CANADA

DEPARTMENT OF MINES

HON. CHARLES STEWART, MINISTER; CHARLES CAMSELL, DEPUTY MINISTER

NATIONAL MUSEUM OF CANADA

W. H. COLLINS, ACTING DIRECTOR

BULLETIN No. 62

Annual Report for 1928

CONTENTS

OTTAWA
F. A. ACLAND
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1929

This document was produced by scanning the original publication.

Ce document est le produit d'une numérisation par balayage de la publication originale.

CANADA

DEPARTMENT OF MINES

HON. CHARLES STEWART, MINISTER; CHARLES CAMSELL, DEPUTY MINISTER

NATIONAL MUSEUM OF CANADA

W. H. COLLINS, ACTING DIRECTOR

BULLETIN No. 62

Annual Report for 1928

CONTENTS

OTTAWA
F. A. ACLAND
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1929

GENERAL ACTIVITIES OF THE MUSEUM

By W. H. Collins, Acting Director

The National Museum of Canada is able to report satisfactory progress during the year 1928 in the collecting of material for scientific study and exhibition, in systematic scientific investigation, in the public display of anthropological, zoological, botanical, geological, and mineralogical specimens, and in educational activities.

Collections were made of much material of merit from the aboriginal races of the country and efforts are being made to procure as much material as may now be available in a form unaffected, or as little affected as possible, by the culture of the Whites. Studies of Indian races were conducted at first hand by scientists who lived among them for a part of the year and made records of their lore, their customs, their religion, their music, their handicrafts, and their whole culture. Excavations were also made of ancient village sites to obtain greater knowledge of the distribution and the culture of the races of prehistoric times.

Mammals and birds were collected at a number of points, particularly in southern British Columbia and on the north shore of the St. Lawrence, and observations were recorded regarding them in their local habitat. One member of the staff accompanied the expedition of the Northwest Territories and Yukon Branch of the Department of the Interior to the Canadian Arctic islands and made zoological observations and collections.

Collections of plants were made at a number of points in Hudson bay, much additional information was gained regarding the distribution of plants, and the herbarium was enriched by many botanical specimens from localities heretofore unrepresented.

Additions were made to the systematic mineralogical and geological collections, and good collections of vertebrate and invertebrate fossil material were made. These have been, or are being, made the subject of careful study and the results will be published.

A supply of new exhibition cases has been procured and such progress will be made towards their utilization as careful selection, labelling, and proper display will permit. During the year 1929 there will be placed on exhibition, therefore, a lot of very choice material from the anthropological collections.

The National Museum of Canada is an outgrowth of the Geological Survey and in certain activities no sharp line of division is yet drawn between the two. The Museum is indebted to members of the staff of the Geological Survey for most enthusiastic co-operation in the exhibition of geological, palæontological, and mineralogical material. Other government departments have shown a much appreciated interest of the exhibition work of the Museum and it is expected that the next annual report will record very tangible results of this interest.

The educational activities of a museum are extremely important. The results of the scientific investigations are issued in the form of bulletins. Efforts are also being made towards reaching the popular audience. The semi-scientific semi-popular lecture is one important medium and the lecture hall of the National Museum is the scene of great activity during the winter months. Further information regarding the lecture courses is given below. Lantern slides for illustrating lectures are loaned, and for these there is an increasing demand. The public has learned to look to the National Museum as a source of photographs of special subjects and there is a large demand for these for educational work and for book illustrations. The Museum is accumulating a library of moving picture films, and several were added during the year to illustrate the life and customs of the Indians. The two books, Birds of Eastern Canada and Birds of Western Canada, illustrate admirably the method of popular education by means of well illustrated and interesting publications. There has been a big demand for these books and they have been very influential in arousing and fostering an interest in the bird life of the country and its preservation.

The Acting Director of the Museum here expresses his gratitude to the Geological Survey, the Entomological Branch of the Department of Agriculture, the Canadian National Parks, the Northwest Territories, and the Forestry Branches of the Department of the Interior, The Royal Canadian Mounted Police, and to other government departments for assistance and co-operation. He is not unmindful either of his debt of gratitude to many individuals and organizations, both Canadian and foreign, for exchanges and donations and for assistance on scientific investigations.

Detailed reports by the various heads of divisions of the Museum follow.

MUSEUM LECTURES

A course of lectures in natural history and other scientific subjects is presented each winter in the lecture hall of the Museum. The lecture committee, consisting of H. I. Smith, M. E. Wilson, and C. L. Patch, on whom falls the responsibility of securing lecturers and organizing the course, reports a very successful year. The purpose of the lectures is to extend the educational influence of the Museum among children, to widen their knowledge, and arouse an interest in scientific subjects. They are delivered to the children Saturday mornings and the attendance is so large that the lectures have to be repeated, the first commencing at 10 o'clock and the second at 11 o'clock. Adults have the privilege of hearing these lectures Wednesday evenings. Appropriate motion pictures are also shown. For the loan of films the Museum wishes to express its gratitude to the Canadian Government Motion Picture Bureau; the Northwest Territories Branch, the Forestry Branch, and the Canadian National Parks Branch of the Department of the Interior; the Province of Ontario Pictures; the United States Bureau of Mines; the Canadian Forestry Association; and the Picture Service Corporation of New York. The small library of films of the Museum was also used.

It is gratifying to report that other departments have manifested a willingness to co-operate with the Museum in providing lecturers. More than half of the lecturers of the season were drawn from the Department of National Defence and from different branches of the Departments of

Agriculture and of the Interior, and their services were contributed voluntarily. This rendered it possible to present a series of lectures on a great variety of subjects such as anthropology, zoology, ornithology, entomology, forestry, agriculture, transportation, geography, geology, and history.

During the series for 1928-29 the total attendance of children at the Saturday morning lectures was 7,950 with an average of 530, and the total attendance of adults at the Wednesday evening lectures was 1,978 with an average of 133. Following is a list of the lectures delivered:

The wonders of the microscopic world, or the accident of size, by Miss C. W. Fritz, J. J. DeGryce, and M. E. Wilson.
Experiences with Ottawa birds, by R. E. DeLury and C. L. Patch.
Petroleum in North America, by G. S. Hume.
Glimpses of native life in far off New Guinea, by D. Jenness.
A visit to the west coast of Canada, by Miss M. B. Williams and H. I. Smith.
Airplanes and how they fly, by A. Ferrier.
How trees grow, by R. D. Craig.
Canada's Arctic regions, by R. M. Anderson.
The importance of the tobacco industry to Canada, by R. J. Haslan.
Mosquitoes and houseflies, enemies of mankind, by C. R. Twinn.
The story of iron, by T. L. Tanton.
Some landmarks in Canadian history, by A. A. Pinard.
How the Department of Mines serves the public, by L. L. Bolton.
From cactus land to ice fields in British Columbia, by H. C. Gunning.
A trip to Australia, by J. M. Swaine and D. Jenness.

DIVISION OF ANTHROPOLOGY

D. Jenness, Chief of the Division, reports:

The Division of Anthropology maintained the same organization and personnel as in the two previous years. The lack of a second ethnologist, and of a physical anthropologist, made it necessary to employ two outside field workers during the year, Mr. C. B. Osgood, of the University of Chicago, and Dr. J. C. Boileau Grant, Professor of Anatomy in the University of Manitoba. Professor Grant will probably be available again in future years, but it is very difficult to find a competent ethnologist who will undertake field work in the remoter parts of Canada, such as northern Ontario, northern Manitoba, and the basin of Mackenzie river. To carry out any effective ethnological work in these regions it will be necessary to fill the vacancy on the staff by the appointment of an assistant ethnologist, preferably a young man who will devote most of his life to field work in these areas.

Field Work

Five parties were engaged in field work during the summer of 1928. H. I. Smith made systematic collections of archæological and ethnological specimens in the southern part of British Columbia, and took motion pictures of the Kootenay, Salish, and Blackfoot tribes; C. M. Barbeau continued his studies of French-Canadian arts and handicrafts in Quebec; W. J. Wintemberg, after examining some prehistoric Indian camping sites on Richelieu river, reconnoitred the north shore of the gulf of St. Lawrence from the strait of Belle Isle to Tadoussac; Dr. J. C. Boileau Grant, Professor of Anatomy at the University of Manitoba, made an anthropometric investigation of the Cree and Chipewyan Indians on lake Athabaska,

and C. B. Osgood, of the University of Chicago, travelled down Mackenzie river to Norman where he has undertaken to make a complete ethnological study of the Hare Indians during the winter of 1928-29.

The field work of H. I. Smith added 323 ethnological and 53 archæological specimens to the Museum's collections, together with more than 4,500 feet of motion picture film. The Indian tribes are now so civilized that it is very difficult to obtain specimens of their earlier tools, weapons, and household furniture, no examples of which will be available a few years hence. The division is, therefore, making a special effort to enlarge its collections while this is still possible, and attempting at the same time to secure photographic records of the fast vanishing native life. It now has material for motion picture films of six different tribes, five in British Columbia and one on the plains.

C. M. Barbeau spent the field season in Quebec city and its vicinity studying, photographing, and copying historical records concerning the carvings, paintings, and handicrafts of French Canada. In September he attended, with D. Jenness, the meetings of the International Congress of Americanists in New York, where he read a paper on "The Origin of Flora and Other Designs Among the North American Indians" that outlined some of the results obtained from his researches.

W. J. Wintemberg made two notable discoveries during the summer. On the north shore of the strait of Belle Isle he found a camping site of the extinct Beothuk Indians of Newfoundland, thus proving that they occupied at one time the southeast corner of Labrador peninsula. He discovered also a camping site of the Iroquois Indians near Kegashka, which is several hundred miles east of the known range of Iroquois forays.

Dr. Grant was very successful in securing measurements and observations of a large number of Indians at lake Athabaska which provided him, among other results, with valuable conclusions concerning the physiological effects of Indian and white admixture. Some blood tests that he obtained from the same Indians confirmed the theory that the pure blood natives do not possess either of the agglutinogens that are generally present in European and Asiatic peoples, a difference that may prove to have an important bearing on the problem of the origin of our native races in America.

A letter from C. B. Osgood, written just before Christmas and received two months later, stated that he was wintering with a small band of Hare Indians at the outlet of Great Bear lake. Influenza had been rife among the natives and the fishing was poor, so that they were suffering considerable hardship. His work, nevertheless, was proceeding favourably.

Office Work

The division published two scientific reports during the past year: "A Comparative Vocabulary of the Western Eskimo Dialects," by D. Jenness; and "The Uren Prehistoric Village Site, Oxford County, Ontario" by W. J. Wintemberg. Two other reports have been submitted for publication: "Totem-Poles of the Gitksan," by C. M. Barbeau; and "Anthropometry of the Cree and Ojibway Indians in Northeastern Manitoba," by Professor J. C. Boileau Grant. A preliminary report on the Anthropometry and Blood Groupings of the Cree and Chipewyan Indians of Lake

Athabaska, covering Professor Grant's field work during the summer, has come to hand. W. J. Wintemberg is completing a report on the Roebuck Village Site in Southeastern Ontario; D. Jenness is preparing a textbook on the Aborigines of Canada, and C. M. Barbeau a monograph on the Songs of the Tsimshian.

C. M. Barbeau published jointly with Dr. Ernest MacMillan a volume of French-Canadian folk-songs entitled "Twenty-one Folk-songs of French Canada," and D. Jenness had an article on the "Physiography and Archæology of Little Diomede Island, Bering Strait," in the Geographical Review for January, 1928.

The division supplied material for five outside exhibits during the past year, each of which entailed considerable office work. It lent a series of French-Canadian specimens for the Canadian Folk-Lore Festival held at Quebec in May; in August it contributed a large number of specimens from various parts of Canada for an exhibition in connexion with the centenary celebration at Pembroke, Ontario; in the autumn it furnished the Canadian National Railways with Pacific Coast Indian specimens for two exhibits, one in Chicago and one in Toronto; and in November it lent a series of old Iroquois specimens to the Buffalo Academy of Science to fill out a special exhibit that was being arranged by that institution.

Dr. A. Hrdlicka, Curator of Physical Anthropology in the Smithsonian Institution, Washington, and Mr. Walter B. Cline, of Harvard University, spent several days at the Museum in the course of the summer studying its Eskimo and Salish crania. Professor R. R. Gates, of King's College, London, also visited the Museum to obtain information concerning the Indian tribes of Mackenzie River basin.

Mr. Jenness superintended the passage through the press of his "Comparative Vocabulary of the Western Eskimo Dialects," and critically edited the two manuscripts listed above that have been submitted for publication. He supplied extensive notes on the various Indian tribes of Canada to the Bureau of American Ethnology, Washington, which is preparing a hand book on the aboriginal tribes of North America, revised at the request of the same institution a lengthy article on the Eskimo that has been prepared by a member of its staff, and indexed for the Editorial Division eight anthropological reports published by the Museum in former years. His own textbook, on the Aborigines of Canada, is now well advanced. Much of his time, as usual, was occupied with official correspondence and with the routine duties of his office, which includes the general supervision of the exhibition and storage of specimens. He attended, with Mr. Barbeau, the meetings of the International Congress of Americanists in New York in September, and participated in the discussions and conferences which took place during its session.

Mr. Harlan I. Smith, during the winter months, arranged for titling motion picture films of the Kootenay, Coast Salish, and Tsimshian Indians, and put in rough continuity the film of the Shuswap and Okanagan Indians. Besides attending to the general archæological routine, he continued to secure and incorporate in the files a large body of information concerning archæological sites in various parts of Canada. A portion of his time was also taken up by the superintendence of the Museum Lecture course and in the reading of proofs for publication.

C. M. Barbeau's time at the Museum was mostly devoted to the completion of his "Totem-Poles of the Gitksan," which was submitted for publication early in the winter, and to the transcription of Tsimshian songs from phonograph records. A set of over a hundred of these songs with melodies, texts, translations, and explanations, is being prepared as a Museum monograph to be completed early in the winter of 1930. The preparation and supervision of the Folk-Song and Handicraft Festival at Quebec required considerable time in the spring of 1929. Over a hundred French-Canadian folk-songs, from the Museum collection, have been sent to several musicians for harmonization and are being published in Canada, England, and the United States.

W. J. Wintemberg completed his memoir on the Roebuck Village Site and also prepared a paper on Representations of the Thunderbird in Indian Art.

Museum Work

In the west anthropological hall the entire series of exhibits devoted to the Nootka Indians of Vancouver island has been completely rearranged. Many of the specimens shown in these exhibition cases are old and of considerable value; in their present arrangement they should prove both attractive and instructive to the visiting public. The east anthropological hall is now equipped with fourteen large exhibition cases that only require diaphragms to make them available for immediate use. One case has already been supplied with a temporary diaphragm in order to display the fine collection of Stoney Indian specimens generously presented by Martin Nordegg; and a second case contains an experimental exhibit of basketry arranged on glass shelves. Much work was done by Douglas Leechman in cleaning and repairing specimens in storage, many of which are a heritage from earlier years when the Museum did not possess a staff with knowledge of and experience in their care and treatment.

Accessions to Museum

The anthropological collections of the Museum were augmented during the year as follows:

Ethnological	406	specimens
Archæological	380	"
Osteological	12	"
Total	798	"

The majority of these specimens were collected by H. I. Smith and W. J. Wintemberg in the course of field work, but the list includes a valuable collection of old Stoney Indian specimens.

The storage of specimens still presents great difficulties, in spite of the fact that a new room, No. 16, has been provided in the basement. The Frank Street building in which the Division of Anthropology occupies the upper storey, is altogether unsuitable for storage purposes because the warmth and the daylight to which the specimens are exposed are causing their slow disintegration, so that many will be totally destroyed within the next 25 or 50 years if they are allowed to remain in their present location.

Up-to-date museums construct special moth-proof and gas-proof storage rooms which are maintained at an even, somewhat low, temperature and illuminated only by artificial light.

Publications

The following articles were published by the staff of the division during the past fiscal year:

Language, Mythology, and Songs of Bwaidoga. By D. Jenness. Memoirs of the Polynesian Society, vol. 8.

Comparative Vocabulary of Western Eskimo Dialects. By D. Jenness. Reports of Canadian Arctic Expedition, vol. 15, part A.

Little Diomede Island, Bering Strait. By D. Jenness. Geographical Review, vol. 19, No. 1 (January, 1929).

The Land of the Midnight Sun. By D. Jenness. The Country Gentleman, December, 1928.

The Downfall of Temlaham. By C. M. Barbeau. The MacMillan Company of Canada, Toronto, July, 1928.

Folk-songs of French Canada. By. C. M. Barbeau. The Toronto Conservatory of Music Quarterly, summer, 1928—"Quebec," London, England, October, 1928.

The Church of Saint-Pierre, Island of Orleans, Quebec. By Ramsay Traquair and Marius Barbeau. The Journal, Royal Architectural Institute of Canada, February, 1929.

Folk-songs of French Canada. By C. M. Barbeau. La Patrie, St.-Jean-Baptiste number, June, 1928.

Annotated program, Canadian Folk Song and Handicrafts Festival. By C. M. Barbeau.

Twenty-one Folk-songs of French Canada. By C. M. Barbeau. Harris and Company, Oakville, Ontario.

The Technique of Certain Aboriginal Cords. By W. J. Wintemberg. Thirty-fifth Annual Archæological Report, 1924-25, being part of Appendix to the Report of the Minister of Education, Ontario, Toronto, 1928.

Artifacts from Ancient Graves and Mounds in Ontario. By W. J. Wintemberg. Trans. Roy. Soc., Canada, 3rd ser., vol. 22, sec. 2 (1928).

Early French-Canadian Pottery. By Douglas Leechman. Canadian Homes and Gardens, September, 1928.

Collecting Harness Brasses. By Douglas Leechman. House and Garden, September, 1928.

West Coast Art. By Douglas Leechman. The Arts, New York, October, 1928.

Native Canadian Art of the West Coast. By Douglas Leechman. Studio, London, November, 1928.

Lanterns and Candles of Old Quebec. By Douglas Leechman. Canadian Homes and Gardens, December, 1928.

Lectures

Lectures were delivered by the staff during the fiscal year as follows:

By D. Jenness:

Glimpses of Native Life in Far Off New Guinea. Victoria Memorial Museum, December 1 and 5, 1928.

The Indians of Canada. Kiwanis Boys' Club, Ottawa. February 7, 1929.

The Romance of Archæology in America. Logan Club, Ottawa, February 27, 1929.

By C. M. Barbeau:

Southward Migrations of the Northwest Coast Tribes; The Modern Growth of the Totem Pole on the Northwest Coast; The Origin of Floral Designs Among the Canadian and Neighbouring Indians. The International Congress of Americanists, New York city, September, 1928.

Folk-songs of French Canada. Women's Canadian Club of St. Catharines, Ontario, and Alma College, St. Thomas, Ontario, December, 1928.

The Folk-songs of French Canada As a Basis for Musical Art in Canada. Empire Club, Toronto, March, 1929.

By Harlan I. Smith:

Museum Work in Canada. Art, Historical, and Scientific Association, Hotel Georgia, Vancouver, B.C.

A Visit to the West Coast of Canada. Victoria Memorial Museum, December 8 and December 12, 1928.

Making Motion Picture Records of the Indians of Canada. Gastronomic Club, Ottawa, January 30, 1929. Home and School Club, Percy Street school, Ottawa. Home and School Club, Elgin Street school, Ottawa.

By W. J. Wintemberg:

Archæological Work on the Labrador Coast. Rotary Club, Fredericton, September 11, 1928.

Accessions to Museum

(a) From Staff:

From Harlan I. Smith:
111 Blackfoot specimens from Gleichen, Alberta
258 West Coast specimens from British Columbia

From W. J. Wintemberg:
3 boxes of archæological specimens from Canadian Labrador
1 box of archæological specimens from New Brunswick

From R. M. Anderson:
1 specimen from Dundas Harbour

From L. J. Weeks:
1 wood drill chuck from Nettilling fiord

From J. B. Mawdsley:
1 pair of sealskin boots from Baffin island

From J. D. Soper:
1 kayak model from Baffin island

(b) Donations:

From National Museum of Denmark:
71 specimens from Central Eskimo

From Mr. Martin Nordegg:
25 Stoney specimens

From late J. A. Tait:
3 Thompson River specimens

From S. J. Wilson:
1 iron arrowhead from Devon island

From F. H. Lambart:
1 pair "lapp boots" from Alaska

From A. E. Robb:
1 ethnological specimen
3 archæological specimens

From W. C. Pound:
1 specimen from south coast of British Columbia

From R. James:
14 specimens from British Columbia

From H. B. Rowe:
5 archæological specimens from British Columbia

From W. J. Bates:
1 tubular pottery pipe from Bracken

From C. Lusk:
1 grooved stone maul from Woolsey, Sask.

From Herman Leisk:
4 skulls and human bones from British Columbia

From A. S. Vaughan:
2 skulls near Quesnel, B.C.

From S. Boys:
1 skull from Wenatchee

From Mr. Osborn:
1 skull and humerus

From Prof. E. E. Prince:
Portion of crania of Seminole Indians

From Frits Johansen:
11 archæological specimens from Ungava

From Inspector A. H. Joy:
9 specimens from Craig Harbour

From C. M. Garber:
8 specimens from Alaska

From R. J. Tait:
1 stone club
1 carved stone mortar

From G. D. Sprot:
3 photographs

From Mrs. J. H. St.-Clair:
1 blow gun and equipment from the Jibaro Indians of Ecuador

From Mrs. J. A. Wilson:
3 photographs
1 pipe
1 bracelet
1 bead bag
} from South Africa

From W. S. Lecky:
7 fragments of pottery from Belmont

From W. J. Coleman:
1 steel spear point from Chalk River, Ont.

From J. Russell:
5 archæological specimens, lake Athabaska

From Major D. H. Nelles:
15 archæological specimens from Grimsby

From "Chief George":
1 stone anchor

From W. Bell Dawson:
8 specimens from West Coast

(c) PURCHASES:

From Mrs. D. B. Dowling:
7 Indian specimens

From Canadian Handicrafts Guild, Montreal:
1 Iroquois cradle-board

From G. D. T. Pickering:
5 specimens from Tête de Boule Indians

Folk-Lore

Mr. Barbeau reports that the folk-lore data collected for the Museum during the past year stand as follows. The voluminous data collected during the summer investigations in Quebec, on the early French colonial handicrafts and school of architecture and sculpture, are mentioned elsewhere in the annual report.

French

The Barbeau (Marius) Collection:

Voluminous notes from early records on sculpture, architecture, handicrafts, etc.
375 folk-song texts
53 folk-tales and anecdotes
230 photographs
6 specimens donated to the Museum

The Lambert (Adélard) Collection:

56 song-texts with phonograph records
3 folk-tales

The Leechman (Douglas) Collection:

20 violin dance tunes of Quebec, recorded on the phonograph at the Museum

Other Collections:

Abbé Georges Côté, 39 photographs
Mlle. M. L. Laurin, 8 photographs, also MS. notes on potters and the ancient church of Lorette
Judge Pouliot, 3 photographs
Linsey Crossley, 4 photographs
Régis Roy, 1 folk-tale
L.-P. Geoffrion, 1 song text
W. J. Wintemberg, 1 song-text
Mrs. J. Mount-Duckett, 1 song-text
A. Y. Jackson, 1 homespun specimen

DIVISION OF BIOLOGY

R. M. Anderson, Chief of the Division, reports:

Field Work

R. M. Anderson in April, 1928, visited the Royal Ontario Museum of Zoology, Toronto; the United States National Museum, Washington; and the American Museum of Natural History, New York, and made extended notes on specimens of Canadian mammals as well as of methods of arranging and exhibiting zoological and botanical specimens. While in Washington, he attended the Tenth Annual Meeting of the American Society of Mammalogists, April 10 to 14, and presented an illustrated paper on "The Bowhead Whale in the Western Arctic." He left Ottawa again July 14 to join the Canadian Arctic Expedition of 1928 as naturalist. The expedition, under direction of Mr. George P. Mackenzie, Northwest Territories and Yukon Branch, Department of the Interior, sailed from North Sydney, N.S., July 19, on S.S. *Beothic*, passing through the strait of Belle Isle, and proceeding directly to Godhavn, Disko island, Greenland, arriving July 26. After a short visit, the *Beothic* crossed Baffin bay to

Bylot island and Ponds inlet, arriving July 30, moving north to Dundas harbour, Devon island, July 31. After some delays on account of ice in Smith sound, the vessel reached Buchanan bay, but was stopped a short distance from Bache Peninsula port, and was ultimately compelled to unload the supplies at the sub-station at Fram Havn. Moving southward the ship crossed to Greenland again, landing some Eskimos at Nerq settlement south of Etah on August 7, and also touched at Hakluyt island in Smith sound the same day. August 8 to 11 were spent in taking aboard supplies from Craig harbour, south side of Ellesmere island, to be distributed to other ports. The *Beothic* then crossed Jones sound to Sparbo, Devon island, where a small herd of musk-oxen was located and motion pictures taken. A second stop was made at Dundas harbour on August 13, and continuing up Lancaster sound to Beechey island, a cache was established for the winter patrol of the Royal Canadian Mounted Police. Ponds inlet was again visited August 15 by going through Navy Board inlet. A short stop was made at Clyde river, northeastern Baffin island, and a longer stop at Pangnirtung, Cumberland sound. The next port was Lake Harbour, on southern coast of Baffin island, which was reached on August 25. Crossing Hudson strait, the *Beothic* stopped at Port Burwell August 27-28, and running down the Labrador coast without incident of note, arrived at North Sydney on September 2, after an absence of forty-five days, and logging about 6,500 miles. Of the 255 hours available at fourteen ports some were lost on account of bad weather and darkness during the latter part of the trip, but fair collections were made, including 108 birds, 19 mammals, a small number of fishes and other forms of life, as well as many photographs. The past year or two have been notable for a shortage of all the smaller mammals in the eastern Arctic, particularly hares and lemmings, and the white and blue foxes, which constitute almost the whole fur trade of this region, have also been very scarce. The birds of prey were also reported to be very scarce, and the observers on the *Beothic* did not see a single snowy owl, gyrfalcon, or large hawk during the trip. A female narwhal was killed in Buchanan bay and the complete skeleton preserved for the Museum.

The expedition had the rare opportunity of seeing from the ship's deck a small herd of musk-oxen on the north coast of Devon island, and still and motion pictures were taken by members of the landing party after two bulls had been brought to bay by an Eskimo with one dog, illustrating the ease with which this now rare animal is hunted. A very important part of the work consisted in getting data concerning the range of the different species of mammals, and much first-hand information was obtained from traders at the different posts, many of whom had been stationed at other remote posts not visited on this trip. The various members of the Royal Canadian Mounted Police detachments, visited at seven different posts, gave much information on the occurrence of big game, sea mammals, and bird life in their districts, supplementing this with data on the life of the intervening country which is covered by their lengthy patrols, and several members of the force have made valuable collections for the National Museum. The present range and relative abundance of the barren ground caribou, Peary caribou, musk-ox, Atlantic walrus, narwhal, white whale, ringed seal, harbour seal, harp seal, bearded seal, hooded seal, and other species were checked and revised.

Mr. C. G. Harrold was employed as assistant zoologist for the season of 1928. He began work April 24 at Davidson, Saskatchewan, returning to Winnipeg May 9. During this time he concentrated on making a greatly needed collection of cranes for the National Museum of Canada. In this, thanks to the able assistance and hearty co-operation of Mr. Reuben Lloyd of Davidson, he was eminently successful and obtained a good series of these shy and wary birds, with full measurements, weights, sterna, and other details. He succeeded in establishing that the enormous flocks of these birds still to be seen in spring in this province, are largely if not entirely little brown cranes, *Grus canadensis*, lingering on their way to their breeding grounds of the far north, and are not the slightly larger resident sandhill cranes, *Grus mexicana*, of the cultivated sections. In fact none of the latter was secured and their future as continuing features of prairie life is still a matter of grave doubt. Another fact of interest brought out by the collection of these birds is that the red coloration of adults of either of these species is adventitious, caused by a deposit of iron stain, and is not a specific character.

P. A. Taverner, accompanied by Mr. Harrold, who had come to Ottawa towards the end of May, carried on ornithological investigations at Matamek, some 8 miles east of the mouth of Moisie river, on the north shore of the gulf of St. Lawrence. Here they were the guests of Mr. Copley Amory for the best part of the summer, to whom is due many thanks for courtesies and assistance in the work. Most of the time was spent in studying land birds which have been rather neglected on this coast in the past. July 13 to 27 was spent at Havre St. Pierre (Eskimo point) with a side trip to Gull bay near East cape, Anticosti island. July 27 to August 7 were spent at Natashkwan and July 8 to 18 at Matamek.

The results of the season's work were quite satisfactory, 326 birds and 61 mammals. A good collection of land birds was made considerably east of any locality on this coast so represented in our collections before, and a number of species were traced well beyond their previously known distribution. The report of common cormorants breeding on the northeast coast of Anticosti was verified and more nests located there than were thought to exist in America today. Though this once common species is enormously reduced in number from what it was originally, its situation is not quite so precarious as feared. An enormous rookery of kittiwake gulls was located at Gull bay and the presence of a small rookery of gannets there verified. There are now four known breeding places for this species in America—Bonaventure island, Gaspe; Bird rock, Magdalen islands; cape St. Mary, Newfoundland; and Gull bay, Anticosti. A number of very interesting plumage observations were made on the water birds and considerable additions to our knowledge of their life histories were made. Some of these are the basis of a number of short papers that will shortly appear in the ornithological journals. Mr. Taverner also attended the forty-sixth annual meeting of the American Ornithologists Union at Charleston, S.C., November 19-22, 1928.

H. M. Laing, of Comox, B.C., was again engaged as assistant zoologist, in continuation of the mammal work begun by him and C. H. Young along the southern boundary of British Columbia in 1927. He collected from May 11 to June 8 at Sterling creek (elevation 1,700 feet) on east slope of

Cascade mountains near Hedley, B.C. He moved next to Keremeos, working on Ashnola creek (elevation 1,500 feet) from June 12 to June 30; on Paul Terebasket creek (elevation 1,350 feet) from July 3 to July 10; and Fairview-Keremeos summit (elevation 3,800 feet) from July 12 to July 29. Camp was made on Testalinda creek, Okanagan river, below Oliver, on Oliver Irrigation Project, and collections made in the dry belt from August 1 to August 13. Work was carried on at 3,900 feet elevation, Osoyoos-Bridesville summit from August 15 to August 31. The next collecting ground was at Westbridge in Kettle River valley (elevation 2,075 feet) from September 14 to September 19, and back to Osoyoos lake (elevation 913 feet) from September 19 to September 29. Camp was moved up to Juniper mountain, south fork of Ashnola creek (elevation 4,500 feet) from October 2 to October 11, and investigations made on the Similkameen mountain sheep. Mr. Laing's results for the season were very satisfactory, and he collected 481 mammals and 56 birds, as well as accessories for several habitat groups of birds and small mammals.

C. H. Young was unable to continue the British Columbia work this year on account of poor health, and spent some time in England on sick leave.

Joseph Rochon, osteological preparator, left Ottawa on July 16 and proceeded to Lacoste, Labelle county, Quebec. He collected in vicinity of Black lake until July 18, bringing back 110 mammals. During the rest of the year his time was mostly spent on cleaning and mounting skulls and skeletons.

C. L. Patch, D. Blakely, and C. E. Johnson did some field work in Ottawa district, principally collecting local material to fill out the collections and obtaining accessories for habitat group work.

M. O. Malte, chief botanist, made a journey to Labrador, Hudson strait, and Hudson bay on board the Hudson's Bay Company S.S. "*Nascopie.*" Sailing from Montreal, Quebec, the boat touched Cartwright, Labrador, and then proceeded to Port Burwell and Wakeham bay, on the south shore of Hudson strait. From the latter point the boat sailed to Lake Harbour, Baffin island, and thence to cape Dorset. After touching Wolstenholme, on the extreme northeast corner of Hudson bay, the course was set for Chesterfield inlet, on the northwest coast of the bay. From Chesterfield inlet the boat proceeded to Southampton, Southampton island, and thence to Port Harrison and Smith island, on the east coast of Hudson bay. After other stops at Wolstenholme, Lake Harbour, and Port Burwell, the boat arrived at St. Johns, Newfoundland, September 10.

Sufficiently long stops, ranging from one to five days, were made at all ports of call, thus allowing a liberal time for making botanical collections in the immediate vicinity. Some 6,000 herbarium specimens of flowering plants and ferns were secured. Much appreciated help in securing this comparatively large number of specimens was given by Rev. H. A. Turner, who most ably assisted in collecting at all points touched.

The scientific results of the journey were very gratifying. They include the discovery of new species and varieties, the securing of ample material indispensable for the interpretation of difficult and hitherto poorly understood genera, such as willows and others, and the securing of a very large number of new plant-geographical records, e.g., not less than fifty from Southampton island alone.

H. M. Raup, assisted by Mrs. Raup, made a botanical survey of the southeastern section of Wood Buffalo park, Alberta, and in connexion therewith, investigated the habits and range conditions of the buffalo that inhabit the region. They left Fort Smith, N.W.T., June 14 and spent one month in Pine Lake region, after which the party moved to Peace point, on Peace river, where one week was spent. Two weeks were spent at Hay camp on Slave river, and in the middle of August an investigation was made of the region bounded on the east by the Slave River flats between Fitzgerald and LaButte, and on the west by the Salt Mountain escarpment. The party returned to Edmonton September 1. About 6,600 herbarium specimens were collected during the season.

Publications

R. M. Anderson continued work as general editor of scientific reports of Canadian Arctic Expedition, 1913-18. The only part issued during the year was vol. XV, part A: Comparative Vocabulary of the Western Eskimo Dialects, by D. Jenness. Some progress was made in preparing indexes for some of the completed volumes of the series. R. M. Anderson's paper on "The Work of Bernhard Hantzsch in Arctic Ornithology," principally in Baffin island and northeastern Labrador, was published in *The Auk*, vol. XLV, No. 4, October, 1928, pages 450-466. A translation of Hantzsch's "Contribution to the Knowledge of the Avifauna of Northeastern Labrador" ("Beitrag zur Kenntnis der Vogelwelt des nordöstlichsten Labradors," Journal für Ornithologie, vol. 56, pages 177-202 and 307-392) by R. M. Anderson and Mrs. Anderson was published serially in *The Canadian Field Naturalist*, Ottawa, beginning with vol. 42, No. 1, January, 1928, and finishing with vol. 43, No. 3, March, 1929. The paper by Mr. Anderson on "The Fluctuations in the Population of Wild Mammals and the Relationship of this Fluctuation to Conservation," read at Provincial-Dominion Game Conference, Ottawa, January 26, 1928, was published in *The Canadian Field Naturalist*, vol. 43, No. 8, November, 1928, pages 189-191. Several notes and book reviews were contributed to the same publication. Mr. Anderson lectured on "Canada's Arctic Regions," illustrated by motion pictures taken on 1928 Arctic Expedition, in Museum Lecture Series, January 12 and January 16, also to Young Men's meeting at Y.M.C.A., January 30.

Other short notes have been published by members of the staff in periodicals, but no formal articles have been listed.

M. O. Malte has continued intensive work on Arctic flora and other work in the herbarium, much of it being of an important revisionary character. During the year the plant collections were distributed as follows:

Division of Botany, Central Experimental Farm, Ottawa.....	10
Dr. F. S. Blake, Department of Agriculture, Washington, D.C..	9
Dr. M. Porsild, Godhavn, Greenland.....	233
Gray Herbarium, Cambridge, Mass.....	86

An important paper on "Commercial Bent Grasses of the Genus Arctogrostis," by M. O. Malte was published in the Annual Report of the National Museum of Canada, and a separate reprint of 500 copies of the same paper was issued by the Department of Agriculture, Ottawa. The

same museum report contained an annotated article on "Birds of the Belvedere Region, Northern Alberta," by P. A. Taverner. J. D. Soper's report, "A Faunal Investigation of Southern Baffin Island," Bulletin No. 53, Biological Series No. 15, was published.

Museum Work

Some progress has been made in installing biological exhibits in the Museum halls. A few habital groups of birds and small mammals have been prepared, and some old single specimens remounted. Little new work has been done in the exhibition of large specimens on account of lack of space. Arrangements have been made with the Forestry Branch, Department of the Interior, to make a beginning of exhibition of certain forest trees of Canada, as well as some of the important forestry products.

The Curator of Insects, Mr. Arthur Gibson, Dominion Entomologist, is also taking preliminary steps to install some new entomological exhibits.

As a result of field work, by members of the staff, considerable additions have been made to the study collections, and much material obtained suitable for subsequent mounting.

The Canadian National Parks Branch, through the Commissioner of Parks, Mr. J. B. Harkin, has kindly continued to send in many specimens of large game predatory and fur-bearing mammals from the various national parks, and the members of various detachments of the Royal Canadian Mounted Police, through the Commissioner, Colonel Cortlandt Starnes, have continued to send in valuable material from the Far North.

An important part of the work of the Museum, which is being carried on almost continuously, is identifying and systematically arranging the collections in botany and zoology which are coming in and making the data obtained from field work and collections available for reference, and in the preparation of reports on the fauna and flora of the country. The function of a scientific museum as a storage repository of scientific material of public interest and as a clearing house for scientific data is as important as its exhibitions for popular interest and education.

Accessions

ACCESSIONS TO THE ZOOLOGICAL COLLECTIONS:

Mammals received and catalogued	748
Birds received and catalogued	686
Amphibians and reptiles received and catalogued	114

MAMMALS:

By members of staff:

H. M. Laing, 455 mammals from southern British Columbia.
P. A. Taverner and C. G. Harrold, 62 small mammals from expedition to north shore of gulf of St. Lawrence.
R. M. Anderson, 19 mammals, Greenland and eastern Arctic archipelago.
Jos. Rochon, 111 small mammals, from Lacoste, Quebec.

By gift:

Frank L. Farley, Camrose, Alberta, 3 least weasels, 1 long-tailed weasel, 1 flying squirrel.

Canadian National Parks, 1 British Columbia red fox and 1 skull of mule deer from Jasper park, Alberta, 5 skulls of black bear from Yoho park, B.C., 3 skulls black bear, 2 skulls coyote, 1 skull grizzly bear, 2 black bears with skin and skull from Waterton Lakes park, Alberta, 4 beaver skins (imperfect).

C. O. Tatham, "Rod and Gun," Woodstock, Ont., 2 European hares in the flesh.

J. H. Fleming, Toronto, 1 cranium of grizzly bear, secured through Major Fred Brewster, Jasper park, Alberta.

Northwest Territories and Yukon Branch, Department of the Interior, 1 skin and skeleton of adult wood buffalo cow—from Wood Buffalo park (collected by district agent), 31 mammals from Mackenzie district (collected by A. E. Porsild and R. T. Porsild), 1 Arctic hare and 1 ground squirrel (collected by Major L. T. Burwash).

Royal Canadian Mounted Police, 3 skins and 5 skulls of Arctic hare from Baffin island.

E. E. Prince, Ottawa, skulls and horns, woodland caribou, mountain caribou, moose, and bison, etc.

Royal Ontario Museum of Zoology, Toronto, 1 skin and skull of little short-tailed shrew *(Cryptotis parva)* from series taken at Long point, Norfolk county, Ontario, in 1927, the first record of the species in Canada.

J. D. Soper, 3 skins of Polar bear cubs, sent down by Eskimos through efforts of J. D. Soper.

Seymour Hadwen, Head of Department of Veterinary Science, University of Saskatchewan, Saskatoon, 6 skins of varying hare and 2 of jackrabbit, illustrating studies in seasonal colour changes.

Lawrence B. Potter, Eastend, Sask., skin fragments of *Lagurus pallidus* and *Citelius richardsonii*, food of burrowing owl.

Major A. A. Pinard, Ottawa, 1 mounted head of white-tailed deer, with abnormal antlers.

R. Arkell, Britannia, 1 Canada skunk, in the flesh.

C. Small, Atherley, Ontario, 8 live bats.

BIRDS:

By members of staff:

P. A. Taverner, Ottawa, 1 starling in the flesh.

D. MacDonald, Ottawa, 1 great horned owl, in the flesh.

C. G. Harrold, 44 birds from near Davidson, Saskatchewan.

H. M. Laing, 57 birds from southern British Columbia.

P. A. Taverner and C. G. Harrold, 327 birds, 5 eggs, from expedition to north shore of gulf of St. Lawrence.

R. M. Anderson, 108 birds from Greenland and eastern Arctic archipelago.

C. L. Patch, 6 skins, 1 mounted bird.

C. E. Johnson, 1 white-throated sparrow.

By gift:

Arthur English, St. Johns, Newfoundland, 1 lapwing skin and stomach contents.

Jack Miner, 2 Cooper hawks, 2 long-eared owls, 1 Canada goose, 5 crows.

H. A. Wiggans, Ottawa, 1 barn owl, in the flesh.

E. Beaupré, Kingston, Ontario, 1 great horned owl in the flesh.

C. O. Tatham, "Rod and Gun," Woodstock, Ontario, 1 lapwing, salted in the flesh, from Ramea island, Newfoundland.

Geo. Whiteley, St. Johns, Newfoundland, 1 lapwing in the flesh.

Walter J. Boyles, Canaan Station, N.B., 1 great horned owl and one goshawk, in the flesh.

William Rowan, Edmonton, Alberta, 1 sandhill crane, skin.

Oscar Pothier, St. Hyacinthe, Quebec, 1 starling in the flesh.

Canadian National Parks, 2 yellow-legs, 1 turnstone, 1 ring-billed gull, from Natashkwan, Quebec, seized and confiscated by federal officers.

Ottawa Humane Society, 1 great horned owl.
Dorothea Patch, 1 sawwhet owl, in the flesh.
L. B. Potter, Eastend, Saskatchewan, 1 goshawk, fresh skin.
C. G. Harrold, Winnipeg, 1 golden plover, skin.
Gower Rabbitts, Game and Inland Fisheries Board, St. Johns, Newfoundland, 1 head, wing, and foot of European coot.
R. E. DeLury, 1 junco, in the flesh.
Mrs. Joseph H. Sinclair, 18 skins of hummingbirds from Andes mountains, Ecuador, through Mr. Frank W. Bedard.
Northwest Territories and Yukon Branch, Department of the Interior, 4 bird skins: black guillemot, harlequin duck, duck hawk, and willow ptarmigan (through Major L. T. Burwash); 4 skins from Baker Lake region: crane, loon, plover, and jaeger (collected by L. T. Burwash); 59 birds, 4 eggs (collected by A. E. Porsild and R. T. Porsild).
Royal Canadian Mounted Police, 8 birds from Baffin and Devon islands, including 1 greater snow goose with egg, from Devon island.
E. G. White, 1 female widgeon, 1 female shoveller from Lochaber, Quebec, in the flesh; 1 blue goose, juvenile in the flesh, from Cap Tourmente, Quebec.
Alfred Mougeot, Masson, Quebec, 1 marsh hawk, alive.
John Arkell, Britannia, Ontario, 2 Cooper hawks, 1 whip-poor-will.
M. B. near Moisie, north shore of gulf of St. Lawrence, 6 birds.
Miss Ida Taverner, Ottawa, 1 purple martin.
Ernest Ball, Smith Falls, Ontario, 1 purple martin.
Morris Lieff, Ottawa, 1 screech owl.
F. Grant, Ottawa, 1 Florida gallinule.
Robert Lockwood, Rockcliffe, Ontario, 1 nighthawk.
B. Crawford, Hull, Quebec, 1 oven-bird.
Ray Hewitt, Ottawa, 1 nighthawk, juvenile.
G. Douglas, Quyon, Quebec, 1 great horned owl, alive.
John Tanton, Ottawa, 1 nest of American goldfinch.

By purchase:

C. G. Harrold, Winnipeg, 2 blue goose skins.
Allan Moses, Grand Manan, N.B., common cormorants in the flesh.

AMPHIBIANS AND REPTILES:

By gift:

Fred Ball, Chelsea and Kingsmere, Quebec	29
Ernest Ball, Portland, Ontario	2
D. J. Blakely, Portland, Ontario, and Gatineau Point, Quebec	37
E. R. Buckell, Nicola, British Columbia	1
Doreen Dodd, Telegraph Creek, British Columbia	3
A. M. Gammade, Kinburn, Ontario	1
C. E. Johnson, Blackburn, Ontario	2
L. M. Klauber, San Diego co., California	1
H. M. Laing, Keremeos, Princeton, Rock Creek, and Comox, British Columbia	5
Emerson Leftly, Ottawa, Ontario	1
Eddie Lennox, Meach Lake, Quebec	2
Hoyes Lloyd, Golden Lake, Ontario	1
Robert Lockwood, Ottawa, Ontario	1
L. Marcotte, Sherbrooke, Quebec	10
R. O. Merriman, Kingston, Ontario	1
W. H. Moore, Scotch Lake, New Brunswick	1
C. L. Patch, Blackburn and Ottawa, Ontario	3
L. S. Russell, Ponoka, Alberta	1
N. B. Sanson, Banff, Alberta	1
Harlan I. Smith, Penticton, British Columbia	1
P. A. Taverner, Natashkwan and Matamek river, Quebec	10
Total	114

PLANTS:

By gift:

H. Groh, Central Experimental Farm, Ottawa	31
Norman Criddle, Entomological Branch, Department of Agriculture, Ottawa	2
Dr. M. Porsild, Godhavn, Greenland	69
Dr. Selim Birger, Stockholm, Sweden	125
Brother Louis-Marie, Oka, Que	100
Professor Marie-Victorin, Montreal, Quebec	224
The Hungarian National Museum, Budapest, Hungary	100
United States National Museum, Washington, D.C.	94
Gray Herbarium, Cambridge, Massachusetts	15

Grateful acknowledgment is made of the receipt of an interesting collection of plants from Bylot island, made by Inspector C. E. Wilcox, R.C.M.P., and of collections of seed from Baffin island, made by Staff Sergeant J. E. F. Wight, R.C.M.P.

DIVISION OF MINERALOGY (Geological Survey)

Eugene Poitevin, Chief of the Division, reports:

The Division of Mineralogy is a division of the Geological Survey, but it has important functions to perform in connexion with the National Museum of Canada. These functions consist in collecting and exchanging mineral specimens and placing them on exhibit, making contributions to the scientific investigations of Canadian minerals, and promoting the knowledge of mineralogy by means of publications, lectures, and the distribution of mineral collections to educational institutions.

More than 3,000 mineral specimens were added to the systematic and economic collections. A fine set of mahogany table cases having been completed, twenty cases were filled with exhibits and plans were made for further exhibits.

In addition to identifying a large number of specimens for the systematic collection, the mineralogists of the division contributed the following studies to Canadian mineralogy.

Eugene Poitevin studied a large suite of specimens from the serpentine belt of the Eastern Townships, Quebec, the principal ones being perovskite from lake Nicolet, and prehnite, natrolite, scolecite, diopside, albite, grossular garnet, etc., from Thetford asbestos mines. He also investigated a new mineral from British Columbia.

H. V. Ellsworth nearly completed the writing of a report on the rare earth minerals of Canada, and also published the following papers:

Thucholite, a remarkable primary carbon mineral from the vicinity of Parry Sound, Ontario.
Cyrtolite intergrowth associated with the Parry Sound thucholite.
Thucholite and uraninite from the Wallingford mine, near Buckingham, Quebec.
Euxenite from Sabine township, Nipissing district, Ontario.
Zircon from North Burgess, by C. Palache and H. V. Ellsworth.
A simple and accurate constant volume pyknometer for specific gravity determinations.

R. J. C. Fabry, analyst, made a number of complicated analyses of minerals such as topaz, beryl, and margarodite from the Silver Leaf mine. He also undertook the study of perovskite and ilmenite from the serpentines of lake Nicolet in the Eastern Townships of Quebec. He made

analyses of natrolite and prehnite from the granite dykes occurring in the peridotite of Thetford Mines; and completed the analyses of a limestone from Ainslie Lake, N.S., and of three rocks supplied by T. T. Quirke from Parry Sound district, Ont. Mr. Fabry also did some research work for Mr. Taverner, to determine whether the colour of certain bird feathers was original or of the nature of a stain.

Educational Collections

The educational section of the Mineralogical Division was equally as busy as the other sections and the magnitude of the work is illustrated by the following table, which shows that 379 collections were shipped to various institutions. Of these, each Standard collection contains 144 specimens, Grade 2 contains 44 specimens, Grade 3 contains 40 specimens, Grade 4, a special collection prepared for the Department of Mines, Quebec, contains 40 specimens, Prospectors collection contains 16 specimens, miscellaneous or special collections vary from a few to more than 100 specimens, and each mineral chips collection contains 46 bags of minerals. Thus 11,835 specimens, having a total weight of 27,400 pounds, were distributed.

Destination	Standard collection	Collection			Prospectors collection	Miscellaneous	Mineral chips	Kegs
		Grade 2	Grade 3	Grade 4				
British Columbia	3	1	1	0	5	0	0	0
Alberta	0	1	0	0	0	2	1	0
Saskatchewan	1	0	1	0	3	0	0	0
Manitoba	2	1	1	0	66	1	1	1
Ontario	4	6	48	0	58	22	2	0
Quebec	7	1	0	75	27	13	0	0
New Brunswick	0	0	0	0	4	1	1	0
Nova Scotia	1	0	0	0	0	2	0	0
Foreign	1	0	1	0	3	9	0	1
	19	10	52	75	166	50	5	2

In addition to the large number of standardized sets tabulated above, the division assembled special collections of mineral specimens for display in Toronto, Regina, and Minneapolis.

Accessions

Donations

United States Geological Survey. Halite with polyhalite and some clay, polyhalite with anhydrite and halite, halite with polyhalite also some green clay, anhydrite and halite with one speck of magnesite on polished face, polyhalite with seams of magnesite, small quantity of anhydrite, from Texas fields, New Mexico; sylvinite-halite and sylvite, green clay, from American Potash Co., New Mexico.

President of the International Nickel Company. Three specimens of nickel-copper ore from Frood mine.

Canadian International Corporation, Montreal, Quebec. Antimony from Lake George, N.B.

A. W. G. Wilson, Mines Branch, Ottawa. Series of zeolites from cape D'Or, N.S.

H. S. Spence, Mines Branch, Ottawa. Large series of specimens, the principal collections being: 1 suite of lithium-bearing minerals from South Dakota, U.S.A.; andalusite from Hill City, South Dakota; series of specimens from Silver Leaf mine, Manitoba; series of feldspar specimens from Loughborough township, Frontenac county, Ont.; series of amazonite and rare earths, Woodcox mine, Hybla, Ont.; series of specimens carrying sphene from lake Eau Claire, lot 14, con. VII, Calvin tp., Nipissing dist., Ont.; series of specimens from molybdenite mine, Wilberforce, Ont.; garnets from McKay feldspar mine, McKay, Ont.; lepidomelane and other minerals from Faraday township, Ont.; phlogopite and tremolite from the Orser mica mine, Bedford township, Frontenac county, Ont.; calcite from Bobs Lake mica mine, lot 30, con. VI, Bedford tp., Frontenac co., Ont.; lattice calcite from lot 13, con. V, North Burgess tp., Lanark co., Ont.; turgite from Black island, lake Winnipeg, Manitoba; przibramite from McNally mine, lot 21, con. V, North Burgess tp., Lanark co., Ont.

L. H. Cole, Mines Branch, Ottawa. One large specimen carrying an association of selenite, calcite, and galena, two large crystals of selenite, two fine masses of cleavable selenite, from Galetta lead mine, Galetta, Ont.

Collected by Officers of the Geological Survey

J. F. Wright. Eight specimens of copper-zinc ore from Sherritt-Gordon mine, northern Manitoba.

E. R. Faribault. Two polished specimens of gold-bearing quartz from Nova Scotia.

T. L. Tanton. One specimen from a palladium-bearing nickel deposit near Shebandowan lake, Thunder Bay district, Ontario.

Eugene Poitevin. Aplite showing large vug coated with prehnite crystals from King asbestos mine, Thetford Mines, Quebec; huge crystals of natrolite from Johnston's asbestos mine, Thetford, Quebec; calcite crystals, pectolite, prehnite crystals, diopside, scolecite crystals, from the Jacobs asbestos mine, Thetford, Quebec.

Eugene Poitevin and A. T. McKinnon. Massive ilmenite, and ilmenite crystals and perovskite crystals occurring in a serpentine body on the shore of lake Nicolet, Wolfe county, Quebec.

H. V. Ellsworth. Considerable quantity of various species of rare minerals from the pegmatites of central Ontario, including cyrtolite, uraninite, thorite, zircon, ellsworthite, titanite, allanite, transparent apatite of gem quality, and other undetermined minerals; and also a complete suite of specimens of the granites and related rocks of the Brockville-Mallorytown area.

DIVISION OF PALÆONTOLOGY (Geological Survey)

E. M. Kindle, Chief of the Division, reports:

Field Work and Collections

Collections for the Museum by members of the division include a suite of Upper Devonian fossils from the Eifel district of Germany and of Middle Devonian fossils from the Middle Devonian of Belgium and France collected by E. M. Kindle.

Miss A. E. Wilson made a collection in the Cornwall area, Ontario, from the horizons between the Aylmer limestone and the top of the Trenton.

Collections made in Alberta by C. M. Sternberg include a nearly complete skeleton of a duck-billed dinosaur, the skull of an undescribed dinosaur, and part of the skeleton of a horned dinosaur. Mr. Sternberg also collected the hind feet of two undescribed, small, carnivorous dinosaurs, the posterior half of a crocodile skeleton, and a fine skull of another crocodile. Several turtles and a fine mammal jaw (*Eodelphis*) were also secured.

Other collections, some of which were both extensive and of good quality, have value mainly from a stratigraphic view point and are chiefly related to work reported on by the Geological Survey.

Museum Exhibits

The preparation of the horned dinosaur skeleton, from the Edmonton formation, has been nearly finished; the missing skull will be modelled from another specimen. Hind feet of two new carnivorous dinosaurs have been prepared and two dinosaur skulls have been partly prepared. A fine skull and jaws and part of the skeleton of a three-toed horse (*Mesohippus*) have been received as an exchange.

Collections acquired by purchase for exhibit include a series of fossil insects preserved in amber and an ammonite nearly 2 feet in diameter.

A fine series of specimens showing the work of boring molluscs in rock construction has been added to the collections to be placed on exhibit when more space becomes available.

Educational Collections

About 75 school collections of fossils have been assembled during the year for the use of teachers and students in the secondary schools. A few fossil collections of more elaborate character than the school collections have also been distributed, and include one to the Museum of the city of St. John, N.B.

Type Material

The types resulting from the description of new species of fossils belonging to the Museum which have been added to the Museum collections during the year may be summarized as follows:

Vertebrates: published in		
Contributions to Canadian Palæontology, Bulletin 49	1	species
Proceedings, Royal Society of Canada for 1928	1	"
Canadian Field Naturalist, 1928	1	"
Invertebrates: published in		
Contributions to Canadian Palæontology, Bulletin 49	8	"
Proceedings, Royal Society of Canada for 1928 (old species illustrated for the first time)	17	"
Plants: published in		
Contributions to Canadian Palæontology	4	"

Donations

A general collection of natural history material presented to the Museum by Dr. Bell Dawson included some good specimens of trilobites from Ottawa district. Dr. Dannenberg of Aachen, Germany, presented a good collection of Middle Devonian fossils from Germany. Professor Smith of Bristol, England, presented six specimens representing genotypes of corals from England and Scotland. The Princeton University Museum presented a cast of the large Cambrian trilobite *Mesonacus gilberti.*

THE ANCIENT EDUCATION OF A CARRIER INDIAN

By D. Jenness

British Columbia west of the Rockies has been for countless centuries a melting pot where tribes of varying origins, coming from north, east, and south, have jostled against each other, mingled, and changed, evolving as a result a peculiar culture that was similar in its broader outlines over the whole area and slowly overflowed eastward into the interior of the country. The present paper makes no attempt to trace the distance to which this west coast culture has penetrated, or is penetrating, for the process was still going on a few years ago. Instead, it selects a single tribe, and stresses mainly one aspect in the life of that tribe, in order to illustrate the manner in which the culture spread and its revolutionary effect on the peoples who came into contact with it.

If we exclude the Arctic coastline, then Canada north of about the 56th parallel, that is to say nearly a half of the total area of the country, was inhabited almost exclusively by the so-called Athabaskan tribes who spoke varying dialects of a common tongue. One of the southernmost of these tribes is the Carrier, which many centuries ago crossed the Rockies (probably by way of Peace river) and settled in northern British Columbia around the valleys of the Fraser, Nechako, and Skeena rivers. At the present time the Carriers extend over an area roughly 250 miles from east to west and 180 miles from north to south, on both sides of the Canadian National railway between Prince George and Hazelton. Around Hazelton they have mingled largely with the Gitksan, a typical west coast people of the Tsimshian group; and for many generations they have had both peaceful and hostile relations with the Kitimat Indians of Douglas channel and the Bella Coola Indians around the mouth of Bella Coola river. These three tribes have so profoundly affected the Carriers, especially the westernmost or Babines, that, apart from their language, and the relative importance attached to hunting as contrasted with fishing, very little remains of their original mode of life.

Early Culture of Carriers

It is reasonable to suppose that before this change in their culture took place the Carriers were hardly to be distinguished from neighbouring Athabaskan tribes; for even today the easternmost Carriers resemble the Sekani tribes to the northward as much as they do their kinsmen around Hazelton, Moricetown, and Babine lake who have been most exposed to west coast influence. If we may assume, then, their original resemblance to the Sekani and other neighbouring Athabaskan tribes, the Carriers were formerly divided into a number of loosely organized groups each with its special hunting territory, a territory that was not subdivided again among the different families, but remained the possession of the entire group. Fixed dwellings were unknown; the groups simply wandered from one hunting or fishing ground to another, setting up tents of skin or rude shelters of brush and bark. Inheritance and descent were in the paternal line, there were no caste distinctions, no regular chiefs,

and no special class of medicine men. Religious ideas were relatively simple. All living creatures were believed to be more or less endowed with supernatural power, which if rightly solicited they often placed at the service of man. The desire of every Carrier hunter was to obtain in secret some tutelary bird or animal which he could call to his aid in time of stress. High gods had no place in this early religion; and of the various supernatural monsters that it was thought once peopled the earth the majority had been killed by a mighty hero in days long since.

Early Educational System

The loose organization of society among the early Carriers, and the simplicity of their religious doctrines, affected the education of the young. The name that a child received at birth was not hereditary in the family, but either some high-sounding title or a word derived from the "medicine" of his father or of some man renowned for "medicine" power; and the name was not changed later, through ascent in rank or dignity, but endured through life, except when it was superseded by some nickname or, in rare cases, by a name revealed when acquiring medicine power. Both boys and girls grew up during their early years free and untrammelled. As soon as they were old enough the boy followed his father and uncles to the chase, the girl helped her mother and aunts in all the domestic duties of camp life. Knowledge of religious matters and of the duties of social life was acquired from observation and from occasional folk-tales told mainly by old women at odd moments of the day or night.

A little more attention was bestowed on the children when they reached their teens. The girl learnt from her female relatives all the restrictions that would surround her for the remainder of her life, the periodical seclusion, the foods that were henceforth forbidden to her, and the precautions that she must observe in handling the weapons of the hunters. The boy too was forbidden certain articles of food from the age of about twelve. Some two years later he was sent out into the woods to seek his "medicine." Then for a few days he wandered alone in the forests, sleeping and dreaming on an animal's tracks, or beside some silent lake, or high up on the slopes of a mountain. But from the moment he returned his probation ended, whether he obtained a "medicine" or not; thenceforward he was as free as in his childhood days, save that now he was classed among the hunters of the community and required to contribute his share towards its support.

Change in Social Organization to West Coast Pattern

Simple in the extreme then was the educational system of the Carriers in those early days before they crossed the Rockies. But, with everything else, it was revolutionized when some of the bands pushed westward into Skeena River valley and encountered Indians from the west coast. The social system was the first to be reorganized. The migratory life of hunting was partly superseded by fixed habitations at favourable fishing localities, and the loose structure of society gave place to a rigid clan system of nobles, commoners, and even slaves. Every clan possessed a "long" or semi-communal house presided over by a head man. Generally

speaking only the nobles of closely related families recognizing the same crest or totem dwelt in the big communal houses; the commoners erected smaller dwellings in the immediate vicinity. Descent and inheritance now followed the maternal line instead of the paternal, although the actual status of the women seems to have remained about the same.

Change in Religious Doctrines

Even if no other changes had occurred this great revolution in the structure of society would have had far-reaching effects on the education of the children. But it was accompanied by an equally great revolution in religious doctrines and ideas. The western Carrier still devoted the greater part of the year to hunting, and he still preserved his early faith in the intelligence of animals, an intelligence he believed to be similar and sometimes superior to that of man. But this simple faith he now converted into a ritual; instead of soliciting the favour of the animals and obtaining their aid by prayer and fasting, he sought to coerce them and to gain their power by the use of spells, magic herbs, and rigid self-discipline, that is to say, by the ritual commonly known as *xal*. Simultaneously there arose, or became more prominent, a belief in a luminary deity, the sky-god *Sa* who in more recent times has been reinterpreted as the God of the Christians, *Utakke*, "He who dwells on high." Violations of the moral code, and violations of the numerous taboos and injunctions that had sprung up in increased numbers, were direct offences against *Sa*, who would be certain to punish the offender before many moons rolled by. A third change in the religion of the western Carriers, and one which also had great influence on the upbringing of the children, was the growth of a belief in certain vague supernatural forces which could smite a man at a moment's notice and make him the medium of supernatural power. Not a year passed, probably, in which some member of the community, man or woman, was not stricken with a kind of hysteria, the "medicine" sickness, that could be cured only by nightly drumming, singing, dancing, and the exorcisms of other medicine men. Every child that watched these performances knew that sooner or later, but probably in early life, he might himself be stricken in the same way and called upon to become a medicine man. All the more likely was this to happen if a parent or an ancestor had been a great medicine man before him; though medicine power was not a direct inheritance and many legends are told of poor and despised orphans who rose to rank and influence through its acquisition.

Development of New Educational System

The western Carrier was now living in a new world. Both society and religion had been changed and systematized, and the education of the children was bound to undergo a similar revolution and development. Not that there was any change in its fundamental purpose; the results it sought to obtain were the same as under the old order of things. Every boy was trained to be a successful hunter, so that he could provide for all the needs of his household and community; and every girl to become a

useful wife and a fertile mother, so that the houses might be filled with children and the village maintain its prosperity and strength. But the all-pervading idea of system had taken hold of the people and education had to fall into line.

So it came about that among the western Carriers, those who were most subjected to west coast influences, education was divided into two parts or courses, which ran concurrently and in many ways overlapped. One was a secular education, the other ethical and religious. It will be convenient to discuss the two separately, beginning with the former.

Secular training, or *geretne*, as it was called, was instruction in the various manual tasks that the children would have to perform when they grew up. With a girl this meant the carrying of wood and water, the curing and cooking of fish, meat, and berries, the tanning of skins, the designing and sewing of clothing, the making of birch-bark baskets, sinew thread, etc.; with a boy it involved such things as house-building, the manufacture of tools and weapons, woodcraft, and the methods of hunting and fishing. For, as in most communities, whether savage or civilized, the man provided the necessities of the home, the woman organized them and worked them up for use.

Secular education of this kind was imparted mainly by the parents and grandparents while the child was very young; later the mother's brothers and sisters played an important role, inheritance and descent now following the maternal line. Just as in those earlier times when the Carriers hunted east of the Rocky mountains, the girls helped their kinswomen in the house and carried wood and water, while the boys followed the men to the fishing and hunting, or played in the open spaces around the villages; only now there was more conscious supervision of their movements, and more direct instruction in their work and play. For example, boys were not allowed to run downhill, only uphill, so that they might gain endurance for the chase. At Hagwelget, the most western of the Carrier villages, several trails lead down a steep cliff to the foot of a canyon, and the boys were trained to race one another from the bottom to the top of this cliff.

The second course in the education of a western Carrier was religious instruction. Here the method adopted was the folk-tale, *gidete*, narrated by the head of the long house after the evening meal. Nearly every story carried with it either the explanation of some phenomenon—like the moaning of the trees beneath the wind or the flatness of the beaver's tail—or else a moral, such as the penalty involved in the violation of a certain taboo; for religious instruction went hand in hand with instruction in manners and morals. Breaches of etiquette or of the moral code might be punished with an occasional thrashing, administered usually by the mother's brother. More often the offence was allowed to pass without remark until the evening. Then, when the inmates of the house were preparing to retire for the night, the old head man from his couch at the back would begin a story to which everyone lent respectful attention. Gradually developing its plot until it applied to the present occasion, he would turn to the culprit and ask "Did you do such and such a thing today?" The boy was bound to confess. Then the old man would resume

his story and stress the punishment meted out by *Sa*, the sky-god, or by the animals, for this breach of the customary law. Men still surviving state that the shame and humiliation inflicted by this method were harder to endure, and more efficacious, than the most severe corporal punishment.

Rank, that new institution borrowed by the Carriers from their west coast neighbours, was a very potent factor in the educational sphere. For rank carried its obligations—*noblesse oblige*. A child of noble rank (and we must remember that the nobility formed a much larger proportion of the population than with us) was given an hereditary name at birth, and a more important title at the age of ten or twelve. These names were bestowed at potlatches in the presence of most of the people. They publicly established the child's place in the community and marked out the line of its future advancement. In return the boy (or girl) owed it to his kinsfolk to live up to his position. He should be respectful to his elders, and especially to the widowed, the aged, and the infirm, whether of equal or of lower rank; Orion's belt in the sky stood as a perpetual warning of the efficacy of an old woman's curse. Misfortune should never be mocked nor sorrow ridiculed. When a widower mourned his loneliness, weeping inside his hut, the boy should softly draw near and ask in low tones whether a little food would be acceptable, or a few sticks of wood to replenish the fire. He should never ridicule the animals, or gloat over success in hunting; the mountain sheep destroyed a whole community because a few youths had cruelly tortured a little lamb. In his play he should never be uproarious, but observe a certain dignity and moderation; *Sa*, the sky-god, carried a whole village into the sky and dropped the lifeless bones to earth again because the children had refused to heed the warnings of their parents and raised a tumult around their homes. Regulations such as these, promulgated by the old men at night through folk-tales, had to be observed by every child, but especially by the nobler born, because their parents had expended much property in potlatches to give them high standing. Filial obligation demanded obedience. Not seldom had the degenerate son of a noble father been eclipsed in fame and honour by some poor orphan who drank in the words of his elders through the half-open door.

Special rules of etiquette were laid down for girls. For example, a high-born girl should look straight ahead as she walked, turning her head neither to right nor left; girls of lower rank should keep their eyes modestly fixed on the ground in front of them. The stone labret worn by the noble maiden was a perpetual reminder to her that she should speak slowly and with deliberation. It reminded her, too, that her kinsfolk had expended much wealth upon her, that she was an asset to the whole community, that she must, therefore, guard her words carefully and never speak ill of any one. A growing girl was fraught with mighty powers for good or evil and this was borne in upon her during a period of two years' seclusion. The special clothing she wore at this period, and the numerous taboos which hedged her round, all educated her to a knowledge of her social status, and the lesson was driven more deeply home by stories handed down from one generation to another.

Modern Decline

Geretne and *gidete*, therefore, direct instruction in the everyday tasks and story-telling, were the two methods evolved or borrowed by the western Carriers to train their children in the newly established mode of life. By these two methods, century after century, they handed down the torch of their civilization. It was on its educational system, indeed, however varied it might be in different places, that the strength and vitality of west coast culture largely depended. As long as this aboriginal education remained intact that culture flourished and spread. The western Carrier tribes had fallen wholly under its influence; and it had taken firm root among the eastern tribes. Even the Sekani to the north were adopting a typical clan system, with crests and privileges, maternal descent, and a division into nobles and commoners. But the times have changed again. Rifles and steel traps have diminished the supply of game and lessened the importance of hunting. Economically life has become more complex, more difficult. Old traditions and old ideas have been discredited, and old regulations and taboos that held sway for countless centuries have been ruthlessly flung aside under the new regime brought in by the white man. The young men no longer respect their elders; the girls stalk brazenly about, aping the manners of their white sisters, but without the guidance of a regulated home life and an unbroken code of conduct. The older men, unable to remould their minds, spend their days in a pathetic attempt to reconcile their traditional ideas and beliefs with the new ones so suddenly thrust upon them from without; or else they cling desperately to the old beliefs, justifying them with the new-born theory of a separate revelation to their ancestors long ago. So the communities are declining. "The old graveyards are small," the Indians say, "but the new ones large and overflowing." And it is not the changed economic conditions that are producing this decline, nor the new diseases introduced by the white man, but the weakening of the old social bonds of the community, and the breaking-down of the old educational system, without its replacement by another as adequate.

A STUDY OF THE CANADIAN RACES OF ROCK PTARMIGAN

(*Lagopus rupestris*)[1]

By P. A. Taverner

In studying the specimens collected by J. D. Soper for the National Museum of Canada in Baffin island (Pangnirtung, lake Nettilling, and cape Dorset) it became evident that two forms of rock ptarmigan were represented in our general collections. One, decidedly yellow or ochraceous, of more northern range; the other greyish and less yellow, of more southern distribution. Reference to literature indicates that little has been written regarding the rock ptarmigan of the main continental mass or of the islands to the north of it. Most authorities have been content conventionally to assume that the bird of the eastern Arctic islands and Greenland was *reinhardi* and that of the mainland was *rupestris*, with *welchi*, under full specific standing, restricted to Newfoundland. The material under survey did not seem to satisfy this hypothesis. The most recent author to study the species is H. S. Swarth[2], but neither do all his conclusions agree with the facts presented by the new material. It seemed advisable then to make as thorough a study of the species as was possible.

Written description unaccompanied by identified specimens is a most unsatisfactory guide to the determination of the various ptarmigan races, and it was evident that little could be done with the material without approximate topotypes of the accepted races. Attempts to borrow such specimens revealed a most surprising dearth of them in collections. Through the courtesy of other museums[3] considerable pertinent material was obtained, though on assembling all the fragmentary nature of the data is evident. The presence of a northern yellow race is generally substantiated, but the picture is obscured by lack of definite outlines and disturbed by the unexplained sporadic occurrence of typical specimens far from what would seem to be their proper range.

The comparison of rock ptarmigan plumages is an exceedingly difficult process. The white winter plumages are practically useless for subspecific determination. The sexes in summer are dissimilar and, besides the juvenile, each have two distinct plumages that, crowded into the short northern season, are decidedly evanescent. It is unusual that either of these plumages is presented in completeness. They blend one into the other and the birds seem in continuous moult throughout spring, summer, and autumn, and masses of early plumage persist through later ones. It

[1] In view of the large amount of individual, sexual, seasonal, and adventitious variation in the species, the consequent large series of specimens necessary for successful study of the races and the paucity of extralimital material available, it does not seem worth while to attempt comparison between New and Old World forms at this time. Therefore, the relationship between *Lagopus rupestris* and *Lagopus mutus* has not been touched upon in this review. As a matter of convenience and without prejudice to the contrary, it is assumed that the North American species is *Lagopus rupestris*.

[2] "Birds of Atlin District, British Columbia"; Univ. Cal. Pub. in Zool., vol. 30, No. 4 (1926).

[3] Museum of Comparative Zoology, Cambridge, Mass.; Museum of Vertebrate Zoology, Berkeley, Cal.; U.S. National Museum, Washington, D.C.; American Museum of Natural History, New York; Public Museum of the City of Milwaukee, Milwaukee, Wis.; Academy of Natural Sciences, Philadelphia, Pa.; and the Carnegie Museum, Pittsburgh, Pa. To these institutions and their curators we desire to express our thanks.

is possible to find more or less complete remains of four distinct plumages in one and the same bird, without any one of them showing decided predominance. Thus traces of last winter plumage may persist while that of next winter is just appearing and the two summer ones present an ill-defined mixture. The seasonal changes are not simultaneous in all individuals and birds of the same sex, time, and place may show widely different plumage development.

The plumage itself is soft and the wear very rapid. This is specially true of the light edgings that are much less resistant to abrasion than the dark parts. Even during the short period these summer plumages are worn the light feather edges which lend the most characteristic subspecific characters are often cut away until racial features are obscured, lost, or even apparently reversed as between races. Another and not the least important difficulty in studying these birds is the optical one of comparing unlike surfaces, feathers in mass on one specimen against individual plumes in another, often with totally different backgrounds that entirely alter the relative visual impressions. The colour patterns are complicated, variable, and subject to great individual variation in both detail and general effect. Size is also a variable quantity in the ptarmigan. Careful measuring of large numbers of specimens may show average differences between the races, but in the birds examined the distinction is so swamped by individual variation as to make it an uncertain criterion for the identification of individuals. A factor that may mislead the investigator is the common overgrowth of the bill and claws of all the ptarmigan. This seems dependent upon the condition of the grounds upon which the birds have recently fed. When the rocks and soil are covered with snow or the birds are living on the soft tundra moss both claws and bill, deprived of the contact with abrasive material, continue to grow and occasionally assume almost monstrous proportions, returning again to their normal size when grit is once more available.

The species is strongly migratory and movement may start comparatively early in the season, resulting in many birds of different origins mixing together and losing their racial groupings before they do their distinctive plumages. With all these sources of confusing variation it is evident that large series of specimens are necessary for a final or detailed study of the species—such a series as probably does not exist in our collections today.

The present series consists of 105 summer-plumaged specimens from Arctic America, the islands to the north, western Greenland, Newfoundland, and a few more southern continental localities. On a purely colour basis they divide into two distinct groups; one strongly yellowish, the other decidedly and generally greyish. Of course, all individuals are not equally marked in these characters and there are numerous intermediate specimens whose reference to one group or the other is more or less uncertain. It is doubtful if any two authorities would agree on the allocations of some of these, or even that a single judge would make exactly the same decision at different examinations. A point to be stressed is that these uncertain birds do not occur only on intermediate ground between consistently constant racial groups where hybrids can be expected, but may occur sporadically anywhere even where pure racial strains would be

supposed to prevail. More disturbing still is the occurrence of typical or even ultra-typical individuals far from their centres of apparent predominance and deep in the range of other forms. Some of these cases can be explained by migration or other factors, others cannot be so easily disposed of and remain to disturb otherwise satisfactory hypotheses.

SPECIMENS EXAMINED

I

Spring Females

Yellowish Group

1.	Am. Mus.	64128	Disko is., Greenland	July	28, 1893	
2.	M.C.Z.	100939	Bedford Pim is., Frank	May	16, 1900	Almost white
3.	N.M.C.	20799	Nettilling l., Baffin is	June	19, 1925	Largely white
4.	"	20754	"	June	10, 1925	"
5.	"	8076	Coronation gulf, N.W.T	June	19, 1911	Breeding
6.	"	7915	Collinson pt., Alaska	June	5, 1914	
7.	"	7956	"	July	4, 1914	
8.	"	7922	"	June	9, 1914	
9.	"	7921	"	June	9, 1914	Breeding
10.	"	7919	"	June	9, 1914	"
11.	U.S.N.M.	93158	Pt. Barrow, Alaska	July	14, 1883	
12.	M.V.Z.	32170	Jade mts., Alaska	May	28, 1899	Breeding
13.	"	9796	Pt. Snettisham, Alaska	Aug.	29, 1909	Juvenile
14.	M.C.Z.	205490	Anticosti is., Que	July	10, 1881	Breeding
15.	U.S.N.M.	43675½	Fort Yukon (Alaska?)	June	, 1864	
16.	M.V.Z.	42035	Near Hazelton, B.C	Aug.	5, 1921	
17.	"	44719	Atlin, B.C	Aug.	1, 1924	Breeding
18.	N.M.C.	16282	Taylor is., Victoria is	July	21,	Pale

II

Spring Females

Greyish Group

19.	A.M.N.H.	64129	Disko is., Greenland	July	28, 1893	
20.	P.A.S.	30139	"	July	16, 1892	
21.	"	26963	Svarte Huk, Greenland	July	8, 1891	
22.	A.M.N.H.	67820	White str., Baffin is	July	25, 1896	
23.	N.M.C.	21147	Amadjuak bay, Baffin is	Aug.	7, 1926	
24.	"	20793	Nettilling lake, Baffin is	June	16, 1925	
25.	"	20772	"	June	13, 1925	
26.	"	20800	"	June	19, 1925	
27.	"	20771	"	June	13, 1925	
28.	Bent	10804	Baffin is			
29.	U.S.N.M.	94437	Ft. Chimo, Ungava	Aug.	27, 1882	
30.	C.M.	74236	McLelan str., Ungava	Aug.	10, 1920	
31.	"	50204	Nastapoka r., Ungava	June	3, 1915	
32.	U.S.N.M.	94441	Ft. Chimo, Ungava	Aug.	10, 1882	
33.	"	94432	"	Aug.	27, 1882	
34.	Milwaukee		Bonaventure is., Que	July	8, 1922	
35.	N.M.C.	16304	Taylor is., Victoria is	July	30, 1919	
36.	"	18554	Cap mt., Mackenzie	July	12, 1922	
37.	M.V.Z.	44721	Atlin, B.C	Aug.	6, 1924	

Spring females are strongly barred below and broadly featheredged above in decided pattern which cannot be easily obscured by the rapid wear that quickly confuses other plumages. This plumage presents the racial characters more plainly and convincingly than any other and is the main reliance for subspecific study of the species. Groups I and II show the difference between yellow and grey races in unmistakable degree. The distinction is obvious at a glance and does not need massed specimens, careful illumination, or critical judgment for demonstration.

Group I is characterized by strong ochre barring below on breast and flanks, and back feathers with broad rusty edgings.

Group II is generally greyish as compared with the above; the ochre below is replaced by white or creamy white. The back is much darker, owing to reduction of or lack of light edgings. These edgings are much whiter than in group I, and seem to wear away much more rapidly—often to disappearance; they seem to disintegrate even before the feather has fully matured.

The following individuals demand particular remark. No. 1 is rather dark and less yellowish, it might almost equally well go in group II. It approaches Nos. 22, 23, 32, 33, and 37. No. 12 is identified as *L. r. kelloggae* by H. S. Swarth and as such is listed in his review of the species (antea). It is ultra-typical of the yellow group and practically identical with No. 14 from the extreme east.

No. 14 is an ultra-typical yellow bird with a large amount of last winter's white remaining on abdomen. It is almost identical with No. 12 as above. The occurrence of this typical, high northern bird in this southern locality is inexplicable. That it was breeding and with downy young (No. 88) accentuates the problem. It is notable that No. 34, geographically the next adjacent specimen, also a probable left-over from migration, and the most southern occurrence of the rock ptarmigan in America, is perfectly typical of the grey group, as would be expected.

In spite of Dr. Joseph Schmitt (Monographie de l'île d'Anticosti, Paris, 1904) to the contrary, it does not seem likely that the rock ptarmigan was ever a regular or normal breeder on Anticosti. The willow ptarmigan, which Schmitt does not mention at all, is common along the whole adjacent mainland coast in winter, still occasionally breeds there (Lewis, Can. Field Nat., XLII, page 192 (1928)), is a far more likely breeder on Anticosti, and is probably the basis of Schmitt's statement. It is very improbable that a distinctive island form could have been produced with such slight isolation as this island offers, and the fact that the specimen which seems to substantiate Schmitt's report shows high northern instead of southern characters only emphasizes the uniqueness of the individual occurrence. In present view of the case I can only regard this bird as a left-over winter migrant from the north breeding far south of its normal range. No. 18 is a strangely pale bird with the yellows largely creamy and like nothing else in the collection. It may possibly be considered with Nos. 76, 77, and 78, also erratics, as possibly representatives of an undescribed race in migration dispersal.

SPECIMENS EXAMINED

III

SPRING MALES

Yellow Group

38.	N.M.C.	8785	Bernard harbour, N.W.T.	July	7, 1915	Largely white
39.	"	7933	Collinson pt., Alaska	June	18, 1914	"
40.	"	7955	"	July	4, 1914	Partly white
41.	"	7968	"	July	7, 1914	

IV

SPRING MALES

Grey Group

(None)

This plumage is barred much as is that of the spring female, but the barring is much finer, almost to vermiculation, and the black elements in the coloration predominate, making a much darker general effect. The birds listed are much alike and carry considerable rusty ochre in their plumage, but there are no spring males in the collection representing the grey form. I assume these belong to the yellow group, from geographical considerations and because they look as would be expected of it. It is notable that the male rock ptarmigan does not moult into spring plumage until considerably later than the female. We have birds as late as July 2 that are still in almost complete white winter plumage. During the moult the males become retiring, secretive, and difficult to find, which explains their comparative scarcity in collections.

SPECIMENS EXAMINED

V

AUTUMN FEMALES

Yellow Group

42.	N.M.C.	18770	Godhavn, Greenland	July	30, 1923
43.	M.C.Z.	48440	Disko is., Greenland	Sept.	2, 1899
44.	N.M.C.	7112	Melville is., Frank	Aug.	16, 1909
45.	"	9874	Kay pt., Yukon	Aug.	17, 1914
46.	"	9946	Bathurst inlet, N.W.T.	Sept.	6, 1915

VI

AUTUMN FEMALES

Greyish Group

47.	M.C.Z.	233363	Disko, Greenland	Sept.	1, 1925	
48.	N.M.C.	20217	Pangnirtung, Baffin is	Sept.	27, 1924	Nearly white
49.	"	20206	"	Sept.	10, 1924	"
50.	M.C.Z.	34812	Newfoundland			
51.	"	10727	Codroy, Newfoundland	Aug.	3, 1895	
52.	"	53607	Newfoundland	Sept.	16, 1910	

The autumn female is generally characterized by much fine vermiculation, making an intimate mixture of colours. The barring is only faintly discernible and much of it is due to the remains of the previous plumage. Few specimens show the plumage in perfection, as the winter plumage commences to appear before all the spring feathers have been shed. Occasional birds show an entirely different pattern. No. 50 illustrates this in highest development, but it is more or less evident in Nos. 47, 49, and 51. No. 50 is sharply but finely barred on breast and up foreneck and flanks and the vermiculations on the back are coarse, sparse, and rather broken. This plumage may be due either to age or individual dichromatism.

The distinction between the two groups of autumn females is not as marked as between spring females, but it is still obvious. The one group is distinctly more rusty, yellowish, and warm, the other grey and cold. Remains of previous plumage connect these birds well with the preceding groups I and II.

It will be noted that the Newfoundland birds, which in the A. O. U. Check-list (1910) are given distinct specific standing, are included with those from Greenland and Baffin island. I can see no reason for separating them from these birds. Indeed, allowing for the slight difference in plumage condition and the known individual variation in the species, No. 51 is practically identical with 47. (*See also* remarks under groups VII and VIII.)

SPECIMENS EXAMINED

VII

Autumn Males

Yellow Group

53.	P.A.S.	26966	Disko, Greenland	Aug.	7,	
54.	M.C.Z.	48364	Umanak, Greenland	Aug.	, 1896	
55.	"	48439	Disko, Greenland	Sept.	2, 1899	
56.	N.M.C.	7113	Melville is., Frank	Aug.	16, 1909	
57.	"	9941	Coronation gulf, N.W.T	Aug.	19, 1915	
58.	"	9940	"	Aug.	19, 1915	
59.	"	9945	Bathurst inlet, N.W.T	Sept.	6, 1915	
60.	"	8819	Cockburn pt., N.W.T	Sept.	30, 1914	
61.	"	9875	Kay pt., Yukon	Aug.	18, 1914	
62.	"	10133	Cape Kellett, Banks is	Sept.	12, 1914	Almost white

VIII

Autumn Males

Grey Group

63.	U.S.N.M.	20346	Sukkertoppen, Greenland	July	24, 1860	
64.	N.M.C.	7114	Middle Hudson str	Sept.	24, 1909	Almost white
65.	"	7111	"	Sept.	24, 1909	"
66.	C.M.	74232	McLelan str., Ungava	Aug.	9, 1920	
67.	"	74233	"	Aug.	9, 1920	
68.	N.M.C.	10131	Cape Kellett, Banks is	Sept.	5, 1914	Almost white
69.	"	8775	Cockburn pt., N.W.T	Oct.	1, 1914	"
70.	"	21146	Amadjuak, Baffin is	Aug.	7, 1926	
71.	M.C.Z.	53606	Newfoundland	Sept.	16, 1910	
72.	"	110726	Codroy, Newfoundland	Aug.	5, 1895	
73.	"	60515	Mt. Blowdown, Newfoundland	Oct.	2, 1912	

IX

Autumn Males

Sandy Group

74.	U.S.N.M.	20347	Sukkertoppen, Greenland.....		
75.	P.A.S.	26965	Disko, Greenland.....Aug.	7, 1891	
76.	N.M.C.	9876	Kay pt., Yukon.....Aug.	19, 1914	
77.	"	10132	Cape Kellett, Banks is.....Sept.	5, 1914	
78.	"	4501	International Boundary, Arctic Circle.....Summer, 1911		(head)

Autumn males in most perfect condition show much finer vermiculation, with considerable minute powderings of colour superimposed. Some birds have a little fine barring hung like a necklace across the throat and upper breast, and here again seems a tendency towards fine, regular barring shown by No. 68 and slightly by 65 and 69. These specimens are, however, well advanced in the white winter plumage, which may have something to do with this particular appearance. It may be a character of age or an individual variation.

Groups VII and VIII are fairly distinct, but IX is strikingly so. The "Yellow group," VII, has a distinct general yellowish rust appearance, whereas VIII is clearly grey with considerable white frosty veiling on the back of the most perfect specimens.

Group IX is a very pale sandy colour. No. 76 is finely barred, as described above for 68, etc. They are absolutely unlike any other birds in the collection. No. 78 is a fragment, consisting of head, wing, and foot, but the head is unmistakably identical with 75. I take 74 to be *reinhardi*, by both character and geography. No. 75 from Disko is not surprising, but that identical birds should be found as far west as the Yukon-Alaska boundary is a disturbing puzzle and one that I cannot attempt to solve. It is possible that these western birds represent a distinct subspecies superficially resembling *reinhardi* as *Bubo v. heterocnemis* of the Labrador does *B. v. saturatus* of the Pacific coast. In this connexion see No. 18, group I, which might possibly be regarded as belonging to this unnamed form. The material on hand though is suggestive only and the data too slight to do more than raise this question without answering it.

The three Newfoundland birds are found inseparable from the others of the grey group. Nos. 63, 66, 67, and 70 are in a strictly comparable state of plumage and I see no material difference between them and these supposed *welchi*. In fact Nos. 71 and 70 are as nearly exact duplicates of each other as it is possible to find in this variable species. Nos. 64 and 65 were taken on ship board in middle of Hudson strait during migration.

SPECIMENS EXAMINED

X

JUVENILES

Yellow Group

79.	M.V.Z.	9796	Port Snettisham, Alaska	Aug.	29, 1909	Full autumn
80.	Bent	1867	Lance au Loup, Labrador	Sept.	9, 1917	"
81.	U.S.N.M.	94433	Ft. Chimo, Ungava	Aug.	26, 1882	"
82.	N.M.C.	18851	Ponds inlet, Baffin is.	Aug.	27, 1923	Half grown
83.	"	18858	"	Sept.	1, 1923	"
84.	"	16292	De Haven pt., Victoria is.	Aug.	25, 1918	Near down
85.	"	16293	"	Aug.	25, 1918	"
86.	"	16294	"	Aug.	25, 1918	"
87.	"	16295	"	Aug.	25, 1918	"
88.	M.C.Z.	205491	Anticosti is., Que.	July	10, 1881	Downy

XI

JUVENILES

Grey Group

89.	N.M.C.	20947	Nettilling l., Baffin is.	Aug.	24, 1925	Nearly fledged
90.	"	20948	"	Aug.	27, 1925	"
91.	"	20949	"	Aug.	27, 1925	"
92.	"	20946	"	Aug.	21, 1925	"
93.	"	20945	"	Aug.	21, 1925	"
94.	"	21148	Amadjuak bay, Baffin is.	Aug.	7, 1926	Half grown
95.	"	21149	"	Aug.	7, 1926	"
96.	"	21150	"	Aug.	7, 1926	"
97.	P.A.S.	26961	Disko, Greenland	July	8, 1891	"
98.	"	26962	"	July	8, 1891	"
99.	N.M.C.	20934	Amadjuak, Baffin is.	Aug.	1, 1925	Quarter grown
100.	"	20935	"	Aug.	1, 1925	"
101.	"	20940	"	Aug.	20, 1925	"
102.	"	20922	Nettilling l., Baffin is.	July	26, 1925	Near down
103.	"	20923	"	July	26, 1925	"
104.	"	20921	"	July	26, 1925	"
105.	"	21115	Cape Dorset, Baffin is.	July	20, 1926	Downy

The juvenile on leaving the down goes into a plumage much like that of the autumn female, but less sharply defined in pattern. Towards the end of the season considerable fine vermiculation appears in the back, but the breast remains distinctly barred. There is a moult of the wing quills during the summer when the greyish or dusky ones of the newly fledged juvenile are replaced by the pure white ones of the coming winter. When other evidences of immaturity are not plain the presence of a few remaining grey wing quills may establish the undoubted juvenility of a specimen.

The distinction between these two groups is not very strongly marked, but is discernible in most individuals and in mass it is convincing. It is evident from the newly hatched downy right through to the late autumn bird going into its first winter's whiteness.

No. 79 is identified by H. S. Swarth as *L. r. dixoni.* It is the yellowest and on the whole the darkest of this group, though the difference between it and No. 83 is not great and is considerably less than is often caused by individual variation in the species. No. 80 is a bird that seems far from its natural range, but the date suggests that it might be an early migrant.

On the whole it seems evident that there are two principal races of rock ptarmigan in North America, a yellow northern and a grey southern one. On laying these specimens down on the accompanying map (Figure 1) in appropriate symbols the general trend is evident. There are generally well-defined yellow northern and grey southern groups. The dividing line between them seems to run from the general vicinity of the Alaska-Yukon-British Columbia corner eastward and a little north, just below Coronation gulf and across central Baffin island to Greenland near Disko island.

The Newfoundland *welchi* is indistinguishable from the grey mainland bird and western *kelloggae* is identical with the yellow one, a conclusion also reached by Swarth (antea). There are several occurrences which disturb this fair arrangement. Both yellow and grey forms are represented in our collection from northern British Columbia, the Yukon coast, west Banks island, central Baffin island, Ungava bay, and Disko, Greenland. Most of these may be dismissed as migrants, others as individual variants or carrying misinterpreted characters. The case of the pale sand-coloured birds is very puzzling. Schiøler (Dansk Ornithologisk Ridsskrift, 19, 1925) restricts *reinhardi* to the west coast of Greenland, latitude 64 degrees and southward. He describes it as very light coloured, light grey on back. This agrees fairly well with No. 74, taken at Sukkertoppen, Greenland, latitude 65° 30′, if "light sandy" is substituted for the translation of "light grey." He distinguishes the birds from latitude 66° to 71° as distinct from *reinhardi* and assumes them to be *rupestris.* His description in the translation available to me is not very clear, but I gather that they are "darker and warmer" than *reinhardi.* This would fit either our northern or southern continental forms, but considering we have birds unmistakably of the northern yellow type from Disko, and that the general trend of the land masses it inhabits is towards north Greenland, it seems safe to infer that the bird of northwestern Greenland is the same as those of the adjacent northernmost islands.

The sandy birds of group IX are undoubtedly *reinhardi,* but what to call the sporadic specimens 76, 77, and 78 that seem identical with them is a puzzling question. Such a discontinuous distribution as seems inferred would be too extraordinary to be accepted on the few specimens at hand. One alternative is that the northern race is dichromatic, with a light phase dominant in southwestern Greenland and a dark one dominant elsewhere. Until further data is forthcoming the question must remain open and subject to conjecture.

The southern grey form is undoubtedly *rupestris* (type locality Hudson bay). For the northern yellow one *kelloggae* (type locality Prince William sound, Alaska) seems to be the next available name, hence we have the following principal races and distributions:

Lagopus rupestris rupestris (Gmelin). Southern rock ptarmigan. Generally greyish. Northern British Columbia and southern Yukon, central Mackenzie and Keewatin, southern Baffin island and the Ungava peninsula to Newfoundland.

Lagopus rupestris reinhardi (Brehm.). Reinhardt's ptarmigan. Generally pale sand coloured. Southwestern Greenland north to near Disko island.

Lagopus rupestris kelloggae Grinnell. Northern rock ptarmigan. Generally yellowish. The interior of Alaska and northern Yukon, the western Arctic coast to Coronation gulf, the Arctic islands, except southern Baffin island; and west Greenland north of Disko island.

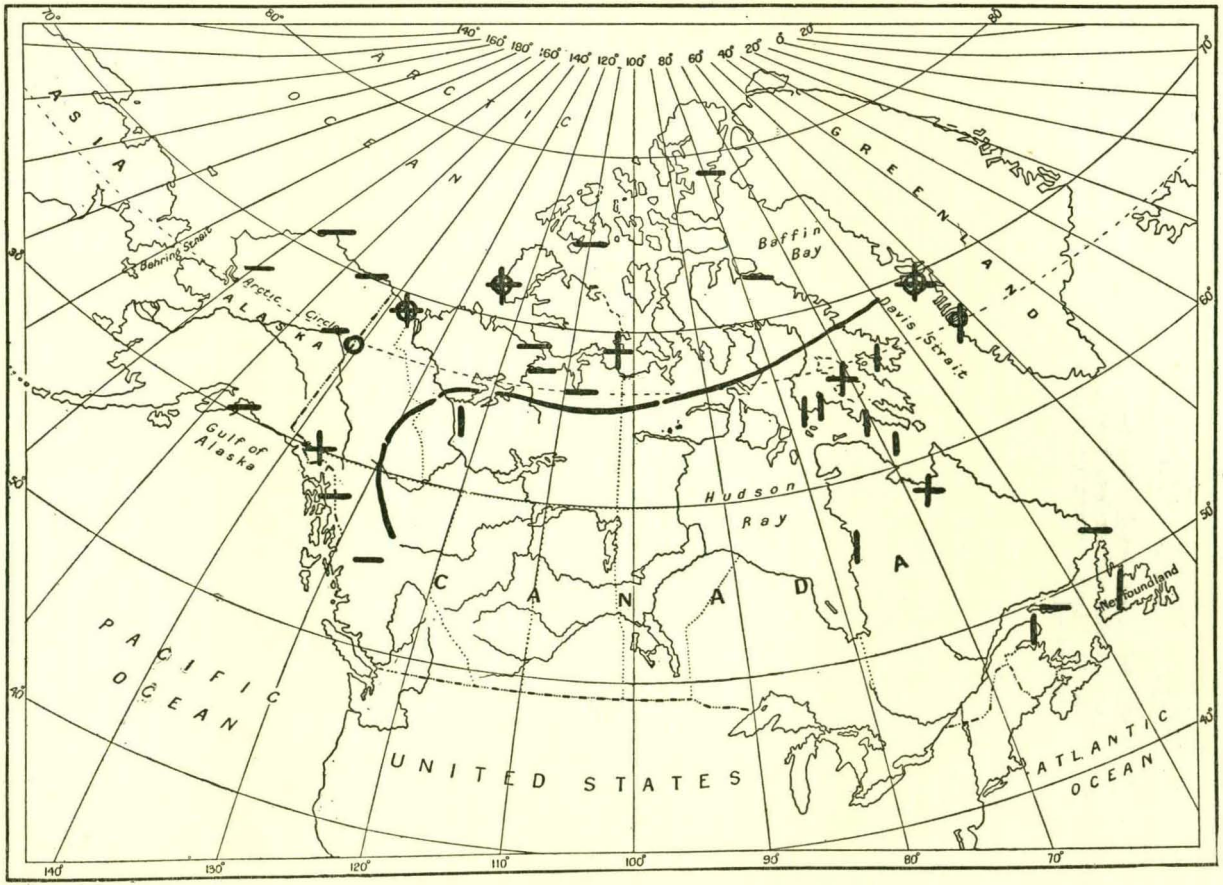

Figure 1.—Occurrence of specimens of rock ptarmigan examined.

I *Lagopus rupestris rupestris*

– *Lagopus rupestris kelloggae*

O *Lagopus rupestris reinhardi*

Approximate division between ranges