



The University of Georgia

Center for Applied Isotope Studies

RADIOCARBON ANALYSIS REPORT

April 10, 2007

Hugo Miller
1215 Bryson Rd.
Columbus, OH 43224-2009

Dear Mr. Miller

Enclosed please find the results of ^{14}C Radiocarbon analyses and Stable Isotope Ratio $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ analyses for the samples received by our laboratory on February 23, 2007.

UGAMS#	Sample I.D.	Material	Size, mg	$\delta^{13}\text{C}$ (‰)	Radiocarbon ^{13}C Corrected Age (YBP \pm 1s)	pmC
01935	P-H-3a	bioapatite	1.00	-6.4	25670 \pm 220	4.09 \pm 0.12
01936	P-H-3a	charred bone	0.47	-15.7	25170 \pm 230	4.36 \pm 0.12
01937	P-H-3a	collagen	0.59	-22.7	23170 \pm 170	5.59 \pm 0.12
01938	P-H-3a	humic acid	0.35	-21.5	2560 \pm 70	72.68 \pm 0.59

The bone was cleaned and washed, using ultrasonic bath. After cleaning, the dried bone was gently crushed to small fragments. The charred bone was treated with 5% HCl at the temperature 80°C for 1 hour, then it was washed and with deionized water on the fiberglass filter and rinsed with diluted NaOH to remove possible contamination by humic acids. After that the sample was treated with diluted HCL again, washed with deionized water and dried at 60°C. The prepared samples was transferred to quartz tube and combusted at 900°C.

The humic acid solution was treated with 6N HCl to precipitate humic acid. The precipitate was centrifuged to separate them. The precipitate was washed with deionized water, dried in quartz tube for combustion, copper oxide was added for oxidation and the sample was combusted at 900°C.

The crushed bone was treated with diluted 1N acetic acid to remove surface absorbed and secondary carbonates. Periodic evacuation insured that evolved carbon dioxide was removed from the interior of the sample fragments, and that fresh acid was allowed to reach even the interior micro-surfaces. The chemically cleaned sample was then reacted

under vacuum with 1N HCl to dissolve the bone mineral and release carbon dioxide from bioapatite.

The crushed bone was treated with 1N HCl at 4°C for 24 hours. The residue was filtered, rinsed with deionized water and under slightly acid condition (pH=3) heated at 80°C for 6 hours to dissolve collagen and leave humic substances in the precipitate. The collagen solution is then filtered to isolate pure collagens and dried out. The dried collagen was combusted at 575°C in evacuated/sealed Pyrex ampoule in the presence of CuO.

The resulting carbon dioxide was cryogenically purified from the other reaction products and catalytically converted to graphite using the method of Vogel *et al.* (1984) Nuclear Instruments and Methods in Physics Research B5, 289-293. Graphite $^{14}\text{C}/^{13}\text{C}$ ratios were measured using the CAIS 0.5 MeV accelerator mass spectrometer. The sample ratios were compared to the ratio measured from the Oxalic Acid I (NBS SRM 4990). The sample $^{13}\text{C}/^{12}\text{C}$ ratios were measured separately using a stable isotope ratio mass spectrometer and expressed as $\delta^{13}\text{C}$ with respect to PDB, with an error of less than 0.1‰.

The quoted uncalibrated dates have been given in radiocarbon years before 1950 (years BP), using the ^{14}C half-life of 5568 years. The error is quoted as one standard deviation and reflects both statistical and experimental errors. The date has been corrected for isotope fractionation. Use of the corrected date assumes the material originally had a $\delta^{13}\text{C}$ composition of -25‰.

If the dates are to be published, please quote the UGAMS numbers, as it identifies our laboratory as having produced the dates.

If we can be of further assistance, or you wish to discuss these results, please do not hesitate to contact me.

Sincerely,

Dr. Alexander Cherkinsky

**Center for Applied Isotope
Studies
University of Georgia**

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INVOICE

April 10, 2007

Results To:

Hugo Miller
1215 Bryson Rd.
Columbus, OH 43224-2009

Invoice To:

Invoice Nos.: 7802

Description of Work:	4 Radiocarbon AMS (¹⁴ C) analysis of charcoal @ \$450.00
	1 Collagen extraction @ \$50.00
	1 bioapatite preparation @ \$50.00
	1 humic acid extraction @ \$75.00
	4 Stable Isotope Ratio (δ ¹³ C) analyses (included)

Total Samples: 4
UGAMS 01935 through 01938.

Please Pay This Total AmountUS\$1975.00
Make Check Payable ToUniversity of Georgia/CAIS

Remit Payment to Center for Applied Isotope Studies
C.A.I.S. Building
120 Riverbend Rd.
Athens, GA 30602-4702

Invoice Submitted byAlexander Cherkinsky

Center for Applied Isotope Studies