

## Relative Dating of Arlington Springs Man

Abstract. *Relative dating tests confirm the antiquity of the Arlington Springs human femur.*

In 1959 P. C. Orr discovered two human femurs at a depth of 11 m (37 ft) in Quarternary sediment exposed at Arlington Canyon, Santa Barbara, California. The discovery was investigated by a team of geologists and archeologists in 1960 (1), and further work at the site resulted in datable carbonaceous material being found adjacent to the human bones. A sample collected by Orr, W. Farrand, and W. S. Broecker was dated by Broecker at the Lamont Geological Laboratory as  $10,000 \pm 200$  years old (2).

If it is assumed that the human bones are not part of a burial from a higher surface, they represent one of the very few Pleistocene men of the Americas. At the suggestion of W. F. Libby, a sample of one of the femurs was sent to us in London for tests of relative datings. My assistant, Mrs. E. Gardiner, made a radiometric assay of the sample as means of assessing its uranium content. The sample was then submitted to the Government Chemist's Laboratory, where R. G. Cooper determined the fluorine and phosphate contents, and E. J. Johnson the nitrogen content (Table 1).

Although no other bones from the same, or from earlier and later, levels have yet been sent for analysis as controls, the ratio of fluoride to phosphate and the uranium content are both high enough, and the nitrogen content low enough, to be reassuring in regard to the high antiquity of the bone in question. Series of bone samples from com-

Table 1. Analyses of early human bones from North and Central America. The italic lines indicate bone source.

F (%)	$\frac{\%F}{\%P_2O_5} \times 100$	e.U <sub>3</sub> O <sub>8</sub> (ppm)	N (%)
1.2	3.6	28	0.23
2.0	6.8	1	0.06
0.8	7.7	13	0.03
0.2	0.6	3	1.2
0.9	3.4		1.4
<0.1	0.1	<1	~4.0
~1.5	36		0.5
1.0	4.9		1.6

parable sites in North and Central America have already been assayed for F, U, and N (3), and when the composition of the Arlington Springs bone is considered in the light of these results, there is no reasonable doubt that it is "fossil" rather than subfossil, and unquestionably it is not a recent intrusive burial. For present purposes the results summarized in Table 1 are sufficiently significant.

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### References and Notes

1. P. C. Orr, *Bull. Geol. Soc. Am.* **71**, 1113 (1960).
  2. ———, *Science* **135**, 219 (1962).
  3. K. P. Oakley and W. W. Howells, *Am. Antiquity* **26**, 543 (1961); K. P. Oakley and A. E. Rixon, *ibid.* **24**, 186 (1958).
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