fraction **20,900 ± 190**

UM-1638. 2.a.i inner fraction **22,900 ± 370**
$\delta^{13}C = -3.31‰$

Same sample (*Dreissena polymorpha*) from Kilbasan fossil shoreline at 1004.9m above msl (37° 21′ N, 33° 13′ E).

UM-1639. 8.b.i rpt **21,800 ± 680**
$\delta^{13}C = -0.31‰$

Shell (*Dreissena polymorpha* and *Theodoxus* cf *fluviatalis*) from Beydili fossil shoreline at 1010.6m above msl (37° 23′ N, 33° 22′ E).

UM-2150. K.80.6.a/b **17,800 ± 630**

Shell *(Dreissena polymorpha)* from Adabag fossil shoreline at 1008m above msl (37° 29′ N, 33° 52′ E).

UM-2151. Adabag marsh: modern **400 ± 80**

Lymnaea cf *stagnalis* and *Planorbarius corneus* dated to check uptake of "old" carbon from surrounding limestone hills. This establishes true chronology for limnologic history of Konya basin by correcting dates on shells from fossil beaches in basin (37° 29′ N, 33° 52′ E).

General Comments: UM-1577 has been subsequently shown to have suffered up to 8% secondary contamination, and, thus, is taken to be min age only. UM-1639 and -1579 date shells from same horizon; the former is considered to be more reliable. Dates indicate that last phase of high lake levels in Konya basin occurred between 23,000 and 17,000 yr ago.

II. ARCHAEOLOGIC SAMPLES

Florida

Little Salt Spring series

Charcoal and shell samples from Archaic midden deposit, Little Salt Spring, North Port (Zone 17 (UTM) 377710-720mE, 2995180-190mN). Dated to evaluate temporal relationship of midden to burial area in adjacent slough. Coll by H S Hale; subm 1980 by C J Clausen, Little Salt Spring Research Facility, North Port, Florida.

General Comment (JS): evidence of soil acid contamination; biased bone dates from this midden area.

UM-2211. LSS 800 604-351 **7750 ± 290**
$\delta^{13}C = -8.6‰$

Elliptio buckleyi.

UM-2213. LSS 800 609-349 **8570 ± 820**

Charcoal.

UM-2214. LSS 800 609-348 **4880 ± 80**
$\delta^{13}C = -0.04‰$

Mercenaria campechiensis.

UM-2215. LSS 800 603-347 **5830 ± 120**
$\delta^{13}C = -12.3‰$

Pomocea paludosa.

UM-2216. LSS 800 624-346 **4770 ± 100**
$\delta^{13}C = -0.76‰$

Bahamas

Bahama series

Samples coll from NE sec San Salvador (24° 05′ 12″ N, 74° 31′ 06″ W). Samples of palmetto series coll from 2m test pit in Gerace site. Habitation site was built upon sand dune possibly disturbed by sand crabs and slash-and-burn cultivation. Material picked from stratigraphic context after fragments were noted while sifting. Coll 1980 by S Winter; subm 1980 by D Gerace, Coll of Finger Lakes Bahamas Field Sta, San Salvador.

UM-2158. SS-W-1-C **1940 ± 180**

Charcoal fragments.

UM-2243. SS-W#3 **730 ± 60**

Charred turtle shell.

UM-2244. SS-W#4 **600 ± 100**

Charcoal fragments.

UM-2245. SS-W#2 **560 ± 80**

Conch shell.

Pigeon Creek series

Five charcoal samples from Pigeon Creek site (24° 00′ 05″ N, 74° 27′ 05″W) San Salvador. Dated to determine time of Arawak occupation in this area. Coll 1980 by R Rose; subm 1981 by D T Gerace.

UM-2271. SSP8p-52-38L **310 ± 80**

Charcoal from 30 to 40cm depth.

UM-2272. SSP81-10 **220 ± 60**

Charcoal from 20cm depth.

UM-2273. SSP8p-52-40L **580 ± 90**

Charcoal from 30 to 40cm depth.

UM-2274. SSP81-33 **620 ± 70**

Charcoal from 26cm depth.

UM-2275. SSP81-52a, b **1380 ± 60**

Charcoal from 40 to 50cm depth.

Jamaica

Cinnamon Hill series

Bone and charcoal samples from undisturbed middens fringing edge of hilltop on Cinnamon Hill (18° 30′ N,77° 50′ W). Arawaks occupied site from est 650 AD to 1526 when Spaniards destroyed village. Dates needed to determine approx time of cemetery and habitation. Coll 1972 by F J Osborne and S W Lee, Archaeol Soc Jamaica; subm 1980 by S W Lee.

UM-2240. B-1→A-1 S B-0→A-0 **660 ± 200**

Charcoal from 0cm to 25.4cm depth.

UM-2241. B-2→A-3 S B-1→A-2 **970 ± 180**

Charcoal from 25.4cm to 50.8cm depth.

UM-2242. Burial 99.6cm deep **480 ± 90**

Human bone in matrix of hard marl.

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[RADIOCARBON, VOL. 23, No. 3, 1981, P 410-421]

RUDJER BOŠKOVIĆ INSTITUTE RADIOCARBON MEASUREMENTS VI

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The following radiocarbon date list contains dates of samples measured since our previous list (R, 1979, v 21, p 131-137). As before, age calculations are based on the Libby half-life 5570 ± 30 yr and reported in years before 1950. The modern standard is 0.95 of the activity of NBS oxalic acid. Sample pretreatment, combustion, and counting technique are essentially the same as described in R, 1971, v 13, p 135-140, supplemented by new techniques for groundwater processing (R, 1979, v 21, p 131-137) and for soil sample treatment (R, 1977, v 19, p 465-475).

Statistical processing of data has been computerized (Obelić and Planinić, 1977). Sample descriptions were prepared with collectors and submitters. The errors quoted correspond to 1σ variation of sample net counting rate and do not include the uncertainty in ^{14}C half-life.

Calculations of age or percent of modern of speleothems and groundwaters are based on the initial activity equal to 0.85 of the NBS oxalic acid activity multiplied by 0.95.

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I. ARCHAEOLOGIC SAMPLES

Čazma series

Fragments of wooden pipeline buried in loamy mud, Čazma (45° 45′ N, 16° 38′ E) central Croatia. Pipeline used for water supply. Samples date occupation of site. Coll and subm 1977 by H Malinar, Croatian Inst Restoration, Zagreb. *Comment* (HM): expected age: 13th century AD.

Z-569. 240 ± 60

Fragments of wooden pile supporting the pipeline.

Z-669. 580 ± 90

Fragments of wooden pipeline.

Z-578. Krka River 1210 ± 70

Fragments of wood *(Quercus)* 4m below Krka R bed near Hodoš (46° 49′ N, 16° 19′ E) Slovenia. Sample dates anthropogenically degraded vegetation. Coll and subm 1977 by A Šercelj, Slov Acad Sci and Arts, Ljubljana.

Gospodska pećina series

Charcoal from entrance hall in cave above spring of Cetina R (43° 59′ 2″ N, 16° 26′ 11″ E) N Dalmatia. Coll and subm 1977 by M Malez, Yugoslav Acad Sci and Arts, Zagreb (Malez, 1975; 1979).

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Z-579. **7010 ± 90**

Charcoal from lower hearth in Stratum C containing animal bones of older Holocene (*Cervus* sp, *Capreolus* sp). *Comment* (MM): expected age: beginning of Younger Boreal period.

Z-580. **5130 ± 90**

Charcoal from upper hearth in the middle of calcite plate, Stratum B. *Comment* (MM): expected age: Older or Younger Atlantic period.

Z-582. Donja Šatornja **610 ± 70**

Charcoal from burial place No. 2/77 in St Nicholas church, Donja Šatornja (44° 11′ N, 20° 41′ E) near Topola, Serbia. Sample dates burial site. Coll and subm 1977 by D Madas, Inst Preservation Cultural Monuments, Kragujevac. *Comment* (DM): expected age: 14th century AD.

Z-586. Tophana, Imotski **230 ± 60**

Fragments of wooden beams found in stony walls of Armory ("Tophana"), Imotski (43° 27′ N, 17° 13′ E) SE Croatia. Coll and subm 1978 by B Bezić, Regional Inst Preservation Cultural Monuments, Split. *Comment* (BB): expected age: 15th to 16th century AD.

Z-604. Viganj **240 ± 60**

Fragments of wooden ship 3m below sea surface in port of Viganj (42° 59′ N, 17° 4′ E) Pelješac peninsula, SE Croatia, Dalmatia. Coll and subm 1979 by Ž Rapanić, Archaeol Mus Split.

Z-605. Slavkovica **940 ± 80**

Charcoal from burial place No. 43/78, Slavkovica (44° 10′ N, 20° 16′ E) Serbia. Sample dates necropolis of medieval Serbian state. Coll and subm 1978 by D Madas. *Comment* (DM): expected age: 14th to 15th century AD.

Kostajnica series

Fragments of wood from piles and beam found in foundation of fortress walls, Kostajnica near Una R (45° 13′ N, 16° 32′ E), W Bosnia. Dates sequences of fortress building. Coll and subm 1978 by D Miletić, Croatian Inst Restoration, Zagreb. *Comment* (DM): expected age: 300 yr.

Z-607. No. 1 **220 ± 50**

Fragments of wooden pile.

Z-608. No. 7 **570 ± 60**

Fragments of wooden pile.

Z-609. No. 5 **390 ± 60**

Fragments of wooden pile.

Z-610. No. 3 **120 ± 60**

Fragments of wooden pile.

Z-611. No. 4 **380 ± 60**

Fragments of wooden beam.

Notranje Gorice series

Wooden fragments of pile dwellings in recent humus at Notranje Gorice (45° 59′ 30″ N, 14° 24′ 30″ E). Coll 1979 by Z Harej, Fac Arts and Sci Ljubljana; subm by A Šercelj. Dates pile dwellings.

Z-717. No. 7 **3090 ± 90**

Z-718. No. 9 **3720 ± 100**

Z-719. No. 61 **4720 ± 100**

Z-722. Koprivnička Rijeka, Rudina I **3750 ± 110**

Charcoal from waste pit at Rudina near Koprivnička Rijeka (46° 07′ N, 16° 37′ E) NE Croatia. Dates settlement of latest phase of Vučedol culture. Coll by Z Marković, Mus Koprivnica; subm 1979 by M Malez. *Comment* (ZM): expected age: beginning of Early Bronze age (Marković, 1981).

Privlaka series

Samples from fortress Gradina (45° 12′ N, 18° 51′ E) near Vinkovci, E Croatia. Dates settlement stratification and fortification construction. Coll and subm 1979 by Nives Pandžić, Center for Hist Sci, Zagreb. *Comment* (NP): expected age: 1st to 2nd century BC.

Z-726. Privlaka 1 **2170 ± 80**

Charcoal from fortress walls reinforced with wooden beams, partially carbonized at surface.

Z-727. Privlaka 2 **6030 ± 100**

Charcoal from partially burned wooden beam in house floor.

Z-728. Privlaka 3 **5600 ± 120**

Wheat grains in soil 1.7m below floor in ruins of burned house.

Z-634. Lipe **1940 ± 80**

Fragments of wooden *(Quercus)* boat 16m long buried in ploughed land overlying lake chalk, 20 to 30cm below surface at Lipe (45° 59′ 10″ N, 14° 26′ 40″ E). Continuation of palynol and archaeol investigations of Ljubljansko Barje, swamp with peat bogs and cultivated land, 20km long and 10km wide, S and SW of Ljubljana, Slovenia. Coll 1978 by Tatjana Bregant, Fac Arts and Sci, Ljubljana; subm by A Šercelj. *Comment* (TB): expected period: Neolithic.

Parti series

Wooden fragments of pile dwellings in cultural stratum, at 80 to 100cm depth at Parti, SE part of Ljubljansko Barje (45° 59′ 20″ N, 14° 32′ 20″ E). Dates pile dwelling settlements. Coll 1979 by T Bregant; subm by A Šercelj. *Comment* (AŠ): expected period: Bronze age. Corresponds to earlier measurements Z-539, -540 (R, 1979, v 21, p 133).

Z-646. No. 1 **4160 ± 100**

Z-647. No. 2 **4010 ± 100**

Z-716. No. 9 **4200 ± 100**

Z-687. Grabovica **3210 ± 70**

Charcoal from funeral pyre, 0.5m deep in grave, at Grabovica near Doboj (44° 44′ N, 18° 07′ E), Bosnia. Date supports archaeol placement of cremation in Bronze age. Coll and subm 1979 by B Belić, Mus Doboj.

Trogir series

Charcoal from hearth, 3m below surface and 2m below sea level in Lapidary, Trogir (43° 31′ N, 16° 15′ E) SE Croatia, Dalmatia. Sample assoc with ceramics, bones, and limestone fragments. Coll 1979 by I Babić, Town Mus Trogir; subm by J Radovčić. *Comment* (JR): expected age: 3000 to 4000 yr.

Z-696. Trogir I **2840 ± 90**

Z-697. Trogir II **3580 ± 100**

Z-734. Dolmen de Bertrandoune I **4090 ± 80**

Human bones from lowest part of archaeol level in funerary room of La Bertrandoune dolmen near Prayssac, Lot (44° 31′ N, 1° 12′ E). Samples were cross-checked using method of chemical pretreatment of bones (Horvatinčić *et al*, ms in preparation.). *Comment*: agrees well with Ly-1220 (R, 1978, v 20, p 19).

Rudnik series

Fragments of wood and charcoal, Ljubljana-Rudnik (46° 0′ 55″ N, 14° 32′ 30″ E) Slovenia. Coll 1980 by T Bregant; subm by A Šercelj. Samples date palynol established age of anthropogenically degraded vegetation in clay.

Z-737. Rudnik **3290 ± 120**

Fragments of wood assoc with wooden oar buried in peaty humus, Zone 1, Trench 3.

Z-773. Rudnik **2700 ± 100**

Charcoal from marshland, Trench 6, 50 to 60cm depth.

II. GEOLOGIC SAMPLES

Z-572. Lesno brdo **1780 ± 70**

Fragments of wood from open profile, 1.5m below surface, Lesno brdo (46° 5′ N, 14° 20′ E) Ljubljansko Barje, Slovenia. Coll and subm 1977 by A Šercelj. Date supports palynol determined age (Younger Holocene).

Ledine series

Peat from bore hole in pond, 1120m above msl on plateau of Mt Jelovica (46° 15′ 40″ N, 14° 6′ 25″ E) Slovenia. Coll 1977 by M Zupančič; subm by A Šercelj. Supports palynol established vegetational phases.

Z-573. 0.5m **980 ± 80**

Z-574. 1.8m **2220 ± 70**

Z-575. 3.8m **3600 ± 80**

Z-576. 4.6m **4020 ± 80**

Z-577. 6.4m **6960 ± 90**

Jama Rupa series

Fragments of wood and charcoal from different layers in "ponor" (swallow hole) Ljubija R between Smrekovac and Golte Mts (46° 24′ N, 14° 37′ E) Karavanke Mts, Slovenia. Hole entrance, 908m above msl. Coll 1978 by A Kranjc and A Vadnjal, Slovenian Acad Sci and Arts, Postojna; subm by R Gospodarič. Dates sedimentation process. *Comment* (RG): expected age: Holocene.

Z-587. Layer 7 **130 ± 70**

Wooden fragments from Layer 7, depth 0.7m.

Z-588. Layer 8 **120 ± 70**

Charcoal from Layer 8, depth 0.5m.

Z-589. Layer 2/3 **120 ± 60**

Charcoal from Layer 2/3, depth 2.1m.

Tučić ponor series

Twig with calcite coating from base of "ponor" Tučić, 147m deep, Ričica R, Gračac polje near Gračac (44° 18′ N, 15° 51′ E) Lika, Central Croatia. Coll and subm 1978 by S Božičević, Geol Inst Zagreb. Dates period of calcite precipitation (Srdoč *et al,* 1980).

Z-615. **270 ± 80**

Fragments of wood.

Z-616. **Modern**

Calcite coating.

Učka Tunnel series

Speleothems from cavern in limestone karst, Učka tunnel (45° 19′ N, 14° 13′ E) Istria, W Croatia. Discovered during construction of hwy through Mt Učka. Coll and subm 1978 by S Božičević. Dates periods of growth of speleothems, formation of cave, and tectonic changes.

Z-617. No. 1 **>40,000**

Base of stalagmite from rock, Hall No 3.

Z-618. No. 2 **>40,000**

Base of stalagmite from limestone boulder near siphon.

Z-619. No. 3 **10,000 ± 200**

Base of stalagmite from overturned limestone block.

Z-648. No. 4 **28,100 ± 1300**

Base of stalagmite from limestone block.

Z-649. No. 5 **7330 ± 150**

Base of stalagmite from limestone rock.

Z-650. No. 6 **31,400 +1700 −1400**

Base of stalagmite from limestone chips.

Z-645. Volarje **12,600 ± 220**

Leaves embedded in lake chalk, from open profile in left bank of Soča R near Volarje (46° 12′ N, 13° 40′ E), Slovenia. Coll by L Žlebnik, Geol Inst Ljubljana; subm 1978 by A Šercelj. Palynol analysis dates sample to beginning of last Würm. Sample dates lake chalk sedimentation rate.

Z-713. Sečovlje **8900 ± 120**

Organic detritus in core of bore hole V-6, 26.5m deep, salt works Sečovlje (45° 29′ 20″ N, 13° 38′ 25″ E) Slovenia. Coll by B Ogorelec, Geol Inst Ljubljana; subm 1979 by A Šercelj. Palynol analysis suggests beginning of Holocene.

Z-714. Erjavčeva cesta **>40,000**

Sandy peat 5m below surface, Erjavčeva cesta, Ljubljana (46° 3′ 35″ N, 14° 30′ 15″ E) Slovenia. Coll and subm 1979 by A Šercelj. Palynol analysis indicates Pleistocene.

Kuk series

Speleothem from conglomerates in Kuk cave, Bistrica R canyon near Dobro polje (43° 36′ N, 18° 31′ E), Bosnia. Dates cave stratigraphy. Coll and subm 1979 by E Kulenović, Geoinženjering, Sarajevo. *Comment* (EK): expected period: Upper Pleistocene.

Z-723. EK-PE-6 **34,800 +2290 −1780**

Speleothem from conglomerates embedded in sandy-gravel layer, 2.5 to 3m below surface of cave.

Z-724. EK-3/II **39,100 +5100 −3000**

Speleothem, 80cm below stratum of calcareous tufa containing fossil bones.

Z-725. EK-PE-13 **35,000 +2750 −2080**

Speleothem from upper layer of gravel mixed with sand.

Z-732. Gigića pećina **19,300 ± 430**

Crystalline calcite from dripstone slab, 25 to 50cm thick, Gigića cave above village Resanovci (850m) W Bosnia. Clay stratum, 100cm thick, below dripstone contains animal bones *(Ursus spelaeus)*. Coll and subm 1980 by M Malez (Malez *et al,* 1972).

Babja jama series

Fragments of wood in dark gray clay, Vogrščček (46° 8′ N, 13° 43′ E) near Most na Soči, Slovenia. "Ponor" (swallow hole), occasionally turns into karst spring. *Comment* (RG): pollen analysis points to Holocene. Coll and subm 1980 by R Gospodarič, Slovenian Acad Sci and Arts, Postojna.

Z-763. Sample 1 **150 ± 80**

Fragments of wood, upper layer.

Z-764. Sample 2 **310 ± 80**

Fragments of wood, lower layer.

Jama Luknja series

Stalagmite with embedded human bones in cave below Luknja castle (45° 49′ N, 15° 6′ E), Krka R valley near Novo Mesto, Slovenia. Coll by A Medle, Speleol Soc Novo Mesto; subm 1980 by R Gospodarič. *Comment* (RG): expected period: Holocene.

Z-765. Sample 1 **1320 ± 110**

Calcite from base of stalagmite close to bone.

Z-766. Sample 2 **230 ± 100**

Calcite, tip of stalagmite, Z-765.

Z-780. **2450 ± 120**

Dripstone, 1cm thick deposited on human bone.

Kopačina series

Snail shells (*Helix* sp) 50cm thick cemented with dripstone from Kopačina Cave near Donji Humac, Brač I, Dalmatia. Shell layer overlies postglacial stratum rich with fauna *(Cervus elephus, Capreolus capreolus, Sus scrofa)*. Coll 1980 and subm by M Malez. Dates formation of snail shell layer between upper humus layer and lower postglacial sediments (Čečuk, in press).

Z-776. Sample 1 **4000 ± 110**

Dripstone with fragments of shells.

Z-778. Sample 2 **7850 ± 140**

Snail shells; most of dripstone removed.

III. GEOCHEMICAL SAMPLES

Radiocarbon assays were done in most cases to complete physical and chemical data on water samples from various aquifers, thermal and mineral springs, etc. Besides radiocarbon and chemical analyses, tritium and stable isotope analyses (^{13}C, ^{18}O, and ^{2}H) were considered most important for hydrogeologic interpretation of data.

Results of radiocarbon analyses of geochemical samples are presented as percent modern. Where applicable, apparent age of water samples is given, calculated on the assumption that no mixing of water or depletion of radiocarbon content occurred. Calculation of apparent age is based on initial activity equal to 0.85 of modern standard and on the Libby half-life, 5570 ± 30 yr.

Mineral waters of Slovenia

Rogaška Slatina series

Mineral waters from Rogaška Slatina spa (46° 14′ N, 15° 39′ E), E Slovenia. Coll Nov 1980 and subm by J Pezdič, "Jožef Štefan" Inst, Ljubljana. Hydrologic study of mineral waters (table 1).

TABLE 1

Lab no.	Sample	Well type	% Modern	Apparent age (yr)
Z-614	V-3-66	Bore hole	0.6 ± 0.6	>40,000
Z-771	G-2	Bore hole	1.7 ± 0.3	32,000 +2000 −1700
Z-772	G-4	Bore hole	91.0 ± 0.6	Modern

Radenci series

Mineral waters from artesian and subartesian wells, Slatina Radenci spa (46° 40′ N, 16° 05′ E) near Gornja Radgona, NE Slovenia. Coll Aug 1978 by J Pezdič and A Popovič; subm by I Kobal, "Jožef Štefan" Inst, Ljubljana. Dated to study origin of water (table 2).

TABLE 2

Lab no.	Sample	Well type	Depth (m)	% Modern	Apparent age (yr)
Z-595	Jurjev vrelec	Subartesian	26	2.1 ± 0.5	31,300 +1500 −1300
Z-596	V-U	Artesian	161	22.0 ± 0.4	12,100 ± 200
Z-597	K-2	Subartesian	10	1.7 ± 0.6	33,200 +4300 −2800
Z-598	K-1	Subartesian	17	1.9 ± 0.6	31,900 +1700 −1400
Z-599	K-3	Subartesian	9	8.9 ± 0.4	19,400 ± 380
Z-601	Zelezni vrelec	Artesian	9	0.3 ± 0.5	>40,000
Z-602	Zdravilni vrelec	Subartesian	22	0.0 ± 0.0	>40,000

TABLE 3

Lab no.	Sample	Well type	Depth (m)	Location N Lat	Location E Long	Colln date	% Modern	Apparent age (yr)
Z-680	Stupnik	Bore hole	Ca 850	45° 41′	15° 50′	6/79	1.2 ± 0.5	$35,700^{+2600}_{-1900}$
Z-733	Sv Ivan, Zelina	Bore hole	Ca 790	46° 58′	16° 15′	6/80	1.6 ± 0.4	$33,200^{+2350}_{-1900}$
Z-758	Sv Ivan, Zelina	Spa	Surface	46° 55′	15° 59′	8/80	45.2 ± 0.4	5050 ± 100
Z-736	Tuheljske toplice	Spa	Surface	46° 04′	15° 47′	8/80	36.1 ± 0.4	8150 ± 110
Z-759	Krapinske toplice	Spa	Surface	46° 06′	15° 50′	9/80	5.9 ± 0.4	21,600 ± 570
Z-761	Sutinske toplice	Spa	Surface	46°03′	16° 02′	10/80	7.0 ± 0.4	20,100 ± 550
Z-762	Stubičke toplice	Spa	Surface	45° 49′	15° 56′	10/80	22.2 ± 0.4	10,890 ± 200
Z-769	Šemničke toplice	Spa	Surface	46° 06′	15° 56′	10/80	19.4 ± 0.4	11,800 ± 200
Z-774	Obradovci 2	Bore hole	Ca 580	45° 37′	17° 57′	11/80	1.2 ± 0.3	$33,800^{+2600}_{-2000}$
Z-775	Sv Jana near Samobor	Spring	Surface	45° 43′	15° 36′	11/80	59.2 ± 0.5	2830 ± 100

Thermal waters of Croatia

1.7 ± 0.3 % modern
+ 1500
Z-756. Migalovci Apparent age: 32,700
− 1250

Thermal water from artesian well, 370m deep, at Migalovci (45° 20′ N, 18° 01′ E) NE Croatia. Coll Aug 1980 by A Vujinac; subm by M Zelenika, Geotehnika, Zagreb. Dated to study origin of water.

NW and NE Croatia series

Samples of water from several thermal springs in NW and NE Croatia. Coll and subm 1979 by INA-Naftaplin staff, Zagreb. Dated to study hydrologic properties of thermal waters (table 3).

Thermal waters and groundwaters of Bosnia and Hercegovina

Hydrologic investigations of thermal waters and groundwaters in Bosnia and Hercegovina. Coll and subm by Geoinženjering staff, Sarajevo.

1.0 ± 0.3 % modern
+ 3400
Z-566. Višegradska banja 37,300
− 2300

Thermal water of artesian type, Višegrad spa (43° 47′ N, 19° 19′ E), Bore hole SB-2. Coll 1977 and subm by N Miošić.

8.9 ± 0.6 % modern
Z-690. Banja Ilidža 18,000 ± 350

Thermal water from Bore hole B-6 at Ilidža spa near Gradačac (45° 54′ N, 18° 25′ E). Coll 1979 and subm by D Mulaosmanović.

9.5 ± 0.4 % modern
Z-698. Banja Tomina Ilidža 17,650 ± 270

Thermal water from Ana spring, Ilidža near Sanski most (44° 41′ N, 16° 47′ E). Coll and subm by N Miošić.

43.5 ± 0.6 % modern
Z-729. Gradačac 5140 ± 130

Groundwater, Bore hole GA-4, total depth 110m, Gradačac. Coll 1980 and subm by N Miošić.

5.5 ± 0.3 % modern
Z-767. Sočkovac 21,900 ± 550

Thermal water from Well OS-2, 76m deep, near Gračanica (44° 40′ N, 18° 18′ E). Coll 1980 and subm by M Butorac.

0.9 ± 0.3 % modern
+ 3500
Z-768. Boljanić 36,400
− 2500

Thermal water from Well OB-1, 73.5m deep, Gračanica (44° 41′ N, 18° 14′ E). Coll 1980 and subm by N Butorac.

Gata series

Thermal water from drilled wells at Gata (44° 56′ N, 15° 48′ E) near Bihać, E Bosnia. Coll July 1979 and subm by N Čubranić, Industroprojekt, Zagreb.

Z-688. Well B-X — **22.6 ± 0.6 % modern** — **12,000 ± 200**

Z-689. Well B-8 — **10.8 ± 0.6 % modern** — **17,900 ± 460**

Z-757. Kaniža — **0.3 ± 0.3 % modern** — **>40,000**

Water from artesian well, 250m deep, at Kaniža (45° 07′ N, 17° 53′ E) near Bosanski Brod, Bosnia. Coll by A Vujinac; subm by M Zelenika, Geotehnika, Zagreb. Hydrologic study for water resource of Kaniža region.

Groundwaters of Vojvodina

Subotica series

Water from drilled wells, Subotica, N Vojvodina. Coll and subm Jan 1979 by A Tot Bagi. Water resource development, Subotica (table 4).

TABLE 4

Lab no.	Sample	Well type	Depth (m)	Location N Lat	Location E Long	Colln date	% Modern	Apparent age (yr)
Z-652	Kelebija	Drilled	128	46° 09′	19° 35′	1/79	48.7 ± 0.8	5740 ± 13[illegible]
Z-653	Novi Žednik 1	Drilled	118	45° 56′	19° 35′	1/79	16.7 ± 0.4	14,200 ± 25[illegible]
Z-654	Subotica, Well 23	Drilled	—	46° 06′	19° 43′	1/79	42.9 ± 0.7	6780 ± 13[illegible]

Ruma series

Water samples from drilled wells, Ruma (45° 01′ N, 19° 50′ E) SW Vojvodina. Coll and subm by M Lazarević, "Jaroslav Černi" Inst, Beograd. Water resource development, Ruma (table 5).

TABLE 5

Lab no.	Sample	Well type	Depth (m)	Colln date	% Modern	Apparent age (yr)
Z-591	Fišerov salaš	Subartesian	148	5/78	21.5 ± 0.4	12,300 ± 210
Z-592	Borkovac	Subartesian	280	5/78	24.7 ± 0.4	11,200 ± 170
Z-731	Hrtkovci, HB-2	Well	60.0	2/80	68.3 ± 0.7	1680 ± 90

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ARCHAEOLOGIC SAMPLES

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Date	Culture or Period	Sample No.	No.	Pg.
	AFRICA			
1000±70	Iron Age	Pta-1026	1	66
130±40	"	-1399	"	65
	ANGOLA			
4140±70	LSA (Late Stone Age)	Pta-772	1	65
2620±50	LSA	-769	"	"
2620±50	LSA (Wilton)	-765	"	"
2160±50	Iron Age	-1025	"	66
	SOUTHWEST AFRICA - NAMIBIA			
>50,500	MSA (Middle Stone Age)	Pta-505	1	45
49,500 $^{+5400}_{-3100}$	SA (Stone Age)	-504	"	48
>49,000	MSA	-507	"	46
>48,400	MSA (Howieson's Poort)	-1415	"	46
>48,200	MSA	-2142	"	53
40,100±1630	SA	-2115	"	50
39,800±1700	SA	-1041	"	46
35,600 ± 680	SA	- 503	"	48
31,200 ± 450	SA	- 544	"	"
26,300 ± 400	SA	-1040	"	46
22,100 ± 220	Pre-LSA	-1750	"	52
21,600 ± 300	LSA	-1032	"	46
19,700 ± 220	LSA	-1203	"	48
18,500 ± 200	LSA	-1039	"	46
13,000 ± 120	SA	-1010	"	47
12,800 ± 140	LSA	-2596	"	55
12,500 ± 120	LSA	-1021	"	47
11,900 ± 90	LSA	-1996	"	53
8410 ± 80	LSA	-1368	"	56
8200 ± 80	LSA	-1013	"	"
7840 ± 90	LSA	-1185	"	51
7280 ± 80	LSA (Wilton)	-1020	"	47
6940 ± 80	LSA	-1751	"	49
6840 ± 60	LSA	-2077	"	55
6510 ± 70	LSA	-1547	"	61
6500 ± 80	LSA	-1536	"	56
6480 ± 80	Pre-pottery (Wilton)	-1019	"	47
6470 ± 80	LSA	-1012	"	56
6330 ± 60	LSA	-1347	"	"
5850 ± 70	LSA	-2654	"	64
5740 ± 60	LSA	-2075	"	55
5570 ± 50	LSA	-1348	"	56
5400 ± 70	LSA (Wilton)	-1186	"	51
5190 ± 70	LSA	-1011	"	56
4840 ± 50	LSA (Wilton)	-1620	"	61
4180 ± 60	LSA	-1295	"	"
3950 ± 60	LSA	-1623	"	61
3130 ± 40	LSA	-1557	"	58
2780 ± 50	LSA	-1776	"	61
2690 ± 60	SA	-2021	"	64
2600 ± 50	LSA	-1556	"	59
2590 ± 60	LSA	-1550	"	62
2540 ± 50	LSA	-1045	"	49
2440 ± 50	LSA	-1042	"	50
2390 ± 50	LSA	-1551	"	62
2300 ± 50	LSA	-2650	"	50
2240 ± 50	LSA	-1546	"	63
2200 ± 50	LSA	-1927	"	50
2140 ± 50	LSA	-2552	"	64
2070 ± 50	LSA	-1049	"	49
1960 ± 45	LSA (pottery Wilton)	-1918	"	47
1720 ± 45	SA	-2006	"	55
1590 ± 50	LSA	-2565	"	45
1550 ± 50	SA	-1535	"	56
1500 ± 40	LSA	-1824	"	53
1370 ± 50	SA	-2681	"	59
1300 ± 50	LSA	-2089	"	45
1280 ± 40	LSA	-2136	"	"
1250 ± 130	LSA	-1945	"	44
1210 ± 50	SA	-1988	"	55
1200 ± 50	LSA	-1933	"	44
1160 ± 50	SA	-2663	"	48
1080 ± 50	LSA	-1558	"	59
1000 ± 60	LSA	-2664	"	64
980 ± 50	LSA	-1832	"	53
910 ± 40	LSA	-1777	"	62
750 ± 80	SA	-1344	"	55
720 ± 45	LSA	-1773	"	62

Date	Culture or Period	Sample No.	No.	Pg.
	SOUTHWEST AFRICA - NAMIBIA (cont)			
710 ± 50	SA	Pta-1863	1	54
620 ± 40	LSA	- 902	"	54
490 ± 50	LSA	-2295	"	51
420±140	LSA	-2645	"	61
420 ± 50	LSA	-2573	"	58
420 ± 45	LSA	-1783	"	62
400 ± 50	Iron Age	-2296	"	50
400 ± 50	SA	-1645	"	57
400 ± 40	LSA	-2111	"	63
380 ± 50	LSA	-2662	"	52
370 ± 50	LSA (Wilton)	-1202	"	48
370 ± 40	LSA	-2230	"	59
370 ± 30	SA	-2554	"	57
360 ± 40	LSA	-1377	"	60
340 ± 40	LSA	-1577	"	63
330 ± 50	LSA	-1131	"	52
320 ± 40	LSA	-1009	"	47
310 ± 50	Historical	- 730	"	66
310 ± 20	LSA	-1801	"	54
300 ± 50	LSA	-2264	"	50
300 ± 50	Iron Age	-1624	"	65
280 ± 40	Iron Age	-2559	"	58
270 ± 50	SA	-2470	"	53
270 ± 50	LSA	-1820	"	62
260 ± 50	SA	-1651	"	57
260 ± 30	LSA	-1610	"	63
250 ± 45	Iron Age	- 434	"	57
230 ± 40	Iron Age	- 433	"	"
220 ± 50	SA	-1834	"	54
220 ± 50	Iron Age	- 432	"	57
220 ± 35	LSA	-1578	"	63
220 ± 30	LSA	-1378	"	60
210 ± 50	LSA	-1821	"	62
200 ± 40	LSA	-1784	"	"
200 ± 40	Historical	- 826	"	66
190 ± 40	SA	-1902	"	45
180 ± 60	LSA	-2014	"	64
180 ± 45	LSA	-1296	"	60
180 ± 40	LSA	-2106	"	"
150 ± 70	LSA	-1867	"	64
150 ± 35	LSA	-1380	"	60
130 ± 50	Iron Age	-2564	"	58
130 ± 45	LSA	-1184	"	51
120 ± 45	LSA	-1050	"	49
110 ± 50	SA	-2066	"	55
100 ± 50	LSA	-1183	"	51
100 ± 45	LSA	-1046	"	49
90 ± 60	LSA	-1868	"	60
90 ± 40	SA	-1895	"	45
80 ± 50	Historical	- 722	"	66
80 ± 45	LSA	-1638	"	63
80 ± 45	LSA	- 676	"	64
80 ± 40	LSA	-2265	"	49
80 ± 35	Iron Age	-1627	"	58
70 ± 50	SA	-2361	"	54
50 ± 45	LSA	-1991	"	52
50 ± 45	LSA	-1625	"	59
40 ± 50	SA	-1132	"	52
30 ± 50	LSA	-2082	"	53
30 ± 35	LSA	-2143	"	52
20 ± 50	SA	-2107	"	59
106,5 0.6%	SA	-1923	"	50
	BELGIUM			
4470±220	Roman	IRPA-282	1	35
3340±190	Roman	-337	"	"
3230±160	Roman	-338	"	"
3140±170	Roman	-283	"	"
2380±130	Roman	-284I	"	"
2120±120	Roman	-284II	"	"
1100±230	Medieval	-220	"	36
830 ± 50	Medieval	-294	"	35
780 ± 40	Medieval	-293	"	"
460 ± 90	Medieval	-346	"	"

ARCHAEOLOGIC SAMPLES

BRITAIN

Date	Culture or Period	Sample No.	No.	Pg.
8770 ± 90	Misassociated	BM-1544	1	16
6760±240	"	-1604	"	18
4730±360	"	-1606	"	"
3770 ± 35	Bronze Age	-1668	"	21
3720±120	"	-1545	"	16
3630 ± 50	"	-1593	"	17
3580 ± 40	"	-1669	"	21
3430±110	"	-1411	"	15
3290 ± 90	"	-1631	"	19
3270 ± 60	"	-1609	"	18
3250 ± 35	"	-1681	"	22
3250 ± 50	"	-1607	"	18
3240±140	"	-1592	"	17
3200±100	"	-1594	"	"
3190 ± 35	"	-1680	"	22
3150 ± 60	"	-1410	"	15
3150 ± 80	"	-1611	"	18
3150 ± 80	"	-1610	"	"
3140 ± 45	"	-1640	"	20
3060 ± 50	"	-1608	"	18
3000 ± 40	"	-1590	"	16
2900 ± 40	"	-1714	"	22
2900 ± 40	"	-1646	"	20
2860 ± 40	"	-1715	"	22
2840 ± 35	"	-1645	"	20
2830±100	"	-1716	"	22
2820 ± 40	"	-1647	"	21
2820±110	"	-1596	"	17
2810 ± 35	"	-1679	"	22
2810 ± 60	"	-1648	"	21
2800 ± 60	"	-1430	"	16
2790 ± 35	"	-1591	"	17
2790 ± 40	"	-1643	"	20
2790 ± 50	"	-1717	"	22
2780 ± 35	"	-1632	"	20
2740 ± 60	"	-1713	"	22
2720±110	"	-1622	"	19
2710 ± 40	"	-1644	"	20
2670 ± 45	"	-1649	"	21
2670 ± 90	"	-1625	"	19
2490±110	"	-1612	"	18
2460 ± 80	"	-1623	"	19
2450 ± 70	"	-1624	"	"
2360 ± 60	"	-1621	"	"
2360 ± 90	"	-1620	"	"
2240±120	"	-1595	"	17
2210 ± 40	"	-1429	"	16
1000 ± 60	Misassociated	-1605	"	18

CANADA

Date	Culture or Period	Sample No.	No.	Pg.
16,910±270		S- 944	1	95
8690±690	Archaic	-1292	"	112
8300±200	Northwest Old Cordillera	- 142	"	94
7930±500	Shield Archaic	- 834	"	100
7660±110	Plains Cody	-1084	"	108
7400±140		- 679	"	96
6660±150	Laurentian	-1154	"	109
6230 ± 80		-1596	"	122
6220 ± 70	Maritime Archaic	-1262	"	111
6150±110		-1457	"	124
6010±100	Moresby	- 677	"	96
6010±130	Agate Basin	-1052	"	100
5760±140		-1448	"	124
5670±140		-1527	"	125
5550±120	Agate Basin	- 813	"	100
5490±100	Shield Archaic	-1026	"	103
5070 ± 80	" "	- 981	"	102
5000±100	Maritime Archaic	-1540	"	127
4950 ± 90	Shield Archaic	-1005	"	102
4930±100	Oxbow	- 577	"	95
4900 ± 80	Laurentian	-1263	"	109
4800±200		- 10	"	94
4790±130	Shield Archaic	- 812	"	99
4770±170	" "	- 979	"	102
4770±170	" "	- 980	"	"
4730±130		-1526	"	125
4650±200		- 9	"	94
4470±120	Plains Cody	-1082	"	108
4550 ± 60	Arctic Small Tool	-1660		132
4390 ± 90	Oxbow	-1447		124
4220±130	McKean	-1210		105

CANADA (cont.)

Date	Culture or Period	Sample No.	No.	Pg.
4160±120		S- 676	1	95
4130±120	Cody	-1083	"	108
4040±130	Plains Archaic	-1435	"	122
3930±110	McKean	-1013	"	105
3830±130		-1301	"	113
3790 ± 60	Artic Small Tool	-1662	"	132
3740 100	McKean	-1209	"	105
3720 ± 80		-1023	"	103
3680±160	Shield Archaic	- 982	"	103
3540 ± 60	" "	-1541	"	127
3500 ± 70		-1593	"	119
3480 ± 70	Pelican Lake	-1012	"	105
3430 ± 60	Artic Small Tool	-1661	"	132
3360 ± 80	Middle Woodland	-1300	"	115
3360±100	Pelican Lake	- 651	"	95
3280 ± 80	Taltheilei	-1006	"	104
3250 ± 50	McKean	-1574	"	129
3120±430	Laurel	-1265	"	111
3010±110		-1290	"	112
3000 ± 70		-1674	"	133
2940±210		-1434	"	122
2860±210	Oxbow-McKean	-1029	"	105
2830±260	" "	-1030	"	"
2800 ± 50		-1595	"	122
2790 ± 90	Artic Small Tool	- 978	"	102
2770±100	Pelican Lake	-1011	"	104
2640 ± 50		-1605	"	131
2610±210	Taltheilei	-1025	"	103
2580 ± 80	"	-1531	"	123
2580±170	Middle Woodland	-1291	"	114
2570±120	Early Taltheilei	-1135	"	109
2530 ± 50		-1609	"	119
2510 ± 90		- 675	"	95
2490 ± 50		-1589	"	119
2490 ± 70		-1429	"	122
2490±250	Laurel	-1266	"	112
2480 ± 50		-1594	"	119
2480 ± 60	Early Taltheilei	-1440	"	123
2470 ± 70	Early Woodland	-1288	"	114
2470 ± 90	Pelican Lake	- 912	"	100
2410±100		-1415	"	119
2410±240		-1417	"	119
2390±110	Early Taltheilei	-1436	"	122
2390±170	" "	-1437	"	123
2370 ± 70		-1608	"	119
2340 ± 60	Early Point Peninsula	-1600	"	130
2280 ± 90		- 767	"	98
2270 ± 80		- 194	"	95
2240 ± 80	Early Taltheilei	-1022	"	103
2210±120	Dorset	-1637	"	131
2180 ± 70		- 932	"	101
2150 ± 70		-1606	"	131
2150±130		-1157	"	109
2090 ± 50		-1202	"	110
2080±120	Early Taltheilei	-1024	"	103
2070 ± 50	Artic Small Tool	-1689	"	132
2060±130	Oxbow-McKean	-1032	"	105
2010 ± 60		- 678	"	96
1990 ± 80	Taltheilei	-1019	"	104
1980 ± 90	Besant	-1522	"	125
1940±100	Dorset	-1203	"	110
1920 ± 80	Late Taltheilei	-1020	"	103
1910 ± 70	Sonota	-1640	"	132
1890±110		- 933	"	101
1880 ± 90	Dorset	- 880	"	99
1870 ± 60		-1416	"	119
1860 ± 70		-1544	"	127
1860±130	Middle Taltheilei	-1439	"	123
1850±100	Oxbow-McKean	-1031	"	105
1750 ± 70		-1428	"	121
1710 ± 40	Sonota	-1641	"	132
1690±150	Dorset	- 847	"	98
1680 ± 50		-1607	"	131
1680±150	Cody	-1081	"	108
1630±130	Middle Taltheilei	- 977	"	102
1590±100	Dorset	- 848	"	98
1570 ± 60	Thule	-1532	"	125
1560 ± 80	Middle Taltheilei	-1008	"	102
1550 ± 60	Dorset	-1206	"	110
1550 ± 60	Early Taltheilei	-1438	"	123
1550 ± 70	Late Woodland	-1442	"	124
1530±100	Dorset	- 883	"	99
1520 ± 70	"	- 849	"	98

Date	Culture or Period	Sample No.	No.	Pg.
	CANADA (cont.)			
1510 ± 90	Thule	S-1534	1	126
1490 ± 70	Dorset	- 846	"	98
1470 ± 90	"	-1204	"	110
1450 ± 50	Artic Small Tool	-1553	"	129
1430 ± 80	Late Woodland	- 688	"	97
1430±150	Sonota	-1338	"	100
1420 ± 70		-1010	"	103
1420 ± 70		-1602	"	130
1420±100	Dorset	- 931	"	101
1390 ± 40		-1575	"	129
1380 ± 90	Thule	-1421	"	121
1360 ± 60	Blackduck	-1303	"	116
1350 ± 80	Middle Taltheilei	-1528	"	124
1340 ± 70	Thule	-1423	"	121
1320 ± 90	Dorset	- 879	"	98
1320±100	Late Woodland	- 687B	"	98
1310 ± 70	Thule	-1424	"	121
1310 ± 90	Dorset	- 845	"	98
1300 ± 70	Middle Woodland	-1289	"	112
1290±110	" "	-1299	"	"
1280 ± 60	Dorset	-1207	"	110
1270 ± 70	Besant	-1506	"	125
1240±120	Middle Woodland	-1268	"	113
1170 ± 90	Blackduck	- 652	"	95
1160 ± 70		-1601	"	130
1140 ± 70	Blackduck	-1367	"	118
1130 ± 90		-1325	"	117
1130±140		-1295	"	115
1110 ± 60	Blackduck	-1272	"	114
1110 ± 80	Late Woodland	- 687a	"	97
1090 ± 90	Dorset	-1205	"	110
1070 ± 40		-1583	"	129
1070 ± 70	Thule	-1320	"	116
1060 ± 60	Late Taltheilei	-1529	"	123
1060 ± 70	Terminal Woodland	-1548	"	128
1050±100	Middle Taltheilei	-1009	"	103
1040 ± 50	Blackduck	-1273	"	114
1040 ± 70	Middle Taltheilei	-1441	"	123
1040 ± 80	" "	-1530	"	"
1040±190	Oxbow-McKean	-1034	"	105
1020 ± 60	Blackduck	-1366	"	118
1020±100	Oxbow-McKean	-1033	"	105
1020±230	Taltheilei	-1158a	"	103
1010 ± 60	Late Woodland	- 741	"	97
1010 ± 60		-1610	"	119
1010 ± 70	Late Taltheilei	-1021	"	103
1010±100	Thule	-1323	"	117
1000±110	"	-1422	"	121
990 ± 70	Blackduck	-1368	"	118
990±100	Thule	-1533	"	125
930 ± 70	Late Woodland	- 739	"	97
920 ± 50		-1631	"	131
920 ± 60	Blackduck	- 913	"	100
920 ± 70	Maritime Archaic	-1542	"	127
910 ± 60	Thule	-1322	"	117
880 ± 60		-1612	"	119
870±130		-1269	"	113
860 ± 70	Thule	- 766	"	98
860 ± 70	Late Woodland	-1287	"	114
850 ± 80	Blackduck	- 690	"	97
850±100	Thule	- 882	"	99
840 ± 60		-1446	"	119
840 ± 60	Micmac	-1603	"	130
830 ± 70	Thule	-1324	"	117
800 ± 60		-1537	"	126
770±460	Norton	- 921	"	100
760±100		- 930	"	101
710 ± 60		-1051	"	107
700 ± 50	Micmac	-1604	"	130
670 ± 70	Late Woodland	- 740	"	97
670±180	" "	- 743	"	97
620 ± 80	Thule	-1327	"	118
620 ± 50		-1723	"	133
620 ± 70		-1539	"	126
600 ± 40	Algonkian	-1552	"	128
550 ± 70	Thule	-1420	"	120
540 ± 60		-1050	"	107
530 ± 80		-1321	"	116
530 ± 80		-1373	"	118
530 ± 80	Huron	-1536	"	126
530 ± 90	Terminal Woodland	-1294	"	115
500 ± 50	Chilcotin	-1611	"	119
500±130	Late Woodland	- 686	"	96
480 ± 50	Old Women	-1238	"	110
470 ± 70		S-1554	1	129
430 ± 50	Chilcotin	-1591	"	119
430 ± 80	Huron	-1535	"	126
430 ± 80	Terminal Woodland	-1547	"	128
400 ± 40	Huron	-1724	"	133
400 ± 80	"	-1538	"	126
380 ± 50		-1240	"	111
380 ± 90		-1239	"	"
370 ± 80		-1372	"	118
350 ± 60	Iroquois	-1298	"	112
350 ± 40	Coast Salish	-1271	"	113
350±130	Late Woodland	- 689	"	97
340 ± 50	Chilcotin	-1590	"	119
320 ± 60	Thule	-1302	"	116
310±110		-1264	"	111
310 ± 60		-1152	"	107
310 ± 80		-1267	"	112
300 ± 60	Algonkian	-1549	"	128
290 ± 40	"	-1551	"	"
280 ± 50	Coast Salish	-1270	"	113
270 ± 60		-1151	"	107
270 ± 90	Chipewyan	-1159	"	103
220 ± 60	Athapaskan	-1319	"	116
220±110		-1158b	"	103
180 ± 40	Chilcotin	-1592	"	119
170 ± 90	Blackduck	-1297	"	115
140 ± 60		-1221	"	110
140 ± 70		-1048	"	107
90 ± 60	Algonkian	-1550	"	128
90±140		-1326	"	117
80 ± 70		-1293	"	115
60 ± 70		-1049	"	107
Modern		-1007	"	102
Modern		-1296	"	115
Modern		-1543	"	127
	ECUADOR			
2930 ± 70	Machalilla Culture	WIS-1125	1	150
2880 ± 80	" "	-1141	"	"
2790 ± 80	" "	-1140	"	"
1350 ± 70	Milagro Complex	-1145	"	"
1270 ± 70	" "	-1150	"	"
	EGYPT			
4900 ± 70	Late Amratian to Early Gerzean	WIS-1152	1	151
4820 ± 80	Late Amratian to Early Gerzean	-1153	"	"
4800 ± 80	Early Amratian	-1183	"	152
4760 ± 80	" "	-1169	"	151
4750 ± 80	Late Amratian to Early Gerzean	-1151		"
4710 ± 80	Late Amratian to Early Gerzean	-1168	"	"
4680 ± 80	Early Amratian	-1182	"	"
4670 ± 80	" "	-1184	"	152
4570 ± 80	Late Amratian to Early Gerzean	-1181		"
4300 ± 80	Late Gerzean to Dynasty 0	-1180	"	"
	INDIA			
$14,400^{+340}_{-320}$	Upper Paleolithic	PRL-470	1	40
3740±160	Late Harappan	-511	"	"
3600±150	" "	-426	""	39
3570±150	" "	-509	"	40
3550±150	" "	-510	"	"
3540±150	" "	-513	"	"
3400±110	Buff & Cream Ware	-428	"	39
3390±150	Sawalda	-429	"	"
3350±110	Late Harappan	-512	"	40
3300±100	Neolithic	-407	"	39
3260±150	"	-409	"	40
3250±110	Malwa	-412	"	39
3230±100	Malwa & Jorwe	-411	"	"
3190±110	Neolithic	-408	"	"
2980±110	Buff & Cream Ware	-419	"	"
2350±140	Early Historical	-456	"	38
2190±100	" "	-452	"	"

ARCHAEOLOGIC SAMPLES

Date	Culture or Period	Sample No.	No.	Pg.
	INDIA			
2070 ± 90	N.Black Polished Ware	PRL-466	1	38
1990 ± 90	Black Slipped Ware	517	"	"
1990±140	N.Black Polished Ware	462	"	41
1980±100	Black Slipped Ware	518	"	"
1940±100	Gray & Red Ware	515	"	40
1920±150	Early Historical	458	"	38
1920 ± 90	" "	459	"	"
1910 ± 90	N.Black Polished Ware	467	"	39
1870±100	Black Slipped Ware	516	"	40
1640±140	Red Ware	392	"	"
1520±140	" "	394	"	"
1410±140	Late Harappan (?)	420	"	39
	IRAQ			
5180±250	Amorite	IRPA-307	1	36
4160±210	"	-306	"	"
4070±230	"	-304	"	"
4030±200	"	-305	"	"
4010±200	"	-310	"	"
3910±200	"	-309	"	"
	SYRIA			
3710±210	Lower Bronze	IRPA-215	1	37
3500±170	" "	-213	"	"
3195±150	" "	-214	"	"
1400 ± 80	Abbaside	-205	"	36
1310 ± 80	"	-212	"	37
1280 ± 70	"	-209	"	36
1090 ± 80	"	-208	"	"
910 ± 70	"	-210	"	37
580 ± 30	"	-206	"	36
	UNITED STATES			
ALASKA				
4480±130	Ocean Bay II	S-1418	1	120
4480±160	" "	-1419	"	"
2560±300		-1040	"	106
2310 ± 70	Kachemak	-1062	"	108
2250±120	"	-1041	"	106
1750 ± 70	"	-1042	"	"
1750±130	"	-1043	"	"
1710 ± 70	"	-1063	"	108
1630 ± 70	"	-1055	"	106
1560 ± 80	"	-1054	"	"
290±100	Koyukuk	- 975	"	101
ILLINOIS				
990 ± 60	Middle Mississippi	WIS-1136	1	146
940 ± 60	" "	-1128	"	145
920 ± 60	" "	-1130	"	"
890 ± 60	" "	-1133	"	146
IOWA				
4100 ± 70	Middle Woodland	WIS-1083	1	146
3400 ± 70	" " (?)	-1144	"	153
NORTH DAKOTA				
760 ± 70	Extended Middle Missouri	WIS-1011	1	146
750 ± 60	" " "	1098	"	"
740 ± 60	" " "	1100	"	"
680 ± 70	" " "	1110	"	147
670 ± 70	" " "	1106	"	"
630 ± 60	" " "	1105	"	"
600 ± 70	" " "	1104	"	146
570 ± 70	" " "	1097	"	"
560 ± 60	" " "	1103	"	"
510 ± 70	" " "	1102	"	"
OKLAHOMA				
650 ± 70	Fort Coffee Phase	WIS-1119	1	148
630 ± 70	Early Fort Coffee Phase	-1116	"	147
580 ± 70	Fort Coffee Phase	-1111	"	"
570 ± 70	" " "	-1114	"	148
560 ± 60	" " "	-1112	"	147
490 ± 70	" " "	-1118	"	148
490 ± 70	" " "	-1117	"	"
480 ± 90	" " "	-1132	"	"
470 ± 60	" " "	-1115	"	"
400 ± 70	Early Fort Coffee Phase	-1109	"	147
370 ± 70	Fort Coffee Phase	-1113	"	"
SOUTH DAKOTA				
3930 ± 70	McKean Complex	WIS-1085	1	149
3520 ± 70	" "	-1086	"	"
1030 ± 60		-1084	"	"
TENNESSEE				
2920 ± 80	Late Archaic (Lauderdale Culture, Perry Phase)	WIS-1149	1	149
2350 ± 80	Alexander Culture, Hardin Phase	-1147	"	"
2000 ± 80	Alexander Culture, Hardin Phase	-1148	"	"

GEOCHEMICAL SAMPLES

AFRICA

Date		Depth	Sample No.	No.	Pg.
27,400±310	Fr.1	Om	Pta-2590	1	77
28,500±370	Fr.2	Om	-2591	"	77
28,100±480		Om	-2419	"	74
25,000±350		11.5m	-1862	"	75
24,800±320		2.85m	-1859	"	71
23,500±660		Om	-1822	"	75
22,400±210		Om	-2584	"	77
22,300±320		6.8m	-1492	"	75
21,300±260	Fr.1	Om	-2651	"	76
21,500±260	Fr.2	Om	-2652	"	76
21,500±190		Om	-2604	"	76
20,900±230		Om	-1091	"	76
20,100±220		38m	-1861	"	75
19,600±170		1m	-1860	"	75
18,100±160		8m	-2083	"	75
14,300±120		0m	-1502	"	73
13,300± 90		0m	-1043	"	73
12,700±100		30m	-1548	"	76
12,500±120	Fr 1	Om	-1647	"	70
12,600±140	Fr 2	Om	-1648	"	70
11,900±100		4.1m	-1238	"	70
11,800± 90	Fr 1	ca 4m	-1830	"	69
11,700±120	Fr 2	ca 4m	-1831	"	69
10,600±110		9m	-2008	"	75
9600 ±90		5-10cm	-1579	"	72
9460 ±90		0-5cm	-1503	"	72
8640 ±70		Om	-1501	"	72
7640 ±80		Om	-1287	"	71
6830 ±70		Om	-1580	"	76
6750 ±79		Om	-1235	"	69
5750 ±50		OM MSL	-1351	"	67
5340 ±60		+3.6m MSL	- 419	"	69
1580 ±50		1.2-1.8m MSL	- 417	"	69
940 ±50		50cm	-1827	"	71
940 ±35		+100m above tree line	-2583	"	77
920 ±50		50cm	-1826	"	71
480 ±45		-	-1835	"	78
440 ±50		Om	-1833	"	70
290 ±35		Om	-2632	"	78
260 ±70		-	- 889	"	79
180 ±40		3m	-2038	"	68
160 ±35		+300m above tree line	-2582	"	77
140 ±60		Om	-2638	"	78
80 ±50		13.7m	- 604	"	78
60 ±45		21.4m	- 689	"	78
(106.4±2.5)%		2.4m	-1646	"	72
(125.1±0.5)%		-	-2155	"	79
(128.3±0.5)%		-	-1907	"	79
(137.6±1.1)%		-	-2154	"	79
(146.9±0.6)%		-	-1838	"	79
(157.3±0.7)%		-	-1839	"	79
(159.1±0.8)%		1m	-2375	"	73

SOUTHEAST AFRICA

Date	Depth	Sample No.	No.	Pg.
>45,000	900m	IRPA -276	"	34
29,900±660	1200m	-248	"	"
21,300±570	900m	-275	"	"
19,600±470	1200m	-277	"	"

SOUTHWEST AFRICA - NAMIBIA

Date		Depth	Sample No.	No.	Pg.
>44,700		+ 3m MSL	-1332	"	67
43,200±2800		+ 9m MSL	-1333	"	67
42,500±3000		+ 4m MSL	-1334	"	67
37,800±1600		+10m MSL	-1336	"	67
37,400±1330		+13m MSL	-1335	"	67
35,600±1500		14m	-2330	"	74
34,500±1000		14m	-2329	"	74
30,700 ± 510	Fr 1	Om	-2426	"	74
32,700 ± 600	Fr 2	Om	-2427	"	74
31,900 ± 460	Fr 1	Om	-2588	"	77
31,600 ± 430	Fr 2	Om	-2589	"	77
29,400 ± 520		40m	-1493	"	74
28,900 ± 500		40m	-2355	"	74
28,900 ± 490		110m	-1494	"	74
28,500 ± 500		0m	-1197	"	73

UNITED STATES

NEVADA

Date	Depth	Sample No.	No.	Pg.
21,500±330	+1213.7m	DE-20	1	27
14,000±400	79.2m	-14	"	27
9900±210	36m	-11	"	25
9900±130	363m	-17	"	27
9300±120	10.6m	-21	"	27
8400±140	28.4m	-15	"	27
7600±150	153.9m	-13	"	25
7600±100	+1213.7m	-18	"	27
5300±160	146.3m	-12	"	25
3500± 60	73.2m	-19	"	27
1100±160	39.6m	-10	"	25
<100	+1182.6m	-16	"	27

NORTH CAROLINA

Date	Depth	Sample No.	No.	Pg.
2840±170	90-100cm	UM-2056	1	139
2700±130	142-168cm	-2057	"	"
2580 ± 90	238-262cm	-2054	"	"
2270 ± 80	206=230cm	-2058	"	"
1630 ± 90	176-200cm	-2055	"	"
360 ± 90	10-25cm	-2053	"	"

OREGON

Date	Depth	Sample No.	No.	Pg.
3100±160	139.3m	DE-1	1	24
3000±140	87m	-5	"	25
2600±210	86m	-3	"	"
100±140	86m	-4	"	"
<100	26.5m	-6	"	"
< 50	68.9m	-2	"	24

SOUTH DAKOTA

Date	Depth	Sample No.	No.	Pg.
>41,400	161.5m	DE-47	1	30
>40,400	143.3m	-44	"	29
>40,300	378.1m	-30	"	28
>39,700	780.9m	-41	"	29
>39,200	938.8m	-48	"	30
>37,500	640m	-23	"	28
>36,600	807.7m	-51	"	30
>36,100	722.4m	-24	"	28
>35,700	832.1m	-42	"	29
>35,400	792.5m	-40	"	29
>34,100	349.9m	-33	"	28
>33,400	378.6m	-34	"	29
32,300±1000	342.9m	-31	"	28
31,900±1700	515.4m	-35	"	29
>30,700	592.8m	-29	"	28
>30,600	192m	-27	"	28
>30,500	124.1m	-45	"	30
30,400±1000	865.6m	-52	"	"
29,900±1600	274.3m	-28	"	28
29.900±1400	259.1m	-39	"	29
29,000±1400	409.3m	-36	"	"
28,800±1100	722.4m	-37	"	"
>28,400	204.8m	-43	"	"
>28,300	581.2m	-32	"	28
28,300±100	731.5m	-50	"	30
>26,200	103.6m	-26	"	28
>23,000	457.2m	-38	"	29
18,300±300	182m	-22	"	28
17,400±230	609m	-49	"	30
8100±140	131.1m	-25	"	28
4000±140	99.1m	-46	"	30

UTAH

Date	Depth	Sample No.	No.	Pg.
>35,600	141.0m	DE-7	1	25
31,000±840	219.5	-8	"	"
27,700±850	335.3	-9	"	"

GEOCHEMICAL SAMPLES

Date	Depth	Sample No.	No.	Pg.
WYOMING				
>40,000	378m	DE-54	1	30
>39,200	221m	63	"	31
>39,200	507.5m	57	"	"
>36,000	345.6m	67	"	"
36,000±2600	247.3m	61	"	"
>35,000	88.4m	60	"	"
33,500±1900	118.9m	58	"	"
33,300±2100	422.8m	68	"	"
18,600 ± 280	213.4m	64	"	"
17,500 ± 370	134.7m	55	"	30
14,200 ± 350	187.1m	53	"	"
10,100 ± 180	33.5m	65	"	31
8900 ± 160	106.7m	56	"	30
8100 ± 180	14m	66	"	31
4200 ± 140	152.4m	62	"	"
<50	28m	59	"	"

GEOLOGIC SAMPLES

Date	Depth or Altitude	Sample No.	No.	Pg.
	AUSTRALIA			
>37,300	ca mean level	ANU-1282	1	5
>34,400	water level	-1281	"	"
>30,350	"	-1280	"	"
6920	"	-1284	"	"
6380	"	-1395	"	"
6610	"	-1283	"	"
6310	"	-1640	"	4
6080	"	-1603	"	10
5850	"	-1287	"	7
5800	"	-1286	"	8
5260	"	-1721	"	4
4980	"	-1639	"	"
4960	"	-1639R	"	"
4910	"	-1479	"	9
4870	"	-1207	"	8
4420	"	-1478	"	9
4380	"	-1559	"	5
4310	"	-1394	"	7
3900	"	-1558	"	10
3750	"	-1380	"	11
3700	"	-1285	"	9
3640	"	-1554	"	11
3550	"	-1413	"	8
3540	"	-1383	"	9
3420	"	-1592	"	"
3350	"	-1553	"	11
3330	"	-1595	"	8
3320	"	-1604	"	10
3320	"	-1388	"	9
3280	"	-1642	"	7
3240	"	-1555	"	4
3230	"	-1410	"	7
3220	"	-1414	"	11
3160	"	-1664	"	4
3130	"	-1663	"	"
3050	"	-1382	"	11
3020	"	-1412	"	"
2990	"	-1643	"	"
2960	"	-1560	"	10
2950	"	-1387	"	4
2840	"	-1208	"	6
2760	"	-1598	"	8
2670	"	-1596	"	"
2550	"	-1557	"	12
2480	"	-1597	"	8
2420	"	-1605	"	7
2370	"	-1384	"	8
2350	"	-1602	"	9
2330	"	-1556	"	8
2330	"	-1606	"	12
2260	"	-1381	"	11
2210	"	-1480B	"	9
2190	"	-1641	"	10
2040	"	-1609	"	6
2030	"	-1386	"	5
1550	"	-1391	"	7
1480	"	-1392	"	"
1460	"	-1475	"	11
1430	"	-1477	"	9
1210	"	-1599	"	11
1180	"	-1591	"	4
1100	"	-1480A	"	9
1070	"	-1411	"	8
>850	"	-1600	"	11
810	"	-1390	"	7
800	"	-1593	"	12
800	"	-1594	"	10
760	"	-1608	"	6
740	"	-1607A	"	12
640	"	-1393	"	7
640	"	-1385	"	6
560	"	-1607B	"	12
520	"	-1476	"	10
510	"	-1389	"	7
470	"	-1871	"	10
380	"	-1601	"	12
+115.3 8.4%	"	-1273B	"	6
+122.2 6.6%	"	-1273A	"	"
+129.2 7.7%	"	-1272A	"	"
+173.1 8.5%	"	-1272B	"	"

Date	Depth or Altitude	Sample No.	No.	Pg.
	BAHAMAS			
23,700±650	1.2m above mean tide	UM-2114	1	144
	BELGIUM			
4770±220	270cm	IRRA-288	1	33
4300±200	265cm	-292	"	"
4260±210	200cm	-291	"	"
4240±190	200 to 215cm	-335	"	34
4030±400	135cm	-290	"	33
3965±190	170cm	-287	"	"
3735±140	155cm	-286	"	"
3450±180	175 to 185cm	-334	"	34
3340±170	130 to 140cm	-336	"	"
3250±150	100cm	-289	"	33
2080±140	100cm	-285	"	"
	INDIA			
>35,000	0.22m	PRL-498	1	41
>35,000	0.22m	-499	"	"
$25,200^{+1800}_{-1500}$	197m	-451	"	42
$15,300^{+590}_{-550}$		-497	"	41
5600 ± 120	15.1m	-449	"	"
5550 ± 110	1.2m	-450	"	"
2780 ± 110		-484	"	42
1620 ± 100		-479	"	"
670 ± 100	+4m	-472	"	41
280 ± 90		-477	"	42
Modern		-481	"	"
Modern	1.51m	-448	"	41
	SCOTLAND			
11,760±250	540cm	Q-1266	1	92
11,120±220	514cm	-1267	"	"
9740±170	469cm	-1268	"	93
9690±140	708cm	-1417	"	88
9640±110	1575cm	-1424	"	89
9610±150	735cm	-1301	"	85
9430±150	673cm	-1280	"	84
9430±110	405cm	-1325	"	86
9250±120	425cm	-1518	"	90
9230±130	698cm	-1416	"	88
9200±120	649cm	-1279	"	84
9140±140	300cm	-1531	"	91
9100±150	457cm	-1450	"	89
8950±140	624cm	-1278	"	84
8670±150	432cm	-1269	"	93
8650±100	360cm	-1326	"	87
8630±100	410cm	-1517	"	90
8310±130	584cm	-1277	"	84
8240±150	677cm	-1302	"	85
8150±150	400cm	-1449	"	89
7650±120	375cm	-1270	"	93
7570 ± 80	295cm	-1327	"	87
7490±110	615cm	-1415	"	88
7280 ± 80	347cm	-1516	"	90
6930 ± 80	1375cm	-1423	"	89
6810±110	357cm	-1271	"	93
6740±100	300cm	-1448	"	90
6720 ± 70	225cm	-1328	"	87
6590±110	630cm	-1303	"	85
6500±130	514cm	-1276	"	84
6160±100	330cm	-1272	"	93
6140±110	615cm	-1304	"	85
6060±100	1260cm	-1422	"	89
5920 ± 80	287cm	-1515	"	90
5670±120	262cm	-1530	"	92
5250 ± 80	247cm	-1514	"	91
5240±110	454cm	-1275	"	84
5210 ± 80	543cm	-1414	"	88
5160±100	577cm	-1305	"	85
4840 ± 90	162cm	-1443	"	87
4760 ± 80	205cm	-1447	"	90
4650 ± 70	498cm	-1413	"	88
4630 ± 80	512cm	-1306	"	86
4570 ± 90	212cm	-1529	"	92
4560 ± 80	1030cm	-1421	"	89
4340±100	383cm	-1274	"	84
4090 ± 70	167cm	-1513	"	91

GEOLOGIC SAMPLES

Date	Depth or Altitude	Sample No.	No.	Pg.
	SCOTLAND (cont.)			
4030 ± 60	437cm	Q-1307	1	86
3810±100	453cm	-1412	"	88
3520 ± 70	162cm	-1528	"	92
3480 ± 80	875cm	-1420	"	89
3420 ± 80	120cm	-1444	"	87
3300 ± 90	272cm	-1273	"	84
3290 ± 70	142cm	-1512	"	91
3170 ± 50	352cm	-1308	"	86
3070 ± 80	105cm	-1445	"	87
2930 ± 80	353cm	-1411	"	88
2760 ± 50	252cm	-1309	"	86
2610 ± 80	695cm	-1419	"	89
2420 ± 80	253cm	-1410	"	88
2350 ± 50	112cm	-1527	"	92
2210 ± 50	80cm	-1329	"	87
1930 ± 50	152cm	-1310	"	86
1680 ± 50	67cm	-1511	"	91
1570 ± 80	172cm	-1265	"	84
1340 ± 40	62cm	-1526	"	92
1110 ± 60	115cm	-1446	"	90
790 ± 60	325cm	-1418	"	89
	UNITED STATES			
ALABAMA				
8330 ± 90	205-212cm	WIS-1186	1	152
CALIFORNIA				
>34,600	185cm	UM-2132	"	142
>31,200	12.1m below mean low water	-2119	"	141
>29,400	14m	-2129	"	142
27,300±570	10m below mean low water	-2118	"	141
26,300±560		-2134	"	141
$22,200^{+1630}_{-1360}$		-2143	"	142
11,400±240	6m	-2128	"	141
4150±100	6-6.2m	-2081	"	140
2930±100		-2133	"	142
2220±110		-2147	"	143
2160 ± 90	155-160cm	-2145	"	142
2090±110	3.3-3.6m	-2082	"	140
1670 ± 90	10m	-2125	"	141
1510 ± 90	75-80cm	-2146	"	142
1490±170		-2141	"	142
1350 ± 90		-2124	"	141
1350 ± 90		-2127	"	"
1020 ± 90		-2126	"	"
890 ± 80	20-25cm	-2079	"	140
840 ± 70	20-30cm	-2144	"	142
690 ± 70		-2080	"	140
610 ± 80	30cm	-2149	"	143
540±120	20-25cm	-2078	"	140
400±100		-2148	"	143
FLORIDA				
24,000±450	40.7mm	UM-2013	1	138
18,700±400	20.7mm	-2012	"	"
18,600±310	30.7mm	-2014	"	"
9770±160	50-56cm	-2075	"	"
8290±150		-2074	"	"
8030±160	122-127cm	-2008	"	137
6210±120		-2072	"	"
5210±120	143-158cm	-2005	"	"
4790±150		-2032	"	136
3860±130	116-122cm	-2007	"	137
3070 ± 80		-2028	"	136
2830±120		-2029A	"	"
2560 ± 80		-2030	"	"
2540 ± 90	7.2mm	-2011	"	138
2400±130		-2025	"	137
2350 ± 90		-2031	"	136
2160±130	10.7mm	-2010	"	138
1840±110		-2022	"	137
1590 ± 90		-2026	"	"
1510±180	53-66cm	-2006	"	"
1370 ± 80		-2029B	"	136
1360±100		-2024	"	137
1320 ± 90	62-69cm	-2136	"	138
1230 ± 90		-2021	"	137
990 ± 80	50-53cm	-2223	"	138

Date	Depth or Altitude	Sample No.	No.	Pg
	FLORIDA (cont.)			
960±110		UM-2027	1	137
920±100	12-24cm	-2224	"	138
900±130	18-23cm	-2135	"	"
540 ± 80	38-50cm	-2009	"	137
390±190	1.7mm	-2071	"	138
109% Modern		-2023	"	137
IDAHO				
400 ± 70	+2804m	WIS-1167	1	152
IOWA				
2160 ± 70	5.2m	WIS-1146	1	152
MASSACHUSETTS				
14,000±130	741-753cm	WIS-1122	1	155
11,500±170	819-825cm	-1177	"	154
10,290±100	703.5-692.5cm	-1123	"	155
10,170±100	1591-1597cm	-1185	"	154
9800±100	701-704cm	-1108	"	"
8970 ± 90	665-655cm	-1121	"	155
8720 ± 80	99-101cm	-1171	"	153
7520 ± 80	530-539cm	-1124	"	154
7250 ± 80	367-382cm	-1179	"	153
6980 ± 90	738-743.5cm	-1127	"	154
6700 ± 80	349-351cm	-1172	"	"
6540 ± 80	1654.5-1659.5cm	-1120	"	153
5240 ± 80	7m	-1129	"	154
5170 ± 80	270-272cm	-1178	"	153
3510 ± 70	204.2-207.7cm	-1176	"	154
3170 ± 70	228-234cm	-1107	"	153
2940 ± 70	226cm	-1126	"	155
1070 ± 70	36cm	-1170	"	153
MICHIGAN				
9540±100	8.57-8.60m	WIS-1079	1	155
8410 ± 80	7.42-7.51m	1080	"	"
4130 ± 70	4.77-4.86m	1077	"	"
1200 ± 70	2.22-2.31m	1076	"	"
MINNESOTA				
7400 ± 80	721-729cm	WIS-1157	1	156
6830 ± 80	745-750cm	-1155	"	"
5800 ± 80	687-695cm	-1165	"	"
5430 ± 70	643-651cm	-1156	"	"
1480	256-266cm	-1158	"	"
NEW YORK				
4570 ± 70	501-525cm	-1096	1	156
3120 ± 70	161-179cm	-1098	"	"
WISCONSIN				
13,000±110	.5-1455.5cm	WIS-1089	1	157
10,710±100	1284-1296cm	-1137	"	"
9590±100	317.5-322cm	-1069	"	158
8960±110	1184-1194cm	-1134	"	157
8280±100	2.2m	-1091	"	158
7700 ± 70	189-192cm	-1090	"	"
7690 ± 90	260-270cm	-1161	"	159
7210±100	1036-1044cm	-1143	"	157
7090 ± 80	990-1000cm	-1135	"	"
4420 ± 80	315-245cm	-1174	"	159
4380 ± 70	59-62cm	-1088	"	158
4200 ± 70	787-795cm	-1138	"	157
3980 ± 80	435-445cm	-1131	"	"
3400 ± 70	290-320cm	-1173	"	159
3310 ± 70	205-235cm	-1175	"	160
2910 ± 70	1.8m	-1092	"	159
2750 ± 70	215-220cm	-1159	"	"
2530 ± 60	1.4m	-1087	"	158
2520 ± 70	538-542cm	-1142	"	157
2390 ± 80	3m	-1093	"	159
1990 ± 70	2.3m	-1095	"	"
1970 ± 80	200-230cm	-1162	"	"
1640 ± 70	2m	-1082	"	158
1160 ± 60	1.35m	-1094	"	159
1140 ± 70	90-100cm	-1160	"	"
1040 ± 70	231-239cm	-1139	"	158

GEOLOGIC SAMPLES

Date	Depth or Altitude	Sample No.	No.	Pg.
	UNITED STATES (cont.)			
NORTH CAROLINA				
5400±170	24.5-25cm	UM-2103	1	139
5000±560	9-10cm	-2105	"	140
4780 ± 90	23.5cm	-2104	"	139
4670 ± 90	17.5-18.5cm	-2099	"	"
4360±100	13-14.5cm	-2106	"	140
4100 ± 90	16-17cm	-2098	"	139
3760 ± 80	12-13cm	-2107	"	140
2930 ± 90	10.5-11cm	-2108	"	"
3780±100	16-17cm	-2095	"	139
2560±110	8-8.5cm	-2097	"	"

Date	Depth or Altitude	Sample No.	No.	Pg.
1860±130	12-13cm	-2093	"	"
1550±100	9-10cm	-2100	"	"
OREGON				
360±100	∿5-7.5cm	UM-2121	1	141
350 ± 60	∿1.8m	2120	"	"
	U.S.S.R.			
9050±90	6.5m	WIS-1196	1	160
5110±80	3.5m	-1194	"	"
1290±80	1.5m	-1195	"	"

OCEANOGRAPHIC SAMPLES

Date	Depth	Sample No.	No.	Pg.
	BAHAMAS			
24,800±910		UM-2076	1	143
21,100±640		-1052		"
20,130±490		-2077		"
20,200±550		-2061		"
3720±150		-2051		"
1610±160		-2069		"
	PACIFIC OCEAN			
$29,000^{+1300}_{-1100}$	280-330mm	PLR-438	1	42
$21,600^{+890}_{-800}$	200-250mm	-437	"	"
$15,900^{+290}_{-280}$	150-200mm	-561	"	"
9760 ± 220	70-90mm	-435	"	"
8610 ± 140	50-70mm	-560	"	"
6750 ± 180	30-40mm	-559	"	"
6220 ± 100	40-50mm	-434	"	"
4880 ± 160	15-20mm	-433	"	"
4490 ± 130	5-10mm	-431	"	"
4170 ± 160	0-5mm	-430	"	"
3220 ± 150	10-15mm	-432	"	"
	SOUTH EAST ATLANTIC OCEAN			
43,600±2800	190.6m	Pta-1167	1	68
27,800 ± 440	78.4m	-1104	"	"
16,100 ± 160	87.2m	-1105	"	"
14,500 ± 130	156.1m	-1166	"	"

Date	Depth	Sample No.	No.	Pg.
14,500 ± 140	112.0m	-1101	"	"
14,300 ± 130	81.2m	- 951	"	"
14,000 ± 160	72,2m	- 949	"	"
13,600 ± 120	76.5m	- 955	"	"
13,600 ± 120	103.6m	-1164	"	"
13,000 ± 110	104.6m	- 956	"	"
13,000 ± 110	99.3m	- 958	"	"
12,900 ± 120	71.3m	- 957	"	"
10,800 ± 90	156.0m	-1165	"	"
10,300 ± 100	111.9m	- 952	"	"
7650 ± 80	20.3m	-1098	"	"
7400 ± 90	20.4m	-1099	"	"
5950 ± 140	59.5m	- 947	"	"
5930 ± 80	66.4m	- 948	"	"
5850 ± 70	97.9m	- 945	"	"
4500 ± 80	58.4m	-1163	"	"
3370 ± 60	77.1m	-1100	"	"
3130 ± 50	89.9m	-1162	"	"
	SOUTHEAST INDIAN OCEAN			
24,400±870	54-57cm	UM-2017	1	144
16,900	24-27cm	-2016	"	"
10,300±310	54-57cm	-2020	"	"
7530±130	25-27cm	-2019	"	"
5950±210	4-7cm	-2015	"	"
3200±140	5-8cm	-2018	"	"
	NORTH SEA			
1980±110		IRRA-333	"	"

ARCHAEOLOGIC SAMPLES

Date	Culture or Period	Sample No.	No.	Pg.
	ARGENTINA			
9340±120	Preceramic	P-2236	2	238
8420±530	"	-2280	"	"
1560±190	"	-2608	"	"
1420±190	Ceramic	-2477	"	"
	AUSTRIA			
23,500 +2500 −1600	Paleolithic	VRI-649	2	325
23,210 ± 510	"	-676	"	"
5430 ± 260		-577a	"	324
5250 ± 110		-577b	"	"
3010 ± 100	Urn Field Culture	-657	"	326
2940 ± 100		-673	"	325
2880 ± 90		-635	"	"
2880 ± 90		-636	"	"
1080 ± 80		-651	"	326
690 ± 90	Middle Ages	-658	"	325
520 ± 80	" "	-659	"	"
450 ± 90		-637	"	"
>Modern		-674	"	326
	BRAZIL			
3300±600		A-916	2	208
	CANADA			
3190 ± 60		A-1369	2	213
2700±120	Archaic	QU-444	"	249
1820±150	Laurel	A-1424	"	213
1590 ± 50	"	-1368	"	"
1330±100		-1294	"	"
1240 ± 80	Prehistoric	QU-445	"	249
1240 ± 70		A-1206b	"	214
980±150		-1349	"	213
560 ± 45	Avonlea	-1324	"	"
490±110	Selkirk	-1196	"	212
470 ± 60	"	-1293	"	213
390 ± 90	Prehistoric-contact	QU-446	"	249
290±120		A-1206a	"	214
280±100		-1183	"	212
23 0.9% Modern		-1425	"	214
	CZECHOSLOVAKIA			
5530 ± 80	5300 yr BP	P-2713	2	228
5250±240	4000 yr BP	-2712	"	"
	ECUADOR			
4020±220	Valdivia	P-2761	2	238
	EGYPT			
2570 ± 60	Ca 675 BC or older	P-2714A	2	231
	GHANA			
5860 ± 60	Later Neolithic	P-2746	2	233
	GREECE			
7990 ± 80	Neolithic	P-2275	2	228
7400 ± 60	"	-2768	"	"
5700±100	"	-2769	"	"
3670±180	Late Minoan I A	-2792	"	229
3380±170	" " " "	-2795	"	230
3340 ± 60	" " " "	-2791	"	229
3300±140	" " " "	-2793	"	230
3180 ± 50	" " " "	-2794	"	"
	GREECE (cont)			
3180 ± 45	Late Minoan 1B	P-2717	2	22
2440 ± 60	Roman?	-2721	"	"
2260 ± 40	" ?	-2720	"	"
2240 ± 60	" ?	-2716	"	"
1510±170	" ?	-2719	"	"
	HONDURAS			
2310±180	Early Formative	P-2750	2	23
2300±140	Middle Formative	-2748	"	"
2710 ± 35	" "	-2747	"	"
2160 ± 40	" "	-2749	"	"
	IRAN			
7620±140		QU-395	2	24
5000±290	Terminal Lapui Phase	P-2624	"	23
4550±280	Initial Banesh Phase	-2626	"	"
4360±230	" " "	-2627	"	"
106 ± 2% Modern		QU-396	"	24
	IRELAND			
2210 ± 40	Early Monastic	P-2737A	2	228
	ISRAEL			
230 ± 40	Persian Period?	P-2718	2	232
	ITALY			
10,070 ± 90	Early Mesolithic	P-2736	2	231
9300±120	Lower "	-2558	"	"
9180±100	Upper "	-2557	"	"
9030±100	" "	-2556	"	"
8330 ± 80	Epipaleolithic	-2735	"	230
7910 ± 70	Paleolithic/Neolithic	-2734	"	"
6750 ± 70	Neolithic	-2733	"	"
3310 ± 50	Nuraghic	-2788	"	231
400 ± 40	Medieval	-2789	"	"
	KENYA			
3970 ± 60	Intro domest animals	P-2609	2	23
3890 ± 60	" " "	-2610	"	234
1700 ± 50	Late Stone Age	-2614	"	"
1470 ± 50	Early Late Stone Age	-2613	"	"
630 ± 50	Late " " "	-2612	"	"
	LA MARTINIQUE, LESSER ANTILLES			
760±100	Suazoid	QU-634	2	250
610 ± 80	"	632	"	"
420±220		633	"	"
	MALI			
1910 ± 50	Iron Age	P-2742	2	235
1660±150	" "	-2679	"	"
1430 ± 70	" "	-2682	"	234
920±150	" "	-2772	"	235
	OMAN			
5140±200	Acermaic Neolithic	P-2739	2	233
4320±200	" "	2740	"	"
4170±220	" "	2838	"	"
4030 ± 70	" "	2673	"	"
4030 ± 50	" "	2741	"	"

ARCHAEOLOGIC SAMPLES

Date	Culture or Period	Sample No.	No.	Pg.
	SOMALIA			
2030 ± 60		P-2611	2	235
	UNITED STATES			
	ARIZONA			
22,360±500		A- 999	2	208
12,300±250		-1157	"	211
10,760±100		-1045	"	209
10,690±150		-1158	"	211
10,420±100		-1152	"	"
9430±130		-1159	"	"
9110±110		-1160	"	"
8980±300	San Dieguito	-1081	"	210
4650±160	Cochise	-1156	"	211
3820±100		- 929	"	208
2290 ± 80	Santa Cruz	-1346	"	216
2030±180	Cochise	-1215	"	214
1780±100	San Pedro Cochise	- 885	"	208
1670±100	Colonial-sedentary,Hohokam	-1197	"	214
1660 ± 60		- 886	"	208
1600 ± 70	Desert	-1214	"	214
1540 ± 70	Vahki Red	-1072	"	209
1440±100	Colonial-sedentary,Hohokam	-1198	"	214
1020 ± 80	Santa Cruz	-1345	"	216
900±120	Cochise	- 891	"	208
790 ± 50	Salado	-1348	"	216
630 ± 50	"	-1347	"	"
350 ± 50	"	-1344	"	"
240 ± 80	Chirichua & San Pedro	-1189	"	211
140±120	Salado	-1343	"	215
Modern		-1190	"	212
Modern	Verde Brown	-1317	"	216
	CALIFORNIA			
950±150		A-1280	2	215
	COLORADO			
1550±340		A-1272	2	215
930±230		-1273	"	"
780±220		-1274	"	"
	MISSOURI			
13,550±400		A-1079	2	210
4200±140		1076	"	209
	NEVADA			
16,910±330		A-1048	2	209
2610 ± 90		-1022	"	"
2040 ± 70		-1025	"	"
2040 ± 70		-1021R	"	"
1990±100		-1020	"	208
1990 ± 45		-1024	"	209
1890±110		-1015	"	208
1780±110		-1021	"	"
1740±120		-1023	"	209
1670±280		- 808	"	207
1270±380		-1008	"	208
220±100	Paiute	-1137	"	210
	NEW MEXICO			
3510±100		A-1169	2	210
1170±150	Pueblo III	-1130	"	"
1080 ± 60		-1288	"	215
920±100		-1129	"	210
120±260		-1270	"	214
Modern		-1057	"	209
Modern		-1138	"	210

Date	Culture or Period	Sample No.	No.	Pg.
	PUERTO RICO			
1380 ± 45	Ostionoid-Saladoid	P-2607	2	237
1170 ± 45	" "	-2596	"	"
1060 ± 45	" "	-2729	"	236
1000 ± 45	" "	-2598	"	"
990 ± 50	" "	-2595	"	"
600 ± 45	" "	-2599	"	"
200±170	" "	-2606A	"	"
	WISCONSIN			
1710 ± 35	Middle or Late Woodland	P-2776	2	236
1180 ± 40	Late Woodland	-2777	"	235

GEOCHEMICAL SAMPLES

CANADA

Date or % of Modern	Depth or Altitude	Sample No.	No.	Pg.
12,260±210	91.4m	QU-178	2	241
21.7±1.2%M				
9780±400	36.9m	- 64	"	242
29.6±1.2%M				
7680±500	71.1m	-137	"	241
38.4±2.4%M				
7560±450	61.0m	-134	"	"
39.0±2.2%M				
7530±500	91.4m	- 92	"	"
22.2±1.2%M				
6440±450	33.5m	-168	"	"
44.9±2.5%M				
6000±570	35.7m	-167	"	"
47.4±3.4%M				
5280±210	31.1m	- 28	"	242
51.8±1.3%M				
5070±110	49.4m	-177	"	241
53.2±0.7%M				
3870±310	91.4m	- 86	"	"
61.8±2.4%M				
3810±270	91.4m	- 87	"	"
62.2±2.1%M				
3170±170	18.3m	-136	"	"
67.4±1.4%M				
3120±140	25.0m	- 65	"	242
67.8±1.2%M				
2780±650	47.2m	-172	"	241
70.7±5.7%M				
2750±170	61.0m	-179	"	242
71.0±1.5%M				
2260±130	73.2m	-176	"	"
75.5±1.2%M				
2210±180	91.4m	-135	"	241
75.9±1.7%M				
1760±120	24.4m	- 90	"	242
80.3±1.2%M				
1240±130	91.5m	-180	"	"
85.7±1.4%M				
1010±180	9.7m	-166	"	241
88.2±2.0%M				
860±190	91.4m	-169	"	"
89.8±2.1%M				
630±200	48.8m	- 88	"	"
92.4±2.3%M				
620 ± 90	10-40m	A-997	"	192
400 ± 60	10-40m	-996	"	"
360±140	14.0m	QU-170	"	242
95.6±1.2%M				
280±170	61.0m	-171	"	241
96.5±2.0%M				
108.0±1.6%M	3.6m	- 89	"	242

ENGLAND

Date or % of Modern	Depth or Altitude	Sample No.	No.	Pg.
>48,500		SRR-608	2	265
>48,500		-610	"	"
$40,080^{+1560}_{-1310}$		-607	"	"
$36,280^{+1750}_{-1440}$		-660	"	266
$33,580^{+1670}_{-1380}$		-611	"	265
>33,450		-663		267
$33,390^{+950}_{-850}$		-603	"	264
$33,050^{+850}_{-770}$		-654	"	266
$29,220^{+650}_{-600}$		-659	"	"
$28,800^{+1100}_{-970}$		-661	"	"
24,450±280		-662	"	"
13,780±130		-609	"	265
13,080±130		-650	"	"
13,030 ± 90		-651	"	"
12,870 ± 90		-649	"	"
12,580 ± 70		-704	"	267
10,730 ± 90		-604	"	265
10,620±120		-656	"	266
10,060 ± 80		-705	"	267
7520±120		-658	"	266
6970 ± 80		-653	"	"
6950 ± 90		-652	"	"
6940 ± 70		-707	"	267
6900±120		-657	"	266
5970 ± 90		-703	"	267
5890 ± 80		-606	"	265
5560 ± 70		-706	"	267
5160 ± 80		-655	"	266
4800 ± 90		-664	"	267
4490 ± 90		-665	"	"
3970 ± 60		-602	"	264
3620 ± 70		-702	"	267
3450 ± 70		-605	"	265
2770 ± 70		-709	"	267
2040 ± 50		-708	"	267

UNITED STATES

ARIZONA

Date or % of Modern	Depth or Altitude	Sample No.	No.	Pg.
22,020±760		A-1245	2	193
20,460±630	148m	-1341	"	194
9520±400	274-373m	-1055	"	193
8860±230	152m	-1342	"	194
8490±100		-1084	"	192
8140 ± 70		-1085	"	"
7935 ± 90	10cm	-1009	"	"
7910±400		-1267	"	"
6740±350		-1268	"	"
5535 ± 80		-1086	"	"
4300±150	20cm	- 983	"	"
630 ± 70	Surface	- 982C	"	"
Modern		- 984A	"	"
Modern		- 984C	"	"
Modern		- 985	"	"
Modern	Surface	- 987	"	"

CALIFORNIA

Date or % of Modern	Depth or Altitude	Sample No.	No.	Pg.
7510 ± 40		A-1255	2	193

NEVADA

Date or % of Modern	Depth or Altitude	Sample No.	No.	Pg.
160.4±4.4%M	30cm	A-1251	2	193

NEW YORK

Date or % of Modern	Depth or Altitude	Sample No.	No.	Pg.
>33,000	20cm	A-1264	2	194
>25,000	20cm	-1263	"	"

UTAH

Date or % of Modern	Depth or Altitude	Sample No.	No.	Pg.
9760±120	1.64-1.68m	A-1241	2	193
8200±170	1.22-1.26m	-1242	"	"
6370 ± 80	0.77-0.80m	-1243	"	"
5470 ± 90	0.45-0.49m	-1244	"	"

GEOLOGIC SAMPLES

ANTARCTICA

Date	Depth or Altitude	Sample No.	No.	Pg.
4800±300	1.25m	SRR-1089	2	255
4760±300		- 732	"	252
3890 ± 60		- 735	"	253
3380±100	ca 2m	-1088	"	255
3210 ± 50		- 734	"	253
3130 ± 40	surface	-1087	"	255
2820 ± 40	"	-1086	"	254
1940 ± 90		- 731	"	252
1450 ± 60		- 733	"	253
1210 ± 40	ca 2m	-1090	"	255
1150 ± 40	ca 1.95m	-1091	"	"
1050 ± 40	ca 1.6m	-1092	"	"
1010 ± 40		-1095	"	256
480 ± 40	ca 1.3m	-1093	"	255
470 ± 60		- 898	"	253
430 ± 40	ca 1m	-1094	"	255
Modern		- 902	"	254
Modern		- 897	"	253
Modern		- 900	"	254
Modern		- 896	"	253
Modern		- 901	"	254
Modern		- 899	"	"
Modern		- 895	"	253

ARGENTINA

Date	Depth or Altitude	Sample No.	No.	Pg.
>32,000	1-1.1m	A-1372	2	202
24,730±860	70cm	-1370	"	"
11,350±180	80-90cm	-1371	"	"
10,930±540	2.2m	-1373	"	"
10,740±150	70-80cm	-1351	"	"
10,530±140		-1638	"	"
10,200±300		-1636	"	"
9740±280		-1637	"	"
9650±800	70-80cm	-1282	"	"

AUSTRIA

Date	Depth or Altitude	Sample No.	No.	Pg.
15,200±400	5.85-5.75m	VRI-643	2	323
13,850±310	5.65-5.55m	-642	"	"
10,520±150	5.15-5.05m	-641	"	"
10,090±150	53m	-663	"	322
9690±180	43.5m	-664	"	"
9560 ± 70	4.85-4.75m	-640	"	323
9500±160	39m	-662	"	322
8520±140	8m	-617	"	324
8240±260	+1420m	-654	"	"
8100±140	4.00-3.95m	-639	"	323
7590±140	7m	-616	"	324
5760±100	6m	-615	"	"
3890±100	5m	-614	"	"
3440±100	4m	-613	"	"
2670±100	0.95-0.85m	-671	"	323
2530±100	3.5m	-667	"	"
2480±110	1.8-1.6m	-606	"	"
2420 ± 80	2.5m	-675	"	"
2250 ± 80	29m	-661	"	322
1950 ± 90	3m	-612	"	324
1790 ± 90	2m	-611	"	"
790 ± 80	1m	-610	"	"
< 350	4.4m	-660	"	322
340 ± 80		-666	"	323
< 220	0.6-1.7m	-665	"	322

CANADA

Date	Depth or Altitude	Sample No.	No.	Pg.
>39,000	+170m	QU-327	2	242
36,300±2410		-279	"	248
24,280 ± 940		-154(1)		246
23,510 ± 950		-154(2)		"
10,900 ± 150	+70m	-492	"	243
10,700 ± 150	+170m	-382	"	"
10,160 ± 120	+137m	-383	"	"
8120 ± 510	+282m	-434	"	244
7940 ± 140	Om	-280	"	248
7820 ± 100	Om	-280	"	"
7760 ± 130	+15m	-579	"	243
6890 ± 120	+240m	-499	"	245
6800 ± 600		-299	"	247

CANADA (cont.)

Date	Depth or Altitude	Sample No.	No.	Pg.
6390±130	+275m	QU-496	2	245
5920±100	+183m	-494	"	244
5840±100	+275m	-495	"	"
5700±100	+16m	-831	"	245
5300±150	46m above surface	A-1047	"	195
5020±100	+183m	QU-493	"	244
4810 ± 70	4m above surface	A-1065	"	195
4750±100	+16m	QU-832	"	245
4460±210		-304	"	247
4270±200	+700m	-476	"	244
4200±100	+60m	-498	"	245
4190±160	+700m	-328	"	244
3830±120	+60m	-497	"	245
3590±110	+16m	-500	"	244
3080±110	+130m	-835	"	246
2940 ± 90	+16m	-833	"	245
2440±100	+15m	-837	"	246
2200 ± 90	+282m	-516	"	244
2120 ± 80		-302	"	247
2050±100	+50m	-504	"	243
1640±130		-303	"	247
1610±230		-307	"	248
1560±120	+1.5m	-240	"	247
1170±150		-301	"	"
970±110	+282m	-515	"	244
830 ± 70	0.5m	-305	"	247
770 ± 80	+2m	-241	"	"
620±210		-308	"	248
470±100	+130m	-836	"	246
280±160	+1.5m	-306	"	248
50 ± 70	+2m	-830	"	245
102±1%M	+15m	-834	"	246
102±1%M		-622	"	"

GALAPAGOS ISLANDS

Date	Depth or Altitude	Sample No.	No.	Pg.
Modern		A-1232	2	205

ENGLAND

Date	Depth or Altitude	Sample No.	No.	Pg.
22,710±200	ca 3.05m	SRR-759	2	269
14,620±360	48-55cm	-682	"	"
14,560±280	45-48cm	-681	"	268
13,940±210	38-42cm	-679	"	"
13,860±270	42-45cm	-680	"	"
13,190±170	33-36cm	-677	"	"
12,920±120	30-33cm	-676	"	"
12,570±240	36-38cm	-678	"	"
12,520±150	20-24cm	-673	"	"
12,500±120	24-27cm	-674	"	"
12,440 ± 90	27-30cm	-675	"	"
12,270±280	0-3cm	-668	"	"
12,210±150	8.5-12cm	-670	"	"
12,130±180	12-16cm	-671	"	"
12,110±130	16-20cm	-672	"	"
11,350 ± 90	3-8.5cm	-669	"	"
10,470 ± 60		-870	"	272
8650±220	200-205cm	-786	"	270
8130 ± 60	246cm	-401	"	260
7780 ± 60	234cm	-400	"	"
7760±140	245-250cm	-790	"	270
7310 ± 60	200cm	-399	"	260
6980 ± 70	145-150cm	-789	"	270
6480±180	ca. 2.3cm	-695	"	269
5700 ± 50	335cm	-511	"	263
5400 ± 50	120cm	-398	"	260
5360 ± 70	280cm	-510	"	263
5300 ± 50	ca 6m	-598	"	264
4940 ± 60	279-281cm	-419	"	261
4850 ± 50	95-97cm	-883	"	273
4800 ± 50	183-185cm	-543	"	277
4780 ± 50	105cm	-397	"	260
4770 ± 50	171-173cm	-542	"	277
4770 ± 50	79-81cm	-882	"	273
4660 ± 60	160-162cm	-541	"	277
4610 ± 60	225-230cm	-568	"	263
4560 ± 60	245cm	-509	"	263
4510 ± 50	150-152cm	-540	"	277
4480 ± 50	1.14-1.56m	-532	"	264

GEOLOGIC SAMPLES

Date	Depth or Altitude	Sample No.	No.	Pg.
	ENGLAND (cont.)			
4480 ± 50	60-70cm	SRR-958	2	275
4410 ± 50	55-57cm	-881	"	273
4390 ± 50	51-60cm	-957	"	274
4340 ± 50	220-225cm	-567	"	263
4310 ± 60	133-135cm	-539	"	277
4290 ± 50	70-75cm	-959	"	275
4280 ± 50	31-33cm	-880	"	273
4230 ± 50	118-120cm	-538	"	277
4180±150	100-105cm	-788	"	270
4160 ± 50	41-49cm	-956	"	274
4100 ± 50	99-101cm	-537	"	277
4050 ± 50	20-22cm	-879	"	273
4050 ± 50	ca 2.2m	-1130	"	278
4020 ± 50	230-235cm	-569	"	263
4000 ± 50	145-147cm	-917	"	274
3940 ± 50	31-39cm	-955	"	"
3920 ± 50	214-218cm	-566	"	263
3910 ± 50	87-89cm	-536	"	277
3860 ± 60	210-214cm	-565	"	263
3820 ± 50	235-240cm	-570	"	"
3800 ± 50	129-131cm	-916	"	274
3720 ± 50	109-111cm	-915	"	"
3700 ± 70	670-800cm	-463	"	262
3690 ± 60	320cm	-877	"	272
3680 ± 80	120cm	-508	"	263
3650 ± 60	243-245cm	-418	"	261
3600 ± 40	3-5cm	-878	"	273
3600 ± 50	66-68cm	-535	"	277
3600 ± 50	255-260cm	-1045	"	278
3420 ± 50	47-49cm	-534	"	276
3020 ± 50	211-216cm	-1044	"	278
2800 ± 50	37-39cm	-1014	"	276
2620 ± 50	85-87cm	-914	"	274
2590 ± 50	179-184cm	-1043	"	277
2530 ± 40	1115.5-153cm	-1042	"	"
2430 ± 60	153cm	-417	"	261
2320 ± 50	25-27cm	-1013	"	276
2250 ± 50	69-71cm	- 913	"	274
2230 ± 80	133cm	- 416	"	261
2210±170	0-20cm	- 694	"	269
2190 ± 60	420-430cm	- 829	"	271
2120 ± 60	445-455cm	- 830	"	"
2090 ± 50	17-19cm	-1012	"	276
2060 ± 50	49-51cm	- 912	"	274
1960 ± 70	90cm	- 415	"	261
1950 ± 50	176cm	- 876	"	272
1950 ± 40	5-7cm	-1011	"	276
1780 ± 60	80cm	- 414	"	260
1750 ± 50	27-29cm	- 911	"	274
1660 ± 60	51-59cm	- 963	"	275
1640 ± 60	370-380cm	- 828	"	271
1580 ± 50	60-69cm	- 964	"	275
1520 ± 70	71cm	- 412	"	260
1500 ± 70		- 977	"	276
1410 ± 60	270-280cm	- 826	"	271
1410 ± 50	11-13cm	- 910	"	274
1400 ± 60	320-330cm	- 827	"	271
1360 ± 50	73cm	- 413	"	260
1330 ± 40	132cm	- 875	"	272
1250 ± 50	70-79cm	- 965	"	275
1230 ± 70	41-49cm	- 962	"	275
1150 ± 60	170-180cm	- 824	"	271
1150 ± 60		- 998	"	276
1130 ± 70	105-115cm	- 817	"	270
1130 ± 70	220-230cm	- 825	"	271
1120 ± 80	106-116cm	- 816	"	270
1110 ± 80	31-39cm	- 961	"	275
1090 ± 40	61.5-63cm	-1041	"	277
1070 ± 60	120-130cm	- 823	"	271
1070 ± 60	80-86cm	- 966	"	275
1030 ± 60	75-85cm	- 545	"	262
980 ± 80	55-65cm	- 458	"	261
950 ± 40	104cm	- 874	"	272
930±100	21-29cm	- 960	"	275
920 ± 60	71-80cm	- 822	"	271
910 ± 60	50cm	- 411	"	260
900 ± 80	50-55cm	- 456	"	261
890 ± 70	120-130cm	- 818	"	270
880 ± 70	52-60cm	- 820	"	271
860 ± 70	70-75cm	- 544	"	262
860 ± 70	61-70cm	- 821	"	271
850 ± 80	55-60cm	- 457	"	261
840 ± 90	42-50cm	- 819	"	271
800 ± 50	80-90cm	- 455	"	262

Date	Depth or Altitude	Sample No.	No.	Pg.
	ENGLAND (cont.)			
790 ± 60	90-95cm	SRR- 547	2	262
770 ± 60	85-90cm	- 546	"	"
660 ± 80	70-100cm	- 462	"	"
580 ± 80	86-96cm	- 815	"	270
520 ± 50	65-75cm	- 454	"	262
430 ± 50	64cm	- 873	"	272
350 ± 60	60-65 cm	- 787	"	270
Modern	10-40cm	- 461	"	262
Modern	ca 1.2-1.25m	- 533	"	264
	FINLAND			
$22{,}950^{+1220}_{-1060}$	4.53-4.67m	SRR-1053	2	279
12,280±250	3.73-3.87m	-1052	"	"
11,080±150	3.16-3.3m	-1051	"	"
8340 ± 90	2.36-2.5m	-1050	"	"
7610±100	5.05-5.21m	-1054	"	"
7300 ± 80	1.96-2.1m	-1049	"	"
5310 ± 70	1.47-1.61m	-1048	"	"
4880 ± 50	5.14-5.3m	-1060	"	280
4690 ± 80	36-41cm	- 872	"	278
4330 ± 50	4.67-4.83	-1059	"	280
3700 ± 50	3.64-3.8m	-1058	"	"
3430 ± 90	34-40cm	-1047	"	279
3080 ± 50	2.92-3.08m	-1057	"	280
2830 ± 50	2.42-2.58m	-1056	"	"
2390 ± 60	1.92-2.08m	-1055	"	"
1450±120	4-10cm	-1046	"	279
900 ± 80	0-6cm	- 871		278
	GREECE			
5770 ± 90	526-559cm	SRR- 669	2	280
5410 ± 70	291-319cm	- 889	"	281
5090 ± 80	249-282cm	- 884	"	280
3780 ± 70	374-424cm	- 890	"	281
3650 ± 60	161-187cm	- 888	"	"
2820±140		- 793	"	"
2340 ± 50	35-71cm	- 887	"	"
2290 ± 90	67-101cm	- 698	"	280
1750 ± 60	304-337cm	- 886	"	"
890 ± 50	44-80cm	- 885	"	"
	GUATEMALA			
>41,000	4.5m	A-1044	2	196
>37,700	2350m	-1527	"	197
>37,700	2470m	-1526	"	"
>37,700	2480m	-1525	"	"
	ICELAND			
10,460±100		SRR-1031	2	281
9930 ± 80		-1030	"	"
3850 ± 50	ca 340cm	-1033	"	282
1050 ± 60	ca 150cm	-1032	"	"
	INDONESIA			
18,500±100	9.66-9.76m	SRR- 472	2	284
17,720 ± 80	8.15-8.25m	-1022	"	"
16,210±160	7.15-7.25m	- 864	"	"
15,620±100	6.6-6.7m	-1021	"	"
12,630±200	880-890cm	- 465	"	283
12,380±110	9-9.1m	- 865	"	"
12,130±140	9.15-9.22m	- 473	"	"
11,500 ± 80	4.1-4.2m	-1020	"	284
10,950 ± 90	8.1-8.2m	-1018	"	283
9230 ± 80	7.6-7.7m	-1017	"	"
9100±200	1000-1005cm	- 466	"	282
8600 ± 90	1755-1765cm	- 471	"	283
8270±130	1575-1585cm	- 470	"	"
8050 ± 60	2.1-2.2m	-1019	"	284
7510 ± 90	1285-1295cm	- 469	"	283
4460 ± 50	5.7-5.8m	-1016	"	"
3850±100	565-585cm	- 468	"	"
2440 ± 70	820-840cm	- 464	"	282
1700 ± 70	2.7-2.8m	-1015	"	283
	MALAYSIA			
660 ± 80	385-395cm	SRR- 467	2	284

GEOLOGIC SAMPLES

Date	Depth or Altitude	Sample No.	No.	Pg.
	MEXICO			
1400 100	+60m asl	A-1119	2	196
1330 200	+75cm asl	-1120	"	"
935 95		-1285	"	205
550 160		-1327	"	204
210 70		-1071	"	"
Modern		-1191	"	205
	NORWAY			
1070 40		SRR-1085	2	285
660 50		1083	"	"
530 40		1084	"	"
	SCOTLAND			
$44,970^{+1450}_{-1230}$		SRR- 758	2	286
$43,970^{+1270}_{-1020}$		- 667	"	285
>42,440	ca 5m	- 595	"	287
38.980^{+950}_{-850}		- 490	"	285
$36,720^{+1030}_{-910}$	ca 4m	- 596	"	287
$34,790^{+1090}_{-960}$	67.55-67.65m	- 906	"	293
$34,420^{+740}_{-680}$	85.67-85.83m	- 907	"	"
$33,890^{+1010}_{-900}$	36.1-36.25m	- 904	"	"
$33,390^{+970}_{-870}$	51.92-52.04m	- 905	"	"
>33,300		- 666	"	285
$32,980^{+710}_{-650}$	180.86-180.95m	- 909	"	293
$31,980^{+840}_{-760}$	115.32-115.44m	- 908	"	"
$28,120^{+800}_{-730}$	11.15-11.30m	- 903	"	"
15,380 ± 110		- 949	"	294
$14,350^{+630}_{-580}$		- 923(b)	"	"
13,500 ± 270		- 925(b)	"	"
13,490 ± 330		- 925(a)	"	"
13,080 ± 150		- 924(a)	"	"
12,920 ± 130		- 927(b)	"	295
12,700 ± 100		- 927(a)	"	"
12,490 ± 150	870-880cm	- 785	"	290
12,460 ± 280		- 924(b)	"	294
12,390 ± 110		- 926(a)	"	"
12,330 ± 110		- 926(b)	"	"
12,290 ± 310		- 923(a)	"	"
11,990 ± 140	880-890cm	- 775	"	289
11,720 ± 130	837.5-847.5cm	- 784	"	290
11,650 ± 190	33-36cm	- 696	"	288
11,270 ± 130	41-43cm	- 697	"	"
11,240 ± 50		- 954	"	295
11,210 ± 190	7.15-8.17m	- 756	"	288
11,140 ± 110		- 761	"	"
10,650 ± 110	807.5-817.5cm	- 783	"	290
10,470 ± 180	922.5-929cm	- 941	"	292
10,330 ± 80	472.5-477.5cm	- 813	"	291
10,280 ± 120	825-835cm	- 774	"	289
10,200 ± 150	809-816cm	- 773	"	"
10,090 ± 90	462.5-467.5cm	- 812	"	291
10,090 ± 100	1242-1248cm	-1186	"	298
10,070 ± 70	784-791cm	- 782	"	290
9990 ± 130	893-900cm	- 940	"	292
9760 ± 150	872.5-877.5cm	- 939	"	"
9540 ± 70	435-440cm	- 811	"	291
9480 ± 70	1237.5-1242.5cm	-1185	"	298
9360 ± 70	6m	- 984	"	296
9280 ± 120	799-805cm	- 772	"	289
9020 ± 150	987-993cm	- 552	"	286
9000 ± 100	847.5-852.5cm	- 938	"	292
8890 ± 70	187-195cm	- 980(a)	"	299
8750 ± 80	13.5-13.96cm	-1068	"	297
8620 ± 90	187-195cm	- 980(b)	"	299
8390 ± 70	256-262cm	- 572	"	287
8320 ± 80	382.5-387.5cm	- 810	"	291
8160 ± 150	21.5-21.96m	-1070	"	297
8080 ± 90	787.5-792.5cm	- 937	"	292

Date	Depth or Altitude	Sample No.	No.	Pg.
	SCOTLAND (cont.)			
8040±140	950-957cm	SRR- 551	2	286
7970 ± 60	246-256cm	- 571	"	287
7950 ± 80		- 990	"	297
7890±100		- 952	"	295
7890 ± 60	161-169cm	- 979(a)	"	299
7870±130	762.5-767.5cm	- 771	"	289
7470 ± 70	325-330cm	- 809	"	291
7340 ± 80		- 869	"	292
7330±360	18-18.4m	-1069	"	297
7120 ± 70	161-169cm	- 979(b)	"	299
7040±100	790-795cm	- 550	"	286
6650 ± 60		- 953	"	295
6630 ± 60	229-238cm	- 460	"	287
6480±160	750-755cm	- 549	"	286
6590 ± 80	725-730cm	- 936	"	292
6360 ± 80	282.5-287.5cm	- 808	"	291
6280 ± 40	1167.5-1172.5cm	-1184	"	298
6200 ± 50	189-191cm	- 985	"	296
6180 ± 90	705-710cm	- 770	"	289
6140±120	705-710cm	- 548	"	286
6040 ± 40	1007.5-1012.5cm	-1182	"	298
6000 ± 50		- 760	"	288
5880 ± 40	1127.5-1132.5cm	-1183	"	298
5820 ± 40	968-972cm	-1181	"	"
5750 ± 80	672.5-677.5cm	- 769	"	289
5740 ± 80	714-721cm	- 781	"	290
5680 ± 60	501-508cm	- 976	"	296
5550 ± 50	214-226cm	- 459	"	287
5550 ± 60	121-129cm	- 978(a)	"	299
5440 ± 60	10cm	- 724	"	288
5200 ± 60	13cm	- 725	"	"
5200 ± 40		- 951	"	295
5030±100	121-129cm	- 978(b)	"	299
4840 ± 90	627.5-632.5cm	- 935	"	292
4790±220		- 989	"	297
4730 ± 50	2m	- 722	"	288
4610 ± 50	81-89cm	- 977(a)	"	299
4590 ± 60	572.5-577.5cm	- 768	"	289
4530 ± 70	233.5-236.5cm	- 807	"	291
4150 ± 70	208.5-211.5cm	- 806	"	"
4100 ± 90	440-445cm	- 767	"	289
4030 ± 70	81-89cm	- 977(b)	"	298
3990 ± 50	10cm	- 723	"	288
3950 ± 70	193.5-196.5cm	- 805	"	291
3800 ± 60	170-180cm	- 586	"	287
3780 ± 70	46-54cm	-1289(a)	"	299
3600 ± 60	342.1-347.8cm	- 766	"	289
3560 ± 70	622-628cm	- 780	"	290
3420 ± 50	130cm	- 981	"	296
3360 ± 50	130cm	- 982	"	"
3100 ± 60	467.5-472.5cm	- 934	"	292
2990 ± 60	130-140cm	- 587	"	287
2920 ± 50	150cm	- 983	"	296
2890 ± 70	369-376cm	- 975	"	"
2820 ± 60	46-54cm	-1289(b)	"	299
2730 ± 70	522.5-527.5cm	- 779	"	290
2720 ± 40	715-720cm	-1179	"	298
2710±100	65-74cm	- 588	"	287
2700 ± 60	143.5-146.5cm	- 804	"	291
2590 ± 40	775-780cm	-1180	"	298
2530 ± 70	357.5-362.5cm	- 933	"	292
2460 ± 70	243.5-246.5cm	- 765	"	289
2280 ± 60	447.5-452.5cm	- 778	"	290
2150 ± 70	225-232cm	- 973	"	296
2090 ± 60	288-295cm	- 974	"	"
1980 ± 50	147.5-152.5cm	- 764	"	289
1780 ± 60	9-17cm	-1288(a)	"	298
1750 ± 60	247.5-252.5cm	- 932	"	292
1630 ± 60	247.5-252.5cm	- 776	"	290
1490 ± 40		- 950	"	295
1320 ± 70	347.5-352.5cm	- 777	"	290
1200 ± 70	9-17cm	-1288)b)	"	298
1010 ± 60	30-40cm	- 589	"	287
940 ± 40	522.5-527.5cm	-1178	"	297
910 ± 60	252.5-257.5cm	- 866	"	290
430 ± 40	322-328cm	-1177	"	297
	SENEGAL			
145.3±1.8%		A-1530	2	202
0±50		1529	"	"

GEOLOGIC SAMPLES

Date	Depth or Altitude	Sample No.	No.	Pg.
	SPAIN			
$39,740^{+1190}_{-1140}$	9m	SRR-730	2	300
$32,400^{+1980}_{-1600}$	20-40cm	P-2540	"	238
4070±250	60-70cm	-2705	"	239
860 ± 50	1.5m	SRR-727	"	300
820 ± 40	1.5m	726	"	299
780±110	1.5m	728	"	300
420 ± 70	1m	729	"	"
	SWITZERLAND			
4760 ± 60	465-505cm	SRR-892	2	300
2460 ± 80	47-82cm	-891	"	"
	UNITED STATES			
ALASKA				
$50,100^{+3200}_{-2600}$		USGS-410	2	316
>49,500		56	"	"
$45,800^{+4500}_{-3400}$	9.4m	-209	"	315
>45,000	3m above base	- 28	"	314
42,800±1440	13.3-13.6m bsl	-249	"	312
>42,600	4m	-175	"	315
>42,500	27m	-167	"	317
>42,000	2m	- 41	"	319
>40,000	ca 31m below msl	-156	"	313
38,300±1300	8m	-186	"	"
38,000 ± 500		-290	"	319
>38,000	2-1m	-162	"	316
>33,900	49m bsl	-210	"	312
>33,000		-176	"	315
29,500 ± 340	175cm	-158	"	313
27,700 ± 950	40m above river level	-413	"	316
>25,000	2.1m below top of fm	A-912A	"	194
>25,000	"	921B	"	195
>25,000	"	922A	"	"
>25,000	"	922B	"	"
>25,000	2.7m below top of fm	924	"	"
>20,000		923B	"	"
18,000±170	ca. 13.7m bsl	USGS-192	"	312
16,400±430	83cm	157	"	313
15,700±1700	2.7m below top of fm	A-923A	"	195
13,200±110	ca. 34m below msl	USGS-155	"	312
12,840±160	16m	- 47	"	318
12,300±120	8.1m	-161	"	"
11,800±200	132cm	-159	"	313
10,500 ± 80	9m	-229	"	317
9890 ±80		-412	"	316
9730±230	15m	-164	"	317
9600 ± 90	9.5m	-163	"	"
8430 ± 70	2m	- 45	"	319
8270±150	ca. 1.5m above base	-207	"	315
8230±100	92-92m	-127	"	311
8180 ± 80		-184	"	314
7260 ± 90	67m	-228	"	311
6490±220	50-51m	-154	"	"
5740±190	15-17m	-126	"	"
5370 ± 90		-376	"	316
4170 ± 45		-374	"	"
3850 ± 45	2.4m below top of terrace	-205	"	314
3740 ± 60	2.3m below top of exposure	187	"	"
3440 ± 60	1.7m	- 76B	"	318
3430 ± 45	130-133cm below sea floor	-291	"	319
3180 ± 50	surface	-108	"	311
3160 ± 80	10.5m	- 43	"	319
3110±100	0.7m	- 30	"	318
3110 ± 70	140-145cm below sea floor	-292	"	319
3090±170	1m	- 78	"	318
3040 ± 50	97-98cm below sea floor	-293	"	320
2280 ± 50		-185	"	314
2270 ± 60	58cm below sea floor	-294	"	319
2090±120	ca. 18m below msl	-183	"	313
1990 ± 80	0.5m	- 75	"	318
1770 ± 70	0.5m	- 31	"	"
1380 ± 50	0.4m	- 77		"
ALASKA (cont)				
1350 ± 50		USGS-188	2	313
770±130	1.5m	-166	"	317
490 ± 90	7.8m bsl	-132	"	312
430 ± 50	3.5m	-165	"	317
320 ± 60		-335	"	318
300 ± 40	0.3m	-219	"	"
120 ± 45	2m	-174	"	315
100 ± 60	1.2m	-206	"	314
ARIZONA				
>40,000	132cm	A-1042	2	199
36,200±6000	99cm	-1043	"	"
>35,000	65-90cm	-1056	"	198
>33,000	37.5-40cm	-1443	"	199
>33,000	35-60cm	-1439	"	"
32,560 ± 730	99cm	-1210	"	"
23,310 ± 690	1.5m	-1554	"	197
>22,000		-1457	"	"
21,910 ± 610	1.5m	-1555	"	"
21,510 ± 640 } 5.6±12% Mod.		-1234	"	196
18,430 ± 300	91cm	-1278	"	199
17,030±1070	strat 1,55-60cm	-1246	"	198
16,700 ± 900	71cm	-1208	"	199
16,580 ± 200	20-25cm	-1200	"	197
16,510 ± 200	20-25cm	-1201	"	"
16,050 ± 310 } 13.3±1.4% Mod.		-1233	"	196
15,500 ± 600	strat 1,35-40cm	-1168	"	198
15,440 ± 250	0-5cm	-1199	"	197
15,230 ± 240		-1238	"	198
13,700 ± 500	20-25cm in Grid G G	-1132	"	"
13,140 ± 320	67cm	-1207	"	199
13,070 ± 470	20-25cm in Grid A A	-1082	"	198
12,980 ± 200	strat 1,25-30cm	-1167	"	"
12,900 ± 400		- 820	"	194
12,470 ± 170		-1318	"	200
12,440 ± 300	61cm	-1070	"	199
11,480 ± 200	0-5cm	-1041	"	"
11,370 ± 300	0-3cm	-1392	"	200
11,290 ± 170	Surface	-1213	"	"
11,140 ± 160	"	-1212	"	"
11,090 ± 190	" 4	-1602	"	"
11,020 ± 200	" 3	-1068	"	199
11,000 ± 140	+535m	-1066	"	"
10,870 ± 200	strat 1,20-25cm	-1155	"	198
10,780 ± 200	+535m	-1067	"	199
10,760 ± 200		-1154	"	198
10,130 ± 480	+700m	-1250	"	205
9390 ± 500	Surface	- 910	"	194
5760 ± 200		-1166	"	198
2450 ± 80		-1165	"	"
1500 ± 50	Surface	-1184	"	"
Modern		-1323	"	202
Modern		-1458	"	197
CALIFORNIA				
>42,900		USGS- 173	2	310
40,300±950		- 288	"	"
39,500±650		- 287	"	"
13,200±160	12-17m	- 160	"	309
8800 ± 80	41m below msl	- 224	"	"
8400±100	36m " "	- 172	"	"
7770 ± 70	32.5m " "	- 171	"	"
7340±380		A- 962	"	204
4370±120		USGS- 220	"	309
4170±140	8.4-9.1m	- 149	"	"
4150±130	60m below sea level	- 285	"	310
4000 ± 35	8.5-9.5m	- 391	"	309
3990 ± 70	10.7-11m	- 147	"	309
3770±150	9.1-9.8m	- 326	"	"
1830 ± 50	5.8m	- 142	"	308
1770 ± 45		- 182	"	305
1710 ± 60		- 221	"	310
1460 ± 60	ca 4m	- 141	"	308
1410 ± 50	ca 5m	- 140	"	"
1160 ± 60	ca 4.1m	- 139	"	"
1130 ± 70	ca 3.8m	- 138	"	"
1130 ± 45	ca 2.3m	- 83	"	"

GEOLOGIC SAMPLES

CALIFORNIA (cont.)

Date	Depth or Altitude	Sample No.	No.	Pg.
1030 ± 40		USGS- 289	2	310
1020 ± 50	ca. 2.5m	- 82	"	308
920 ± 60	ca 0-5m above stream level	96	"	306
860 ± 50	ca 1.5m " "	" - 298	"	"
800 ± 60	ca. 1.8m	- 84	"	"
460 ± 60	ca. 1.8m	- 136	"	"
320 ± 60	ca. 2.4m	- 137	"	"
300 ± 40	30-50cm	- 191	"	311
270 ± 60	90cm	- 211	"	"
190 ± 50	ca 1.3m	- 144	"	306

FLORIDA

Date	Depth or Altitude	Sample No.	No.	Pg.
21,100±900	0-1m above MLW	MRRI- 145	2	219
20,600±480	1-2m above MSL	- 161	"	"
20,100±640	0-1m above MLW	- 132	"	"
20,000±710	1-2m above MSL	- 167	"	"
19,740±400	"	- 164	"	"
19,300±970	0-1m above MLW	- 130	"	"
18,300±380	1-2m above MSL	- 170	"	"
17,200±600	"	- 168	"	"
7430±160	∿0-1m above MLW	- 299	"	225
7370±220	0-1m above MLW	- 144	"	219
7250±290	" MSL	- 302	"	225
6990±370	" MLW	- 138	"	219
6940±120	" MSL	- 303	"	225
6910±290	MSL	- 124	"	219
6890±140	∿0-1m above MLW	- 214	"	224
6540±100	"	- 291	"	225
6410±120	"	- 215	"	224
6410±100	∿70cm above MLW	- 147	"	220
6330±110	∿0-1m above MLW	- 253	"	225
6310±130	"	- 248	"	224
6160±100	"	- 255	"	255
6140±110	"	- 251	"	"
6110±180	1-2m above MSL	- 166	"	219
5790±140	0.5m above MSL	- 285	"	226
5740±200	∿0-1m above MLW	- 295	"	225
5650±120	"	- 245	"	224
5620±120	0-80cm above MLW	- 282	"	225
5620±160	∿0-1m above MLW	- 213	"	224
5600±170	0.5m above MSL	- 287	"	226
5560±190	"	- 288	"	"
5550±240	0-1m above MLW	- 136	"	219
5550±140	MSL	- 122	"	"
5490±120	∿0-1m above MLW	- 252	"	225
5440±150	"	- 300	"	"
5400 ± 90	0.5m above MSL	- 293	"	226
5280±160	∿70cm above MLW	- 160	"	220
5250±100	"	- 148	"	"
5170±100	0.5m above MSL	- 283	"	226
5150±240	∿0-1m above MLW	- 297	"	225
5140±170	0-80cm above MLW	- 280	"	"
5130 ± 90	"	- 294	"	226
5100 ± 90	0-80cm above MLW	- 268	"	225
5090±130	1-2m above MSL	- 169	"	219
5030±290	0-1m above MLW	- 134	"	"
4910 ± 90	0.5m above MSL	- 292	"	226
4910 ± 90	0-80cm above MLW	- 281	"	225
4900±120	"	- 260	"	"
4900±120	1-2m above MSL	- 163	"	219
4890±150	∿70cm above MLW	- 201	"	220
4850±110	0.5m above MSL	- 286	"	226
4800±110	0-1m above MSL	- 211	"	221
4730±110	∿70cm above MLW	- 141	"	220
4700±370	∿1m below ground level	- 290	"	226
4760±110	∿0-1m above MLW	- 296	"	225
4620 ± 80	0-1m above MSL	- 209	"	221
4590±210	MSL	- 119	"	219
4590 ± 90	"	- 120	"	"
4580±170	0-1m above MLW	- 143	"	"
4550±160	∿1m below ground level	- 289	"	226
4540±110	∿0-1m above MLW	- 298	"	225
4510±110	0-5cm above MLW	- 199	"	221
4440±120	0-80cm above MLW	- 259	"	225
4420±160	∿70cm above MLW	- 139	"	220
4360±120	0-80cm above MLW	- 257	"	225
4280 ± 90	∿0-1m above MLW	- 301	"	"
4240±320	MSL	- 123	"	219
4210 ± 80	0-1m above MLW	- 131	"	"
4100 ± 80	0-1m above MSL	- 205	"	221
4060±110	"	- 212	"	"

FLORIDA (cont.)

Date	Depth or Altitude	Sample No.	No.	Pg.
4000±110	0-80cm above MLW	MRRI- 273	2	225
3990±290	∿70cm above MLW	- 159	"	220
3920±130	1-2m above MSL	- 162	"	219
3810±200	0-50cm above MLW	- 191	"	221
3770 ± 90	"	- 196	"	"
3750±230	"	- 193	"	"
3720±140	∿70cm above MLW	- 151	"	220
3690 ± 90	"	- 204	"	"
3690 ± 80	"	- 152	"	"
3680±100	0-50cm above MLW	- 195	"	221
3640±130	"	- 203	"	"
3570±130	0-80cm above MLW	- 272	"	225
3450±100	0-1m above MSL	- 210	"	221
3440±120	∿70cm above MLW	- 154	"	220
3370 ± 90	0-80cm above MLW	- 271	"	225
3140±110	MSL	- 106	"	218
3130 ± 80	0-1m above MSL	- 207	"	221
3120 ± 90	0-50cm above MLW	- 192	"	"
3070±120	∿70cm above MLW	- 156	"	220
3050±100	0-50cm above MLW	- 202	"	221
3040 ± 80	0-80cm above MLW	- 270	"	225
2920 ± 90	0-50cm above MLW	- 190	"	221
2860 ± 90	70cm above MLW	- 157	"	220
2650 ± 80	∿1m above MSL	- 175	"	"
2600±120	"	- 177	"	221
2550±170	"	- 188	"	220
2520±120	∿70cm above MLW	- 150	"	"
2520 ± 80	MSL	- 102	"	218
2500±110	"	- 104	"	"
2410±100	∿70cm above MLW	- 149	"	220
2410 ± 80	∿1m above MSL	- 179	"	221
2270 ± 90	"	- 178	"	"
2260±310	"	- 180	"	220
2230 ± 70	0-1m above MSL	- 208	"	221
2200 ± 80	∿1m above MSL	- 185	"	"
2160 ± 70	"	- 186	"	"
2130±130	0-80cm above MLW	- 269	"	225
2120±150	∿1m above MSL	- 189	"	220
2110±110	MSL	- 125	"	219
2090 ± 80	∿70cm above MLW	- 153	"	220
2030 ± 80	1-2m above MSL	- 165	"	219
1980±120	∿1m above MSL	- 182	"	220
1980 ± 70	"	- 187	"	221
1880 ± 80	0-1m above MSL	- 206	"	"
1830±130	∿1m above MSL	- 183	"	220
1830±110	"	- 184	"	"
1340±110	"	- 176	"	"

GEORGIA

Date	Depth or Altitude	Sample No.	No.	Pg.
3330 ± 90	∿1.2m above MLW	MRRI- 265	2	224
3030 ± 70	"	- 266	"	"
2960±100	"	- 264	"	"
2890 ± 90	"	- 278	"	"

MISSOURI

Date	Depth or Altitude	Sample No.	No.	Pg.
34,300±1200		A-1080	2	201
29,340 ± 900	1.6m-1.7m	-1000	"	204

NEVADA

Date	Depth or Altitude	Sample No.	No.	Pg.
>33,000	+549m	A-1411	2	203
32,000±4400		-1257	"	206
25,000±1300		-1271	"	200
23,700±1000		-1448	"	"
21,470 ± 760		-1611	"	"
20,010 ± 630	75cm	-1204	"	206
15,030 ± 300		-1253	"	"
13,310 ± 210		-1449	"	200
11,360 ± 260		-1202	"	"
6950 ± 320	50-52.5cm, level 20	-1298	"	201
6740 ± 240	just below surface	-1254	"	206
6410 ± 270	175-183cm	-1239	"	207
6290 ± 300	170-180cm	-1163	"	"
5320 ± 70	355-365cm	-1177	"	"
5310 ± 280		- 998	"	206
5020 ± 150	277-287cm	-1203	"	207
4810 ± 80	325-340cm	-1176	"	"
4450 ± 360	215-225cm	-1269	"	"
4450 ± 110	290-300cm	-1175	"	"
3980 ± 130	257-367cm	-1174	"	"

Date	Altitude or Depth	Sample No.	No.	Pg.
3970 ± 120	200-220cm	A-1178	2	207
3740 ± 100	230-240cm	-1173	"	"
3720 ± 200	200-210cm	-1172	"	"
3640 ± 100	144-148cm	-1069	"	206
2940 ± 100	90-100cm	-1064	"	"
2400 ± 150	2.5-5cm	-1297	"	201
Modern		-1330	"	"
Modern		-1329	"	200
Modern	3m below stream terrace	USGS- 92	"	320
Modern		- 93	"	"

NEW MEXICO

Date	Altitude or Depth	Sample No.	No.	Pg.
>33,000	30cm	A-1001	2	195
11,740±900	+1.5m	-1002	"	"
6820±550	110-120cm	-1429	"	206
6410±1270	110-120cm	-1430	"	"
4000±330	1.09m	-1126	"	205
3470±150	70-80cm	-1354	"	206

NEW JERSEY

Date	Altitude or Depth	Sample No.	No.	Pg.
4650 ± 70	4.15m	P-2722	2	239

OREGON

Date	Altitude or Depth	Sample No.	No.	Pg.
6160 ± 70	4.8m	USGS- 107	2	320
6090 ± 60		- 105	"	"
5870 ± 60		- 106	"	"

SOUTH CAROLINA

Date	Altitude or Depth	Sample No.	No.	Pg.
23,320±560	∿10-40cm above MLW	MRRI- 236	2	223
18,500±340	∿1m above MLW	- 222	"	222
18,500±440	∿0-70cm above MLW	- 241	"	223
17,400±470	∿10-40cm above MLW	- 233	"	"
8390±160	∿1m above MLW	- 224	"	222
8250±120	"	- 220	"	"
6180±100	∿10-40cm above MLW	- 234	"	223
6130±100	∿1m above MLW	- 219	"	222
5870±130	"	- 258	"	"
5600±110	"	- 217	"	"
5600±110	∿10-40cm above MLW	- 235	"	223
5390±120	"	- 231	"	"
4810±110	"	- 232	"	"
4560±140	∿1m above MLW	- 226	"	222
4490±100	∿10-40cm above MLW	- 229	"	223
4450±150	"	- 237	"	"
4450±120	∿70cm above MLW	- 256	"	"
4420±100	∿1m above MLW	- 216	"	222
4380±100	∿10-40cm above MLW	- 230	"	223
4370±170	∿1m above MLW	- 262	"	"
4310±100	∿10-40cm above MLW	- 228	"	"
4270 ± 90	∿70cm above MLW	- 254	"	"
4240±170	∿0-70cm above MLW	- 242	"	"
4230 ± 90	∿1m above MLW	- 221	"	222
4170±140	"	- 261	"	223
4150±130	"	- 227	"	222
3980±170	∿0-70cm above MLW	- 244	"	224
3770 ± 80	"	- 240	"	223
3730±120	∿1-1.5m above MLW	- 250	"	"
3660±140	∿0-70cm above MLW	- 238	"	"
3630±200	"	- 246	"	224
3400±160	"	- 243	"	"
2920±220	"	- 239	"	223
2850 ± 80	∿1-1.5m above MLW	- 249	"	"
2020 ± 90	1-2m above MLW	- 277	"	224
2010±110	"	- 276	"	"
1670 ± 80	"	- 274	"	"
1240±100	∿1m above MLW	- 223	"	222
1230 ± 70	1-2m above MLW	- 275	"	224
1230 ± 80	"	- 263	"	"

TEXAS

Date	Altitude or Depth	Sample No.	No.	Pg.
23,350±1200	8m	MRRI-1289	2	205
12,100 ± 200	+1500m	-1563	"	201
11,846 ± 167	"	-1588	"	"
11,760 ± 610	15cm	-1533	"	"
11,590 ± 230		-1519	"	"
11,020 ± 180		-1584	"	"
10,760 ± 150	15cm	-1534	"	"
10,670 ± 140	+2000m	-1583	"	"

UTAH

Date	Altitude or Depth	Sample No.	No.	Pg.
>40,000	4.32-4.44m	A-1140	2	203
12,220±880	7.05-7.10m total organic matter	-1112	"	204
12,120±1250	6.46-6.56m " " "	-1111	"	"
10,970±200	6.46-6.56m " " "	-1162	"	"
8800±300		-1110	"	"
7780±100		-1114	"	"
7270±300		-1113A	"	"
7260±250		-1113B	"	"
6800±250		-1139B	"	203
5720±120		-1139A	"	"
4350±120	2.54-2.65cm	-1170	"	"
3490±300	2.15-2.25m	-1135	"	"
2580±160	2.54-2.64m	-1035	"	"
2500±600	0.79-0.92m	-1037	"	"
2200 ± 50	1m	-1121	"	"
750±200	4.3m	- 852	"	194

VENEZUELA

Date	Altitude or Depth	Sample No.	No.	Pg.
13,880±120		USGS- 247	2	320
13,830±120		- 247A	"	321
13,650±120		- 247B	"	"

WALES

Date	Altitude or Depth	Sample No.	No.	Pg.
7380±160	405-415cm	SSR- 639	2	301
7070 ± 80	580-600cm	- 408	"	"
4760 ± 90	345-355cm	- 638	"	"
3580 ± 80	390-410cm	- 407	"	"
3420±110	285-295cm	- 637	"	"
2670±120	225-235cm	- 636	"	"
2060 ± 60	105-115cm	- 634	"	"
1630 ± 90	165-175cm	- 635	"	"
1470 ± 80	180-200cm	- 406	"	"
820 ± 60	210-240cm	- 410	"	302
770 ± 70	110-130cm	- 409	"	"

WEST INDIES

Date	Altitude or Depth	Sample No.	No.	Pg.
2160 ± 80	140-145cm	SSR-1005	2	302
2130 ± 40	179-184cm	-1002	"	"
1860 ± 60	109-114cm	-1009	"	"
1400 ± 50	108-113cm	-1006	"	"
1150 ± 70	111-116cm	-1008	"	"
930 ± 80	204-209cm	-1004	"	"
880 ± 60	125-130cm	-1010	"	303
840 ± 50	42-47cm	-1003	"	302
570 ± 60	45-50cm	-1007	"	"

OCEANOGRAPHIC SAMPLES

ATLANTIC OCEAN

Date	Depth	Sample No.	No.	Pg.
34,280 450	51-68cm	SRR- 561	2	257
$29,170^{+670}_{-620}$	108-117cm	-1037(a)	"	259
28,100 190	34-51cm	- 560	"	257
$16,820^{+570}_{-540}$	55-62cm	-1036(b)	"	259
$16,090^{+680}_{-630}$	108-117cm	-1037(b)	"	259
15,210±290	55-62cm	-1036(a)	"	258
15,160±260	43-53cm	-1039	"	259
$14,670^{+380}_{-370}$	101-102cm	-1040	"	"
13,160±190	45-48cm	- 801	"	258
12,680±250	17-34cm	- 559	"	259
12,330±140	32-40cm	-1035	"	256
10,420±370	68-73cm	- 558	"	258
9670±100	45-48cm	- 803	"	"
6530±230	56-60cm	- 557	"	256
5140±300	27-30cm	- 555	"	"
4820±150	0-10cm	SRR-1034(b)	2	258
4680 ± 50	"	-1034(a)	"	"
4570 ± 50	0-9cm	-1038	"	259
3430 ± 60	0-6cm	- 802	"	258
3040±260	13-15cm	- 554	"	256
2970 ± 60	82-85cm	- 797	"	258
2410±100	0-6cm	- 800	"	"
2140 ± 80	57-60cm	- 796	"	257
1730±290	42-45cm	- 556	"	256
1530±140	73-76cm	- 799	"	258
1130 ± 50	27-30cm	- 795	"	257
980±180	35-40cm	- 563	"	"
970±180	0-7cm	- 798	"	258
940 ± 60	55-60cm	- 564	"	257
670 ± 80	0-7cm	- 794	"	"
480±100	15-20cm	- 562	"	"

ARCHAEOLOGIC SAMPLES

BAHAMAS

Date	Culture or Period	Sample No.	No.	Pg.
1940±180	Bahamian prehistory	UM-2158	3	408
1380 ± 60	Arawak	-2275	"	"
730 ± 60	Bahamian prehistory	-2243	"	"
620 ± 70	Arawak	-2274	"	"
600±100	Bahamian prehistory	-2244	"	"
580 ± 90	Arawak	-2273	"	"
560 ± 80	Bahamian prehistory	-2245	"	"
310 ± 80	Arawak	-2271	"	"
220 ± 60	"	-2272	"	"

BELGIUM

Date	Culture or Period	Sample No.	No.	Pg.
>30,000	Middle Ages	IRPA- 311	3	350
>30,000	" "	- 315	"	"
>30,000	" "	- 314	"	"
>30,000	Roman	- 313	"	"
9920±390	"	- 318	"	"
9540±330	"	- 317	"	"
8330±350	"	- 320	"	"
5450±260	Mickelsberg culture	- 367	"	349
4000±210	Middle Ages	- 296C	"	350
3940±210	" "	- 296D	"	"
3410±200	Roman	- 322	"	"
2490±130	"	- 339	"	349
2490±140	"	- 340	"	"
2200 ± 60	"	- 377	"	348
2110±130	"	- 316	"	350
2060±130	"	- 342	"	348
2030 ± 60	"	- 371	"	"
2000 ± 70	"	- 370	"	"
1960 ± 50	"	- 368	"	"
1930 ± 50	"	- 369	"	"
1920 ± 50	"	- 379	"	349
1830 ± 50	"	- 372	"	348
1760 ± 50	"	- 375	"	"
1750 ± 50	"	- 374	"	"
1730 ± 50	"	- 383	"	"
1730 ± 50	"	- 384	"	"
1660 ± 50	"	- 373	"	"
1540 ± 40	"	- 382	"	349
1500 ± 80	High Middle Ages	- 312	"	350
1490±150	Roman	- 390	"	349
1440 ± 40	"	- 376	"	348
1050 ± 50	"	- 389	"	349
990 ± 80	High Middle Ages	- 319	"	350
630 ± 50	Roman	- 381	"	349
310 ± 40	Middle Ages	- 298	"	350
Modern	" "	- 296A	"	"
Modern	" "	- 296B	"	"
Modern	" "	- 303A	"	"

CANADA

Date	Culture or Period	Sample No.	No.	Pg.
3780 ± 85	Late Archaic Gennessee Component	I-10,313	3	339
2550 ± 90	Early Woodland	-9862	"	"
2480 ± 85	Vinette I - Early Woodland	-10,651	"	338
2430 ± 85	Early Woodland	-9565	"	339
2420 ± 90	" "	-9861	"	"
1070 ± 80	Glen Meyer	-10,630	"	"
715 ± 75	" "	-10,629	"	"
705 ± 75	Iroquois Pottery	-10,631	"	"
625 ± 75	Glen Meyer	-10,628	"	"
230 ± 80	Late Historic	-10,262	"	338
220 ± 80	" "	-10,261	"	"

CHILE

Date	Culture or Period	Sample No.	No.	Pg.
6650±155	Early Archaic-Shell Fish Hook culture	I-9817	3	342
6620±390	Early Archaic-Shell Fish Hook culture	-9816	"	"

CYPRUS

Date	Culture or Period	Sample No.	No.	Pg.
4410 ± 60	Late Stone age	Lu-1695	3	402
3660 ± 55	Bronze age	-1694	"	"
3630 ± 55	" "	-1726	"	"

ECUADOR

Date	Culture or Period	Sample No.	No.	Pg.
8810±395		I-10,097	"	342

FRANCE

Date	Culture or Period	Sample No.	No.	Pg.
4090 ± 80		Z- 734	"	413

IRELAND

Date	Culture or Period	Sample No.	No.	Pg.
9440±100	Stone age	Lu-1809	3	401
5750 ± 85	"	-1840	"	402
5240 ± 80	Megalithic	-1441	"	399
5040 ± 60	"	-1698	"	400
5000 ± 65	"	-1808	"	401
4940 ± 85	"	-1810	"	"
4320 ± 75	"	-1750	"	400
3780 ± 60	Neolithic	-1759	"	401
2770 ± 55	Bronze age	-1839	"	402
2630 ± 55	Early Iron age	-1627	"	400
2540 ± 70	"	-1625	"	399
2510 ± 55	"	-1626	"	400
2490 ± 55	"	-1585	"	399
2480 ± 55	"	-1624	"	"
2480 ± 55	"	-1584	"	"
2440 ± 55	"	-1586	"	"
2260 ± 80	Iron Age	-1631	"	400
1990 ± 50	"	-1755	"	401
1860±110	Late Iron Age	-1628	"	400
1830 ± 50	"	-1699	"	"
1730 ± 70	"	-1630	"	"
1690 ± 55	"	-1811	"	401
1520 ± 50	"	-1752	"	400
1320 ± 70	Viking age	-1838	"	402
1310 ± 50	"	-1757	"	401
1260 ± 50	"	-1756	"	"
1230 ± 50	"	-1758	"	"
1160 ± 50	"	-1753	"	400
1120 ± 50	"	-1841	"	402
1010 ± 50	"	-1754	"	401
600 ± 45	Historic	-1442	"	399

ITALY

Date	Culture or Period	Sample No.	No.	Pg.
2320 ± 60		IRPA- 408	3	350
2310±140		- 341	"	"
2290 ± 60		- 407	"	"

JAMAICA

Date	Culture or Period	Sample No.	No.	Pg.
970±180	Arawak	UM-2241	3	409
660±200	"	-2240	"	"
480 ± 90	"	-2242	"	"

MALAYSIA

Date	Culture or Period	Sample No.	No.	Pg.
2490 ± 90		I-10,758	3	342
1560 ± 90		-10,756	"	"
1470 ± 90		-10,757	"	"

ARCHAEOLOGIC SAMPLES

Date	Culture or Period	Sample No.	No.	Pg.
	MEXICO			
540±150	Preceramic	I-10,762	3	340
460±150	"	-10,761	"	"
930±150	"	-10,760	"	"
250 ± 95	Early Ajalpan	-10,460	"	341
100±140	Preclassic Lagunita phase	-7859	"	"
585 ± 90		- 9155	"	"
255 ± 80	Huamelulpan I	- 8614	"	"
975 ± 80	" II	- 8615	"	"
690 ± 85	Las Flores phase	-10,458	"	"
615 ± 85	Monte Alban II	-10,459	"	"
420 ± 80	Late Classic Bejuco phase	-10,085	"	340
270 ± 80	"	-10,086	"	"
210 ± 80	"	10,087	"	"
	PACIFIC ISLANDS			
2120 ± 80	Late Eastern Lapita	I-8355	3	343
185 ± 80		-8354	"	"
>180	Late Prehistoric	-8356	"	"
	SWEDEN			
970 ± 65	Neolithic	Lu-1779	3	398
940±110	"	1780	"	"
920 ± 60	Early Neolithic	1828	"	396
2770 ± 55	Early Iron age	1708	"	397
2710 ± 85	"	1713	"	"
2670 ± 55	Neolithic	1804	"	398
2560 ± 55	Early Iron age	1710	"	397
2550 ± 55		1803	"	398
2420 ± 65		1807	"	"
2290 ± 55		1715	"	397
2150 ± 50	Late Iron age	1714	"	"
1890 ± 55	Early Iron age	1709	"	"
1770 ± 65	"	1711	"	"
1690 ± 55	Late Iron age	1805	"	398
1600 ± 85	"	1806	"	"
1200 ± 50	"	1690	"	396
1180 ± 50	"	1689	"	"
1100 ± 50	"	1691	"	"
1030 ± 50	"	1688	"	"
990 ± 50	"	1687	"	"
	UNITED STATES			
	CALIFORNIA			
390 ± 80	San Luis Ray II	I-10,627	3	337
290±110		-10,626	"	"
	FLORIDA			
8570±820	Archaic	UM-2213	3	407
7550±290	"	-2211	"	"
5830±120	"	-2215	"	408
4880 ± 80	"	-2214	"	"
4770±100	"	-2216	"	"
	MINNESOTA			
1170±120	Blackduck Pottery	I-10,475	3	338
1070 ± 20	"	-10,140	"	337
	PENNSYLVANIA			
3170±250	Marcy Creek Plain Pottery	I-10,165	3	338
720±100	Stewart Phase of Shenks Ferry	-10,166	"	"
470±100	Stewart Phase of Shenks Ferry	-10,167	"	"

Date	Culture or Period	Sample No.	No.	Pg.
	YUGOSLAVIA			
7010 ± 90	Younger Boreal	Z-579	3	411
6025±100		-727	"	412
5600±115		-728	"	"
5125 ± 85	Atlantic	-580	"	411
4720±100		-719	"	412
4200±100	Bronze	-716	"	413
4160±100	"	-646	"	"
4010±100	"	-647	"	"
3750±110	Vucedol, Early Bronze	-722	"	412
3720±100		-718	"	"
3580 ± 95	30th-40th BC	-697	"	413
3290±120		-737	"	"
3210 ± 70	Bronze	-687	"	"
3090 ± 90		-717	"	412
2840 ± 90	30th-40th BC	-696	"	413
2700 ± 95		-773	"	"
2165 ± 80		-726	"	412
1940 ± 80	Neolithic	-634	"	"
1210 ± 70		-578	"	410
940 ± 80	14th-15th AD	-605	"	411
605 ± 65	14th AD	-582	"	"
580 ± 90	13th AD	-669	"	410
565 ± 60	17th AD	-608	"	411
390 ± 60	"	-609	"	"
375 ± 60	"	-611	"	412
240 ± 60	13th AD	-569	"	410
240 ± 60		-604	"	411
230 ± 60	15th-16th AD	-586	"	"
215 ± 50	17th AD	-607	"	"
120 ± 60	"	-610	"	"

GEOCHEMICAL SAMPLES

YUGOSLAVIA

Date	Depth	Sample No.	No.	Pg.
>40,000	22m	Z-602	3	417
>40,000		-757	"	420
>40,000	9m	-601	"	417
>40,000		-614	"	"
$37,300^{+3400}_{-2300}$		-566	"	419
$36,400^{+3500}_{-2500}$	73.5m	-768	"	419
$35,700^{+2600}_{-1900}$	ca 850m	-680	"	418
$33,800^{+2600}_{-2000}$	ca 580m	-744	"	"
$33,200^{+4300}_{-2800}$	10m	-597	"	417
$33,200^{+2350}_{-1900}$	ca 790	-733	"	418
$32,700^{+1500}_{-1250}$	370m	-756	"	419
$32,000^{+2000}_{-1700}$		-771	"	417
$31,900^{+1700}_{-1400}$		-598	"	"
$31,260^{+1500}_{-1300}$	26m	-595	"	"

YUGOSLAVIA (cont.)

Date	Depth	Sample No.	No.	Pg
21,900±550	76.0m	Z-767	3	419
21,600±570	0m	759	"	418
20,100±550	0m	761	"	"
19,400±380	9m	599	"	417
18,000±350		690	"	419
17,900±460		689	"	420
17,650±270		698	"	419
14,250±250	118m	653	"	420
12,350±210	148m	591	"	"
12,140±200	161m	596	"	417
12,000±200		688	"	420
11,850±200	0m	769	"	418
11,250±170	280m	592	"	420
10,750±200	0m	762	"	418
8150±110	0m	736	"	"
6780±130		654	"	420
5740±130	128m	652	"	"
5140±130	110.0m	729	"	419
5050±100	0m	758	"	418
2830±100	0m	775	"	"
1680 ± 85	60m	731	"	420
Modern		772	"	417

GEOLOGIC SAMPLES

AFRICA

Date	Depth or Altitude	Sample No.	No.	Pg.
15,900±600	10.25-10.75m	I-10,490	3	337
1380±190	1.0m	10,491	"	"

AUSTRALIA

Date	Depth or Altitude	Sample No.	No.	Pg.
4600±120		I-10,195	3	336
205 ± 75		-10,196	"	"

BELGIUM

Date	Depth or Altitude	Sample No.	No.	Pg.
8700±370	435-480cm	IRPA-350	3	345
7830±330	350-400cm	-355	"	346
7780±330	765-795cm	-353	"	345
7500±340	455cm	-352	"	"
5720±270	295-325cm	-351	"	"
5350±290	500cm	-356	"	346
4480±240	203-208cm	-388	"	"
4330±230	188-195cm	-387	"	"
3440±190	139-152cm	-386	"	"
3200±200	155cm	-345	"	"
2890±150	100cm	-344	"	"
1440 ± 90	250cm	-349	"	345
1380±100	250cm	-354	"	"
1180 ± 80	65cm	-347	"	"
660 ± 50	120cm	-348	"	"

CANADA

Date	Depth or Altitude	Sample No.	No.	Pg.
>38,000		I-9772	3	335
10,780±160	560-570cm	-7269	"	334
9930±250	330cm	-7858	"	335
9750±140	930-940cm	-5786	"	333
8790±150	292cm	-7857	"	335
8210±160	440-450cm	-7274	"	"
7280±280	210-220cm	-8879	"	334
7460±280	210-220cm	-8879C	"	"
6970±120	410-420cm	-7268	"	334
6560±120	183-200cm	-7223	"	335
6220±110		-7741	"	333
5710±140	480-490cm	-5785	"	"
5300±100	230-240cm	-8692	"	334
5070±100	195-205cm	-8691	"	"
4690±130	220-230cm	-7267	"	"
4090±250	250-260cm	-9067	"	"
3890±130	140-150cm	-7222	"	335
3510±180	200-215cm	-9066	"	334
2660±170	100-115cm	-9065	"	"
2100 ± 80		ISGS- 436	"	382
1800±100		- 443	"	"
1620 ± 80		- 435	"	"
1480 ± 80		- 441	"	"
900±100		- 442	"	"
510±150	0-20cm	I-9064	"	334

GREENLAND

Date	Depth or Altitude	Sample No.	No.	Pg.
$39,300^{+2600}_{-2000}$	+8m	Lu-1785	"	390
$38,400^{+2250}_{-1750}$	+48-+58m	-1787	"	"
$35,400^{+1650}_{-1350}$	+75m	-1786	"	"
$33,700^{+1200}_{-1050}$		-1788	"	391
11,540±135	58.5-63.5cm	-1746	"	392
9540±115	31-37cm	-1748	"	"
9330±145	46-48cm	-1747	"	"
7440 ± 95	118-123cm	-1741	"	391
6630±110		I-10,433	"	335
6120 ± 90	9-15cm	Lu-1749	"	392
5140±130	95-100cm	-1742	"	391
4530±130	70-75cm	-1743	"	"
3670±150	45-50cm	-1744	"	392
2390±120	20-25cm	-1745	"	"

ICELAND

Date	Depth or Altitude	Sample No.	No.	Pg.
6870 ± 95	388-393cm	Lu-1735	3	390

IRAN

Date	Depth or Altitude	Sample No.	No.	Pg.
32,300±1250	22m asl	UM-2117	3	406
29,800±1100	18m asl	2165	"	"
23,000 ± 660	17.5m asl	2166	"	"
16,000 ± 250	14.5m asl	2167	"	"
8530 ± 120	17.5m asl	2115	"	"
5430 ± 90	17.5m asl	2116	"	"
4080 ± 140	20m asl	2168	"	"

MALAYSIA

Date	Depth or Altitude	Sample No.	No.	Pg.
>40,000		I-10,183	3	336

MEXICO

Date	Depth or Altitude	Sample No.	No.	Pg.
4360±150	489-491cm	Lu-1734C	3	394
3360±175	467-469cm	-1733C	"	"
2700 ± 80	489-491cm	-1734	"	"
1820 ± 60	250-251cm	-1731	"	"
720 ± 50	150-151cm	-1730	"	"
360 ± 50	101-102cm	-1729	"	"
310 ± 75	467-469cm	-1733	"	"

NORWAY

Date	Depth or Altitude	Sample No.	No.	Pg.
10,240 ± 95	239-300cm	Lu-1727	3	389
8120 ± 80	236-241cm	-1728	"	"

PACIFIC ISLANDS

Date	Depth or Altitude	Sample No.	No.	Pg.
6360±110	Surface	I-9818	3	336
6240±110	1.3m	-9819	"	"
6120±110		-9820	"	"

POLAND

Date	Depth or Altitude	Sample No.	No.	Pg.
11,290±105	960-985cm	Lu-1790	3	393
11,020±110	964-967cm	-1792	"	"
10.900±120	994-1000cm	-1793	"	"
10,850±100	977-986cm	-1789	"	392
10,770±100	960-968cm	-1791	"	393

SCOTLAND

Date	Depth or Altitude	Sample No.	No.	Pg.
6090±300	+560m	IRPA- 362	3	347
5670±250	+640m	- 366	"	"
5230±260	+600m	- 361a	"	"
5160±240	+600m	- 361b	"	"
5070±260	+230m	- 358	"	"
4660±240	+515m	- 364	"	"
4350±240	+515m	- 365	"	"
4200±230	+485m	- 363	"	"
4140±210	+485m	- 360	"	"
3720±200	+230m	- 359	"	"

SPITSBERGEN

Date	Depth or Altitude	Sample No.	No.	Pg.
7540 ± 80	40cm	Lu-1772	3	390

SWEDEN

Date	Depth or Altitude	Sample No.	No.	Pg.
18,480±220		Lu-1704	3	388
17,600±160		1836	"	"
11,810±160		1705	"	"
11,410±105		1837	"	389
11,390±105	634-639cm	1767	"	386
10,900±100	365-370cm	1769	"	387
10,830±100	610-615cm	1770	"	"
10,790±100	245-250cm	1768	"	"
10.730±100	427-432cm	1766	"	386
10,420 ± 90		1707	"	388
10,290±135	564-567cm	1773	"	387
10,040 ± 95	305-310cm	1771	"	"
10,020 ± 95	280-285cm	1765	"	386
9910 ± 90	485-490cm	1763	"	"
9740 ± 90	275-280cm	1764	"	"
9630 ± 90	592-596.5cm	1772	"	"

SWEDEN (cont.)

Date	Depth or Altitude	Sample No.	No.	Pg.
9150 ± 90	462-466cm	Lu-1774	3	387
8840 ± 85	720-725cm	-1657	"	385
8450 ± 85	448-452cm	-1775	"	387
8390 ± 80		-1706	"	"
7880 ±100	1175-1180cm	-1666	"	385
7710 ± 75	670-675cm	-1658	"	"
6650 ± 70	620-625cm	-1659	"	"
5640 ± 65	1160-1165cm	-1667	"	"
5390 ± 65	570-575cm	-1660	"	"
5220 ± 65	90cm	-1738	"	386
5030 ± 65		-1736	"	"
4500 ± 60	520-525cm	-1661	"	385
4010 ± 60	470-475cm	-1662	"	"
3570 ± 55		-1702	"	388
3300 ± 55	420-425cm	-1663	"	385
3040 ± 55		-1700	"	388
2980 ± 55	1125-1130cm	-1668	"	385
2140 ± 50		-1703	"	389
1500 ± 50	370-375cm	-1664	"	385
1300 ± 50		-1701	"	388
900 ± 50	50-54cm	-1820	"	395
860 ± 50	320-325cm	-1665	"	385
830 ± 50		-1720	"	389
800 ± 50	60-62cm	-1821	"	395
790 ± 50		-1721	"	389
760 ± 50		-1719	"	"
540 ± 55	58cm	-1823	"	396
170 ± 45	43-45cm	-1817	"	395
160 ± 45	100cm	-1737	"	386
70 ± 45	37cm	-1822	"	395
50 ± 45	38-43cm	-1816	"	"
Δ=+31.0 8.1%	20cm	-1818	"	"
Δ=+70.3 7.1%	40-44cm	-1824	"	396

SWITZERLAND

Date	Depth or Altitude	Sample No.	No.	Pg.
13,000±120	ca +430m	Lu-1723	3	393
6650 ± 75	+410m	-1761	"	"

TURKEY

Date	Depth or Altitude	Sample No.	No.	Pg.
22,900±370	400cm	UM-1638	3	407
21,800±680	290cm	-1639	"	"
20,900±190	400cm	-1637	"	"
19,500±440	290cm	-1579	"	"
19,000±330	300cm	-1578	"	406
17,800±630	ca 250cm	-2150	"	407
14,700±160	115cm	-1577	"	406
400 ± 80		-2151	"	407

UNITED STATES

ALASKA

Date	Depth or Altitude	Sample No.	No.	Pg.
9540±150		I-10,331	3	330
9180±150		-10,368	"	"
9130±150		-10,328	"	329
8440±160		-10,332	"	330
8280±140		-10,330	"	329
6240±120		-10,329	"	"
4890±230	3.6m	-10,371	"	330
3950±120		-10,369	"	"
3320±100		-10,370	"	"
2380 ± 80	0.45m	-10,372	"	"
520 ± 80	4.0m	ISGS-296	"	380
350 ± 80	1.1m	-312	"	"
(163.4±0.4)% Modern	39.9m	-317	"	"

CALIFORNIA

Date	Depth or Altitude	Sample No.	No.	Pg.
43,200±1100		ISGS-578	3	377
>40,000		I-9731	"	382
34,550 ± 490		ISGA-542	"	377
16,520 ± 150	1.7m	518	"	"
15,630 ± 460		525	"	"
11,330 ± 150		543	"	"
10,800 ± 80	8.1-8.9m	580	"	376
4840 ± 80	1.6m	544	"	377
3950 ± 100	3m	UM-2155	"	405

CALIFORNIA (cont.)

Date	Depth or Altitude	Sample No.	No.	Pg.
2720±110	2m	UM-2157	3	405
1890 ± 80		ISGS -602	"	376
1600 ± 80		I-9706	"	331
(99.3±0.1)% Modern	2.1m	ISGS- 609	"	376

FLORIDA

Date	Depth or Altitude	Sample No.	No.	Pg.
6570±160	85-100cm	UM-2198	3	405
5750±110	39.25-26"	-2260	"	"
3870±220	190-195cm	-2195	"	404
3710 ± 80	40-50cm	-2194	"	"
3030 ± 90	40-50cm	-2197	"	405
2480 ± 80	13.5-25.5"	-2259	"	"
2070 ± 90	400-405cm	-2196	"	"
990 ± 80	50cm	-2223	"	404
920±110	12-24cm	-2224	"	"
490±110	0-4cm	-2278	"	"

ILLINOIS

Date	Depth or Altitude	Sample No.	No.	Pg.
>50,000		ISGS- 241	3	355
>50,000		- 430	"	356
>48,500		- 242B	"	"
>47,800		- 242A	"	"
41,200±1600	12.95m	- 375	"	358
40,500±1100	4.5-4.9m	- 557	"	365
40,500±1700	6.98-7.04m	- 562	"	363
40,400±1400	4.95-6.45m	- 559	"	365
40,200±1500	13.1m	- 393	"	359
38,920±1100	6.0-6.2m	- 654	"	364
>38,700		- 255	"	356
37,950 ± 700		- 423	"	361
37,290 ± 790		- 624	"	366
>36,500		- 378	"	357
36,100 ± 550	13.1m	- 392	"	359
35,600±1000		- 374	"	357
34,290 ± 840		- 490	"	361
>34,200		- 447	"	"
31,400 ± 740	4.5m	- 479	"	362
30,980 ± 400		- 400	"	360
>29,100		- 254	"	356
28,970 ± 290		- 409	"	361
27,000 ± 770		- 535	"	363
27,300 ± 540		- 614	"	366
27,230 ± 420	6.3m	- 661	"	"
26,820 ± 200	5.01m-5.17m	- 561	"	362
26,680 ± 380		- 533	"	363
26,180 ± 760	12m	- 476	"	358
26,100 ± 170	6.75-6.85m	- 662	"	366
26,050 ± 330		- 575	"	365
26,050 ± 370		- 594	"	"
25,960 ± 280		- 529	"	363
25,680 ± 1000		- 530	"	"
25,370 ± 310		- 531	"	"
25,170 ± 200		- 536	"	364
23,930 ± 280		- 307	"	359
23,110 ± 800		- 413	"	360
22,850 ± 290		- 422	"	361
22,170 ± 450		- 534	"	364
21,910 ± 270		- 292	"	359
21,780 ± 410		- 549	"	364
21,460 ± 210		- 546	"	"
21,250 ± 220		- 261	"	359
20,910 ± 520		- 412	"	360
20,830 ± 160		- 560	"	365
20,510 ± 170		- 547	"	364
20,160 ± 250		- 649	"	366
19,680 ± 460		- 532	"	363
18,910 ± 200		- 401	"	358
16,020 ± 260		- 421	"	359
15,330 ± 170		- 331	"	357
14,380 ± 150	12.50-12.60m	- 527	"	336
13,440 ± 250	2.20-2.30m	- 334	"	357
13,300 ± 240	6.10-6.50m	- 426	"	362
12,990 ± 120	13.70m	- 271	"	357
11,280 ± 110	11.51-11.59m	- 528	"	361
11,070 ± 210	8.52-8.58m	- 463	"	360
10,860 ± 80	11.11-11.19m	- 526	"	361
10,590 ± 250	8.00-8.06m	- 451	"	360
8300 ± 100	9.62-9.68m	- 519	"	361
7810 ± 100		- 383		358

GEOLOGIC SAMPLES

ILLINOIS (cont.)

Date	Depth or Altitude	Sample No.	No.	Pg.
7680±100	6.95-7.00m	ISGS-417	3	361
6460±100	1.47-1.63m	-521	"	362
6090±100	6.00-6.10m	-459	"	360
5840 ± 90		-358	"	357
5680±120		-397	"	359
5330±100	3.95-4.10m	-416	"	361
4680±150	4.80-4.90m	-461	"	360
4300 ± 80		-266	"	352
4250±120		-395	"	359
4190 ± 80		-286	"	352
4160 ± 90	2.03-2.10m	-517	"	361
3940 ± 80		-548	"	364
3370 ± 80	1.05-1.10m	-516	"	361
3270 ± 80	9.00-9.30m	-563	"	365
3010±100	6.25-6.50m	-574	"	"
2330±170	2.65-2.72m	-460	"	360
2060 ± 90	23m	-454	"	362
1970± 80	13.7m	-453	"	"
1770 ±130		-391	"	359
1750± 80		-356	"	352
1600±100	65-75cm	-390	"	359
1580 ± 80		-278	"	353
1320 ± 80		-333	"	"
1270 ± 80		-379	"	358
1240 ± 80		-381	"	"
1230 ± 80		-396	"	"
1200 ± 80		-285	"	353
1110 ± 80		-284	"	"
1050±100	1-1.05m	-462	"	360
1020 ± 80	0.45m	-350	"	353
910 ± 80	0.70m	-277	"	356
860±100		-394	"	358
790 ± 80	0.50m	-279	"	353
700 ± 80		-380	"	358
440 ± 80	1.00m	-367	"	354
390 ± 80	1.75m	-351	"	353
270 ± 80		-650	"	366

INDIANA

Date	Depth or Altitude	Sample No.	No.	Pg.
>50,000		ISGS-431	3	371
>40,000		-388	"	"
36,380±800		-386	"	370
25,480±420	3.05-3.35m	-523	"	372
25,480±400	2.70-2.90m	-598	"	373
24,790±230	3.7m	-583	"	"
24,070±570		I-9637	"	331
23,690±980	15.2-15.50m	ISGS-524	"	372
22,960±200		-528	"	"
22,340±520	7.30-7.45m	I-10,075	"	331
22,080±220		ISGS-567	"	372
21,830±510	52.5m	I-10,073	"	331
21,610±310	8.53-8.69m	ISGS-455	"	371
21,580±180		- 597	"	373
21,310±350		- 382	"	370
21,100±200		- 378	"	"
21,010±350	6.90m	- 477	"	"
20,990±160	7.60-7.80m	- 582	"	372
20,660±180		- 541	"	"
20,110±360	5.1m	- 475	"	370
20,100±400		I-10,074	"	331
20,100±400		I-9634	"	"
14,550 ± 80		ISGS-491	"	372
14,080±150	1.25m	-502	"	"
13,820 ± 80	1.15m	-504	"	371
13,600±215	2.3m	I-9636	"	330
13,360±100	1.00m	ISGS-505	"	371
13,220±100	0.94m	-492	"	"
13,070 ± 90	0.8-0.9m	-610	"	"
12,060±100	0.33m	-501	"	"
9220±210	5.20-5.50m	-247	"	370
9010±190	11.50-11.60m	-248	"	"
7670±130	10m	I-9635	"	330
3980 ± 80		ISGS-617	"	373
2140±100		-640	"	"

IOWA

Date	Depth or Altitude	Sample No.	No.	Pg.
> 39,300		ISGS-244	3	367
31,100± 2000		-503	"	"
27,500± 800		-243	"	"
25,300± 650	5.00-5.40m	-512	"	"
24,500± 820		-553	"	368
13,680 ± 80	10.40m	-552	"	367
12,610±250		-641	"	368

MINNESOTA

Date	Depth or Altitude	Sample No.	No.	Pg.
10,730±150	810-820cm	I-8459	3	333
9780±140	780-792cm	-7272	"	332
7320±120	690-700cm	-7271	"	"
3690±120	300-310cm	-7270	"	"
3400±110	400-410cm	-8458	"	"
790 ± 90	50-60cm	-8533	"	"

MISSISSIPPI

Date	Depth or Altitude	Sample No.	No.	Pg.
19,310±460		ISGS-612	3	381
18,400±400		-613	"	"

MISSOURI

Date	Depth or Altitude	Sample No.	No.	Pg.
8810 ± 90		ISGS-326	3	381

NEW MEXICO

Date	Depth or Altitude	Sample No.	No.	Pg.
27,500±1300		ISGS-344	3	378
21,180±560		346	"	"
20,500±600		458	"	379
8860±230	3.00m	347	"	378
7830 ± 90	4.60m	343	"	"
6390±120	2.44m	608	"	380
5200±150		607	"	379
2960 ± 80		373	"	"
1690±100		389	"	"
1650 ± 80	0.9m	372	"	"
1300 ± 80		615	"	380
990 ± 80	0.61-1.20m	369	"	378
840 ± 80		370	"	379
400±100	0.30m	585	"	380

NORTH DAKOTA

Date	Depth or Altitude	Sample No.	No.	Pg.
10,970±160	1430-1450cm	I-8481	3	333
8300 ± 40	1350-1370cm	-8480	"	"
2830 ± 90	580-600cm	-8479	"	"

OHIO

Date	Depth or Altitude	Sample No.	No.	Pg.
>45,160	+1.68m	ISGS-590	3	376
>44,600	base	-432	"	375
42,220± 850	62m	-433	"	"
21,070± 100		-604	"	376
15,570± 340	466-486cm	-252	"	374
14,500± 150		-402	"	375
14,050 ± 80	base	-348	"	374
13,640± 210	350-360cm	-250	"	"
13,400± 140	5.6m	-405	"	375
13,050± 100		-437	"	"
12,550± 230	3.25m	-621	"	"
12,470± 140	4.47m	-622	"	"
12,260± 90	5.08m	-403	"	"
10,470± 100	2m	-409	"	"
10,430 ± 90	2m	-407	"	"
10,060± 160	209-214cm	-249	"	374
9320 ± 90		-618	"	"
8790 ±180	1.32m	-658	"	375
8150 ±120	0.9-1m	-410	"	374
4690 ±100	0.3-0.4m	-411	"	"
128.5±1.2% M	1.5-2.25m	-639	"	376

TENNESSEE

Date	Depth or Altitude	Sample No.	No.	Pg.
25,320± 170		ISGS-656	3	381
24,990± 270		-653	"	"
23,390± 200		-652	"	"

WISCONSIN

Date	Depth or Altitude	Sample No.	No.	Pg.
40,800±2000	12.32-12.39m	ISGS-256	3	368
>36,500	12.07-12.23m	262	"	"
20,270 ± 650	8.80-10.40m	558	"	369
11,980 ± 100		480	"	"
11,790 ± 80		264A	"	368
11,640 ± 90		264B	"	369
11,640 ± 80	4.60-4.70m	666	"	"
11,630 ± 80	4.50-4.60m	660	"	"
10,920 ± 90	4.60-4.70m	659	"	"
5500 ± 80	2.70-2.75m	313	"	355
4890 ± 80	2.10-2.15m	260	"	354
4740 ± 80	1.70-1.75m	259	"	"
3950 ± 120		288	"	"
3800 ± 80		318	"	355
3280 ± 80	0.95-1.10m	265	"	354
1450 ± 80		297	"	355
880 ± 80		325	"	"

Date	Depth or Altitude	Sample No.	No.	Pg.
WISCONSIN (cont.)				
770 ± 80		ISGS-253	3	354
580 ± 80	0.4m	-332	"	355
560 ± 80	0.65-0.90m	-362	"	354
500 ± 80		-289	"	"
WYOMING				
8200 ± 80	2.00m	ISGS-513	3	382
8000±110	1.06-1.36m	-515	"	"
7000±140	1.36-1.66m	-514	"	"
4960 ± 80	1.21-1.66m	-520	"	"
	YUGOSLAVIA			
>40,000		Z-617	3	414
>40,000		618	"	"
>40,000	5m	714	"	415
$39{,}100^{+5100}_{-3100}$	80cm	724	"	"
$35{,}000^{+2750}_{-2080}$		725	"	"
$34{,}800^{+2290}_{-1780}$	2.5-3m	723	"	"
$31{,}400^{+1700}_{-1400}$		650	"	"
28,100±1300		648	"	"
19,300 ± 430		732	"	416
12,600 ± 220		645	"	415
10,000 ± 200		619	"	414
8900 ± 120	26.5m	713	"	415
7850 ± 140		778	"	416
7330 ± 150		649	"	415
6960 ± 90	6.4m	577	"	414
4160 ± 100		646	"	413
4020 ± 75	4.6m	576	"	414
4010 ± 100		647	"	413
4000 ± 110		776	"	416
3600 ± 80	3.8m	575	"	414
2450 ± 120		780	"	416
2220 ± 65	1.8m	574	"	414
1780 ± 70	1.5m	572	"	413
1320 ± 110		765	"	416
980 ± 80	0.5m	573	"	414
310 ± 80		764	"	416
270 ± 80	147m	615	"	414
230 ± 100		766	"	416
150 ± 80		763	"	"
130 ± 65	0.7m	587	"	414
120 ± 60	2.1m	589	"	"
120 ± 70	0.5m	588	"	"
Modern	147m	616	"	"

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