Following the Obsidian Trail

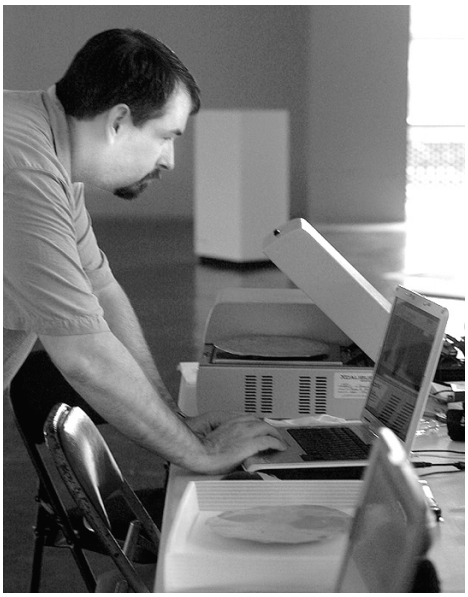
R. J. SPEAKMAN

Obsidian projectile points from Kamchatka.

THE CLASSIC MODEL that dominated First Americans studies for half a century—that the first immigrants trudged across the Bering Land Bridge connecting northeast Asia and Alaska, and went on to people the Americas—has been battered in recent years by the discovery of Monte Verde and other pre-Clovis occupations in the New World. Nevertheless, recent discoveries in Alaska by archaeologists, notably Chuck Holmes (**MT 20-1,** "Early Americans in Eastern Beringia: Pre-Clovis Traces at Swan Point, Alaska"), are convincing evidence for some scientists that at least one wave of migrants passed through on foot. To keep this theory alive, though, demands answers to such questions as, Where did they come from? How many were they? When were they here? Fortunately, the travelers themselves are giving us many of the answers. They were toolmakers, and one of the more abundant toolstones available to them in Beringia (eastern Siberia and Alaska) was obsidian, volcanic glass, a substance that tells a scientist with the knowledge and the right equipment the precise location of the quarry where it was obtained.

The wonders of obsidian

Jeff Speakman of the Smithsonian Institution, who has traced obsidian artifacts to their source in North America and Asia, emphasizes the importance of obsidian in resolving the Beringia question. Obsidian is prime toolstone due to its workability and the extremely sharp edges produced when it's knapped. What makes obsidian so valuable to archaeologists is its unique chemical signature that precisely and unambiguously identifies its source. Speakman explains that "each source [of obsidian] has



Jeff Speakman analyzing gold artifacts by PXRF at the Museo Antropológico Reina Torres de Araúz, Panama City, Panama, July 2007.

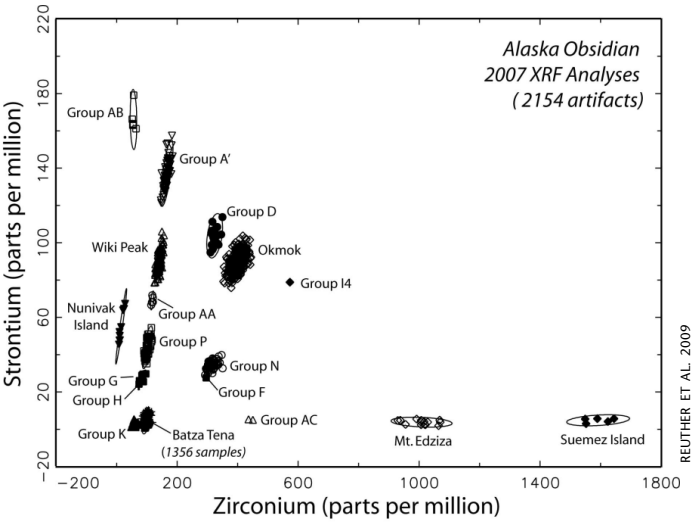
a unique fingerprint, and if you know what that fingerprint is . . . you can analyze the artifacts and tell exactly where the artifacts came from." Much can be discerned by identifying the source of a fragment of obsidian. "By knowing that information," Speakman says, "you are able to track migrations of people, social interactions, trade paths, and long-distance movement." Without obsidian sourcing, such facts are practically invisible in the archaeological record. Concerning the particular long-distance migration that archaeologists are eager to confirm, of peoples crossing the Bering Land Bridge during the Pleistocene, obsidian could be the key to answering this question. If Russian obsidian dating to the Pleistocene is found in Alaska, this discovery will go a long way to proving the theory correct.

The sourcing process itself has evolved over the years, and seems to have peaked at a fortunate time. Of a number of processes used to source obsidian, three stand out as the most reliable methods: instrumental neutron activation analysis (INAA), laser ablation inductively coupled plasma-mass spectrometry (LA-ICP-MS), and X-ray fluorescence spectrometry (XRF).

The grandfather of the group, which has great precision and high accuracy, is INAA; on the down side, it requires a nuclear reactor and destroys the obsidian sample being tested.

ICP-MS is as sensitive as INAA, yet less invasive to the artifact being tested. The drawbacks with ICP-MS are that it is still somewhat destructive to artifacts and quantifying data can be an arduous task. ICP-MS also requires an initial investment of several hundred thousand dollars and a dedicated laboratory and staff. Nonetheless, such instrumentation is quite common at most major research institutions and is rapidly replacing INAA as a preferred method for trace-element analysis of rocks and minerals.

XRF, though not as sensitive as INAA or ICP-MS, has the great advantage of being completely nondestructive and has been used extensively to analyze obsidian since the 1960s. But it gets better; XRF has evolved into PXRF, P for portable, which gives scientists the ability to source obsidian in situ. This is especially handy for sourcing museum pieces, particularly



The obsidian fingerprint: All obsidian from the same source has identical proportions of certain trace elements, which makes it possible to match obsidian artifacts with their source. This bivariate plot of zirconium and strontium elemental concentrations (analyzed by PXRF) shows 2,154 obsidian artifacts and geologic source samples analyzed by Speakman and Natalia Slobodina, fall 2007.

those in other countries. Not only is this device handy, its results are highly accurate. It "is ordinarily what I use for sourcing obsidian, even at the Smithsonian," says Speakman, who considers the instrument essential in the search for Northeast Asian obsidian in eastern Beringia. It yields source data while in the field at Alaskan and Russian sites. What's more, it harmlessly analyzes obsidian articles in Russian museums, thereby eliminating the hassle of transporting a truckload of machines across borders.

May the source be with you . . .

There are 32 known sources of obsidian in eastern Beringia, which includes Alaska and the parts of neighboring Yukon and the Northwest Territories not covered by glaciers. These sources are known to the extent that archaeologists are aware of their existence; however, only nine of them can be located on a map and only seven are known to have been utilized by prehistoric peoples. Though the locations of the other sources have yet to be pinpointed, their existence is inferred from their "fingerprints," which were lifted from obsidian artifacts scattered around Alaska and Canada. It's just like "CSI"; we haven't apprehended the culprit, but we know who done it.

It isn't easy to locate a source of obsidian, particularly in Alaska's frigid vastness. Sometimes a location can be estimated by consulting geologic maps and triangulating in on a source using the distribution of artifacts made of the unique obsidian quarried from it, but this involves a lot of guess work. Most often, Speakman says, "Geologists are the ones who find the sources first and the archaeologists find out later."


R. J. SPEAKMAN

Natalia Slobodina, University of Washington, analyzing obsidian artifacts from Alaska using PXRF at the Smithsonian's Museum Conservation Institute, December 2007.

Archaeologists took notice of the rediscovered Batza Tena obsidian source in 1970. This source, whose name translated from the Koyukon language means *Obsidian Hill*, is located in central Alaska. Today we think of this as remote, but prehistorically, according to Speakman, it was probably easily accessible, which would account for its being the most common obsidian used by prehistoric people throughout Alaska. Like many obsidian sources, Batza Tena spawned a number of sites, some associated with quarrying activities. Artifacts made of Batza Tena obsidian were widely dispersed in the late Pleistocene and early Holocene, reaching distances of 500 km. The runner up is Wiki Peak obsidian, at 460 km. Wiki Peak obsidian, although extensively used, wasn't easy to get. Instead it is found in what Speakman describes as "fairly isolated pockets," a consequence of the challenging terrain in this part of Alaska (compared with Batza Tena, which is conveniently located on a tributary of the Koyukon River). Jeff Rasic, with the National Park Service and the University of Alaska, another key player in this project, recently visited Wiki Peak. He found artifacts throughout this area.

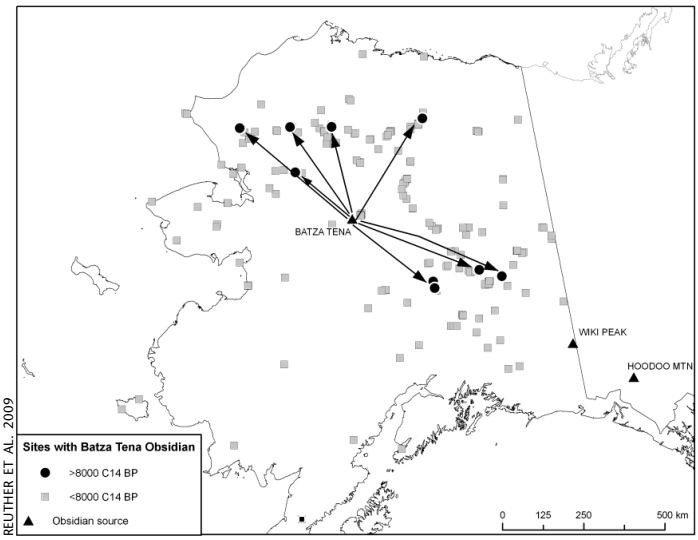
Apart from Alaska, there is an obsidian source in the Aleutian Islands on a volcano called Okmok. There are dozens of sources in British Columbia, the Yukon Territory, and southeast Alaska; obsidian from three of them—Hoodoo Mountain, Suemez Island, and Mount Edziza—was used extensively by prehistoric people. Obsidian from Mount Edziza, for example, has been found in the Alaska interior, about 1,200 km from its origin.

Post–Cold War cooperation

After the fall of the Soviet Union at the end of 1991, researchers from America and the former Soviet Union joined forces in an attempt to confirm the Bering Strait theory. It was thought that when scientists from these two continents got together it would be a simple matter of comparing their respective fluted points. However, no Clovis-like material has been discovered in Siberia. This doesn't rule out the possibility that early people migrated over the Land Bridge; it simply means scientists are going to have to get creative to prove it.

Today obsidian sourcing is practiced by scientists in Siberia

in the states of Kamchatka and Chukotka. Kamchatka is a well-documented area, as far as obsidian is concerned. In all, 30 sources lie within its borders, but only 16 were used prehistorically. Interestingly, there is a group of sites here known as the Ushki Lake sites, which contain components thought to be older than 13,000 CALYBP (**MT 18-1,** "Hunting Pre-Clovis in Siberia: Year 2000 Excavations at Ushki, Kamchatka").



Distribution of Alaskan archaeological sites known to have obsidian obtained from the Batza Tena source.

This obsidian project, spanning continents, is a huge international effort. Collaborating with American researchers including Speakman and Michael Glascock, of the University of Missouri, are Russian scientists Yaroslav Kuzmin, Vladimir Popov, Andrei Grebennikov, Margarita Dikova, and Andrei Ptashinsky. Together they have studied Ushki Lake and discovered six sources of Kamchatka obsidian that were utilized in the Pleistocene. This information confirms the significant mobility of these early people. It also suggests they may have kept moving, right across the Land Bridge, to become the first Americans.

The state of Chukotka in northeast Russia is a little less forthcoming with information. Analysis of obsidian artifacts from the surrounding area documents three sources, but only one has been located, Krasnoye (Red) Lake. Some 150 artifacts have been analyzed from this state, and 90 percent of them come from the Krasnoye Lake source.

The big question

You have to be able to identify East Beringian obsidian so you can distinguish it from Siberian obsidian. But if the location of a source is unknown, how can you know whether obsidian came from Alaska or, say, Siberia? And there are 23 obsidian sources whose locations remain unknown.

Since the database for Northeast Asian obsidian is very thorough, it's unlikely that unknown obsidian material found in Beringia comes from sources in Northeast Asia. "We've analyzed about a thousand artifacts and geologic source samples from Kamchatka," says Speakman. "We have a very good idea of what the obsidian looks like chemically. So I think that there's little likelihood that some of the unknown Alaska groups are from Kamchatka." However, he allows the slim probability that unknown sources may lie in Chukotka and areas west of there because these locations are less well understood.

With all this information, has any Siberian obsidian been found in Beringia? The answer is yes. Unfortunately, none of it is datable to the Pleistocene. John Cook of the Bureau of Land Management in Alaska documented the first immigrant obsidian from Russia in a 1995 article in *Arctic Anthropology;* since then, a handful of other pieces have surfaced. All of these, however, date to the late Holocene. Nonetheless, Speakman and his Alaskan collaborators, Jeff Rasic and Joshua Reuther (Northern Land Use Research, Inc., Fairbanks), remain optimistic that Siberian obsidian will be found in Alaskan archaeological sites that date to the late Pleistocene or early Holocene.

There are a number of sites dating to the Pleistocene in Beringia. The oldest is the Swan Point site, whose cultural zone has been dated to about 12,000 RCYBP. Swan Point lies almost directly between Batza Tena and Wiki Peak, and all its obsidian artifacts are assumed to be made of material from Alaskan sources. The puzzle is further complicated, of course, by the number of sites that predate Swan Point in both the continental U.S. and South America.


V. K. POPOV

Geologist Andrei Grebennikov (*left*) and Speakman examine obsidian at Nachiki, Kamchataka, summer 2004.

But what can it mean?

So why hasn't Russian obsidian from the Pleistocene been found in Alaska? The first obvious answer is simply that the Bering Land Bridge wasn't the original access to the New World as we thought. This is a difficult bit of information to swallow for those of us who have been taught it since elementary school. It begs the question, Where else? Dennis Stanford and Bruce Bradley argue that Clovis was introduced by immigrants from the Solutrean culture in Europe (**MT 17-1,** "Immigrants from the *Other* Side?"). According to this hypothesis, boat people made their way to the New World 15,000 to 20,000 years ago by skirting the North Atlantic ice sheet. Other re-

searchers, including Loren Davis and Roberta Hall (**MT 22-1,** "Late-Pleistocene Occupations on the Oregon Coast"), and Alan Bryan and Ruth Gruhn (**MT 17-2,** "The Baja Connection"), envision boat people skirting the Pacific coast and settling as far south as Baja California. These theories are still overpowered by the classic model of migration over the Bering Land Bridge, and they haven't been seized upon by the archaeological community at large. But evidence continues to mount in support of both of these scenarios.

There's another alternative to tossing the dominant Bering Land Bridge theory out the window: Perhaps the Clovis culture never existed in Northeast Asia. "Clovis could be a New World manifestation," Speakman suggests, "but the actual people themselves are migrants that could have come across the Bering Strait, or by boat along the North Atlantic ice sheet." His line of thinking opens an entirely new can of worms labeled *pre-Clovis,* and he shares it with good company. For example, Steve Holen of the Denver Museum of Nature & Science attributes broken mammoth leg bones at sites in Nebraska and Kansas to human intervention—*bones dated to 7,000 radiocarbon years before Clovis* (**MT 23-1,** "Early Mammoth Bone Flaking on the Great Plains"). Perhaps, Holen proposes, the first colonizers made the trek across the Land Bridge, just as the classic theory dictates, but thousands of years before the Clovis culture flourished in North America.

Though none have been found yet, there may be sites that predate Clovis in western Beringia. Any such site would be of enormous interest to North American archaeologists, but finding it is proving difficult. The Ushki Lake sites in Kamchatka, thought to be older than Clovis by a few hundred years, proved to be younger when it was re-dated by Mike Waters and Ted Goebel of CSFA.

The question of the Bering Land Bridge migration still hasn't been resolved. After all, only a handful of immigrated Russian obsidian artifacts dating to the Holocene have been found. There's still a lot of looking to do, and lots of obsidian to source. A piece of Pleistocene-aged obsidian from Russia found in Alaska may be sitting in Speakman's lab as you read this, waiting to be sourced. MT

–Katie Hill

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Suggested Readings

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✷A Center for the Study of the First Americans publication.