

## 1994 Workshops in Archeometry

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are largely obscured by post-accretionary movements. In few places are these problems more acute than in Cape Breton Island and southwest Newfoundland where, as related by Shoufa Lin and others, two opposing promontories collided, causing intense deformation, high-grade metamorphism, and an abrupt narrowing of the mobile belt. Moving across the Atlantic, the mosaic of terranes in the Scandinavian Caledonides was described by David Roberts and Brian Sturt, revealing both parallels and contrasts with the Appalachian part of the orogen. The final paper, by Kevin Pickering and Alan Smith, represented a bold and controversial attempt to model the evolution of the entire Appalachian-Caledonian jigsaw puzzle from the Late Proterozoic to the Middle Devonian. It seems that previous speakers had been unduly limiting themselves by using only one lapetus Ocean when two provide far more room in which to manoeuvre.

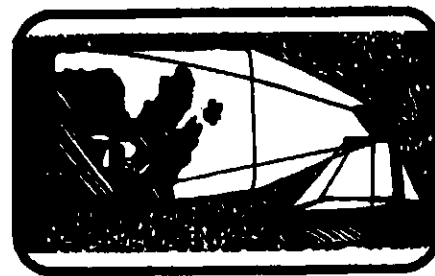
On 14 August, field trip participants set off, in excellent weather, for three days of exploring the remains of the lapetus Ocean (or oceans). The first day's excursion was led by Brian O'Brien, with input from Tomasz Dec and Scott Swinden. The route, from north to south down the Fortune Harbour Peninsula, crossed the marine volcano-sedimentary sequences of both the Notre Dame and Exploits subzones of the Dunnage Zone. Basalts were deftly distinguished by laminated extended REE diagrams and seemed to describe a recurring theme of island arcs succeeded by back-arc basins. Halfway through the day, participants were able to view the Red Indian Line, the major structural divide in the Dunnage Zone, and, according to several papers presented during the conference, the suture between the Laurentian and peri-Gondwanan terranes of lapetus.

The second and third days were led by Hank Williams and, fittingly, covered some of the earliest work he did for the Geological Survey of Canada in the 1960s as well as some of his most recent work. The first of these two excursions started in the ever-perplexing Dunnage Melange and proceeded onto New World Island to view exposures in both the Exploits, Notre Dame and Twillingate subzones. Southeast of Red Indian Line, stops displayed Early Ordovician brachiopods and basalts, Late Or-

dovician turbidites and Silurian melange. Northeast of the line, the Early Ordovician relationship between deformed Twillingate Granite and younger dykes and volcanic rocks was examined.

The final day of the field trip consisted of a transect across the Dog Bay Line, which separates subaerial and marine Silurian strata. The first stop, as on the previous day, was in melange, this time the Carmenville Melange. The field trip then proceeded to Horwood to see the marine Silurian rocks on the east side of the Dog Bay Line and then to the line itself for igneous blocks in black shale (more melange). On the west side of the line, rocks that are unrepresented to the east were viewed on both limbs of the Farewell Syncline. Late Ordovician to Early Silurian conglomerates are well flattened on the southeast limb near Dog Bay Line and much less deformed on the northwest limb. The last stop showed that the contact between these marine turbidite deposits and the overlying subaerial volcanic rocks of the Botwood Group is undeniably stratigraphic, although its relationship to deformational events leaves much room for discussion.

Papers from the conference are to be published as a Special Paper of the Geological Association of Canada. The commitment of the participants was reflected in the large number of manuscripts submitted at the conference. The convenors left Grand Falls with enough papers in hand for an outstanding publication. The co-operation of the authors has made it possible to proceed with peer review immediately and timely publication can be expected.



## 1994 Workshops in Archeometry

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The annual archeometry workshop at the State University of New York (SUNY) at Buffalo is eagerly anticipated by regular attendees. It allows presenters the opportunity to try out new ideas, to "iron out the kinks" in new presentations, and, most importantly, to talk with colleagues in a quiet atmosphere conducive to generating new ideas for archeometric research. This year was no exception. Approximately 40 scientists from Ontario and New York attended the fifth meeting, 26-27 February 1994. As always, the talks were informal with no prescribed length, except that set by the health of one's vocal cords. Questions occur at any time, and essentially no limit exists for the discussions following each paper.

Participants convened on Saturday morning, having braved another winter storm and having been fortified by the preconference breakfast goodies. Doug Perrelli, the conference organizer, welcomed everyone. Ezra Zubrow (SUNY, Buffalo) reported that, of some 10,000 archeologically oriented articles in the major international media, only 50 mentioned archeometry or archeometric methods, and interestingly, none of those was carried by the wire services. Major radio/TV networks reported no archeometry news, but did carry about 60 archeological items. Generally, one archeometric item is reported for every 200 to 2 000 archeology items. Discussion centred on the reasons for this lack of coverage. Several people noted that most archeological stories depended on archeometric data, but that it was often not reported. Several people not-

ed that their experience with the press had led to numerous misreported stories or frustration after having given a detailed interview that was then quashed by a senior editor. The newsworthiness of the archeometric data was questioned by several, who thought that the general public would not understand much archeometry due to their inadequate mathematical and scientific literacy. Some archeometrists noted that even the average archeologist does not always completely understand the archeometric methods. Zubrow suggested that, because archeometrical research lacked an underlying theory, archeologists did not consider it to be "real archeology." The measurement studies are often not rewarded well by institutions, or considered interesting, while the departments that house the equipment often accuse the archeometrists of wasting their time doing "that archeology stuff rather than real science." Participants continued to discuss these ideas throughout the conference.

Hilary Stewart-Williams (McMaster U.) reported on his recently developed, improved method to analyze  $^{18}\text{O}$  in the phosphate fraction of tooth enamel using an  $\text{Ag}_3\text{PO}_4$  precipitation rather than  $(\text{BiPO}_4)_2 \cdot \text{H}_2\text{O}$ . Tests on beaver teeth showed consistent  $\delta^{18}\text{O}$  results for different teeth from a male and female beaver killed at the same time. For human teeth from Teotihuacán, Mexico,  $\delta^{18}\text{O}$  data suggest some of the population may have been immigrants. Discussion centred on other possibilities to explain the Mexican results, including dietary differences among the social classes, and slavery.

Jack Rink (McMaster U.) discussed the recent improvements in electron spin resonance (ESR) dating. At Karain, Turkey, he found the excessive calcite roof-fall debris (sedimentary "lumpiness") caused the range in the dates for the lumpy layers to appear less consistent. At Kulna, the Czech Republic, the Micoquian industry dates to  $60\text{--}65 \pm 10$  ka, assuming early or linear U uptake (EU or LU). At El Castillo, Spain, the basal Aurignacian layers dated to  $30\text{--}34 \pm 3$  ka (assuming EU or LU). In the discussion, the problems of water content and U uptake and their effects on external dose rate calculations were explained further.

Using ESR-dated teeth from Sterkfontein and Swartkrans, South Africa,

Bonnie Blackwell (Queen's College) showed that extraneous teeth have drastically different accumulated ESR doses and U concentrations from the *in situ* teeth. Calculating their dates requires that their dose rates be corrected with a time-averaged dose rate calculation. At Swartkrans, both Members 3 and 5 contain teeth reworked from older units in the cave, while the Sterkfontein teeth suggest several sets of extraneous teeth in Member 4. Discussion clarified that this was not a different way to deal with the poor date resolution ("lumpiness") presented by Rink, but a way to date the extraneous teeth that occasionally get reworked in karst, glacial or fluvial settings.

Henry Chaya (SUNY, Albany) supervised a senior project for physics students who used X-ray fluorescence (XRF) to analyze the trace elements in obsidian artefacts from sites excavated by Lucy Johnson (Vassar College) on the Aleutian Islands. Using several statistical tests, they determined that all the obsidian did derive from the same source. Future research will attempt to locate this source. More such projects could be attempted with real samples in undergraduate courses.

Having used neutron activation (NAA) on obsidian and chert artefacts from several Great Lakes Paleoindian sites to analyze for trace elements, Pat Julig (Laurentian U.) found that Hudson Bay Lowland Chert was a catchall term, as is the Knife River Flint, for which it is commonly mistaken. Gunflint chert represented several different chemistries depending on the layer from which it was collected. Julig noted that all these sources can contribute to exotic artefacts found at most Paleoindian sites around the lakes.

In examining Clovis obsidians from the Hoyt site, Ken Tankersley (SUNY, Brockport) found an odd feature on the hafted portion of an obsidian point. Using scanning electron microscopy (SEM) and different chemical analyses, he determined that the material was either amber or tree gum mixed with a carbon flux from burned wood. Using amber as a mastic would explain the frequent amber discoveries in Paleoindian sites, including the Lindmeier site.

After examining "buckets of glass trade beads," Ron Hancock (U. of Toronto) found that Na, K, Al, Ca, Co, Cu, V, Mg, As and Sb were useful elements to distinguish 16th century from 17th and

18th century blue beads. When the process to produce  $\text{Na}_2\text{CO}_3$  was perfected in approximately 1870, bead producers no longer needed to use NaCl to make the soda glass, causing a change in the Cl content. Hancock hopes to examine more trade beads from museum collections to perfect this seriation. He noted that single beads can be analyzed and later returned to collections unharmed.

Saturday evening brought welcome relief in the form of a great buffet. In the informal museum setting, everyone had ample time to discuss the day's topics and delve further into research projects in progress. Discussion lasted into the late evening (the Olympics notwithstanding).

Sunday morning saw everyone back for more science. Using NAA, XRD and petrology on Roman Period (4th century BCE to 4th century CE) Etrurian pottery, Ted Peña (SUNY, Albany) determined that most workshops turned out several pot styles, using mainly Pleistocene marine clays. In the extreme north, however, two workshops carefully guarded their production secrets until as recently as 1950. Over the centuries, these towns have produced specialized pots from local clay sources less than 1 km away. These clays contain significant volcanic sediment that acts as a natural temper, but Peña also feels it constrains the shape and style due to its shrinkage and heat conductivity.

Chris Pool (Ithaca College) used 22 elements in XRF analysis of Classical Period (450–650 CE) ceramics at Matcapán, Mexico. Cluster and principle component analysis showed that as production becomes standardized into small "factories," the chemistry becomes more uniform.

For examining Classic Period ceramics from Alta Vista, Mexico, Nicola Stazi (SUNY, Buffalo) also examined 22 elements by XRF. While Teotihuacán declined at 750–850 CE, Alta Vista flourished with temple and monument construction, and the expansion of mining to exploit malachite, ochre and tourmaline. Certain wares were being produced only at specialized sites by approximately 750 CE.

After reviewing basic paleodiet research principles using stable isotopes, Henry Schwarcz (McMaster U.) updated the group on his recent results. Following the Mesolithic-Neolithic transition in coastal Portugal, Neolithic

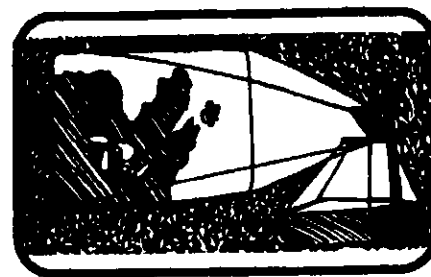
peoples had a much more restricted diet from almost exclusively terrestrial sources, whereas the Mesolithic people had, in addition, exploited marine resources. Residues on ceramics from sites in northern Manitoba indicate that the flat plates were probably used to fry fish and other foods. At Wadi Halfa, Nubia, the skeletal isotope ratios suggest little change in the food from the Christian to the Meroitic Periods (~100-1600 CE), except that males in the Meroitic and X Group cultures ate more meat than females. A strong trophic level shift in  $\delta^{15}\text{N}$  ratios in children of approximately 5-7 years of age suggests that weaning occurred then. Isotopes in their hair suggest that more people died in the early summer and that their summer diet was almost exclusively millet and sorghum, while their winter diet was almost exclusively wheat. We do know, however, that they did store food, which should have averaged the isotope ratios more over the year. More research is needed into hair growth rates and possible fractionation.

Marie Conrad (SUNY, Buffalo) introduced us to the horrors of life in the poorhouse in mid-19th century New York State. Historic accounts give conflicting reports on the nutritional state of inmates, ranging from "well fed" to "suffering 1000 different diseases ... [all called] starvation." In order to examine the nutritional state of skeletons preserved in the Highland Park collection, she will examine paleopathologies, stable isotope chemistry, and some trace element chemistry.

Ezra Zubrow thanked all the speakers for attending and presenting their research, and the sponsors, including the Canada/America Trade Centre and SUNY (who currently cover speakers' hotel and food costs). Zubrow also invited all the speakers to contribute their papers to a new, fully electronic journal, *Anthro*, being edited at SUNY Buffalo. The conference program will also appear in this journal, which is currently free upon request from [apyezra@UBvms.cc.buffalo.edu](mailto:apyezra@UBvms.cc.buffalo.edu). Further information is available over email or by writing Professor Ezra Zubrow, Department of Anthropology, SUNY Buffalo, Buffalo, New York, United States 14222.

As always, SUNY Buffalo hosted a great meeting, with plentiful, interesting science, useful discussion, and good food. The only complaints heard by the attendees concerned the fact that the

third session occurred during the Olympics gold medal Olympic hockey game, and that some beer seemed to have a  $-3\text{‰}\delta^{15}\text{N}$  signature. The organizing committee, especially Doug Perrelli, deserve congratulations for a smooth conference. The organizers are always looking for new topics, and new scientists to present them. If you are involved in archeometric research, please contact Ezra Zubrow. SUNY welcomes all interested attendees.



## IGCP 280

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On 29 August 1993, the final meeting of the International Geological Correlation Programme (IGCP) Project 280 convened in Beijing, China. Following a day of mainly sightseeing in Beijing, foreign delegates and their Chinese hosts entrained on the evening of 30 August for an overnight trip to Shenyang. After breakfast in the railway station, we drove on one of China's very few freeways to Anshan, an iron and steel mining and smelting town in Liaoning Province, 1 000 km northeast of Beijing and three hours from Shenyang. (China's highways are not nearly as well developed as her railway system. We found that road travel was generally slow. Speeds of 50 km/hour could rarely be maintained for more than a few minutes because of the narrowness of the roads, and because of pedestrians, bicycles and tractor-drawn one-ton trailers that appeared in great numbers near every town and village. The tractors are slow and low-powered, and as they will not, or cannot move over, traffic crawls past towns and villages. From their abundance and the fact that they were usually filled with stone, gravel, sand or dirt, one gained the impression that much of China was under construction.)

Everywhere we travelled, the people seemed relaxed, well-dressed and well-fed, and were universally friendly and polite. In the countryside, people seemed to have more time and were obviously interested in whatever the foreigners were doing. One European geologist who has worked for many years on China's old rocks suggested China is