National Museum of Natural History · Smithsonian Institution
WASHINGTON, D.C. 20560 · TEL. 202-381-5456

February 21, 1974

Dr. Karl W. Butzer
The University of Chicago
Department of Geography
1101 East 58th Street
Chicago, Illinois 60637

Dear Dr. Butzer:

In November you sent Don Ortner a sample from the bottom of a phial found at Axum, Ethiopia. We have had considerable trouble with our amino-acid analyzer, so I've just gotten to work on it. Please forgive the delay.

Your sample contains a high proportion of protein. I had to dilute it well beyond normal to analyze it. The attached recorder output shows that the sample contains amino acids in percentages highly suggestive of connective tissue (skin), with possibly a bit of hair. Connective tissue characteristically shows a high hydroxy proline and proline content, as well as approximately one third glycine. Calculations for residues per thousand confirm this. Hair contains cysteine, while collagen does not. There seems to be some cysteine present, suggesting the hair.

By chance, I am also interested in animal odors, and in my opinion your phial probably was a perfume bottle. I understand that the civet cat inhabits Ethiopia. This animal produces an intense musk odor in its anal glands. These glands are usually cut out, air dried, and ground for use as a perfume. The bottom of the phial probably contains a small bit of skin and a trace of hair remaining from this process. The calcite could be mineral deposition from ground water -- it doesn't take much.

It was an interesting problem. May I suggest a small publication or note on this to demonstrate the possibilities that analyses of this type can have for archeology?

If you wish to pursue the problem please feel free to call or write.

Sincerely,

David W. Von Endt

David W. Von Endt
Research Chemist
Department of Anthropology

Enclosures

Good digging, Karl!
Best regards,
Kent

Butzer - 3 samples

EFFICIENCY LINE NO 6636

Std. 11

	Run #	Conc.	Run #	Conc.	Run #	Conc.	Run #	Conc.	Run #	Conc.	Run #	Conc.
G.G.												
Asp	1.31	449219					2342246	136862	45.24	4.972	602257	47.96
Thr	1.26	467942					2214262	125153	15.50	1.706	176820	12.92
Ser	1.11	528330					1657971	184328	27.16	2.592	287724	22.91
Glu	1.16	506659					4220018	509621	74.40	7.828	926595	73.79
Gly	1.00	587481	695139				2062382	204.05	150.05	15.707	1422083	113.64
Ala	1.19	485676	228665				6784[illegible]	119.02	139.028	14.681	1654681	121.77
Cys	2.15	2132219					—	—	17.681	2.504	368899	29.38
Val	1.37	428864					—	—	2.504	111660	28.89	
Met	1.18	496880					743657	88933	13.11	2.0089	101585	8.09
Ile	1.39	422749					626284	86852	12.80	2.2612	116222	9.26
Leu	1.10	524367					1209484	144082	21.24	2.5362	279359	22.25
Tyr	1.17	502428					95.61	11186	1.65	2.0105	23523	1.87
Phe	1.26	467911					733993	92475	13.63	1.5270	182040	14.58
Hyp	1.41	416428					—	—	—	—	—	—
His	1.38	426032					2847976	391267	57.98			
Hyp	1.53	284844					2015169	308401	45.47	3.2042	571814	45.79
Arg	1.78	229429					2069457	367492	54.18	4.2956	768202	63.38
							5.2 mm	327399	48.27	90.3 mm	566652	45.13
Hypro		6296.13	155.03 mm				2175.5 +	758066	111.76	27.54	1147455	93.93
Pro		3485.36	140.0-11.									
							ε = 6782.962 = 3782.96			ε = 1255731.0 = 1255731		
		ε = 195126.0/4 = 48781.50					100			1000		

Std. 11 Sample B-10 µl

Std. 11 Sample B-10 µl

Std. 11 Sample: 20 µl B

EFFICIENCY LINE NO 6636

Pond 5 2/13/74

Pond 1 2/12/74

Pond 6 2/12/74

Pond 7 2/12/74