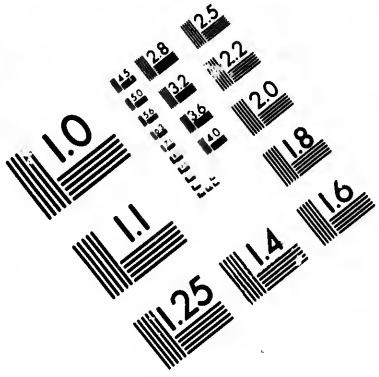
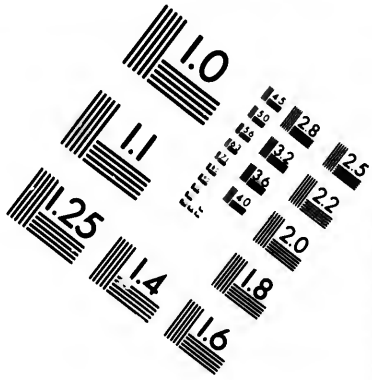
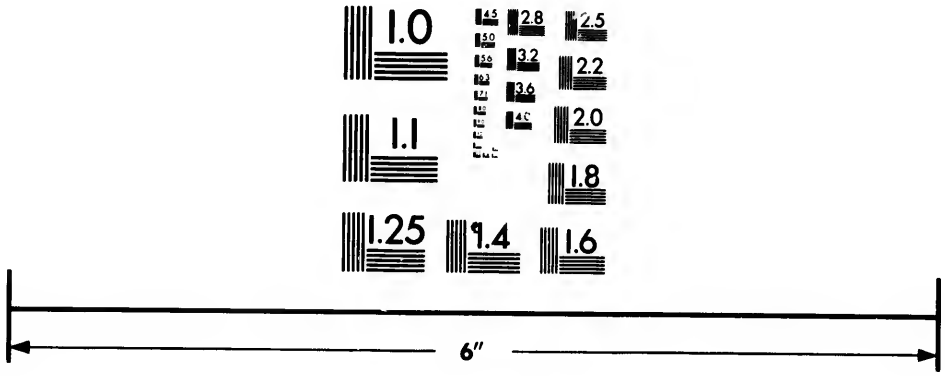
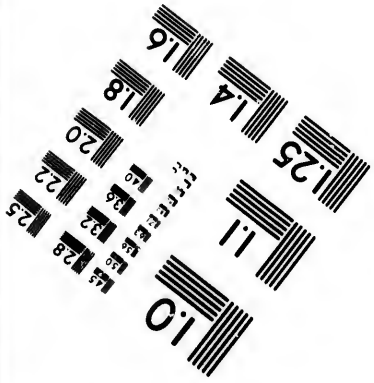
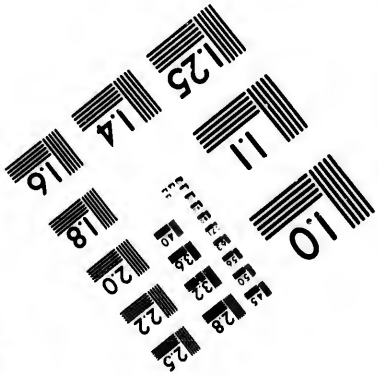



# IMAGE EVALUATION TEST TARGET (MT-3)




Photographic Sciences Corporation

23 WEST MAIN STREET
WEBSTER, N.Y. 14580
(716) 872-4503

## Technical and Bibliographic Notes/Notes techniques et bibliographiques

The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming, are checked below.

- ☐ Coloured covers/ Couverture de couleur
- ☐ Covers damaged/ Couverture endommagée
- ☐ Covers restored and/or laminated/ Couverture restaurée et/ou pelliculée
- ☐ Cover title missing/ Le titre de couverture manque
- ☐ Coloured maps/ Cartes géographiques en couleur
- ☐ Coloured ink (i.e. other than blue or black)/ Encre de couleur (i.e. autre que bleue ou noire)
- ☐ Coloured plates and/or illustrations/ Planches et/ou illustrations en couleur
- ☐ Bound with other material/ Relié avec d'autres documents
- ☐ Tight binding may cause shadows or distortion along interior margin/ La reliure serrée peut causer de l'ombre ou de la distortion le long de la marge intérieure
- ☐ Blank leaves added during restoration may appear within the text. Whenever possible, these have been omitted from filming/ Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.
- ☐ Additional comments:/ Commentaires supplémentaires:

L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

- ☐ Coloured pages/ Pages de couleur
- ☐ Pages damaged/ Pages endommagées
- ☐ Pages restored and/or laminated/ Pages restaurées et/ou pelliculées
- ☑ Pages discoloured, stained or foxed/ Pages décolorées, tachetées ou piquées
- ☐ Pages detached/ Pages détachées
- ☑ Showthrough/ Transparence
- ☐ Quality of print varies/ Qualité inégale de l'impression
- ☐ Includes supplementary material/ Comprend du matériel supplémentaire
- ☐ Only edition available/ Seule édition disponible
- ☐ Pages wholly or partially obscured by errata slips, tissues, etc., have been refilmed to ensure the best possible image/ Les pages totalement ou partiellement obscurcies par un feuillet d'errata, une pelure, etc., ont été filmées à nouveau de façon à obtenir la meilleure image possible.

This item is filmed at the reduction ratio checked below/
Ce document est filmé au taux de réduction indiqué ci-dessous.

| 10X | 12X | 14X | 16X | 18X | 20X | 22X | 24X | 26X | 28X | 30X | 32X |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | ✓ | | | | | |

The copy filmed here has been reproduced thanks to the generosity of:

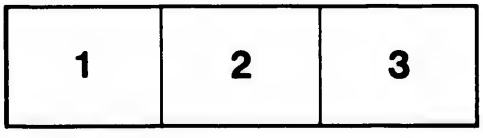
University of British Columbia Library

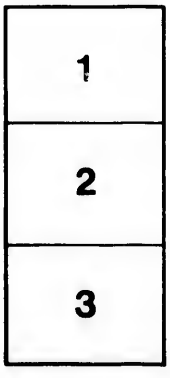
The images appearing here are the best quality possible considering the condition and legibility of the original copy and in keeping with the filming contract specifications.

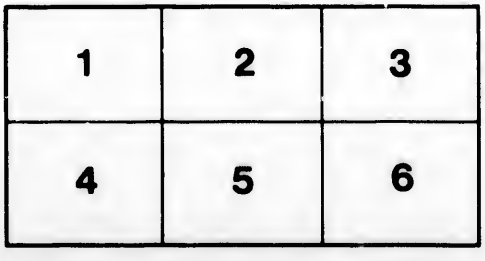
Original copies in printed paper covers are filmed beginning with the front cover and ending on the last page with a printed or illustrated impression, or the back cover when appropriate. All other original copies are filmed beginning on the first page with a printed or illustrated impression, and ending on the last page with a printed or illustrated impression.

The last recorded frame on each microfiche shall contain the symbol → (meaning "CONTINUED"), or the symbol ▽ (meaning "END"), whichever applies.

Maps, plates, charts, etc., may be filmed at different reduction ratios. Those too large to be entirely included in one exposure are filmed beginning in the upper left hand corner, left to right and top to bottom, as many frames as required. The following diagrams illustrate the method:




L'exemplaire filmé fut reproduit grâce à la générosité de:

University of British Columbia Library

Les images suivantes ont été reproduites avec le plus grand soin, compte tenu de la condition et de la netteté de l'exemplaire filmé, et en conformité avec les conditions du contrat de filmage.

Les exemplaires originaux dont la couverture en papier est imprimée sont filmés en commençant par le premier plat et en terminant soit par la dernière page qui comporte une empreinte d'impression ou d'illustration, soit par le second plat, selon le cas. Tous les autres exemplaires originaux sont filmés en commençant par la première page qui comporte une empreinte d'impression ou d'illustration et en terminant par la dernière page qui comporte une telle empreinte.

Un des symboles suivants apparaîtra sur la dernière image de chaque microfiche, selon le cas: le symbole → signifie "A SUIVRE", le symbole ▽ signifie "FIN".

Les cartes, planches, tableaux, etc., peuvent être filmés à des taux de réduction différents. Lorsque le document est trop grand pour être reproduit en un seul cliché, il est filmé à partir de l'angle supérieur gauche, de gauche à droite, et de haut en bas, en prenant le nombre d'images nécessaire. Les diagrammes suivants illustrent la méthode.

32X

Excerpt from the Journal and Proceedings of
THE ROYAL GEOGRAPHICAL SOCIETY, 1, Savile Row;
FRANCIS EDWARDS, 83, High Street, Marylebone, W.

## LAKE LOUISE, IN THE CANADIAN ROCKY MOUNTAINS.

By WALTER D. WILCOX.

WHILE making a hasty overland journey by the Canadian Pacific Railway during the summer of 1891, my attention was called to the remarkable beauty and grandeur of the Canadian Rockies. Again in July, 1893, in company with a college friend, I spent several weeks at Banff and Lake Louise, the latter a beautiful sheet of water surrounded by the grandest mountains along the line of the Canadian Pacific, and now annually visited by possibly one hundred tourists. Remaining two weeks at Lake Louise, we had time to attempt the ascent of the two highest mountains in the vicinity, but failed in each instance, being stopped by a vertical rock wall of great height on one mountain, and on the other by the dangerous condition of the snow, where we narrowly escaped an avalanche. We were not properly equipped for accomplishing much in a region unexplored and unmapped, where we were necessarily our own guides, and where, by reason of the heavy forests in the valleys, it is very difficult to carry a tent or provisions to any great distance from head-quarters.

The failure of this season inspired me with a desire to organize, if possible, a party for the summer of 1894, which should be equipped to thoroughly explore and survey the region in the vicinity of Lake Louise, to ascend several of the highest peaks, and to make photographs of every interesting feature. It is not necessary to dwell on the difficulties attending the organization of a party of men to travel several thousand miles to a region about which they knew nothing save what they could

gather from a few photographs and tales of my former experiences. Suffice it to say that a party, consisting of Samuel Allen, of the Swiss Alpine Club, Yandell Henderson, Lewis F. Frissell, George Warrington, and the writer of this article, all of Yale University, was induced to go, and arrived on the field early in July.

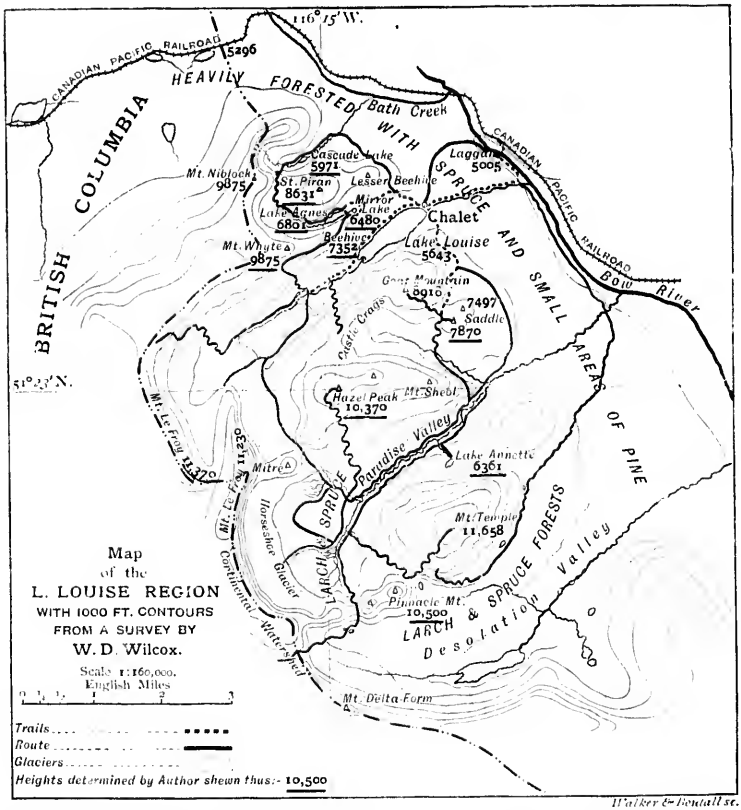
The outfit consisted of a plane table and telescopic alidade, kindly furnished by the United States Geological Survey, a prismatic compass, two steel tapes, a mercurial barometer, two watch-size aneroids, a thermometer, and compasses. For our mountain work, we had several hundred feet of manilla rope and four ice-axes modelled after the most approved Alpine form. For photography, there were three cameras and twenty-five dozen dry plates of several degrees of rapidity.

It would be in place here to define more accurately the location of the field of operations. Roughly speaking, we may define it as a region in the extreme western part of the province of Alberta, and south of the Canadian Pacific road, in lat. 51° 25′ N. The extent of the area might be approximately indicated by saying that it would all be included in the half-circle formed by the line of the railroad and the arc drawn with a radius of 10 miles from the station called Laggan. That the area thus limited should have occupied us an entire summer will appear less remarkable after a discussion of the extent and character of the difficulties presented.

From the line of the railroad at and near Laggan, one sees to the south a long range of lofty peaks in great part covered with snow and ice, and forming the grandest scenery along the entire road, the Selkirks not excepted. This is the summit range of the Rockies, the watershed of the continent, for on the other side of these mountains the water flows into the Pacific, while here the rushing waters of the Bow river are hastening toward the Atlantic. Two miles south of Laggan there is a small lake hardly ¼ mile in length, but so beautiful in itself and in the grand mountains which surround it, that a waggon road has been opened throughout the forests to the lake, and a Swiss chalet erected near the shore for the reception of tourists. This was first occupied in July, 1894, though as early as July, 1891, there was a log-house with several rooms for the entertainment of travellers. We made the present chalet our head-quarters for the greater part of the summer.

In order to understand the topography of the tract surveyed, in a general way, it may be described as follows: The Bow river valley, running about south-east and north-west near Laggan, has an average width of fully 4 miles. The main range of the Rockies runs nearly parallel to the valley, and lies about 6 miles to the south-west of it. The area surveyed includes five short spur ranges which branch off at right angles from this summit range, and hence cause the valleys between them to open into the Bow valley at right angles. The altitude of the Bow river at Laggan is 5000 feet. Mount Temple, the highest in the

region, is 11,658 feet above sea-level. Mount Lefroy is the next, with an altitude of about 11,370 feet, and, in addition, there are nine or more peaks over 10,000 feet in height. The average elevation of the lateral valleys is about 5800 feet. Now, the absolute height of mountains is generally thought of the first importance, but those who have given any attention to the subject know that their relative height above the valleys is the criterion by which we judge their impressiveness and grandeur.




The gloomy depth of these Rocky mountain valleys, and the unusual steepness of the cliffs overlooking them, entirely redeem their inferior height, when compared with the Alps or other well-known mountainous regions. Without further discussion by way of introduction, this article will be perhaps better understood when the various subjects are treated under the heads of History, Geology, Botany, Meteorology, a short discussion of the Fauna, and of our methods of surveying. It might be appropriate to say that what applies to the small area explored,

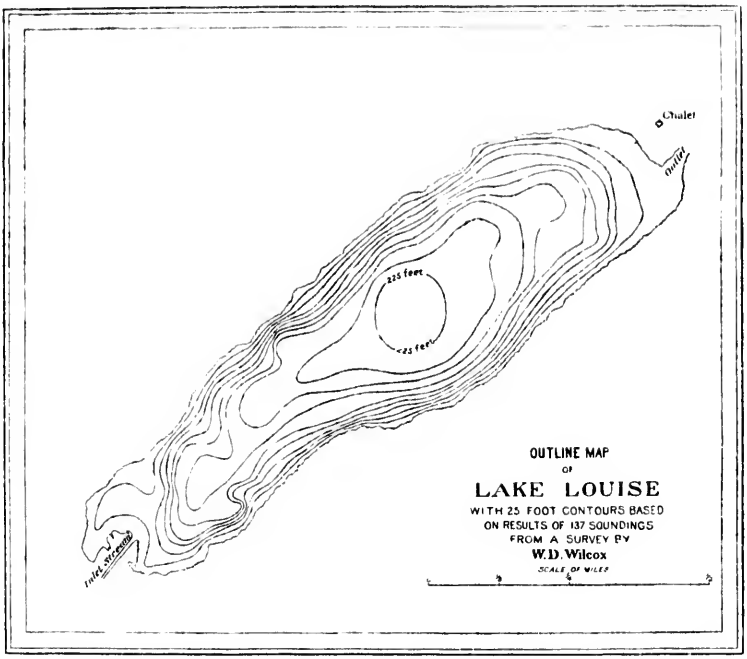
applies almost equally well to a much larger tract, and that little or nothing new could have been added if the area had been many times greater. The geological structure, of course, would vary much in every way even if a slightly more extensive area had been surveyed, except in regard to the Quaternary; the flora and fauna less so; while the climatal conditions would remain fairly constant, and only vary locally.

*History.*—Speaking generally of the Rocky mountains between the latitudes of 49° and 51° 30′ N., Dr. Dawson says in his "Preliminary Report" on that region, that previous to Palliser's expedition in 1857, no maps or knowledge of passes existed south of the Athabasca pass, though the region had been traversed as early as 1810 by Howse. The first published account of travels in the region was by Sir George Simpson. He crossed the Rockies in 1841, and his narrative of the trip appeared in 1847. His description of the country is not clear, nor can many of the places be identified from it. In 1858, Dr. Hector, entering the mountains by the Bow river valley, crossed the watershed by the Vermilion pass, and after following the Vermilion, Kootanie, and Beaverfoot rivers, returned over the watershed by the Kicking Horse pass, which he discovered, and which is the one now used by the railroad. Dr. Dawson, in 1874 and subsequently, retraced all of Dr. Hector's routes, and traversed many others besides. In 1881 the first railroad surveys were made in this region. In 1886 the first tourists were carried across the continent on the Canadian Pacific road. The first published account by a tourist, so far as the writer knows, and, in fact, the only accessible information on the region, except a few short and mostly inaccurate descriptions in guide-books, occurs in the last chapter of Dr. Green's book, 'Among the Selkirk Glaciers.' Here an account is given of his visit to Lake Louise, which therefore falls within the limits of the small region explored by our party in 1894.

Of any previous specific explorations in this region before our work began, or of any mountain ascents, except that of Mount Lefroy, climbed in 1890 by McConnell, we had no knowledge. Nor were we able to obtain any maps of this region, except Dr. Dawson's, the small scale of which rendered it useless for our work. It was, therefore, somewhat in the spirit of pioneers and first explorers that we visited the several valleys mapped. We were always our own guides, as no one could be found who knew anything definite about the passes or mountains. The Canadian Pacific road seems to have appreciated the attractiveness of the Louise region, and, with a view towards encouraging tourists to visit the place, have constructed a waggon road more than two miles in length, connecting Laggan with the lake. Three trails have already been made, leading from the chalet to points of interest in the vicinity.

*Geology.*—The formations represented are about 3500 feet of Lower Cambrian quartzites, overlaid in the higher peaks by a series of limestones attaining here a maximum section of 2500 feet. A single

trilobite, together with a few fragmentary specimens, was found at an altitude of 9500 feet while making an ascent of Hazel peak (10,370 feet, from aneroid reading). These fossils were found on a long scree slope, and though we spent some time searching for the original beds, we did not succeed. Fragmentary specimens of trilobites were also found at an altitude of 10,500 feet while ascending Mount Temple. The best specimen was identified by Mr. C. D. Walcott, Director of the United States Geological Survey, as *Zacanthoides spinosus*, thereby referring the limestone beds from which they came to the Middle Cambrian.




Folds and flexures are absolutely wanting in the whole region surveyed, except for a general but very gentle synclinal structure, having the summit range as the axis. The strata are therefore nearly or quite horizontal everywhere, except in the extreme ends of the spur ranges as they approach the Bow valley. Here there is a gentle and gradual upward tilting, indicative of an anticlinal structure in the Bow valley. The maximum dip here approaches 12°. The valleys are, therefore, formed entirely by erosion. A very interesting example of the results of aërial erosion is seen in the beautiful mountain named by us Pinnacle mountain. The wonderful slender pinnacles or columns seen on the slopes of this mountain are from 100 to 200 feet high, and

so small in diameter as to give them the proportions of a pencil set on end. There one can see these pinnacles in all stages of formation, narrow high ridges being the next to last. These have been worn down in such a manner as to make flutings and channels in the ridges, owing, possibly, to planes of fracture. A further accentuation of the channels finally pierces the ridge entirely, and it dissolves into a row of pinnacles, indicating where a ridge formerly existed. These pinnacles are further remarkable on account of their low altitude (8000 feet), showing that extensive glaciation has not existed since they were formed or nearly formed.

*Quaternary.*—There are no deposits of any age between the Middle Cambrian and the quaternary. The action during this age has, however, had much to do in determining the features and topography of the region. The cliffs at the base of the valleys always exhibit the action of ice to a greater degree, while those near the summits, unless near existing glaciers, show a preponderant aërial action. There is no clearly defined line of demarcation between them, and the evidence of one form of action or the other vary locally to a considerable degree. An average altitude of about 9000 feet seems to be the upper limit of any previous general glacial action. We may therefore imagine the maximum glaciation of the Quaternary to have, for the greater part, submerged these valleys and mountains with a field of ice, above which the higher mountains appeared as islands. We may also presume that the flow of the ice had, in the short valleys and in the longer Bow valley, the same general direction as the existing surface drainage. Standing on the summit of Goat mountain and looking across the Louise valley to the west, this faint line of highest glaciation can be discerned on the mountains, with a downward slope corresponding somewhat to the slope of the valley bottom. This might be deceptive but for the fact that the slight upward tilting of the strata as they run northward is cut across by the slight downward slope of the former glacial level. The altitude of the ice-level at the head of the valley was approximately 9000 feet, and probably 8000 feet at the "gap," or entrance.

*Glacial Striæ.*—These were observed in surprisingly few places, though constant attention was paid to their discovery. In Paradise valley, the bed rock one mile north of the present glacier is well scored and striated in and near a stream channel. This instance was, however, below the level of present glaciation. The only other striations observed in the quartzite were in the Louise valley, on the very summit of a small mountain called the Beehive, 7352 feet in altitude. Long, coarse, but shallow striations are formed here, some of which were quite faint, and only distinguished from the rest of the surface rock by lines of dark lichens growing in them. The direction of these striæ was parallel to the general direction of the valley, and shows that the ice which made these scorings was not merely local, but part of a great current setting

out of the valley. Here we have direct proof that the ice formerly existed up to a level of at least 1709 feet above Lake Louise, and 1934 feet above its bottom. Near the base of the Beehive, at Lake Agnes, a single stratum of soft red shale about 7 feet thick appears, and may be traced for some distance north and south. Though the beds of quartzite above and below show merely a rounded, polished contour, destitute of striæ, this softer stratum is most exquisitely carved with striations of all sizes down to the merest hair-lines. Apparently the quartzite was too hard to receive scratches from pebbles and boulders of its own structure. The rounding of the cliffs, however, and of all projecting knobs of rock, is almost universal in these valleys, especially on

LAKE LOUISE FROM NEAR THE END ON WEST SHORE, LOOKING SOUTH-WEST; INFERIOR PEAKS OF MOUNT LEFROY IN THE DISTANCE.

the "stoss" side, which was here usually the south-west exposure. One very fine example of glacial elasticity was discovered in the red shale referred to above. A small projecting buttress on the side of a vertical cliff had been worn down into a conical form with a flat top, some 3 feet high, and nearly 2 feet in diameter at base. This frustum was beautifully fluted and striated with vertical *spreading* lines which opened more and more toward the base. This was done by a branch glacier which occupied the Lake Agnes trough, and presumably remained some time after the period of maximum glaciation. This glacier was undoubtedly very similar in size and steepness to the glacier which now exists on Hazel peak.

*Morainal Material.*—Drift covers the whole Bow valley up to the base of the mountains. At the Bow river the bluffs rise 125 feet above it, and consist of typical boulder clay throughout. The river itself rests on this material, and shows no bed rock at this point. The new waggon road follows the outlet stream from Lake Louise, and gives some good sections. The stream itself has cut down as much as 100 feet in many places through the boulder clay. Many fresh pebbles and boulders were turned out in the construction of the road, which are about equally of limestone and quartzite; most all the boulders show rounding and striations on one or more sides. The largest piece was a great slab 25 feet long by 8 feet wide, and from 3 to 4 feet thick. The whole surface of the Bow valley up to Lake Louise is plainly a series of moraines. The present chalet is built on one, which makes the dam to the lake, and all the way to the Bow river there is a succession of nearly parallel ridges, presumably left by a fan-shaped extension of the Louise glacier as it retreated, and after the general glaciation of the Bow valley had disappeared. It appears that there was a long pause at the gap, during which time the glacier piled up two or three hundred feet of morainal material, and formed a dam to its own waters after it retreated. A glance at the contour map of the lake shows, from its great depth, how much material must have been transported in order to so completely choke the end of the valley. A tendency to submarine moraines is suggested by the contours at the head of the lake. The terminal moraine of the existing glacier lies about one mile south of the lake, and some 600 feet above it. The piles of moraine are about 700 feet in width, and average fully 150 feet in depth—an immense mass of material, but not at all surprising after a glance at the glacier itself, which for a mile from its snout is so thoroughly covered with *débris* as to completely conceal the ice. Some of the boulders on the glacier were calculated to weigh from 35 to 40 tons. Immediately beyond the present moraines, which have a very recent and fresh appearance, the landscape is often forest-clad, and the boulders have an aged appearance, entirely different from the oldest boulders of the moraine. When we take these points in connection with the fact that nothing that might be styled a moraine exists between the lake and the present terminal moraine, we may conclude that the retreat of the glacier from the lake-bed to its present position was too rapid and uniform to leave any traces of terminal moraines. The fact is evident, from a study of many glaciers in the Rocky mountains, that the existing glaciers are now nearly as large as they have ever been since their final retreat in the great Ice age. This is contrary to the almost universal retreat of the glaciers in Switzerland, Norway, and Alaska. Nevertheless, Dawson notes that there are universal indications of increased humidity and rainfall in this part of the Rockies, such as abnormal height of lakelets without outlets, which has killed a belt of trees on their borders—evidence of recent floods

greater than any previous ones for fifty or one hundred years, and other signs of greater rainfall. If these conditions have existed for even a few years, the glaciers would be sensibly increased.

*Present Glaciation.*—A reference to the map shows that the present glacier is quite extensive. The longest glacier occupies the end of the Louise valley, and is over $3\frac{1}{2}$ miles long. The structure of the rock strata is such as to cause the formation of great fields of snow near the summits of many of the mountains, which become glaciated and flow downwards for 1000 or 2000 feet at steep angles, often 45°, and then break off in great masses as the ice is slowly pushed over the precipice. This condition of things is the cause of frequent magnificent avalanches, for the hanging glaciers often exist at the top of a nearly perpendicular


LOOKING TOWARDS MOUNT ~~VICTORIA~~, ~~11,270~~ FEET, FROM THE SUMMIT OF COAT MOUNTAIN, 8918 FEET, FOUR MILES DISTANT.

rock wall from 1000 to 2000 feet high. The ice thus breaking off is a source of fresh supply to the glaciers below. In July and August the thunder of these avalanches is very frequent, especially before sunrise. Water freezing in the crevasses must be the immediate cause of this. The thickness of the ice in the hanging glaciers is from 200 to 250 feet. They show about twenty dark lines running horizontally in the cross-section. These are 12 or 15 feet apart near the top, but compressed to a foot or less at the bottom. They undoubtedly register the annual snowfall, the dark bands being the dirt which is brought down by slides during July and August, while the white part represents the uninterrupted accumulation during the rest of the year.

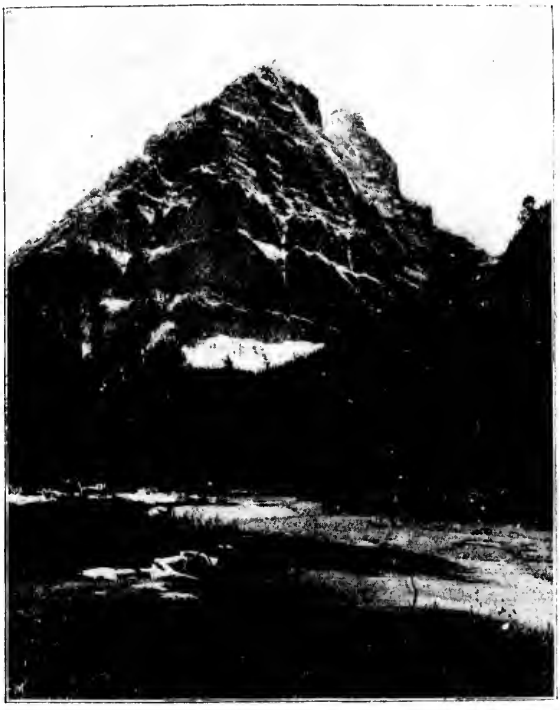
A brief *résumé* of the results of the Quaternary would call attention to a certain relation between present glaciers and existing lakes. Lake Louise is the result of a long pause of the retreating glaciers while the dam was piled up. The flat bottom of this lake, together with its very steep sides, gives the U-shaped cross-section characteristic of glacial valleys. The same relation exists between the glaciers and lake in Desolation valley, also the small glacier on the west side of Mount Temple. No lake exists in Paradise valley corresponding to Lake Louise, but a glacial dam is very apparent, and above it a long tract of level swampy land. For some reason the dam was not high enough to give the lake great depth, and this, combined with a stream charged with much more sediment than in the Louise valley, has conspired to fill up the basin and obliterate the lake which undoubtedly existed here. In this way Lake Louise is being rapidly filled, as may be seen by the well-formed delta. Moreover, for one-fourth of a mile above the head of the lake the land is quite level, and only rises 2 or 3 feet above the lake, indicating the original area of the water-surface. In July and August the muddy stream from the glacier rushes swiftly along, carrying sediment and pebbles, up to an inch in diameter, into the lake, depositing the heavier particles on the delta, and sending a line of discoloured water far out into the lake, the deep blue-green waters of which become quite milky toward the end of summer. The lacustrine deposits are of unknown depth, but consist of a dark blue, somewhat arenaceous clay, which covers the bottom everywhere.

*Flora and Fauna.*—These were not studied at all, though it was our intention to make a collection of plants if there was time enough. A distressing accident during a mountain ascent delayed the surveying work so much that this line of study had to be given up. However, some of the more important and interesting plants and animals that came before our attention will be mentioned.

*Flora.*—The almost universal forest tree from the Bow river up to the tree-line is Englemann's spruce. This tree forms a rich and luxuriant dark forest wherever the slopes are not too steep to support a thin soil. They average 75 feet in height and about 15 inches in diameter. This tree is occasionally replaced in part by small areas of the black pine. The Lyall's larch can only contest on equal terms with the spruce at about 6800 feet above sea-level, and from there up to the tree-line, which is here about 7400 feet. It might be mentioned, in connection with the tree-line, that the snow-line, as determined by the limit of névé on the glaciers of this region, lies somewhat lower, approximately 7000 feet. One or two snow patches remained near the shores of Lake Louise (5643 feet) till August 1.

There are only a very few deciduous trees, which appear chiefly along the banks of rivers or in open sphagnum swamps caused by slight morainal dams, and also in the clearings made on the mountain slopes

by snow avalanches in winter. A few bushes, and especially the numerous herbaceous plants, make a most beautiful and brilliant floral display during July and August. Epilobiums and Castilleias line the barren, gravelly flood courses of glacial streams, and make a bright but discordant array of magenta and scarlet flowers. A species of Myosotis grows very abundantly in the valleys. *Aquilegia Canadensis*, which is scarlet in the eastern states, here grows yellow throughout. The forests are filled with multitudes of elegant flowering plants, of which none



ENTRANCE TO PARADISE VALLEY, LOOKING SOUTH OF WEST. THE FOREGROUND REPRESENTS THE FILLED UP GLACIAL LAKE, CORRESPONDING IN POSITION TO LAKE LOUISE.

is more widespread or more attractive than the one-flowered Pyrola (*Moneses grandiflora*). As in all Alpine regions, the plants seem more brilliant in coloration as the snow-line is approached. Many dwarfed forms of plants, chiefly Compositæ, grow on peaks and slopes over 8700 feet above tide, while a species of anemone, though growing lower, often seems to push its eager stalk through the edges of retreating snow, and blossom within a few yards of snow that is almost perpetual. No adequate idea, however, of the number and variety of flowering plants in these mountains could be conveyed without the aid of a systematic

list, which unfortunately is not at hand. It might be stated that the vegetable life is a feature of the greatest beauty, no available spot, from valley bottoms almost to the limits of vegetation, is left unoccupied.

*Fauna.*—A great number of interesting animals were either seen or their tracks observed—the black bear, mountain lion, lynx, wolverine, porcupine, weasel and marten, several species of rodents, squirrels, rabbits, marmots, and a number of small rat-like animals inhabiting the rocks in Alpine regions. By far the most characteristic animal in the region is the Rocky mountain goat. This animal corresponds in habits and shyness to the chamois of Switzerland. The coat is nearly snow-white, long, shaggy, and very thick. Both sexes are furnished with horns about 7 to 10 inches long, curving gently backwards, and very sharp. One goat was shot by a member of our party, after six weeks' constant hunting, which weighed about two hundred pounds. They are said to attain a weight of three hundred pounds in some specimens. In all, twenty-eight goats were seen by us, several singly, the rest in herds of five, six, and eleven respectively. They are a magnificent animal, inhabiting the loftiest mountain slopes, and running with ease and indifference along precipitous ledges and places impossible to man. Endowed with wonderful faculties of scent, sight, and hearing, and being, beside, very timid by nature, they are a most difficult animal to hunt, and will naturally preserve themselves for many years, as few hunters have the patience or fortitude to get near enough for a shot.

Lake Louise and its outlet is quite full of small trout, which do not ever attain to more than 10 inches in length, but are very excellent for the table.

The forests are full of a great variety of birds, many of which sing the greater part of the summer. In the deeper woods are found a species of pheasant called the blue grouse, and along with these, and also more frequently in the "alps" and rocky slopes of lesser mountains, a species of grouse called by some ptarmigan, and by others the fool hen. Both these birds are good eating, and, when fired at, will usually remain quite unmoved until killed. Hence the name of the species.

Great flocks of black ducks, mallards, and divers visited the lake during August and September, as many as fifty being seen at once from the chalet.

The entomology of the region has been almost exhaustively studied by Mr. Bean, a telegraph operator at Laggan. He has a larg d exceedingly valuable collection of beetles and butterflies. Some of the species found at great heights are identical with those discovered in the Arctic regions, and never found outside of those places before or since, except on these mountain summits.

The insect life has a most important and serious bearing on the traveller in the shape of mosquitoes and horse-flies. The mosquitoes are well-nigh innumerable, and constitute the only drawback to this

otherwise ideal mountain region. They entirely disappear every year after August 12 or 15.

*Meteorology.*—One of the most important considerations in a mountain region is the character of the weather during the summer season. Whymper has written, in his book on the great Andes of South America, sufficiently about the persistently rainy character of the weather there to deter almost any one from visiting those mountains with the intention of mountaineering. During July and August the weather in the Canadian Rockies is unusually steady, with a great preponderance of clear sunny days. Rain rarely falls during the six weeks from July 1 to August 15, except occasional showers at night. A period of rainy weather lasting three days occurred during the first week of August, which was, however, exceptional.

MOUNT TEMPLE, 11,658 FEET, FROM THE "SADDLE," LOOKING SOUTH.

Over two hundred observations of the mercurial barometer and thermometer were made from July 25 to October 9 inclusive. Daily observations were made, and, whenever possible, as many as three, at the hours of 8 a.m., 2 p.m., and 8 p.m. The maximum temperature observed was 78° on August 19; the minimum on September 22 and October 6 being 21°. The hottest week fell between August 17 and 23 inclusive, when the morning and evening readings averaged 57° and 58° respectively, and the 2-o'clock readings 74°. From these data it may be seen that the tourist and mountaineer have no hot valleys

from which to start their exploration or ascents, as is the case in Switzerland. A cool, dry atmosphere, most remarkably lucid, and a deep-blue sky, coloured to the most distant horizon, are the normal conditions. The south-west is the quarter from which the prevailing wind blows, though this is a difficult point to ascertain in a narrow, deep valley where the mountains must influence the lower air-currents to a great degree. The month of June is one of the worst of the year, rainy, changeable weather being the rule. Snow may be expected by September 15 in all but the lowest valleys. Consequently, the summer season is very short. A brief consideration of the astronomical conditions will solve this at once. The latitude of this region (50° 25′) is so high, that during summer the sun is above the horizon three-fourths of the day. Twilight continues throughout the night as late as July 6, the time of our arrival. Hence the shortening of the days towards the equinox is very rapid, and winter sets in very suddenly. The moon is rarely seen, and never at the full until the latter part of August. Hence we may conclude, inasmuch as the sun occupies the same part of the ecliptic in winter as the full moon in summer, that there are several months near the winter solstice during which the sun practically *never* rises in those narrow mountain valleys. The cold of midwinter is intense, but probably no more so than in the plains to the east, where the thermometer at times falls to 65° or 70° below zero Fahr. Snow was almost constantly on the ground at the level of Lake Louise after September 15, but this was said to be unusually early. During the summer months snow may fall above the level of 9000 feet at any time, and frosts often occur in the valleys.

It is difficult to judge of the total precipitation, as no reliable data are at hand. The snow is said to be 6 or 8 feet, or even 10 feet, on a level in the valleys during the winter. Owing to the tendency for the maximum precipitation to take place on and near the highest mountain, this fall would be much increased over the névé regions. From sections of hardened snow, which, having a glacial flow, were crowded over a precipice and so caused to break off, the average depth between the dark bands referred to above as showing the annual snowfall seemed to be about 18 feet.

In regard to dangerous and sudden storms, only two instances were observed of sudden formation of clouds below the mountain summits, and in both these cases the barometer gave ample warning.

A few remarks might be made under this topic in regard to forest fires. These originate, in great part, from the railroad, but also from careless hunters and prospectors, who are, indeed, accused of wilfully firing the forests to open up the country, and more rarely from Indian hunters. A certain cause, but probably rare, is lightning. An authentic instance was reported last summer of a gentleman who saw a lightning flash, and, shortly after, fire in the forest where it struck.

Hundreds of miles of forests have been already consumed, and the danger is always present and apparently increasing. The smoke from these fires, though often 50 or 100 miles distant, obscures the atmosphere more or less almost one-third of the time during July and August.

*Methods of Surveying.*—The surveying was done by means of plane-table and alidade, the latter furnished with a powerful telescope. A base-line of 600 feet was first measured with a 50-foot steel tape on the shore of Lake Louise. This was the longest possible straight level place

MOUNT TEMPLE, WITH LESS FOREGROUND, TO SHOW THE DEPTH OF VALLEY.

to be found. A series of small cairns built of flat stones was constructed to a height of 18 inches above the water-surface, having been first roughly aligned by the alidade. These were 50 feet apart. Smooth, flat stones capped each of these, and by means of the alidade sighting on a plumb-line, marks were made on these in alignment. A steel tape was used to measure from one cairn to another. This was repeated a number of times, and then movable signal flags were placed at either end of the base-line. The lake was then mapped very carefully by

means of a great number of signal flags. This work required over three weeks. The lake was afterwards sounded, mapped, and contoured from 137 soundings.

After the lake was mapped, a one-inch scale map was started, and two of the lesser mountains located. The plane-table and alidade were then carried to the summits of each of these mountains, not, however, without considerable labour. The principal features of the area were located from these points, and the streams, etc., sketched in from over 120 photographs taken in all parts of the region. Subsequently, another base-line of 3900 feet was measured on the railroad track, in order to get angles on some of the peaks visible from there. Comparisons between the results from the two base-lines show considerable accuracy. Goat mountain and St. Piran differed on the two maps by about 118 feet on a total distance of almost two miles. Some errors must creep in on account of the bluntness of mountain summits and their varied aspect from different positions. Independent angl. with a plotted distance gave 8876 and 8880 feet for the height o' . signal flag on St. Piran, a result far within the limits of probable error by this method. The height of Mount Temple resulted in 11,611 and 11,691 feet from the two ends of the base-line. These average 11,651 feet, which is within 7 feet of the calculated height. It was not known until this result had been worked out that the mountain measured was Temple, and, in fact, this close result first excited the suspicion that led later to a knowledge of its previous measurement.

*Conclusion.*—The characteristic features of the region by which these mountains and the Canadian Rockies in general are differentiated from other mountain regions, as the Alps, Andes, and Himalayas, are found not so much in the geological age and nature of the strata as in the extent and character of those erosive forces which have resulted in forming narrow, deep valleys, often with precipitous rock walls of great height and grandeur, thus making the mountains relatively very high. Added to this, climatic conditions sufficiently moderate in summer to tolerate, and humid enough to encourage, a rich vegetation, there results a fortunate combination of beauty and grandeur which has already begun to attract the admiring attention of travellers. The by no means excessive precipitation of snow is offset by a long period of nearly ten months for accumulation, resulting in extensive glaciation on the higher peaks. As these points are favoured by the addition of a clear, cool, and invigorating atmosphere, there is but little doubt that the Canadian Rockies will enjoy an ever-increasing popularity and favour among travellers and mountaineers.

# ZOOLOGICAL SOCIETY OF LONDON.

**The scientific publications of the Zoological Society of London are of two kinds "Proceedings," published in an octavo form and "Transactions" in quarto.**

A set of the "Proceedings" contains several thousand articles and notices by the greatest authorities of the age.

Darwin, Broderip, Bell, Waterhouse, Yarrell, Owen, Gould, Huxley, Forbes, Sclater, Volley, Gunther, Newton, Mivart, Wallace, Dresser, Lilford, Newton, Saunders, Seebohm and other well known naturalists contributed to the publication. A few subjects and authors may be noted, as under:—

**Huxley.** The Classification of Birds.

**Day's** Valuable Papers, afterwards issued as The Fishes of India

**Crisp's** Valuable notes on Pathological Subjects.

**Owen** (Sir R.) on Anatomy.

**Flower's** Papers on Cetaceans.

**Salvin** on South American Birds and Butterflies.

**Sharpe** on Kingfishers and Swallows.

**Wallace.** Birds of the Malay Archipelago.

**Dresser.** Papers on European Birds.

**The Prosectorial** Memoirs of Forbes and Garrod.

**Sclater.** On the Birds of Central and South America.

**Hudson.** Mammals and Birds of the Argentine Republic.

**Johnston.** Zoological Investigations in British Central Africa.

**Gould.** Several hundred Papers on Birds and Mammals.

and others of equal interest.

## SPECIAL OFFER OF THE PROCEEDINGS OF THE ZOOLOGICAL SOCIETY OF LONDON.

**PROCEEDINGS OF THE SCIENTIFIC MEETINGS,** COMPLETE SET from their beginning in 1830 to 1905, *with several thousand plates*, the greater number BEAUTIFULLY *coloured*, 75 vols, bound in 51 vols, 8vo, new half green morocco extra, gilt tops, by PORTER. 1830—1905 **£65**

The "Proceedings" contain not only notices of all business transacted at the scientific meetings, but also all the papers read at such meetings and recommended to be published in the "Proceedings," by the Committee of Publication. A large number of plates and engravings are issued in the volumes of the "Proceedings," to illustrate the new or otherwise remarkable species of animals described in them. Amongst such illustrations, figures of the new or rare species acquired in a living state for the Society's guardians are often given.

——— Another set, 75 vols in publisher's cloth. 1830—1905 **£52 10/-**

* Odd volumes and parts in stock. Send list of wants.

**TRANSACTIONS OF THE ZOOLOGICAL SOCIETY OF LONDON,** a COMPLETE SET from the beginning in 1833 to 1909, *over* 1000 *plates of Mammals, Birds, Fishes, Mollusca, etc., chiefly* COLOURED, vols 1 to 17, and Index in 17 vols, new half morocco extra, by MORRELL, with the parts of 18 (as far as issued). 1835—1909 **£56**

☛ Please note that the above sets are all genuine Original Issues, **with the Coloured Plates as issued by the Society.**

### The following are offered separately:

**PROCEEDINGS OF THE COMMITTEE OF SCIENCE AND CORRESPONDENCE OF THE ZOOLOGICAL SOCIETY OF LONDON,** 8vo, 2 vols (Letterpress only). No plates were issued.

**1830-31.**

No copies in stock. Please report any copies.

**1832** **2/6**

Orkney Birds—Mammals and Birds of Nepaul—Fishes of Madeira and Ceylon—Birds of Chili and Mexico, etc.

## PROCEEDINGS OF THE ZOOLOGICAL SOCIETY OF LONDON

8vo, 15 vols (Letterpress only), no plates were issued. 1833-184
(First Series)

**1834** **3/6**

Birds of Western Africa; North America, etc.; Zoology of New Holland an Hayti—Fishes of Western Africa—Insects of Guiana, Mollusca and Concife —Mammals of Nepaul, etc.

**1835**

South American Crustacea—Fishes of Trebizond—The Australian *Gunar*- Himalayan Birds—Natural History of Mauritius—Marsupials of N.S. Wales- Birds of the Cape of Good Hope—also several papers on Birds, by Gould.

**1836** **3/6**

Indian Antelopes—Kangaroos—Whales—Birds from the Swan River, Mexic and N.S. Wales (by Gould), etc., etc.

**1837** **3/6**

The Spermaceti Whale—The Great Auk—Australian Birds—Fishes of Madeira- Quadrupeds of South Africa—Insects of Manila, etc.

**1838** **3/6**

White Elephants—North American Squirrels—Mammals of the Philippine Islands—Australian Birds and Quadrupeds—Indian Mammalia and Birds- Japanese Salamander, etc.

**1839** **4/-**

S. American Birds—Indian Serpents—Birds of Malaya—Birds and Mammals of Assam—New Zealand Birds, etc.

**1840** **4/-**

Tibetan Sheep—Shells of the Philippine Islands—Australian Birds, Fishes and Mammals—Birds of Tangier—Whales, etc.

**1841** **4/-**

Philippine Land Shells—Australian Birds and Mammals—Birds of Jamaica— Fishes of the Australian Seas—Birds of Thibet and Cashmere—Insects of Tropical Africa, etc.

**184** **2/6**

Shells from Chusan—Birds of India, Western Africa, Australia, etc.—Chilian *Helicidae*—Papers on Reptiles and Fishes—Insects of Western Africa, etc.

**1844** **2/6**

Birds of V.D. Land—Mammals and Birds of Western Australia—Natural History and Zoology of Abyssinia—Fishes of Jamaica—Papers on Shells (from various countries)—Monkeys of Ceylon—Rare Insects, etc.

**1845** **2/6**

Birds of China—Australian Birds and Mammals—Shells—Nepalese Birds—Bats of the Philippines—Siberian Mammals, etc.

**1847** **4/-**

South American Ornithology—Lepidoptera—Rare Birds of Australia and New Zealand—The Cetacea of the British Islands—The Indian Elephant—Shells from the Eastern Archipelago—Chilian Birds' Eggs, etc.

**INDEX. 1830-1847** **2/6**

**SECOND SERIES**, 13 vols, 1848 to 1860. Plates were issued with this Series.

A complete set of the 13 vols, the letterpress in yearly volumes and the series of 440 plates grouped bound in sections as noted. **£7 10/-**

AVES, 2 parts in 1, 173 *plates* — REPTILIA and PISCES, 43 *plates*
RADIATA, 18 *plates* — ANNULOSA, 72 *plates*
MOLLUSCA, 51 *plates* — MAMMALIA, 83 *plates*

*** The rarest portion of the PROCEEDINGS. Out of print and scarce.

Also, SEPARATELY—

BIRDS, 173 *plates* and 13 vols letterpress. 1848-1860 £3 10s

——— ANNULOSA and RADIATA, 190 *plates* and 13 vols letterpress £2 10s

——— REPTILIA and PISCES, 43 *plates* and 13 vols letterpress £2

——— MAMMALIA, 83 *plates* and 13 vols letterpress £2

## The following volumes of letterpress only (no plates) at 2/- EACH YEAR.

### 1848

Australian Birds—Mammals of Borneo—Terrestrial Birds of New Zealand—Crustacea—Brazilian Bats, etc.

### 1849

Entomostracous Crustacea—Australian Mammals and Birds—New Zealand Marine Molluscous Animals—Serpents of St. Lucia—African Nocturnal Lepidoptera, etc.

### 1850

Papers on *Entomostraca*, Crustaceæ, etc. (about 50 articles)—Australian Birds—Mammals of Ceylon—The Nolaris (rare N. Z. bird)—Swan River Batrachians—Dipterous Insects of Africa, etc.

### 1851

Raptorial Birds of British Guiana—Bivalve Shells of New Zealand—Birds of Madeira—Borneo Shells—Longicorn Coleoptera from New Holland, etc.

### 1852

Mollusca—Tortoises—The Tree Kangaroo—Land Shells—S. America Birds—Monkeys of the Amazon, etc.

### 1853

Gasteropodus Mollusca—Entozoa—Bovine Animals of the Malay Peninsula—Humming Birds of Peru—Indian Mammalia—Exotic Moths, etc.

### 1854

Cerithidea—Pulmonferous Mollusca—Indian Birds (Papers by Frederic Moore)—Birds of Ecuador—Lepidopterous Insects and many papers on Conchology, etc.

**1855**

Californian Shells—Indian Birds—Birds of the Peruvian Andes—Tortoises of America, Ceylon and Australia—Mammals of the Himalayas—Birds of Texas and Sante Fé, etc.

**1856**

The Blacks of Moreton Bay and the Porpoises—Notes on Birds made during the Voyage of the *Rattlesnake*—Mammals of Nepal and Tibet—Panama Mammals and Birds—Shells of Kashmir and Tibet, etc.

**1857**

Central African Natural History—Birds of the Victoria River Depot—[N.W. Australia]—Birds of Guatemala—The Cassowary—Axiferous Zoophytes—Lepidopterous Insects of N. India—Birds of California and Mexico, etc.

**1858**

Birds of India—Himalayan Mammals—Land and Freshwater Shells of Ceylon—Australian Polygoa—Birds of Western Africa—Birds of Ecuador and Mexico—Longicorn Coleoptera, etc.

**1859**

Birds of Cashmere—The New Holland Jabiro [Gigantic Crane]—Nudibranchiate Mollusks of Port Jackson—Birds of the Falkland Is.—Birds of Siam and New Caledonia—Vertebrata of Ecuador—Reptiles and Fishes of Northern Africa, etc.

**1860**

Freshwater Bivalve Mollusca—The Giraffe—Reptiles of Siam—Reptiles and Fishes of Mexico—Angola Birds—Sandwich Is. Mollusca—Natural History of Ecuador (many papers), etc.

**INDEX VOLUME. 1848-1860** **2/6**

---

## PROCEEDINGS OF THE SCIENTIFIC MEETINGS OF THE ZOOLOGICAL SOCIETY OF LONDON, 1861-1870.

**1861.** LETTERPRESS ONLY, **2/-** LETTERPRESS and 44 PLATES, **4/6**

Entozoa—Australian Birds and Mammals—Pacific Coast Fishes—Rare Eggs—Land Shells—The Ophidians of Bahia [Brazil], etc

**1862.** LETTERPRESS and 46 PLATES **3/6**

Lyre Birds from Port Philip—Formosa Birds—Butterflies—Corals—Australian Snakes—West African Natural History—Marine Shells—Rare Birds of New Guinea—Birds of the Sulu Islands, etc.

**1863.** LETTERPRESS and 42 PLATES **3/6**

Shells of Australia—Shells from Vancouver Islands—Butterflies of Panama—East African Birds—Birds of Borneo and Central America, etc.

**1864.** LETTERPRESS and 41 PLATES **3/6**

Seals and Tortoises—Australian Natural History—Central American Fishes—Zoology of Spitzbergen—Birds from Costa Rica and Panama—East African Insects—Parrots of the Malayan Region, etc.

**1865.** LETTERPRESS ONLY, **2/-** LETTERPRESS and 47 PLATES, **3/6**

Marine Molluscan Fauna—Indian Ornithological Notes—Fishes of Cochin—Australian Birds—Birds of the Malayan Archipelago, etc.

**1866.** LETTERPRESS ONLY, **2/-** LETTERPRESS and 46 PLATES, **3/6**

Shells from the Amazons; Central Africa, Formosa, etc.—Coleoptera of Formosa—Duvinal Lepidoptera—The Sperm Whale—Avifauna of Australia, etc.

**1867.** LETTERPRESS and 47 PLATES **4/6**

Japanese Shells—Australian Marine Mollusca—Fishes of India—Birds of Australia, Zanzibar, Indian Archipelago, etc.—Mammals and Birds of Cape York—Snakes—Peruvian Birds, etc.

**1868.** LETTERPRESS AND 45 PLATES **4/-**

Seals of the Falkland Islands—Indian Raptores—Mammalian Fauna of Greenland—Ornithology of the Agentine—Fishes of India—Australian Birds—Salmon Breeding, etc.

**1869.** LETTERPRESS AND 50 PLATES **4/-**

Natural History Notes from Burmah—Shells of the Pacific Islands—Silicco fibrous Sponges—Spiders and Scorpions—Tonga Is. Birds—Ichthyology of Tasmania—Australian Snakes, etc.

**1870.** LETTERPRESS AND 53 PLATES **3/6**

South Sea Island Sea Shells—Diurnal Lepidoptera—Ornithology of Buenos Ayres—Mammals and Birds of China, etc.

**INDEX. 1861-1870** **2/6**

**INDEX. 1871-1880** **2/6**

A long series of the PROCEEDINGS from 1832 to 1888, with all the COLOURED and other plates, also Indexes, 62 vols **£35**

☞ **The plates of the separate volumes are uncoloured, but the complete sets are as issued by the Zoological Society, with the coloured plates.**

FRANCIS EDWARDS, 83, High Street, Marylebone, London, W.

# GOULD'S ORNITHOLOGICAL BOOKS.

**Imperial Folio Size.**

**BIRDS OF GREAT BRITAIN**, 367 COLOURED PLATES, 5 vols, half morocco. 1873 **£60**

**BIRDS OF AUSTRALIA**, with SUPPLEMENT, ABOUT 700 COLOURED PLATES, 8 vols, half morocco. 1848-69 **£160**

NEW COPIES AT REDUCED PRICES.

**HORN** (W. A.) Expedition to Central Australia, edited by Baldwin Spencer, *illustrated with numerous coloured and other plates, photographs, woodcuts, etc.*, complete in 4 volumes, 4to, cloth. *Melbourne*, 1896-7, issued in paper wrappers at £4 10s, and now offered in cloth for **£1 15s**

COMPRISING :—

Vol. I.—**Through Larapinta Land**, with a summary of the Zoological, Botanical, and Geological results by Prof. Spencer; HYMENOPTERA by W. F. Kirby; additions to the Fauna, etc.

Vol. II.—**Zoology**, including Mammalia, Birds, Reptiles, Amphibia, Fishes, Insects, etc., by Prof. Spencer and others.

Vol. III.—**Physical Geography, Geology and Botany**, by Prof. Tate, J. A. Watt, W. F. Smeeth, and J. H. Maiden.

Vol. IV.—**Anthropology**, by E. C. Stirling, and notes on the **Manners and Customs of the Aborigines of the McDonnell Range**, by T. J. Gillen.

One of the most important works on the Anthropology and Natural History of Australia.

**BALDWIN** (W. C.) **African Hunting from Natal to the Zambesi** (including Lake Ngami, the Kalahari Desert, etc.), 46 *illust.*, 8vo, cloth. 1894 (pub. 18s) **5s 6d**

**SAVILLE-KENT** (W.) **The Great Barrier Reef of Australia**, 16 *coloured and* 48 *other plates*, folio, cloth. 1892 (pub. £4 4s) **28s**

Corals and Coral Reefs, Pearl, Marine Fauna, etc.

**DIXON** (C.) **Our Rarer Birds**, *many wood engravings by* WHYMPER. *Bentley*, 1888 (pub. 14s) **3s**

Studies in Ornithology and Oology. The book makes a very good introduction to a study of bird life.

## LIBRARIES PURCHASED AND VALUED FOR PROBATE.

FRANCIS EDWARDS is always pleased to purchase large or small Collections of Books, Engravings, and Autographs, and prepared to pay a Fair Cash Price for the same.

Distance from town immaterial. No charge is made if within 30 miles of London. Prompt cash settlements.

Books removed without trouble or expense to the Vendor.

## PLEASE NOTE.

£1 Orders are sent free in the British Isles.

Books can now be mailed to all parts of the world at 4d. per lb.

Post Office Orders should be made payable at Devonshire Street, and cheques crossed National Provincial Bank of England.

Catalogues of books on special subjects are continually being issued, and can be sent post free on receipt of address.

*Printed for Francis Edwards, Bookseller, 83, High Street, Marylebone, London, W. by G. R. Flower, "Ye Bartholomew Presse," 12—14, Verulam Street, E.C.*

, W.

**KS.**

ls, half
£60
OURED
£160

Baldwin
, *photo-*
cloth.
os, and
£1 15s

ological,
y W. F.

, Fishes,

rof. Tate,

**ers and**
llen.
Australia.

**Zambesi**
th. 1894
3s) **5s 6d**
6 *coloured*
4 4s) **28s**

*Bentley,*
b. 14s) **3s**
uction to a

**OBATE.**
or small
and pre-

ithin 30

nd cheques

can be sent

*London, W.*
*eet, E.C.*