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EDITORIAL

Last issue, we worried about planes, boats and metal detectors being used to damage archaeological sites. And previously we have inveighed against bulldozers.

This time, the problem is feet.

Nick Adams, of the Ontario Ministry of Culture and Recreation, raises the matter in a Fall issue of the O.A.S. Arch Notes.

The problem is that people increasingly are heading for the bush, and they tend to use the easiest trails and camp in the most comfortable campsites. And those, of course, are the trails and campsites that people have used for millenia.

Adams notes finding two really isolated Ontario lakes with an outfitter's camp neatly placed on top of an ancient midden. In each case, he says, "part of the site was salvaged (by archaeologists) but not before a considerable amount of it had been walked away."

And sheer pedestrian erosion isn't the only problem - the innocent campers dig fire pits, tin-can rubbish pits, and latrine pits, adding a whole new layer of midden...and untold damage to the layers below.

Anyone for some of those sun-drenched provincial campsites like Saltery Bay, or the rugged escapism of the Bowron Lakes?

One answer is to close off areas, as has happened with the Lascaux Caves and Stonehenge. But less repressive - though more expensive - is to identify the "hot" spots, and create even more attractive campsites nearby.

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ROY CARLSON

By Don Bunyan

Sketch by Hilary Stewart

When we started this series of "informal and affectionate biographical notes" about British Columbia archaeologists, our intention was to alternate between present and past. The last three notes have all been about men of the past, so a return to the present is overdue. Our subject (victim?) this time is the Archaeological Society's favourite archaeologist, the man who inspired the formation of the A.S.B.C. in the first place, Dr. Roy L. Carlson

Roy is one of those rare people who know their aims from an early age and who then set about to achieve them. Born in Bremerton, Washington on the 25th June, 1930, he first became interested in archaeology when in the seventh grade of school. He borrowed from the library two books by Ann Morris, "Digging in Yucatan" and "Digging in the Southwest," and promptly decided that he would become a digger too. After under-graduate studies at Olympic College, Bremerton, he majored in anthropology at the University of Washington in Seattle. Roy persevered in his interest in archaeology and ethnology, getting his B.A. in 1952 and his M.A. in 1955. He was engaged in archaeological field work at excavations as a student in the San Juan Islands in 1950 and as a field assistant at Lind Coulee in 1951.

Roy's introduction to British Columbia archaeology was his arrival in 1952 to work as a field assistant for Carl Borden during the latter's second season of survey and excavation in Tweedsmuir Park. "My acquaintance with Carl Borden began in June 1952. He was standing on the bank of the Stewart River at the site of the prehistoric village of Chinlac when I and another student arrived in a small boat to take part in the excavation of this known Carrier Indian site..." (Carlson 1979a). Tweedsmuir Park was the setting for another and more important introduction. It was there that Roy met Maureen Kelly, a recent graduate in archaeology from the University of British Columbia who was also employed on the survey. Maureen returned to U.B.C. to study social work, getting her baccalaureate in the subject in the spring of 1953. They were married one Saturday in June, and Maureen worked while Roy continued his studies.

After obtaining his Master's degree in 1955, Roy could no longer resist the pull of the army. After his spell of military duty during which the first two of their four children were born (the eldest, Catherine, has followed in her parents' footsteps and is now an archaeologist herself - is this the start of a dynasty?), Roy was released to the uncertainties of the civilian world. He took a post as Curator of the Klamath County Museum in Oregon, and stayed there two years. Then, in 1958 he began study and research at the University of Arizona, and was awarded his Ph.D. from that institution in 1961.

In the same year, Dr. Carlson went to Boulder, Colorado, as a Research Associate at the University of Colorado Museum. There, in an odd but purely fortuitous closing of a circle, he found that his main task was to work on material collected by his early idols, Ann and Earl Morris, in the southwest during the 1920s and '30s. He surveyed the area, relocated their sites, analyzed the material, and wrote it up (Carlson 1963 and 1965).

In 1964 he and two others sought and obtained a grant from the National Science Foundation for an archaeological survey of the Second Cataract area of the Nile Valley. After that first safari, Roy was appointed the following year as Field Director of the fourth Colorado expedition engaged in archaeological excavations in the Aswan reservoir area of the Sudan. It was during this period that Roy heard about the building of a new university in British Columbia. The fact that his wife was a Canadian undoubtedly influenced his action in sending off an enquiry, as the result of which he was invited to develop northwest studies at the new institution. Simon Fraser University wanted him to start work in the fall of 1965, but he was then still employed in the Sudan. He attended the opening of the university, then flew off to Africa, returning to Burnaby Mountain to begin teaching in May 1966, as an Assistant Professor.

Archaeology at Simon Fraser University was initially within the precincts of a Department of Political Science, Sociology and Anthropology. This arrangement Roy describes as structurally unsound: he soon realized that if the University were to engender good archaeological teaching and research it would need a separate Department of Archaeology, in which should be retained those aspects of anthropology relevant to archaeology. This proposal took practical effect in the fall of 1968, with the organizing of archaeological studies in a separate unit. Eventually, in the spring of 1971, the Board of Governors of Simon Fraser University gave final approval to the formation of the Department of Archaeology, with Dr. Roy L. Carlson as Professor and Chairman of the Department. S.F.U. is one of only two universities in Canada to have such a separate department.

In spite of the responsibilities of chairing a department, the administrative burden and his teaching load, Roy has managed to get into the field, always in B.C., every summer since joining S.F.U. He has undertaken excavations at Mayne Island, Kwatna, McNaughton Island and Namu; surveys of Seymour Inlet, Quatsino Sound, the Queen Charlottes and the region of the Nass River and Portland Canal and Inlet; and the exciting tracing of Alexander Mackenzie's route from the Fraser to Bella Coola. He also found time to make a set of five videotapes on the archaeology of the province for the University of the Air in 1978: any of our readers who were hardy enough to get up to watch television at six o'clock in the morning will remember these as both interesting and instructive.

This last activity is consistent with Dr. Carlson's philosophy that the archaeologist is not doing his job properly unless his results get to the public. It was his course of lectures in 1966 under the auspices of the Centre for Continuing Education at U.B.C. which stimulated the students at the course to form the Archaeological Society of British Columbia, and he has given the Society endless support and encouragement ever since. Roy became a member of the Archaeological Sites Advisory Board in 1967 and of its successor, the Provincial Heritage Advisory Board, in 1977. In contrast to some of his younger confreres who carp at what they see as a lack of communication between the specialists in their field and the public, Roy considers that archaeological public relations in B.C. are healthy, compared to those in many other areas that he knows. As examples of this, he points to such institutions as ASAB/PHAB and the A.S.B.C., and to the continuing effort at public education conducted by museums, colleges and universities in the province. However, he is not complacent, and considers that an abiding effort is necessary, starting with the school system and continuing into adult education, always striking a balance between concern with the local heritage and interest in the universal.

Roy having worked in widely separated areas, his writings cover a correspondingly wide range. However, as a teacher, an administrator, a member of many boards and consultative bodies and an active field worker, he has perforce let his writing-up lag behind his working-out. In this he is not alone among archaeologists -- a race notorious for their delay in publishing results. ("Final Reports" seldom get written in less than 20 years, it seems!) This year, having retired from the chairmanship of the successful and respected Department that he helped found, Roy is fully engaged in writing. At hand, awaiting his attention, is material from all his areas: the Southwest, the Sudan, and the British Columbia coast. (He did not way whether all of the Morrises' material had been dealt with!) We can all look forward with much pleasure to a flood of publications in the next year or so, for his style is succinct, comprehensible and free of academic pomposity. A work in preparation which members of our Society are bound to enjoy is "The Prehistory of Northwest Coast Indian Art", due out soon. Meanwhile, the abbreviated bibliography below will give readers a chance to sample some of Dr. Carlson's writings on British Columbia prehistory. We eagerly await the flood, Roy!

Abbreviated Bibliography

Carlson, Roy L.

1963 Basket Maker III Sites near Durango, Colorado. University of Colorado Studies, Series in Anthropology. No. 8, 82 pp.

1965 Eighteenth Century Navajo Fortresses of the Governador District. University of Colorado Studies, Series in Anthropology. No. 10, 116 pp.

1970 (Ed.) New Discoveries in the Archaeology of B.C., B.C. Studies No. 6-7, Vancouver.

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Excavations at Helen Point on Mayne Island. Ibid, pp. 113-123.

1972 Excavations at Kwatna. In Salvage '71, edited by R.L.C., pp. 51-58. Dept. of Archaeology, S.F.U., Publication No. 1, Burnaby.

1976 The 1974 Excavations at McNaughton Sound. In Current Research Reports, edited by R.L.C., pp. 99-114. Dept. of Archaeology, S.F.U. Publication No. 3, Burnaby.

1979a Charles E. Borden (Obituary). Canadian Journal of Archaeology, No. 3, 1979, pp. 233-239.

1979b The Early Period on the Central Coast of British Columbia. Ibid, pp. 211-228.

A REVIEW OF THE RECENT ACTIVITIES UNDERTAKEN BY THE LILLOOET ARCHAEOLOGICAL PROJECT

BY ARNOUD H. STRYD, CARIBOO COLLEGE, KAMLOOPS, B.C.

Recent inquiries by several colleagues into the current "state of affairs" of the Lillooet Archaeological Project led me to prepare this report on the more recent undertakings of the project. This paper, which is based on a recent progress report submitted to the Social Sciences and Humanities Research Council of Canada (Stryd 1979), discusses the main research activities which have been carried out under the auspices of the Lillooet Project since the conclusion of fieldwork in 1976.

THE LILLOOET ARCHAEOLOGICAL PROJECT

The Lillooet Archaeological Project is a long-term, continuing research project started in 1969 to investigate the archaeology of the Fraser River valley around the town of Lillooet in British Columbia's south-western interior. The project is concerned with two problems: the need for a more elaborate and tested archaeological chronology for the mid-Fraser area including the Lillooet area (Stryd 1978:8-9) and the need to test the suggestion by Sanger (1961:25-26) and Stryd (1971:42) that the prehistoric pit house settlement patterns of the Lillooet area may have been significantly different from its ethnographic counterpart (Stryd 1978:9). Five specific objectives were established for the research (Stryd 1978:9-10):

1. To construct a sequence of archaeological units for the last 3000 years in the Lillooet area, including an examination of the validity of the Kamloops Phase concept for the Lillooet area.

2. To describe the development of aboriginal culture in the Lillooet area over the last 3000 years and, if possible, to determine the origin of ethnographic culture in this area.

3. To describe the prehistoric house pit settlement patterns of the Lillooet area.

4. To determine whether or not the earlier settlement patterns are significantly different from their ethnographic counterpart.

5. To explain how and why this earlier form of settlement, if different from the ethnographic pattern, evolved into the ethnographic pattern.

With these objectives in mind, six seasons of archaeological reconnaissance and excavation were undertaken in the Lillooet area under my direction between 1969 and 1976. An area of about 100 sq km was systematically surveyed and over 200 archaeological sites were recorded. Special attention was focused on the 72 pit house sites which ranged in size from isolated house pits to large villages of more than 50 house depressions each. Excavations varying in scale from small test pits to large block excavations were carried out at 28 different sites. Eighty-three house pits in 19 different sites were investigated; the need for salvage work resulted in the excavation of nine non-house pit sites. Large amounts of archaeological material were recovered including more than 22,000 artifacts, over 72,000 faunal and botanical macrofossils, about 500 features, and 23 human burials along with volumes of less tangible archaeological data. The history and major undertakings of the project have been reviewed in a recent article (Stryd 1978).

RESEARCH ACTIVITIES SINCE 1976

Laboratory analysis of this material and interpretation of the data have been the focus of the project since the completion of the fieldwork. Much of this analysis has been undertaken by consulting specialists with the generous support of the Social Sciences and Humanities Research Council of Canada and Cariboo College. My primary responsibility has consisted of the planning of the research program, the continued administration of the project, and the co-ordination of the activities of the participating specialists. A review of the various specialized analyses which were undertaken follows.

Faunal Analysis

Faunal remains were recovered in nearly all of the archaeological sites which were excavated. About 72,000 whole and fragmentary items including the skeletal elements of land mammals, fish, and birds, as well as a few invertebrate shells, were collected. Leonard Ham, doctoral candidate in anthropology at the University of British Columbia, agreed to undertake a thorough analysis of these remains. The purpose of this study was twofold: to provide basic descriptive information as to the types and frequencies of skeletal elements present along with age, genus, and species (whenever possible) of each identifiable element; and to obtain information on the subsistence practises of the local archaeological cultures. Ham submitted the following brief progress statement:

> This study will attempt to account for differences observed in faunal assemblages recovered from house pits of four different time periods and three separate localities. Faunal data has been analysed from 24 sites in the Lillooet area... In total, 72,160 pieces of faunal material weighing 71,863.2 g were recovered from these sites...
>
> The analysis of the subsistence patterns suggested by these faunal assemblages remains to be done...[but]...data recovery is heavily skewed towards the Historic Period from the Fountain sites. As the original research was not specifically designed to recover faunal material, this bias isn't totally unexpected given the unlikely chance of bone preservation correlating with prehistoric factors governing settlement selection. Clearly this will somewhat dampen the scope of this analysis though

> not sufficiently to prohibit the recovery of useful information.
>
> Superficial examination of this material indicates the possibility of some areal differences in subsistence over time; the prehistoric presence of the horse which no doubt had some effect on subsistence; differences in the presence of coastal trade items; and possibly a continuation of prehistoric subsistence patterns well into the Historic Period in the Fountain area. There does not appear to be any evidence in the faunal record of marked environmental change during the time period under study...

Coprolite Analysis

Richard G. Holloway of the Department of Biology at Texas A & M University analyzed ten coprolites recovered from a deep pit in the floor of House Pit 65 at the Bridge River village site (EeRl 4). Prior to analysis, it was hoped that the coprolites would be human and that they would yield information on prehistoric subsistence and diet. Holloway concluded, however, that all ten specimens probably are dog coprolites (Holloway 1977:5,17). Examination of the coprolites revealed that all but one contained animal macrofossils including fish vertebrae and "ribs", bird bones, reptile vertebrae, rodent teeth, fragmentary carnivore phalanges, and various fragmentary deer bones. Three specimens contained as yet unidentified fibrous plant material and small pieces of charcoal were observed in four coprolites. Inorganic particles including small pebbles and various minerals, especially quartz, were common in eight specimens. The paucity of pollen in the coprolites led Holloway to suggest a winter occupation for the site because that is the time of year when flowering plants are absent (Holloway 1977:13-16).

Plant Macrofossil Identification

Plant remains were retrieved from many of the archaeological sites which were excavated. Although dry screening with a fine mesh was the only recovery technique used, just over 500 specimens were recovered ranging in size from large pieces of tree bark to tiny seeds. The identification of this material was undertaken by Dr. Rolf W. Mathewes of the Department of Biological Sciences at Simon Fraser University with the assistance of Larry King. Mathewes says of the work completed to date:

> Most of the botanical remains submitted have been identified. Besides an abundance of birch bark rolls, a variety of seeds, leaves, cones and miscellaneous remains have been identified. Particularly interesting remains include a collection of puffball mushrooms (*Bovista*), cracked seeds of *Pinus ponderosa*, charred cones with seeds of *Pseudotsuga menziesii*, a flattened "cake" of *Amelanchier alnifolia* berries, a large unidentified seed and a plant gall. An abundance of seeds of Chenopodiaceae, *Prunus virginiana*, and *Rubus* sp. is characteristic of some samples. A historic site also revealed a seed of a domesticated cherry...

Palynological Analysis for Environmental Reconstruction

The reconstruction of past environmental conditions in the Lillooet area is an important part of our research as a knowledge of the ecological "background" can add much to the understanding of prehistoric human adaptations and local culture change and stability. Palynology, the study of spores and pollen grains, has long been utilized to furnish such environmental information. Because of regional ecological variation, the most reliable paleoenvironmental data for any area must by necessity be based on local palynological studies. Because no pollen profiles were available for the Lillooet area nor for any immediately adjacent area, Dr. Rolf W. Mathewes agreed to undertake a palynological study which would examine the post-Pleistocene vegetational and climatic history of the Lillooet area with special emphasis on the four millenia represented by the excavated archaeological sites.

In 1976 and 1977, Mathewes collected sediment cores for palynological analysis from Chilhil Lake and Cinquefoil Lake in Three Lakes Valley east of Lillooet and from pond-sized Phair Lake just south of Lillooet. Preliminary examination of the cores revealed that the Cinquefoil Lake core was not suitable for further analysis because of the presence of extensive inorganic clay layers which contained little pollen. The two other cores were processed by doctoral candidate Miriam Mulstein under Mathewes' supervision. Both cores were sampled at 5 cm intervals and 450 pollen grains were identified and counted per sample. The raw counts per sample were then converted into percentages and a computer-generated pollen frequency profile (pollen diagram) was printed for each core.

The Phaire Lake Core has a basal radiocarbon date of 6,780 ± 260 years B.P. (I-10,043) whereas the Chilhil Lake core yielded a basal radiocarbon age estimate of 7750 ± 180 years B.P. (WAT-360) along with an anomalous basal date of 4860 ± 120 years B.P. (I-10,044). Three additional radiocarbon dates have also been obtained on the Phair Lake core while two more organic samples from the Chilhil Lake core have been submitted for age determination.

Information on past environmental conditions in the Lillooet area now awaits the interpretation of the two pollen diagrams. This work is in progress and a written report with pollen diagrams will soon be available.

Pollen Analysis of Sediment Samples

Mathewes also undertook a trial palynological examination of sediment samples which we had collected from several archaeological sites. The purpose of this work was to determine whether or not these sediments contained identifiable pollen and, if so, what kinds of information could be obtained from them about archaeological plant usage and storage. Of particular interest was the identification of plants which might have been brought into the winter houses as food, bedding, etc. and of plants which presumably were placed in the so-called "storage pits."

A trial run of 20 samples representing a variety of archaeological features, site ages, and sediment types was selected. The samples came from several house pit sites, an isolated historic burial, and a non-house pit habitation or temporary campsite. The sites range in age from about 4000 years ago to the Historic period. Eight samples consisted of sediments collected from strata interpreted as house pit occupation levels or "floors" and five samples came from small and medium-sized pits dug into these house pit "floors" and which we tentatively labelled as storage pits. One other sample came from quite a large "storage pit" located just outside a house depression. Three samples were associated with human burials and another two samples consisted of fill found inside two pieces of rolled up birch bark which may be the remains of prehistoric containers. The final sample consisted of inorganic sediments taken from a possible living surface or occupation "floor" at a non-house pit habitation site. Mathewes sends along the following brief progress statement:

> Twenty samples have been processed for pollen analysis, using concentrations and relative percentages of each type identified. Five samples have been completed, yielding between 195 and 17,000 pollen and spores per cubic centimeter of soil. Pinus, Chenopodiaceae, and Artemisia are the dominant pollen types, with lesser amounts of Alnus, Pseudotsuga, Gramineae, Picea, and Abies. The Chenopodiaceae pollen is higher than expected from present-day surface samples, and may reflect a high degree of local soil disturbance on the sites. The significance of these data will not be known until all samples from occupation horizons, cache pits, and burials are analysed and compared...

Human Skeletal Analysis

Human remains were encountered at thirteen sites. Although burials are a common archaeological feature of this area and represent a potential major source of demographic and social information, no attempt was made to excavate any burial sites at the requests of the local Indian bands. The bands did, however, encourage us to salvage any burial sites which had been badly disturbed or were subject to imminent destruction and salvage excavations were undertaken at seven sites (EeRl 18, 19, 30, 51, 80, 167, and 169). The R.C.M.P. collected a burial from a disturbed site (EdRl 22) and bleached human remains came from the surface of two sites located during our regional survey (EdRl 12 and EeRl 1). Lastly, three interments were encountered while excavating prehistoric house pit sites (House Pit 19 at EeRk 4, House Pit 45 at EeRl 4, and House Pit 6 at EeRl 6). The bands gave us permission to study these burials; in return we agreed to reinter all human remains upon completion of our analysis.

The human skeletal sample consisted of 23 partial and complete discrete burials plus three collections of miscellaneous mixed skeletal elements from an unknown number of individuals from EeRl 18, 30, and 169. Owen Beattie, Lecturer in Physical Anthropology in the Department of Anthropology at the University of Alberta, undertook the analysis of the skeletal material. The aim of this work was: (1) to provide an estimate of the minimum number of individuals represented at each site, (2) to provide identification for each individual burial as to skeletal elements present, sex, and age at death, (3) to provide a comprehensive biological description and an evaluation of disease and nutrition for each burial, and (4) to provide whatever data possible on the biological and demographic characteristics of the population. Beattie recently finished his laboratory analysis and he sends along this brief progress report:

> The material ranges from isolated teeth to complete skeletons, and preservation is quite variable from very friable bone to well preserved specimens...
>
> Method of analysis includes comprehensive recording of cranial, dental, and postcranial metric and non-metric information. Sex and age determinations were made utilizing standard physical anthropology techniques...
>
> One site (EeRl 18) posed a difficult problem in that a majority of the material is a mixture of remains possibly from up to forty individuals (Stryd and Baker 1968:51). The minimum number of individuals was estimated from the innominate bones, the most represented bone in the sample. Five males, four females, and three of indeterminate sex were identified in addition to three discrete interments which were not disturbed. A total of 241 post-cranial bones, four mandibles, and six skulls were individually analysed; matching of some of the larger skeletal elements was also accomplished.
>
> Perhaps the most interesting burial from the total Lillooet collection is that from EdRl 22. This individual is an adult male with a number of skeletal defects caused by trauma. These include fractured and fused foot phalanges, a crushed lumbar vertebral body, a basalt projectile point fragment embedded and partially incorporated (i.e. healed) within the distal left radius, and a series of three confluent, partially healed cranial perforations of the left parietal bone most likely caused by severe blows to the head.
>
> Other preliminary observations of the total sample include expected degenerative arthritic joint changes correlated in severity with age; indications of extreme dental attrition with molar dentin exposure occurring during the early 20s; consistent occurrence of apical abscesses after pulp exposure; very common occurrence of dental calculus and lack of dental caries; collapsed vertebral bodies; frequent occurrence of third molar congenital absences; and a number of congenital defects, particularly of the vertebral column (arch defects).
>
> The calculation of metric indices and non-metric frequencies is now in progress... The data generated by this analysis should form a basis for an increasing accumulation of early interior human biological information.

Obsidian Trace Element Analysis

Although obsidian artifacts and waste flakes comprise less than 1% of all the lithic materials recovered in our investigation at Lillooet, considerable attention was focused on these objects because of their potential for providing information on prehistoric and ethnographic trade practises. Because of the absence of local obsidian sources, all occurrences of this material must have been the result of native trade. Trace element analysis can distinguish different types of obsidian based on their chemical properties and, when the chemical characteristics of various source flows are known, can identify the precise place of origin of each of the obsidian types.

Our fieldwork recovered 136 obsidian specimens, including both artifacts and debitage, from 13 sites. Almost three-quarters of these came from two sites: EeRk 4 (n = 41) and EeRl 171 (n = 59). The obsidian covers much of the time span represented by the excavated sites from 4000 years ago to the Historic period.

Our involvement with trace element analysis began in 1971 when we contributed seven pieces of obsidian to a pilot project undertaken by Dr. Roscoe Wilmeth of the Archaeological Survey of Canada and Dr. David Evans of Atomic Energy of Canada in which they applied neutron activation analysis and X-ray fluorescence to obsidian artifacts from British Columbia (Wilmeth 1973, Stryd 1973b). In 1974, sixty-seven obsidian samples were submitted to Dr. Erle Nelson of the Department of Archaeology at Simon Fraser University as part of his comprehensive trace element study of archaeological obsidian from western Canada, Alaska, and the American Pacific Northwest using energy-dispersive X-ray fluorescence (Nelson et al. 1975). Lastly, in 1978, Drs. Lee Sappington and David Chance of the Laboratory of Anthropology at the University of Idaho requested samples of archaeological obsidian from Interior British Columbia for trace element comparison with their obsidian from Kettle Falls in Washington State. Twenty-five samples from Lillooet were contributed including sixteen pieces already analyzed by Nelson.

Eighty-three of our 136 obsidian specimens have now been subjected to trace element analysis. The 53 pieces not analyzed were omitted primarily because of their small size. The three studies identified a total of twelve different kinds of archaeological obsidian at Lillooet: Wilmeth's Groups 1 (n = 5), 3B (n = 1), and 4A (n = 1) and Nelson's Anahim-1 (n = 41), MacKenzie-2 (n = 4), Ilgachuz-1 (n = 2) and -3 (n = 1), Newberry-2 (n = 12), Glass Buttes-2 (n = 3), B.C. Central Interior-A (n = 5), and Unknown-A (n = 1) and -B (n = 2). Sappington could not differentiate between Nelson's Ilgachuz-1 and Ilgachuz-3 types and proposed a tentative Ilgachuz-Undifferentiated type (n = 5). This total was reduced to eleven when it was discovered that Nelson's Anahim-1 and Wilmeth's Group 1 types were chemically indistinguishable. Sources for six of the eleven types are currently known. Four sources -- Anahim-1, MacKenzie-2, and Ilgachuz-1 and -3 -- are located within a 20 km radius of one another in the Coast Mountains of British Columbia between 35 and 55 km north to northwest of Anahim Lake (Nelson and Will 1976:152). Nelson's analysis has shown that this was also the source for Wilmeth's Group 1 obsidian (Nelson and Will 1976:152) rather than nearby Tsitsutl Peak which was the source proposed by Wilmeth (1973:31-32). The two other sources identified by Nelson, Glass Buttes-2 and Newberry-2, are both located in central Oregon.

The sources for the remaining five types of obsidian have not yet been located but the occurrence of pieces of B.C. Central Interior-A obsidian at sites near the mouth of the Chilcotin River and near Anahim Lake (Nelson personal communication, 1979) suggests a central interior or central coastal source, possibly in the obsidian-rich area north and northwest of Anahim Lake where most of the other sources have already been located. Wilmeth's Group 3B obsidian, which occurs only at Lillooet and at Namu midden on the central British Columbia coast west of Bella Coola, may also have come from the Anahim Lake area. According to Wilmeth (1973:37), the source for Group 4A obsidian may lie somewhere in southern British Columbia because this type of obsidian has only been found at Lillooet and at the Milliken site near Yale, B.C. The two other unknown types (Unknown-A and -B) are restricted in distribution to the Lillooet area and may come from an as yet discovered local source.

Obviously, most of the obsidian found at Lillooet came from a small area of volcanic peaks in the Coast Mountains near Anahim Lake, approximately 280 km northwest of Lillooet. Obsidian Creek on Anahim Peak was the most important of the sources in this area since more than half (46 of 83) of the analyzed obsidian is of Anahim-1 type. Anahim-1 obsidian appears to have been used at Lillooet for at least the last 1500 years; radiometric dating of some of the older excavated components may push this date back several thousand years. Unfortunately, the Mt. MacKenzie and Ilgachuz Range sources are represented by very small samples. The four pieces of MacKenzie-2 obsidian come from a single house pit village (EeRl 4) dated between 1100 and 1800 years ago. Half of the eight Ilgachuz specimens were uncovered in an historic house pit at site EeRk 9 with the other pieces covering the same time span as the Anahim-1 obsidian.

All of the Oregon obsidian came from site EeRl 171 which, with a radiocarbon date of 4145 ± 205 years ago, is the oldest dated site excavated in the Lillooet area. Various kinds of Oregon obsidian are commonly found in archaeological sites along the coast of southern British Columbia and Washington State (Nelson personal communication, 1979); the presence of Glass Buttes-2 and Newberry-2 obsidian at Lillooet marks the furthest inland occurrence of these obsidian types in British Columbia. Probably the Oregon obsidian at Lillooet came in trade from the southwest from coastal British Columbia or Washington State. What remains to be determined is whether this is an isolated occurrence of coast-derived obsidian or if this is all we have uncovered so far of an earlier and more extensive obsidian trade with the southern B.C. coast. If so, we will need to look at why the people at Lillooet began to utilize obsidian from the Anahim Lake area and completely ignored or forgot about their former sources for this scarce commodity.

Radiocarbon Dating Program

An extensive radiocarbon dating program was undertaken in conjunction with our field and laboratory work. A paucity of dated comparative material forced us to rely heavily on radiocarbon age determinations for placing archaeological assemblages in time and for developing an archaeological chronology.

Sixty radiocarbon age determinations have been received and two more are expected. Fifty-four of these assays date primary archaeological deposits with associated artifacts (Table 1). The eight other samples came from lake sediment cores collected for palynological analysis. One archaeological sample dated an exposed paleosol containing cultural material (EeRk 5) and buried by a massive earthflow, making this sample of geological as well as archaeological interest.

Radiocarbon age estimates have been obtained from thirteen archaeological sites, all but two of which are house pit habitation sites. The two other sites include a small habitation site without any evidence for house pits (EeRl 171) and the buried paleosol with cultural material mentioned above. Thirty-three individual house pits have been dated; eleven of these have been dated more than once. Almost half the age estimates come from the Bell site village (EeRk 4) with another eight assays from the Bridge River village site (EeRl 4). All the archaeological dates were obtained on wood or charcoal samples.

The radiocarbon assays span the last five millenia with the oldest date being 4730 ± 380 ^{14}C years B.P. (I-10,169) and the youngest date being 395 ± 80 ^{14}C years B.P. (I-9025). Most of the mean dates, however, fall within the period from 500 to 2,000 years B.P. and more than half occur between 1,000 and 1,500 years B.P. Discussion of the archaeological significance of these age estimates awaits further study although summary comments are available for some of the first dates which were received (Buckley 1976:184-5; Rutherford et al. 1975:335-6; Stryd 1973a:28-9,36,177, 283-4,430-1; Wilmeth 1978:63-5,75). It should be noted that I-6076 is incorrectly cited as I-6067 in Buckley (1976:184).

Dendrochronological Analysis

The recovery, during excavation, of a relatively large number of pieces of charcoal and wood suitable for tree-ring dating led to the initiation of a trial dendrochronological study under the direction of Marion Parker of Forintek Canada Corporation (formerly the Western Forests Laboratory of Environment Canada). The purpose of this project was to find out whether or not the tree-ring samples could be dated, thereby providing age estimates for the assemblages in which they occurred. Our intent was to check for cross-dating within and between sites as a means of relative dating to be followed, wherever possible, by a calculation of absolute age by matching the archaeological samples against living tree chronologies.

Just over 200 tree-ring samples from seventeen sites were submitted for dendrochronological analysis. Almost all of the samples are charcoal with the remainder consisting of either partially decomposed wood or a combination of wood and charcoal. Douglas fir, lodgepole pine, and ponderosa pine are the predominant species represented according to Stan Rowe of Forintek Canada Corporation. All three species generally produce sensitive tree-ring sequences and are well suited for dendrochronological study, especially when they have grown in arid regions such as British Columbia's interior dry belt (Parker and Johnson 1977:1).

Table 1. Archaeological radiocarbon age determinations from the Lillooet area

N	Site & Area	Field Sample #	Provenience	Laboratory Sample #	Age in ^{14}C Years B.P.*
	BELL SITE (EeRk 4)				
1.	House Pit 1	C9	Feature 25 - Timber	I-9561	1080 ± 80
2.	House Pit 1	C8	Feature 10 - Post hole	S-764	2965 ± 95
3.	House Pit 1	C7	Feature 9 - Post hole	I-9848	1495 ± 80
4.	House Pit 2	C6	Timber in roof fill	I-9723	1295 ± 80
5.	House Pit 2	C3	15 cm bs	S-662	1305 ± 80
6.	House Pit 4	C2	54 cm bs	I-9026	1010 ± 80
7.	House Pit 5	C1	Feature 1 - Timber	S-937	1380 ± 65
8.	House Pit 6	C6	Floor B	I-6077	1590 ± 90 ***
9.	House Pit 6			I-6077C	1420 ± 200
10.	House Pit 7	C1	Basal deposit	I-9562	1325 ± 80
11.	House Pit 8	C4	Floor B	I-9027	1150 ± 80
12.	House Pit 8	C5	under Floor B	I-9563	1365 ± 80
13.	House Pit 13	C3	40 cm bs	I-9564	1100 ± 80
14.	House Pit 13	C2	28 cm bs	S-709	1380 ± 65
15.	House Pit 14	C3	45 cm bs	S-938	1575 ± 145
16.	House Pit 15	C1	20 cm bs	I-9569	935 ± 80
17.	House Pit 19	C3	20 cm bs	S-763	1430 ± 60
18.	House Pit 19	C13	Floor A	I-6076	1515 ± 90 ***
19.	House Pit 19			I-6076C	1250 ± 200
20.	House Pit 19	C5	20 cm bs	I-6633	2730 ± 90
21.	House Pit 21	C1	Basal deposit	S-765	1470 ± 140
22.	House Pit 22	C10	Floor A	S-660	1215 ± 90
23.	House Pit 22	C8	Basal deposit	S-659	1930 ± 70
24.	House Pit 23	C2	45 cm bs	S-661	1560 ± 90
25.	Locus 56	C1	Rock-filled pit	I-9028	1250 ± 80
26.	Locus 93	C1	40 cm bs	I-9570	1155 ± 80
	EARTHFLOW SITE (EeRk 5)				
27.	--	C1	Paleosol	I-10,755	4730 ± 380
	GIBBS CREEK SITE (EeRk 7)**				
28.	House Pit 1	C2	Basal floor	GaK-3284	920 ± 90
29.	House Pit 3	C1	Basal deposit	I-9029	1515 ± 80
	LOWER BELL SITE (EeRk 16)				
30.	House Pit 1	C1	Basal deposit	I-8060	1290 ± 85
	BRIDGE RIVER SITE (EeRl 4)				
31.	House Pit 36	C1	40 cm bs	I-9006	1495 ± 80
32.	House Pit 45	C1	Floor A	I-8052	1380 ± 85
33.	House Pit 51	C1	Floor A	I-9007	1150 ± 80
34.	House Pit 51	C3	Floor D	I-8053	1760 ± 85
35.	House Pit 64	C1	Floor B	I-9008	1450 ± 80
36.	House Pit 64	C3	Floor C	I-8054	1680 ± 85
37.	House Pit 65	C4	Floor A	I-8055	1260 ± 85
38.	House Pit 65	C5	Feature 5 - Pit	I-9571	1300 ± 80

Table 1. Continued.

N	Site & Area	Field Sample #	Provenience	Laboratory Sample #	Age in ^{14}C Years B.P.*
	WEST FOUNTAIN EAST SITE (EeRl 6)				
39.	House Pit 7	C1	55 cm bs	I-8056	1260 ± 85
40.	House Pit 9	C1	Basal deposit	I-8057	1075 ± 85
	FOUNTAIN SITE (EeRl 19)				
41.	Locus 4	C2	Feature 13 - Hearth	S-583	1490 ± 70
42.	Locus 3	C3	Feature 17 - "Oven"	S-584	1505 ± 70
	SETON LAKE SITE (EeRl 21)				
43.	House Pit 5	C1	Floor B	I-9009	2100 ± 80
44.	House Pit 13	C2	Floor B	I-8058	1220 ± 85
45.	House Pit 16	C1	Floor A	I-9010	855 ± 80
46.	House Pit 19	C1	Basal deposit	I-8059	2360 ± 90
	MITCHELL SITE (EeRl 22)				
47.	House Pit 1	C4	Floor C	S-580	2185 ± 85
48.	House Pit 1	C5	Floor E	S-581	2550 ± 80
49.	House Pit 1	C6	Floor F	S-582	2775 ± 75
	SQUATTER'S SITE (EeRl 36)				
50.	House Pit 2	C1	Basal deposit	I-9572	980 ± 80
51.	House Pit 10	C1	Floor A	I-9024	520 ± 80
	EAST SITE (EeRl 40)				
52.	House Pit 1	C3	Basal deposit	I-9025	395 ± 80
	SALLUS CREEK SITE (EeRl 52)				
53.	House Pit 1	C1	Basal deposit	I-10,755	810 ± 75
	TERRACE SITE (EeRl 171)				
54.	Locus B	C1	--	I-9724	4145 ± 205

*age in ^{14}C years B.P. calculated using the Libby half-life of 5568 ± 40 years, with an error limit of one standard deviation. No attempt has been made to correct for past fluctuations in the level of atmospheric $C^{14}O_2$.

**The Gibbs Creek site was originally recorded as EeRk 1.

***dates from the same sample.

Assisted by Sandra Johnson, Les Jozsa, Paul Bramhall, and Derek Wales, Parker sectioned and X-rayed all samples with eight or more discernible rings. After excluding all branch and hardwood fragments, samples with badly cracked surfaces, and samples exhibiting less than 15 sensitive annual rings, the radiographs of 30 samples were selected for scanning on a computerized densitometer which measured the width and density of each annual ring and produced a ring-width plot for each sample. A computerized matching program searched these plots for instances of cross-dating by comparing the samples with one another as well as with four archaeological and living tree-ring sequences: (1) a living tree chronology from nearby Pavilion Lake, collected by H.C. Fritts in the 1960s (Stokes et al. 1973), (2) a living tree chronology from Gang Ranch located north of Lillooet at the mouth of the Chilcotin River (Parker and Johnson 1977:3), (3) a floating archaeological composite from site EkRo 18 also located near the mouth of the Chilcotin River (Matson and Ham 1974), and (4) several increment cores especially collected for this purpose from trees growing around the Bell site at Lillooet (Parker and Johnson 1977:3).

Numerous instances of cross-dating were observed. Most took place between samples from the same house pit and, in some cases, the samples obviously came from the same tree. Instances of within house pit cross-dating were especially common in House Pit 3 at the Ollie site (EeRk 9) and in House Pit 2 at the Bell site (EeRk 4). Inter-house pit cross-dating at the same site occurred between House Pits 2 and 8 at the Bell site with the former radiocarbon dated at 1295 ± 80 and 1305 ± 80 years B.P. and the latter dated at 1150 ± 80 and 1365 ± 80 years ago. Two cases of inter-site cross-dating were observed. The first was between House Pit 9 at the West Fountain East site (EeRl 6) and House Pit 51 at the Bridge River site (EeRl 4). A ^{14}C date of 1075 ± 85 years B.P. came from House Pit 9 at EeRl 6 while an unused portion of the EeRl 4 tree-ring sample was radiocarbon dated at 1150 ± 80 years B.P. The second and more spectacular instance of inter-site cross-dating consists of a tentative match between House Pit 2 at the Bell site and site EkRo 18 excavated by Matson and Ham at the mouth of the Chilcotin River about 100 km north of Lillooet. The Chilcotin site is radiocarbon dated at 1290 ± 80 years B.P. (Matson and Ham 1974:6); the radiocarbon assays for the Lillooet house pit were given above.

Calendar dates were obtained for some of the tree-ring samples by matching the samples against the living tree chronologies available from Pavilion Lake, Gang Ranch, and the Bell site vicinity. Because the living tree chronologies go back only a few hundred years, most of the archaeological samples were too old to be included in this comparison. All the samples dated by this method came from House Pit 3 at the Ollie site (EeRk 9) which had previously been assigned to the Historic period based on artifact content. Although no fits were observed with the Gang Ranch chronology, several matches were noted with the other two living tree chronologies. Nine cross-dated samples formed an archaeological composite which corresponded to the years A.D. 1783 to 1854 on the Pavilion Lake chronology. The later date probably represents the cutting date as the bark was intact on the outside of the sample. Another composite of two samples dates from A.D. 1555 to 1602 on the Pavilion Lake chronology. This composite, however, lacks an outside bark ring so that A.D. 1602 is not the year when the tree was cut down. Some of the Ollie site samples also matched with the Bell site living tree cores but they did not produce any new cutting dates.

Two preliminary reports on the initial phase of the dendrochronological project have been prepared (Parker and Johnson 1977; Parker, Johnson, and Bramhall 1979)) and analysis of the radiographs is continuing.

FINAL COMMENTS

In addition to the laboratory activities outlined above, three brief non-archaeological surveys were carried out in the Lillooet area as part of the Lillooet Project. Dr. June M. Ryder, of the Resource Analysis Branch of the Ministry of the Environment in Victoria, studied the geomorphology and post-Pleistocene geological history of the Lillooet area (Ryder 1978) while ethnographers Dorothy I. Kennedy and Randy Bouchard, of the British Columbia Indian Language Project in Victoria, visited the area to collect information on a variety of traditional cultural practises, notably those related to pit house settlement (Kennedy and Bouchard 1978). Dr. Rolf W. Mathewes surveyed the area to collect plant specimens and to make personal observations which would augment the published literature on the environment and biotic resources of the Lillooet area (Mathewes 1978).

Lastly, Doris Lundy, of the British Columbia Provincial Museum, examined a unique concentration of 94 petroglyph-bearing boulders (EeRl 42) located near the mouth of Gibbs Creek just north of Lillooet. This site is the largest known petroglyph site in the Province and exhibits a variety of stylistic elements. The results of her study are discussed in a manuscript report (Lundy 1977) and in two published papers (Lundy, 1978, n.d.).

As a result of the various activities undertaken by the Lillooet Project since 1976, several contributions have been made to the archaeological and related literature for interior British Columbia. Most of these contributions, however, take the form of unpublished manuscripts. The major published report so far is: Reports of the Lillooet Archaeological Project. Number 1. Introduction and Setting, edited by Arnoud H. Stryd and Stephen Lawhead, in "National Museum of Man Mercury Series, Archaeological Survey of Canada, Paper," No. 73, Ottawa, 1978, which contains papers by D.I.D. Kennedy and R. Bouchard (1978), R.W. Mathewes (1978), J.M. Ryder (1978), and A.H. Stryd (1978). Doris Lundy's papers have been mentioned above as have several other manuscripts by other researchers. Owen Beattie has completed for publication an article on the human osteological material while June Ryder is preparing a paper for publication on the earthflow deposits along Kettlebrook and Gibbs Creek which will stress the significance of the radiocarbon age estimate obtained on the paleosol buried by these earthflows (Table 1, site EeRk 5).

Almost all of the specialized analyses described above have now been finished or are nearing completion. With the "winding down" of the laboratory work, the final phase of the project can begin. Over the next few years we intend to, firstly, provide a comprehensive description of the archaeological sites, the cultural stratigraphy, and the archaeological materials such as artifacts, faunal and plant remains, burials, and features collected or observed during the six seasons of fieldwork, and, secondly, to assess the collected data in terms of the five research objectives defined earlier. Requests for support for this final phase of the work have been submitted and will, hopefully, lead to the successful completion of the Lillooet Archaeological Project.

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A.S.B.C. DIARY

Monthly Meetings - second Wednesday - Auditorium, Centennial Museum - 8 p.m.

May 14 Wayne Choquette speaking on Prehistoric Stone Technology in the Kootenays

June 11 Annual General Meeting. Guest speaker: To be announced.

Centre for Continuing Education, UBC

May 30 - June 1 Trip to Ozette archaeological site and the lab at Neah Bay. Fee: $125. Phone: 228-2181, local 237, 252

June 22 - 27 Trip to 'Ksan, and Indian villages of Gitsegyukla, Kitwanga, Kitwancool and Kispiox, via bus and ferry. Fee: $410. Phones as above.

July 4 - 27 Peru, Ecuador and Panama/Guatemala - tour with Frances Robinson, fine arts historian. Includes cruise of Galapagos Islands or Amazon jungle tour. $3500 (approx. and subject to change). Information - 228-2181, local 237, 252.

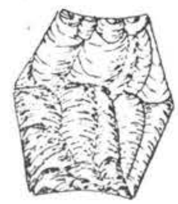
Describing Artifacts, No. 21

(Part of a continuing series on artifact description, reproduced from the handbook for archaeological staff working on the National Inventory Project in B.C. The Midden extends thanks to Tom Loy of the Provincial Museum for permission to reprint.)

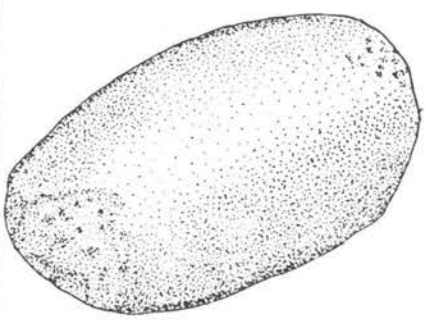
SPLITTING TECHNIQUE

Splitting is the term properly used to describe the process of removing a blank from bone or antler raw material, by first making a groove and then utilizing a pièce esquillée. The hammerstone is usually a non-manufactured stone showing battering or pitting on one or more ends or sides; the piece esquillee is characteristically an artifact showing battering and flaking at both ends, resulting in a double wedge shape.

PIÈCE ESQUILLÉE

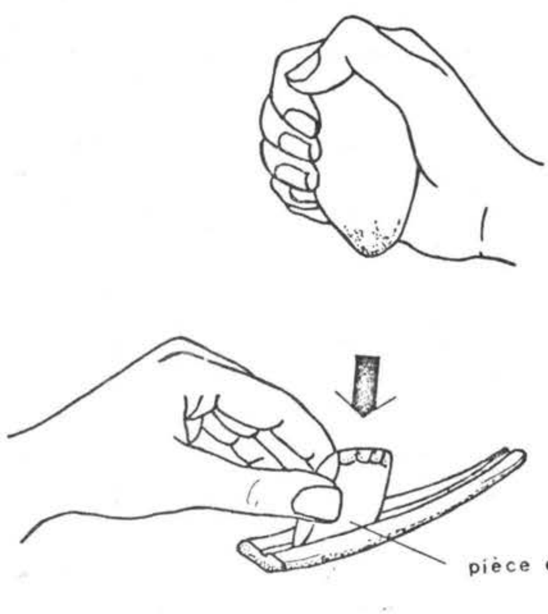


Pièce esquillée: A lithic artifact, characterized by bi-polar battering and flaking with a consequent double wedge shape. The inferred use is for splitting bone and antler.



HAMMERSTONE

Hammerstone: Stone object showing battering or pitting on one or more sides or ends. A convenient utilization of natural form and material with no obvious manufacturing.



SPLITTING

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# # # # # #

Peru's Golden Treasures

If you missed the Society's bus tour to visit this priceless collection at the Seattle Art Museum, you will be interested to know that the exhibit will be there until July 20, 1980.

Dr. Richard S. MacNeish

Dr. Richard S. MacNeish, Director, Robert S. Peabody Foundation for Archaeology, Andover, Massachusetts will be giving a lecture at Simon Fraser University on June 5, 1980 at 8 p.m. in the Images Theater. The title of his talk is "Early-Early Man in the New World."

Course Offerings in the Archaeology Dept. at S.F.U. for Summer

Arc. 131 - Human Origins - Mark Skinner
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For further information on these courses, please contact the Archaeology Department at 291-3135.

* All the above courses may be taken with the permission of the instructor.

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