

THE  
BRODIE  
CLUB



ROYAL ONTARIO  
MUSEUM OF ZOOLOGY

THE 987<sup>th</sup> MEETING OF THE BRODIE CLUB

The 987<sup>th</sup> meeting of The Brodie Club was held on Oct. 19, 2004 in Rm. 432 of the Ramsay Wright Zoological Laboratories at the University of Toronto.

Chairman: Edward Addison  
Secretary: Oliver Bertin

There were 19 members and eight guests.

Richard Joos, chair of the Toronto Bird Observatory, and observatory members Ian and Margaret Sturdee were guests of Mary Boswell

Allison Tasker and Gary Hendry were guests of Ron Tasker

Richard Aaron was the guest of Bruce and Ann Falls

Rosemary Addison was the guest of Ed Addison

Iballa Elena Rodriguez is the wife of the speaker, and guest of Kevin Seymour

The September minutes were approved with one minor change. Tasker said spruce budworm are slowly knocking out the balsams at his Manitoulin property, leaving room for pine (not maples) to come in.

NEW BUSINESS:

Jim Rising has been given the Distinguished Ornithologist Award by the Ontario Federation of Ornithologists for his outstanding contribution to the study of birds in Ontario. Previous winners include Bruce Falls and the late Murray Speirs.

The incumbent officers and committee members were returned to office by acclamation. Several members volunteered for occasional secretarial duties. Their offers were gratefully accepted.

John Speakman offered material from the Nature Conservancy of Canada, a group which wants to buy the Windmill Ranch on Carden Alvar.

Jane Young wrote to say that her father, life member Keith Reynolds, remains keenly interested in the activities of the Brodie Club. He looks forward to the monthly newsletters with great interest.

SPEAKER:

The speaker was Diego Garcia-Bellido. A palaeontologist from the Universidad Complutense de Madrid, he is doing post-doctoral research on the Burgess Shale in the Department of Natural History at the Royal Ontario Museum.

## NEW DEVELOPMENTS FROM THE BURGESS SHALE

The Burgess Shale is considered one of the best fossil locations in the world because it contains a remarkable collection of Cambrian fossils, many in excellent condition.

The dig is located in the Rocky Mountains of British Columbia mountains in the Kicking Horse Pass, just west of the Alberta border and a 3.5-hour hike north of the railway town of Field, B.C. The site is halfway up a scree slope on Fossil Ridge at the 2,300-meter level, overlooking Emerald Lake and the TransCanada Highway. It is accessible to the public with the permission of Parks Canada.

The area was explored in the late 1800s during the construction of the Canadian Pacific Railway. A number of geologists and engineers worked for the railway and spent much of their time exploring the countryside for fossils.

Charles Walcott was credited with discovering the Burgess Shale. He collected thousands of fossils between 1909 and 1924. Percy Raymond collected in 1930. Harry Whittington of the Geological Survey of Canada took a new look in 1966 and 1967, while the ROM's Des Collins collected between 1975 and 2000, helped in later years by Garcia-Bellido. Most of the early fossils are stored in the Smithsonian Institute, but recent collections have gone to the ROM.

Garcia-Bellido is the son of two Spanish biologists and the grandson of a Greek and Roman archaeologist. He combined the two disciplines and became a palaeontologist. He was working as a student at Cambridge University in 1994 when he heard about the Burgess dig. He applied to Collins as a volunteer for the 1995 summer season and was accepted. He returned in 1997 and 2000.

The site has been dated to about 505 million years BP, about midway through the Cambrian period which is now believed to run from 542 to 488 million BP. The Cambrian era came at a time when the continents were shifting. The Burgess Shale and much of North America was part of the continent of Laurentia, which was located on the equator. Gondwana was another, larger continent that included Europe, Africa and Australia and parts of Nova Scotia and Florida.

Cambrian fossils are particularly interesting because there was a sudden blooming of life during this era, and the appearance of the first unequivocal multicellular organisms. About 175 species in 18 phyla have been found in the Burgess Shale, indicating a rich faunal life that lasted for many millions of years before one of many major extinctions knocked the numbers back.

There was an explosion of life in the Cambrian because the world's climate was warming up after a long ice age, and because the continents had an increasing coastline and shallow warm seas. The Burgess Shale was a particularly rich site because it sat off shallow waters close to the equator. There were a fair number of species in the pre-Cambrian era, before about 600 million years BP, but those fossils are simple, with no mouth, no digestive tract and little in the way of complex body structure.

There are four quarries on the site in the shadow of the Cathedral Escarpment, an ancient dolomite reef that overlooked the sediments below. A mudslide apparently buried the reef fauna in a fine silt that preserved the soft parts of the fossils. The reef protected these fossils from mechanical damage allowing a remarkable level of preservation.

Various teams have excavated the ancient reef using picks and shovels, hammers and chisels and electric saws. They have found a remarkable variety of animals and plants. Garcia-Bellido listed more than 160 species of animals, including 67 Arthropods (trilobites, crustaceans and chelicerates) and 42 Porifera or sponges. Another 12 species have been lumped into the Problematica for want of anything better.

In his 1980s book on the Burgess Shale, Stephen Jay Gould referred to the Problematica as “weird wonders” because they seem to mix and match many other families. Some include combinations of worms, arthropods, molluscs and other unnamed species. *Hallucigenia* has seven pairs of legs and spines, while the *Opabinia* has five eyes.

The fossils are so well-preserved in the Burgess Shale that Garcia-Bellido has been able to distinguish the internal organs of such crayfish-like arthropods as *Marrella splendens*. The circulatory system, spine, digestive tract, gills, eyes and mouth parts all show up.

Garcia-Bellido often uses a *camera lucida* to prepare a tracing of each specimen and then reconstructs a 3-D drawing or object. The Royal Ontario Museum has made a series of accurate plastic reproductions for sale through the Department of Palaeobiology.

Occasionally, similar species are found, buried at different angles, aiding the reconstruction of 3-D images. The shale is so fine that fossils have been found with micro-corrugations on the shell, suggesting that the animal showed iridescence, or perhaps colour.

One of the most remarkable fossils shows the arthropod *Marrella* squeezing out of its exoskeleton during one of its periodic moults. The fossil confirmed what everybody had suspected but nobody had shown — that arthropods moulted as far back as the Cambrian.

Garcia-Bellido and Collins published that finding in *Nature* on May 6 this year.

The Burgess Shale is so rich in species that palaeontologists can decipher some interesting animal behaviour. There was apparently predation because *Leanchoitia superlata*, another crayfish-like animal, had effective defence mechanisms, including two pairs of eyes, serrated edges along the edge of the cephalic shield and spines on the telson, or tail.

Occasionally, trilobites — crustaceans that resemble a modern horseshoe crab — have been found with bite marks on the shell, as if they had just escaped a hungry predator.

Cambrian researchers have been able to reconstruct different faunal community — and the food chain — of a tropical reef, showing the different species at various water depths. There were at least 18 phyla of animals in the Burgess Shale, including sponges, jellyfish, priapulids, arthropods, brachiopods, annelids, molluscs, echinoderms, hemichordates and chordates. There were arthropods, polychetes and sponges at one level; bigger sponges, jellyfish and corals at another. The top predator was apparently *Anomalocaris*, a terrifying crustacean-like beast. Other species lived in the sediment, crawled or swam.

### QUESTIONS:

- There are about 60,000 specimens from the Burgess Shale in the Smithsonian in Washington, mostly from early excavations. The ROM came later but has a bigger collection, now estimated at 100,000 specimens. It is considered the biggest collection in the world.
- The Problematica were a new phylum of odds and sods that didn't seem to fit anywhere else. Researchers are sorting through many of them, but are unwilling to make many taxonomic decisions until they investigate similar Cambrian deposits in Greenland and China.
- People have looked at the deposits above and below the Burgess Shale, but they are not as well preserved because they were not protected by the overhang of the Cathedral Escarpment.
- There has been poaching at the Burgess Shale. Good specimens occasionally turn up, selling for \$10,000 or more.
- The site has been listed as a UNESCO World Heritage site since 1981. It is protected by federal parks officials who strictly limit the number of visitors to the site and their activities. Ecotourists are allowed to visit the site, but only under the supervision of a designated tour guide.
- The shales have been dated to an accuracy of about 1 per cent — giving a variability of about five million years. Trilobites can also be used to give relative dates. The richest deposits were probably laid down over a period of 100,000 to 200,000 years.
- About 167 species have been described in varying degrees of detail, of which Walcott described about 110. Some species have been stored on museum shelves since 1910 and never looked at since. Some species are so numerous — there are 25,000 *Marrella* — that they lend themselves to destructive testing, 3-D replication and the like.
- The explosion of species came about for a variety of reasons. There were a lot of shallow, warm aquatic environments following a long ice age, and a rise in the level of oxygen in the water, allowing larger animals to flourish.

The speaker was thanked by Jock McAndrews.

### NOTES & OBSERVATIONS:

- Sandra Eadie saw about 1,000 Pacific White-sided Dolphins schooling off the northern tip of Vancouver Island. She also saw Hump-backed and Minke Whales, but no Killer Whales.
- John Speakman has successfully attracted Orioles and a Downy Woodpecker to his hummingbird feeder. It took a while for the birds to catch on.
- Glenn Coady has seen Nuthatches and woodpeckers at hummingbird feeders.
- David Tomlinson has also seen a Downy Woodpecker at these feeders, but rarely.
- Jean Iron visited Van Wagners Beach near Hamilton in mid-October and saw eight Jaegers fly overhead, in close. Falls spied light and dark morphs of the Jaeger on the same trip. Iron also saw a Gannet, Kittiwakes and ducks. She noted a large number of dead Loons, Grebes and diving ducks on the beach, perhaps killed by botulism poisoning.



Gannet

- Fred Bodsworth said there was a serious die-off of Loons, Grebes and Mergansers in Lake Erie two years ago. It was apparently attributed to botulism.
- Addison said a large number of Loons died from botulism poisoning in Lake Huron in the 1960s. Botulism breeds in anaerobic environments. The toxins are picked up by worms, maggots, arthropods, fish and ducks.
- Mary Boswell caught a Yellow-breasted Chat in mid-October in a mist net on the Leslie Spit, believed to be a first for the location. She has seen a few Red Knots on the beach there. A Barred Owl flew over the net while she was extracting a Winter Wren, and hovered nearby.
- Addison saw a flock of 40 Sandhill Cranes near Sault Ste. Marie on Sept. 17. He saw another 19 from the highway.
- Coady said the fifth and final year of the Breeding Bird Atlas will kick off April 9 at Kortright Park.
- Hendry said farmers near Collingwood are having serious problems with Wild Turkeys which descend on their crops of corn and soybeans and eat large quantities. He often sees flocks of 30 and 40 birds.
- Bodsworth has seen Wild Turkeys near Port Carling. Ann Falls said they were introduced by native people near Bala. Speakman has seen nine turkeys at his cottage on Lake Simcoe north of Beaverton, while Coady has seen or heard of them in the Rouge River valley, Algonquin Park and the Ottawa Valley.

The meeting adjourned at 9:20 pm.

NEXT MEETING:

The next meeting will be held at 7:30 pm on Nov. 16 in Room 432 of the Ramsay Wright Zoological Laboratories at the University of Toronto. Dan Strickland, a retired park naturalist from Algonquin Provincial Park, will talk on the biology of Gray Jays.