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VIENNA RADIUM INSTITUTE RADIOCARBON DATES X

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Measurements have continued with the same proportional counter system, pretreatment procedure, methane preparation and measurement, and calculation, as described previously (R, 1970, v 12, p 298-318). Uncertainties quoted are single standard deviations originating from standard, sample, background counting rates and half-life. No $^{13}C/^{12}C$ ratios were measured.

Sample descriptions have been prepared in cooperation with submitters.

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SAMPLE DESCRIPTIONS

I. GEOLOGIC, GLAZIOLOGIC, LIMNOLOGIC, AND FOREST SAMPLES

A. Austria

VRI-618. Podlanig, Kärnten **28,300 ± 700**

Wood in talus under Late Glacial Age ice-margin terrace, Podlanig (12° 54′ 50″ N, 46° 41′ 10″ E) near St Jacob im Lesachtal, Carinthia. Coll 1977 and subm by D van Husen, Geol Inst, TU Vienna. *Comment* (DvH): dates talus and stagnant water sediments of damming-up phase in Gail Valley.

VRI-619. Nieselach, Kärnten **26,300 ± 600**

Lignite from lignite horizon (Fritz, 1971) overlain by coarse gravel and by ground moraine at the top, Nieselach (46° 36′ 30″ N, 13° 30′ 30″ E), Gail Valley, Carinthia. Coll 1977 and subm by D Van Husen. *Comment* (DvH): chronologic fixation of lignite horizon in Würm Ice age.

Helfenberg series, OÖ

Samples from surroundings of Helfenberg, Mühlviertel, Upper Austria. Coll 1976 and subm by F Kral, Univ Bodenkultur, Vienna.

General Comment (FK): question of forest history.

VRI-587. Afiesl **750 ± 70**

Wood (spruce) ca 1.5m below corn-field, Afiesl (48° 35′ 15″ N, 14° 08′ 30″ E), alt 750m. *Comment* (FK): date is max for end of former woodland.

VRI-588. Hinterau **590 ± 70**

Brown carr-peat at depth 14 to 24cm above which *Larix* is continuously found, Hinterau (48° 35′ 50″ N, 14° 08′ 40″ E), 720m NN. *Com-*

ment (FK): date indicates autochthonous *Larix* palynologically detected and gives max age for later clearing.

VRI-630. Flachau, Salzburg **<250**

Wood from stem below 10 ton-stone in landslide material at —4.5m in Griesgraben (47° 20′ N, 13° 23′ E), Flachau, Salzburg. Coll 1978 and subm by Forsttechnischer Dienst f Wildbach- u Lawinenverbauung, Salzburg. *Comment*: dates landslide.

VRI-631. Böckstein, Salzburg **4420 ± 100**

Wood 13.2m below ground from excavation of water power Sta Böckstein (47° 05′ 13″ N, 13° 06′ 57″ E) near Badgastein, Salzburg. Coll 1978 and subm by SAFE. *Comment* (SAFE): dates Holocene valley filling.

St Martin a Tg, series, Salzburg

Wood, St Martin am Tennengebirge, Salzburg. Coll 1978 and subm by W Weinmeister, Forsttechnischer Dienst f Wildbach- u Lawinenverbauung, Salzburg.

VRI-633. Sample 1 **2280 ± 100**

Branch or root ca 60cm below surface in uppermost bog layer overlain by sand (47° 29′ 57″ N, 13° 22′ 44.5 E). *Comment* (WW): max age of sand deposition on alluvial cone of rivulet Schöberlbach and min age for cone.

VRI-634. Sample 2 **6130 ± 120**

Stem at base of rivulet Schöberlbach earlier covered by 6m dolomite detritus (47° 29′ 57.5″ N, 13° 20′ 24″ E). *Comment* (WW): dates flood causing fall of trees into rivulet bed.

VRI-464. Pass Thurn, Salzburg **11,560 ± 170**

Cyperaceae peat at base —3.2m of bog Wasenmoos, Pass Thurn (47° 18′ 21″ N, 12° 25′ 03″ E), 1205m alt, near Mittersill, Salzburg. Coll and subm by S Bortenschlager, Bot Inst, Univ Innsbruck. *Comment* (SB): age is min of ice retreat and fixes beginning of peat growth. Expected ca 13,000 BP.

VRI-594. Spital am Pyhrn, Steiermark **9680 ± 210**

Wood in rubble of E slope of Mt Mitterberg near Spital am Pyhrn (47° 40′ N, 14° 20′ E), Styria. Coll 1977 when tunneling Hwy A9 Pyhrnautobahn and subm by H Auferbauer, Steiermärkische Landesregierung, Graz. *Comment* (HA): dates postglacial slope overburden.

Trieben series, Steiermark

Sphagnum peat from lowland moor Aubruckermoos near Trieben (47° 29′ 20″ N, 14° 30′ 30″ E), alt 690m, Styria. Coll 1974 and subm by F Kral.

General Comment (FK): dates palynologically detected events.

VRI-500. 150-160cm **6000 ± 100**

Peat at depth 150 to 160cm. *Comment* (FK): date proves spreading of *Abies* even in more central parts of E Alps during middle of Atlantikum.

VRI-501. 285-300cm **6490 ± 90**

Peat at depth 285 to 300cm. *Comment* (FK): date proves existence of outposts of *Abies* spreading in older Atlantikum.

Stubaital Series 1, Tirol

Peat of bog Buntes Moor (46° 59′ 27″ N, 11° 08′ 45″ E), 2285m alt, Stubai Valley, Tyrol. Coll 1973 in dug profile and subm by Sigmar Bortenschlager.

General Comment (SB): dates palynologically detected events. Completes earlier search (Mayr, 1964; 1968; R, 1970, v 12, p 303).

VRI-530. Buntes Moor 6 **3150 ± 80**

Peat at depth 279 to 285cm. *Comment* (SB): dates end of lowering timber line.

VRI-531. Buntes Moor 7 **3490 ± 80**

Peat at depth 303 to 307cm. *Comment* (SB): dates end of growth of thickest peat layer in profile and beginning timber line decrease.

VRI-532. Buntes Moor 8 **5690 ± 110**

Peat at depth 350 to 355cm. *Comment* (SB): dates beginning peat growth and tree pollen increase at beginning of climatic amelioration.

Stubaital Series 2, Tirol

Samples of bog near glacier Grünau-Ferner (46° 59′ 50″ N, 11° 11′ 37″ E), 2190m alt, Stubai Valley, Tyrol. Coll 1975 in dug profile and subm by Sigmar Bortenschlager.

General Comment (SB): dates palynologically detected events. Completes earlier search (Mayr, 1964; 1968; R, v 12, p 306).

VRI-533. Grünau-Ferner 1 **6980 ± 130**

Dy at base, depth 214 to 216cm. *Comment* (SB): dates beginning peat growth and min age for ice retreat.

VRI-534. Grünau-Ferner 2 **6270 ± 100**

Cyperaceae peat at depth 188 to 189cm. *Comment* (SB): dates end of peat growth and beginning of climatic deterioration.

VRI-535. Grünau-Ferner 3 **5820 ± 100**

Cyperaceae peat at depth 134 to 144.5cm. *Comment* (SB): dates end of peat growth and beginning of climatic deterioration.

VRI-536. Grünau-Ferner 4 **4920 ± 140**

Dy at depth 113 to 115cm. *Comment* (SB): dates end of peat growth and beginning of climatic deterioration.

VRI-570. Ampass 1, Tirol **25,630 ± 660**

Earthy peat from sedimented peat band, 3 to 7cm thick, in sand-silt-zone ca 2m thick followed by ca 20m gravel overlain by 1 to 2m ground moraine and recent soil. Coll 1976 near Ampass (47° 15′ 39″ N, 11° 27′ 28″ E), Inn Valley, Tyrol, 680m alt, and subm by Gernot Patzelt, Geog Inst, Univ Innsbruck. *Comments* (GP): max age for beginning of Inn Valley gravel filling prior to last glaciation. (HF): No humic acid separation.

VRI-582. Lanersbach, Tirol **7830 ± 130**

Wood in landslide, Nandis-Alpe, E work Tux near Lanersbach (47° 09′ 50″ N, 11° 53′ 30″ E), Tyrol. Coll 1975 and subm by Ilse Draxler, Geol BA, Vienna. *Comment* (ID): dates landslide.

B. CSSR, Italy, Nepal, Saudi Arabia

Boubínský prales series, CSSR

Carr peat of reservation Boubínský prales, Bohemian Woods (48° 56′ 30″ N, 13° 50′ 50″ E), 960m alt, CSSR. Coll 1975 and subm by A Kriesl and F Kral, Univ Bodenkultur, Vienna.

General Comments (FK): chronologic classification of palynologically detected events was expected, but dates are too young. Possibly sample contamination by humic acids. (HF): No humic acid separation was possible.

VRI-546. 62-70cm **4240 ± 70**

Peat and wood remnants at depth 62 to 70cm. *Comment* (FK): date of beginning of fir and beech spread was expected, however too young by ca 1500 yr.

VRI-547. 92-100cm **6800 ± 110**

Peat with silt at depth 92 to 100cm. *Comment* (FK): date of beginning of spruce spread was expected, however too young by ca 2500 yr.

VRI-499. Forcellona, Italy **8900 ± 130**

Carex-carr peat at depth 110 to 120cm from lowland moor near Forcella (46° 57′ 40″ N, 11° 37′ E), 1330m alt, Italy. Coll 1974 and subm by Friedrich Kral. *Comment* (FK): date of palynologic interest, proving assumption of relatively rapid spread of spruce from refuge at SE border of E Alps against W.

Sarnthein series, Italy

Samples from different depths of bog Dura-Moor (46° 38′ 25″ N, 11° 27′ 35″ E), Villanders-Berg near Sarnthein, Italy. Bog is outside of outermost end moraines of Egesen phase. Coll 1976 by boring and subm by Sigmar Bortenschlager.

General Comment (SB): dates palynologically detected events. Dates fit expectation.

VRI-539. 450-472.5cm **10,020 ± 190**

Gyttja in contact with clay from depth 450 to 472.5cm. *Comment* (SB): dates beginning of organic sedimentation and min age for ice retreat.

VRI-548. 385-405cm **8920 ± 130**

Gyttja from depth 385 to 405cm. *Comment* (SB): dates increase of *Alnus,* decrease of *Pinus* and beginning increase of *Picea.*

VRI-549. 330-340cm **7870 ± 140**

Gyttja from depth 330 to 340cm. *Comment* (SB): dates intersection of *Picea* with *Pinus* curve and beginning of *Abies* and *Fagus* curve.

VRI-553. Sarnthein, Italy **9370 ± 150**

Gyttja from base of bog Schwarzsee, depth 375 to 383cm, Villanders-Berg (46° 39′ 59″ N, 11° 25′ 55″ E) near Sarnthein, Italy. Coll 1976 and subm by Sigmar Bortenschlager. *Comment* (SB): date is min for ice retreat in area and beginning of vegetation.

Kathmandu series, Nepal

Samples in lake sediments of Kathmandu Valley, Nepal. Coll 1977 by Herbert Franz, subm by H Müller, Univ Bodenkultur, Vienna.

General Comment (HF): clue to age of terraces in Kathmandu Valley (Franz & Kral, 1975) in relation to tectonic movements.

VRI-607. Chobar-Hill **>36,000**

Pine cones and bark near cement factory S Kathmandu (27° 40′ N, 85° 15′ E) found in drain ditch at base of Chobar Hill. Site several meters below upper edge of lake sediments.

VRI-608. Karpathi **29,200 ± 1100**

Wood in lake sediments below brown colluvium; near Karpathi, N border of Kathmandu Valley (27° 42′ N, 85° 27′ E).

VRI-599. Farasan, Saudi Arabia **4330 ± 100**

Shells in coastal terrace of island of Farasan (16° 35′ N, 42° 10′ E), Saudi Arabia. Coll 1977 and subm by Josef Zötl, Hydrogeol, TU Graz. *Comment* (JZ): coastal terrace may be caused by tectonic uplift or by sea-level fluctuation of Red Sea. Date can be compared to age of known phases of raised sea level.

VRI-600. Harat Al Birk, Saudi Arabia **32,200 $^{+1800}_{-1500}$**

Shell in ancient shoreline along S margin of Harat Al Birk (18° 08′ N, 41° 36′ E), Saudi Arabia. Coll 1977 and subm by Josef Zötl. *Comment* (JZ): dates shoreline.

VRI-601. Wadi Al Atk, Saudi Arabia (1.8 ± 0.4) % modern

Crusts of calcareous sinter in base of young terrace sediments in Wadi Alt Atk (Lithimah, 20° 15′ N, 41° 38′ E), Saudi Arabia. Coll 1977 and subm by Josef Zötl. *Comment* (JZ): dates overlying gravel terrace. An assumed recent activity of 85% modern (Münnich & Vogel, 1959; Geyh & Schillat, 1966) gives model age 30,900 $^{+\ 2000}_{-\ 1600}$; upper age limit 32,200 $^{+\ 2000}_{-\ 1600}$ is obtained with 100 % modern.

II. ARCHAEOLOGIC AND HISTORIC SAMPLES

A. Austria

VRI-577. Falkenstein, NÖ 5140 ± 90

Charcoal in hearth pit at depth 120cm in hut cut in Quads 6 to 9, excavation at Schanzboden (ring rampart) near Falkenstein (48° 43′ 22″ N, 16° 35′ 05″ E), Lower Austria. Coll 1976 and subm by Johann-Wolfgang Neugebauer, Bundesdenkmalamt, Vienna. *Comment* (J-W N): ca 600 yr too young.

VRI-596. Weyregg, OÖ 1740 ± 90

Wood from piling at depth −2m in lake Attersee, Weyregg (47° 54′ N, 13° 34′ 17″ E), Upper Austria. Coll 1977 and subm by Johann Offenberger, Bundesdenkmalamt, Vienna. *Comment* (JO): remnant of wharf or breakwater of unknown age.

VRI-578. Unterbuchberg, OÖ 1450 ± 70

Wood remnant at base of Lake Attersee, depth −1.5m, Unterbuchberg (47° 52′ N, 13° 33′ E), Upper Austria. Coll 1976 and subm by Johann Offenberger. *Comment* (JO): date disproves expected La Tène age. De Vries corrected age is AD 570 (Suess, 1970).

VRI-579. Fuschl, Salzburg 1430 ± 90

Wooden piling at base of Lake Fuschlsee, depth −1m, near Schloβ Fuschl (47° 48′ 30″ N, 30° 55′ E), Salzburg. Coll 1972 and subm by Bundesdenkmalamt, Vienna. *Comment* (BDA): dates disproves assumption of Neolithic lake-dwelling relict.

VRI-583. Pfarrwerfen, Salzburg <200

Wooden plank of track road below 2.5m loamy soil; Pfarrwerfen (47° 21′ N, 13° 12′ E), Salzburg. Coll 1976 and subm by Friederich Moosleitner, Mus Carolino Augusteum, Salzburg. *Comment* (FM): parts of track road on stone are found at many locations between Salzburg and Villach. This 1st wooden sample should decide between Roman and Middle age origin. Neither has been proven correct.

VRI-603. Waidmoos, Salzburg 7000 ± 130

Wood below peat layer, 1.5m thick, near Waidmoos bei Lamprechtshausen (48° 01′ N, 12° 57′ E), Salzburg. Coll 1977 and subm by E Stüber, Haus d Natur, Salzburg. *Comment* (ES): dates bones of domestic pig found in same layer.

VRI-598. Vienna **2330 ± 80**

Charcoal from settlement of Hallstatt culture excavated in Vienna 10, Unterlaa (48° 08′ N, 16° 25′ E). Coll 1976 and subm by Ordolf Harl, Mus Stadt Wien. *Comment* (OH): precisely dates settlement.

B. Iran, Iraq

Kordlar series, Iran

Charcoal excavated from settlement hill, 28m elev, Tepe Kordlar (37° 50′ N, 45° E), near Rezaiyeh, W Aserbeidschan, Iran. Coll 1976 and subm by Andreas Lippert, Inst Vor- u Frühgesch, Univ Innsbruck.

General Comment (AL): samples complete dates of Early Iron age layers (R, 1979, v 21, p 119).

VRI-479. Sample 1/1976 **2920 ± 90**

Room B near S entrance, oldest Iron age horizon.

VRI-480. Sample 2/1976 **2640 ± 80**

Room Z, Layer IV.

VRI-632. Tell Ababra, Iraq **<200**

Charcoal in Layer 1, Pit E, Tell Ababra, Sec B, Gabal Hamrin-Areal (ca 34° 14′ N, ca 45° 03′ E) Iraq. Site not found on maps. Coll 1978 by M Ludescher, subm by Inst f Sprachen u Kulturen des Alten Orients, Univ Innsbruck. *Comment* (ML): dates archaeol layer.

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UNIVERSITY OF WISCONSIN RADIOCARBON DATES XVII

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Procedures and equipment have been described in previous date lists. Except as otherwise indicated, wood, charcoal and peat samples are pretreated with dilute NaOH and dilute H_3PO_4 before conversion to the counting gas methane; marls and lake cores are treated with acid only. Very calcareous materials are treated with HCl instead of H_3PO_4.

The dates reported have been calculated using 5568 as the half-life of ^{14}C with 1950 as the reference year. The standard deviation quoted includes only the 1σ of the counting statistics of background, sample, and standard counts. Background methane is prepared from anthracite, standard methane from NBS oxalic acid. The activities of the dated samples for which $\delta^{13}C$ values are listed have been corrected to correspond to a $\delta^{13}C$ value of $-25‰$.

Sample descriptions are based on information supplied by those who submitted samples.

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I. ARCHAEOLOGIC SAMPLES

A. North Dakota

Anderson Mound site (32RM236)

Charred wood (either *Pinus* or *Juniperus* spp) from wood-lined burial pit, 50 to 75cm below ground level, in early Plains Woodland burial mound excavated 1959-1960 by Elden Johnson, Univ Minnesota, in Ransom Co (46° 31′ 20″ N, 97° 26′ 15″ W). At least 2 burials recovered from mound, assoc with cord-roughened pottery, projectile points, scrapers and lithic debitage. Mound may be related to Sonata complex (Hewes, 1949; Neuman, 1975). Subm by Rain Vehik, Univ Oklahoma, Norman.

WIS-1016. Anderson Mound site (32RM236) **470 ± 75**
$\delta^{13}C = -26.0‰$

Acid treatment only. Sample counted only once.

WIS-1021. Anderson Mound site (32RM236) **265 ± 70**
$\delta^{13}C = -25.9‰$

Sample treated with base and acid.

B. South Dakota

WIS-1074. Crow Creek site (39BF11) **610 ± 55**

$\delta^{13}C = -26.8‰$

Charcoal from outer fortification ditch, lower level of Bone Bed "B", mass deposit of human bone, Crow Creek site, Buffalo Co, (43° 59′ 50″ N, 99° 19′ 54″ W). Material dates end of occupation of site when massacre of at least 500 people occurred. Event took place in middle or end of Initial Coalescent component (Kivett & Jensen, 1976). Sample coll Oct 1978 and subm by T E Emerson, Univ S Dakota, Vermillion.

II. GEOLOGIC SAMPLES

A. Kansas

WIS-1030. Max Brown Gravel Quarry **2395 ± 65**

$\delta^{13}C = -27.4‰$

Quercus sp (id verified by R Miller, Forest Products Laboratory, Madison, Wisconsin) buried within river terrace gravel at depth of 12m in Max Brown Gravel Quarry, Bonner Springs, Johnson Co (39° 3′ N, 94° 5′ W). Coll October, 1978, by W C Johnson, Univ Kansas, Lawrence. Specimen dates lowermost (youngest) terrace level within lower Kansas R system; identifies period of intensified river activity thought to be in response to climatic change during Holocene. Sample dated to attempt to document synchroneity of Kansas R system and those of upper Midwest, specifically Kickapoo R system (Johnson, 1978).

B. Minnesota

Horseshoe Lake series

Core HD taken with 2.5cm diam Livingstone piston sampler in March 1974 from Horseshoe Lake, Isanti Co (45° 27′ N, 93° 2′ W). Core from area of thickest sediments in lake basin, depth to glacial drift 1110cm. Depths measured from water surface, depth of water at core site 117cm. Horseshoe Lake is on Anoka Sand Plain in E central Minnesota in tension zone between conifer forest and deciduous forest, near S limit of continuous range of *Pinus strobus* and *Betula Papyfera*. Pollen diagram from core is near completion. Coll and subm by E J Cushing, Univ Minnesota, Minneapolis. Late glacial portion of pollen stratigraphy was dated by Stuiver, Y-1973 -1978 (R, 1969, v 11, p 574).

WIS-1025. Horseshoe Lake site **910 ± 70**

$\delta^{13}C = -18.9‰$

Algal copropel with fine plant detritus, scattered *Najas* seeds, from 207 to 217cm segment of core. Increase of birch pollen at 200cm and of white pine at 185cm suggests invasion of oak forest by these sp near lake; southward migration of sp may have resulted from cooling of climate. Sample counted only once.