Reports

Soapstone Artifacts: Tracing Prehistoric Trade Patterns in Virginia

Abstract. *Rare earth element abundances in soapstone from quarries and artifacts in eastern Virginia were determined by instrumental neutron activation analysis. By comparing these abundances it was possible to trace artifactual material to the outcrops which served as the source of this material during the first millennium B.C. Certain known sociopolitical boundaries in prehistoric Virginia were inferred to be older than previously assumed.*

Prehistoric trade networks of artifacts made from soapstone can be reconstructed by using instrumental neutron activation analysis (*1*). We report here an analysis of the movement of this material along the James River drainage in Virginia; this is the first in-depth application of this technique to a specific location.

Trade, or any movement of materials, is an important facet of any society since it is associated with the behavioral aspects of religion, economics, politics, arts, and the like. It is an elusive trail to follow, even under the relatively ideal conditions of modern ethnography. The prehistoric trail is vastly more elusive because exchanges must be inferred from imperishable remains. Soapstone (*2*) is one of the more common eastern North American trade materials, having been mined and distributed for thousands of years. However, mineralogical and major element differences do not permit classification of quarries adequately enough to identify the source of a soapstone artifact such as a pipe or culinary vessel.

The many well-known aboriginal soapstone quarries in eastern North America are limited to a chain of intermittent lenses along the eastern edge of the mountainous regions in the Piedmont. Individual quarries and artifacts from these locations have different concentrations of trace elements because the talcose rocks were formed from a variety of materials under different metamorphic conditions. In particular, the rare earth elements (atomic numbers 57 to 71) vary in both absolute and relative abundances. These variations may be graphically displayed by dividing the concentration of a particular rare earth element by its concentration in chondritic meteorites, which are considered to represent the average abundances of these elements in the universe. The even-odd effect (*3*) of abundances from nucleosynthesis is eliminated when the normalized concentrations are plotted against the atomic numbers of the elements, and the curve reflects the slightly different chemical properties of these elements during the geological processes involved in the formation of the rock (*4*). The rare earth concentrations and distributions are significantly different for soapstone from different geologic formations, as indicated in Fig. 1A, where each rare earth distribution curve represents the average for 4 to 15 samples. In contrast, the variations within a particular quarry region are usually in the absolute rather than the relative concentrations. In Fig. 1B the dashed lines enclose the range of values measured in over a dozen samples from quarries along a single soapstone formation in Albemarle

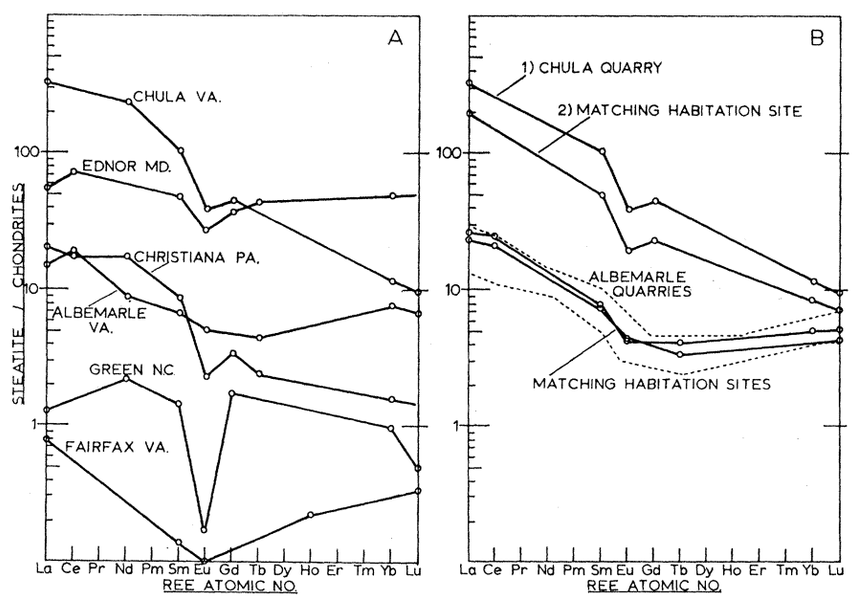

Fig. 1. (A) Variations in rare earth element (*REE* distributions in soapstone from different quarry locations in Virginia and nearby areas. (B) Rare earth element distributions for one sample from the Chula quarry in Virginia (curve 1) and a matching sample from a habitation site (curve 2). (Dashed lines) Variations observed for a group of quarries within a single 32-km lens in Albemarle and Nelson counties, Virginia. The two curves falling within this range of variations represent soapstone bowls from habitation sites. It is inferred that the bowls were made from material from the matching quarry locations and were transported, probably by waterway, to the sites.

Scoreboard for Reports: In the past few weeks the editors have received an average of 63 Reports per week and have accepted 11 (17 percent). We plan to accept about 10 Reports per week for the next several weeks. In the selection of papers to be published we must deal with several factors: the number of good papers submitted, the number of accepted papers that have not yet been published, the balance of subjects, and length of individual papers.

Authors of Reports published in *Science* find that their results receive good attention from an interdisciplinary audience. Most contributors send us excellent papers that meet high scientific standards. We seek to publish papers on a wide range of subjects, but financial limitations restrict the number of Reports published to about 12 per week. Certain fields are overrepresented. In order to achieve better balance of content, the acceptance rate of items dealing with physical science will be greater than average.

and Nelson counties in Virginia. As examples of how samples from habitation sites match certain quarries, distributions for two of the many artifactual samples which matched the Albemarle-Nelson formation are also shown in Fig. 1B.

The Albemarle-Nelson region contains the largest exploitable deposits of soapstone in Virginia (see Fig. 2). It was first anticipated that these quarries would be the source of a major portion of the artifactual material found along the James River drainage basin. By matching rare earth distribution patterns this was found to be the case, but only for habitation sites west of the geological fall line which separates the Piedmont region from the Coastal Plain. This includes sites west of the Blue Ridge Mountains in the Shenandoah Valley and sites as far as 130 km east (downstream) along the James River. The samples from just north of the James River drainage in the Shenandoah Valley do not match soapstone from the Albemarle-Nelson quarries, but do match a lens found in Madison County, the material probably having been transported through a nearby gap in the Blue Ridge Mountains.

With the exception of a single site 8 km east of the fall line, the artifactual material from the Coastal Plain does not resemble the Albemarle-Nelson material in terms of trace element concentrations. Much of the material appears to have originated from the Chula quarry in Amelia County (see Fig. 2). To show the differences, an example of the rare earth distribution for one sample from the Chula quarry and an artifact from Virginia Beach (about 195 km to the east) are also shown in Fig. 1B. Several specimens from the Coastal Plain have been analyzed which do not match the trace element patterns of soapstone from any quarry tested to date.

One of the most interesting artifacts analyzed was from a site in Isle of Wight County. This sample differs in its rare earth distribution from any Virginia samples yet tested but is very similar to a series of samples from quarries in southeastern Pennsylvania. If the soapstone was transported along the coast it could have traveled down the Chesapeake Bay, a distance of more than 320 km. If we assume that this is the case, and that soapstone quarries were operated during Late Archaic or Early Woodland times (2000 B.C. to A.D. 500) (*5*), this would indicate long distance water transport at a very early period. In this case, dugout canoes should be dated as early as birchbark canoes (*6*).

The initial, limited correspondences based on 165 samples (about half from quarries and half from habitation sites) indicate that the sources of soapstone can be identified. The mechanisms for the movement of this material from the sources to the habitation sites may be complicated and are still largely unknown. To determine the time difference between the occurrences of soapstone artifacts in the Piedmont and Coastal Plain regions, we need very accurate dates for the habitation sites. Unfortunately, the necessary accuracy in dates is seldom available in this region. It has been assumed that the soapstone quarries were in operation during Early Woodland or Late Archaic times, which fits some of the dated habitation specimens (*7*) and is also the time when soapstone culinary vessels were most popular in other areas (*8*). The period of maximum soapstone transport is also the time when the first ceramics, which show strong stylistic homogeneity, were being made in the Coastal and Piedmont areas. Shortly afterward, these areas become stylistically distinct and remained so until the time of the Jamestown colonists, who found the stylistic border was indeed a linguistic and political border between the Piedmont Siouan and Coastal Algonquian speakers (*9*).

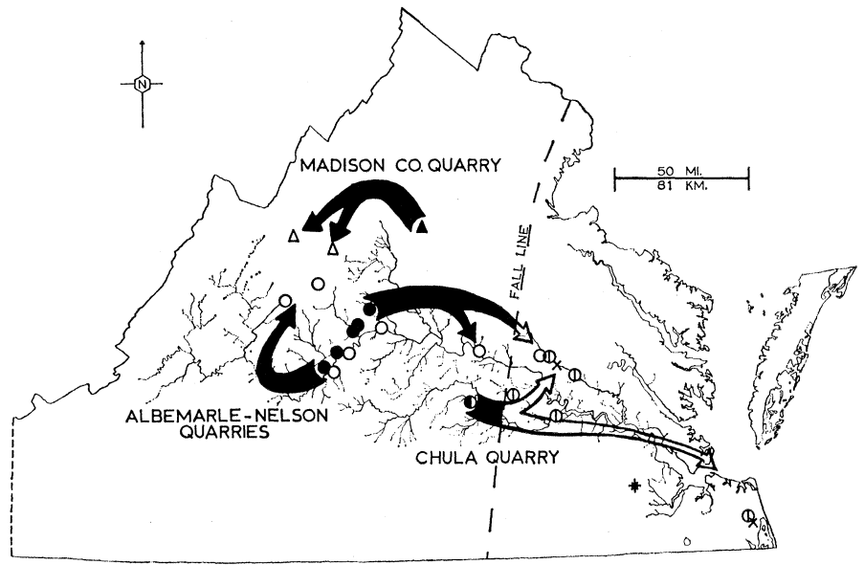

Fig. 2. Map of eastern Virginia and the James River drainage basin showing the principal directions of movement for material from the major soapstone quarries in the region. The existence of a barrier between source utilization areas is shown at the geographical fall line. (●) Largest soapstone deposits in Virginia, in Albemarle-Nelson quarries; (○) habitation sites from which artifacts match Albemarle-Nelson soapstone; (△) samples matching soapstone lens (▲) in Madison County; (◐) Chula quarry material; (⦶) artifacts matching Chula quarry material; (×, *) artifacts that do not match any samples from Virginia quarries tested. The artifact from the site marked * resembles material quarried in southeastern Pennsylvania (see text).

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References and Notes

1. R. O. Allen, A. H. Luckenbach, C. G. Holland, *Archaeometry*, in press.
2. Soapstone is a hydrous magnesium silicate whose simple basic formula is $(Mg,Fe^{2+})_3Si_4O_{10}(OH_2)$. Formed under metamorphic conditions, this talcose material (called steatite in its pure state) has been called soapstone because of its softness and greasy or soapy feel. Because of its softness, it could be easily carved by stone tools, and was used quite extensively by the prehistoric populations of North America.
3. The rare earth elements with even atomic numbers are more abundant than the adjacent ones with odd atomic numbers. This is a relic of nucleosynthesis resulting from the greater stability of nuclei with paired protons.
4. L. A. Haskin, F. H. Smith, R. A. Schmitt, R. H. Smith, in *Physics and Chemistry of the Earth*, L H. Ahrens, Ed. (Pergamon, New York, 1966), p. 167.
5. See J. B. Griffin, Ed., *Archeology of Eastern United States* (Univ. of Chicago Press, Chicago, 1952).
6. ———, *Science* **156**, 175 (1967).
7. H. A. MacCord, *Q. Bull. Archaeol. Soc. Va.* **18**, 1 (1964).
8. See, for example, W. A. Ritchie, *The Archaeology of New York State* (Natural History Press, Garden City, N.Y., 1969), p. 150.
9. C. G. Holland, *Q. Bull. Archaeol. Soc. Va.* **21**, 2 (1966).
10. Funds provided by NSF grant GS 41500.

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