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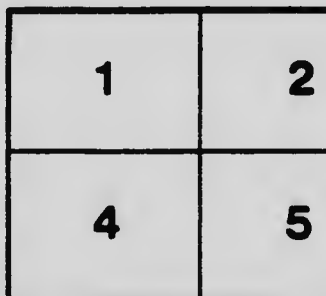
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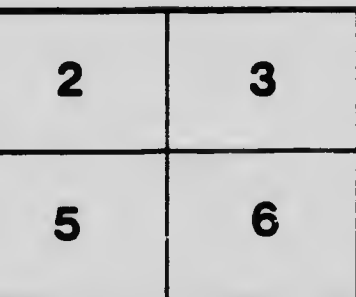
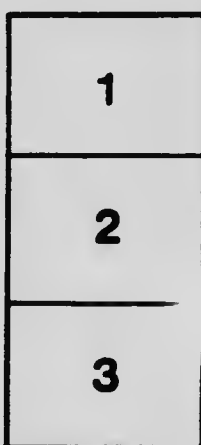
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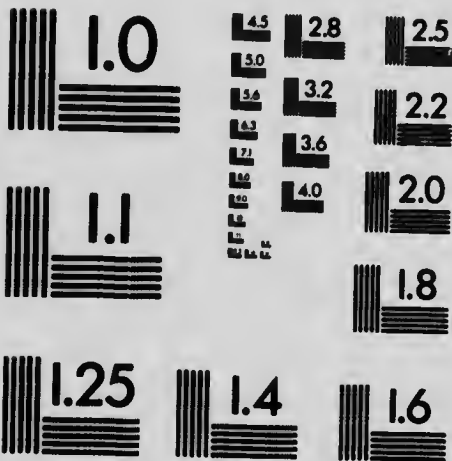
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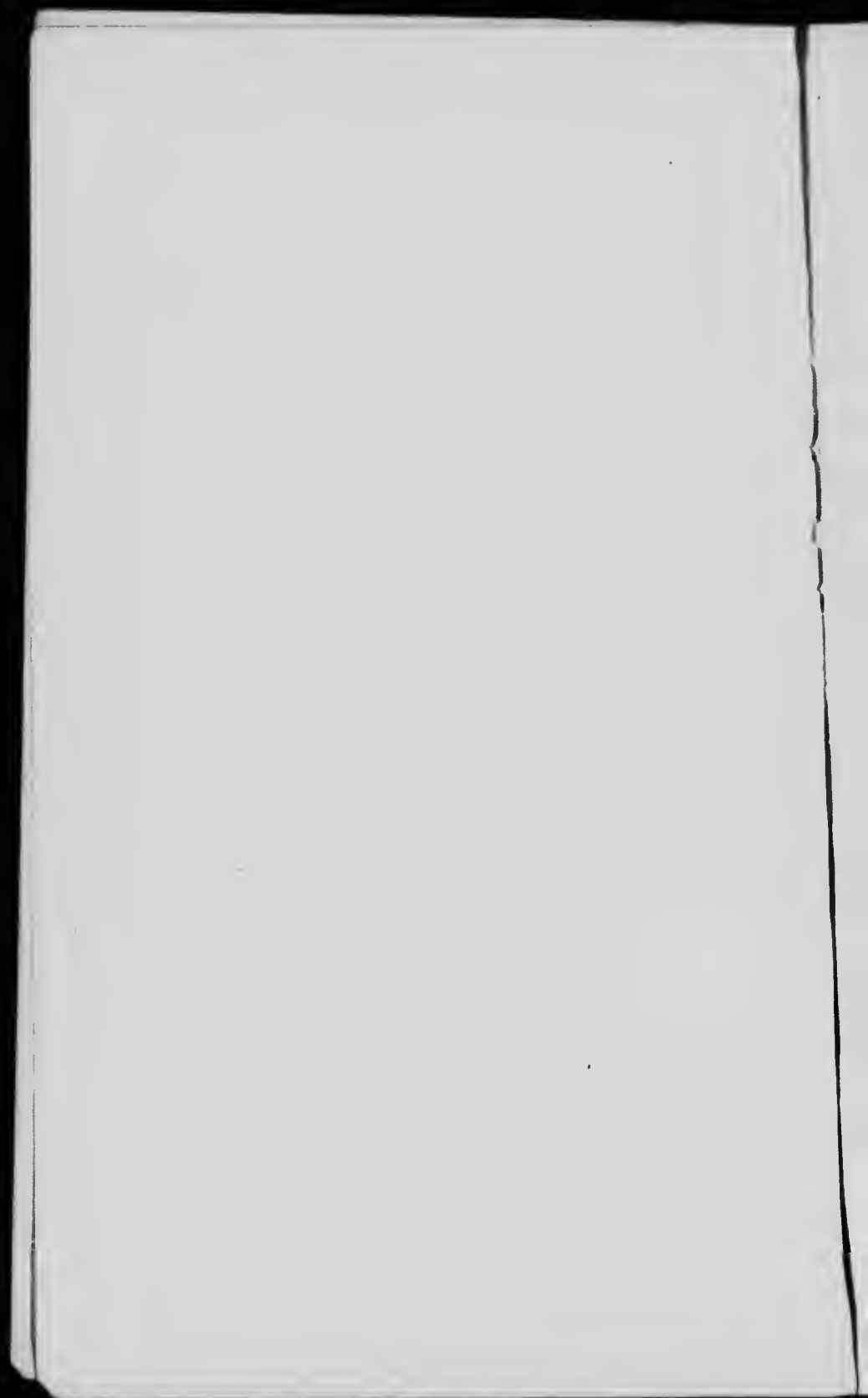
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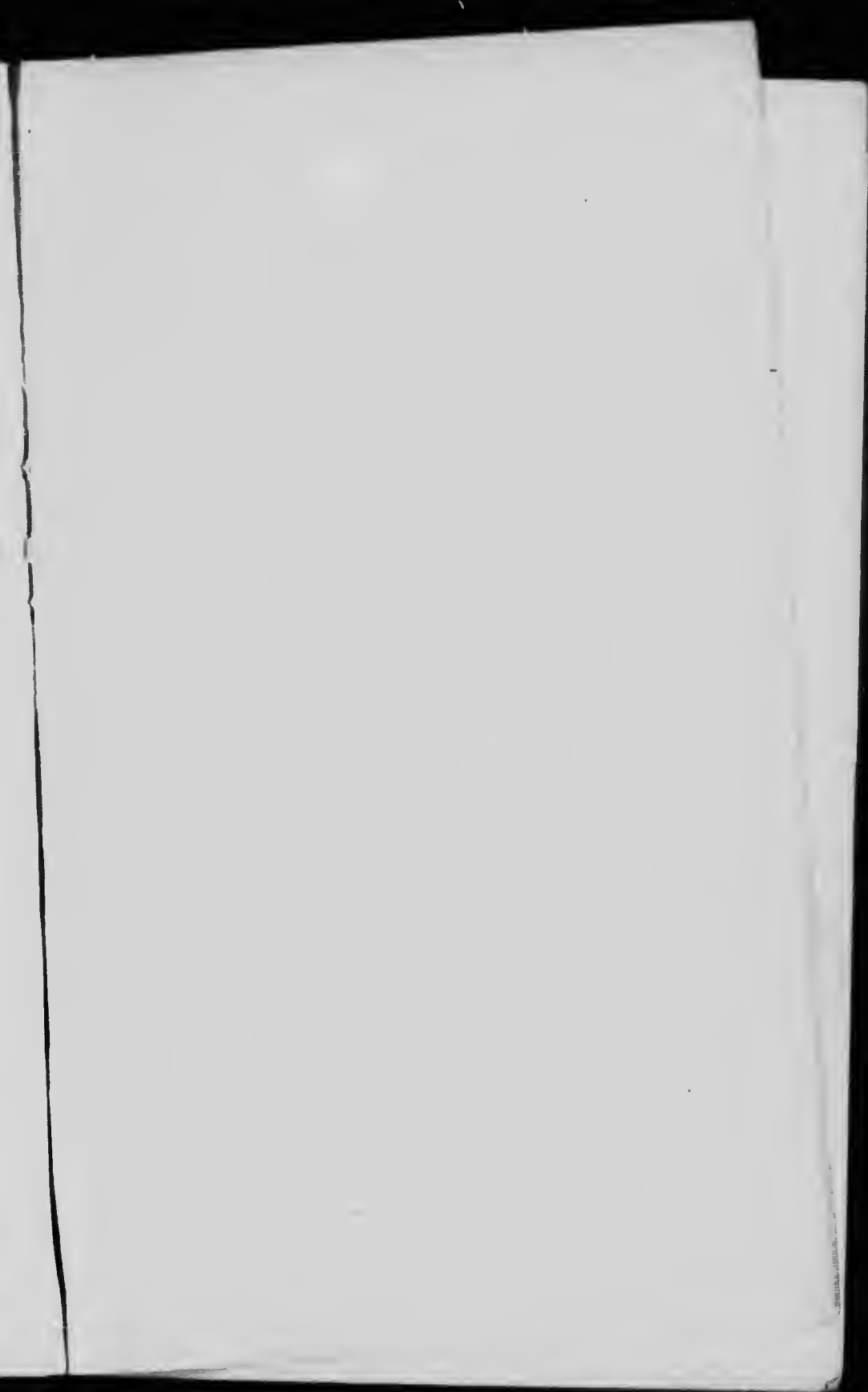
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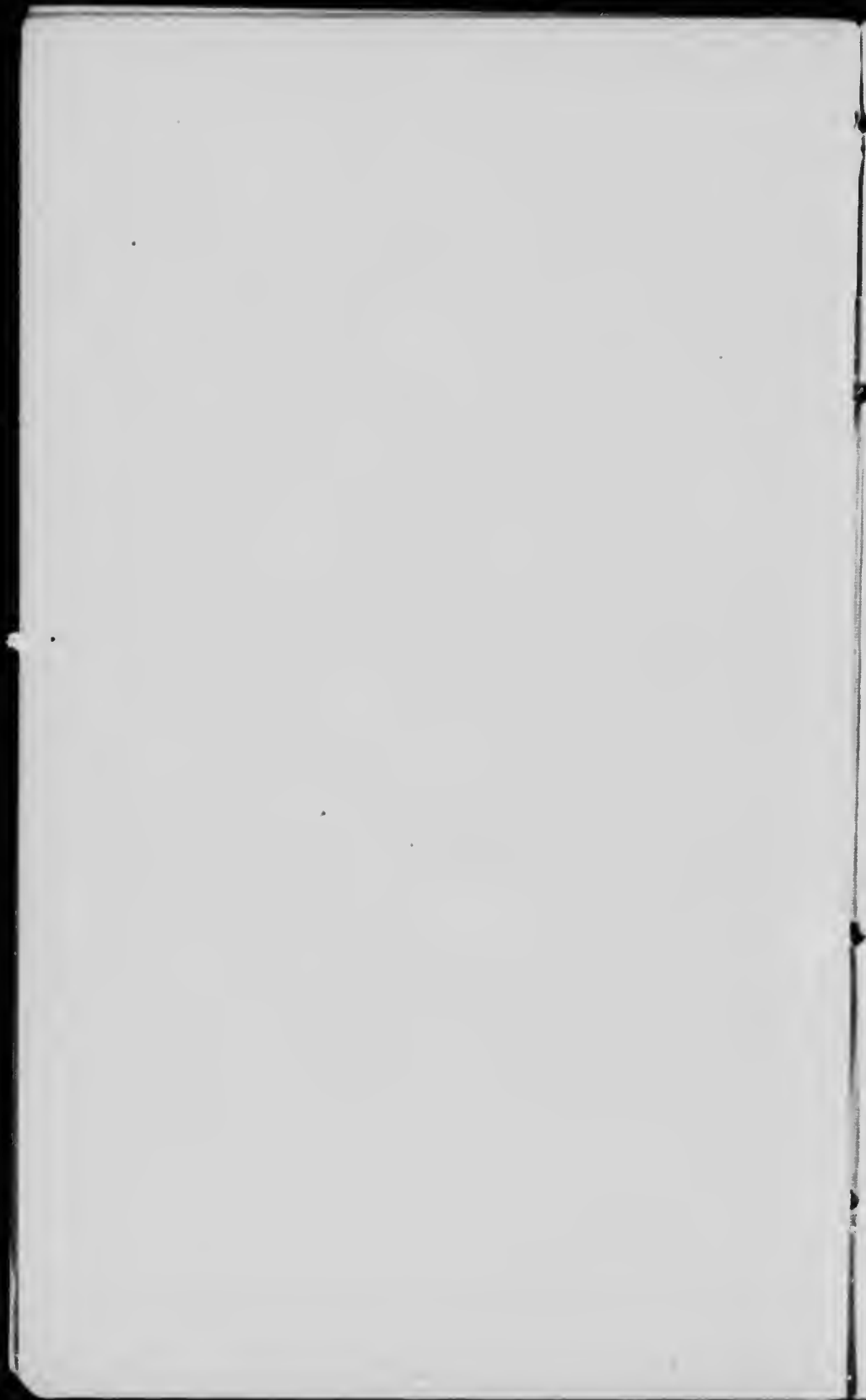


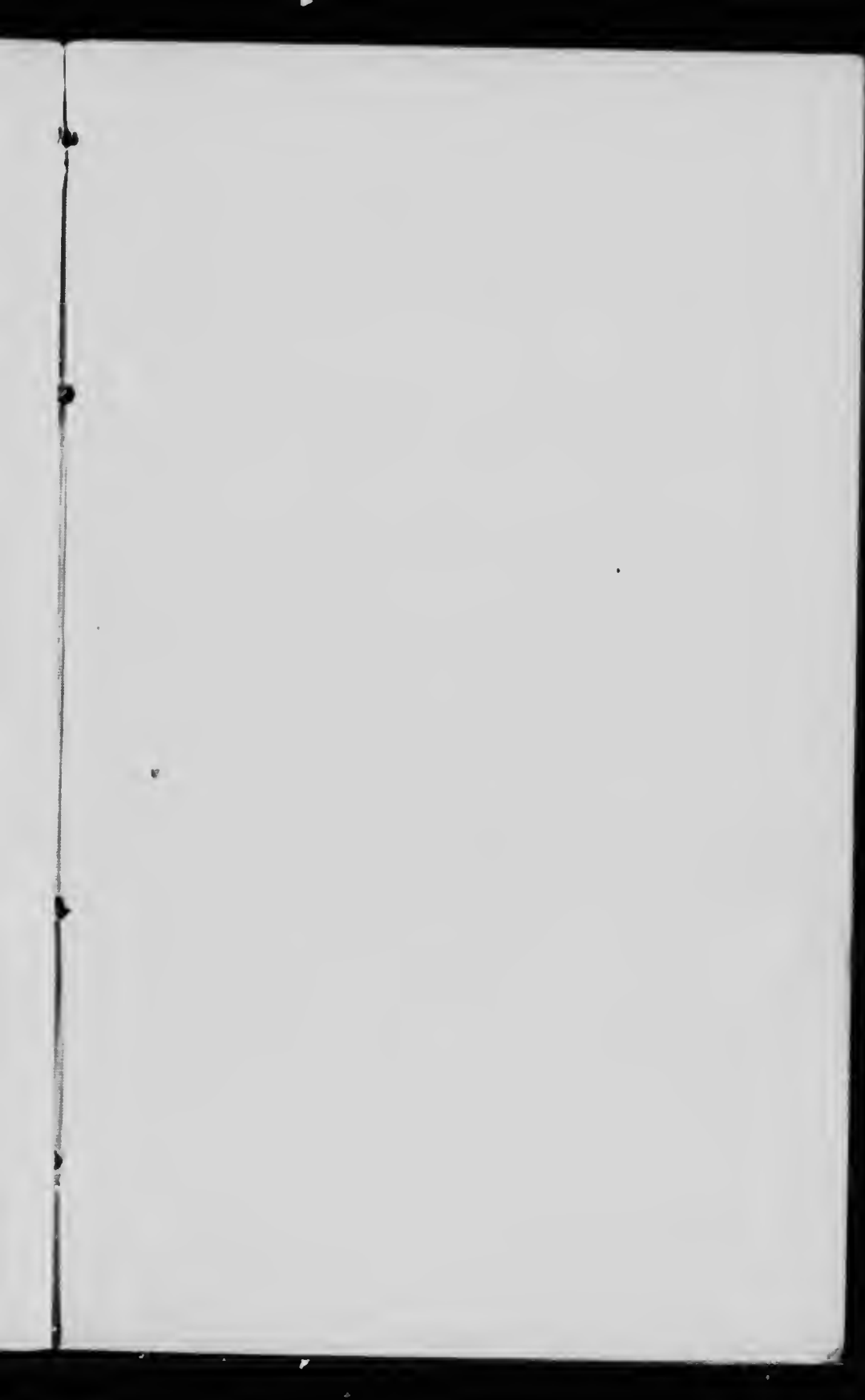
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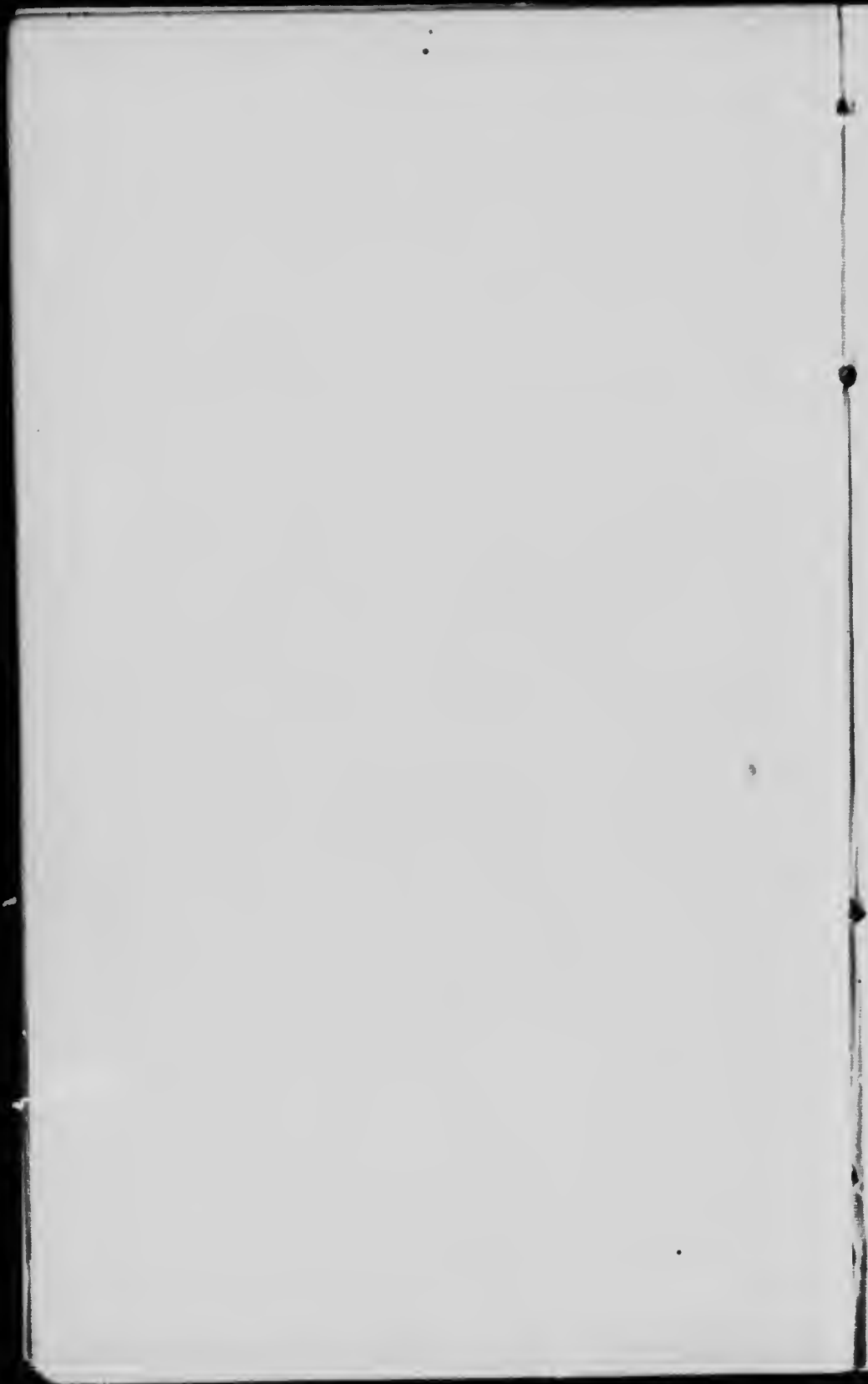
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**ON THE COLLECTION OF ZOOLOGICAL SPECIMENS
FOR THE
VICTORIA MEMORIAL MUSEUM**

ZOOLOGY

BY
P. A. TAVERNER



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THE COLLECTION OF ZOOLOGICAL SPECIMENS

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INTRODUCTORY.

The Victoria Memorial Museum has already a considerable amount of zoological material in its collections; but Canada is broad, and the surface of her resources has been merely touched. In the existing collections, no branch of zoology is, as yet, exhaustively represented. The only areas from which a few scattered specimens have hitherto been gathered are, southern British Columbia, along the International Boundary to eastern Saskatchewan, and extreme southern Ontario; and even in these parts there is still much collecting to be done. It will readily be seen, therefore, that there is a large field from which contributions to the Museum collection can be made by its friends, and especially through the medium of the Geological Survey field parties, and other exploratory expeditions. Any zoological specimens from the untouched regions may be regarded as valuable acquisitions.

Canada is a growing country, of great promise; and the older countries are taking advantage of this fact; for a number of their larger museums have better representa-

tive specimens of Canada's fauna than is found in her own national museum at Ottawa. National pride should stimulate her people to make some effort on behalf of their own institution. Visitors from other lands take pride in depositing in their own national repositories the results of their hunting and other excursions on Canadian soil; and it is to be hoped that our people will not fall behind those of other nations in patriotic interest. We wish to make our Museum truly *National*, truly representative of the country, and one to which every citizen can point, with pardonable pride. To attain this result, however, will demand the sympathetic interest and co-operation of the whole people—collectively, and individually.

It is not to be supposed that an institution of this kind, maintained by the Government, can ever rival private institutions of like character, independently of help from public spirited individuals, outside the Government technical staff. The prestige of such renowned institutions as the British Museum and Smithsonian Institution, is due as much to the generous aid and practical interest of private individuals as to direct government support. Wealthy though the government of a prosperous and progressive country may be, there are constant drains on its financial resources, hence experience shows that where Science and Art institutions rely on government aid alone, they are never able to compete with those which are backed by the active interest and wide influence of private patronage.

We appeal, therefore, to those Canadians whose work or sport carries them to distant or out-of-the-way places in the Dominion, or in other lands, to remember that, the Victoria Memorial Museum is the legitimate repository of the zoological specimens they gather, and which they do not desire to retain as personal trophies. In every instance full credit will be given to the donor, together with

a guarantee that such acquisitions will be kept safely, for all time, as far as is humanly possible, and put to the best possible scientific and educational use. The classification, and public exhibition of these contributions will be an aid in extending useful knowledge, and will add to the prestige of Canadian science.

Moreover, not only can those interested in the science of zoology help by supplying specimens, but also by making notes, and gathering information as to the distribution and habits of Canadian wild life. Such records, especially those from localities which have been only meagrely studied, are invaluable; often of more importance than actual specimens; and although some of the notes may not be deemed of sufficient importance for official publication, yet the aggregate of such information will be of value in estimating and appreciating the zoological resources and conditions of the country.

Before closing this appeal for private contributions of zoological specimens, etc., there is one aspect of the subject to which it is necessary to refer, namely, to the fact that, private donors sometimes impose confining conditions which are altogether unreasonable. It is to be supposed that the technical officers of the Museum are competent to handle specimens in a way most advantageous to the advancement of science; therefore, to hamper them with arbitrary conditions, imposed by those less experienced in the scientific study of the subject, is more apt to militate against, than for, the interests of zoology. Circumstances so change in a few years, that restrictions which at one time seemed reasonable, are found, later on, to be an almost intolerable interference with the proper use of specimens, and against the interest of education and progress. Hence it is hoped that specimens donated to the Victoria Memorial Museum by public spirited individuals, for the advancement of science, will be given fully and freely; without those entangling restric-

tions and embarrassments that have hindered the usefulness of so many similar institutions, and defeated, very largely, the object of their existence, namely, the conservation and universal diffusion of knowledge.

ZOOLOGICAL COLLECTING.

INTRODUCTION,

In collecting zoological material in out of the way and little known localities, the first question the amateur is likely to ask is: "What to collect." The experienced naturalist, of course, should know in general what is the most desirable material in any given locality and is in a position to pick and choose to advantage. The beginner, however, on the other hand, has to go more or less by guess, and in the endeavour to gather what is best, as often guesses wrong as right. As an aid to him in making the best of his opportunities, the following suggestions are written.

In general, when the collector is undecided as to what is of the most value, it is best to adopt a rule to take that which seems the most characteristic of the locality. The chances are greatly in favour of that being rare in a little worked locality, which is common elsewhere. In any event a collection of rarities from any one place fails to give a just idea of local conditions for it is the abnormal facts that have been chosen to represent them rather than the normal. Of course, anything that is known to be rare should be obtained if possible, but unless the collector is well posted on the subject, it is not wise to neglect a good amount of common material close at hand for the sake of a few things that may seem at the time to be rare.

In the bird fauna, the most characteristic forms in any given locality are the summer residents. Hence, breeding birds are always desirable, and give a better idea of local

ecological conditions than do migrants which, in their long journeys, are forced to pass through many habitats more or less uncongenial to their requirements.

The most profitable course for a beginner under such conditions, is to endeavour to collect specimens of everything that comes under his notice, beginning with the commonest. The mere fact of locality gives most things zoological an enhanced value. Many species vary under the geographical influence of their distribution, sometimes broadly, sometimes so minutely that it takes the closest study to detect the differentiation. The form in evidence may or may not be identical with others from a well studied locality, but in either case they are valuable, as the demonstration of a lack of variation in a locality is of as much scientific importance as that of its occurrence.

Corollary to the above, is a rule that may be stated as "Never neglect the inconspicuous." Striking beauty or unusual form are not criteria of scientific value. What seems unusual or new to the beginner is often an old story to the experienced naturalist. Fine showy specimens are to be met with in many collections, and are generally already much better represented in them than their relative importance demands. Probably, the duller and more obscure specimens are in more immediate demand than the brighter ones. While the finely antlered buck that the sportsman sweats to bring out in good shape may be a magnificent trophy, it can likely be duplicated or even surpassed in many existing collections. Moreover, the species has probably been already well studied, but the inconspicuous mouse, creeping in the grass where the nobler animal fell, may be a new and undescribed species. It is not to be inferred, however, that such fine specimens are not to be secured when possible, but an exaggerated idea of their importance is to be guarded against.

In like manner it does not follow that because a specimen is in a worn or moulting condition of damage or

pelage, it is valueless as a specimen. It may not be possible to use it for a showy specimen in the exhibition halls, but in study collections, specimens are required of each species in every possible natural condition. In order to give a just idea of the value of such material it is well to state that the true specimens of any museum, the collections that give the institution its true scientific standing, are not those found in the glass exhibition cases of the main halls, but are those stored away in the dark cabinets of the laboratories where only the student or the special inquirer usually sees them. In fact, it is quite a serious question whether any really valuable specimens should ever be mounted and exposed to the disintegrating influences of light and air in the public exhibitions where its life is limited and where it is unavailable for close examination and study. For scientific work, a specimen is a specimen, no matter in how worn or ragged a condition it may be, so long as it truthfully represents a stage of life of the species it represents. In fact it is just such specimens in which most collections—ours amongst the number—are weakest. We can usually find plenty of adult spring male birds in collections, or fine antlered bucks; but specimens of young, moulting, or changing plumages of birds, or summer coated animals, are difficult to find, though of equal and often greater interest to the naturalist.

Another point to bear in mind is that while well made specimens are most desirable, any specimen is better than none at all. If time and circumstances, or lack of ability combine to prevent the making of perfect preparations, make them up as well as circumstances permit, but save them at any rate. The difference is only an esthetic one and not scientific, and we are collecting for the latter and not the former reasons. In making skins or other zoological preparations in the field, put all the time and care upon them that can be well spared, but remember that

two fairly good specimens are worth more than one mechanically perfect as long as the imperfections are but in the make-up and looks, and are not of a nature to imperil its lasting properties or usefulness.

Grease is the greatest enemy, after insect pests, that dried specimens such as skins, etc., have. A skin may be beautifully shaped, and each feather and hair may be in its proper place, but if every particle of fat has not been removed from within, the triumph is but momentary. In a short time, depending upon circumstances, the grease works out and stains everything a dirty yellow, and shortly the skin itself disintegrates and falls to pieces. In technical terms it "burns." With care, a properly made skin should last indefinitely, and should be prepared with this in view. Study specimens are not made for to-day or to-morrow, but as far as we are able to preserve them, for all time. We are gathering to-day, material for future generations to study. Many of the specimens that are of comparatively little interest now may be the treasures of the future, and it is our responsibility that we hand to posterity our material in condition that will render it available for use. It must be remembered that many forms of life are disappearing, and in many cases all the material the future can obtain is that which we are at present gathering.

It sometimes happens that circumstances prevent thorough cleaning of a valuable specimen at the time of collection. In this case, it is best to do the work as well as opportunity permits, then dry and ship in to the museum, where it can be relaxed and properly taken care of at the earliest possible moment, before the damage has gone so far as to render the operation too difficult or dangerous. In the early part of the autumn or when the weather is not too warm and railway communications are good, it is often possible and advisable to make up specimens roughly, insert pads of carbolated cotton—solution to be

given later—and ship to the museum fresh, there to be properly cleaned and finished. With the thermometer up to about eighty, in the hottest part of the day, specimens have successfully come through in this manner after being for a week on the road. This is specially to be recommended in the case of large birds, or greasy ones, when adequate facilities for cleaning or drying are not available in the field, or when the birds are desired for mounting in the public exhibitions.

Again it sometimes occurs that it is impossible to make any preparation of a specimen whatever, yet it is important that at least identification be secured. In this case, secure some part of it, if it is a mammal, a fragment of hair or skin showing the most characteristic detail; the tail is, in many species, diagnostic. If a bird, bring back a wing, head, foot, or tail, or all of them if possible. An entire specimen is better than a collection of fragments, several pieces are better than one, but that is better than nothing at all. Some of our most valuable records have been substantiated by just such fragmentary material.

One thing should be borne in mind while collecting. A Natural History Museum is no place for freaks. A few such may not be out of place as illustrating the lengths to which the abnormal may go in nature, but the value of such things as two headed calves, four legged chickens, natural pictures in rocks, etc., is but too generally overrated. Such things are only monstrosities, and there is very little to be gained from their study. Likewise, albinos (white) and melanotic (black) specimens of normally differently coloured species, are of but comparatively small interest. Such creatures are merely caused by a lack or a superabundance of the pigment in the cells of the outer covering and are the result of purely individual phenomena, and not racial or geographic influences. While alive, they may be of considerable interest to breeders working out problems of heredity, but dead and stuffed, they amount to

little more than curiosities, and any great amount of time, labour, or money, spent upon their acquisition is largely wasted.

Another generally misunderstood subject is the comparative value of mounted specimens to a museum. In by far the great majority of cases, a skin is much more desirable than a mounted specimen. In the first place, study specimens are often at a higher premium than those for exhibition; and in the second, as the exhibitions are planned according to a comprehensive plan, specimens, unless specially set up for their prearranged space, rarely fit satisfactorily into groups or other schemes. Usually, ready mounted specimens, to fulfil their uses, have to be remounted before they can be used. Interesting specimens coming in in the shape of skins can be more advantageously mounted and make more satisfactory finished preparations than when previous mounting has set them into positions that, though good in themselves, are more or less unsatisfactory for the exact requirement of the space in which they are designed to be placed.

The next point that it seems advisable to emphasize should really have come first, as it is the most important part of any branch of scientific collecting. It bears upon the vital necessity of preserving proper data with the collected material. No matter how rare or valuable a specimen may be, unless it has full data attached it is practically worthless. In fact a good label without a specimen has a certain amount of value, but a specimen without a label is almost valueless. There should be a label attached to every specimen indicating (1) the locality in which it was collected; (2) the date; (3) the sex; and a long way (4) one or more measurements depending upon the specimen and its anticipated use. The collector's name should also show on the label in order that the authority for the facts there stated may be located and due credit given. To please himself the collector may

add the name of the species, but this is the least important feature and unless the collector is more or less expert it is as likely to be wrong as right. In any event, it is an unessential, as every species bears a name upon its face which can be read at any time by the initiated.

In regard to locality, endeavour to tie up to some definite and well known geographical locality. The number of times such names as Mud lake or Sucker creek have given trouble is infinite. If in organized territory, the county, township, and nearest post-office will do excellently, but if in unorganized country, and there is no definite point nearby having an accepted name, latitude and longitude will have to be used, or either with a river intersection. As altitude has considerable to do with the distribution of life, it is most desirable that it should be stated on every label, where possible, when the specimen is from an area having a strongly accentuated relief.

In the matter of dates, always write the name of the month or its proper abbreviation. Never express it by number. This is a very common practice, but wholly to be condemned. Some use a system in which the month number comes first, and some reverse the order; while others use either system indiscriminately and confusion is the result.

Sexing of specimens is another thing that requires considerable attention. Alcoholic or other fluid preservations where the object is preserved entire require no sex determination, but with skins or fragmentary preparations, the sex should always be stated. No sex mark should ever be put upon a label unless it has been determined by examination of the genitalia. However well any one may know the secondary characteristics of a species, it is never safe to put conclusions so reached upon a label. If one man can determine the sex by these means, so can another at a later time. The sex marks on a label should always mean that it has been determined by the absolutely

certain method of dissection. Sexing breeding specimens is always an easy matter, but in cases where the genitalia are more or less dormant, as in fall killed and juvenile birds, it is often an entirely different matter. Never hesitate to put a question mark after a determination where there is the slightest shade of doubt. Even experienced collectors have to do this at times, and nothing so engenders suspicion of a beginner's work than to find that he has imagined himself competent to decide every sex determination in a lot of fall and juvenile specimens. The caution will bear repeating, never to put an unqualified sex mark on a specimen unless you are absolutely sure of it. Also make it a rule to use exactly the proper form of sex mark in every case. The symbol ♂ means male and ♀ is female. There are slight variants of these in more or less current use, but they are continually causing trouble and should be avoided.

Some collectors follow the practice of putting a number upon the specimen and then making a note of it with the data on loose sheets or in a book devoted to the purpose. Such a course is to be highly condemned. Sooner or later the loose sheets or the book will be lost, and the value of the collection disappears with them. If each individual is securely fastened to its own data, the danger of such a loss is reduced to a minimum. Should proper label blanks be unobtainable, any good tough paper will serve, and even, at a pinch, a bit of wood, whittled flat, can be written on and will serve the purpose well.

The best medium for the writing of labels is the most permanent one. A waterproof India ink is the first choice and a good black pencil comes next. Ordinary ink or a fountain pen runs badly with a little moisture and should be avoided. Indelible pencil is about the worst possible medium for the purpose. Keep the labels as small as possible. Large labels can go on large specimens, but small specimens with sheets of writing paper attached to them

are exceedingly awkward to look at or to handle. A museum puts its own label on a specimen when it receives it, but the original label is retained in order to verify or correct possible mistakes in copying, etc., and ungainly labels are much in the way in the cabinet trays. Another thing to be avoided is the use of coloured strings in labels. The slightest amount of water makes the colour run, and disfigures the specimen, causing discolorations that may at some time be regarded as natural, giving rise to misinterpretation of fact.

Finally, the only safe rule in label writing is to put nothing thereon but actually ascertained facts. Inferences and conclusions made in the field are extremely valuable but their place is in the note book. On the label there should appear nothing but "the truth, the whole truth, and nothing but the truth."

BIRDS.

COLLECTING.

No explicit directions can be formulated for the actual collection of birds. As the shot gun is the principal instrument of use, collection resolves itself into a problem of stalking within range and shooting straight, and only differs from hunting in the care that is taken in killing and carrying cleanly. There are, however, a few hints that experience has shown to be of value.

Any gun that will kill is sufficient, but for all around work it is hard to beat a double barrelled twelve gauge shot gun. If a permanent camp is established the collector can furnish himself with any number of firearms for the different kinds of game he intends to collect, but where space and weight is at a premium, the above in the long run will give the best satisfaction. A double

barrel has the advantage over a repeater in that two different sized loads can be carried in the barrels at once, each ready for instant use as occasion may demand. A twelve gauge is a good all around bore, well tried by experience and adequate for the largest game one is likely to meet as well as the smallest, when properly loaded. Its greatest recommendation, however, for this work, is the facility with which fresh ammunition can be obtained for it. This is a point of no small importance when the collector is working far away from his own regular dealer.

For small birds at very close range a .22 calibre rifle with shot shells often works very well. The older the weapon and the more worn the grooves of the rifling the better. It is hardly advisable to use a good new rifle for this purpose as the shot lodges in the grooves and until removed will spoil its shooting with ball.

AMMUNITION.

In regard to ammunition, any smokeless powder of recognized make is most satisfactory; the exact brand is largely a matter of personal opinion. In shooting small birds in tangled underbrush, or over long grass, the absence of smoke in seeing just where the game falls is of great advantage. However, when nothing else is obtainable old-fashioned black powder will do good service. The load must be accommodated to the size of the birds, and the range at which they are killed. Small birds in heavy brush where the range is always close demand small squib loads, while the same birds in high trees often require the full load of the gun. The proper loads can only be judged by experience and as their number is legion, under the various circumstances of field work, it is usually advisable for the collector to load his own shells. He then can modify them as each day's work seems to demand. The general rule given for loading for this purpose is equal bulks of black powder and shot. With smoke-

less powder its equivalent should be used, depending upon its strength. However a little more powder strength than the above never comes amiss, as the superior penetration it gives cuts cleaner and smoother holes in the skin and causes less effusion of blood. Varying sizes of shot are necessary and the following will be found satisfactory for various birds,—

No. 14....for all small birds.

No. 10....for birds the size of robins and blackbirds.

No. 8....for birds the size of small hawks and large waders.

No. 6....for birds the size of partridge and ruffed grouse.

No. 4....for birds the size of large hawks, owls, ducks, etc.

For larger sizes current practice and experience will decide the most effective loads.

On prolonged expeditions, brass shells will be found the most satisfactory as they can be reloaded indefinitely, and where space and weight are at a premium, one set will last the season and save the carriage of quantities of empty cases.

OTHER EQUIPMENT.

A pair of good field glasses is nowadays almost indispensable to an ornithological field worker. They enable him to successfully identify birds at distances far beyond the ability of the naked eye. The better the glass the better satisfaction it will give. Some of the modern prismatic binoculars are by all means the best available, but nothing higher than an eight power should be used. When carrying a gun, it is found impracticable to hold higher power glasses steadily with the one free hand, under the varied and often awkward circumstances of the field. The points to bear in mind in picking out a pair of glasses are sharpness of definition, absence of chromatic aberration,

and size of the field. For catching hurried glimpses of birds between leaves, the latter is a very important desideratum. It is to be remembered, however, that in dull or cloudy weather a low power glass will yield brighter images, and hence better results than a larger magnification.

A creel or fish basket is a most valuable adjunct to a collector's outfit. It carries birds in the best of shape without crushing or squeezing, and forms a receptacle for carrying cotton, papers, bottles of cornmeal or plaster of paris, insect killing bottles, empty shells, and other such paraphernalia that the collector soon finds it expedient to carry with him in the field.

CONDUCT IN THE FIELD.

Of conduct in the field, nothing need be said more than applies to general hunting. Quietness of action and the avoidance of unnecessary quick movements are the best rules of action. One little expedient in common use among ornithologists it may be well to mention. Place the moist lips against the back of the hand, and draw air into the mouth. A fine squeaking sound will be produced which repeated a few times will be found to excite all the small birds within hearing to a remarkable extent, especially in the summer or autumn months, and will often lure them out from the concealment of dense brush into the open, giving opportunity for a fair shot.

CARE OF SPECIMENS IN THE FIELD.

On picking up a bird just shot, often the first thing to do will be to kill it and finish the work not completed by the gun. To do this in a manner that will not injure the plumage and will accomplish the end in the quickest and most humane manner, grasp the bird with the thumb and forefinger across the body and just under and slightly behind the wings, and press firmly and steadily. This constricts the heart and lungs and death takes place in a

moment. Large birds like hawks and owls cannot be thus summarily dealt with. In such cases, carefully avoiding the bill or talons which can often inflict ugly wounds, lay the bird on its side on the firm ground, when pressure of the knee supplemented by the weight of the body, will produce the same effect as above. Attempting to choke a bird by constricting the air passages of the throat is useless in many cases, as birds have direct air communication between the lungs, the large hollow bones, and other cavities and air sacs of the body, and can breathe through any of them, or even through a shot hole through the body, as easily as through their natural air channels.

As soon as the relaxation of the body shows that the bird is dead, carefully wipe off what blood clots there may be, and plug the mouth, sometimes the nostrils also, with cotton batting. It is well to carry a small bottle of cornmeal in the pocket or creel, and to work some of this into feathers that are blood-soaked. When this is completed, and the feathers smoothed out, drop the bird head first into a cornucopia of paper, fold the open ends carefully about the tail and lay away in the creel, if one is carried; if not, in a pocket where it will be secure from undue pressure until return to camp. Half the battle of making nice skins is to get them into camp or headquarters in good shape. A little extra care in the field will save much work and time in making up.

For cornucopia papers, nothing is better than the advertising pages of current magazines. It is stiff, smooth, and of convenient size and shape. Folded double it fits the breast pocket nicely, and a single page can be used for a small bird, while a double one is sufficient for many of the larger birds.

PREPARATION FOR SKINNING.

A freshly killed bird yet warm is not easy to skin cleanly. It is better to wait a bit until the blood and juices have had time to set or coagulate. During rigor-

mortis, the bird is stiff in the joints and difficult to handle. In small birds this does not cause much inconvenience but in large ones it does, and in such cases it is advisable to wait a little longer until the body limbers and softens before beginning actual skinning operations. Then replace the throat and nostril plugs with fresh cotton. This is often neglected, much to the sorrow of the operator, who subsequently finds that the bird he expected to be smooth and clean has bled during skinning and is an exasperating mass of blood, feathers, and stomach juices.

The first thing usually done preliminary to skinning is to clean off what blood there may yet be remaining on the plumage. If there has been but little, and cornmeal was well applied to it at first, a few pinchings of the hard nodules will cause them to disintegrate and a little careful scratching with the nail will often free the feathers of the last traces of blood, leaving them in nearly perfect condition. If, however, the stains are more extensive, it will be necessary to wash them and then dry the spot to its natural fluffiness. Some prefer to defer this operation until after the skinning operation has been concluded for it is often found that the consequent manipulation has caused the juices to flow again and the work has largely to be done over. However the procedure is the same in either case, and may as well be described here.

CLEANING.

First, wash the soiled parts with a wisp of cotton batting dipped in clean water. A small soft sponge is most convenient for this purpose, taking care to stroke the feathers the right way of the shafts and separating them from time to time that every part of the stain may be reached. It is often necessary when large dried clots of blood are found hardened about the bases of the quills to

lay a pad of wet cotton on the spot and set the bird away for a few minutes while another specimen is taken care of. Shortly the refractory clot will be found to have softened and can be removed with ease.

DRYING.

As soon as all foreign matter has been thus removed, wipe the spot as dry as possible and then apply with another bit of batting, gasoline, benzine, turpentine, or kerosine; wash again until the place is well saturated with this medium, and freely dust on either plaster of paris, hardwood sawdust, or fine cornmeal to absorb the moisture. Work it well into the feathers and shake it out again. Repeat the operation, meanwhile working the plumage with the fingers and beating it softly with the flat of the hand or a smooth ball until the filaments are dry and well fluffed up. Performing the operation in a current of air facilitates it greatly. As a general rule, gasoline or benzine is the most satisfactory for the above use and turpentine or kerosene should only be used when it is proposed to dry with plaster of paris. Kerosene is to be used only in default of any of the former. When there is grease present on the plumage, or plaster is the drying medium, the use of one of the above is a necessity, otherwise it is only a great help in drying quickly. If the wet spot is small, quick deft work can be done with plaster without anything between it and the water, but ordinarily it prevents the plaster from setting in the feathers and so causes trouble.

The choice of the above drying materials depends somewhat upon the specimen being handled, and, of course, also upon what is available. Plaster of paris works most quickly, but unless the bird is white or light coloured it is very difficult to remove its last traces from the plumage and the resultant specimen is likely always to look dull and dingy. In light coloured specimens this does not

matter as much. The great secret in using plaster in this way is to use enough of it. Paradoxically as it may seem, the more that is put on to the feathers the less has to be dusted out. Coarse plaster, generally styled "calcined plaster," is better for cleaning purposes than fine "dental plaster" as its coarser grain is easier to remove than the impalpable dust of the finer kind.

With a black or dark coloured bird, hardwood saw-dust is by far the best drying medium, but in default of it, cornmeal answers well, though not so quickly. Never use pine saw-dust or that made from wood containing pitch. It will not absorb the water and is likely to stain. Plumage may be dried without any of the above, though it takes considerable patience to so treat any large surfaces. All that has to be done is to keep manipulating the feathers with the fingers or a piece of dry batting, in the wind if possible, until the water has evaporated. The manipulation is necessary to prevent it from drying in stiff plastered masses and to make it fluff naturally. When feathers are nearly dry, but seem to refuse obstinately to assume the light fluffiness of nature, it will sometimes save time and energy to lay aside for a few minutes while other operations are proceeded with, when it will usually be found to have finished the process by natural evaporation and be in good condition to proceed with.

SKINNING.

The only operation now preliminary to skinning is to measure the bird. The only useful measurement that cannot be taken from a prepared skin is that of length. Many collectors use the metric system for this work, but as its results mean little or nothing except to the expert, it seems advisable to adhere to the old English system which every one understands and which is used still in the majority of our literature. Inches and decimal fractions of them are on the whole most satisfactory. Lay

the bird back down on the rule and hold the tip of the tail at the zero of the scale. Then extend the head just enough to straighten out the curves of the neck without stretching it. The length should be noted on the label at the time of measurement so that it is not forgotten or lost. It is best to measure every bird in exactly the same manner so as to get similar and comparable results.

The most convenient place to make bird skins is, of course, a table, but sometimes the tail board of a wagon, a board on the knees, or even the knees themselves must be used where conveniences are lacking. As for tools, a sharp scalpel, small scissors, and a pair of spring forceps are in general all that is necessary; in fact, as in other handicrafts, a poor workman is usually noted for his fine collection of tools, and in making bird skins, about the only instrument that is really necessary is a knife, and a jackknife will answer every purpose. Other tools are luxuries and not necessities. To begin, lay the bird on its back in front of you and separate the feathers to the skin from about the middle of the breast bone to the vent. A wet finger stroked along the line of demarcation will cause the down to lie back nicely and expose the skin. With scalpel or knife, cut through the skin the length of this line. If possible make the cut shorter, beginning at the end of the breast bone, if necessary, make it longer, but carry it down through the vent in each case. Care must be taken in this matter that the cut includes only the skin and is not continued through the walls of the abdomen, which are very thin, in which case the viscera is sure to emerge and make a mess of the feathers. The safest way to make the cut is to insert the point of a knife between the skin and the abdomen and cut outwards. When the cut is made, separate the skin from the body on each side, in a small bird with the back of the knife or the blunt end of the scalpel, with a large one the fingers will be the best tool. When this stage is reached,

pull one leg out at right angles to the side of the body, and press in on the heel. The knee joint will then show within the skin and next to the body. Disconnect this joint with either the knife or scissors, and do the same with the other leg. You will be able then to separate the skin from the muscle a short way up the thighs.

The next thing to do is to cut off the tail. The scissors are generally the best tool to use here. Stand the bird upright on its shoulders, bend the tail sharply over the back and, at its base, where the tissues are drawn tight, make the cut, severing the tail from the body. This is the most critical point in the amateur's bird skinning and if here you cut through the skin on the rump as well as the meat and bone, you can comfort yourself with the reflection that almost everybody else has done the same with their first skins. The final bones of the tail must be left attached to the large feathers which are anchored to them and which are needed for support. If, however, you have managed this cut successfully, the skin can be separated from the body down the back until a line opposite the top of the breast-cut is reached, after which the skinning must continue all around the bird, and the pelt as you proceed will gradually turn inside out. The actual skinning process requires a knack to do it nicely, that only experience can give. It consists largely of a scraping with the nails rather than a pulling or knifing, and can only be acquired by practice. At times a little pulling will be needed, but it should be but sparingly indulged in, as the skin stretches very readily. Sometimes, and in some species, the skin sticks tightly to the body, and the knife has to be freely used in separation. No definite rules can be given and each moment the operator must use the method that produces the results. Large birds are apt to be very awkward at this stage, and it is usually more convenient, as soon as the tail has been cut off, and the back skinned a short way

down, to suspend the bird by a chain or string. Then no effort is necessary to hold up and all attention and both hands can be directed towards the actual removal of the skin. A good stout cord with a strong fish hook at the end is convenient. It can be thrown over a beam, branch, or tent pole, tied off, and the body hung on the hook. The barb of the hook should be removed and the point filed sharp. The hook can be inserted in the body anywhere about the pelvis where good and convenient anchorage is found. Experience will soon show the best place.

The skinning now proceeds all round the bird until the wings are reached. These are cut through close to the breast and unjointed. If the knife is directed at what corresponds to the arm pit and cuts downward and inward, a point will be found where the joint will open and disarticulate almost of itself. This is another little trick that experience only can teach.

As soon as the wings are cut off, the neck almost skins itself down to the head. The great majority of birds can be skinned right over the head; in other words, the neck skin is larger than the head and the latter pulls through the former. We will continue with this assumption and take up the question of other conditions later. A little difficulty is often encountered by the amateur in getting the skin just over the base of the skull, but a little humoring and coaxing will usually accomplish the end. It finally goes over the critical point with a rush, and the ears are reached. The ears in birds are external cavities of considerable extent in all species. In hawks, they are very large, and in owls they are almost cavernous, but they are always lined with a continuation of the outer integument. When the bird is turned inside out, as we have this one now, the ears resemble little bags of skin embedded and running backward into the skull. In small species this bag can be pinched up between the fingers

and pulled out of its cavity. In large ones it has to be cut off at its mouth. When this is done, the skinning is continued down over the head until the eyes are reached. These show up as large dark bluish bodies under a thin film of partially transparent tissue. At the first cut at the juncture of this tissue with the skin, the bright coloration of the eyeball shows. This is another critical point where care must be taken. Some collectors use the scissors for the operation and others the knife. It is best to use whatever seems the most convenient as the operation now is to cut the inner lining of the eyelid away from the skin. The skull can, at the same time, then be severed from the neck and a little planning will make it evident that the tongue and throat tissue can be separated from the lower jaw bone, and remain attached to the neck and body.

The skin can now be transferred to the table and the eyes taken from their sockets, the back of the skull and roof of the mouth cut away, and as much of the interior removed as possible. None of the exterior or outline frame work of the head, nor the articulation of the jaw-bones should be disturbed except to remove what little muscular or fatty tissue may cover them. The brains will be found to be enclosed in a tough integumen, and a little experience will enable the operator to remove it in one mass expeditiously and cleanly.

The wings and legs have now to be attended to, as so far they have only been cut from the body, and all their muscular development remains within the skin. Taking the enlarged upper end of the humerus or upper arm bone of the wing in the left hand, it skins easily down to the first or elbow joint. Here there are two courses open to the collector. The large flight feathers, the secondaries, are anchored directly to the bone from this joint onward, and if the specimen is ever to be mounted, it is most desirable that these feathers be not stripped

from the bone. Some birds are very long in this joint, and all the flesh cannot be removed from the inside of the skin, but an incision has to be made from the under surface of the wing for this purpose and this will be described later. Holding the wing by the humerus by one hand, or hanging it up on the hook from which the body has been removed, it will be found quite possible, with a little care, to skin down the upper or forward side of the wing without disturbing the fastenings of the flight feathers. When the flesh is thus laid bare from shoulder to wrist joint, it must all be removed from the bones, and the latter made as clean as possible. The same operation is performed with the other wing, and then the legs are proceeded with. After doing the wings, the legs will offer no difficulties. There are no large feathers to be looked after, and it simply means clean skinning down to heel joint at the upper end of the tarsus and the subsequent removal of the flesh.

The bird is now skinned and turned inside out. It must all be gone over and every particle of fat or flesh removed from it. In most birds, it peels off readily in flakes of greater or less extent, in ducks, loons, and many other water birds, however, it will be found that the body feathers extend through the skin and their bases are embedded in a thick layer of tenacious fat, and all covered with a tough integumen that makes its removal difficult, but if the bird is to last any length of time, it must all be removed until each quill stands up clean and clear by itself. It will be noticed that the quill ends are arranged in more or less regular order, leaving the lanes of fat crossing each other at angles. Each one of these lanes can be scored down its length with a sharp knife, after which the grease and oil may be scraped out and removed.

Throughout the process of skinning and "fleshing," as the inner cleaning of the skin is called, there will be more

or less blood, grease, or other juices flowing, and a good supply of absorbent should be kept readily to hand throughout the work for instant application. The best material for this work is the same hardwood saw-dust mentioned before, the next best is a good fine cornmeal, and the third choice is plaster of paris. The saw-dust has a faculty of staying where it is put, and when covered with it, such slippery things as clots of blood or fragments of fat are very easily picked up and removed. It also has a cleaner feel under the hand and gives a firmer hold to parts under manipulation. Whenever bloody, greasy, or other masses are observed, they should be thoroughly covered with the dust, soaked up with it and removed, and the application repeated until all is comparatively clean. In handling very greasy birds like waders, the subject should be constantly deluged with absorbent, as the soft fat readily melts under the heat of the hand into clear oil that permeates everything. In these cases, the great secret of making clean skins is speed of manipulation, a soft touch, and plenty of absorbent. At all times, of course, it is necessary to keep the ends of the plumage away from the grease and dirt of the interior of the skin, body, or hands. The knack of doing this while proceeding with other operations is only to be gained by experience and practice. The hands require frequently to be washed in the absorbent and then used to stroke the feathers back out of the way. Each operator soon originates his own mannerisms in doing this, and as long as they accomplish the end, they are good.

The skin has now been cleaned and is ready for the poison. The most convenient poison is dry white arsenic which should be dusted all over the inside of the skin with a stiff brush like a shaving brush or a wisp of cotton batting held in the forceps or tied to a stick. See that the fleshy parts such as the base of the tail, the skull, and leg bones, receive thorough applications. It is best

to perform this work on a clean sheet of paper so that the arsenic that spills about can be caught and returned to the original receptacle and used over again. Be careful in handling the arsenic not to get any more than possible on the hands and to keep it from flying about in the air where it may be inhaled. There is no danger in handling arsenic in this manner unless great quantities are used and continuously for some time. The important point for the ordinary collector to observe is to keep it out from under the finger nails where it is apt to cause small sores that while local in their extent and of short duration, are often rather painful. Always wash the hands and clean the nails after poisoning skins. Arsenical soap is always to be preferred for poisoning when there is a good supply of hardwood saw-dust at hand. The soap is brushed well over the skin in the form of stiff suds, and then the whole is dusted with the saw-dust, after which it may be handled without the hands coming into contact with the poison at all. Fine cornmeal, in place of saw-dust, works very well for this also.

The soap is also of advantage as it moistens the skin which sometimes has dried perceptibly during the latter operations, and is found a little stiff in turning right side out again, as is now to be proceeded with.

After the skin has been poisoned, the eye sockets in the skull should be filled with cotton batting, packed in tightly enough to fill the orbit but not to bulge the skin when the head is returned; and wisps of cotton likewise wrapped about the leg bone to replace the flesh that has been removed. In small birds this latter is not necessary, but in large ones having heavy muscular legs it is important. The head then should be carefully worked back through the neck. This sometimes to the beginner is a critical operation, but patience and coaxing should always accomplish it. Do not be disheartened if on the first skin or so the neck splits on going either way over the head:

almost every one has done that in their early attempts. A careful pull on the projecting ends of the primary wing feathers, and the legs, guided by careful manipulation within the skin, will return those members to their natural condition. Taking the skin, now right side out, by the bill and holding it up and shaking slightly, while smoothing the surface with the hand, the feathers should fall smoothly into place, and the skin, if it does not need further cleaning, is ready for making up.

It often happens with even the most skilful skin-maker that the first appearance of the skin when thus returned is far from being a joy to the heart. Blood and juices have often run from the mouth, the eyes punctured by shot have emptied their contents upon the plumage of the neck and head, and the whole remainder is soaked with grease, or blood, or both, from the skinning. This is an extreme case, but the conditions are often found to a greater or less degree. The remedy is washing as before described. In extreme cases of grease, the whole skin had better be put right into gasoline, or other like grease removing agent, and thoroughly washed, and if no water has to be put on for blood, it is a small matter to dry as before described.

In case of the long winged birds mentioned before, it will be necessary after the skin has been turned to open the wing on the under side, making a cut just under the large under wing coverts—the feathers that cover the bases of the flight quills—from elbow joint to wrist, skin forward and remove the flesh adherent to the bones through this opening, after which all is poisoned and the incision carefully sewed up as later described.

Some birds, as various ducks and wood-peckers, have heads too large to draw through the neck skin. In this case, the neck is cut off as soon as it is evident that it will not come through without unduly stretching the skin, and after the remainder of the work is finished and

the skin returned, an incision is made at the base of the skull and down the back of the neck, through which the head can be proceeded with as usual. This cut should also be sewed up afterwards.

The next thing to do is making up. In this, no two operators follow the same method, each one to a greater or less extent inventing processes of his own that he finds produce the most satisfactory results. The whole object is to make the specimen look like a dead bird, arranged in orderly manner to show all its characters neatly and clearly and to take up as little room in the cabinet as possible. General directions may be given as follows, but in the details the collector will soon find methods that will appeal to him, and which, as long as they produce the result, will be satisfactory. The skin with the feathers smoothed into place is laid down on its back, the abdominal incision lying open on the top, and bill pointing to the left, a small stick is taken a little shorter than the length of the neck and body, and wrapped around with a wisp of cotton batting to imitate as closely as possible the shape and size of the neck and body. For most small birds, a burnt match makes a most convenient neck rod, and if the operator is a smoker, the materials will always be ready to hand. Larger birds require something heavier, but any sliver of wood or convenient twig will do. Many collectors use no neck rod at all, but a view of a cabinet full of skins with broken necks, will at once convince any one of the importance of this little feature. The neck end of the artificial body thus made is introduced until the end of the rod is wedged firmly into the skull, its exact location there being a matter of experience and trial. The body skin is then drawn together over the body and the general effect noted, and smaller or larger wisps of cotton introduced with forceps or a straightened wire wherever it seems to need it after which all is smoothed down and the abdominal incision sewed up. For

sewing up, almost any needle will do, and any thread, from ordinary cotton on a small ball to a piece of string on a large one. Begin the seam at the vent, always sewing up against the plumage and passing the needle from the inside of the skin outwards, as in the "base-ball stitch." Attention has to be paid that the thread does not pass over bunches of feathers, and press them up or down, out of place. It should pass freely between their bases without perceptible displacement. If it has been done neatly, with a little manipulation, the plumage will close over the seam hiding it completely.

The body has next to be sexed. Lay it in front of you on its right side, the back toward you, and cut with scissors or knife through all the ribs and down to the elongated process of the pelvis that projects downward from the side. Gently pry open the slit thus formed and with the back of the knife part the viscera from the back of the body cavity at the "small of the back." If the bird is a male, two bean shaped bodies will show at the base of the kidneys. These are the testes and are normally of a light yellow colour though sometimes almost black with the suffusion of blood from shot wounds. The left is always the larger, sometimes greatly so. In the female the ovaries are to be found in the same place, a mass of small round yellow bodies. In spring and during the breeding season, these sexual organs are large and most conspicuous objects and can hardly be overlooked, often filling the body cavity to a considerable extent. In the autumn, in adults, they shrink to very small proportions and have to be looked for carefully. In juveniles that have never bred they are often microscopic in size and sometimes almost impossible to recognize with certainty. At such times the super-renal glands that lie in the same locality are often mistaken for testes on the one hand and ovaries on the other. They lie flatter to the body than either of them and confusion between them must be

avoided. Unless the observer is certain of the organs he sees it is better not to mark the sex at all or follow it with an interrogation point.

The sex is now to be marked upon the label. The feet of the specimens are crossed, and the label tied across their juncture. Some collectors tie the label upon only one leg, but when so done the danger of the leg pulling off in later handling is great and the double fastening is greatly to be preferred even though it may so give the student a little more trouble in his fine examinations and measurings.

The exact shape to be given the bird skin is now a matter of consideration and varies with the species and makers ideas. A few suggestions, however, for guidance, are advisable. In ordinary and small skins the head should be extended with the bill pointing straight out along the axis of the body. It is much easier to stow it away in the cabinets and in the field, since if bent forward, or to either side, there is less danger of the neck getting broken when the skin is dry and brittle. Long necked birds such as herons should have the head bent back over the body, and in birds of the above class if the feet are drawn up in front to the breast, it will make a more compact skin and be equally available for study. Of course, if the neck is so bent, a neck rod cannot be used and a simple wisp of cotton should be inserted instead. In all large birds, every effort should be made to keep them as small as possible while exhibiting their details to the fullest extent. Small birds with pronounced crests can have the head laid flat with the bill pointing to one side and the crest raised to its fullest extent.

One of the easiest and most satisfactory ways to arrange the plumage on a bird at this stage is to grasp the skin between the thumb and forefinger under the wings and pinch it together when it will be found that the back plumage will readily stroke into place, lying fair and smooth. It is then laid down on its back; the

breast and under plumage arranged with fingers or forceps; and the wings laid in place at the sides. Some do this on a small bed of thin sheet cotton batting, raising up the latter at the side as the wings are placed and holding them so with a pin stuck into the table as a brace. When both sides are thus arranged, the finishing touches can be put on the breast, the cotton finally closed over and the two sides of the wrapping fastened by twisting together between thumb and forefinger fine filaments from opposite sides. Another way is to pin together a ring of paper to the diameter of the intended skin, and as soon as all arrangements of the plumage are made slip it within the circle which will hold all in place while drying. Large skins are easily arranged by using cloth in place of the cotton wrapping. The very best material for this is old mosquito bar that has been wet and dried in a crumpled state. The crumpling gives a very agreeable elasticity and the open texture makes easy pinning, so that just the proper tension can be placed at each point, and beautiful skins can be so made. Cheesecloth or other open goods are quite satisfactory for this purpose. The skin should now be put away to dry, in the shade, and of course out of reach of rain or water. The length of time the drying takes depends upon atmospheric conditions and the size and condition of the specimen. In some climates, specimens absolutely refuse to dry at all, and then special arrangements have to be made for drying artificially, but this applies more to tropical collecting than in our temperate climates.

A question often asked is: "What makes the best stuffing?" The answer is: "Almost anything except that of animal derivation." Cotton batting when to be had in quantities is perhaps best for even the largest birds, and small ones is the most desirable; however, tow, oakum, moss, or grass (if dry), frayed rope ends, or even newspapers are good—anything that is convenient and soft, and of vegetable or mineral origin. Wool or other animal

products in a skin are invitations to insect pests too pressing for them to refuse and should never be used under any consideration.

The following is the formula for arsenical soap:—

White bar soap, rather soft than hard..2 lbs.

Powdered arsenic..2 lbs.

Camphor..5 ozs.

Carbonate of soda..6 ozs.

Alcohol..8 ozs.

Slice the soap and melt in small quantity of water over slow fire, stir frequently. Add soda and stir in arsenic. Dissolve camphor in alcohol and add. Stir thoroughly and boil. Pour into tins or other vessel, and stir occasionally while cooling to prevent arsenic from settling to bottom. This should cool quite solid but work up readily into stiff lather under application of water and a brush.

When railway connexions are good it is often advisable to send in to museum fresh skins, to be cleaned or fleshed under better facilities than are afforded in the field, or for the purpose of mounting, as material can always be mounted in better fashion from fresh than from dry skins. When the weather is not too warm, such specimens can be safely sent for considerable distances if filled with padding wet with the following solution:—

Water.. $\frac{1}{2}$ pt.

Commercial carbolic acid..1 oz.

SMALL MAMMALS.

COLLECTING.

The collector should carefully read the introduction. For collection of small mammals—up to the size of the woodchuck—the trap is the principal reliance

of the collector. The gun is of service among the larger of these, but more as an auxiliary than as a main dependence. For these larger sized animals, the various forms of the Newhouse trap catching by the foot is the great standby, but for mice, shrews, and the smaller fry, some of the small traps arranged as deadfalls or chokers, give the best satisfaction. There are many of these made, mostly on one or two general principles and varying from each other only in minor details.

The principal points to be observed in choosing these kinds of traps are: lightness and compactness, that a great number can be carried with ease, and that they catch or kill without crushing the skull. Price is also to be considered as large numbers are generally used and many are lost.

For trapping larger forms mentioned above, better instructions are to be found in works on fur trapping than can be included in these pages, and for such specimens but a few general suggestions can be made, experience being the best teacher as to places and artful schemes by which to circumvent the wary.

The traps should be laid along a route that can be gone over morning and evening. It is a good scheme to bait a supply of the small traps in camp, and then carry them along the route to be covered in the pockets or in a bag—of course unset. They are best placed in the evening as most of the game of this sort is nocturnal in habit. A notebook and pencil should be carried along and notes made of the position of each trap as it is set, otherwise, the memory is likely to fail to recall at the next visit just where each has been placed, and some will be overlooked. The use of the notebook can best be explained by an example of some entries:—

"Starting east from road by blasted stump ten paces, trap under overhanging root. East by north, two rods, under black stump. Twenty feet to right, by large stone," etc., etc., to end of route.

A course laid out in this manner will be easy to follow again and the loss of overlooked traps will be small.

Traps should be set under the upraised ends of logs, stones, or other such likely looking places. It is well to examine the small patches of dry dust here and there, especially around large solitary objects such as stumps and boulders, to see if footprints indicate that it is the resort of game, and traps put as thought advisable. Long grass is often labyrinthed near the ground with the clear cut trails and tunnels of small animals and these should be searched for and planted with traps. In fact there are thousands of places that the trapper can try, and the more varied and diverse the localities chosen are, the more chance is there of securing a variety of species.

The traps should certainly be visited early in the morning, and indeed as often as possible, for small mammals spoil very much more quickly than larger ones or birds, and with but a short exposure to the heat of the day are practically worthless. They also have propensity to eat each other up, and many cases are sure to be found where trapping has served to furnish an easy dinner to a close relative of the victim.

Experience will soon show what are the profitable localities to work about a new camp, and the work can then be largely confined to them though it is always well to keep a few traps set in other locations, for every once in a while a new species will be found in some of them.

Preparation.

The measurement of small mammals in the flesh is far more important than of birds, and should always be taken when the skin is made. The important ones to take are three, length, length of tail, and length of hind foot. All these are to be taken in straight lines as with a pair of dividers or a stiff rule, and not following the undulations of the body as with a tape.

Length.—The length is from the tip of the nose to the end of the last vertebra of the tail. The best way in the field is to lay the animal down on its back on a board, and extending it to full extent, prick pins into the board at either extremity, then remove animal and measure the distance between with either metric or inch scale, divided to tenths.

Length of tail.—This measurement is from the base of tail to end of last vertebra. Lay specimen over the edge of board with body hanging down and tail flat on upper surface. Arrange animal so the edge of board fits into the angle formed by tail and body, see that the tail extends true and straight and at right angles to edge of board, and stick in pin at extreme end of tail bones. Measure distance between edge and pin as before.

Length of hind foot.—This is from the tip of the nail of the longest toe to the heel. Place the foot flat down on the board as if walking flat footed, supporting the body with one hand while the other arranges the foot straight and places pins, one at the tip of the claw, and the other close against heel. Measure space between pins.

CLEANING.

Cleaning is much more easily performed on mammals than on birds. All that has to be done is to brush out blood and dirt with stiff brush. If washing is required, the drying is easily accomplished with liberal applications of cornmeal or hardwood saw-dust worked into fur and brushed out again. Repeat until dry.

SKINNING.

Lay animal on its back and make the incision from between the forelegs almost to vent. Remove body through this opening taking care not to stretch the skin more than can be avoided. Take particular care in the region of the eyes and lips as the skin is easily cut there. Sever

the legs from the body as fast as they are reached, and return to them when body and skull are removed, skinning them as far down to the feet as possible, and cleaning the meat from off the bones. The tail should be pulled from the skin sheath out between the fingers or by means of a cleft stitch.

Go over skin with care and remove all fragments of flesh or fat, especially the latter, from its interior, scraping it to get out as much oil as possible. Then poison with either dry arsenic or arsenical soap as before described for birds on page 27. Cut annealed or soft iron wire of diameter depending upon size of specimen, about same length as that of body and tail, and insert one end into tail sheath, working the poison into it at the same time, and the other up into head. Fill the skin nearly to its natural size, and shape, with cotton batting, tow, excelsior, oakum, or any other vegetable fibre that may be convenient. Never use wool or other animal fibre under any consideration. In animals of the larger size, the tail wire should be taper wrapped with cotton or other fibre, to fill out naturally, and the legs should be wired as well.

The skin should now be sewed up with the usual baseball stitch, i.e., with the needle always passing from the inside of the skin outward at each stitch, also catch lips together with thread and tie. Now lay skin on small board or piece of bark with its belly down. Arrange tail out straight behind, the hind legs extended backward in like direction and the fore legs forward and parallel with the body, never projecting from the side. Tie the label to a hind foot and pin all the members in place by passing pins through them into the board beneath. Arrange the minor details as the ears, whiskers, and so forth, and set away in shade to dry.

In all mammal specimens the skull should be saved, and form part of the specimen. Disarticulate it from the neck and carefully remove all flesh matter possible, with-

out injury to the small bony processes. The brain can be removed with a jet of water from a syringe. In damp weather it may be necessary to sprinkle rough cleaned skulls with powdered borax to keep remainder of tissue from decomposing, but do not use arsenic for this or salt, if it can be avoided. The skull should be numbered to correspond with the skin or, what is better in the field, attached to it.

LARGE MAMMALS.

COLLECTING AND PREPARATION.

The collection of large mammals is really nothing but hunting in its generally accepted sense, and no special directions can be given for it here. For such information, consult the various works on the subject, and hunters of experience.

The technic of removing skins from large mammals is generally well known among the hunting fraternity, and requires but slight mention. The manner, however, of making up of skins for scientific purposes is only slightly understood, and the following directions are to cover these requirements.

MEASUREMENTS.

Preparatory to skinning an animal, there are a few measurements that it is very desirable to take. These should all be made in straight lines except when noted otherwise, i.e., as if with a pair of compasses, and not following the undulations of the body as with a tape line. A certain amount of care will be necessary to get these with exactness. The animal should be laid on the ground and posed as naturally as possible, care being taken that shoulder heights and leg lengths be about what they should be if the parts were compressed by the weight of the animal standing.

Length.—From tip of nose to tip of bones of tail.

Height of shoulder, i.e.—Distance from ground to top of shoulder blade.

Height of elbow.—Distance from ground to point of elbow on foreleg, and attachment of hamstring on hind.

Body length.—Distance from front of shoulder blade below base of neck to centre of hip joint.

Width.—Distance across breast between front edges of shoulder blades.

Girth.—Distance around body just behind foreleg, and also in front of hind legs. These two latter should be made with tape line, and especially if animal is long haired, the tape should be pulled tightly down, and close to the skin.

With these measurements, it should be comparatively easy for a taxidermist to reconstruct the animal's general outline. A few other minor measurements may be more or less desirable such as distance from tip of nose to corner of eye, and from the latter to base of ear, also girth of neck behind ears, and of legs at various stated points.

The measurements taken, the skinning can be proceeded with. The first incision is made from between the forelegs on the centre line of the belly, back to the tip of the tail. Cuts are then made across the body and down the back of each leg through the foot pads, or between the hoofs. The whole skin can be removed from the legs and body through these cuts. In case of large soft footed animals, the feet and toes should be skinned their entire length, and in ruminants, down to the hoof sheath, and all fleshy parts opened up and cleaned. The entire leg bones should either be left attached by their ligamentary connexions or cut off close to hoofs or claws. In any event, they should be cleaned and saved as part of the specimen. Be careful around the genitalia not to slash the parts, but retain as much of their general shape as possible.

With long haired animals the belly cut can be continued up the throat to the short hair of the lower jaw, and the head removed through it, but in short haired animals like deer and antelope, such a seam could never be sewed without showing badly, so the opening should be made for them along the back of the neck. With horned animals this is, of course, necessary in any event. With them, a Y shaped cut should be made with the branches extending to the base of the horns and the stem extending down the back of the neck as far as necessary for the removal of the skull.

The skin around the bases of the horns should be carefully pried and cut away from them, and the ears cut off close to the skull. Be particularly careful about the eyes so as not to cut the lids in any way. In front of the eyes in many ruminants is situated a deep pit, the tear duct, where the skin runs down well into the skull, and lies close to the bone. The lining should be removed from the bone with the utmost care. About the mouth, cut the lips free from the head close up to the jaw bones and cut the nose off well back towards the cartilage of the skull.

When the skin is finally entirely removed from the body, flesh off as much of the adherent fat and other tissue as possible, spread out flat on the ground and rub in handfuls of salt. Take particular attention that the nose, lips, bases of the ears, and feet are well salted. Attach good strong label with full data, and dry skin outspread in the shade. Do not attempt to dry in the sun, or by artificial heat.

Clean the skull of as much meat as possible, and dry also, marking it plainly to correspond with skin. Do not, unless absolutely necessary, hack away base of skull to remove brains, but extract them with spoon-shaped spatula through spinal opening. Scientifically, mammal skulls are of as much and in some cases of even more importance than skins, and should always be carefully preserved.

Examine skin from time to time, especially around the edges where it has a tendency to curl over on itself, and around the fleshy parts of the nose and feet, and wherever it may have fallen into folds, and if these parts seem to be slow in drying, pin them out so as to expose them to the air. When thoroughly dry, the skin may be folded or rolled up and packed, but if to remain for any length of time, it should be occasionally reopened to make sure that all is well.

When within reach of good railway connexion with the museum, if the skin is well packed with salt, it may be sent in green, to be mounted or taken care of there. Always notify consignees, however, either by letter or telegraph that specimen in such condition is on the way, so they may be ready to give it instant attention on arrival. If you do this, use plenty of salt—it is impossible to use too much—and see that it is in immediate contact with all parts of the fresh skin. Another way in which skins may be sent in in a fresh state is to immerse in a strong salt solution and head up in barrel or keg.

Never use alum on mammal skins. There are many salt and alum formulae published, but the latter causes indefinite shrinking, and hardening, and renders all later tanning or mounting difficult and unsatisfactory.

REPTILES, AMPHIBIANS, AND FISH.

COLLECTING.

The collecting of reptiles, and amphibians, is often comparatively easy once the subjects are found. All that has to be done is to catch them. The agility and expertness, of course, necessary to this end vary with the species. Slug-gish toads can be merely picked up, while the more active lizards are extremely quick in their movements and it requires considerable agility to take them. The habits and habitats of the different forms are so numerous and varied

in character that it would be out of place to attempt to go into lengthy descriptions of detailed methods of capture here. About the only point that needs special mention is in reference to snakes. In Canada, the only snake of which any fear need be shown in capture, is the rattle snake. *There are no other poisonous reptiles in the Dominion.* In its various forms, the rattle snake gets into Canada in the southern Ontario peninsular, and up along the Georgian Bay coast and islands, and along the International Boundary belt across the prairies provinces, mountain regions, and southern British Columbia.

Though the danger from the bites of these Northern rattle snakes has been generally over estimated, they are capable of inflicting serious and most painful wounds, and should be approached with care. However, as they cannot spring at one, and at the most can only strike about half their own length from their coil, a little caution will enable one to catch them with a forked stick across the neck close up to the head. The easiest way to carry any kind of reptile in the field is in small cotton bags tied with draw strings about the throat. To kill, immerse bag and contents in a pail, and let remain for a couple of hours *completely covered* with water.

Reptiles, amphibians, and other cold blooded animals can often be sent in alive. Small ones can be placed in a box with moist paper, leaves, moss, or other such material that will keep them from shaking about, and as they require but little air, unless the receptacle is hermetically sealed, they will come through by mail well enough. Larger specimens, of course, should be expressed. Wherever possible, it is better to send in individual or small collections in this way than as liquid preparations.

PRESERVATION.

Reptiles, amphibians, and fish are usually preserved in fluid preservatives, either alcoholic or formalin. Either of the following formulae are satisfactory:—

Formalin (Shering 40% solution)... .. 4 parts.
 Water... .. .96 parts.

or

Alcohol (commercial 95%—97%)... ..10 parts.
 Water... .. . 4 parts.

The specimens should have openings made on the belly before immersing in these solutions as otherwise they will decompose internally before the preservative has time to penetrate, and the accumulation of gas thus formed will invariably burst the abdomen. If a hypodermic syringe is carried, the liquid should be injected into the abdominal cavity in several places, down the throat and up the anus. Otherwise, the abdomen should be opened up with a longitudinal cut sufficient in length to allow free access of the liquid to the interior.

In all cases, fasten a label to the specimens preferably written with well dried waterproof India ink, but with a good *black* lead pencil as second choice. If a number of specimens are gathered at the same time, and place, one label in the container will do for all, but in that case nothing else should be included without proper distinguishing data, fastened directly to it, that no confusion may possibly arise.

Without doubt, copper containers with screw caps are the best for such material, but any wide mouth bottle or the ordinary fruit sealers with the rubber washers and screw tops are most excellent if they can be carried through the exigencies of the field.

It is often difficult to get corks for large bottles, of close enough grain to prevent leakage. Open or porous corks if soaked a few minutes in melted paraffin, candle ends will do nicely, and will be found perfectly safe.

If the objects are large and thick they should have the above liquor drained off the second day and replaced with fresh. In some cases it is safest to repeat this again a few days afterward, after which all danger of spoiling should be passed.

In all cases when the specimens have to stand handling and shaking as in travelling, the containers should be filled to the top with liquid as this minimizes the disturbance of the specimens by splashing.

INSECTS.

COLLECTING.

The principal instrument for collecting insects is the net. There is various forms of folding nets on the market, but all, when opened for use, are fundamentally, only scoop nets of fine stout mesh on a metal ring about 16 inches in diameter, fastened to the end of a stick from 3 to 5 feet long. With these the insects are captured either by quick scooping swoops or by stealthy approach, placing the ring carefully over the specimen while holding the net open by drawing out on the tip with the free hand. It takes some experience and technic to remove butterflies or moths from the net and kill them without disturbing the fine scales that cover the bodies and wings and give them their peculiar coloration.

It is generally regarded better with Lepidoptuous insects to stun them before removal to the killing bottle. To do this, catch the thorax through the folds of the net between the thumb and forefinger just under the wings and pinch smartly. This paralyzes the large nerve ganglia situated there and stops fluttering immediately. The subject can then be easily transferred to the cyanide jar for killing.

Of course, with bees and wasps this is both unnecessary, and undesirable.

A killing bottle is made from almost any large mouthed bottle, the larger the mouth the better. Small battery jars without any throat or necking are nearly ideal, but ordinary glass fruit sealers with screw caps are quite satisfactory. It is well to carry a number of various sized

bottles in the field. Test tubes fit the vest pocket nicely and make excellent killing bottles for the smaller sized insects. The bottles are prepared by placing enough broken crystals of cyanide of potassium in the bottom to cover it pretty well and then pouring plaster of paris mixed to the consistency of thick cream over them. Tap the bottom gently a few times to dislodge air bubbles and allow to set in upright position. The mouth of bottle should be stopped by a good tight cork or stopper, enough remaining projecting to allow of its easy removal.

An insect placed in a bottle so prepared is soon overpowered by the fumes, and is killed in greater or less time, depending upon the species, and the strength of the preparation in bottle. Some of the large moths are wonderfully resistant to the poison, and should be left in for some hours at least, while a few minutes are more than sufficient for the general run of smaller creatures.

Dampness in the plaster is essential to the proper working of the bottle, and in dry climates it is sometimes necessary to supply the deficiency with a few drops of fresh water. Usually, however, there is if anything, too much moisture in the bottle and, as the crystals deliquesce with the dampness of the air, their place is filled with a dark brown liquid that is apt to escape through or around the plaster plug and disfigure the specimens. When this is observed, a small hole should be punched in the plaster, and the liquor allowed to escape. A little cotton batting, or crumpled tissue paper should be placed in the bottle on top of the plaster to absorb what wetness there may be, and to afford a soft resting place for the delicate insects that may be enclosed. This pad should be replaced from time to time with clean material.

Too many insects, especially butterflies and moths, should not be jumbled into a bottle together; their first flutterings, and subsequent shaking about are sure to cause in-

jury to each other. If unable to use a fresh bottle for each couple or so of specimens, another wad of soft cotton, or tissue paper should be placed gently over the ones already in before introducing new specimens. Never put beetles or other hard insects in direct contact with moths or butterflies in the bottle.

A cigar box with bottom lined with cork is convenient in the field for carrying insects, when it is necessary to empty the filled bottles. Insect pins should be carried for this purpose, and the insects temporarily pinned in the box. Beetles should be pinned through the left wing case up near the base, and it is usual to pin butterflies and moths under these conditions through the sides, under the wings. They will thus lie down flat, and a great number can be pinned in small space by a method, descriptively called "shingling" whereby they are made to overlap without touching each other. Insects should always be pinned so that they stand with one-fourth of the pin showing above them. A small paper label with data should be impaled on the pin below each specimen.

Another way of carrying lepidopterous insects without pinning is "papering." A sheet of paper longer than wide is folded diagonally at an angle of 45° so the crease is equi-distant from either end. The insect is placed with the body in this crease and the paper closed up carefully against the wings, when the overlapping pieces on the right angled sides can be creased down to lock all together. The projecting corners should then be folded and creased to ensure greater protection against unfolding. Care must be taken that wings, legs, antennæ or other parts are not creased in with the paper. The data should be written on the paper before inclusion of the contents, and the paper finally packed carefully away in box with cotton batting between layers to prevent shaking. Insects papered this way will travel well, and can be relaxed and properly pinned at later times.

All handling of butterflies or moths must be done with the greatest care as the slightest touch will remove the delicate scales that colour them. The fingers are clumsy tools for this delicate work, and the subjects should never be touched by them. A pair of fine spring forceps should be used for manipulation entirely and a little practice will enable one to handle delicate specimens by this means without damage.

Beetles, bugs, and other coarse insects are much easier to handle than the above. Perhaps the best way to take care of them in the field is to place them in alcohol immediately upon return to camp Use:—

Alcohol (commercial 95%).. . . .10 parts.

Water.. . . . 4 parts.

No preparation is necessary, just put subjects in the fluid. Benzine or gasoline is also good for this purpose, and when the bottle is nearly full, if saw-dust is added it will prevent the shaking and consequent breaking of specimens, and also render leakage less likely. Large mouthed bottles should be used.

A very fascinating form of collecting is "sugaring." It is done at night and many species can be taken that way that are otherwise never seen. A mixture of molasses, sugar, or other sweets (stale beer or rum is thought to make the mixture more alluring) is daubed on tree trunks, etc., along a woodland or other path, in the early evening. After dark the route is gone over again with a dark lantern. Casting the light ahead, the smears of bait show black against the object on which it has been placed, and numbers of moths and other insects will likely be seen feeding on it. The light must then be turned off and the collector stealthily steal up within striking range. The light is then suddenly turned upon the feeding insect to be captured, and advantage taken of its momentary stunning glare to place the mouth of the killing bottle over it. It sometimes requires a

little dexterity to place the cover over the bottle without allowing the prey to escape, especially if upon rough and deeply seamed bark, for which latter reason a little care should be used in the choice of objects sugared, that comparatively smooth places are taken for its application. The route can be gone over and over again through the night and valuable lots of specimens can be thus taken.

Another favourite hunting place for the entomologist is under electric or other lights at night. These often attract great clouds of insects, most of which seem to become mentally disorganized by the glare. Insects will come dashing into the circle of light, wheel about it a number of times, and then fall fluttering drunkenly to the ground. Others will attach themselves to the poles, wires, and buildings nearby, and all such places should be examined for specimens. A moth on the wires is easily dislodged by throwing a stick against the wire, the jar will loosen its hold, and it will usually drop to the ground.

Beetle traps are easily set about a permanent camp. Wide mouthed bottles, like pickle bottles, with molasses or almost any strong smelling bait in the bottom, set in the ground with the mouth flush with surface and loosely covered with leaves or bark, can be left in place for days with occasional visits, and will well repay their use. The trapped contents when removed are generally well smeared with bait, but that can be easily removed with a little clean water.

Moth traps are also productive of much good material. A lantern or other strong light set in the woods and partially enveloped with a large smooth funnel, paper will do if nothing else is at hand, leading down to a large open cyanide bottle. If the bottle is about half filled with loose moss, excelsior or cotton batting, the moths will work into its interstices where they cannot flutter against each other and damage their wings. This apparatus may be set all night, and visited in the morning.

"Beating" also produces many good things in the way of beetles and bugs. A strip of white cotton cloth about a yard square is held out open and flat by the means of two diagonal sticks extending from corner to corner. This is held horizontally by the crossed sticks under the branch of a tree or bush, especially when in bloom, which is then beaten vigorously with a stick in the other hand. Numbers of insects will fall into the cloth, and can then be picked out and bottled.

The beauty of using all these various methods of collecting is that each yields its own special species and many forms can be easily gathered by some one of these methods that are never seen by the others. A variety of methods produces a variety of species, and a comprehensive collection from a locality can only be gathered by following all of them.

The great hunting ground for beetles is on the ground, under decayed logs and stumps, in the crevices of the rough bark of trees, or between stones and rocks. The vicinity of carrion, though not a pleasant place, is usually productive of many specimens and a freshly felled tree in the woods attracts others. Sandy shores of lakes are often well populated, not only by tiger beetles flying about in the sun, but by a population washed up by the waves; and boards and drift wood lying on the sand above water mark offer shelter to many that have crawled out of the water and sought hiding. The muddy bottoms of stagnant ponds well repay dredging. Masses of muck can be raked out and spread on old papers for examination. It will usually be found thronging with life, and many fine water and other beetles and insects can be obtained in this way.

LAND AND FRESH WATER SHELLS

BY

Bryant Walker.

COLLECTING APPARATUS.

For land shells, a "Ferris" hoe is very useful. This is made by getting a small, light handled garden hoe and having the blade cut down at a machine shop. It should be about 3 inches wide on top and taper to a sharp point. Then cut off the handle so that it will be as long as a cane. This makes a most convenient tool for turning over logs and breaking up rotten wood and digging around stumps and among the dead leaves. A pair of fine curved pointed collecting forceps is also necessary for picking up the small species. Small glass bottles should be carried, as the small species are apt to get lost in the dirt and slime, if put into the same receptacle as the larger ones. It is better not to put the small species in alcohol as they are collected, as they are then killed at once with the animal more or less extended. If put in a dry bottle and left a few hours they will withdraw into their shells, leaving the aperture clear and fit for examination. This is especially necessary with the Pupidae, where the arrangement of the apertural teeth is a specific characteristic.

For the larger species tin cases of a convenient size to slip readily into the coat pockets are most convenient. Several boxes and a number of vials should always be carried, so that specimens from different localities may be kept separate.

For the fluviatile species it is necessary to have a dipper. This is made from an ordinary tin dipper, by removing the bottom and substituting one of fine wire cloth. By removing the end of the handle, the dipper can be slipped on the end of a cane or pole when in use. This is useful not only for reaching the larger specimens from the shore or boat, but especially for sifting the mud

and sand from the bottom, where a multitude of small species live, which otherwise would not be found. It will be found more convenient to empty the contents of the dipper, when thoroughly washed out, into a pail and carry the whole mass home before undertaking to pick out the shells. If attempted in the field, many of the smaller and more desirable things are overlooked. By spreading the mass out in the sun for a short time, it will become dry and friable, so that the shells can be easily separated and picked out. An ordinary reading glass is very useful for the detection of the more minute forms in sorting over much material.

WHERE TO COLLECT.

Everywhere. The land species love dampness and darkness. They are to be looked for under logs, bark, and leaves in suitable localities. Many species bury themselves in rotten logs, and these should be broken up with the hoe. The accumulation of dead leaves around fallen trees is a favourite habitat and should also be carefully and slowly gone over with finger and hoe. The thick grass and dense thickets along the margin of ditches and streams will usually reward a careful examination. Southern and western exposures, being dryer, are not so fruitful as eastern and northern hillsides and shady ravines. Coniferous forests are usually quite barren of molluscan life. An open hardwood forest in a limestone region is the ideal hunting ground. Nearly every permanent body of water has its molluscs, varying according to its character. Some species are found only in rapid flowing water, and others only in ponds and still water. Ditches and other stagnant waters are usually good collecting ground for *Pisidia* and other small species. The low places in the woods, which dry up in the summer, have a number of species that are not found elsewhere, and which bury themselves in the mud when the water disappears. Sand banks in rivers and lakes are

the favourite resort of many of the smaller species. The under side of the lily pads should be scrutinized, while the *Ancylus* should be looked for on stones and dead clam shells.

CLEANING AND PREPARATION OF SPECIMENS.

The largest *Helices* should not be put into alcohol unless desired for anatomical purposes, as it is almost impossible to remove the animal after it has become hardened. They should be boiled as soon as possible. The water should be boiling, not simply hot. Species of about the same size should be boiled together in order that the operation may be successful. A small wire drainer with a long handle is very convenient for holding the snails while boiling. If dropped directly into the water, there is apt to be trouble in fishing them out and they are likely to be boiled too much. The time varies according to the size and the species, some requiring more time than others. If not boiled enough, the muscular attachment to the shell will not be loosened, and the animal will not "pull" at all. If boiled too long, it is apt to break in two and give a good deal of trouble before extraction. The time required varies from ten seconds for a species of the size of *Polygyra monodon* to sixty seconds for *P. albolabris*. It is well to experiment a little at first with a specimen or two of each kind until the proper time is found. Only a few should be boiled at a time, as they "pull" more easily while warm. When boiled, the animal should be slowly and carefully pulled out. Too much haste is apt to cause the animal to break apart, leaving the apical whorls still in the shell. The curved points of the collecting forceps are convenient for extracting the animals and hooks of various sizes can be made from safety pins. By tying these on to small wooden handles very effective instruments can be made. A small, fine-pointed dental syringe is indispensable for this work. If the animal cannot be started with the hook, or if it breaks

in two, a jet of water from the syringe will usually solve the difficulty. In case very desirable specimens get into this predicament, putting them in alcohol for twenty-four hours will contract the remnant of the animal sufficiently to enable the successful use of the syringe. Many of the species have the aperture so obstructed with teeth, that it is difficult to extract the animal with the hook. In such case, a vigorous use of the syringe will force enough of the body out of the shell to enable the hook to be used. When the animal is completely extracted, the interior should be thoroughly washed out with the syringe. A small piece of sponge on the end of a fine copper wire, which can be bent in any direction, is very useful for removing the mucous, which is apt to adhere to the interior of the shell. This should always be carefully attended to, as it will greatly disfigure the specimen when dried. The exterior should then be thoroughly scrubbed with a soft tooth or nail-brush. No oil or acid should be used on any of the land shells. It is not desirable to attempt to clean the small species by removing the animals. By keeping them for a short time in a dry place, the animal will retire far within the shell. Then they should be put into 25 per cent alcohol for a day or two. If to be left longer in the alcohol, the strength should be increased. Twenty-four hours, however, in the alcohol is all that is necessary. Then they can be dried in the air without leaving any offensive odour. Either before or after drying they can be cleaned by putting them in a bottle with some fine, clean sand and shaking them together until all the dirt has been removed by the sand.

With the exception of the larger species of *Planorbis*, which are more easily cleaned by boiling, it is practically immaterial whether the fluviatile univalves are boiled or put directly into diluted alcohol. In either case there is no difficulty in extracting the animals. The minute species are treated the same as the small land shells. In the operculate species, it is desirable to retain the oper-

cula of, at least, part of the specimens. These are easily removed from the animal and, after being cleaned, should be put inside the shell and the aperture plugged with cotton. All the foreign matter both inside and outside of the shell should be removed by thorough washing. All the water species are apt to be more or less encrusted with deposits of lime or oxide of iron. These can be removed by immersing them in oxalic acid. Care should be taken not to prolong the operation, or the texture of the shell may be injured. The *Ancylis* are always more or less coated in this way, and can easily be cleaned by floating them for a few seconds on the acid, upside down, and then gently brushing them off with a soft brush while held on the tip of the finger.

The larger bivalves should be well washed and, if necessary, scraped off with the knife as soon as taken, care being taken not to injure the epidermis.

They can be boiled, if desired, when the shells will open and the animals easily removed. But as a rule, it is more convenient to cut the muscles, which hold the valves together, with a thin bladed knife and scrape the animal out. Care should be taken not to break the edge of the fragile species when inserting the knife. All traces of animal matter should be removed, and after a thorough washing the valves tied together with a string until thoroughly dried. Never use coloured twine for this purpose, as it is apt to stain the shells. Any surface encrustation can be removed either with oxalic or muriatic acid. The latter is more convenient for the larger species, and can be applied with a small brush. It does not bite the fingers, so that it can be used freely. Care, however, must be exercised in using it and the specimens frequently washed, lest damage be done to the shell. The smaller bivalves, the *Sphaeria* and *Pisidia*, are best treated by putting into diluted alcohol for a day or two and then drying them. If left too long the shells are apt to open, which interferes with the looks of the specimens.

The larger species of *Sphaerium* are better with the animal removed. This can be done after boiling for a few days in alcohol. As these are usually too small to be easily tied together to keep the valves from gaping, each specimen, while the hinge is flexible, should be closely wrapped up in a small piece of tissue paper until completely dry.

Both in collecting and cleaning, the specimens from each locality should be kept carefully separated and labelled. Too much importance cannot be given to this point. The study of geographical distribution of the mollusca is one of the most important branches of conchological work, and this, to be of any value, must be based on absolutely accurate work on the part of the collector.

PACKING SPECIMENS.

Small specimens should not be mixed with large ones, as they are apt to get lost; nor should fragile shells be put in with stronger ones, as they are likely to be broken. The minute specimens can be put into gelatine capsules, small vials, quills, or paper tubes, made by rolling writing paper around a lead pencil, gumming down the edges and stopping the ends with cotton. Don't mix shells from different localities. Write the locality on a label and wrap it up with each vial or package. Use plenty of cotton in packing fragile shells. Pill boxes and match boxes are convenient for packing purposes. Wrap up each vial or box separately, then if a smash does occur there is a fair chance of saving some of the specimens and no danger of mixing the contents of different packages. Don't send paper boxes by mail. It is simply tempting Providence. Pack in a wooden box.

Packages up to four pounds in weight may be mailed free, if addressed:—

O.H.M.S.
To The Director
Geological Survey
Ottawa.

Natural History Division.

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