Directions for collecting Zoological Specimens.

Mammalia. The smaller animals of the class may either be skinned, or enclosed entire, (an incision being previously made in the under side of the animal) in jars or barrels, which are to be filled up with some spirituous liquor, as gin, or what is preferable when it can be procured, proof spirit diluted with half its bulk of water. If no spirit can be had, strong brine must be adopted, in respect to their retaining their natural colour, brine is even preferable to spirituous liquors for preserving the specimens.

To skin the larger mammalia, make an incision in a straight line along the belly, from the vent to the throat, detach the skin carefully with the knife. Make all incisions where they will be least visible.
when the skin is set up, as the inside of the legs & thighs, but practice will be the best instructor in this purely mechanical business. The skin & bones of the legs and feet are to be left. The brain, eyes, and tongue must be extracted, and as little fat as possible be suffered to remain adhering to the skin, which is then to be dressed with the arsenical soap for the mode of making and applying which see below. If, however, some fat remain, which cannot well be got rid of, strew it over with powdered tan (or the bark of oak, willow &c.) previously to applying the soap. Mr. Wittkere has given the following as the method of dressing this used Morocco. Wash the skin in fresh water, scrape off the flesh, and deep the inside with some of the following mixture; alum, two pounds; butter milk, one quart; meal, two or three handfuls; fold it up carefully, press it together. After two days, wash the skin, drain off the water, dress it well on the inside with
powdered alum, and fold it up as before. After three
days unfold & dry it in the sun, without removing
the alum; when dry, sprinkle it with fresh water,
again fold it for two hours, and scrape the inside clean,
and rub it with sandstone until it become soft and
pliable; then hang it up in the shade to dry.
The ears, lips, and feet of the large mammals
should, when practicable, be well anointed with
spirits of turpentine which will assist their
drying, and tend to destroy insects; when dry, roll
up the skin with the hair innermost, beginning with
the head, & put a layer of dried grass or moss be-
tween the folds, to prevent its being injured
by rubbing. The skin must be occasionally
unrolled and examined and if practicable ex-
posed to a hot sun, and fresh spirits of turpentine
added, if any symptoms of insects appear.
Tobacco, the stronger the better, strewed in the
package, will be serviceable, and in countries
where spices and aromatic drugs can be procured at a reasonable rate, these may be used to great advantage, and even to suspend the necessity of applying the arsenical soap.

When a very large animal has been killed, under circumstances which prevent the application of the arsenical soap, the skin should be stretched out on the branches of a tree to give the air free access to every part of it, and, as soon as it is cold, well dressed on the inside with wood ashes.

Entire skeletons (especially of the rarer animals) should be procured if possible. It is not necessary that they should be jointed or set up, but having removed all the soft parts, boil the bones, and when well dried, pack them with moss or grass or the best packing stuff at hand, so that they may travel securely. Take especial care that not a bone, tooth, or claw be lost.
Birds. In respect to birds the collector should proportion his shot so as to injure the skin & feathers as little as possible. As soon as the bird falls, the blood should be carefully wiped up, and cotton placed within the beak to absorb any that might flow from the mouth, to prevent its staining the plumage. Birds should be skinned as soon as may be after they are killed, if suffered to remain till putrefaction has begun, the feathers fall off.

The mode of skinning birds is similar to that of skinning the mammalia, and equal care must be taken both to make the incisions as small as possible, and in the least parts of the feathers should be separated as not to be injured by the knife in dividing the skin. The incision may be made from the vent to the breast. The head & legs must in all cases be preserved if the coccygeal joint in the skin, otherwise the tail feathers

will be liable to drop out. In packing the skin, care must be taken that the plumage be not injured by contact with the harder parts, which for that purpose should be surrounded with cotton, tow, or the best soft packing material at hand, as dried leaves or grass. Then more than one individual of the same species can be procured, it is desirable that a second specimen should be preserved in spirits, and the same remarks apply to the smaller mammals, and indeed to all the orders. The birds should be dried with same materials as those of the mammals, but the animal soap, if used at all, must not be too liberally applied.

The plumage of birds varies extremely at different periods of their life, and different seasons of the year, it is of great importance to obtain both sexes, if possible, of all ages, from the chick just
hatched to the adult in its matured plumage; and also in their summer & winter liveries. Birds eggs should be assiduously sought for & the species carefully identified. The best method of entering them is, by making a small hole near the middle of the shell, of about a quarter of an inch in diameter, into which a small tube is to be inserted, so as nearly to touch the opposite side of the shell, which being held with hole downwards is easily emptied of its contents, by blowing gently through the tube. If no more convenient instrument be at hand a straw will make a very serviceable blow pipe. Birds nests are rather nuisances than otherwise; in collections from their containing dirt & litter and being frequently infested with insects; never the less as part and parcel of ornithology, they deserve a high degree of interest & must by no means be neglected. The collector should therefore take accurate descriptions of the materials, form & size of every nest he finds, always being extremely cautious to ascertain the species to which each one effectively belongs; he should also make careful drawings.
of every variety, and even collect such of the smaller nests as possess any peculiarity in point of material, structure or mode of suspension.

Reptiles & Fish. are best preserved in spirits, each specimen being previously wrapped in a linen cloth, but when too large to be so treated, serpents and fish should be carefully skinned, with the least possible injury to the scales, or any of the external organs, & with especial caution not to destroy the form of the skin, which may be preserved by stuffing it lightly with cotton or tow, or filling it with sawdust; and the thumbs bored with the head, feet, & fins on, instead of being skinned whole, fish may be divided into two nearly equal portions by an incision passing longitudinally through the vertebrae of the head, the back & belly, but on one side of the dorsal, caudal anal and ventral fins so as to leave one half of the animal with the gills, and all the organs of motion perfect. Then flesh may then be easily removed from this portion, of replaced by tow which will preserve the form of the body.
when well dried, this portion is to be carefully packed. On the whole, this method deserves the preference above all others; and fish thus preserved, when provided with proper artificial eyes, and mounted on flat bases, afford excellent specimens.

The upper and lower shells of the tortoise tribe should be separated by dividing the same ligamentous or spongy portion which unites them on each side, between the fore and hind legs, after which the fleshy parts may be easily removed, the head, legs, and integuments of the body being carefully preserved. As to the lizards and crocodiles they may be skinned in the usual manner, care being taken not to injure the tails of the former, which are very brittle; or when not too large preserved in their skins, which is still better.

The form and colour of the eyes, in all the vertebrata of whatever class, should be carefully observed and noted down the moment they are taken. This precaution should never be neglected.

In collecting shells, whether terrestrial or aquatic, the skilled naturalist must always give the preference to live shells.
that is such as are still inhabited by the living animal, but if they cannot be obtained, dead shells are better than none, though, for the most part, they are mostly faded. The more delicate species must be packed in cotton or other soft substance, or in default of such in fine sawdust. Shells containing their animals as well as all the other mollusca must be preserved in spirits or brine.

Crustacea. The marine species may be killed by being immersed in cold fresh water, and they should be left in it for several hours to free them from the adhering salt, which if not well washed out renders them liable to attract moisture from the atmosphere, and injure the specimens; when well washed separate the upper shells and remove as much of the fleshy parts as possible, and then carefully dry and pack them. The smaller species may be pierced with pins, like insects, if the consequence bulk of the packages be not an objection. Entire Crustacea may be preserved in spirits or brine.

Humanity requires that all the animals that we collect...
should be deprived of life in the most expeditious and least painful manner that can be devised, and no agent appears so effectual as pure hydrocyanic (prussic) acid. A small quantity of that fluid is to be placed in a well corked phial, or other close vessel with a piece of blotting paper to prevent its flowing over the specimens. The vapour of the acid, (which the collector must be careful to avoid inhaling) thus fills the vessel, and is so fatal to animal life that almost instant death ensues on placing a subject within its destructive influence. Though chiefly employed for killing insects, prussic acid, used as above directed, is equally applicable to every animal not too large to be exposed to its vapour in well closed cases.

Arachnida, Spiders, scorpions and scari are best preserved in spirits as well as the myriapoda, including the julii, the scolopendra, and other individuals of the order. But no good method, sufficiently easy and simple to be practised by the travelling collector, has been hitherto discovered for the effectually securing the colour of
many of the animals of this class, especially the spide.

Insects. The myrmecoc and parasitic insects, the former,
including the lepidoptera, petrobi and psedura, the latter,
the pediculi and surmidae, are very minute, and may be
collected in quills and killed by exposure to heat or
the vapour of fumus acid. The parasitic insect main
male, birds, reptiles, fish and even insects. Birds
especially are subject to these pests, and in some
instances certain parasites are peculiar to a particular
species. The collector must therefore
carefully inspect the plumage of all the birds to kill, and
accurately note down from what species each individ
ual is respectively taken. The examination
must be made whilst the bird is still warm, as the
parasites leave the body soon after it becomes cold.

Lynnet laid a sheet of paper on the body of the dead
bird, and placed on it a well warmed and folded hand
kitchen; the heat induced the insects to leave the bird
and assemble on the paper; thus they were easily collected.

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Colocyptera—Beetles may be at once put into spirits. The late unfortunate Drummond packed colocyptera, both large and small, in full boxes, with powdered camphor, placing a thick of tissue paper between each layer of insects. In this way, neither specimen was injured, and the insects retained sufficient moisture not to need being relaxed before they were picked. Besides prussic acid and spirits, colocyptera may be killed by immersion in nearly boiling water. The collector must omit no opportunity of obtaining the larve & pupae as well as the perfect insects and carefully note the species. They may be preserved in spirits or in the following manner invented by M. Laurent. Kill the larve with prussic acid vapour, then half a pin into the anus, and expel the intestined and their contents by pressing the body between the thumb & forefinger beginning at the head. When well emptied, insert a straw or other small tube proportioned to the size of the larve into the anus, & fix it in its place by means of a
Small pins passed through the last segment of the skin of the larva and the tube; next expose the skin to a gentle heat over a chafing dish of coals covered with an iron plate, till it has contracted round the tube, which will take about half a minute; then, by blowing through the tube, the tube will swell out to resume its original form, in which state it must be carefully dried over the hot plate, turning the tube round and round, and continuing to blow that the skin may not collapse, and the larva retain its perfect form. If the pins or tube adhere to the skin, cut each off as close to it as possible, without attempting to withdraw them.

Orthoptera.—Including the earwigs, the cockroaches, mantis, locusts, and some of the Anoploptera, as the lantern fly (fulgora) and cicada may all be preserved in spirits, but better dry; in which case they must be pierced through the thorax, the intestines being carefully removed and replaced by cotton.

Of the remaining orders the neuroptera by monoptera, lepidoptera and diptera, are best preserved by being vertically pierced through the thorax.
Coleoptera are always to be pierced through the right elytron so that the pin may come out beneath between the first and second pair of legs with a pin and stuck securely in boxes lined with cork or some substance sufficiently soft and elastic to allow the pin to enter it easily and hold it securely. To save space several insects may but with caution be placed on one pin, and those lepidoptera whose wings when at rest are carried vertically on the back may be pierced through the thorax laterally by which a greater number may be fixed on one pin. The box should be filled with the prussic acid vapour as directed above.

The species of these orders, except the lepidoptera, may also be kept in pill boxes but piercing them is preferable. The hemiptera should be pierced through the thorax and the sooner they are caught the better as they become very brittle on drying.

Anelida (Starfish) including the Schiurae and conatulae as well as the whole tribes of worms amphiporidae, nereid, leach, tunicate gorabii together with all the lower animals not provided with shells or other solid covering may be preserved in spirits; or if convenient the
Asteria having been first well soaked in fresh water for several hours, may be extended on boards, with their arms retained in the proper position by some still quite dry, and then very carefully packed in tissue paper & cotton.

The echini (sea urchins) are very difficult to preserve dry with their spines on, especially the Indian species which have very large and very heavy spines. Having killed the animal, expand the anus and clear out the contents of the body, as completely as possible, with a small spoon or earpick, then soak it for ten minutes in fresh water, taking care that the spines do not fall off. Next fill the shell with cotton and lay it on a board, and introduce between each spine a little ball of cotton or silken paper, so as to retain them all in their proper position, and let them dry undisturbed. Then pack each specimen carefully in a separate box, leaving the cotton or paper between the spines. If need of time a storage room forbid this method, preserve the specimens entire in spirits. At all events, take care that none of the spines be lost, or those of one individual meet with those of another.
Intestinal worms must be carefully sought for among the viscera of every animal which the collector might and when found preserved in spirits. General Remarks. Every specimen, dry or in spirit, should have a number attached to it corresponding to one in the collector's note book in which he must enter his observations concerning it; as for instance:

The country where found
The season when

Habits
Habitat
Local name

The collector must be furnished with knives, scissors, scalpels, pliers, nets, a large assortment of pins of various sizes, needles, a hammer, small hatchet, packing cases large and small, including cork boxes for lepidoptera, and a great number of pill boxes in nests—cotton and paper—and also with a folding-net, hoop-net, water net for fish, dipper,
glass phials, &c., for collecting insects. He must have a good supply of prussic acid and alkalinical soap.—The composition and mode of making the latter is as follows:

- Camphor — — — 5 lb
- Pulverized arsenic — — 2 lbs
- White soap — — — 2 lbs
- Subcarbonate of potash 12 oz
- Powdered quick lime 4 oz

Melt the soap completely with heat in a small quantity of water, and add the potash & lime, then remove it from the fire. Stir the arsenic, next add the camphor, previously rubbed to powder, with a little spirit of wine, & mix the whole thoroughly; it should now have the consistence of paste. Preserve it in carefully closed glass vessels, labelled as Poison.

To use it, mix the quantity required with cold water, to the consistence of tolerably clear soup, and apply it with a brush to the inside of the skin. In addition to the above, a small microscope for the examination of infusory animalculae is desirable and...