13th British Columbia Paleontological Symposium

Vancouver 2021

Virtual Symposium Abstracts

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Serendipity and the discovery of British Columbia's first K/Pg boundary section; snapshot of a marine phytoplankton turnover and paleoenvironmental change in the North Pacific realm

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The as yet informally named Oyster Bay Formation (Haggart et al. in prep), exposed along the coastline of eastern Vancouver Island south of Campbell River and Oyster River, has been the subject of paleontological research since the 1990s with a focus on resolving the age of the strata (e.g. Haggart et al. 1997; Cockburn and Haggart 2007; Haggart et al. 2018). These sedimentary rocks are in part represented by the beds of the Appian Way locality which are renowned for their preservation of an extensive paleobotanical (e.g. Mindell et al. 2006) and marine invertebrate (e.g. Schweitzer et al. 2009) fossil record. Prior to this investigation, deep time work in marine palynology has been limited to California (e.g. Drugg 1967), Japan (e.g. Kurita 2004), and only recently, British Columbia (McLachlan et al. 2018, 2019) in the North Pacific region. The present study (McLachlan and Pospelova 2021) has established the Oyster Bay Formation as comprising a ~93.5 m thick succession spanning ~4.5 to 5 myr of geological time ranging from the late Maastrichtian to early Selandian across three stratigraphic sections using dinoflagellate cyst relative dating. Furthermore, approximate placement of the K/Pg boundary has been made possible by a suite of temporally constrained dinoflagellate cyst K/Pg interval indicator taxa. This development renders eastern Vancouver Island as the location of the first conformable K/Pg boundary section in North America west of the Rocky Mountains and in the north-eastern Pacific based on biostratigraphic controls. In addition to resolution of the age of the formation, the exquisitely preserved dinoflagellate cyst assemblages allow for reconstruction of the marine phytoplankton community in the lead up to the terminal Cretaceous event and its subsequent response in the early Paleocene in tandem with signals reflecting localized shifts in nutrient input. From a global standpoint, the palynological assemblages mirror climatic changes across the K/Pg boundary consistent with observations from numerous localities across both hemispheres. These findings also carry broader morphological implications for dinoflagellate cyst taxonomy and ecophenotype utility in paleoenvironmental reconstructions (McLachlan 2021; McLachlan and Pospelova 2021; McLachlan et al. 2021).

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Fossil turtles from the Late Cretaceous Nanaimo Group of Vancouver Island

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Fossil turtles are a rare element of the Late Cretaceous Nanaimo Group. Over the years, a handful of significant specimens have been recovered from the Haslam (Trent River) Formation on Vancouver Island.

The depositional environment of the Haslam Formation in the study area is a silty shallow marine environment. One described specimen from the Puntledge River, known from a mandible, partial limbs, and shell fragments, has been referred to *Desmatochelys* cf. *D. lowi*. Another major specimen is an undescribed helochelydrid turtle from the Trent River. This specimen consists of a partial carapace and almost complete plastron only missing the epiplastra and entoplastron. This specimen is in the same family as *Naomichelys speciosa* as indicated by its unique shell sculpture, but likely represents a new species.

A new specimen was recently collected from the Puntledge River, approximately 2 km from the specimen referred to *Desmatochelys* cf. *D. lowi*. The specimen is unprepared, but it seems to preserve pieces of the carapace and plastron as well as some limb elements. Preparation will be required to determine whether this represents *Desmatochelys* cf. *D. lowi* or a previously unknown species from the formation.

In addition to their rarity, these specimens are important for documenting biogeographic patterns in marine vertebrates from the Late Cretaceous, and have implications for relating west coast ecosystems to the more highly sampled Western Interior Sedimentary Basin.

Reproductive, vegetative, and developmental traits of an Eocene spice bush from the Princeton chert of British Columbia

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Lauraceae is the flowering plant family that includes spice bush, cinnamon, and avocado. Currently the family comprises thousands of species, mainly found in the tropics, although several species occur in the warm temperate regions of the world, such as *Sassafras* in the eastern USA.

Plants are woody trees or shrubs with small trimerous flowers (organ whorls in three's), although some species have dimerous flowers (whorls with two organs each). In each flower there are two series of petal-like organs (tepals), typically cream to yellow in color, and of similar shape and size. Inside the whorls of tepals there are three to four whorls of stamens, which bear pollen in their anthers. Anthers may have two or four sporangia/pollen-sacs, which dehisce to release pollen by flap-like structures. This kind of flap-like anther dehiscence is diagnostic of Lauraceae. When there are four whorls of stamens, the inner-most whorl is staminodal; staminodes are under-developed stamens remaining small and that do not produce pollen.

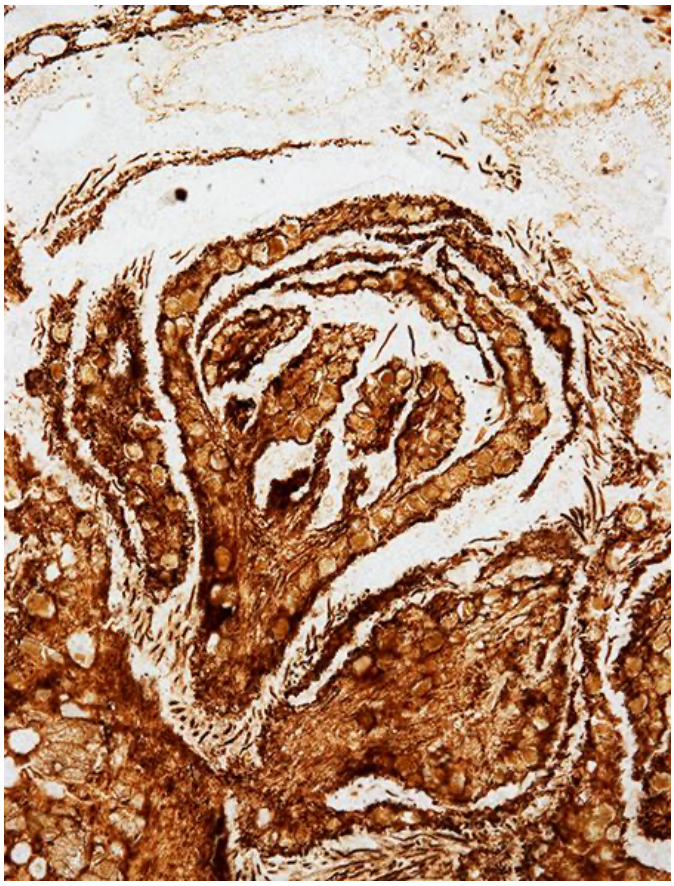
Indian bay leaf (*Cinnamomum tamala*)

Isolated leaves can be difficult to distinguish from other tropical families; as many tropical trees typically have leaves of similar shapes and sizes. Pollen grains of Lauraceae are usually psilate, smooth and without ornamentation. Further, pollen is thin-walled and less apt to preserve in the sediment record. Since most plant fossils are pollen and compression-impression leaves, Lauraceae are often underrepresented in the fossil record. When and where well-represented, their fossils are usually only resolved to the family level. Although rare, there are a handful of isolated flowers known from the family in the fossil record. This lack of resolution in the fossil record inhibits the power of fossils in understanding the evolutionary history of this diverse family and the important biomes in which it occupies, such as the Amazon rainforest.

The Middle Eocene Princeton Chert locality, Allenby Formation, preserves numerous reproductive and vegetative structures from a lauraceous plant. Fossils are prepared by making cellulose-acetate peels from cut-faces on blocks of chert that have been etched with hydrofluoric acid. These peels provide microscopic resolution of tissues comparable to those of medical histology tissue preparations. To study the plant remains in the preparations, transmission light microscopy is used. Numerous specimens are known, often co-occurring with remains of the dawn redwood *Metasequoia milleri* Basinger et Rothwell.

Leaves and twigs are abundant as well as isolated flowers, and whole inflorescences in-bud. Further, the range of variation found across the specimens shows a developmental series from immature whole inflorescences, through floral maturity, early fruit development, and fully mature fruits bearing embryos. The suite of whole-plant traits, including developmental stages, represents a level of detail unknown in any previous fossil Lauraceae. The unique set of characters, which includes having dimereous and trimerous flowers in the same inflorescence indicates that the Princeton Chert plant is an extinct genus.

Immature inflorescence



Flower in bud

The Cephalozygoptera, a new suborder of Odonata

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Today the insect order Odonata is comprised of three suborders: the dragonflies (Anisoptera), damselflies (Zygoptera), and the Anisozygoptera, a rare group of three or four species found in mountainous regions of Asia. Rob Cannings (RBCM, emeritus) and I have been examining the Odonata of the early Eocene of British Columbia and Washington. We described the dragonflies in 2018, nine fossils of eight new species in two modern families that are common, plentiful, and diverse today. Next, we formed a team with Robert Erikson and Seth Bybee at BYU in Utah and Rolf Mathewes at SFU to describe 78 specimens of Zygoptera. Almost all of these belong to the extinct family Dysagrionidae, a few to a new family that we named the Whetwhetaksidae, and only one to a modern family, the Euphaeidae. We were surprised to see what looked like consistent damage to the heads of the dysagrionids, which gave them a shape that doesn't appear zygopteran at all. In reviewing the literature, we found that all Dysagrionidae specimens described over the last century bear this odd shape. We also saw this shape in all specimens of a closely related extinct family, the Sieblosiidae. All previous authors had assumed that the heads of these Dysagrionidae and Sieblosiidae had been distorted during fossilization, in all specimens, in the same way, and in a manner seen only in them. The Dysagrionidae and Sieblosiidae also share a number of character states of the wings that are rare within the Zygoptera. It became clear that this odd head shape is their true shape and that these weren't zygopterans at all. We grouped these families as the new suborder Cephalozygoptera, and tentatively assigned the Whetwhetaksidae to it, which is known only by wings. Out of the 78 specimens, 77 belong to the Cephalozygoptera or tentatively so, and only one to the Zygoptera (Euphaeidae). The Cephalozygoptera are first known by a single dysagrionid from the Cretaceous of China, and then appear in the earliest Eocene of Denmark. They dominated the Odonata of British Columbia and Washington and are well represented in the Eocene of Wyoming and Colorado. They are present but uncommon in the Eocene through Miocene of Eurasia. The Sieblosiidae are diverse in the Oligocene of Europe and are last seen in the late Miocene of Spain, the last of the Cephalozygoptera.

The paper may be downloaded free at:
https://www.mapress.com/zt/article/view/zootaxa.4934.1.1

Perusing presumed pachyderms: looking for BC's youngest mammoth and other oddities

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Take a visual journey with the British Columbia Megafauna Project. Travel west to Vancouver Island, east to the Okanagan, and north to the interior to explore the extinct and extant megafauna in museum collections and see how they are processed in the SFU Chemistry lab. Published records for Late Pleistocene megafauna in BC are sparse compared to our Yukon, Albertan, and Washington neighbours, and this project has increased what is known about BC megafauna through proteomics, stable isotopes, and radiocarbon dating from samples of tusks, teeth, and bone.

Fossil aroid spadices from British Columbia and Alberta

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Araceae (aroids) are a diverse monocot plant group of about 105 living genera and over 3300 species. This family has characteristic reproductive structures termed the spathe (an often colorful subtending leaf) and a tightly packed spike of flowers termed the spadix. Three well-preserved araceous inflorescences (spadices) have been reported recently in the Cretaceous and Paleogene of Alberta and British Columbia. All three of these spadices show affinities to the Proto-Araceae, a group delimited in molecular phylogenetic analyses that contains the living genera: *Gymnostachys*, *Orontium*, *Lysichiton* and *Symplocarpus* (skunk cabbage, Fig. 1).

Fig. 1. *Symplocarpus* (skunk cabbage) spadix

The first of these is *Albertarum pueri* Bogner, Hoffman & Aulenback (2005) described from the Horseshoe Canyon Formation near Drumheller, Alberta (Fig. 2). The single specimen is dated as Campanian, Late Cretaceous, 72 Ma, and is part of the permineralized flora. It is fertile to the apex and probably had bisexual flowers with a long attenuate style and a perigone of six tepals. The gynoecium was probably trilocular with one anatropous seed per locule. Seeds are ellipsoidal with a thick, ribbed seed coat, and were probably attached to the fruit axis (axile placentation). This plant was deposited in a delta floodplain and probably grew in a wetland environment.

Fig. 2. *Albertarum pueri* spadix

Bognerospadix spiersiae Stockey, Hoffman & Rothwell (2021) is represented by two spadices from the Paleocene, Paskapoo Formation near Blackfalds, Alberta (Fig. 3). The Blindman River locality, where these spadices were found, has been dated as Middle Tiffanian (Ti3) based on

land mammal ages, and plants are 59 Ma. *Bognerospadix spiersiae* is associated with an aroid leaf *Orontiophyllum grandifolium* (Penh.) Stockey, G.L.Hoffman & Rothwell, comb. nov. Spadices are cylindrical, with helically arranged, bisexual, perigoniate flowers, each with six free tepals and a protruding style. Fruits are trilocular, with axile placentation and one curved boat-shaped seed per locule. Leaves and spadices each conform to an early-diverging lineage of Araceae, increasing the known diversity of Proto-Araceae. Together, they provide strong evidence for extinct Proto-Araceae with novel combinations of characters shortly after the Cretaceous-Paleogene floral transition.

Fig. 3. *Bognerospadix speirsiae* spadix

Two new permineralized spadices currently under investigation from the Appian Way locality by Stockey, Rothwell, Gemmell & Beard come from the calcium carbonate concretions (Fig. 4). These aroids probably lived close to a stream side, were washed into the ocean and preserved along with numerous crabs and a huge suite of angiosperm fruits and seeds, wood and leaves, as well as large numbers of conifer remains. While the stratigraphy of this site is under investigation, most authors agree with an Eocene age. The flora is most similar to that of the London Clay Flora and the Clarno Nut Beds. The spadices are large, cylindrical, with a parenchymatous septate pith with hundreds of helically arranged, bisexual flowers. Each has a perianth of 6 hooded tepals, three carpels, each containing one basally axile, orthotropous ovule. Remains of probable stamens have been identified, but no pollen.

Fig. 4. Appian Way spadix

These three spadix types have been compared to other living and fossil aroids in a morphological data matrix and analyzed using TNT spawned through WinClada. Possible affinities of each spadix type will be discussed in light of studies on living Araceae.

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Dinosaurs of the Sustut Basin

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More than 2000 m of Barremian through Maastrichtian-aged sediments are exposed over more than 9000 km^2 of the northern interior of British Columbia, but much of this vast Cretaceous terrestrial fossil record remains unexplored because of the challenges in accessing sites in this region. Nevertheless, a dinosaur specimen (RBCM P900) consisting of articulated and disarticulated limb and girdle elements was discovered in 1971 near the confluence of the Sustut River and Birdflat Creek, in the southern portion of the Sustut Basin. Originally published as an indeterminate neornithischian in 2008, in 2019 it was reinterpreted as the new species of leptoceratopsid ceratopsian *Ferrisaurus sustutensis*. RBCM P900 includes parts of the pectoral girdles, left forelimb, left hindlimb, and right pes, and can be distinguished from other leptoceratopsids based on the proportions of the ulna and pedal phalanges. A 2017 expedition to the confluence of the Sustut River and Birdflat Creek relocated the original collection site for RBCM P900. *Ferrisaurus* was derived from the Tango Creek Formation, the lower of the two units of the Sustut Group. Palynomorphs indicate that the site is Maastrichtian in age and equivalent to the lower Hell Creek Formation in Montana and the unconformity between the Battle and Horseshoe Canyon formations in Alberta. A carapace fragment from the turtle *Basilemys*, the first record of the Nanhsiungchelyidae from this region, was recovered, as were numerous fossil leaves from multiple sites. The potential for new fossil discoveries in the Sustut River area is hindered by the forested landscape and limited outcrops; RBCM P900 was discovered when more outcrops were exposed during construction of the Dease Lake extension of the BC Rail line, which is now abandoned and rapidly being reclaimed by vegetation. Fieldwork in the northern part of the Sustut Basin in 2019 focused on two localities in Spatsizi Plateau Wilderness Provincial Park. Outcrops in these areas are more consistent with descriptions of the Brothers Peak Formation, the upper unit of the Sustut Group, although more precise age estimates are currently unavailable. Although fieldwork was cut short because of an unusually heavy August snowfall, one site produced numerous new fragmentary dinosaur bones including a large rib, possible limb elements, and a possible skull element. Large pieces of wood were abundant at the other locality, and rare leaf impressions and invertebrate remains were also collected. Together with fragmentary remains collected during a 2013 Royal BC Museum botanical field expedition, there is evidence for tyrannosaurs, large ornithischians, and possibly a small theropod and crocodylomorph in the northern Sustut Basin. The outlook for new discoveries in the park is excellent given the large expanses of unvegetated plateaus with exposed Sustut Group rocks. Future fieldwork is planned for Spatsizi Plateau Wilderness Provincial Park and will hopefully provide new, more diagnostic faunal remains for this region, shedding light on dinosaurs and their ecosystems from the latest Cretaceous on the western side of the North American Cordillera.

Our changing view of the Burgess Shale: new discoveries from species to ecosystems

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The Cambrian period marks the rapid first appearance of most major animal groups in the fossil record, an event referred to as the Cambrian Explosion. During this time, animal life increased in complexity, both at the scale of individual animal ecologies and entire ecosystems, representing one of the most significant biotic events to occur in Earth's history. While many fossil sites around the world yield Cambrian fossils, for over 100 years the Burgess Shale has given us an unparalleled view into this first major diversification of animal life. However, the mental images formed when one thinks of the Burgess Shale are heavily skewed to the original Walcott Quarry, the oldest and best studied of the Burgess Shale fossil localities. In fact, several other major deposits exist within the Burgess Shale, revealing a complex mosaic of spatiotemporal diversity patterns among these ancient animal communities.

In this talk, I will introduce data which have been collected by several researchers over the last two decades that present an evolving picture of the Burgess Shale fauna. Recently described species representing a wide variety of different phyla with drastically disparate ecologies will be presented to underscore the novel insights which the Burgess Shale continues to yield. Most significantly, four major Burgess Shale paleocommunities will be compared in terms of biodiversity and ecological structure. These sites include the original Walcott Quarry; the Raymond Quarry located directly above the Walcott Quarry; the Tulip Beds of Mount Stephen; and the recently discovered Marble Canyon fossil site. What these data reveal together is that marine ecosystems during this time period differed drastically from each other, thus our understanding of the complexity of the Cambrian period is still far from comprehensive. A more holistic picture of the evolution of early life on this planet will rely on new modes of analysis, more robustly integrated datasets and, most crucially, new fossil discoveries spurred by exploratory field work.

Fossils of the East Kootenays and Recent Research

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The unique sedimentary geology of the East Kootenays on the western slopes of the Rockies presents a cross section of life on Earth through most of the geological time scale from the late Proterozoic to Recent. Fossils have been recovered from virtually all the periods with only a few minor gaps. Recent finds by amateurs and professionals all point to the fact that as more research takes place, these gaps are most likely going to be filled and more new species discovered.

As well, work on the Early and Middle Cambrian has revealed a number of new species of trilobites, and some yet to be identified enigmatic species. Much more work and study will be required. The plethora of species now identified from the Middle Cambrian McKay Group show a diversity as great or greater than any other site on Earth including Chinese and Moroccan beds. To date, fifteen McKay sites have been found just on the Bull River alone, including a possible Eager Formation site not previously catalogued.

Along with these discoveries comes the growing pains of government protections of the sites and future study and access by collectors.

Biography:
Guy completed his BA in Psychology in 1974, and a Degree in Urban Land Economics in 1984 and also has 3 years of an unfinished Bachelor of Science. Law school was originally in the works, however a good government job derailed future educational and vocational plans. Guy became interested in fossils when he moved to Cranbrook, B.C, in 1975 and started digging at the Rifle Range site. He has since explored numerous sites in the Kootenays, has been included in articles and has also written numerous non-scientific articles on fossils. Other interests included writing, photography, and natural history. He is also an artist and has even appeared in a Hollywood movie production. He has served on the Board of Directors as a member and Chair of the Cranbrook History Centre and as the Paleontology coordinator and advisor. He conducts fossil talks and displays at area schools and implemented a children's and adult's fossil program through the museum.

Mesozoic seed plant diversity; another Lower Cretaceous contribution from Apple Bay, Vancouver Island

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Fossil floras record that angiosperm megafossils first appear in the Barremian Stage of the Lower Cretaceous. Flowering plants rose to dominate modern vegetation by a combination of rapid evolution and by replacing other types of plants, which brought about more than a ten-fold increase in the diversity of plant species. However, that dominance was not achieved until the end of the Mesozoic or beginning of the Paleogene.

Fig. 1. Plant parts in Apple Bay concretion

Therefore, it is surprising to find a pre-angiospermous flora in Lower Cretaceous (Valanginian Stage) deposits at Apple Bay, Vancouver Island, B.C that rivals the diversity of many Cenozoic flowering plant floras. In contrast to the more easily recognized fossil leaf imprints (compression/impression fossils), the Apple Bay plants are preserved at the cellular level within marine carbonate concretions, and are almost unrecognizable until the concretions are cut into slabs. However, after they are cut (Fig. 1), they show plant organs that can be prepared as thin sections (Fig. 2) to identify plant organs and to reconstruct whole plants (Fig. 3).

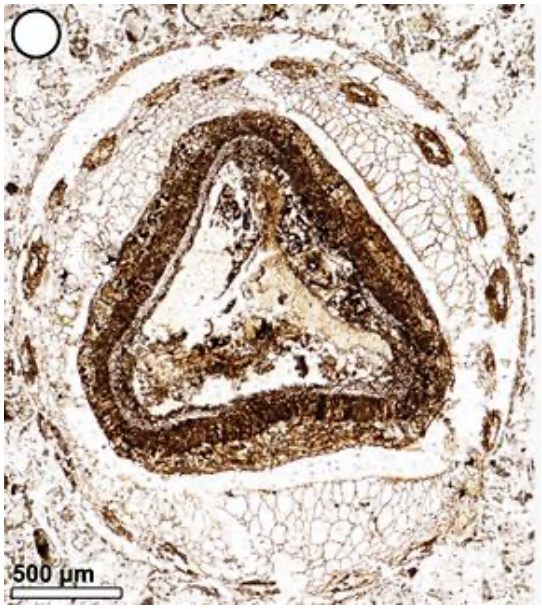

Fig. 2. Triangular x.s. of new plant seed surrounded by round cupule

Although only about 75% of the Apple Bay plants have thus far been described and named from concretions in the collections, there already are two types of fungi, one lichen, nine mosses, one liverwort, two ground pines (*Lycopodium* or *Diphasiastrum*, and *Selaginella*), two species of horsetails (*Equisetum*), and more than 15 types of

ferns. The ferns include one marattialean and filicalean ferns belonging to the families Osmundaceae, Gleicheniaceae, Dipteridaceae, Schizaeaceae, Dicksoniaceae, Cyatheaceae, Dennstaediaceae, Athyriaceae, and possibly Pteridaceae, as well as several species that have not been assigned to a family. Seed plant fossils of living groups include cycad leaves, a gnetophyte cone, as well as stems, leaves, pollen cones, seed cones, and seeds of the conifer families Pinaceae and Cupressaceae.

There also are fossils of three extinct major groups of seed plants (gymnosperms), including leaves and two types of seed cones of the Bennettitales, and seed cones and leaves of the Doyleales. *Doylea* was originally thought to represent a cupulate seed fern and has also been compared to flowering plants, but it is now recognized as a distinct group that is somewhat similar to conifers.

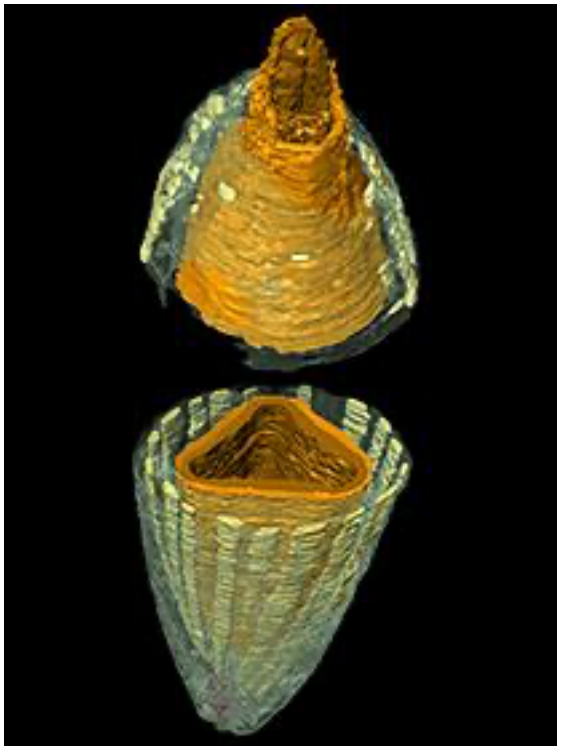

Fig. 3. AVIZO reconstructions of cupulate seed apex and base, with the cupule represented primarily by the resin canals (in light green), and the seed showing primarily the seed coat (in gold and brown).

Recently, another new major group of gymnosperms has been recognized within the Apple Bay flora. Fossils of this plant consist of cupules, each of which bears a seed that is erect and occurs at the tip of a stem-like organ. The cupule closely surrounds a single triangular seed (Figs. 2, 3), and the cupule wall has about 20 longitudinally oriented resin canals (Fig. 3). The cupulate seeds are reconstructed from serial thin sections using the program AVIZO, revealing that they are ellipsoidal with the seed protruding slightly beyond the tightly enclosing cupule (Fig. 3).

Together, the Apple Bay fossils emphasize that diverse floras were present before the first appearance of flowering plants. Some of those floras formed forests of gymnospermous trees with a ground cover of mosses, ferns, and other plants that reproduced by spores. Contrary to popular belief, gymnosperms continued their rapid phylogenetic radiations at least into the Early Cretaceous.

Hitchin' a Ride - a Tale of a Well-Traveled *Buchia*

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The beaches of the City of Mukilteo, Washington State, are composed predominantly of pebbles and cobbles of volcanic rock derived from the North Cascades crystalline core and the more recent Cascade magmatic arc, mixed in with common shell fragments. Locals commonly walk the beach for exercise and to locate pieces of elusive beach glass. However, in May, 2018, an unusual new object was found on the beach - a large cobble of silty fine-grained sandstone containing fossils!

The fossils are preserved as moulds and casts of bivalves (clam shells) assignable to the genus *Buchia*. The *Buchia* fossils are densely packed in the cobble with several scores to hundreds of individuals likely present. They are oriented in all positions, and represent a chaotic assemblage of shells that likely accumulated in a high-energy environment on the sea-bottom.

The genus *Buchia* existed during Late Jurassic to Early Cretaceous time and species of the genus form an extensive lineage of relatively short-lived forms which are useful for biostratigraphic age dating. There appear to be several different *Buchia* species morphologies present in the cobble, including *Buchia keyserlingi* and *Buchia pacifica*, which together suggest a mid-Valanginian age (ca. 135 million years ago) for the cobble.

Buchia fossils are found in outcrop at several places in northern Washington State, including in the Mount Baker region and in the San Juan Islands. As the *Buchia* species that are present in San Juan Islands are different from those found in the Mukilteo Beach cobble, we can rule out that locality as the original source of the cobble. As well, the exposures of Jurassic-Cretaceous strata in the Mount Baker foothills are limited in extent and the packed accumulations of *Buchia* that characterize the Mukilteo cobble have so far not been identified there, only isolated, less numerous examples being found. Interestingly, one of the closest localities to Mukilteo where such an assemblage of *Buchia* fossils is known is in the Peninsula Formation of the Harrison Lake region of British Columbia. The accumulations of *Buchia* fossils found in the Peninsula Formation are also densely packed, with tens of thousands of individuals forming thick shell beds. It is hypothesized that the Mukilteo *Buchia* cobble was transported from its point of origin in the Harrison Lake area to Mukilteo via the Puget Lobe of the Cordilleran Ice Sheet.

Fossil decapod crustaceans from Vancouver Island and Haida Gwaii, British Columbia, Canada: new taxa and ongoing research

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Fossil decapod crustaceans from Vancouver Island, British Columbia, Canada were first described in the late 1800's and early 1900's by Whiteaves (1884, 1885, 1895, 1903) and Woodward (1896, 1900). Later, Rathbun (1926) reported fossil crabs from the west coast of North America including British Columbia. Jeletzky (1973) reported crab occurrences on islands adjacent to Vancouver Island, whereas Feldmann & McPherson (1980) summarized the known occurrences of fossil decapods from Canada and Ludvigsen & Beard (1994, 1998) illustrated several decapod species from Vancouver Island. More recently, there have been a number of papers describing new taxa from Vancouver Island (Schweitzer et al. 2003, 2004, 2009; Nyborg & Fam 2008; Nyborg et al. 2014, 2015, 2016, 2019, 2020a-c; Nyborg & Garassino 2017; Garassino et al. 2020).

Current work on the fossil crabs of Vancouver Island include: 1. Revision of the raninids *Joeranina platys* (Schweitzer and Feldmann, 2001) and *Joeranina harveyi* (Woodward, 1896) based upon new specimens and comparisons of specimens from Oregon State; 2. The fossil crab fauna from the Hesquiat Formation is currently being described - potential new species of *Megokkos* and *Macroacaena*, as well as new species of isopods; 3. Two new dwarf crabs from the Pender Formation along Oyster River are being described; 4. Several new taxa from Hornby Island are also being described; and 5. New erymid and nephropid lobsters from Haida Gwaii are in the review process. Continued research and description of new fossil crab taxa from Vancouver Island and surrounding areas will aid in a better understanding of the paleogeographic distribution of fossil crabs of the northeastern Pacific region and how they relate to larger worldwide distribution patterns.

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An exceptionally diverse permineralized bryophyte flora from the Late Cretaceous of Vancouver Island

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Fig. 1. Polytrichaceous leaf. Scale bar = 100 µm

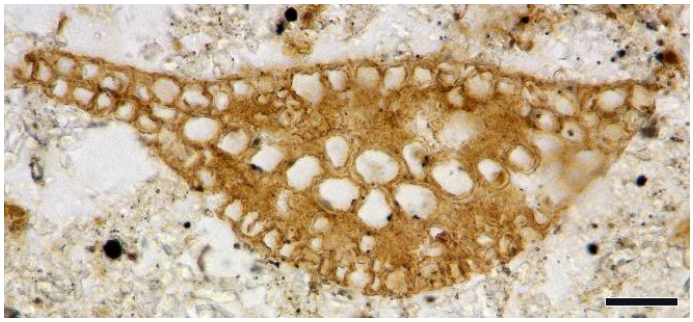

Fig. 2. Dicranalean leaf. Scale bar = 25 µm

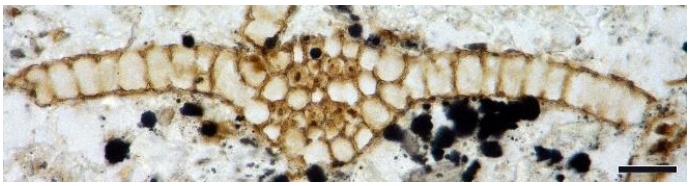

Fig. 3. Pottiaceous leaf. Scale bar = 25 µm

Even though bryophytes (mosses, liverworts, and hornworts) are considered the earliest diverging groups of land plants and are speciose in the modern biota (~20,000 spp.), rich pre-Cenozoic non-vascular floras are rare. A recently-discovered Late Cretaceous plant locality on Vancouver Island preserves the most diverse pre-Cenozoic bryophyte flora ever found. More than 275 leafy gametophytes, assignable to fourteen types, are recognized. These fossils are permineralized in three calcium carbonate concretions collected from a Late Cretaceous (Santonian to Campanian) fossil assemblage from the Trent River Formation. Fragments of fern, gymnosperm and angiosperm foliage, wood, fruits, seeds, an athyrioid fern rhizome, and a filicalean fern gametophyte are also elements of this assemblage. Thirteen of the fourteen forms have complex leaf anatomies diagnostic of mosses. One kind has leaves that are anatomically simple and unistratose (one-cell-thick) throughout. This form probably represents a leafy liverwort. The mosses encompass much of the extant taxonomic and morpho-anatomical diversity of the group. They are assignable to Sphagnum (3 spp.), Polytrichaceae (2 spp. – Fig. 2), Grimmiaceae (1 sp.) Leucobryaceae (1 sp.), Dicranales (3 spp. – Fig. 3.), Pottiaceae (1 sp. – Fig. 4), Tricostaceae (1 sp.), and Hypnales (1 sp.).

Many of these types are both the oldest and the first permineralized fossils of their respective clades. Collectively, these fossils indicate that mosses had achieved most of their present taxonomic diversity (including some extant genera) by the Late Cretaceous, which is substantially earlier than hypothesized by molecular dating approaches. Ongoing research to document each of these fossils in detail will dramatically expand our understanding of Cretaceous moss diversity. Together with recent discoveries of permineralized moss fossils from other Mesozoic deposits, the Trent River flora will enable deep time perspectives, for the first time, to be integrated into our understanding of bryophyte evolution.

My History with The Vancouver Paleontological Society

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A brief glimpse into the time spent with the amazing people who helped shape the person I am today.

The Vancouver Paleontological Society is one of the most important and influential parts of my life. In honor of all that I have gained from growing up within the society I will be sharing fond memories and how it all fueled the pursuit of my life long passion.