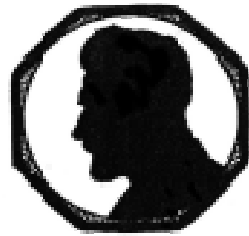


THE
BRODIE
CLUB



ROYAL ONTARIO
MUSEUM OF ZOOLOGY

THE 1,000TH MEETING OF THE BRODIE CLUB

The 1,000th meeting of The Brodie Club was held on Feb. 21, 2006 at the Faculty Club of the University of Toronto.

Chairman: Ed Addison
Secretary: Oliver Bertin

The 1,000th anniversary committee included:

Ed and Rosemary Addison	Bruce and Ann Falls
Fred Bodsworth	Kevin Seymour
Sandra Eadie	Jennifer Young

GROUP PHOTO OF MEMBERS

THE 1000TH ANNIVERSARY DINNER

MEMBERS:

Back Row from left: Paul Aird, Ron Scovell, Paul Catling, Kevin Seymour, Ross James, John Speakman, Marc Johnson, Ron Pittaway, John Riley, Harry Lumsden

Second Row: Don Huff, Sheila Mackay-Kuja, David Hussell, Rosemary Addison, Trudy Rising, Jock McAndrews, Alexandra Eadie, Jennifer Young

Third Row (seated): Russ Tilt, David Tomlison, Enid Machin, Ann Falls, Jim Bendell, Yvonne Bendell

Fourth Row (seated): Michael Downing, Hugh Currie, Fred Bodsworth, Norma Martin, Ron Tasker, Claire Muller, Margery Ritchie (guest), Bob Ritchie, Ed Addison

Front Row (on floor): Ellen Larsen, Oliver Bertin, Bruce Falls, Steve Varga, Norman Martin, Bill Rapley, Helen Juhola, Aarne Juhola

Present but missed photo: Glenn Coady, Mary Boswell, David Sherry

RECEPTION:

Members arrived at 5 pm to renew old acquaintances, chat and view archival photographs of club members and past events. Members, past and present, gathered for a group photograph before adjourning to the dining room where Addison welcomed the members to the 1,000th anniversary dinner.

ATTENDEES:

There were 93 members and guests, second only to the 700th meeting when 110 members and guests attended.

Ed Addison	Guest: Kathryn Falls
Rosemary Addison	Don Huff
Guests: Emily Addison, Pete Addison, Melissa Rose	Guests: Rosemary Speirs, Beatrice Olivastri
Paul Aird	David Hussell
Guest: Linda Pim	Guests: Ricky Dunn, Jeremy Hussell
Jim Bendell	Ross James
Yvonne Bendell	Marc Johnson
Guest: Lynda Bennett	Aarne Juhola
Oliver Bertin	Helen Juhola
Guests: Eleonora Bertin, Peggy Haist	Sheila Mackay-Kuja
Fred Bodsworth	Guest: Allen Kuja
Guests: Dorothy Andrews, Barbara and Ed Welch, Nancy and Rick Hannah Bob Curry, Glenda Slessor	Ellen Larsen
Mary Boswell	Harry Lumsden
Paul Catling	Enid Machin
Guest: Brenda Kostiuk	Norman Martin
Glenn Coady	Norma Martin
Hugh Currie	Jock McAndrews
Guest: John Carley	Guest: Sharon Hick
Michael Downing	Claire Muller
Guest: Penny Downing	Guest: Isobel Boardman
Sandra Eadie	Ron Pittaway
Guests: Warren Clements, Chester and Camilla Gryski, John and Lois Casselman	Bill Rapley
Bruce Falls	Guest: Paula Rapley
Ann Falls	John Riley
	Guests: Kathy Lindsay, Julia Riley, Peter and Camilla Dalglish
	Trudy Rising
	Guest: Mary Kay Winter

Bob Ritchie
 Guests: Margery Ritchie, Robert A. Ritchie,
 Heidi Clausen
 Bev Scott (who could not attend)
 Guest: Margaret Crossman
 Ron Scovell
 Kevin Seymour
 David Sherry
 John Speakman
 Guest: Betty Speakman
 Ron Tasker

Russ Tilt
 David Tomlinson
 Guests: Deirdre and Beth Tomlinson, Dan
 and Nat Barcza
 Steve Varga
 Jennifer Young
 Guests: Elizabeth and Wilfrid Lockett,
 Roberta and Jeff Seidman
 Steve Scott
 Guest Speaker, guest of the Brodie Club
 43 members and 50 guests

ACKNOWLEDGEMENTS:

Addison read greetings from members who were unable to attend the anniversary dinner.

Erica Dunn, wife of member David Hussell, has been elected president of the American Ornithologists' Union.

Member Marc Johnson and his wife recently had a baby girl, a possible future member. If she joins, she would be the third second-generation member in the club. Michael Downing and Oliver Bertin are both sons of former members.

Downing had another claim to fame. He travelled the furthest to attend the meeting, from Halifax.

DECEASED MEMBERS:

Norm Martin, an active participant since 1959, read a list of members who had died since the 90th anniversary dinner on Jan. 17, 1995. A minute's silence was held for the deceased members. We regret to say that long-time member Alan Helmsley died subsequent to the meeting at the age of 87.

Fred Ide	Jan 19, 1996	May 8, 1928
Jack Oughton	May 6, 1996	Sep 19, 1933
Howard Savage	Mar 16, 1997	Sep 17, 1963
Richard Saunders	Jul 25, 1998	Dec 20, 1949
David Fowle	Oct 14, 1999	May 4, 1948
Robin Hepburn	Dec 14, 1999	Mar 25, 1958
Bill Carrick	Oct 7, 2002	Mar 18, 1947
Mary Tasker	Feb 1, 2003	Apr 1, 1999
Murray Fallis	Jul 8, 2003	Feb 27, 1934
Don Young	Oct 1, 2003	Feb 23, 1959
Ed Crossman	Dec 21, 2003	Sep 19, 1961
Ann Fowle	Feb 28, 2004	Mar 19, 2002
Walter Tovell	Dec 30, 2005	Apr 1, 1964
Keith Reynolds	Jan 8, 2006	Apr 18, 1967
Alan Helmsley	Mar. 3, 2006	1953

MEMBERSHIP SENIORITY LIST:

Addison read the list of the 20 most senior members, a third of whom were able to attend the anniversary celebrations.

R. Yorke Edwards	1947-03-18	Alan Helmsley	1953-
Douglas Miller	1947-03-18	Eric Thorn	1953-03-03
Bev Scott	1947-03-18	Russ Tilt	1953-03-03
Bruce Falls	1949-12-20	Roger Hansell	1958-01-28
Bob Ritchie	1949-12-20	Ron Tasker	1958-02-25
Frank Cook	1949-12-20	Rev. Norm Martin	1959-
Alexander Cringan	1949-12-20	C.S. Rufus Churcher	1959-02-23
Jim Soper	1949-12-20	Robert Dailey	1959-02-23
Harry Lumsden	1950-01-17	John Lunn	1959-02-23
Fred Bodsworth	1953-03-03	Laszlo Szijj	1959-02-23

DINNER:

Dinner was served at 6:30 pm.

MENU

Dinner rolls with butter

Curried butternut squash and pear soup

Pork tenderloin with apricot and apple stuffing

Filet of salmon with lemon beurre blanc

Vegetarian Moroccan stew

Green beans almondine

Baby carrots

Mashed potatoes with celeriac roots

Cheese with biscuits and grapes

Coffee / Tea

Fancy cookies

RETROSPECTIVE:

Bruce Falls, who is still active in the club after 56 years, gave

A RETROSPECTIVE OF THE BRODIE CLUB

Our club was founded by a group of young men in November 1921. There had been no natural history society in Toronto since 1895, when a group that Dr. William Brodie started in 1880 was disbanded. Dr. Brodie was a dentist whose first interest was natural history. Jim Baillie described him as Canada's greatest all-round naturalist of his time. Seton said he influenced everyone who came in contact with him. Later in life he became the first Provincial Biologist, presiding over collections, many of which were his own. To get the measure of this remarkable man you should read Louise Herzberg's very interesting biography of William Brodie entitled *A Pocketful of Galls*. The club has a copy.

The new club was called the Toronto Naturalist's Club but, when the Toronto Field-Naturalists' Club was formed two years later, our club was renamed in honour of Dr. Brodie. In 1924, 21 charter members signed the constitution. A third of them were staff of the Royal Ontario Museum (the ROM), a third were from the University and a third were amateurs. A few dated back to Dr. Brodie's Club. I remember most of these men.

Lester Snyder was ringleader

I wish I could characterize many of them but I can only mention a few. The ringleader was Lester Snyder — front and centre in the 1930 photo on your invitation. He had recently been appointed as an ornithologist at the ROM. Snyder wanted a club of amateurs and professionals with whom he and his colleagues could interact. I remember him as a serious, modest and helpful man who was so dedicated to the club that he attended 497 of the first 500 meetings. He was encouraged by his boss, J.R. Dymond, who headed Zoology at the ROM. J.R. was broad in his interests, good at organizing people and getting things done. He encouraged student biologists like Bev Scott, Norm Martin and me.

Another original member from Snyder's group at the ROM was Jim Baillie, a gangling youth who was keen on birds. Snyder said "he recorded everything so we made him the first secretary." Later, many of us young naturalists met in Jim's office, which became the nerve

centre for Toronto birders, while Jim typed his columns for the Evening Telegram.

J.H. Fleming was the elder statesman. Influenced by Dr. Brodie in his youth, he built up a collection of world birds that doubled that of the ROM after his death. Technically an amateur, he exuded ornithological erudition and was a frequent contributor, often bringing his own specimens to the meetings. He became president of the American Ornithologists Union.

Stuart Thompson, a nephew of Seton, was the quintessential amateur. A skilful observer, he liked to lead hikes and give talks. He interested young boys in nature and I can trace my start through a neighbour who was one of Stuart's group. Finally I should mention W.E. Saunders of London, a corresponding member who often spoke at meetings. Such was his enthusiasm that he always drew a large audience. Doug Clarke said he never grew old. Our late member Keith Reynolds was one of his protégés.

Other distinguished naturalists across Canada were made corresponding members, including P.A. Taverner at the National Museum and J.A. Munro in B.C. As the club grew, a considerable diaspora of young men, whose careers took them away from Toronto, spread the club's influence far and wide.

Club was always unusual

From its inception, the Brodie Club was unusual. It had a limited membership — 20 at first, later 35 and recently 50. Newcomers had to be accepted by the existing members. Doug Clarke said that to join you had to wait for someone to die, move away or get kicked out. Several early members were dropped for non-attendance; later they were given a softer landing as corresponding members.

Looking back, Baillie said these rules furthered the fraternity and congeniality that characterized the club. The members looked for serious fellow naturalists. At the 23rd meeting, a committee was formed to design a test for prospective members but that idea apparently died a natural death. When there were few grey heads, distinguished older naturalists such as Fleming and Saunders were recognized as honorary members. More recently, active members automatically become honorary when

they reach 65. We are in danger of becoming an honorary club!

In the early years the Brodie Club was like an informal branch of the ROM, a two-way relationship. The small museum staff could meet with fellow naturalists whose activities augmented the collections. There was rumoured to be a want list of specimens. For its part the club had a meeting place, access to the collections and a supply of speakers. Close ties to the ROM lasted many decades but are regrettably long gone.

The Brodie Club hides its light under a bushel. It has no president, no executive, no address or phone number. The only positions other than committee members are a secretary and a treasurer. Russell Rutter was secretary for 18 years — an “iron man” performance, while Bob Lindsay was treasurer for decades. Oliver and Aarne take notice!

Natural history was goal

The main purpose of the Brodie Club is to enhance its members’ interest in natural history. At first members set about to educate themselves, taking turns giving talks on the families of birds, illustrated with specimens from the museum. By the time they got to the mammals, each species was covered under a seven-point outline. This continued through reptiles and amphibians but I don’t think they made it through the fish. They branched out into other series on ecology and distribution of different plants and animals. Of course, guest speakers and individual members introduced other topics until the programme became as eclectic as it is today. The results of expeditions were often reported at the club by a panel of museum staff. Special meetings with several speakers were held as memorials to Fleming, Saunders, Taverner and, recently, Bill Carrick. Articles in current journals, and meetings that members had attended were reviewed. Each year a committee of members reviewed the status of birds, mammals, reptiles, insects, plants, fungi and so on. Notable guests included A.P. Coleman on geology, Dean C.D. Howe on Forestry and Harold Innis on the fur trade.

According to published proceedings, 20% of the talks in the early days were on birds, with the others divided into 20 categories. Garnet Bell talked about Fungi, T.F. McIlwraith spoke on man’s relationship to nature, Greg Clarke, dressed appropriately, gave an amusing account of angling. Several meetings were given over to recollections of earlier times by members

and guests. Seton recalled Passenger Pigeons as far as the eye could see, viewed from Taylor’s Hill in the Don Valley. He ended his talk with a wolf howl that brought in the night watchman. For at least the first half of the club’s history, members, often two or more to a meeting, gave 90% of the talks. Since the meetings were every two weeks, they covered a lot of ground. Field observations were considered the lifeblood of the club and only guest speakers took precedence.

Started in ROM basement

I must mention the venues in which the club has met. They began in a basement lab at the ROM that was used by day to skin and mount animals, make casts of specimens and prepare skeletons and also served as a lunchroom for the staff. On Tuesday nights, they had to knock off early to clean up plaster, viscera and the like and drag in tables for the meetings. As in all the meetings held at the ROM, staff had to man the door. Latecomers could tap on a window or just climb in. The room, shown in the 1930 photo, had a high ceiling and Terry Shortt remembers a blue haze of smoke descending until you could no longer avoid it by crouching. I’m sure that rubbing shoulders with the staff in that lab, the members felt they were part of the museum. But it got better.

In 1932, the club christened the Brodie Room, part of a gallery around the dome above the museum’s fourth floor. Members sat around an L-shaped table; those at one end couldn’t see their counterparts at the other end. After the basement lab, this was a clean, tidy room. Fleming declared the new facilities to be excellent and members expressed their thanks to Snyder — “the father of the club.” There was a blackboard, a lectern, a painting of Dr. Brodie examining specimens, a case of stuffed birds and a bookcase housing the club’s library. Except for a difficult period when the Brodie room became a storeroom, it was the meeting place until 1971. After that, we used lecture rooms in the museum and the planetarium until, in 1978, Howard Savage came to the rescue and the club left the ROM for good. Lester Snyder, who had died a decade earlier, must have rolled over in his grave.

For nearly 18 years, the Brodie Club met in the Faunal Archaeo-Osteology lab in the old Borden dairy on Spadina Circle. To reach the room, you entered a dark doorway off the street, climbed a steep, dimly lit stairway and walked along a narrow corridor guided by the lighted area in the distance. This was a small

lecture room, one wall of which was chicken wire festooned with skeletons and animal skins. Behind the wire was Howard's office and a large collection of bones used to identify animal remains in archaeological sites. Howard Savage, a pediatrician who retired to a second career teaching anthropology students looked after the club's interests much as Snyder had done in the early years. After Howard's second retirement the club moved to the well-appointed seminar room in the Department of Zoology where we still meet. For some members, a certain nostalgia remains for the sights and smells of the faunal lab.

Brodie Club spawned FON

Although the Brodie Club exists for its members, it has exerted some influence for conservation. In 1931, J.R. Dymond laid out a blueprint for a Federation of Ontario Naturalists, and it was a committee including Dymond, A.F. Coventry, McIlwraith and Snyder that contacted other clubs, and brought the FON into being. They persuaded W.E. Saunders to be the first president. After that the club channeled much of its conservation activity through the FON. Now Ontario Nature, it is celebrating its 75th year. Rosemary Speirs who is the vice-president, is with us tonight.

While many of the early members were collectors, they were outraged by indiscriminate shooting and were particularly concerned with the protection of hawks and owls. In 1931, a committee prepared articles on Ontario birds of prey that appeared in the *Toronto Globe*. These publications met with general approval and requests for hundreds of copies poured in from across North America.

Jack Miner was not amused

However, Jack Miner, a poster boy for conservation on account of his goose sanctuary, was not amused. He regarded hawks and owls as evil and put out a pamphlet entitled *Facts about Hawks* and sent it to his influential friends. In what Doug Clarke called a moment of weakness, the club responded with its own publication, *The Brodie Club Examines Jack Miner's Facts about Hawks*. Museum staff were terrified of what "Wild Goose Jack's" powerful political allies might do. However, the Miner group couldn't find an organization to attack — a benefit of the club's low profile. No such bravado was exercised again.

Members of the Brodie Club specializing in birds founded the Toronto

Ornithological Club (the TOC) in 1934 and the two clubs continue in parallel, sharing some of their members. A Brodie Club project, the Christmas Bird Census, was later assumed by the TOC. Hugh Currie, the vice-president and also a Brodie Club member, is here.

Although somewhat subdued after the Jack Miner affair, the club continued to set up committees and despatch a spate of letters for or against a variety of government policies. Examples include letters written in support of protecting the escarpment and natural areas at Pelee, increasing biology in schools and against wolf bounties and attempts to eliminate predators.

Kettleby Kabin Klub

The first of many club field days was held in the spring of 1924 on the western outskirts of the city. The second outing was to Kettleby Kabin, a shack owned by the museum staff near the Holland Marsh. Another favorite place was Minesing Swamp and Doug Clarke recalled a field day when the advance of younger members into the swamp was marked by a receding roll of gunfire as he beat Rutter to a Yellow-throated Vireo. On another occasion, Baillie fooled Cliff Hope and Stu Thompson into shooting a stuffed Kookaburra, a museum specimen with no data. By 1936, general shooting was discouraged. These early field trips were convivial affairs with some members sleeping in tents or under the stars after an evening bonfire. Less hardy souls arrived the next morning.

The Brodie Club was started by men and continued as a men's club for many years. There was considerable resistance when, in the 25th year, secretary Rutter suggested holding an annual ladies' night so wives and girlfriends could see what their men folk did on Tuesday nights. According to Doug Clarke, the first female to attend a meeting was a chimpanzee that rode around on a tricycle when the club met at the zoo. I was there when the first woman guest attended. She was Maud Udvardy, the attractive wife of Miklos Udvardy, a guest speaker recently arrived from Europe. Snyder was especially courteous in welcoming her but she could see that there were no other women present. That visit had consequences! Mrs. Udvardy discussed it with Doris Speirs who then founded the Margaret Nice Club for women naturalists. At the 700th meeting in 1972, there were many women; perhaps Rutter's ladies' night had arrived. After that there were women guests

at meetings, and Donna Mackenzie from the Ministry of Health spoke to the club. Sheila Mackay, who is here tonight, became the first female member after attending the requisite three meetings. The rest is history and, oddly enough, the sky hasn't fallen.

Eleventh celebration

Tonight we celebrate our 1000th meeting but this is the latest in a long line of celebrations — 11 by my count. Some were modest affairs in the club's meeting room. Most involved a retrospective talk, so I've been scooped by Dymond, Baillie, Snyder, Rutter, Clarke, Savage and Carrick. These earlier accounts are well worth reading. At the 100th meeting, the members partook of "a sumptuous feast spread on boards long since stained with museum specimens." Mindful of the historic occasion, they signed a paper plate for posterity. It is in our exhibit. The 300th meeting was held in Dr Paul Harrington's premises and was remembered with "pleasant and perhaps rather moist nostalgia." Just after the war, the club's 25th year was celebrated at the Royal York Hotel. The club's 500th meeting was held at a pub on Bloor Street.

Ribald minutes

The rather ribald minutes were written by secretary Bob Ritchie who is here tonight, but we shouldn't shoot the messenger. He reported that "the morale was maintained but morals were deteriorating — the next celebration might be in a brothel." The 700th meeting broke all records with 110 members and guests attending. Terry Shortt gave an amusing account of his trips to the Arctic, India and other remote places. Throughout his life, he couldn't escape the outreach of the Brodie Club. Even his wife was the daughter of a member. There were two special meetings in Hart House and the 900th was held here at the Faculty Club. There are 93 members and guests here tonight.

According to Snyder, there was no need for club histories because everything was recorded in the minutes. Having read the first 500, I would like to paraphrase a few items, including field observations and other news.

- There were refreshments at the early meetings. This practice was dropped and the annual fee was lowered from \$1 to 50 cents.
- The Kettleby Kabin Klub (Ontario's KKK) that I mentioned earlier appeared in the

scandal sheet "Hush." A lapsed Brodie member with a key had used the shack for mid-week philandering. Hairpins and other evidence resulted in the only expulsion of a member (except for non-attendance).

- The first Starling in Toronto was sighted in December 1923 (the month when I was born). Fleming predicted they would overrun the country.
- A Big Brown Bat flew into a meeting and joined the museum collection.
- Fleming reported in November 1926 that 16 Snowy Owls had already arrived at Spanner's taxidermy shop.
- Flocks of Canada Geese were notable observations.

Suckers milked cow

- Dymond debunked a newspaper report of suckers milking a cow crossing a stream.
- Paul Hahn was buying Passenger Pigeon specimens for the museum.
- At the 121st meeting, the treasurer received \$9.35, the remaining funds from Dr. Brodie's earlier club. Apparently the Brodie Club had become a responsible successor.
- The club met at the Riverdale Zoo, guests of member Dr. Archie Campbell. It seemed appropriate to meet surrounded by animals, even though their cries drowned out the reading of the minutes. A chimpanzee shook hands all round, "no doubt pleased to meet so many good evolutionists."
- Birds were often judged by their food habits. Finding no game fish in the stomachs of a Kingfisher, a Great Blue Heron, and a Bittern, Bell said that this "reflected much credit on the birds."

Missing head

- Fleming told of a Curlew Sandpiper collected in the 1800's that had been displayed at the Toronto Gun Club. During an altercation, it had been mutilated with the head finding its way into his collection. Many years later he recovered the body sporting the head of a Red-backed Sandpiper (Dunlin). The re-united specimen was passed around.
- Southam displayed a box of live shorebirds that he would band and release the next day.
- It was wartime and several members were in the armed forces or were meteorologists at RCAF bases. Those on the home front

needed identification to avoid being arrested for carrying binoculars.

- Steve (J.A.) Brodie spoke on the need for conservation in post-war reconstruction. He was an active member and a nephew of Dr. William Brodie.
- There was a report of a groundhog chasing cars.
- There were several recent records of Gray Foxes in Ontario.
- Stu Downing apologized for reporting a deformed fox as a Raccoon Dog — a very exotic mammal.
- The ashtray situation was becoming desperate. The club bought some but they proved to be too small.
- Baillie had completed 1000 columns for the Telegram.
- In Europe, a Starling that imitated a train whistle had to be shot.

Deer sees red

- Lindsay who worked at the High Park Zoo told of a watchman being attacked by a rat. He fetched a cat, but the rat chased the cat and the man had to dispatch the rat. On another occasion, a Santa Claus came to be photographed with a deer. Lindsay had to hold the deer off with a broom when it attacked Santa.

- Dr. Campbell had died. It was recalled that he donated wooden fireplugs for the use of dogs at the Humane Society.
- Snyder proposed that the little green flycatchers were actually two species.
- In 1938, a museum trip to Lake Edward, Quebec included Bev Scott. He must have been a child prodigy!
- Of course there were many other interesting reports.

The Brodie Club has a long history with considerable ebb and flow in its fortunes. It was thriving in the 1930s, declined during the war years and nearly went extinct in the 1950s when there was a gap of a few months with no meetings. However, a change to meeting once a month and recruitment of younger members restored its vitality. I should say the club is thriving at present but, as has been the case many times in the past, the future depends on attracting new enthusiastic members.

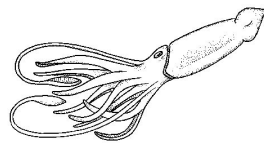
I'd like to close with a quotation from secretary Rutter at the 25th anniversary in 1946: "This club should cultivate in its own members and in others the attitude of a true naturalist; not attempting always to justify nature study on utilitarian grounds but as a labour of love, the profits from which include a more satisfying conception of the universe and a better philosophy of life."

GUEST SPEAKER:

The guest speaker was Steve Scott, head of the marine geology laboratories in the Department of Geology of the University of Toronto.

He has studied life at the bottom of three oceans as a researcher at UoF and through his cross-appointment with a marine institute in Brittany, in western France. He has participated in 28 oceanographic and submersible expeditions, and made many major discoveries in biology and geology in the depths of the sea.

He returned to his ocean-front home in Finisterre three days after his talk to the Brodie Club, to teach marine geology to his French students.



VOLCANOES, LIFE AND MINERAL RESOURCES IN THE DEEP SEA

Man has been to the moon and sent unmanned expeditions to Venus, Mars, Jupiter and Saturn. But we know almost nothing about the depths of the oceans that surround us.

Few people have been to the bottom of the oceans mainly because it is so difficult to work there. That is a shame because the oceans contain many fascinating and important phenomena. They are also big. Salt water covers 71 per cent of the surface of the world, while the Pacific Ocean alone occupies more space than all of the land surfaces of the world.

There have been many oceanographic expeditions over the years, of which the first and most important was the pioneering 40-month voyage of HMS Endeavour in the mid-1870s.

Mir descends 6,500 m

In 1990, Russia sent the research ship, Akademik Mystislav Keldysh, on an expedition to Papua New Guinea. The Mir submersible robot was lowered 6,500 metres to the depths of the sea, an extremely hostile environment with no light and intense pressure.

Other countries have done deep-sea research, including France with its Nautilus submersible and Canada with ROPOS, a remotely operated platform that has descended 5,000 metres.

Using these and other tools, researchers have confirmed the presence of fault lines that encircle the earth where the tectonic plates meet. The fault lines head down the centre of the Atlantic, circle the Southern Ocean south of Australia, and branch up the Pacific, past New Zealand to Fiji and Japan.

These plates are moving apart at a rate of two centimetres a year in the North Atlantic and by 16 centimetres in the South Pacific. Elsewhere, notably off Japan, they are coming together.

Thousands of volcanoes

There are thousands of volcanoes along these fault lines where extremely hot basaltic magma from the centre of the earth comes into contact with cold sea water creating jets of water that shoot out of the sea floor at flow rates that reach six metres a second.

These gushers often resemble plumes of dense black smoke that shoot up and then spread out like the water vapour from a nuclear

explosion. The 'smoke' contains such minerals as copper, iron, zinc, iron, silver and gold, often in a sulphide compounds that precipitate out to create tall stalagmites on the ocean floor.

The deposits can be as large as Toronto's Skydome, and contain enough minerals to sustain a commercial mining operation.

Several expeditions have investigated the viability of deep-sea mining. In 1870, Jules Verne wrote about the mining possibilities in his famous book *20,000 Leagues Under the Sea*. More recently, the CIA's Glomar Explorer research vessel was purportedly looked for manganese nodules when it wasn't hunting sunken Russian submarines.

Two mining companies have gone several steps further and put the search for deep-sea minerals on a commercial basis.

Britain's Neptune Resources and the Nautilus Minerals division of Canada's Placer Dome mining company have obtained exploration licences for large areas of the Pacific Ocean floor.

Neptune drilled near New Zealand

Neptune has recently drilled just north of New Zealand, while Nautilus has drilled in the Manus site north-east of Papua New Guinea. Neptune did not find commercial quantities of mineral sulphides on that expedition, but Nautilus came across "very encouraging" deposits worth a possible \$3.2 billion.

Their drilling results can be found on two websites, www.nautilusminerals.com and www.neptuneminerals.com.

Mining geologists have investigated ways of bringing the mineral deposits up to the surface for processing. They could lower the necessary machinery from the floating semi-submersible rigs that are used by oil companies to drill for oil.

Robotic bulldozers could be equipped with grinders on the front, conveyor belts at the back and a system of buckets to bring the ore to the surface.

Alternately, the deep-sea miners could adapt the giant vacuum cleaners that are already used off South Africa to suck diamonds off the ocean floor.

These mining projects are in the earliest stages. But they are far enough advanced that

the United Nations is developing regulations to control the environmental impact of future deep-sea mining in international waters.

That's the geology side of the story. The biology is even more interesting. Scott said a large variety of animals appear to thrive as far down as 1,500 metres in the vicinity of these deep-sea smokers, despite an environment that can only be described as extreme — pitch black, poisonous, at crushing pressures, at 350C to 400C or four times the boiling point of water.

Chemicals replace light

There is no light at all at these depths, giving a world that is chemotrophic, rather than photosynthetic. Any life derives its energy from hydrogen sulphide, carbon dioxide, methane and the nutrients that are associated with these chemicals.

The temperature cools to liveable temperatures of 30C to 60C further away from the volcanic gushers. The minerals precipitate out in these cooler regions, leading to mounts of iron ore, iron oxides and iron oxyhydroxide deposits that reach close to the surface near such places as Pitcairn Island in the South Pacific.

DNA is found on the deep-sea volcanic glass, indicating that microbes are extracting the

nutrients. Nearby iron deposits are broken down by iron-oxidizing bacteria, giving the foundation of a food chain that includes tube worms, anemones, huge crabs and snails the size of a fist, all this at 1,500 metres below the surface of the water!

Life on other planets

The existence of life under such extreme conditions led Scott to ponder the existence of microbes under equally extreme conditions on Mars and the moons of Jupiter and Saturn, where water and volcanic materials could possibly support life.

Mars, after all, has a liquid core, volcanic heat and traces of water flow. Europa, one of Jupiter's moons, appears to have traces of water with abundant evidence of past volcanoes. And Saturn's Titan moon has evidence of rivers, shorelines and seas of what could be liquid methane.

As NASA said: "Scientists have discovered marine life on Earth that thrives in the deep ocean near hydrothermal vents. This discovery provides us with a model for how similar organisms might survive on Europa."

Questions:

- McAndrews commented that there is light at very great depths. A glow is sometimes seen around the deep-sea vents and photosynthesis does occur at very great depths. Octopus are found at 3,000 metres and deep-sea fish have huge eyes. Perhaps, he said, these species are able to see at very low light levels.
- Scott said deep-sea mining may affect life at these depths, reducing animal diversity. Biologists are working on ways to minimize the environmental concerns.
- Eadie said the deep-sea crabs resemble the spider crabs that are found in shallower waters. Octopus are found at very great depths.
- Trudy Rising commented that the federal government last October set aside the so-called Endeavour Marine-Protected Park in the 2,600-metre trench off Vancouver Island. It is the world first deep-water conservation area. The government is now working out rules on allowable activity, which would probably include bans on activity, bans on taking samples and bans on moving species away.
- Scott said there were different trophic levels in the vicinity of the under-sea plumes. Some species occur close to the vent, others are found further away.

The speaker was thanked by Jock McAndrews.

The meeting adjourned at 9:55 pm.

NEXT MEETING:

The 1,001th meeting will be held on March 21st at 7:30 pm Rm 432 of the Ramsay Wright Zoological Laboratories at the University of Toronto. The speaker will be Alex Mills, who will talk on *The Biology of Migration Timing: Using banding data to investigate more than simply where birds go*. Mills has done considerable work on the differential timing of the migration of male and female birds using records at the Long Point Bird Observatory.

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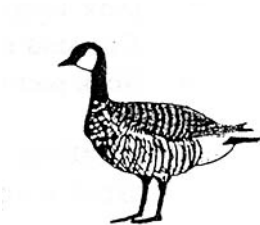
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