

SCIENTIFIC TAXIDERMY FOR MUSEUMS.

(BASED ON A STUDY OF THE UNITED STATES GOVERNMENT COLLECTIONS.)

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In a valued communication, dated January 16, 1893, the present writer was honored by a request from the United States National Museum to furnish to it a paper upon what may briefly be termed "scientific taxidermy" in its widest sense. My attention was especially invited to the progress that had been made in the art of taxidermy, as exemplified on the part of the various methods used in the preparation of, and the modes of mounting resorted to, in the case of all kinds of animals for museum exhibition. It was proposed that in a general way this study should review the field, in so far as the collections contained in the U. S. National Museum and Smithsonian Institution were concerned, from those times when specimens of mounted animals were first being made by those institutions to the day when the opening of the World's Columbian Exposition at Chicago permitted people to see, in the varied groups and single examples of preserved animals from nearly every department in nature sent there, what could be accomplished in such matters through the operations of skilled moderns in the taxidermic art. What was expected of me was further definitely defined, in the letter to which reference is made above, in the following words: "We should like to have your unbiased opinion of the different pieces and kinds of work, whether favorable or unfavorable, and should be glad to have you indicate, so far as you feel disposed to do so, what lines of work, in your opinion, promise the best results if carried further, and what you think should be abandoned." This injunction, when faithfully performed in the case of any art whatsoever, is the only proper test of our progress in it, and it is through comparison alone of early accomplishments, work recently performed, and what is being done in the particular line at the moment, that we can inform ourselves precisely where we stand. Very soon it became possible for me to direct my attention to this matter, and a preliminary overlook of the field convinced me that my chief duty lay in making just criticism of the results attained on the part of the artist in taxidermy, rather than an enumeration and description of all the details of

technique of that art. Much that refers to the last-named class of work has been and will be shortly still more thoroughly set forth in certain papers and reports published by the National Museum. Some valuable instructions of that kind, I understand, are in press at the present writing, and ere long the scientific taxidermist will have before him all that refers to correct methods of the mounting of animals, as well as plastic modeling and everything that has any bearing thereupon.

The present paper, then, will have little or nothing to do with what might properly be called the chemistry and mechanics of taxidermy, but will rather deal with it from the standpoint of the art student and biologist. At some points these two lines, however, converge, but never distinctly intersect each other; and my chief object will have been attained, if this paper proves itself to be a useful adjunct to the others upon kindred lines of inquiry. Properly, it will fill the place of the last of the series, for the reasons that have just been stated.

History goes to show that there has been just as much of an evolution, of progressive advancement, in the science and art of taxidermy as there has been in the case of the necessity for, the growth and improvement in the building of, the stocking, and the management of museums. To a very large extent these two developments have been *pari passu* in nature, and, in one sense, they are quite dependent upon each other. To instance my meaning, it may be said that a handsome, instructive, and scientifically preserved group of animals may utterly fail of a useful purpose by being placed upon exhibition in some poorly lighted, indifferently ventilated, and otherwise unsuitable museum-hall; while on the other hand no amount of architectural beauty and perfectness in the latter will ever serve to shield a group of animals that have been mounted by a person ignorant in all the departments of scientific taxidermy, from the criticism that work of that kind is sure to have continually poured down upon it by the intelligent natural historian.

It can be shown, then, that the taxidermic art, as in the case of all the arts and sciences, has had its dawn, having been nursed in a cradle of crude beginnings, far back in history, and since which time it has enjoyed a very remarkable career of development. To me there is no doubt but what it came into being with such pristine pursuits as prehistoric tanning, the embalming of the human body, and those of certain domestic animals as the cats and dogs found in prehistoric remains of Egypt and elsewhere. Sure it is that Hanno, the very ancient Carthaginian navigator, in the record that he has left us of his African explorations, made five centuries before Christ, gives an account of his discovery of the gorilla, and "having killed and flayed them, we conveyed their skins to Carthage." There they were preserved for many generations, and are, no doubt, the *Gorgones* described by Pliny (146 B. C.).

Our own Pueblan Indians, as the Zuñians and others, make very good "flat skins" of small birds to-day, an art no doubt traceable in

them to the Mexicans, and the latter have probably practiced it for ages.

Montezuma, as stated by Cortez, possessed robes covered with the skins of the Trogon and other brilliantly plumaged birds. From the making of these flat skins for personal ornament to the desire to preserve in their natural appearance similar forms, as well as other small animals of all kinds, for the ornamentation of habitations, is both easy to be imagined, and very probable what took place. Gradually there was a demand for that kind of work, and it fell to the hands of those most skilled in its performance. They were the early taxidermists. Before specialization was ever dreamed of for the early arts of whatsoever kind, there always, so history teaches, existed a kind of an affinity bonding more or less closely together, the naturalist, the medical man, and the conservator of the curious in nature. Shakespeare's portrayal of the London apothecary is illustrative of this, within whose

Needy shop a tortoise hung,
An alligator stuffed, and other skins
Of ill-shaped fishes.

Complete differentiation in certain quarters, in these days of the manhood of those sciences, has not as yet been thoroughly brought about, and even in some of the old German cities of the present time we yet hear of organizations known as "The Society of Naturalists and Physicians," and in some of our own late expeditions made under the auspices of the Government, the duties of "surgeon and naturalist" are relegated to one individual.

Now, although the mere preserving the skins of animals is an operation to be easily traced back through nearly all races of people to the dawn of history, this does not altogether hold true with the "mounting" of animals.*

Taxidermists are quite agreed that this phase of the art is of comparatively quite modern origin. For instance, Montagu Browne has remarked that—

Little is known of the beginnings of the practice of the "stuffing" or "setting up" of animals for ornament or for scientific purposes; and it is highly probable, from what we gather from old works of travel or natural history, that the art is not more than some three hundred years old. It was practiced in England towards the end of the seventeenth century, as is proved by the Sloane collection, which in 1725 formed the nucleus of the collection of natural history now lodged in the galleries at South Kensington.

It was not until the middle of last century that any treatise devoted to the principles of the then little-understood art was published in France, Réaumur's treatise (1749) being probably the first. This was followed at intervals by others in France and Germany, until the beginning of the present century, when the English began

* Probably, as Mr. Goode informs me, the oldest museum specimen in existence is a rhinoceros still preserved in the Royal Museum of Vertebrates in Florence. This was for a long time a feature of the Medicean Museum in Florence, and was originally mounted for the museum of Ulysses Aldrovandus in Bologna. It dates from the sixteenth century.

to move in the matter, and several works were published, notably those by E. Donovan,* W. Swainson,† Capt. Thomas Brown,‡ and others. These works, however, are now inadequate, and since the Great Exhibition of 1851, when the Germans and French taught British taxidermists the rudiments of scientific treatment of natural objects, several works have appeared upon the subject from the pens of American and English authors, such as J. H. Batty,§ R. Ward,|| and Montagu Browne.¶

That the art is recent was also held by Dr. Holder, who, in an able address given before the Society of American Taxidermists, said that the—

First authentic examples in this comparatively new art with which we are familiar are those produced through the patronage of the Prince Maximilian, of Nieu Wied, Germany. This distinguished naturalist had spent several years in exploring the bird region of North and South America. Equipped with every needful appliance for successful research, he included in the personnel of his staff a practical taxidermist, and the numerous species of American birds and mammals, embracing many types of great value, testify to the thorough exploration which the Prince accomplished in these regions. It was the good fortune of the American Museum of Natural History to come into possession of the entire collection of natural objects which formed the well-known museum of this naturalist, and thus, through this collection, we have representations of the earliest period of the art.

Among the numerous examples contained in the Maximilian collection are a number that yet bear the original label in the handwriting of the Prince. The frequent occurrence of *Meiner Reiser* (my journey), accompanied by dates from 1812 upwards, a period comprising a full three score years and ten, is recorded testimony of great historical value. Unscathed as those specimens are by museum pests, they present a most satisfactory evidence of the reliability of arsenical treatment as a means of perpetuation well nigh indefinite. How much earlier the art was practiced we have no definite knowledge. The numerous stuffed skins of reptiles, or rather mummies, found in Egyptian tombs naturally claim our notice as perhaps the earliest examples.**

Extending over a very considerable period of duration we next find the art of taxidermy passing through a stage of its development, of which no end of examples quite parallel with it might be cited from

* Instructions for Collecting and Preserving Various Subjects of Natural History, London, 1794.

† The Naturalist's Guide for Collecting and Preserving Subjects of Natural History and Botany, London, 1822.

‡ Taxidermist's Manual, Glasgow, 1833.

§ Practical Taxidermy and Home Decoration, New York, 1880.

|| Sportsman's Handbook of Practical Collecting and Preserving, London, 1880.

¶ Practical Taxidermy, London, 1879, second edition, 1884; also, article Taxidermy, Encycl. Brit., ninth edition, vol. XXIII, p. 89, from which the above quotation is made.

** J. B. Holder, Dr. Third Annual Report of the Society of American Taxidermists, Washington, 1884, p. 40. In this connection it is well worthy of notice that in the same report Mr. L. M. McCormick (then of the U. S. National Museum) presents us with a most valuable and useful Bibliography of Taxidermy (pp. 91-112), wherein the earliest work cited on the art is that of Johann Daniel Geire, which consists of merely two pages from the Miscell. Acad. Nat. Curios, entitled "De vernice ad conservanda insecta et animalia," being published December 2, 1689. Nothing of any importance, however, appearing between that date and the well known work of Ferchault de Réaumur, which was given to the world in 1748.

the early histories of other arts and sciences. Photography and chemistry are excellent instances of it. During the times to which I refer, taxidermists both in this country and Europe, with but rare exceptions, could be grouped in two classes—the first, and by far the most numerous, was chiefly represented by men coming from the lower planes of society, who endeavored to throw as much mystery about their operations as possible; in fact, to keep their art a secret one, and if divulged at all, only done so at a high figure. The second class, as a rule better men socially, consisted of those who seemed to think that to either be a taxidermist or even to publish anything on the subject, required an humble apology to society. My private library contains works illustrative of both these classes. The first is a miserable little volume of some thirty pages published by its author, Mr. S. H. Sylvester, at Middleboro, Mass., in 1865, and entitled “The Taxidermist’s Manual, giving full instructions in mounting and preserving birds [etc.], sec. ed. (Price, \$1.)” Apart from the ridiculous meagreness of the information it affords, a single leading page is entirely devoted to the following “suggestion:”

As common things lose their charm, so is it more particularly in this art. A person having this work should not leave it exposed to the eyes of the curious. The same caution should be used in the practice. Work by yourself that none may know the mysteries of the art, unless they are willing to pay for the information as you yourself have done.

No less a book than the one published by Capt. Brown illustrates the second class to which we have referred.* In his preface this author remarks that—

In the following treatise it has been my object to attend more to rendering the meaning clear than to elegance of language; and, besides, to get the work up in a style at once creditable and moderate in price, so that it might be generally useful. At the same time I have preferred avowing myself the author to publishing the work anonymously, being firmly of opinion that no man should publish on a subject which he is ashamed to acknowledge. (p. vi.)

Such a “suggestion” as has been given us by Mr. Sylvester will never again appear upon the page of any standard work devoted to the art of taxidermy and published by a civilized nation any more than Capt. Brown’s thought of apologizing for the admirable little treatise which he has given us on the subject will ever be repeated in a similar work. Capt. Brown had the less to be “ashamed” of in his book, for in his introduction he places himself upon the record by his observations as being one of the very first to sound the keynote, which, swelling through the last quarter of a century, has had its due influence in lifting taxidermy from the realm of an ignoble pursuit to the broad

* Thomas Brown (Capt.), F. L. S., late president of the Royal Physical Society, etc. *The Taxidermist’s Manual; or, The Art of Collecting, Preparing, and Preserving Objects of Natural History, designed for the use of Travelers, Conservators of Museums, and Private Collectors.* London and Edinburgh, 1870. (Plates vi, pp. 150.)

platform of one of the most important and exact of all the sciences. I refer to the paragraph in which he has said:

Although considerable advances have been made of late years in the art of taxidermy, it is still far from perfection. This is to be attributed, in a great measure, to the education of the persons who practice this art; for among all I have met with employed in the preservation of animals, none have had the advantage of anatomical study, which is quite indispensable to the perfection of stuffing. One or two individuals, it is true, have attended to the structure of the skeleton of man and a few of the more common animals, but this is far from the information which they ought to possess; for nothing short of a general and extensive knowledge of comparative anatomy can qualify them sufficiently for an art which is so comprehensive and varied in its application (pp. 2, 3).

Prophetic words, indeed, and not in a few quarters has the prophecy of this distinguished authority been largely fulfilled. More light, however, is needed in other places, and in many of our museums of the very highest standing the examples of taxidermy they offer us are far, very far from our ideal of what they should be.

Charles Waterton is another worthy name that must not be forgotten here, and fully seventy years ago, in his *Wanderings in South America*, he wrote, in his quaint and impressive old style, yet pregnant with truth:

Were you to pay as much attention to birds as the sculptor does to the human frame, you would immediately see on entering a museum that the specimens are not well done. This remark will not be thought severe, when you reflect that that which was once alive has probably been stretched, stuffed, stiffened, and wired by the hand of a common clown. Consider, likewise, how the plumage must have been disordered by too much stretching or drying, and, perhaps, sullied, or at least deranged, by the pressure of a coarse and heavy hand—plumage which, ere life had fled within it, was accustomed to be touched by nothing rougher than the dew of heaven and the pure and gentle breath of air.

These are potent words as coming from the pen of a man who wrote them within a year or two of three-quarters of a century ago. Especially is this the case when that ingenious naturalist in the same work enjoins that—

If you wish to be in ornithology what Angelo was in sculpture, you must apply to profound study and your own genius to assist you.

You must have a complete knowledge of ornithological anatomy. You must pay close attention to the form and attitude of the bird, and know exactly the proportion each curve, or extension, or contraction, or expansion of any particular part bears to the rest of the body. In a word you must possess Promethean boldness, and bring down fire and animation, as it were, into your preserved specimen.

“Repair to the haunts of birds on plains and mountains, forests, swamps, and lakes, and give up your time to examine the economy of the different orders of birds.” is also the kind of study Waterton recommended in 1825 to those who desired to preserve birds in their strictly natural attitudes as they assumed them in life and in nature.

Standing almost alone as he did as a sound instructor of the taxidermic art in the first quarter of the present century, he is represented

at this writing, or in the very last part of the century's last quarter, by scores of teachers in Europe and America who entertain precisely similar opinions. Not only this, but recruits are rapidly coming to the ranks as time hastens on, and it is quite safe to predict that in another century, or even less, the old-time "bird-stuffer" will cease to be found "in the flesh" among us.

Already I have given above, in the words of Montagu Browne, who have been the chief promoters of this art in Great Britain; other nations also have in this way powerfully contributed to the material progress of taxidermy. In France the immortal names of Verreaux, Verdey, and others had a most beneficial influence; and our own country has been by no means backward in this particular.

Within the past ten years or more the published opinions of a number of these writers are the best evidences upon the substantial nature of the progress of this science that we can here adduce, and by quoting some of them I resort to the most effective means in my power to illustrate what taxidermy has attained to in those places where its standard is now considered to be at the highest plane of its present development.

Turning again to the article Taxidermy, by Mr. Montagu Browne, already referred to above, we find him concluding it thus:

A new school of taxidermy, with new methods, whose aim is to combine knowledge of anatomy and modeling with taxidermic technique, are now coming to the front, and the next generation will discard all processes of "stuffing" in favor of modeling. Within the limits of an article like the present it is impossible to do more than glance at the intricate processes involved in this. In the case of mammals, after the skin has been completely removed, even to the toes, a copy is made of the body, posed as in life, and from this an accurate representation of form, including delineation of muscles, etc., is built up in light materials; the model is then covered with the skin, which is damped and pinned in to follow every depression and prominence; the study is then suffered to dry, and, models having been made, in the case of large animals, of the mucous membrane of the jaws, palate, tongue, and lips, these are truthfully reproduced in plastic material. The ordinary glass eyes are discarded, and hollow globes, specially made, are hand-painted from nature, and are fixed in the head so as to convey the exact expression which the pose of the body demands. Birds, if of any size, can be modeled in like manner, and fishes are treated by a nearly identical process, being finally colored as in a "still-life" painting.

To give a life-like appearance, attention is also paid to artistic "mounting." By this is meant the surrounding of specimens with appropriate accessories, and it is well exemplified by the new work shown in the natural history museum at South Kensington, where, for example, birds are arranged as in a state of nature, feeding, or flying to their young, sitting on their eggs, swimming in miniature pools, or preening their feathers whilst perched lovingly side by side, and surrounded by exquisitely modeled foliage and flowers. This, with correct modeling of the specimens, which, except in rare instances, is not quite so striking in the new groups, indicates the future of the art, the hope of which lies in the better education of taxidermists as designers, artists, and modelers.

Not only should they be better instructed in designing, in art, and in modeling, but, what is quite as important, they should be trained espe-

cially in the power of correct observation in animal morphology, and in other matters which will be enumerated further along.

Dr. Sharpe has given us a very able article touching upon the question of artistic taxidermy.* He says:

At Leyden, where a staff of trained taxidermists is kept in the museum, some attempt has been made to vary the usual mode of stuffing animals by representing them in varied and active positions, and thus the general effect is never monotonous. But this was never done in the British Museum, and the constrained attitudes of many of the specimens exhibited at Kensington form part of a legacy from the parent institution, the bad influence of which it will take many years to efface. Thousands of specimens have been unmounted already or have been transferred to the duplicates and distributed to such provincial museums as prefer to tread in the old paths, and will accept specimens belonging to the bad old times.

The credit of having broken away from time-honored tradition, in the mode of mounting animals in this country is certainly due to Mr. John Hancock, who taught how to combine scientific accuracy and artistic feeling. Mr. Hancock's name is at Password throughout England wherever taxidermy is mentioned, and in London his ablest representative has probably been Mr. A. D. Bartlett, the well-known superintendent of the zoölogical gardens, to whom we owe many of our most beautifully mounted specimens in the bird gallery. But the first to suggest this combination of art and taxidermy *for an entire museum*, was undoubtedly Mr. E. T. Booth, of Brighton, whose collection of British birds in the Dyke Road Museum, still remains one of the sights of England, and is not surpassed in interest by any natural history exhibition in the whole world. Here may actually be seen our native birds in their haunts, every species being represented as in a wild state, with corresponding natural accessories, reproducing as nearly as possible the surroundings as they were when the birds were alive, and representing the scenes sketched by the collector at the time of capture. Many years before we actually saw Mr. Booth's collection, its fame had reached our ears, and the idea seemed to us to indicate what the museum of the future, ought to be; thus we lost no opportunity of advocating this system of artistic taxidermy in all our public lectures. At Leicester the notion was well received, and some groups of British birds were mounted under the auspices of the natural history committee of the town museum, until by the appointment of Mr. Montague Brown, as the curator of the museum, Leicester obtained the services of a taxidermist as skilled as he is energetic, and the result has been that the system of natural mounting has been extended to the entire collection of birds, so that not only British, but foreign species are represented with their familiar surroundings in a state of nature. The Leicester Museum is the only one which has applied the principle in its entirety with the utmost success and public appreciation. * * *

And further along in his article, and referring to the series of the groups of British small birds and their nests in the South Kensington Museum, Dr. Sharpe adds:

In this corridor are placed most of the smaller perching birds, some of the artistic work being very satisfactory. The mounting of the specimens has been done by Mr. Pickhardt, who, when he exercises his full powers, is probably without a rival as a bird-stuffer, and the majority of the plants have been reproduced by Messrs. Minton, of Soho Square, but a great deal of the arrangement of the cases is done in the taxidermist's room of the museum by Mr. James West, one of the staff. And here it

*Sharpe, R. Bowdler: Ornithology at South Kensington. The English Illustrated Magazine, No. 51, December, 1887. London: Macmillan & Co., pp. 165-175. Illustrated.

must be explained that the groups of British birds exhibited are absolutely true to nature, the birds being in every case the actual ones which built the nest in the identical situation reproduced in the case.

So wonderfully interesting is Sharpe's article that the writer would fain republish here every word of it, but we must hasten on to the expression of opinions of others.

When commenting upon the "Common Faults in the Mounting of Quadrupeds," our veteran taxidermist, Mr. William T. Hornaday, has said:

The task of the taxidermist, if properly appreciated, is a grave and serious one. It is not to depict the mere outline of an animal on paper or canvas and represent its covering of hair, feathers, or scales; nor is it to build up a figure of yielding clay and cast it in plaster. It is to impart to a shapeless skin the exact size, the form, the attitude, the look of life. It is to recreate the animal, or at least so much of it as appeals to the eye; to give it all that nature gave it except the vital spark. It should be an exact copy, as if it were a cast of the animal as fashioned by nature's cunning hand. It must stand the crucial test of being viewed from all points—from the side, the front, from behind, above, and below.

More than all this, the animal must be prepared to stand the test of time. It must not swerve from its poise; it must not shrink nor change its form; it must retain its smoothness and resist the ravages of destroying insects.*

Mr. Hornaday, it will be remembered, was at one time in charge of the taxidermical department of the U. S. National Museum, and many of his most successful accomplishments, grand groups of our larger mammals, preserved in the most masterly style, are in the cases of that institution—silent attests to the durability and thoroughness of his work. A number of these will be noticed further on in the present paper.

There was much in Mr. Hornaday's studio at the National Museum that reminded me of the workshop of that giant among American taxidermists of his time, the late John G. Bell, of New York. There I met him over a quarter of a century ago. His place was somewhere down upon Broadway, and his room upon the second or third story of the building. At the entrance door downstairs was a small case containing a mounted scarlet ibis and a few other birds, to invite attention to those in search of his rooms above. At that time, about 1868, I was a student of one of Mr. Bell's best graduates, Mr. James W. Jenkins, now of Madison, Ill., and very well do I remember my first introduction to that Broadway establishment. I had been engaged by Prof. Albert S. Bickmore to accompany, as naturalist, one of the Polar expeditions, then organizing, to make collections for the American Museum of Natural History, and had been sent with specimens of my bird-skins to Mr. Bell to have him pronounce upon them and my work generally, with the view of having his opinion on my fitness for the position. As I entered the room I observed an old red fox chained to a bolt in the wall, but lying down with

* Third Ann. Rep. of the Soc. Amer. Taxidermists, p. 67. 1882-'83.

his head between his forepaws and eyes upturned in my direction. On the floor in his immediate neighborhood were a number of beautifully mounted birds on stands, and fearing lest the animal should suddenly arise if I came farther into the apartment, and do some damage, I started to pass round and give him as wide a berth as possible. The room was small, and Mr. Bell was engaged with a couple of students at a window opposite where I entered, but he turned in time to see my detour around the fox, and did not spare me in his merriment at my thinking the animal was alive. To some extent, however, he mitigated my chagrin by saying he had deceived over a hundred visitors with that fox during the five years it had lain there. I could not help but admire his tall and well-knit frame, his piercing blue eyes, and general bearing. His specimens too, which I examined, were perfect works of art, and, as all know who have ever had a similar opportunity to study them, were the admiration and the envy of the taxidermists of those days, now long gone by.

Of all the taxidermical institutions, however, that this country has developed none can in any way compare with the natural science establishment of Prof. H. A. Ward, of Rochester, N. Y. Not only has Prof. Ward powerfully influenced for good the growth of the art in America, or we may truthfully say throughout the civilized world, but he has by inspiring others with his enthusiasm and energy built up a school of advanced taxidermists that are worthy emulators of his skill, and who have with marked ability passed the torch in many directions. There is not a museum in our land at all entitled to bear the name that is not in some way, whether directly or indirectly, indebted to him for improvements of all kinds in its taxidermic methods, and the proper modes of exhibiting materials illustrative of the kindred arts and sciences.

Mr. F. A. Lucas, who has done so much to develop the exhibiting of osteological subjects, and models and specimens of both vertebrates and invertebrates at the U. S. National Museum owes much of his success to his early training under Prof. Ward, and the art is not only under lasting obligations to him, but through his wise teaching it has been firmly and permanently placed in that quarter upon a safe and lasting basis. That Mr. Lucas appreciates "The scope and needs of taxidermy" in their truest sense no one can doubt who has ever read his article of that title in the Third Annual Report of the Society of American Taxidermists.

Mr. Frederic S. Webster is another of whose writings and productions the country has every reason to be proud, and the high standard of work so constantly put forth by that artist has always had a most beneficial effect upon the younger aspirants in the United States.

Attention of American and European students has also been drawn from the old-time museum models in taxidermy and directed to a closer

copying of nature through the far-reaching works of Dr. Elliott Cones, who has said, in his *Key to North American Birds*:

Faultless mounting [of birds] is an art really difficult, acquired by few; the average work done in this line shows something of caricature, ludicrous or repulsive, as the case may be. To copy nature faithfully by taxidermy requires not only long and close study, but an artistic sense; and this last is a rare gift. Unless you have at least the germs of the faculty in your composition, your taxidermical success will be incommensurate with the time and trouble you bestow. My own taxidermical art is of a low order, decidedly not above average. Although I have mounted a great many birds that would compare very favorably with ordinary museum work, few of them have entirely answered my ideas. A live bird is to me such a beautiful object that the slightest taxidermical flaw in the effort to represent it is painfully offensive. Perhaps this makes me place the standard of excellence too high for practical purposes (p. 40, 2d ed., 1884).

Powerful impulses of the best kind have often been instilled into the art through the patronage and guidance of those who have at different times in their careers been either directors of, or curators in, our larger museums. I speak especially in this country of the Smithsonian Institution and the National Museum.

Through the wise and ever-operative influence of our great Nestor of all the sciences zoölogical, Prof. Spencer F. Baird, he so directed the management of those institutions when under his administration that their workshops came to be the great drill ground for many of the most deserving who possessed the evidences of success in skillfully preserving all manner of objects illustrative of the various classes of the animal kingdom.

What has been the outcome of much of his wisdom we hope to portray, however faintly, in the following pages. Most ably has Prof. Baird's influence been fostered and furthered by the succeeding efforts along similar lines of those who are his successors in the administration of the Museum and who at the present time are doing so much to give actual shape and form to what before was simply in outline and crude beginnings. Where such influence tells the best is in the directing of the skilled efforts of the taxidermic artist in those cases where the latter, through lack of opportunity, fails to possess the requisite knowledge of the forms and habits of many of the world's rarer animals. Indeed, frequently some of the best group pieces of mounted mammals, birds, and others, have resulted from the combined knowledge and skill of the capable zoölogist on the one hand and the trained taxidermist upon the other. Not a few of such groups are to be found in the collections of the Government museums.

Very often it will be seen, then, in the future, I think, that fine, realistic groups of mounted animals will be produced that will be composites; in other words, will be the resultant of the combined labors of the biologist, the taxidermist, the modeler, and the designer and artist. Rarely will all these prerequisites be found in one man, though occasionally undoubtedly it will be so; then the museum which can claim his services will be very fortunate.

Among many others who have been more or less influential in insisting upon the highest standard for the art, in each and all of its branches, we must not forget the distinguished names of Joseph H. Batty, the author of a number of works upon practical taxidermy; C. J. Maynard, the well-known writer of the *The Naturalist's Guide*; Prof. J. W. P. Jenks, who, through a long and honorable career, has never ceased his efforts in not only doing much for taxidermy, but in the introduction of study series of animals in the public schools in New England and elsewhere; and a host of other worthy promoters.

At the National Museum, at Washington, in recent times, in addition to the fine group pieces of Hornaday and of Lucas, there has been some masterly work done in the taxidermic art by Mr. Joseph Palmer, and his son, Mr. William Palmer; also by Mr. Nelson R. Wood and Mr. Henry Denslow, the nature of which I have already noticed in a popular article published in *The Great Divide*, of Denver, Colo., for December, 1892, and which will be referred to again in the present connection.

From the opinions, then, of the European and American taxidermists as I have thus far quoted them, it is evident that the general development of the art shows at this time very marked improvement, and the tendency among its votaries is to raise it to the highest possible standard of excellence. With such a movement the writer is in the most hearty sympathy, and I am of the opinion that the day is not far distant when taxidermy will find its lawful place on the platform of the most highly cultivated of the arts. As a matter of fact it has every right in reason to stand side by side with painting and with sculpture, and its students need have no fears in claiming such a station for it.

To be a scientific taxidermist requires, or should require, in the first instance, a very thorough education, quite equal to that given by our best colleges. He should have a complete training in biology, with especial emphasis having been placed upon his studies in comparative morphology, so as to be familiar, as far as possible, with the vertebrate skeleton and topographical anatomy, to include more particularly the study of the superficial muscles of vertebrates. He should have such a conception of physics as to be able to decide upon the possible and the impossible in animal postures. In a way, he should be a good artist, be enabled to use the photographic camera, and make intelligent sketches of animals of all kinds and their natural haunts. He should be fully abreast of the times in all taxidermic technique *per se*, and possess fine mechanical skill.

As full a knowledge as can be attained of the habits of animals from personal observations should be added, as well as a constitutional desire to become familiar through current literature of all advances made from time to time in his art, and a healthy ambition to ever utilize them and improve upon the same.

So far as human ability is concerned, were I at this moment called

upon to decide as to the relative merits of the talent required to paint a life-size elephant, to sculpture one in stone, or to properly preserve one in a natural position and color so it would safely resist the ravages of time and all else that might injure it, I should not hesitate a moment in rendering an opinion, for I should say it lay with the scientific taxidermic artist. Mind you, when I do thus decide I have had in my lifetime, with specimens of smaller animals, experience with all. At the best, however, the difference is but of very small degree, and yet the taxidermist, in a way, should be master of both the art of the painter and the art of the sculptor, for frequently he has to use the brush with great fidelity to nature, and the time is fast coming on when he must be able to build up, in clay at least, the entire forms of the larger animals which he aims to preserve.

Next, it may be asked, Why a collegiate education? Simply because I believe a man in any calling is a better man in every way for having received the four years' training which a university gives him. And surely neither the taxidermist, nor the artist, nor the sculptor offer any exception to the rule. Moreover, everything that the skilled taxidermist would acquire in a college course would materially assist him in his profession in his subsequent career. Whatever may have been written, and whatever may have been said on the broad question of the college man versus the self-made man, it has been my experience that the kind of men that bring our country the most desirable recognition from other nations are those who have received a liberal education. A taxidermist should be a good general biologist, and he should pay especial attention to the habits of all animals in nature; the geographical ranges of fauna; breeding habits; the peculiar habits indulged in by various kinds of animals; their natural resorts during times of feeding, amusement, or conducting their young. Plants of all kinds should with scrupulous care be studied from the taxidermist's standpoint, as well as the localities where they grow, nature of surfaces of the ground, and all else presented on the part of field, ocean, stream, and forest. Nothing should escape his constant study of such matters, and, above all else, he should cultivate the faculty of patience. An impatient man, it may be safely said, can never attain to the highest position the art has in its power of giving him.

In comparative morphology, as I have said, he should devote a great deal of time to the skeleton and to topographical anatomy. The study of the skeleton is of the very highest importance, as without a knowledge of it there is no hope at all of a man being a perfect taxidermist in all its varied departments. Normal movements of the articulations and the *ligaments* that control them should receive most careful consideration, and no opportunity lost to study such matters scientifically upon all kinds of animal cadavers. Special drawings made by the taxidermist should record special points observed and worked out—the possibilities in normal movements and postures as exhibited by the

osseous system. In its entirety, however, this can not be fully appreciated without a full knowledge of the muscular system, for there are possible movements that the skeleton, when cleaned and dried, is capable of making, which, in life, become impossible from the operation of muscles and tendons. So myology must be systematically studied *pari passu* with the subject of skeletology, and with the aim constantly in view of acquiring a clear insight into the normal postures of animals.

This leads to the consideration of the question of correct form, and to acquire that requires prolonged research and study upon the entire subject of topographical anatomy. Muscles extended; muscles contracted; muscles at rest; contours formed by the normal deposit of adipose tissue; contours formed by parts of the skeleton that are merely subcutaneous; contours formed by the presence of glands of all kinds, of sesamoidal bones, cartilages, and every other structure that may in any way affect the normal contour of an animal. To this must be added the careful study of all external characters proper, as the hair and analogous parts, throughout the animal kingdom—the eyes and their surroundings, the nasal structures, the mouth of all vertebrates and invertebrates. Indeed, there is not a point properly falling within the range of topographical anatomy in its very widest sense that should be beneath the special notice of the taxidermist.

Colors of parts should also receive marked attention; and the taxidermist should keep a notebook devoted to that one branch alone. Never should an opportunity be lost to record by actual painted sketches the colors of every external anatomical character presented on the part of any animal whatsoever. Zoology itself would be far freer from gross errors of the color descriptions of animals were naturalists, as a rule, more careful in such matters. This is marked by the ease in ichthyology and in the naked skin-tracks of mammals and birds. We, then, are naturally led to the question of drawing and painting; and no one will doubt the necessity of a taxidermist being more or less proficient in all these branches. But none of them will be of any service to him unless the power be supplemented by the more important faculty of being a correct observer, and to be a correct observer is to see and appreciate things as they really exist. Taxidermists should have a knowledge of not only making correct sketches of all kinds of animals and their haunts and of plants and coloring them correctly, but they should be enabled to use such instruments as are demanded in making reduced drawings correctly from large subjects. Coloring in oil is also of great value in restoring the tints in some cases on the skins of preserved animals, and the student in this art should constantly aim to cultivate his sense of color appreciation and of the matching of all the various shades.

More or less pertinent to this question, Capt. Thomas Brown has said:*

* Taxidermist's Manual, pp. 3, 4.

A knowledge of drawing and modeling are also indispensable qualifications, to enable the stuffer to place his subject in a position both natural and striking. It is the too-frequent practice for the stuffer to set about preserving the animal without having determined in what attitude he is to place it, so that it will appear to most advantage and be in character with the ordinary habits of the creature. This he leaves to the last efforts of finishing his work, and, consequently, its proportions and character are likely to be devoid of all appearance of animation.

The first thing, therefore to be attended to in all great national natural history establishments is to choose young persons who are yet in their boyhood to be instructed in this art most important to science. Their studies should be commenced by deep attention to drawing, modeling, anatomy, chemistry, while they at the same time proceed with the practical part of their art. Every opportunity of examining the habits and actions of the living subject should be embraced and its attitudes and general aspect carefully noted. Without strict attention to these points, so manifestly obvious, the art of preserving animals never will attain that degree of perfection which its importance demands. On the other hand, if this art is pursued in the manner here recommended, artists may be produced who will fulfill the objects of their profession with honor to themselves and advantage to their country. Would any person expect to arrive at eminence as a sculptor if he were unacquainted with the established preliminaries of his art, namely, drawing and anatomy? The thing is so self-evident, that I am only surprised it has not long ago been acted upon. Upwards of twelve years have elapsed since I pointed out these facts to the professor of natural history in the University of Edinburgh, but things continue as they were before that time.

Since Capt. Brown wrote these words, and very true ones they are, another art and the accessories to it have enormously developed. I refer to the art of photography. Now, if there be one thing more useful to the scientific taxidermic artist than another it is a full practical knowledge of the use of the photographic camera and all that directly pertains thereto. Its application is most varied, and is greatly enhanced by the use of the time and instantaneous shutters. By the use of the camera the taxidermist can secure subjects that the unaided eye and pencil can never give him, and these are all kinds of animals in rapid motion, and they may be obtained, after a due amount of practice, by the use of the photographic camera. One has but to study the superb series of photographs obtained through the indefatigable Eadward Muybridge to appreciate my meaning here. No taxidermist who has any regard for an attainment of excellence in his calling should neglect to make good photographs of all the living animals that he can, and that upon every possible opportunity. This should not be confined to wild animals alone, but to all the domestic ones in their most common attitudes.

Horses, cows, dogs, cats, pigs, and all the barnyard fowls should by no means be beneath his notice. They should also be taken from many points of view, I might say from every possible point of view, and then be nearer what the taxidermist really needs in his work. He should carefully keep a series of large-sized and suitable scrapbooks wherein all his photographs should be carefully inserted, together with his sketches, and everything of the kind, with their full histories and notes,

etc., recorded upon opposite pages. Photographs should be made also of plants of all kinds directly in the places where they occur in nature; also the resorts of animals of every description; birds' nests; and, in short, every possible natural subject and creature and locality that the taxidermist may be called upon to reproduce in his workshop. He should also make photographs of dissections, the skeletons of animals, models, and designs, and of dead animals. Ever should it be prominently before his mind that one of the greatest of all taxidermical desiderata is the obtaining of good models of all kinds and descriptions, and models true to nature in every sense of the word. Frequently artists who are correct observers and portrayers of animals make fine illustrations of them, either in the form of colored or uncolored prints, and these the taxidermist should secure for his "note book" whenever he possibly can.

On this point Mr. Staebner has very truly remarked:*

It would seem almost superfluous to insist on the value, nay the absolute necessity, of good illustrations as aids to the taxidermists, were it not that the importance of the subject appears to be hardly yet fully appreciated by many of the very ones to be most benefited.

There was a time, now happily past, as the work exhibited by this association abundantly proves, when individuals who mounted birds and animals (as their cards set forth) were content to run a hide full of packing material, sew it up, and call the effigy by this or that name, according as this or that animal was desired. The degree of monstrosity, if it may be so termed, thus produced, was in inverse ratio to the care of the workman for his art and his knowledge (often scant enough) of the external appearance of the animal he was attempting to reproduce. These monstrosities of taxidermy are still to be seen in many of our public museums, where, let us hope, they at least serve the purpose of teaching the younger generation, how not to do it.

As in all other departments of human activity, so in this is the skilled workman plainly superseding the unskilled, and the class of work thus becoming more and more a source of pride and satisfaction. The man with a love for his art, necessarily something of a naturalist and with a naturalist's care, anxious about the correctness of all the details of his work, must utilize all the aids at his command, and of these aids accurate drawings and paintings occupy the chief place. These are the taxidermist's works of reference to which he goes for information precisely as another goes to his encyclopedia, since the ability is given to no man to carry all the minute points of an animal's external appearance in his mind. That the representations for this purpose should be what are strictly understood as works of art is obviously unnecessary.

The objects to be secured, however, and which they should possess to meet the requirements of the case are: (1) accuracy of outline; (2) truthfulness of attitude, and (3) in order of importance, correctness of coloring, and in so far as they conform to these things are they already, by just so much, works of art. What is technically known as artistic effect should here be a secondary consideration. Having secured the first three essential points, attention may be given to the last.

In the case of rare animals such representations as is well known are the sole reliance of the taxidermist. That they have a value even in the case of more familiar animals may be instanced by the case of the walrus. The pictures of this mammal

* Staebner, F. W.: Note on the value of animal illustrations to taxidermists. Third Ann. Rep. Society of American Taxidermists, 1882-'83, pp. 72-74.

in all the professed works on zoölogy and natural history, even in so good and generally correct a work as Brehm, are glaringly false, and it is only within the last few years that anything approaching truthful representations—figures drawn from observation instead of copies of previous drawings originally evolved from the artist's "inner consciousness"—have been given us, and so it happens that of mounted specimens of the walrus showing the true appearance of the animal almost the only ones at the present time are the one at Cambridge, and that other at the United States National Museum mounted by Mr. Hornaday.*

How often has a painstaking taxidermist wished for a means of refreshing his recollection on some little matter of detail concerning a creature's anatomy, and been obliged to finally guess at it because of the lack of adequate illustrations. Let me not be understood as deserving the assistance afforded by zoölogical gardens. It is just here that they come into play, and as it is better for the taxidermist to observe at first hand, so these are even better than drawings for reference; but the fact is they are far from being readily accessible at best in this country, and in the few instances in which this objection does not apply the variety of specimens which they contain is too limited, so that we are still compelled to supplement them by a more ready source of information, and thus we fall back upon pictorial representations as on the whole most convenient. As above implied, however, these representations must be taken from life by skillful hands, and must give us the animals as they look, and not as the artist thinks they ought to look.

But in order that we may have such we must encourage those who work in this line—the Landseers, the Baryes, the Wolfs, the Spechts, etc., whom, under a change of name, we have in this country in the Beards, the Kemeyses, etc. We must make it profitable for them to undertake the work we so much need, and if we have the good of taxidermy at heart, if we have faith in its capabilities as an art we will do this, for in so doing we are helping it and ourselves as well as them.

In *The Auk* for April, 1891, the present writer published a letter entitled "Camera notes for ornithologists," which, not being of very great length and quite in line with the views just quoted above, will, I think, bear repeating here, and enlarging upon a little further along. I said:

At the last congress of the American Ornithologists' Union there were exhibited many photographs of all sorts of ornithological subjects, and the majority of them were examined by the writer with great care.

For one, I was disappointed in the results arrived at by the authors of the most of them, as there appeared to be such a total absence of any practical result attained. Among the best that I saw were some taken by Dr. Edgar A. Mearns, but even those, the work of a most painstaking naturalist, did not come up to what the camera is capable of performing for practical ornithology. Little or nothing is to be gained in this latter direction by photographing bunches of game or badly mounted specimens and similar subjects. Any tyro can accomplish as much as that, and ornithology not be called upon to thank him for it.

In the present communication it is the writer's object to relate some personal experiences which may be of assistance to those interested in this line of work.

Now, in the first place, as to some of the objects to be attained: There are a number of these. We may desire, for example, a sharp, clear photograph, which either may be natural size or may present the subject reduced, for the use of the lithographer, in order to place in the latter's hands an accurate figure to be copied on to stone, and the plates printed therefrom to be used for illustrative purposes. The

* In this connection see the various figures of the walrus illustrating the present report, Plates LXXXV, LXXXVI.

subject may be a bird, its young, or its nest, or a dissection of a bird, or its skeleton, or its eggs, and so on indefinitely. Owls present to many artists difficult subjects to draw satisfactorily, but there is no reason why we should not, by the aid of the camera and a 5-by-8 plate, for a small sum, and in very short order, have ready for the lithographer a life-size figure, and a perfectly accurate one, of such a species as *Nyctala acadica*, or upon a similar plate a handsomely reduced figure of *Bubo virginianus*. Again, by varying our material, colored figures are easily obtained for like purposes. Photographs of this character may also be used to make wood cuts from, or they may be reproduced by some of the various styles of "process work." Yet another object: We may desire to produce by the aid of a camera an accurate figure of any of the above-mentioned subjects from which an electrotype can be directly made. This also is now easy of accomplishment, and such illustrations meet a vast variety of needs in descriptive ornithology. These, then, are some of the principal objects to be attained, viz, clear, accurate figures, either life size or reduced to any desired size, and either plain or colored, which (by the use of different materials) can be used at once by either the lithographer, the wood engraver, the "process worker," or the electrotyper.

Your material must be the best in all particulars. I use a large, first-class, quick-working lens; a Blain's camera for the 5 by 8 plate; the iron and oxalate developer, using the chemically pure material (filtered); bichloride of mercury and ammonia for intensifying, etc.

Our method of procedure can best be illustrated by a few examples. Say we wish to reproduce, life size, a hawk's egg. Suspend on the wall opposite and under the strong sunlight, a smooth, half-inch pine board; cover this with white blotting paper, held on with some half dozen artists' thumb tacks. Of course your egg is to be blown and not show the opening. Next you decide whether or no you desire it to throw a shadow; if you do, you simply fasten it to the blotting paper with a small piece of soft wax, exposing to the camera the side you wish represented; if you do not, you insert a piece of wire a few inches long into the board and perpendicular to it, and fasten the egg to the end of it with a soft piece of wax. Place a bucket of water on the floor under the egg, in case the specimen should accidentally drop off. Focus the egg natural size and sharp on the ground glass of your camera; this may be ascertained by a pair of calipers, comparing the actual length of the egg with its image upon the ground glass. Insert your smallest diaphragm and expose, the time of exposure being governed by your former experiences. I prefer Seed's dry plates. They give excellent results. After developing, unless you get a very strong negative it is always best to intensify your plate, and this is done by the usual mercury and ammonia process. Now, if you wish an uncolored figure to be lithographed, or woodcut, or for some of the special processes, you must print on the best ready sensitized albumen paper, toning the print handsomely afterwards. On the other hand, if you desire a colored figure, you must print on plain, *i. e.*, non-albumenized, sensitized paper, and afterwards color the print by hand with Newton's water-colors from the specimen. Pure white eggs stand out well when photographed against black velvet or crape; this also applies to some skulls and other osteological specimens, when they are cleaned to a state of glistening whiteness.

Such a procedure defines the outlines well for the engraver.

When we come to the photographing of birds, living birds, for the purpose of obtaining the proper kind of figures that can be used for the various methods of reproduction now in vogue, we enter upon a field where one can display no end of patience, tact, and ingenuity. It will be a long day before the writer will forget his experience in obtaining a photograph of a live screech owl. Three times I walked half a mile from the house where I could get a sky background for him on the summit of a hill, where an old natural stump was also to be found to serve as a perch for him. Just as good a result can be obtained by photographing your bird in your studio with a sheet for a background, and then you may choose any kind of

perch you desire, from a museum T to the limb of a rugged old pine with the cones and spines on.

Right here, however, I desire to mention a process, no doubt already known to many, for which there is no end of use. Say you have obtained a fine, intensified negative, the subject being a bird caught in the act of some habit peculiar to it. You wish to obtain a good, strong, accurate outline figure of it, from which an electrotype can at once be made, to serve as an illustration for some article upon which you may be engaged. Make a print from the plate upon plain, nonalbuminized, sensitized paper. Remove the print to the dark-room and wash out the silver from it thoroughly. You may tone, but it is not absolutely necessary unless there is very considerable detail in your figure. Dry the print in the dark, and keep in a perfectly dark place until evening. When evening comes complete your work under a good lamp where the direct rays do not fall upon your print. Pin this latter out on a small drawing-board with artists' thumb tacks, and then with a mapping-pen (No. 291, Gillott's) and Higgins' American drawing ink carefully ink over by lines and otherwise the outlines of your figure. In doing this you will have the opportunity of making it appear just as you desire your outline ink sketch to appear when it comes to be finally printed from the electrotype. Having carefully completed your work, immerse the print flat in a tray containing a saturated solution of bichloride of mercury. This in a moment takes out all of the print except the ink outline you have traced, and this latter it leaves upon a pure white sheet of paper. Next dry the print thoroughly and mount upon a suitable card. At a small cost, a good electrotype can be made from this figure. Photographing against a sheet, of course, takes out a great deal that you do not want in your reproduced figure, but by the process just described you need not have a single point or line more than you want. It works admirably where we wish to reduce the subject to any required size; in osteological subjects and in dissections; in deformities of birds; and indeed in dozens of other cases. To naturalists in general I would say that the process just described is absolutely invaluable; by its means ready and accurate sketches are made of characters of country; of all sorts of ethnological subjects, as pottery and native arts, sometimes so difficult to draw; of complicated skeletons; of living animals of all kinds, and thousands of other subjects too numerous for enumeration.

With some live birds the following plan will be found to work well: Suspend a shelf, at the proper height, from the wall of your studio and in the proper light. This shelf, as usual, is to be entirely covered with white blotting paper, and upon its horizontal part is to be firmly fixed the limb, trunk, or rock, or turf upon which you desire your specimen to appear. Set up your camera and focus this perch sharply on your ground-glass; next put in your smallest diaphragm and attach your "pneumatic shutter" ready for instant use. Gently take your living bird in your hand, smooth its feathers, caress it for a moment or two, then quietly place its head under its wing, and by beginning slowly soon rapidly whirl your specimen in a circle. This, as it were, "put it asleep," but it will seize the perch with its feet, or rest quietly on rock or turf. Place it as near as possible in the position you desire, and stand ready for a semi-instantaneous picture. Be perfectly quiet. In a few moments your bird gradually comes to, rights himself, preens up a little, looks around, steadies himself into a natural attitude, finally looks himself, and then more or less animated. This is your chance, puff the snap on him!

Upon reading this over I find few, if any, alterations to make, and since it was written I have succeeded in obtaining not a few good figures according to its directions, some of which are republished as illustrations in the present paper and will be described a little later. There is one thing, however, that needs notice, and in order to get a good electrotype or stereotype, it is not necessary to proceed as above

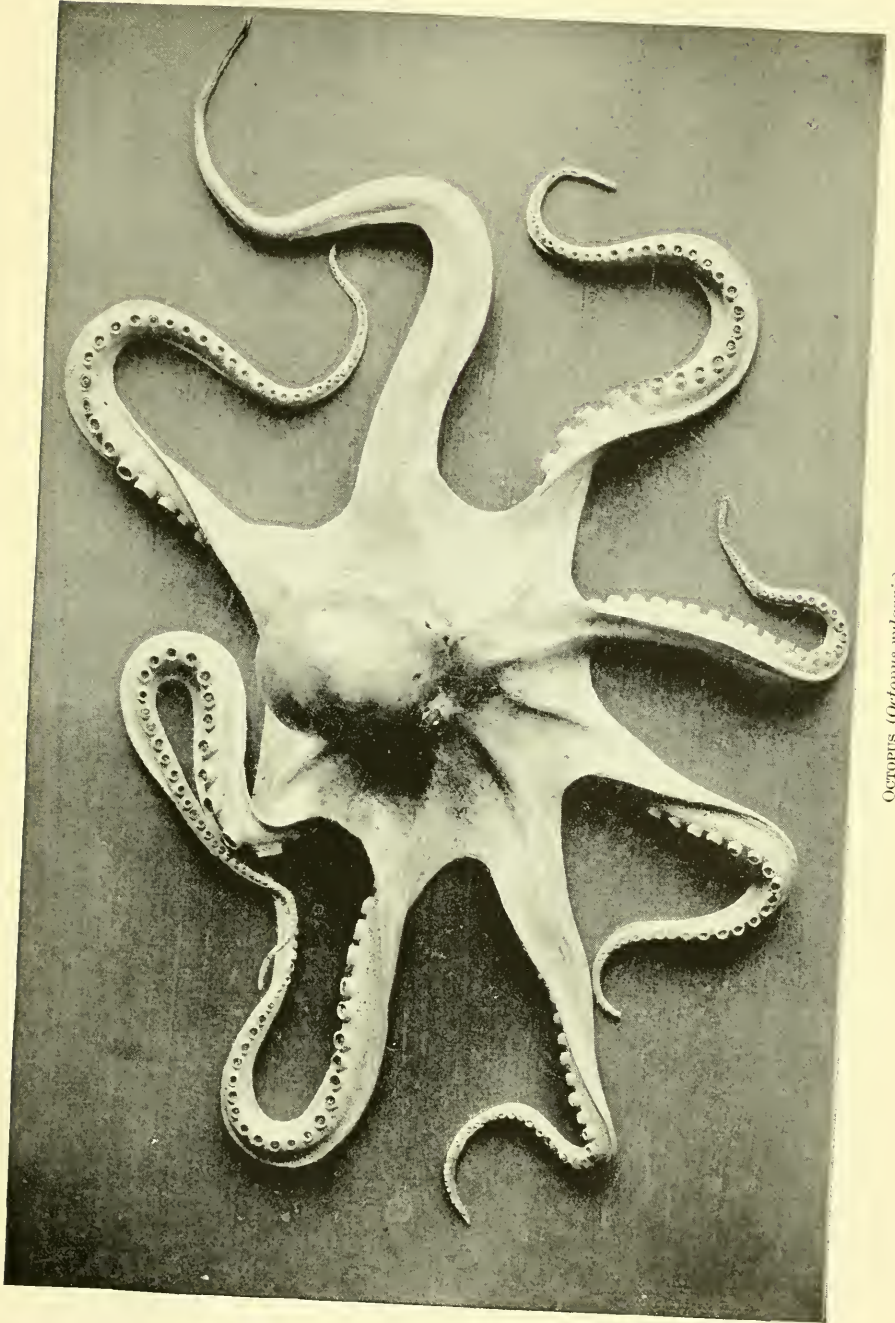
given, for we can simply make a blue print; that, as we know, can be done in a few moments, and is a finished picture, *i. e.*, does not require toning and fixing. Then trace what you desire to appear on your blue print as directed, and bleach out with a saturated solution of bicarbonate of potash. This gives you a black and white drawing of any finish, according to the labor you may desire to put upon it, and is the working drawing now so commonly used for newspaper cuts; but when printed upon the best paper, for the resulting electrotype or stereotype furnishes an excellent drawing for a variety of purposes, and a very useful one for the working naturalist and practical taxidermist.

Blotting paper in large sheets makes a far better background than a sheet, and you may use it pure white, or blue, or gray, according to the effect you desire to produce. Your subject should be well in front of the background, and, if possible, so far in front as to avoid a shadow being thrown upon it. Pictures thus taken out of doors, on clear, bright days, are generally excellent.

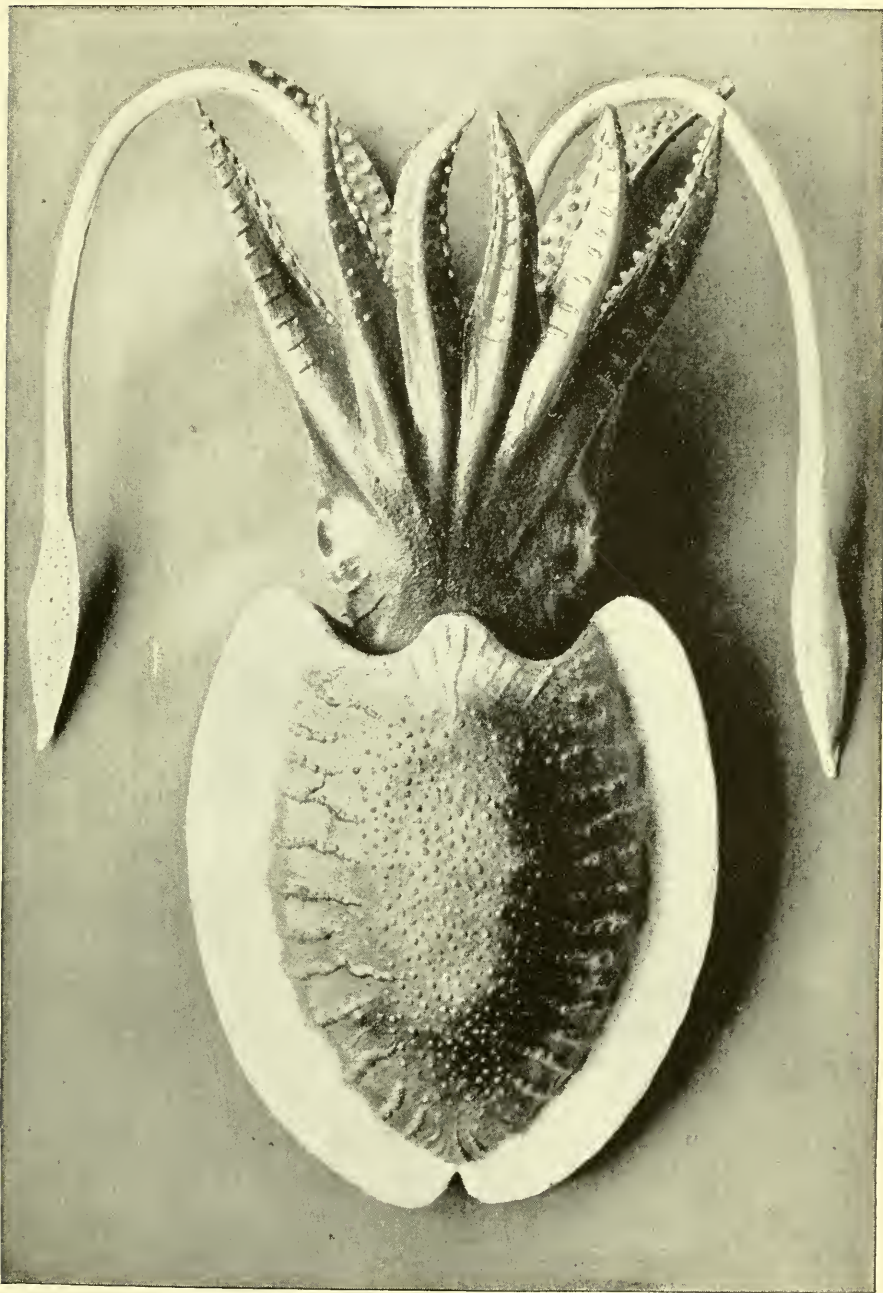
Returning now to the requirements of the skilled taxidermist, I have said, and Capt. Brown supports me in it, he should have such a knowledge of physics and chemistry as will assist him in the case of the first in deciding upon the possible and impossible in the matter of the attitudes of animals, and to some extent in the surroundings, as in the rock work, etc., now extensively used in reproducing large groups. With respect to chemistry he should be so much master of its general principles as to be enabled to practically apply it to the action and composition of preservatives for the preservation of every description of animal tissue. Not only that, but such a knowledge will be useful to him in experimenting with the preservation of many kinds of plant growths and kindred structures. For instance, I have recently been shown specimens of the leaves of some varieties of trees that had been gathered in nature and so perfectly restored that there was no very great depreciation in them, either of form or color, and the effect when properly done is most excellent.

Fruits are now frequently reproduced by the methods of the plastic cast, and are so perfect as to absolutely deceive the most critical of observers. The persimmons in the Raccoon Group in the National Museum were manufactured in that way, and it is by no means an easy task, aided by the eye alone, to distinguish them from the originals.

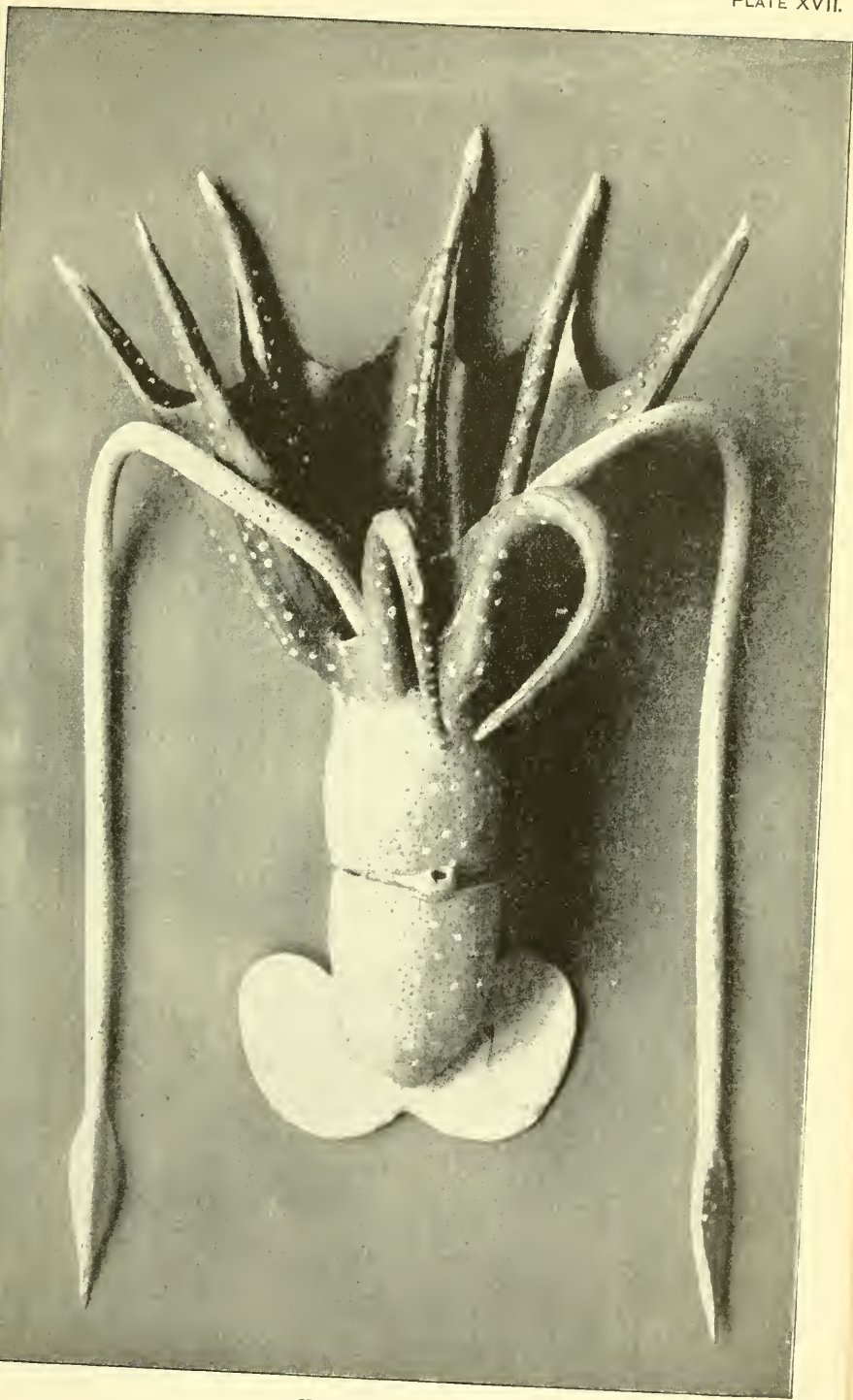
This brings us to the question of the various modes of modeling, and here is one of the branches of the taxidermic art, upon which too great an amount of skill and ingenuity can not well be expended. Here all the acquirements of the art student in taxidermy can be applied and nothing lost by the labor. It involves the application of all his knowledge of anatomy, his technique, his taste, and indeed, nearly everything which it has been recommended above for him to prepare himself in. He should be able to make casts of both vertebrates and invertebrates in plaster of Paris; he should be familiar with the various methods now



Octopus (Octopus vulgaris).
From a gelatine cast; reduced.



COMMON SQUID (*Sepia officinalis*, ♂).
From a gelatine cast; reduced.



HISTIOTEUTHIS BONELLIANA.
From a gelatine cast: reduced.

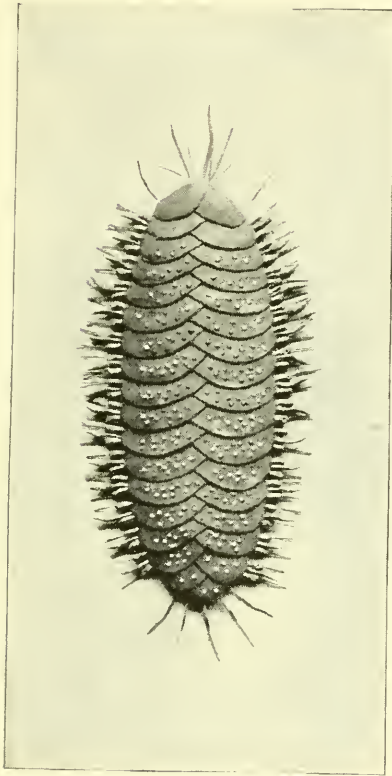


Fig. 1. *Polynoë leucohyba*.



Fig 2. *Gastrolepida clarigera*.

ANNELIDS.

From gelatine casts; somewhat enlarged.



A MARINE WORM (*Bonellia viridis*).
From a gelatine cast; greatly enlarged.

so generally in use, of the reproduction of many of the smaller animals in the different kinds of plastic material; he should be an adept in the use of clays, wax, wood, and other materials for the restoration of parts. In short, now that taxidermy is a rapidly progressing art, the advanced students and representatives of it, require, I think, no word from me here to stimulate them to keep abreast of the many improvements taking place in it. Among other things it should be the aim of taxidermists to establish in this country at least several good societies, where from time to time they could meet and exhibit the most recent successes in their art. Where papers could be read, and the work of individuals generally compared. Organization, in other words, I must believe, would at the present stage of the art's development, be a benefit.

The writer of this paper has ever been a strong advocate of the establishment of large, thoroughly equipped Government institutions of learning or universities, and of the nation's duty to educate in the best possible manner her aspirants in the different departments of science and art. What a national safeguard it would be in such a profession, for example, as medicine; what a source of stimulation to such an art as taxidermy? I weigh my words well, when I say that if such an institution could annually graduate in this country 50 thoroughly educated and skilled taxidermists, it would in time, far more heavily redound to our national credit than much else I could name which our Government indulges in. Apply it to all the arts and sciences, and we would command the respect of every nation of the globe, and, better than this, it would be that kind of respect which skill, knowledge, and culture always brings, and which brilliant display of warships, guns and warism can never inspire.

Let us pass next to the consideration of the question of some of the results now attained to by modern taxidermists in the preserving of animals for museum exhibition. Here we meet with at the very outstart, a phase of the art in which the workers at the U. S. National Museum have kept themselves fully abreast with the advances made in it. Recently some beautiful work has been turned out here, especially in the line of single specimens, as well as groups, of marine invertebrates for the World's Columbian Exposition at Chicago.

Take, for example, such an elegant reproduction of an Octopus as is shown in Plate XV (*O. vulgaris*). This triumph in the matter of an exact model, perfectly preserved, of a large soft invertebrate animal is accomplished through the use of the plaster mold, and gelatine cast, now so successfully brought to such perfection. Under the careful supervision of Mr. F. A. Lucas, whom I must thank here for the selection of the six specimens illustrating this department, the proper specimens are first picked out from the collection or are chosen from plates, and pass next in order to the most skilled modellers, casters, and colorers. Of the series I here present, Mr. A. H. Baldwin has made the

models after the drawings of various artists which will be hereinafter mentioned. After a model has been made, a mold is next taken, and from it a gelatine cast is secured which later is finally trimmed to life, and faithfully colored to nature. Mr. J. W. Scollick is responsible for the delicate manipulation required in securing accurate molds and castings from the models, and then they once more pass to Mr. Baldwin's hands to be colored. After this operation and when perfectly dry, they may either be tastefully mounted upon properly tinted pieces of small boards of a suitable kind of wood, dressed down to a right thickness, or they may play their part in a group, wherein all the natural surroundings of such creatures are reproduced, save the element in which they exist. This specimen of *Octopus vulgaris* was based on the figure given by Verany, as was also the models of *Sepia officinalis*, shown in Plate XVI and in one of *Histioteuthis bonelliana*, shown in Plate XVII, and so may be relied upon as being more or less true to nature.

Unless one has seen one of these finished gelatine casts of such an animal as an Octopus, it is hard to realize what a perfect representation it gives us of the living animal; and, the cast being perfectly pliable, much as is the best of good rubber, it still further enhances the resemblance to the original. But to produce this, requires skill and art of a very high order at nearly every step of the process. In the first place, if we are to model from a drawing, that drawing must be known to be accurate; if we model from a specimen, we must be sure about placing it in a posture that the animal is known to habitually assume. Great skill is next required in making a perfect model or copy of the design or specimen, and then it goes without saying that it is only through long experience and care that the necessary molds and casts are obtained. Much depends at last upon the ability of the artist to faithfully color the result of all the previous efforts; that is, the trimmed cast. Hornaday has said in his work on Taxidermy:

For irregular objects, the working of a gelatine mold is perfection itself. It yields gracefully in coming out of the undercuts and around corners, takes every detail perfectly, and in the jacket its shape is always the same. A careful operator can make from twenty to fifty copies of a cast in a single mold before its loss of sharpness necessitates its abandonment (p. 267).

Hornaday's brief chapter on the making of molds and casts in the volume just quoted is one of the most useful and valuable in the book.

In passing, I am tempted to say here that the Cuttlefishes to which this Octopus belongs are the most highly organized members of the class of animals constituting the *Cephalopoda*. As the *Malakia*, they were fully recognized by Aristotle over three hundred years before Christ. Of their distribution, Nicholson has said that—

They are all marine, active, rapacious, and carnivorous in their habits, swimming vigorously by means of the jets of water emitted from the funnel, or in an opposite direction by means of fins, and creeping about the sea bottom by means of the prehensile arms. Some forms (such as the *Octopodida* and *Sepia*) are essentially littoral animals,

frequenting shallow seas, living in the vicinity of the land, and specially affecting rocky bottoms. Others (such as *Tremoctopus*, *Sepiola*, *Argonauta*, *Spirula*, *Architeuthis*, *Onychoteuthis*, etc.) are pelagic animals, living in the open ocean, often far from land, and swimming at or near the surface. Though more varied as regards their specific and generic types in the warmer seas of the globe, cuttlefishes are found in almost all seas, and are sometimes extremely numerous individually even in the colder oceans. It seems also certain that our present knowledge as to the pelagic forms is only very imperfect. As to their dimensions, none are extremely minute, and some attain truly gigantic dimensions. Not to speak of the fabulous accounts of colossal cuttlefishes given by many of the older writers, such as Pouttoppidan and Olaus Magnus, we are now acquainted through the observations and descriptions of scientific witnesses, such as Banks and Solander, Quoy, and Gaimard, Steenstrup, Verrill, etc., with various huge cuttlefishes, inhabiting both the Atlantic and Pacific oceans. Some of these, though only known by imperfect specimens, certainly attain a length of 15 feet or upwards to the body and head, and from 30 to 40 feet or upwards in the long tentacles. All these giant cuttlefishes appear to belong to the suborder of the *Decapoda*.*

These gelatine casts are not only accurate and beautiful objects to be placed in the cases of any museum, but they, by being kept under the protection of glass doors, will last for almost an indefinite length of time, unaltered in color or form. The range of the applicability of the gelatine cast is well-nigh infinite. I have seen fish, frogs, serpents, lizards, and similar animals thus reproduced, and so perfectly that their faithful portrayal of the original subjects was truly marvelous. As to fruit of all kinds, it can be imitated so closely that sometimes, by the aid of the eye alone, one can not correctly decide between the original and the copy thus made.

For the presentation of form, color, and general character, such reproductions of animals as the common Squid, shown in Plate XVI, and the *Histioteuthis*, shown in Fig. 4, leaves but little to be desired along such lines. No one can for a moment doubt but what a great deal is to be hoped for from this department of animal preservation, and the encouragement of it is to be most highly recommended.

Other fine successes in this direction are shown in Plate XVIII, Fig. 1, Plate XVIII, Fig. 2, and Plate XIX. Plate XVIII, Fig. 1, of a specimen of *Polymoë leucohyba* (somewhat enlarged), and likewise the *Gastrolepidia clarigera*, shown in Plate XVIII, Fig. 2 (somewhat enlarged), are from Schmarada, both being very instructive representations of the originals. As is known, these low forms belong to the *Annelida*, each being genera in the order *Polychæta* of that group.

Another beautiful reproduction of an interesting annelid is shown in Plate XIX. This is also from a photograph of the gelatine cast in the collections of the U. S. National Museum and represents a specimen of *Bonellia viridis* of the Mediterranean Sea. It is greatly enlarged, and the model based upon the drawing given us of this form by Lacaze-Duthiers, who has rendered an account of this marine worm in a paper

* Nicholson, H. A. Art. "Cuttlefish." Encycl. Brit. 9th ed. vol. vi., pp. 739, 740.

entitled "Recherches sur La Bonella (*Bonellia viridis*)." (Ann. Scien. Nat., tom. x, Paris, 1858, pp. 49-110, Pls. 1-4.)

Such annelida as *Bonellia* represents belong to the order Gephyrea, and, according to W. C. McIntosh, "seem to approach the Echinoderms through the Holothuroidea." They are all marine types, being very widely distributed throughout nature, specially in muddy regions, some being frequently found in univalve shells.

By such representations as these, and by the judicious use of explanatory tables, surely the museum of the future has a fine field to look forward to, for such an art as this is capable of classifying in cases, according to natural taxonomical schemes, whole groups of animals, that heretofore have been studied only from the specimens and from plates and drawings. It also admits of similar casts, duly colored, of the anatomical structure of these little popularly known types, and, as I have already said above, of placing many of them in their cases surrounded by reproductions of the objects of their several environments in nature.

Passing next to the art of taxidermy as applied to crustaceans we are confronted with an entirely different problem than the one of which we have just been speaking. And, as the writer has had no personal experience of the kind, it is with no little pleasure that I find a brief but able article on this subject by my friend Mr. F. A. Lucas, and from it I here quote such parts as are in keeping with the present paper, by which I mean that the outstanding difficulties will be indicated while the technique of the art will be omitted.

Lucas has said:

Mounting of crabs, lobsters, and other crustaceans is somewhat of a thankless task, requiring an outlay of considerable time and trouble to arrive at results at all satisfactory. At first sight it would seem an easy matter to mount an animal whose form is determined beforehand, but a little trial develops the fact that, like bringing up children, it is much easier in theory than in practice. As crustaceans dry they become very brittle, and the small legs and delicate feelers break only too readily. Worse than all, the beautiful colors with which these creatures are adorned while living fade rapidly, and the only way in which they can be renewed is by a dextrous use of paint. Therefore the great requisites for mounting crustaceans are a careful touch, a good eye for colors, and some knowledge of the proper methods of applying them. The preparation of crustaceans is a little peculiar, inasmuch as, instead of the skin being removed from the body, the body is removed piecemeal from the skin. * * *

* * * Crustaceans may be mounted either on plain pedestals or on artificial rock work, according to the purpose they are to serve, and in any case they should be kept out of the dust as far as possible, since, owing to their fragile nature, they are very difficult to clean.*

* On the Mounting of Crustaceans. Third Annual Report of the Society of American Taxidermists, pp. 74-77, 1882-'83. As it is a fact quite as well known to every one interested in the matter as it is unfortunate, that The Society of American Taxidermists no longer has any existence, I will here make a bibliographical note of the two former reports of that society for the benefit of those who may desire to con-

In time we must believe that the plastic method as described above for invertebrates will come to be generally used for crustaceans as well. There is no reason that I can at present see that it should not, and every reason that it should. No specimens of the group preserved in that way have come to my attention in the collections of the National Museum or elsewhere, and so I have no plates of the same to offer here. Those prepared by the methods recommended by Mr. Lucas are so well done, and differ so little or not at all from those animals as they are recognized by us in nature, that nothing would be gained by reproducing photographs of them as illustrations to the present report; therefore the idea was not entertained.

This fact has also influenced in regard to insects; moreover, in the case with that group our Government has already published very full instructions upon their mounting and preservation for museum purposes, and that taxidermist who aspires to be a master of every department of his art can do no better than consult the admirable treatises of Prof. C. V. Riley, and of Prof. A. S. Packard, and others in the same field.

When we come to fishes, however, we at once enter upon the borderland of the taxidermy of the great realm of the vertebrata, and for it there exists a not inextensive literature, and methods and instructions are found almost without end.

Fishes seem to have constituted the *bête noir* of the museum collector and the taxidermist for ages past, and until the use of the gelatine cast came into vogue their natural preservation seemed almost hopeless. In alcohol many of them become shrunken, and a large percentage part with their natural colors entirely. Moreover, the usual cylindrical jars used to exhibit them in, on the museum shelves, so distort their forms to the eye of the casual observer who thus views them through the glass, that another serious disadvantage is added. To a large extent, this has recently been overcome by Mr. J. E. Benedict, of the National Museum, who, by indefatigable patience and thought, has devised very neat appearing glass receptacles, with plane surface sides, and a few ingenious devices for sustaining the contained specimens in more natural positions, thus largely doing away with the aforesaid disadvantage.

sult them in the future. I am indebted to Mr. Lucas for the loan of them, and they are works of no little interest. They are as follows:

First Annual Report | of the | Society | of | American Taxidermists. | — | March 24th, 1880, to March 25th, 1881. | — | Rochester, N. Y. | Daily Democrat and Chronicle Book and Job Print, 3 West Main st. | 1881. 8vo., pp. 36. 3 process plates.

Second Annual Report | of the | Society | of | American Taxidermists. | — | March 25th, 1881, to March 24th, 1882. | — | Compiled by the secretary. | — | Rochester, N. Y. | Judson J. Withall, Book and Job Printer, 39 N. Union street. | 1882. 8vo., pp. 56, with an announcement and index. 2 plates.

It is very much to be desired that this society should be reorganized, and that upon a basis of organization of some of our best societies in the arts or sciences. The need for such a society is great.

Still, where alcohol is the preservative used, there yet remain the loss of color and the distortion due to shrinkage. Many authors in the art of taxidermy have suggested in their works from time to time various plans for the skinning of fishes, and "stuffing" them much in the same way that birds and mammals are done. But as a rule, failure of greater or less degree is generally the outcome of all such attempts. I have studied collections of stuffed fishes in many parts of this country and elsewhere, and I yet have to meet with one in any museum or private collection, that comes up to what it ought to be. We turn from the cases of such objects with feelings of anything but a pleasurable nature. We hear a great deal said about the beauty of birds, and they are beautiful, but I, for one, see a beauty that is quite equal to it in the vast majority of fishes. Where has nature a lovelier object to offer for our admiration than a finely marked adult speckled trout just as the fellow is pulled out of his natural element and lies in the bright rays of the sun, panting upon a grassy bank? And, do we ever see anything that very much resembles his incomparable charms in our miserable dried-up collections of "stuffed" fishes? Hornaday has said:

Certain it is that in nearly every large zoölogical museum the stuffed fishes are the least attractive, and the least lifelike of all the vertebrates. In many instances the reptiles are not far behind in unsightliness, although, as a rule, they are a little more lifelike than the fishes. In only one natural history museum out of twenty-seven have I found a collection of stuffed fishes which surpassed in number and quality of specimens the collection of birds and mammals, and formed the most attractive feature of the entire museum. That fish collection is to be seen in the Government museum at Madras, India, and I have reason to believe it is at present the finest of its kind in existence. The collection consists of a very general assortment of specimens from the Indian Ocean, and particularly from the Coromandel coast, and besides a large number of small specimens it also contains as many large sharks, *Rhinobatida*, and rays as the authorities have been able to obtain without duplicating the species.

The specimens were all mounted while fresh from the ocean, which, of course, has been a great advantage to the taxidermist. I was somewhat surprised to learn that the taxidermist in question was an Indian native named P. Anthony Pillay, because East Indian natives of all classes are almost without exception very bad taxidermists. Upon being introduced to Mr. Pillay, an old Mohammedan gentleman with a long white beard, dressed in the style of his class, he very obligingly explained to me his method of mounting fish of all kinds.*

Personally, I have but little or no confidence in cultivating the art along on these lines, notwithstanding the measure of success attained to by the Indian taxidermist just mentioned. For all large zoölogical museums I believe that experimentation should proceed in the direction of discovering, if possible, some clear, transparent, preservative fluid that will not change the form or color of the specimens, and then exhibiting them in such positions as we would see them in aquaria and such tanks containing living fishes as are to be seen at the exhibi-

* Hornaday, W. T.: A New and Easy Method of Mounting Fish Medallions. Second Ann. Rept. Amer. Taxidermist, 1881-'82, p. 38.



SKATE (*Raia erinacea*)
From a plaster cast; greatly reduced. (Cat. No. 16508, U. S. N. M.)

tion room, the grottos, of the U. S. Fish Commission at Washington, D. C. Mr. Benedict, no doubt, has the correct idea in regard to the form of the receptacles that should contain them, and that is a very important step in advance. Added to this, the taxidermic artist has a beautiful field open to him in his method of making plaster casts and casts of gelatine, upon both of which he may exert his utmost powers and ability to color so as to have them resemble the natural fish as closely as possible, and I mean the natural fish immediately after he has been removed from the water and wiped dry. The study of the proper colors alone is in itself a vast subject, for they must not only counterpart the natural shades of the specimens, but they must be selected with the view to their permanency and general effect. Various methods of gilding and silvering upon plaster-of-Paris, gelatine casts, and papier-maché ones require careful research and consideration, as by their use many admirable results are to be obtained.

As to the large cartilaginous fishes, as the rays, sharks, and their kin, we must believe that the processes just referred to are at present the only ones known to us by which the living specimens can be reproduced with any marked fidelity to nature and fit for a first-class museum.

By the old fashion "stuffing" method, it seems quite out of the question, even for the most skilled taxidermists among us, to succeed in thus preserving a shark's skin, or that tissue in the troublesome ray. They will not resist the effects of time. They shrink, become distorted, and finally burst, and bring only failure and disrepute upon the art. One may as well try and stuff a soap bubble, and fortunately there is no necessity for either experiment.

In his usual vigorous style, the artist I have last quoted, remarks:

Rays are the meanest of all subjects that vex the soul of the taxidermist. Shun them as you would the smallpox or the devil. Such abominable animated pancakes, with razor edges that taper out to infinite nothingness, were never made to be mounted by any process known to mortal man. To mount the skin of a vile ray, and make it really perfect and lifelike, is to invite infinite shrinkage, rips, tears, warps, defeat, and humiliation at the hands of your envious rivals. If you must mount a ray, by all means get square with it at the start. Stuff his miserable old skin with tow or straw, the more the better. Ram him, cram him, "full to the very jaws," like the famous rattlesnake skin that taxidermist Miles Standish stuffed "with powder and bullets." If you can burst him wide open from head to tail, by all means do so, and you may call me your slave for the rest of my life. Make him nice and round, like a balloon, and then no matter what he does afterward to mortify and disgrace you, and to drag your fair standard in the dust, you will always have the satisfaction of knowing you are square with him.

Once when I was young and innocent, I encountered an enormous ray. He was not thrust upon me, for I achieved him—and my own ruin also—at one fell stroke. I mounted him willingly, nay, eagerly, as Phaeton mounted his chariot, to show the rest of the world how all rays should be done. I mounted his vast, expansive skin over a clay-covered manikin that had edges like a Damascus razor, and I made him flat. He was flat enough to navigate the Platte River at low water, which even a thick shingle can not do. He was lifelike and likewise was a great triumph. But almost the moment my back was turned upon him forever, he went back upon me.

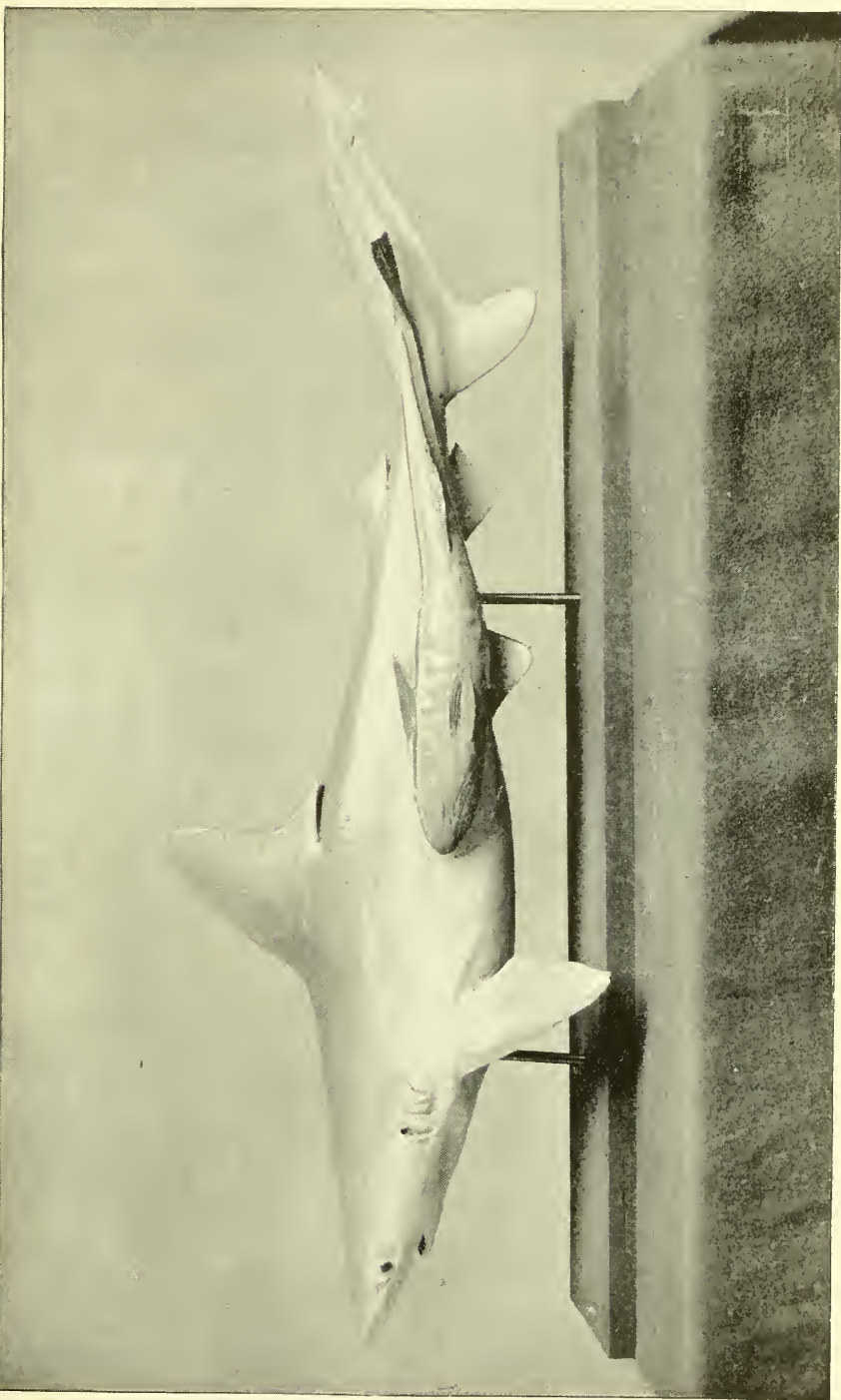
I had put him up to stay put, so far as my part was concerned, so he just got mad and literally tore himself to tatters. He became almost a total wreck, and to make my defeat a more genuine and unmitigated crusher, Prof. Ward sent word to me, all the way from Washington, that he would sell me that large ray for \$5. I never forgave him for that.

The best way to mount a ray is to make a nice plaster cast of it, paint it, and then bury the accursed ray in a compost heap. As a class these fishes are remarkable, and highly interesting, and there is a far greater variety of them than anyone who is not an ichthyologist might suppose. To me there is no other group of fishes more interesting, and, I may add, there is no other group that is, as a general thing, so poorly represented in museum collections. They exhibit all possible intermediate forms between the ordinary shark and the perfectly round, flat ray. The intermediate forms, *Rhinobati* and *Rhamphobatis*, are naturally really the most interesting.*

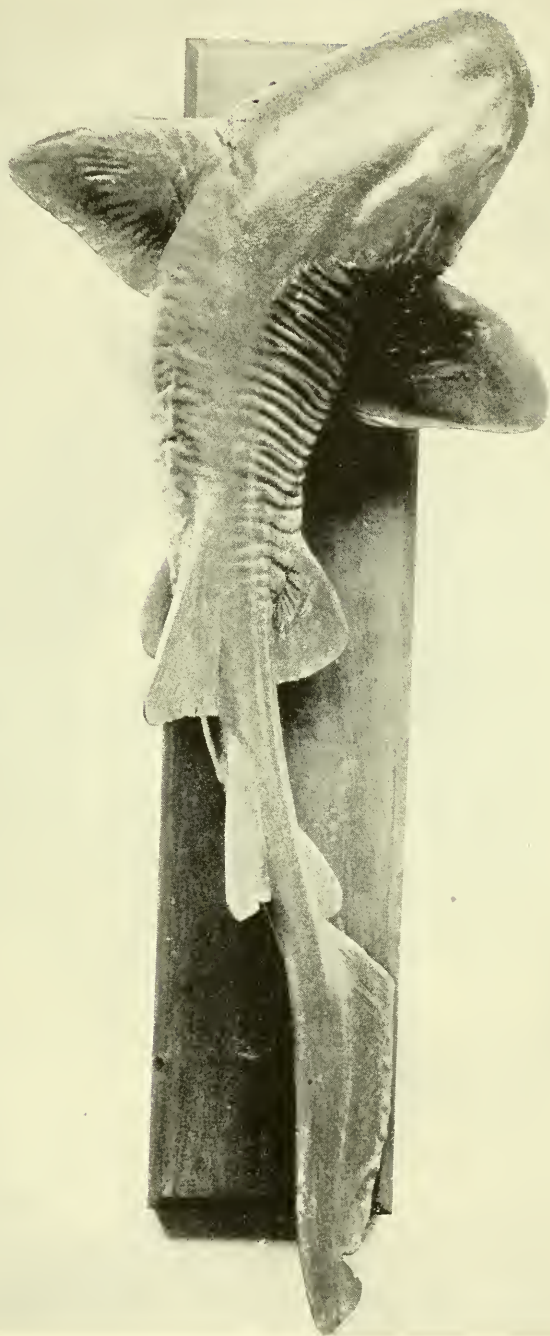
Some very fine plaster-of-Paris casts of fishes of all kinds are to be found in the collections of the U. S. National Museum, but as has just been remarked, for some reason or other the rays are but meagerly represented. These fishes, however, cast beautifully in plaster, and their colors are not difficult to imitate. It would be hard, for example, to find a more fitting specimen for museum exhibition than the plaster cast of the skate shown in Plate XX of the present paper. The plastic method also reproduces them with even greater fidelity, and it has the advantage of not being near so easily injured or broken. So perfect are these two methods that I will warrant that were we to take the living skate, the gelatine and plaster casts, make photographs of them all of the same scale and under the same conditions as the one seen in my plate, we could only with the greatest difficulty distinguish among them.

Not only is it possible to reproduce life-like representations of living fishes by means of the plaster-of-Paris cast, but to a certain degree we can also, by the same means, show some of the habits of this interesting group of vertebrates. A fine example of this is seen in Plate XXI of this report, wherein we are presented with a most excellent cast of a shark (*Carcharhinus obscurus*) to whose left side has attached itself a Remora (*Echeneis naucrates*), a habit this parasitic fish is habitually addicted to, as is well-known. This fine piece of work, done by Mr. Joseph Palmer, of the museum, has been colored very closely to imitate life, and is not only a most interesting and instructive object to have on exhibition in any zoölogical museum, but leaves but little to be desired in the matter of conveying a correct idea of the form and general appearance of these fishes, and in a method at once practical and, with care, enduring. The mode of mounting such specimens is also seen in the figures in the plates, and it probably can not very well be improved upon, consisting as it does of two strong metal upright standards of the proper length, and which are embedded below in the horizontal base or stand of wood. This latter may be either plain pine, painted black and heavily varnished, or it may be of any of the dark, hard

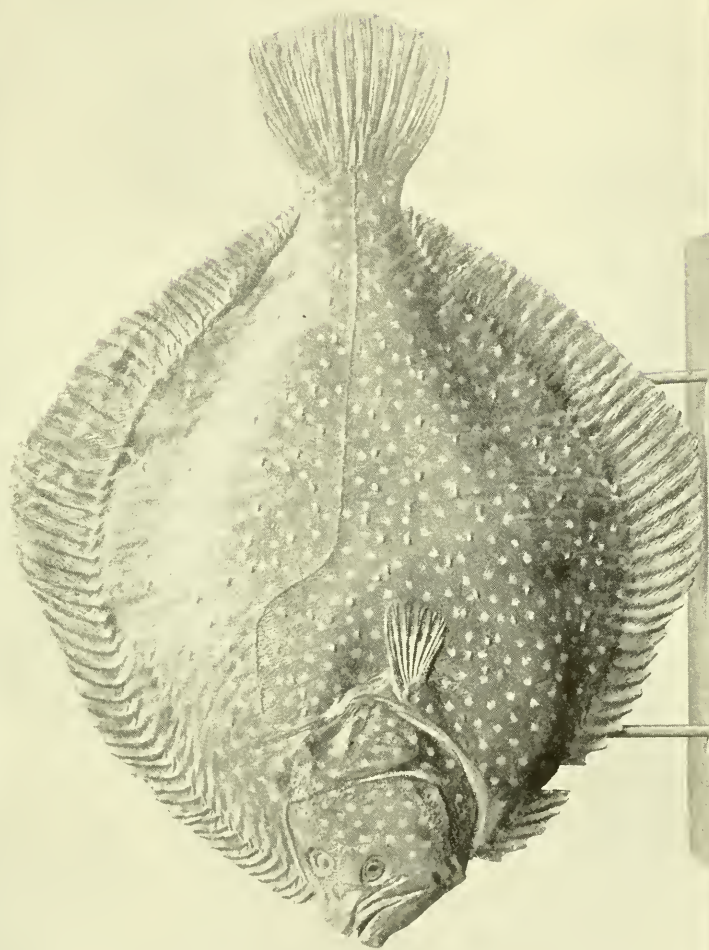
* Taxidermy, pp. 215, 216.



SHARK (*Carcharias obscurus*) AND REMORA (*Echeneis naucrates*).
From a plaster cast; greatly reduced. (Cat. No. 16670, U. S. N. M.)



NURSE SHARK (*Ginglymostoma cirratum*).
From a plaster cast: greatly reduced. (Cat. No. 16909, U. S. N. M.)



TURBOT (*Rhombus marinus*).
From a plaster cast.

woods highly polished. In any event the aim should be to have it all of a pattern and kind throughout the museum for subjects of one class, as these fishes. It admits placing the label adopted by the museum in front and in the center below, which may be attached in various ways, or simply fastened to an obliquely cut block of wood, finished in the same style as the base, and left to rest free upon it. It is important that the base should be as long, or nearly as long, as the specimen it supports, for that not only lends an appearance of good balance and symmetry to the whole, but it also is a great safeguard against the cast being accidentally tipped over and broken, or broken by the specimen projecting out beyond it too far, and so not properly protecting it.

The Remora shown in Plate XXI is at once recognized by the black stripes down its side and the white corners to the caudal fin. It seems to attach itself principally to the sharks, thus differing with its congener of the ocean (*Remora squalipeta*) so frequently found adhering to the sides and bottoms of ships at sea, well below their water line.

Another fine cast of a shark (*Ginglymostoma cirratum*) also in plaster, is seen in Plate XXII, and viewed upon superior aspect. This not only gives an absolutely correct idea of the animal it was taken from, but shows very well the peculiar lateral corrugations of the skin, so characteristic of this and other species.

Of the Teleosteans I am enabled to present in my plates quite a number of interesting and well-known forms, and if the methods of casting in plaster-of-Paris and plastic compounds be so successful in the case of the cartilaginous fishes, it requires nothing to be said that it is equally applicable to them.

All of the casts of the specimens here offered are from the collections of the National Museum, and the perfect manner in which they are done is well exemplified in the specimen of the turbot shown in Plate XXIII (*Rhombus maximus*). Most, if not all of them, were executed by Mr. Joseph Palmer with the assistance of his son, Mr. William Palmer, under the supervision and direction of some ichthyologist of the museum's staff, and skillfully colored by Mr. A. Z. Shindler. Among the principal points to be looked to in making such casts is (1) the selection of as perfect specimens as possible, especially in the matter of unmutilated parts, as fins and tail, and structures of the head; (2) the parts should be exhibited in a natural manner or properly spread out; (3) the cast so made as to exhibit special characters; it should be colored true to nature in a way already indicated; and, (5) finally, they should be well mounted, labeled, and exhibited in a closed glass case.

Later on we shall see that fish do not require in these matters quite as much knowledge, care, and study as do the reptiles; still they require a good deal, and it should invariably be bestowed upon them.

More or less uniformly colored, and comparatively smooth fishes, show up fully as well as those with many salient characters, and this

is well seen in such an example as the common Pompano (*Trachynotus carolinus*) of Plate XXIV, Fig. 2, which gives a most complete idea of this interesting species. In most of these specimens the ventral fins, it will be seen, have, before casting, been brought up so as to be in contact with the body of the fish. This is done with the view of giving them the support of the latter and thus greatly decreasing the danger of having them broken off either through subsequent handling of the cast or otherwise.

Plaster casts of fishes also admit, in some cases only, of having the proper kinds of glass eyes inserted in them after the cast is made; or some special structures added, as the barbels of certain species, or spines of great delicacy, or hair-like appendages—these structures being composed of some other material than plaster, and being painted and made to naturally harmonize with the specimen as in life. This is rarely, if ever, necessary in the case of those fishes cast in gelatine or similar plastic compounds. This feature of the work admits of no little skill and knowledge on the part of the caster and painter of these vertebrates. Nothing should in any event be omitted that will lend a true and life-like appearance of the original specimen, and very encouraging progress is being made along such lines.

Another excellent plaster cast of a fish is seen in Plate XXV; taken from a specimen of the Mirror carp (*Cyprinus carpio*), a fish with an interesting history in this country now, and which, among other characters, is at once recognized by having "extraordinarily large scales which run along the sides of the body in three or four rows, the rest of the body being bare."

A fine cast is also shown in Plate XXV, fig. 2, it being the Buffalo fish (*Iliobus urus*).

It is needless almost to invite attention here once more to the fact of how well these casts here represent the forms as they appear in life. The red fish or bass of the Southern States (*Sciæna ocellata*) has also been cast, and a fine example of it exists in the collections of the Museum. Where a fish has strong and pronounced external characters, such as large scales, large projecting rays to the tail or fins, and marked characters of mouth or operculum, they are sure to constitute one of the most favorable varieties of fish to cast in plaster, and they, when skillfully painted, make some of the most striking specimens among a collection of such objects. This may be appreciated by an examination of the cast of the Parrot fish (*Scarus* sp.?), shown in Plate XXIV, or to nearly an equal extent in the one of the Trigger fish (*Balistes caprisens*), a specimen of which is to be found in the Museum's collections; and as for the reproduction of color markings, we see a good example in the cast of the well-known Mud fish (*Amia calva*), to which Plate XXVI, Fig. 2, of this paper is devoted.

We have already alluded to the use of the plastic method of casting for fishes, and so far as my personal investigations have been directed

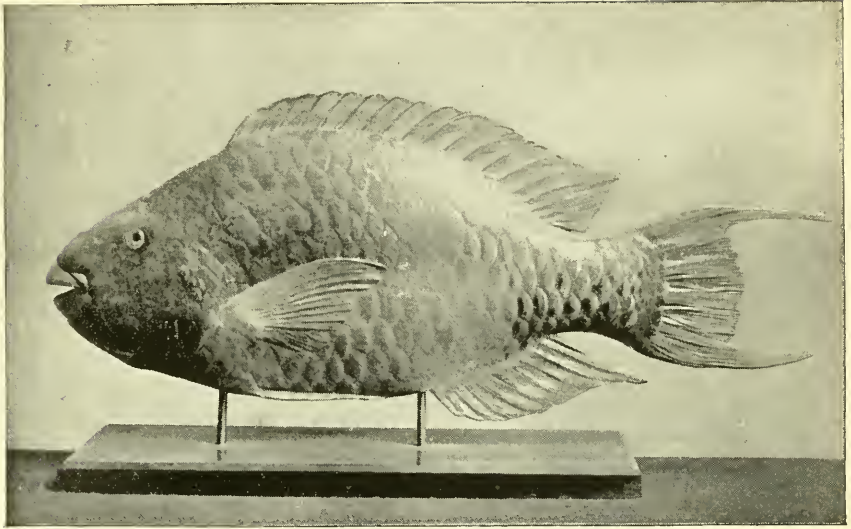


Fig. 1. PARROT-FISH (*Scarus* sp. ?).
From a plaster cast.

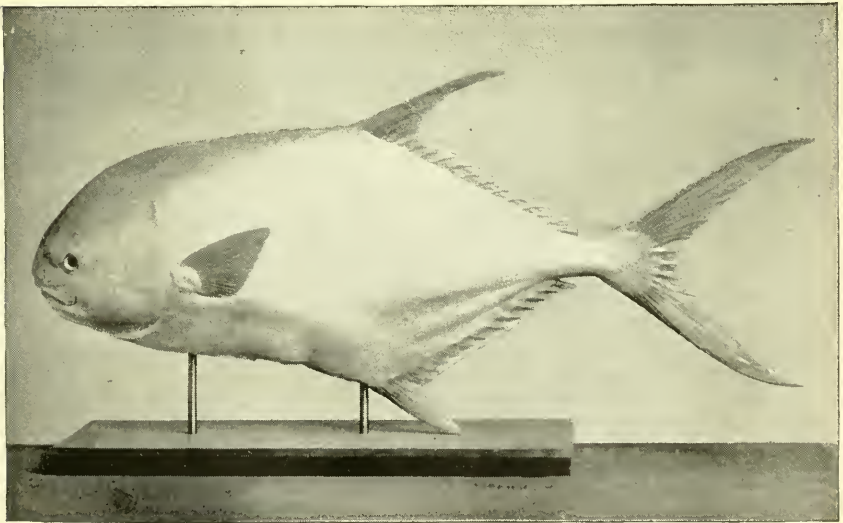


Fig. 2. COMMON POMPANO (*Trachymotus carolinus*).
From a plaster cast. (Cat. No. 23351, U. S. N. M.)

they have been concerned principally with the work of that nature done by the U. S. Fish Commission, much of which was accomplished with the view of having it exhibited at the World's Columbian Exposition. In this connection my thanks are due Dr. Tarleton H. Bean for the use of a series of photographs of the results of such methods and other processes. These, unfortunately, with the single exception of the Opah, were taken too small to be used here, and as the originals had been forwarded to Chicago, it was too late to have them photographed of a larger size. My thanks are also due to Mr. Denton for his kindness in showing me his method of reproducing specimens of fish and reptiles by the plastic method from casts made in plaster, and for submitting to me for examination specimens of his work after they had been painted and prepared for final exhibition. It would be difficult to overestimate the value of this kind of work, and the field is a broad one, full of importance and interest to the art student in taxidermy.

Specimens of many species of fish made according to such processes bear very close resemblance to the living types, so much so that photographs of the two are scarcely to be distinguished. This may best be appreciated by an examination of the specimen in the U. S. Fish Commission, or the reduced photograph which that institution has of the plastic cast of the Opah, from a specimen taken upon our own coasts. Its peculiar form and high coloring rendered it a specially fine subject for the skill of the person who reproduced it. Ichthyologists have always expressed great interest in this member of the finny kingdom, and if the digression be not considered too great, I will quote here what Mr. Goode has said of it in *The Fishery Industries of the United States* (p. 335). According to this distinguished authority, the Opah family, or the *Lamprididae*, "is represented in the Atlantic by a single species, *Lampris guttatus*, a pelagic fish, which appears to be more abundant in the deep waters of northern seas than elsewhere. It has been observed at many points upon the Norwegian coast, about Iceland and Madeira, as well as in the Mediterranean, but is of unusual occurrence everywhere, except perhaps about Madeira. On the coast of England it is one of the great rarities, and is much sought for by collectors on account of its beauty. It is said to be one of the most brilliantly colored fishes known—'red and green, with tints of purple and gold dotted over with silvery round spots. Iris of the eye is scarlet, and fins of lively red.' A specimen was obtained years ago near Sable Island, Nova Scotia, and the species will doubtless be found still nearer our shores. It is said that no young specimens have yet been seen. The species attains the length of 4 feet and more, and is said to be very excellent eating."

Everything that has been said above in regard to the various methods employed in times past, as well as at present, for the preservation of fishes for exhibition in zoölogical museums and elsewhere applies with equal truth to reptiles. The day has apparently fully arrived when

the advanced student of taxidermy will no more think of employing the old time-honored methods of stuffing a frog or a snake or a tortoise than he would of mummifying a bird—a practice that was formerly recommended, it is said, to avoid the apparent difficulty of removing the skin. Of all the effigies, I think, in the forms of bad taxidermy that have figured in such nightmares I have suffered from, or in my waking dreams, the various stuffed snakes I have seen certainly take the palm. They have been enough to frighten clean out of existence one laboring under an attack of *mania a potu*, as well as the reptiles one claims to see upon such an occasion. It is almost impossible to remove the skin from any kind of an ordinary snake without disastrously disturbing its delicate scales and their beautiful arrangement. And, as for the “stuffing” of frogs, why that may be left to those lovers of the “grotesque in taxidermy,” for surely such feats have no place in a scientific museum, and it has always been a wonder to me how they ever could claim even a smile from a thorough naturalist, let alone words of praise.

My meaning in these premises will be made perfectly clear by turning to Plate XXIX, Fig. 2, which is from an excellent photograph of a specimen of Gould's monitor (*Monitor gouldi*) now in the collections of the U. S. National Museum.* This favored representative of the taxidermy of a past decade, formed a part of the South Australian exhibit sent to the Centennial Exhibition, at Philadelphia, in 1876, and subsequently, presented to the Institution, where it now is. To the enlightened taxidermist my saying it is a stuffed lizard would be all sufficient, but I fain would invite attention to the absolutely impossible attitude it has been compelled to assume. It is nailed to the base with coarse pins, whose heads show on the top of every individual foot. The hind feet are rammed to a bursting point—the forefeet are empty. To save length of stand the tail has been forced round to the side, and the toes are alternately pointing to the four quarters of the globe. We do not pass favorably upon that kind of work any more, and the only interest it has for me is the stage it represents in the growth and development of the art of taxidermy, though it is a comfort to know that the day for such ridiculous productions is rapidly passing into history.

By whatever method done, the casting of most reptiles has one great advantage over the casting of most fishes—an advantage to the extent of exercising a greater skill and knowledge on the part of the operator, for it must be easy for one to realize that to make a plaster mold of a flounder and a plaster mold of a frog are two very different matters. The first, beyond a spreading of tail and fins, requires but little arrangement, whereas in the case of the second I have met with many a person who could not for the life of him place a dead frog in a natural attitude, to say nothing of making one ready and obtaining a plaster mold of it. Lizards are sometimes still worse. It is now, then, that we come to a point where good photographs, good

* Catalogue No. 8896.

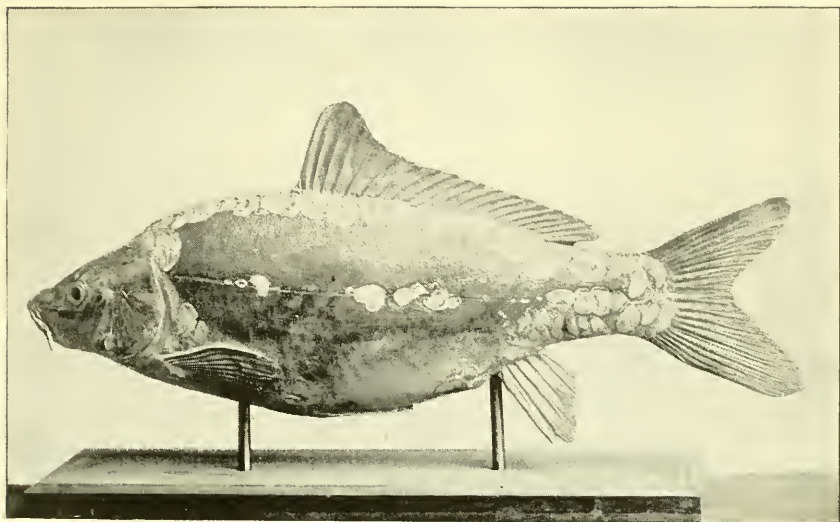


Fig. 1. MIRROR CARP (*Cyprinus carpio*).
From a plaster cast; greatly reduced. (Cat. No. 25257, U. S. N. M.)

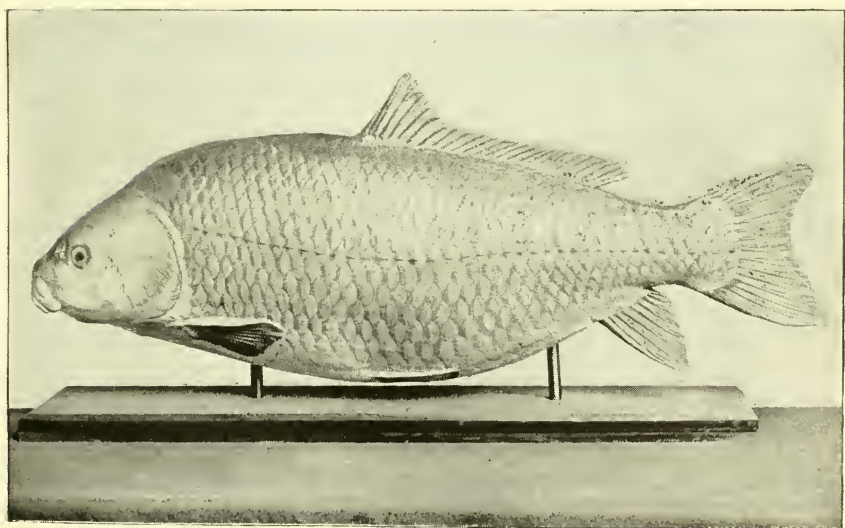
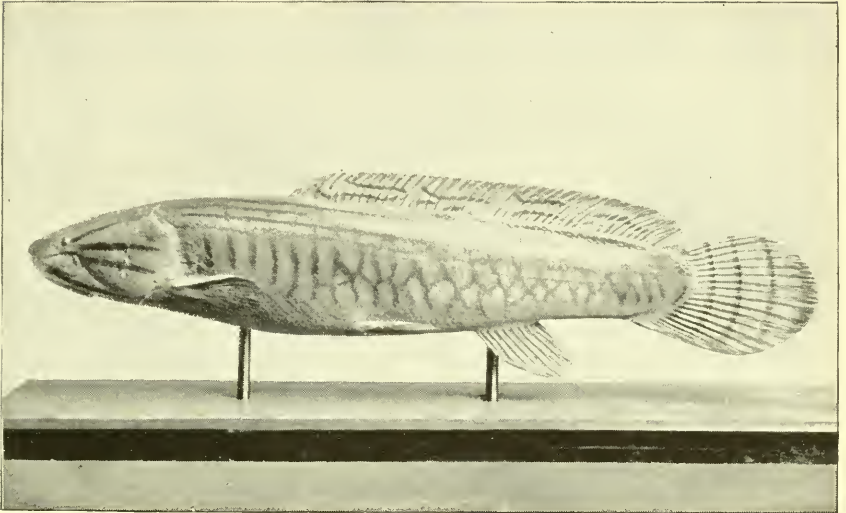


Fig. 2. BUFFALO-FISH (*Ictiobus urus*).
From a plaster cast; greatly reduced. (Cat. No. 23558, U. S. N. M.)



THE MUD-FISH (*Amia calva*).
Plaster cast. (Cat. No. 20776, U. S. N. M.)

models, and good illustrations in the vertebrate series really first come into play. It is only the exception among fishes that such necessary adjuncts elsewhere will be found useful. One would hardly think of looking for a model to make a cast of a "Needle Gar," for instance; he might in the case of such a form as the Goosefish (*Lophius piscatorius*); whereas in the case of an attacking Cobra, or some of the winged or frilled lizards models would soon be in demand, or at least very much more so. Snakes form no exception to these remarks, for the attitudes assumed by them in nature are not only various in the extreme, but in some cases downright peculiar. And, in good groups of reptiles peculiar characters and habits should be exhibited by showing them or exhibiting them by a duplication of the species composing the group. The blowing viper (*Heterodon*) should not only be preserved and shown with expanded and flattened fore parts, but at a state of rest likewise. Take another example in the little lizard *Anolis*, the American chameleon; we would by no means gain a full idea of its form and appearance from one specimen, colored bright pea-green, and the flaming red ornament at the throat retracted; but we should have a group of at least four or five of them, showing all such remarkable characters, as well as the various tints it may assume when it exerts its chameleonic powers. With many lizards and with many snakes this is not always necessary, and with them one good, faithfully colored cast will be quite sufficient.

Of course, the very large reptiles, as large Iguanas, Alligators, and even such large snakes as Anacondas and Pythons, admit of being skillfully mounted by the manufacture of bodies made of tow—that is, a manakin, with internal wire supports and a final clay covering; but, as I have said, it would appear that the time has come when all small reptiles will no longer be so preserved, and the tendency to cast them is on the increase. An ingenious method of preserving small reptiles in alcohol is resorted to by Mr. Samuel Garman at the Museum of Comparative Zoölogy at Harvard College, but I have never had the personal opportunity of investigating it, though the fact that so able an herpetologist recommends it as is Mr. Garman is enough to say that it possesses its merits for museum purposes. He claims that by its means he "can give the specimens life-like attitudes, or arrange them in groups, as if playing, courting, or fighting; and the liquid heightens their beauty, as the water does that of the pebble at the seashore, while ravages of insects are entirely out of the question."

The larger Chelonia, as the Hawksbill, the Green turtle, the Leatherback, and the Loggerhead, can also be mounted by the processes usually recommended by the best taxidermists and successfully, and Mr. Lucas has pointed out an admirable way for mounting the smaller turtles,*

* Lucas, F. A.: On the mounting of turtles. Third Ann. Rep. Soc. Amer. Taxidermists, 1882-'83, pp. 84-90, 2 figs.

but even this does not convince me but what such mounts will finally be superseded by the plastic methods and subsequent artistic painting. I speak especially for the large scientific institutions where a full series of alcoholics can be maintained in alcohol, and the exhibition series are intended simply to faithfully present the external characters and appearances of the specimens.

The National Museum possesses at least one very elegantly preserved crocodile. Mounted much in the manner pointed out above, it has been placed in an attitude of rest, with very simple surroundings, but made the more interesting from the fact that the taxidermist has placed upon its back one or two specimens of that small Black-headed Plover (*Charadrius melanocephalus*), which in nature may often be seen perched there, attracted as it is by the insects which occur in numbers upon that part of the huge reptile.

Here we not only get a fine and naturally preserved specimen of an important and widely known animal, but we likewise have represented in the most striking manner one of the most engaging chapters in its history.

In alluding to groups of reptiles, Hornaday, after all his long experience, has said that—

I know of but one good group of reptiles, and that is a group of turtles which was prepared by Mr. F. A. Lucas, and displayed at the exhibition of the S. A. T. in New York in 1883, where it received a medal, and afterwards was presented by him to the National Museum. This altogether unique and pretty group teaches one very important lesson, viz, that even the most commonplace animals are interesting when they are well mounted and grouped with a setting which represents their natural haunts. Some of the specimens in this group are represented above water, and some beneath it, while one enterprising individual is caught in the act of diving, with half of his body under water and the other half out. The situation represents the successful accomplishment of a very neat mechanical feat and is of itself an illustration of the possibilities in such matters.*

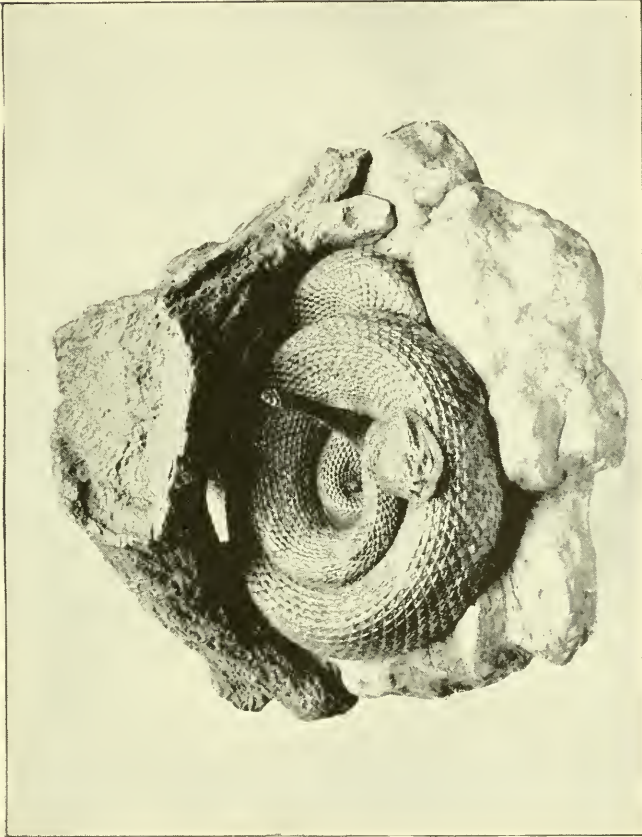
But progress of the most substantial nature, thanks to Mr. Goode, is now being made along such lines in his collections of the U. S. National Museum, and I believe that in a very few years hence the exhibition series of this institution will stand among the very finest in the world. The consummate skill of the Palmers, Mr. Lucas, and a large trained staff of many others of the first ability in designing, painting, and casting, is sure to make it so. Dr. Stejneger has been kind enough to place at my disposition a number of the casts of his department (Reptiles), for which and other courtesies my thanks are here tendered him.

With regard to the attitudes assumed by snakes, we may say that they are exceedingly numerous and many of them very interesting to behold. To secure figures of these for the use of modelers and casters we have a host of fine illustrations throughout the literature of reptiles, but I am more and more inclined to believe that a work devoted to a carefully prepared series of photographs of snakes taken directly in

* Taxidermy, pp. 249, 250.



COMMON GARTER SNAKE (*Eutania sirtalis*).
From a photograph of a living specimen by the author.



RATTLESAKE (*Crotalus adamanensis*).
From a plaster cast; greatly reduced. (Cat. No. 9501, U. S. N. M.)

their natural haunts is in reality what is now most in demand. At zoölogical gardens, at least here at Washington, they are usually kept in wire cages, often huddled together, and rarely assume the animated attitudes most natural to them, and so, even if photographs could be obtained of them there, they would hardly meet the end in view. That they are easily obtained in nature I have recently demonstrated in one instance for illustration in the present connection, though I am confident with just a little more practice in that way the results can be made all that is to be desired. About a month ago on my premises I secured a good-sized Garter snake, uninjured in the least degree, and at once placed him in a large glass jar. Immediately I cut out, on the bank of a stream on my place, a suitable piece of ground, with plants growing on it, for my "base." This I placed out of doors on a large box about the height of my camera, and for a background behind it I placed a large sheet of common white blotting paper. My snake was then removed from his jar and placed on the base. By tapping him on the head he at once threw himself in the position I secured him in in the photograph, of which Plate XXVII is a good copy.

Now, this operation altogether took less than an hour, and a fairly good figure was the result. But it may be accomplished very easily in another way; for all we have to do is to "go afield" armed with our camera and a necessary number of plates, and a thin board covered with white blotting paper for our background, to be used for cutting off superfluous foliage, etc. On meeting with a snake, or indeed any small animal, he may in 50 per cent of the cases be obtained by the methods above indicated. Recently I have even succeeded in getting them on the ground by placing the camera right down in front of them, putting up my background, then assuming a prone position myself, focused and got my figure.

Such a photograph of the Helodermas was obtained by me in New Mexico. The specimens represented in it were my own; they were healthy and vigorous, and had been disporting themselves in the sun, when, becoming tired, they sought the shade of some plants, and as they assumed positions of rest I there photographed them.

All the figures of snakes given in the present report are from plaster-of-Paris casts in the collections of the National Museum. They were all made, I believe, by Mr. Joseph Palmer, and most naturally colored. They are wonderfully fine things, and a credit to any museum in existence. But what is still more to the point they faithfully represent the originals, and that is what we want. Not only are these snakes in plaster, but so are the tasteful bases of rock, etc., upon which they have been placed. Take, for example, the rattlesnake shown in cast 950. With tail elevated, and the reptile thrown into natural coils, partly within the recess of the spreading roots of a large tree, we have an accomplishment in plaster the equal of which for that particular snake I do not believe to be extant.

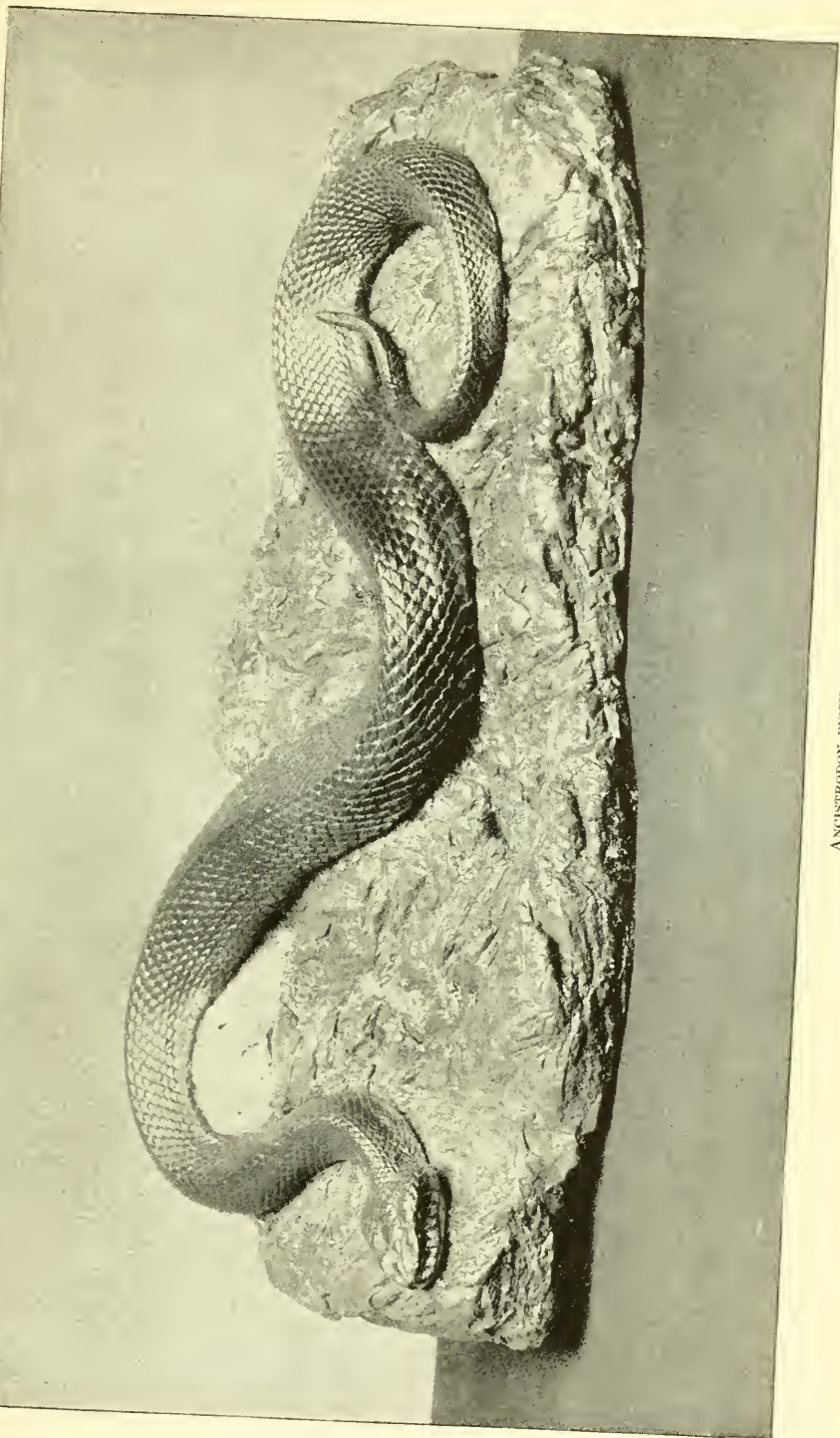
Quite as good is the young *Ancistrodon* in the collection, for here, too, the snake is partly within a recess and fully the anterior fourth of the animal free.

Errors can sometimes occur, however, even in apparently such a simple procedure as properly coiling up a snake for a plaster cast, and as fine a work of art as it is in other respects, I am inclined to think that in nature a snake never so abruptly bends the neck as close to the head as has been done for the one in Plate XXX. A dead snake may be placed in a great many postures which in nature it never assumes, and these dead attitudes must be guarded against; and it is just here where the results of good photographs of snakes in nature come in most advantageously.

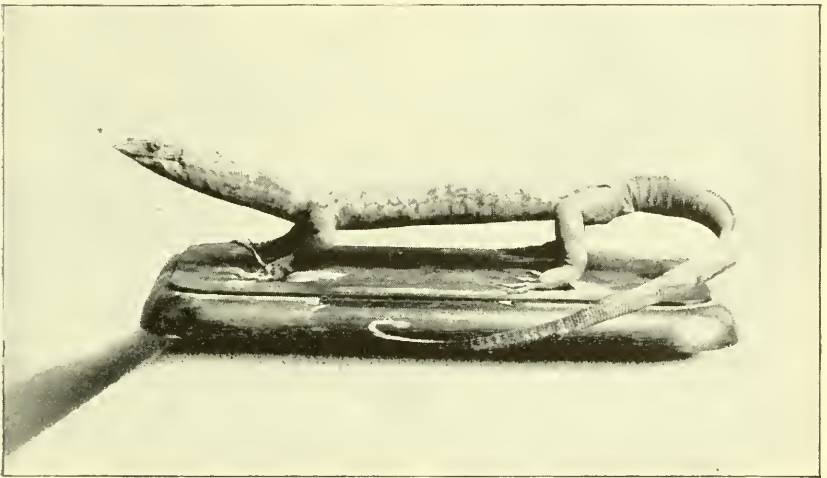
In the coloring of snakes and other reptiles we should rely solely upon specimens that are alive, and taken as subjects if possible just after the "shed." It is almost needless to add that a cast should only be painted from the snake from which the cast was made, and not another specimen of the same species. Frogs, for some reason or other, are not always well drawn and colored, and, as I have before remarked, some of the most abominable stuffed specimens and casts of them are in existence. Those in some of our museums bear no closer resemblance to the original animal than a camel does to a chestnut burr. They are simply horrid. This is often the case, too, in many departments of decorative art. Even our Indians, who occasionally make pretty good hits, crude as they are, at pictorial decoration with some of the animals they happen to be most familiar with, miss it when they try the frog. Attempts made by the Japanese in such matters are often very much better than the results turned out by the brushes and implements of our own artists and designers. There is one very life-like plaster-of-Paris cast, colored, of this Batrachian in the collections of the National Museum, and it is reproduced in Plate XXXI of the present paper. It shows the animal in one of its most common poses, and may well serve as a model for anyone who desires to copy it for any purpose whatsoever.

Some grand results in the matter of the casting of turtles, both large and small ones, have been accomplished in the workshops of the Museum. These are either in plaster-of-Paris like all the specimens here figured, or in some few cases the natural shell of the animal has been retained, and the exposed external parts, as head, legs, and tail, cast in the usual plastic material used, and subsequently fitted to the former. When cast in plaster-of-Paris, they of course have to be painted, as in the case of all animals so reproduced. When photographed, these tints do not show, and consequently my figures, with the partial exception of the box tortoise (*Cistudo*), exhibit only the form of the specimen.

Especial attention is invited to the beautiful cast of *Aspidonectes* Plate XXXII, which is not more than one-sixth the linear length of the

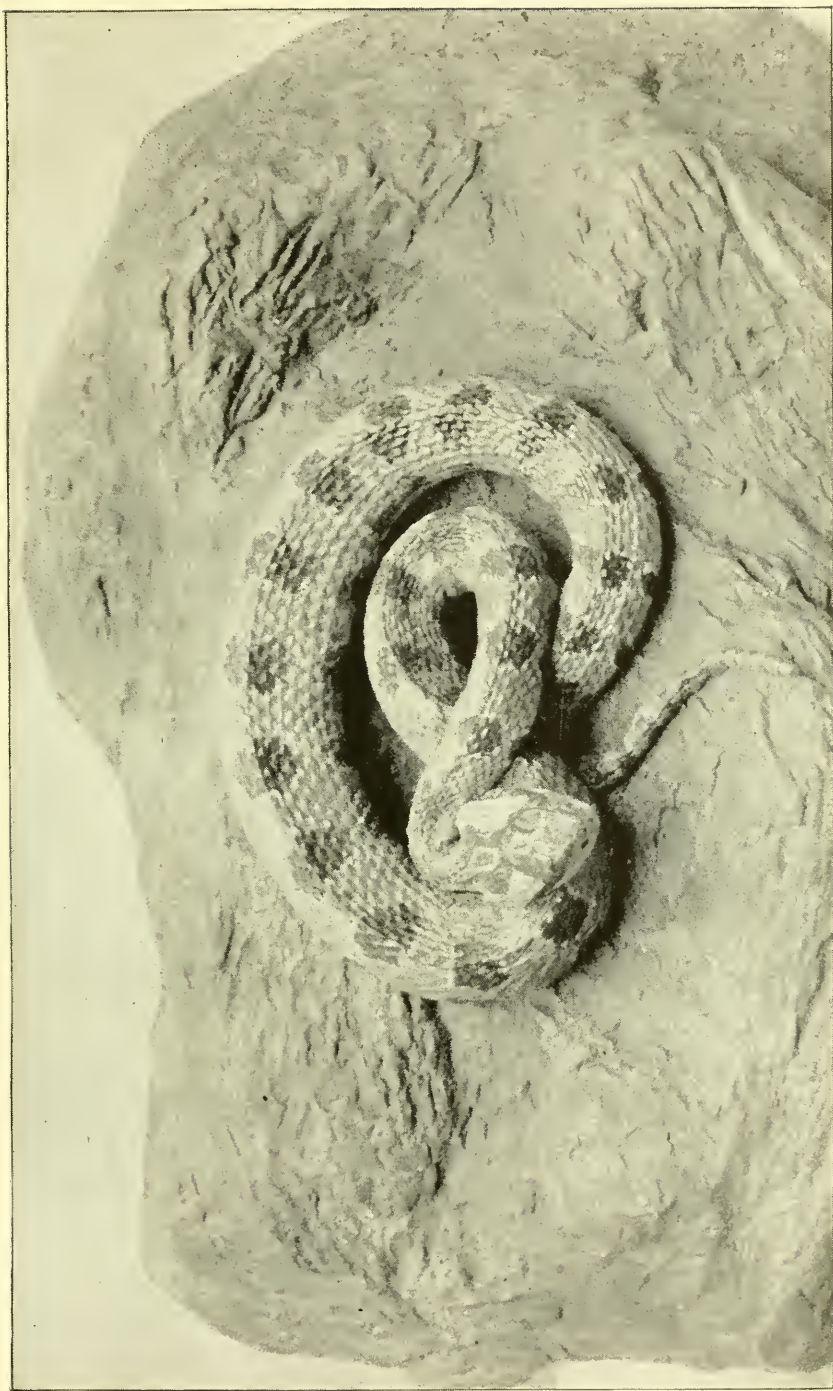


ANCISTRODON PISCIVORUS.
Plaster cast; greatly reduced. (Cat. No. 10488, U. S. N. M.)



MONITOR GOULDI.

Stuffed specimen; old style, faulty mounting. (Cat. No. 8896, U. S. N. M.)



SISTRURUS MILIARIUS.
From a plaster cast; greatly reduced. (Cat. No. 5006, U. S. N. M.)



BULL FROG.
From a plaster cast; reduced.

original. So far as external form is concerned it simply stands as good as the original, as offering to the naturalists of all ages an absolutely correct idea of this interesting chelonian. Lizards are more difficult to cast than are turtles, as in many of their details of external structure they are more delicately formed, and, upon the whole, I do not think an equal success has been attained at the Museum in the plaster casting of saurians as has in the case of the chelonians. Nevertheless the plaster casts of some of the larger lizards leave us nothing to be desired in that art. A truly magnificent thing is seen in the plaster cast of *Tupinambis* (Plate XXXV). It would seem to be perfect in every particular, and by all odds is the finest result of the kind that I have ever had the pleasure of examining.

Just here this is all I have to say in regard to the preservation of reptiles for museum exhibition, but the subject, in a general way, will be reverted to again before closing this paper.

We next pass to a consideration of the preservation of birds. Upon entering this department, after passing fish and reptiles in review, we seem almost to come into entirely new fields. Zoologically birds are not one bit more important than either fishes or reptiles, but from a popular standpoint they have probably received, as every biologist knows, fully fifty times the attention. Ornithological literature, taken by and large, is a hundred fold more voluminous than that of the two other groups just mentioned put together. Thousands of birds have been preserved by one method or another (not including alcoholics), to *one* fish. When one alludes to the art of taxidermy in the presence of the laity the idea that first comes up is, that the taxidermy of birds only is intended; mammals are far less frequently thought of by such people; and fish and reptiles rarely or never. Plates, figures, drawings, and illustrations of this group are far more numerous; and, notwithstanding my sincere efforts to equalize the illustrations for the various departments in this paper, somehow or other the plates of birds constitute nearly one-half of them. Many taxidermists devote themselves to birds alone, and it is only those in this country who are really finished adepts in the art that can skillfully handle the preservation of any kind of an animal whatever, birds included.

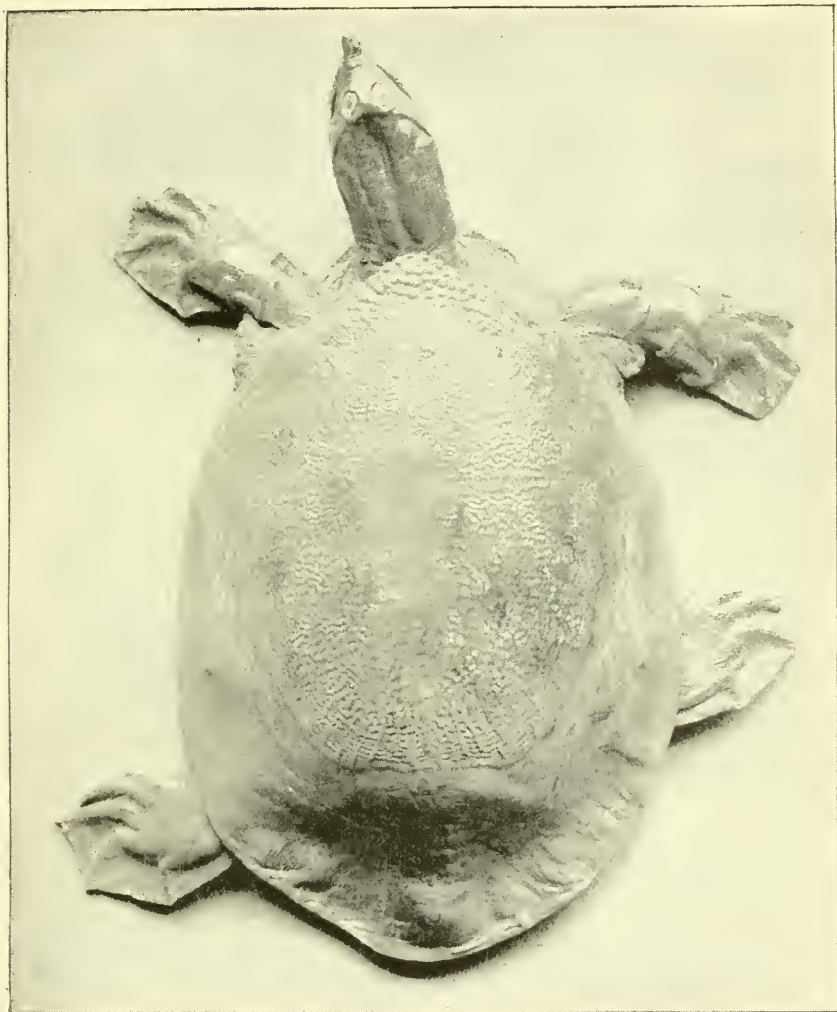
Taking all this into consideration, one would naturally think that that department of taxidermy had made far greater progress than any other; but I hasten to say this is by no means the case. If we take the collections of such an institution as the National Museum for example, we find upon examination that there is quite as much bad taxidermy among birds as there is among mammals, and when it is bad it is very bad. On the other hand, from the host of "terrifics" that still linger in the cases of the ornithological department there has been growing out of it of recent years a most satisfactory and most encouraging progress. Both individual specimens as well as groups of birds are now being produced which bear every evidence of the highest accomplishments

attained to by taxidermists anywhere in the world. There are two great reasons for this: First, taxidermy itself has only recently been raised from the plane of mere cheap jobbery to the place it long ago should have occupied—that is, to a school of living art; and, second, the selection from that school for employment in the Museum of at least a representation.

Everything I have thus far said in the foregoing pages in the matter of models, of grouping, and, indeed, of reproducing nature in the Museum with respect to fishes and reptiles, applies with equal force to birds. With regard to the photography of birds in their native haunts and elsewhere, for the purpose of securing models as guides to natural attitudes of this class of vertebrates for the taxidermic artist, it would seem to be far more important here than with either reptiles or fish. This is so from the fact that in the case with the last two the specimens are now most frequently cast, while, as we well know, with birds it is different; they being skinned, the artist must have a model to go by for the restoration of form.

Where models are not followed, especially in those cases where the taxidermist may never have seen the bird either alive or even a good figure of it, the most pitiable results follow. This is well seen in Pl. XXXVI, showing two king penguins—birds of the same species. The taller of the two was mounted by one of the old school-men taxidermists years ago, and it is so bad that I consider it quite beyond the pale of criticism. The second and more upright bird, recently done at the Museum, although in some particulars not everything it should be, is such an advance upon the first, that comparison becomes quite unnecessary. Bad mounting of the kind just referred to is still more disastrous when it has been done in the case of a bird of great rarity, and consequently of almost priceless value. This was unfortunately the case in regard to the specimen of the Great Auk (*Plautus impennis*) owned by the National Museum. A figure of this as first mounted by some ancient bungler is shown on Pl. XXXVII, Fig. 1. No living auk in good health ever stood in that position; but thanks to what art can sometimes accomplish in these days, this outraged bird was not destined for all eternity to stand as a drum-major at dress parade.

It was determined to have it remounted; an operation, owing to the age of the specimen and a lack of knowledge as to what condition the skin might be in, that required a full measure of judgment relative to what taxidermy could hope for in such premises. The work of remodeling was accomplished by Mr. Wood, of the National Museum, and the result is shown in Plate XXXVII, Fig. 2, and this now probably extinct fowl, one of the treasures of the department, presents a far more respectable appearance, and is certainly posed in a far more natural attitude, though judging from Audubon's plate of it, I believe it still to be not a posture this auk was wont to assume. Still, it was most assuredly the

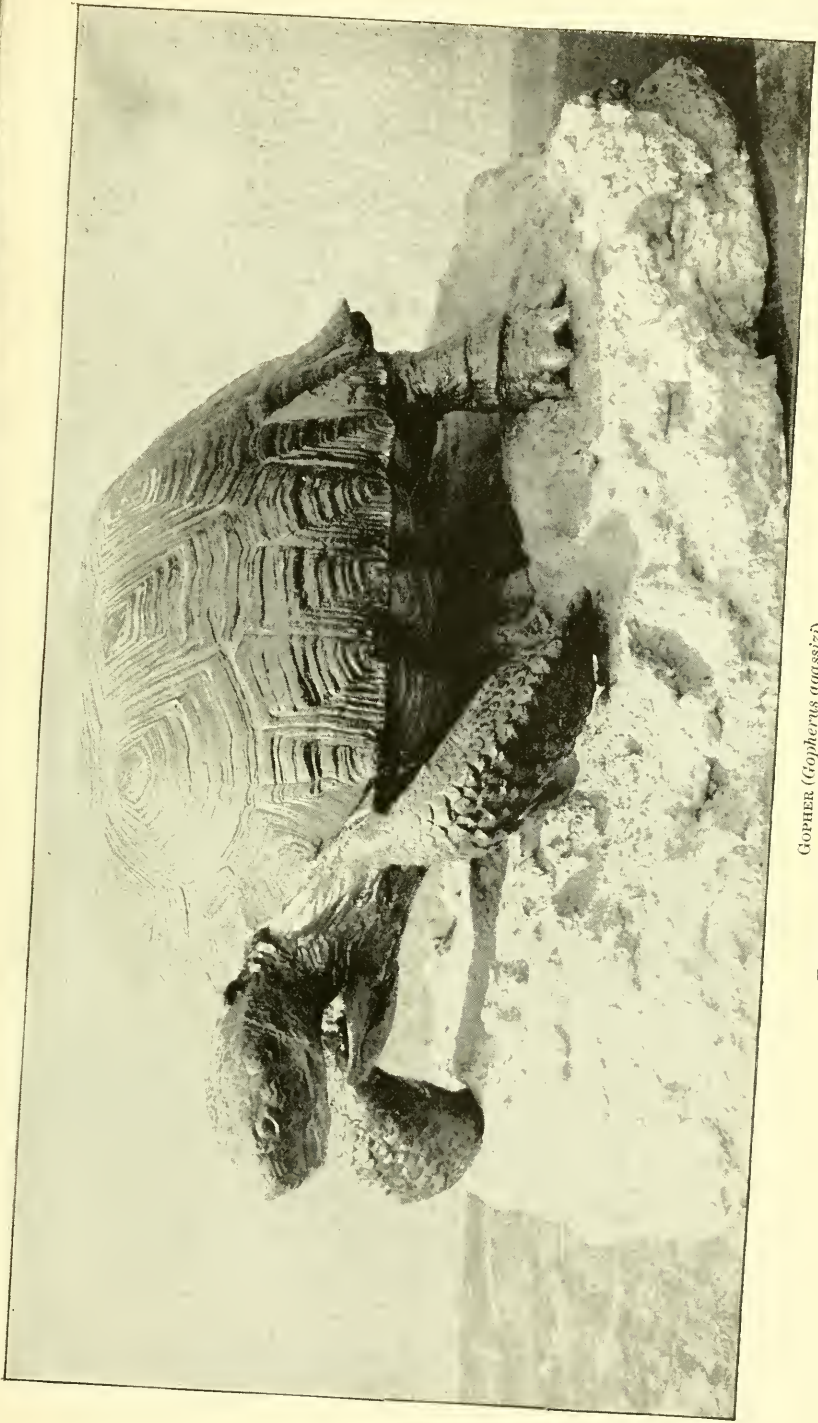


SOFT-SHELLED TURTLE (*Aspiderochelys ferox*, ad.).

From a plaster cast; greatly reduced. (Cat. No. 8899, U. S. N. M.)



Box Turtle (*Cistudo clausa*).
From a plaster cast; reduced. (Cat. No. 10329, U. S. N. M.)



Gopherus agassizii.
From a plaster cast: reduced. (Cat. No. 10412, U. S. N. M.)



TUPINAMBIS TEGUIXIN.

From a plaster cast ; reduced. (Cat. No. 20790, U. S. N. M.)



OLD AND IMPROVED METHODS OF MOUNTING A PENGUIN.

From specimens in the National Museum. (Cat. Nos. 124684 and 15686, U. S. N. M.)



Fig. 1. As first preserved.



Fig. 2. As remodeled by Mr. Nelson R. Wood.

THE GREAT AUK (*Plautus impennis*).

(Cat. No. 57328, U. S. N. M.)

very best that could have been done under the circumstances; for when birds' necks are stretched out of all proportion, and then allowed to remain that way for years, it is by no means an easy matter to even partially restore them again to their normal lengths. Even among the more common birds there still linger numerous examples of old-style bird stuffing in the cases of the National Museum. Some of these absolutely violate every correct principle of taxidermy, and it is devoutly to be hoped that the time is not far distant when they can be presented to some fourth-rate museum or college "in the provinces." Surely both this Museum and the people have outgrown such scarecrows. I allude to such looking affairs as we have represented in Plate XXXVIII of this report, a specimen of *Larus occidentalis*. Now, gulls make especially beautiful subjects when they are well mounted; for in nature they are graceful in the extreme, and their plumages, so simple and so harmoniously blended, are very attractive. Plate XXXIX, a mounted specimen of *Creagrus furcatus* in the national collection, is in my opinion an absolutely lifelike reproduction of the bird as it appeared when it was alive. It is nature and simplicity itself, and, with its neat stand, leaves nothing to be desired in the way of mounting a single individual in an attitude of rest.*

There is no class of vertebrates that admit of grouping for museum exhibition that can exceed birds. Most of the species are small, which is an advantage, inasmuch it allows us to increase the amount of natural surroundings; then a great many birds have very peculiar habits and construct a great variety of nests, and these may often be reproduced with the greatest possible interest.†

One of the most lifelike groups of birds known to me is the pair of Black Ducks (*Anas obscura*) and young, which form a part of the ornithological mounted collection of the American Museum of Natural History of New York City. Through the kindness of Dr. J. A. Allen,

* This gull was the work of Mr. Nelson R. Wood, one of the taxidermists employed in the National Museum, who also prepared all the mounted domestic fowls and pigeons here shown with the exception of the white-faced black Spanish cock (Plate LXIX, Fig. 2); the Parrot (Plate XLIV, Figs. 1, 2); the Baltimore oriole (Plate LXXIII); the turkey (Plate XLVIII); and the great horned owl (Plate LXXXI). Mr. Wood has cheerfully tendered his assistance to me in several ways during my examination of specimens, for which he fully deserves my thanks, as he does for the loan of his living specimen of Gambel's partridge and Black Sumatra cock, both of which by photography have been secured for plates for this paper.

† According to Mr. Goode: "The mounting of animals in picturesque and lifelike groups in the midst of accessories taken from their natural haunts appears to have been first attempted by Prof. Paolo Savi in the early part of the present century. In the museum of the University of Pisa nearly one hundred of these are still preserved. One of these, a group of starlings upon the head of a dead sheep, is as fine as anything since produced anywhere; and a pair of boar hounds attacking a boar is, for action, the best piece of mammal mounting I have ever seen. The collection is a wonderful one, and is still perfectly preserved."

of that institution, I am enabled to present that group here as one of my illustrations. It is shown in Plate XL.*

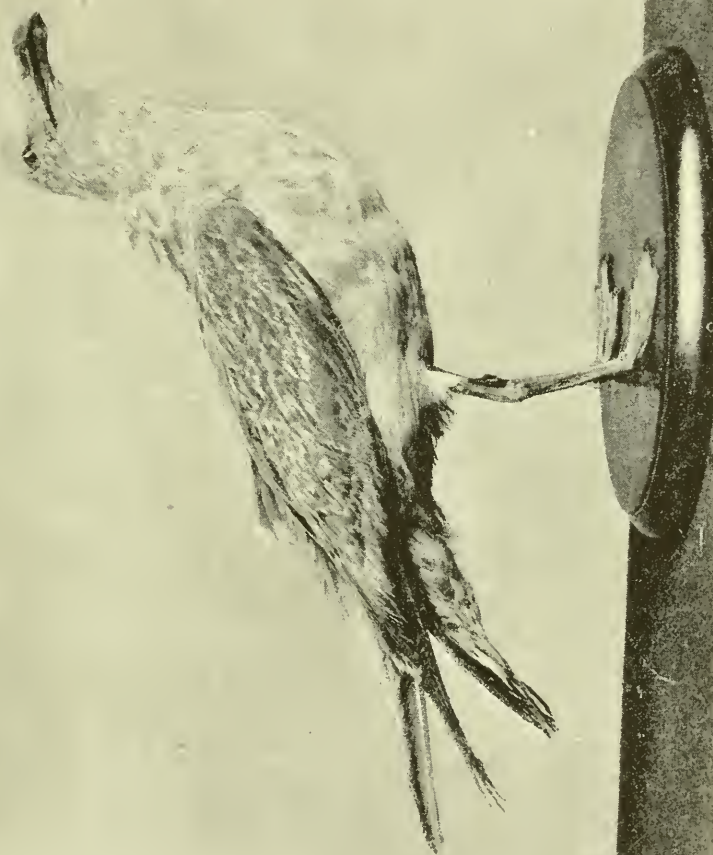
The subjects shown in Plate XLIII, Parrot; Plate LXI, California Partridge; Plate LXII, Massena Partridge; Plate LXIII, Quail; Plate LIX, Fig. 2, Quail; Plate LXIV, English Pheasant; Plate LXV, Moor Cock; Plate LXVII, Ruffled Grouse; Plate LXVII, Fig. 1, Dusky Grouse; Plate LXVII, Fig. 2, Richardson's Grouse, and the well-mounted turkey head in Plate LXIX, are all examples of Mr. Denslow's style of mounting. My thanks are due him for the loan of the drawing from which the figure of the Great Horned Owl, shown in Plate LXXII, was made. It is from his well-filled "note-book" of drawings and photographs of all kinds of animals from life and good illustrations—just such a book as every taxidermist should compile. Mr. Denslow was at one time employed by the National Museum and is in my opinion a taxidermist of the highest order of merit.

Great simplicity may characterize groups of birds, or they may be gotten up with every refinement of detail. A beautiful piece of work representing the former style is to be found in the collection, where two flamingoes and their nests are represented; while of the latter kind, it would be difficult to find a group anywhere that would present so many interesting features, and such wonderful harmony in detail, as is seen in the group of jacanas, which, together with the flamingoes, were sent on to the World's Columbian Exposition. The piece of pond work in this latter, including the flowers and their leaves, and the handling of the bottom, are simply exquisite. Such work is an adornment to any museum, and a whole chapter in zoölogical science to any visitor who may chance to give it any study whatever. The artist, I regret to say, is not known to me, but there is no question that he knew a jacana.† I have seen the birds alive in nature, and the way he has rendered the peculiar habit the males have of vertically erecting their wings, in a manner similar to our Solitary sandpiper, is capital. This delicate case, as I have just said, was sent on to the World's Fair at Chicago, and it is to be hoped that no misfortune will befall it either in going there or having it returned here.

Perhaps some of the finest groups in the world are at South Kensington of the British Museum, and at the commencement of this paper I quite extensively quoted from Dr. Sharpe's article upon the nature of many of them. That distinguished ornithologist, who is in charge of the department of ornithology there, has kindly sent me, as I have before said, two beautiful photographs of their method of mounting specimens of the diurnal Raptores. Those photographs, unfortunately, I had to have very much reduced, but still they show very well the

*This group was designed and prepared by Mr. Jenness Richardson, at the American Museum of Natural History, in 1890; the studies being made from life at Gardiner's Island, New York, in May, 1889. The accessories were made by Mrs. E. S. Mogridge, under the supervision of Mr. Richardson, and are actual facsimiles from nature.

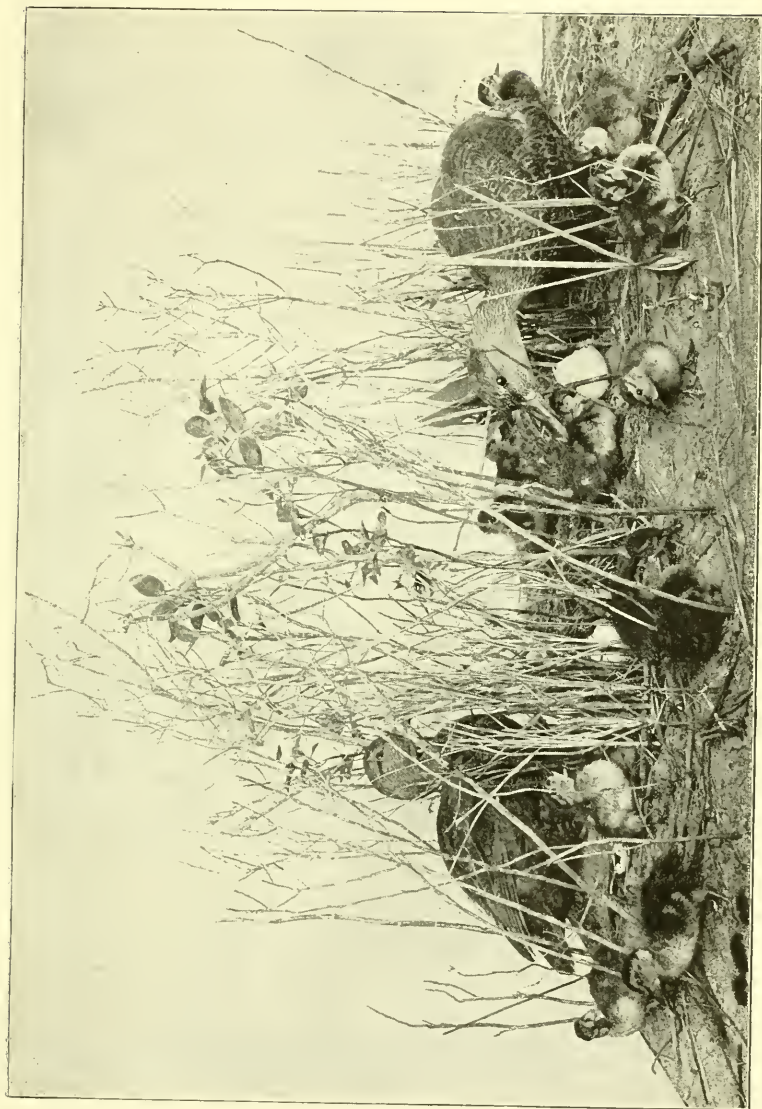
†The group was mounted by Henry Marshall, for many years the principal bird taxidermist in the National Museum. —EDITOR.



RING-BILLED GULL (*Larus occidentalis*, juv.).
Example of an incorrectly mounted Gull. (Cat. No. 6674, U. S. N. M.)



SWALLOW-TAILED GULL (*Cecropus forficatus*).
Example of correctly mounted Gull. (Cat. No. 115908, U. S. N. M.)



BLACK DUCKS AND YOUNG (*huts obscura*).

From a figure published in "The Auk," of a group in the collection of the American Museum of Natural History, New York.
Reproduced by permission of Dr. J. A. Allen, editor of "The Auk."



grandeur of the scale upon which such work is executed. Their copies are faithfully rendered in Plates *XL* and *XLII*, and to study them simply means to excite our fullest admiration for such bold and truthful rendering. In Plate *XL* one of the birds is exhibited in full flight, and yet the rocky wall behind him seems to be in contact with his tail, and, inasmuch as there is no perch for him to have pitched off of in full flight, the question might naturally arise, going at the rate he apparently is, whence did he come? The defect so apparent is probably due to the picture itself, which does not represent the actual and necessary space that exists between the sailing bird and the rocky cliff behind him.

Such illustrations bring up to my mind the great question of the amount of activity permissible in birds mounted for museum exhibition. My opinion in these premises can be briefly put. The great bulk of individual specimens of small birds exhibited in the cases of a large scientific zoölogical museum should be mounted up on the T of the perch in one of the most common attitudes of the species; a slight dipping forwards, or slight inclination of the head in some direction, being alone permissible. But this would give rise to great monotony, and to break that we would advise a certain amount of activity in single specimens. This should be accorded to those birds which normally are very active in nature. With respect to groups of birds we may to a greater extent indulge in arranging birds in different attitudes. At the best this is what we would naturally look for anyway, for in groups of birds the individuals composing it are more frequently mounted in the act of performing something, either feeding their young or flying, or nest-building, or some other avocation. Even violent action, as fighting each other, or capturing their prey, may be introduced in a limited number of groups.

The scolding parrot, shown in Plate *XLIII*, which, by the way, is a masterly piece of work, is an excellent example of activity shown in a single specimen, and this one subject would give relief to a dozen quiet parrots in the same case; or, for example, the other species, equally as well rendered, shown in two views in Plate *XLIV*, Figs. 1 and 2. For ordinary small birds the style shown for the female oriole in Plate *LXXIII* is sometimes desirable, especially when a bird is selected having such active habits as the oriole has, and where the artist can succeed in reproducing one of its more usual postures as well as has been done in the case of this specimen. Otherwise it most certainly should not be attempted. But the acme of all activity and of all grouping is reached when such artistic pieces of work, so faithfully executed, so full of interest and all that is natural, are set forth as the piece shown in Plate *XLV*. Mr. Adams, who both collected and mounted this most attractive thing, would certainly have "capped the climax" had he been able to have brought home the very section of the tree in which that identical Hornbill built her nest. This part is artificial, having been built up of fine papier-maché; but it is only fairly well done. It represents the male of one of the

species of Hornbills feeding the female, whom he has imprisoned during the period of incubation in a hollow tree. I never pass it that I do not think of what Wallace has said of the habit in his Malay Archipelago (p. 147):

I had sent my hunters to shoot and while I was at breakfast they returned, bringing me a fine large male of the *Buceros bicornis*, which one of them assured me he had shot while feeding the female, which was shut up in a hole in a tree. I had often read of this curious habit, and immediately returned to the place, accompanied by several of the natives. After crossing a stream and a bog, we found a large tree leaning over some water, and on its lower side, at a height of about 20 feet, appeared a small hole, and what looked like a quantity of mud, which I was assured had been used in stopping up the large hole. After a while we heard the harsh cry of a bird inside, and could see the white extremity of its beak put out. I offered a rupee to anyone who would go up and get out the bird, with the egg or young one, but they all declared it was too difficult and they were afraid to try. I therefore very reluctantly came away. In about an hour afterward, much to my surprise, a tremendous loud, hoarse screaming was heard, and the bird was brought me, together with a young one which had been found in the hole. This was a most curious object, as large as a pigeon, but without a particle of plumage on any part of it. It was exceedingly plump and soft, and with a semitransparent skin, so that it looked more like a bag of jelly with head and feet stuck on than like a real bird.

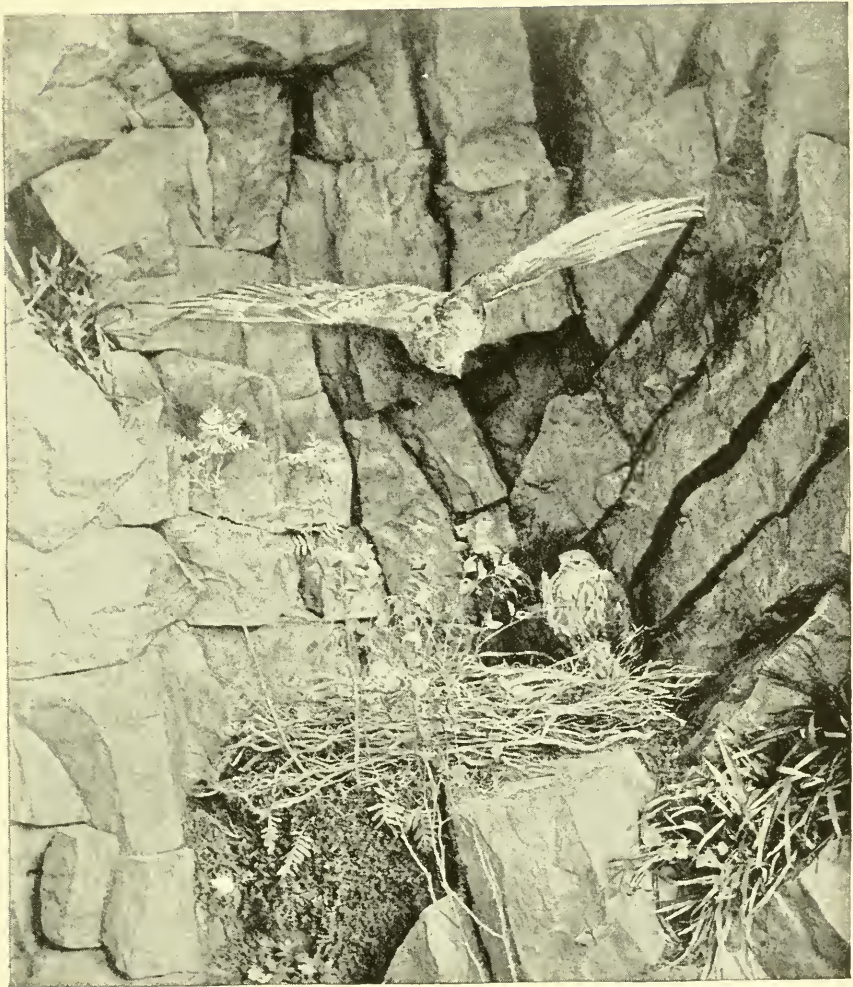
The extraordinary habit of the male in plastering up the female with her egg and feeding her during the whole time of incubation and till the young one is fledged, is common to several of the large hornbills, and is one of those strange facts in natural history which are "stranger than fiction."

A very favorable commencement has been made at the National Museum of illustrating our own native birds by similar methods, and it would not be easy to overestimate the value and interest that attach to so important a step. We have already in one handsome single case a pair of shrikes with their nest and young in a thorn-apple bush, while upon several of the spines of the latter are suspended various insects and a small mammal, showing the habit of those interesting birds in nature of thus impaling such creatures. Others are in the course of making, and still others in contemplation. A pair of Wood Ducks with their real nest, taken from some lofty tree, is a good subject for some enterprising artist, and many others suggest themselves to us. There were magnificent groups of our birds sent on to the Columbian Exposition at Chicago, and when these are returned, as they will be, it will form a fine basis for such a collection to be added to in the future. I fear I must leave a great deal unsaid here that I would like to say, but it is to be devoutly hoped that the wide interest our people are taking in such matters, and the national desire of building up a National Museum at our fair capital, will induce our Government to open the public purse to the extent of bestowing the room required for the proper exhibition of this series, even to the giving of a large and suitable building, now so much needed through the rapid increase and accumulation of such treasures.

This will be the more necessary inasmuch as within a few years past, through the wise foresight of Mr. Goode, another very important de-



METHOD OF MOUNTING DIURNAL RAPTORES EMPLOYED IN THE BRITISH MUSEUM.
Reproduced from a photograph lent by Dr. R. Bowdler Sharpe, keeper of the Department of Ornithology, British Museum.



METHOD OF MOUNTING DIURNAL RAPTORES EMPLOYED IN THE BRITISH MUSEUM.
Reproduced from a photograph lent by Dr. R. Bowdler Sharpe, keeper of the Department of Ornithology, British Museum.



A SCOLDING PARROT.

From photograph of a specimen in the U. S. National Museum. (Cat. No. 126612, U. S. N. M.)



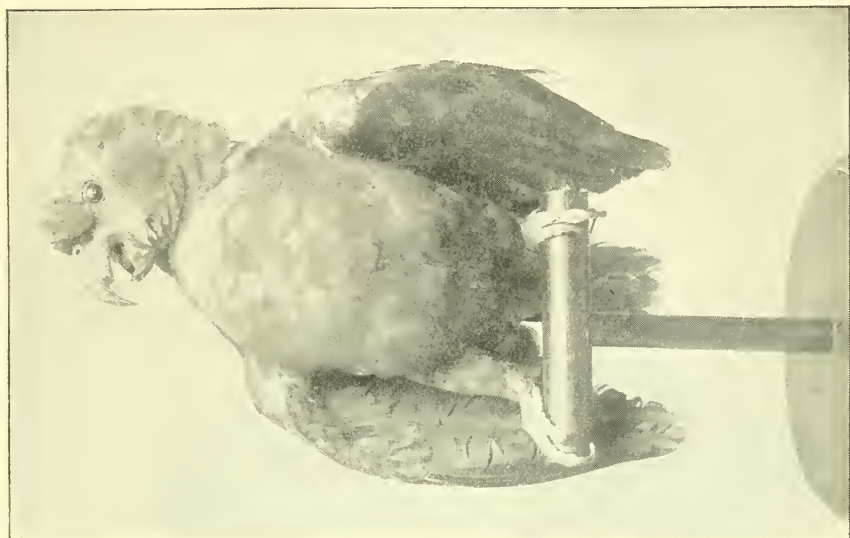


Fig. 2. Front view.

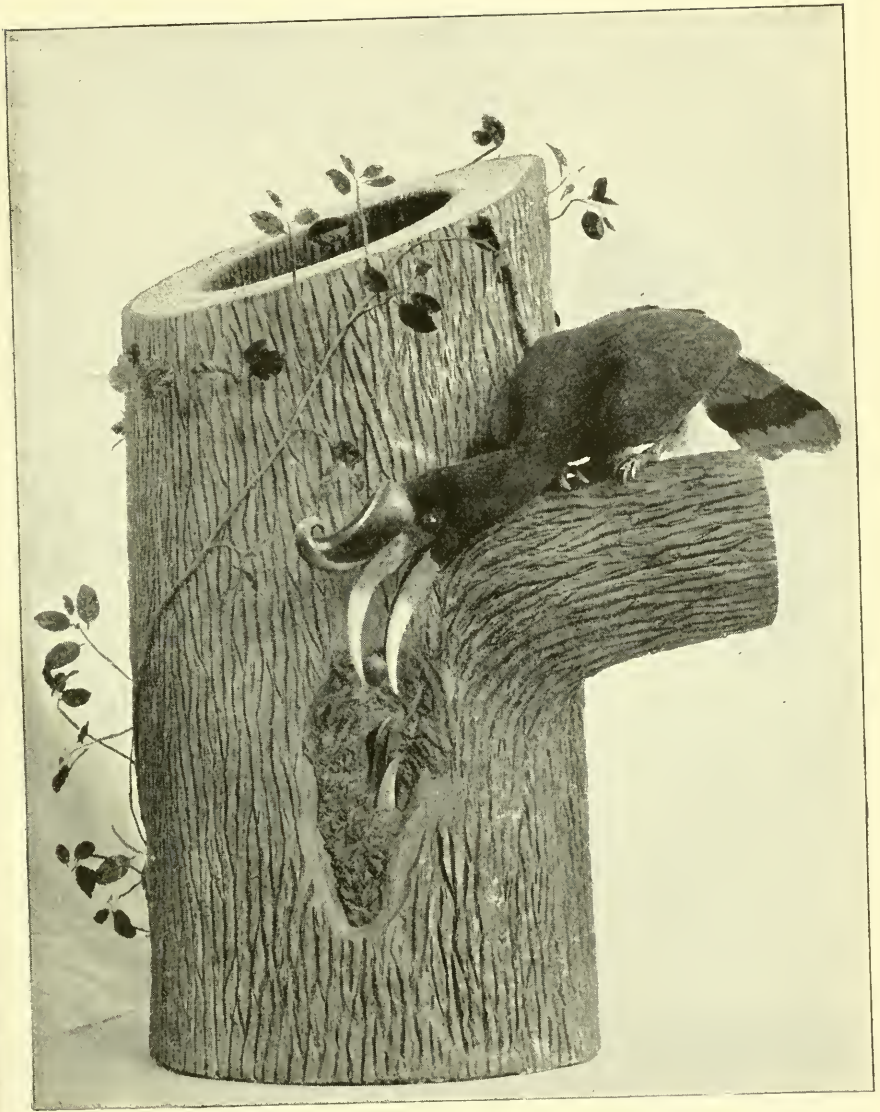


Fig. 1. Rear view.

PARROT ON THE DEPRESSIVE.

(Cat. No. 12487, U. S. N. M.)





MALE HORNBILL FEEDING IMPRISONED FEMALE.

(Cat. No. 116621, U. S. N. M. Collected and mounted by Mr. C. F. Adams.)



partment is growing up at the Government museums, and this in the field we now have under consideration, and it is the exhibition of the finest possible specimens of all our domesticated fowls, especially pigeons, chickens, and the like. So far as the art has applied itself to the preservation and representation of these lately, it has been most satisfactory, and many masterpieces of this kind now adorn the series.

The style in which the fowls are being done is well exemplified in Plates XLVI and XLVII. Mr. C. A. Sharp, of Lockport, N. Y., imported the birds there shown from England. They are both prize-winners, and both splendid samples of Indian game fowl, cock and hen. At their death they were presented by Mr. Sharp to the National Museum. "Lady Whitfield," the hen, is an hundred-dollar bird, while her consort brought \$350. From an artistic point of view, in so far as taxidermy is concerned, they are markedly superior pieces of workmanship and in every particular—pose, topographical anatomy, coloring, spirit, and all. To appreciate their beauty, we have but to compare them with some of the taxidermy that was done during the old régime of the Museum's history. I mean such types of it as I am enabled to show in Plate XLIX, Fig. 2—a White-faced black Spanish cock—a relic I exhumed from the vaults of the specimens now being discarded. What a beauty (!)—saddle-backed, tail thrown up like a toucan's, wires showing everywhere, most all of his body in front of his legs, stepping off with both feet flat on the ground, and such a weird, grotesque, consequential, lop-sided aspect anyway—this fright with no form of a fowl known to me is only fit to grace the front window of a fourth-class cheap bird "stuffer's" shop. A few more such "spooks" as this still linger on exhibition, as if by courtesy to the past, but they will shortly have to make way before the work now coming in.

Sometimes these game cocks are "undubbed," that is their wattles and comb are not trimmed off. In preserving these parts in a bird like this they are cast from the original and restored in a plastic material, that will keep indefinitely without change of form or color. After the bird is mounted, these are properly attached in their places on the head, and the suture lines colored over. The effect is absolutely perfect, and to show how perfect it is I have introduced two additional figures, nearly life size, of the head of a game cock (Plate XLVIII, Figs. 1, 2). They will bear the minutest inspection from every critical point known to taxidermists. In Fig. 2 the eye is unfortunately marred by the light refraction, but we can not avoid that in photography. Thoroughly lifelike again is the pretty specimen shown in Plate L, a Silver-spangled Hamburg hen. The artist who mounted this specimen is a close student at all times of the various attitudes assumed not only by fowls and pigeons of all kinds, but of the feathered creation at large, and in this instance has happily hit the appearance of a hen feeding as she walks along or regarding some small object on the ground that has attracted her attention.

Another worthy subject is seen in Plate XLIX, Fig. 1, a proud old black Sumatra cock, that comes from a line of fowls unsurpassed by any in beauty or form. Mr. Wood, of the Museum, owns one or more of the grandsons of the rooster here portrayed, and through the skill and patience of Mr. T. W. Smillie, in charge of the photographic gallery of the National Museum, I am enabled to present figures from photographs of this cock, taken from the live bird.

They are valuable as models, going to show the disposition of plumage, the contour of general form, its attitudes, and general appearance. These fowls are black all over, with strong blue and green reflections in every changing light. Special attention is invited to the elegant manner in which the superb tail is horizontally carried and the proud carriage of the bird in Plate LXI. O'ye artists of the pen and block who diligently illustrate for our thousand and one agricultural periodicals all over this country, and sometimes do not quite hit in your efforts the galline form divine, pray look upon these portraits before getting down to your easels again, and profit thereby!

Other remarkably fine pieces of work of this kind are seen in Plates LII, LIV, and LV. They are all equally good and deserving of the highest compliment that I can give them, and that is they are absolutely true to nature. My only regret is that they are not colored as well, for they would then be still more lifelike and their real beauties greatly enhanced. This factor is not so much missed in the good old light Brahma hen in Plate LV, for she is largely black and white. She was presented to the National Museum by Mr. Charles Griffin, of Shelter Island—with the cock that goes with her they constitute a pair of fowls of great beauty. (Plate LIV and LV.)

Many of the domestic pigeons have also been treated at the Museum quite as artistically as have the fowls. No opportunities have been lost to catch these in their every mood, and reproduce them in preserved specimens of the individuals themselves. One of the prettiest subjects sent on to the Chicago fair by the National Museum was a large pigeon-coot covered with many varieties of our tame pigeons, both the common and the rarer kinds. It was gotten up by Mr. Lucas in a manner that admitted of no improvement, bearing as it did a true likeness to an original. Two of the pigeons that were upon it are shown in Plate LVI and LVII. When one thinks of the stiff and unceuth things that so many taxidermists give us and call them pigeons, it is positively grateful to turn to these here shown, and observe the eminently natural attitudes in which these gentle creatures have been thrown. One of the prettiest pieces of taxidermy that I have ever had the pleasure of studying is the dozing dove-coot pigeon, depicted in Plate LVI. We hope that this collection, now so well advanced, will continue to grow both numerically and in the variety of the species. Were it possible to obtain some of the steps in Mr. Darwin's numerous experiments with pigeons, and all that he demonstrated thereby, and the corresponding forms and



INDIAN GAME HEN. "LADY WHITFIELD."
(Cat. No. 106057, U. S. N. M.)



INDIAN GAME COCK (DUBBED).
(Cat. No. 106079, U. S. N. M.)

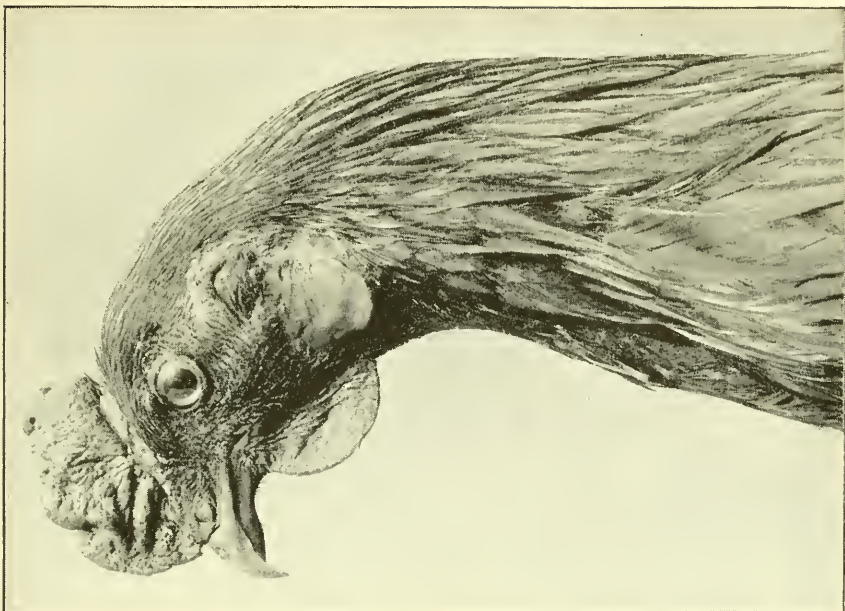


Fig. 2. Lateral view.

HEAD OF INDIAN GAME COCK (UNDUBBED) NEARLY LIFE SIZE.

(Cat. No. 106080, U. S. N. M.)

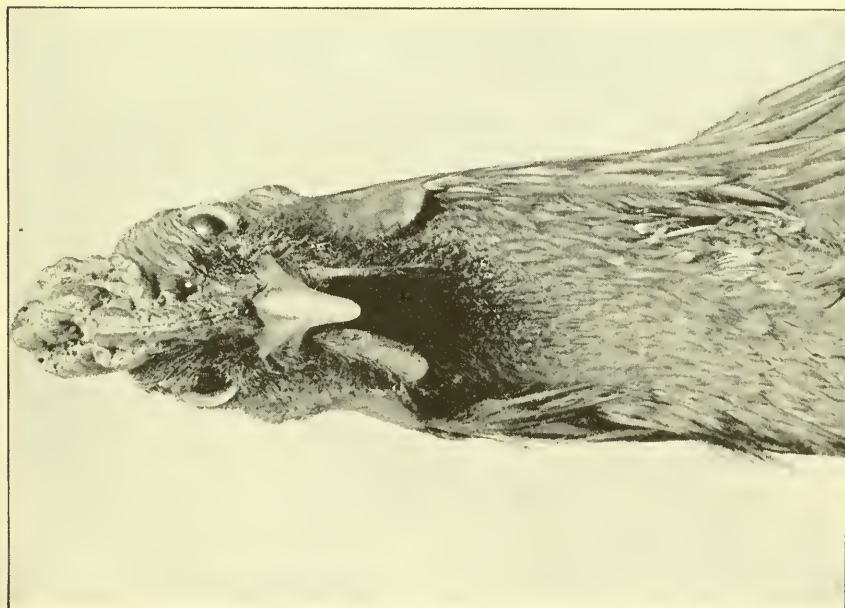


Fig. 1. Front view.



Fig. 2. WHITE-FACED BLACK SPANISH COCK.
(An example of bad taxidermy.)



Fig. 1. BLACK SUMATRA COCK.
(Cat. No. 106018, U. S. N. M.)



SILVER-SPANGLED HAMBURG HEN.
(Cat. No. 106074, U. S. N. M.)



BLACK SUMATRA COCK. (Erect posture.)
(From photograph of living specimen, lent by Mr. Nelson B. Wood.)



BROWN LEGHORN COCK. (Calling the hen.)



BLACK SUMATRA COCK. (Attitude of rest on one foot.)
(From photograph of living specimen, lent by Mr. Nelson R. Wood.)

crosses could be obtained, the plan would not be a bad one to devote a few cases to illustrate so important a subject.

When we come to study the collection of mounted specimens of the Gallinæ in the ornithological cases of the Smithsonian Institution in the large hall where all the mounted birds are exhibited, we find the same condition of affairs presented to us, as has been described for the other avian groups. Inferiority of work, as a rule, characterizes the older specimens, while real merit marks the most of those that have appeared within comparatively recent times. This appears to have been the case, in so far as the latter kind are concerned, during a period extending over perhaps a twelve month prior to the opening of the World's Columbian Exposition. Some fine work began to make its appearance just then, due apparently to that cause, which was having a similar stimulating influence in all quarters, no art or industry being exempt from it. The advances in methods and results was being silently watched by me with a keen interest and appreciation, not to say a feeling of pride and exultation at the genuine gain that was being made in such matters.

My attention, among other things, was especially drawn towards the group to which allusion has just been made, particularly the American partridges and grouse and their allies. Some of the species of partridges that were being mounted and placed in the cases struck me as being more life-like than was common, and I mentally compared them with my recollections of the living species in nature, as well as all the figures I knew of them. As the present paper began to take on form I determined, if possible, to introduce copies of a few photographs of living partridges, and, as has been mentioned on a previous page, the opportunity was duly presented. Mr. Smillie was good enough in my presence to make several exposures upon a living specimen of Gambel's partridge, and some of those results are well worthy of publication. They are presented in Plate LIX, Fig. 1, and Plate LX. In the first figure the bird had elevated all his feathers just prior to preening himself. This in a way should be compared with the quail shown in Fig. 2, recollecting, however, that the living bird is not on the ground and that the mounted one is done with the act of preening and is just about to shake herself.

In Plate LX the bird was taken as it sat quietly upon a perch, and slightly elevated the feathers at the neck and forepart of the body. It shows that one of the feathers of its plume was broken and hung down below the others and is not a shadow, as might by some be supposed. This figure is a fine model for those who may desire to mount a partridge in this attitude. Although of a different genus, it is interesting to compare this with the partridge shown in Plate LXIII, which is one of the best mounted specimens of a *Colinus* with which I am acquainted. It will be noticed that the slight flatness that naturally exists over the pectoral region is apparent in both the living bird and in the specimen

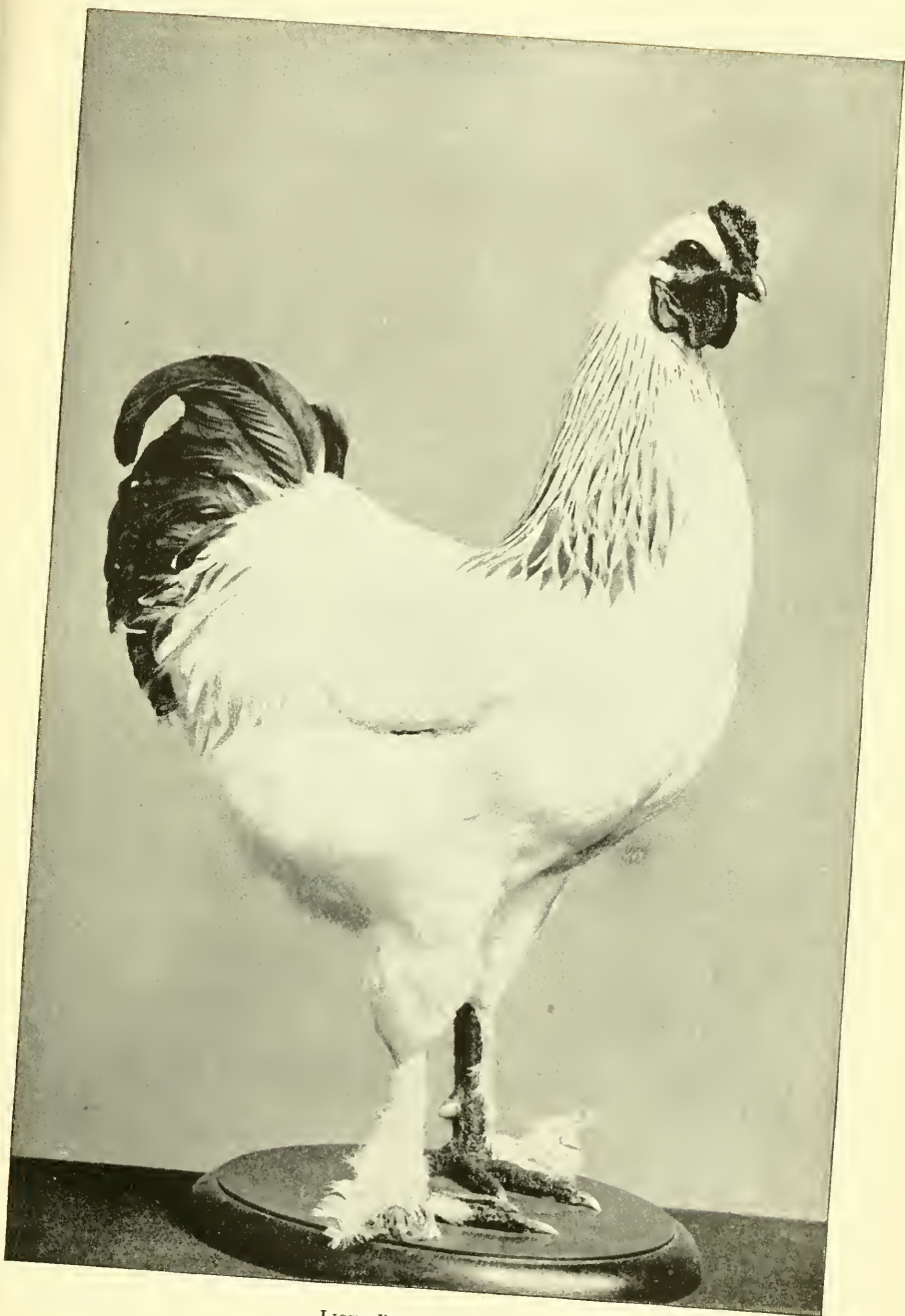
shown in Plate LXIII. This feature should also be compared with what we see in Plate LX.

Some excellent judges of the taxidermy of birds have spoken very highly of the California partridge shown in Plate LXI, and though apparently in all essential respects faultless in workmanship, design, and execution, it is to me not as pleasing a result as the *Cyrtonyx* seen in Plate LXII. Birds of the latter species I have seen in New Mexico, and in nature they exactly have the form here shown. The model used in this case, however, was from the figure in Gould's monograph on the *Odonophorinae*, while in the case of the California partridge it was from life.

Of the larger game birds the Museum has quite a number of a character not to be excelled by any institution in the world, and probably not fully equaled by any other in this country. They must excite even the admiration of those who care ever so little for either ornithology or for the feats of pure art in taxidermy. But such people, fortunately, I am not now dealing with and care less for. But tell me, where is the naturalist, or the sportsman, or the taxidermist, or the cultured anywhere who can not see the extreme beauty and excellence in such specimens as I have been permitted to present in such a piece as the Pheasant portrayed in Plate LXIV, or the moor cock shown in the next plate following, or Plate LXV. It is too bad we can not show the color in such a specimen as this, for it is surely a gorgeous fowl. There is another specimen of the moor cock in the collection and the taxidermist has attempted to mount it in an attitude of strutting on a log, or a large bough, I do not remember which now, for I only remember the unpleasant sensation left upon me after having seen the bird itself. It has the appearance as though it was about to have a spasm. It is an excellent example of—very bad taxidermy.

Wolf's superb drawings form almost an inexhaustible supply of graceful and accurate postures and positions of all kinds of vertebrates, and it was from that work that the artist secured his model for the Ruffed grouse reproduced in Plate LXVI. In placing this, however, before the camera I gave it a front view rather than a lateral one, this being, as is well known, one of the severest tests to which you can submit the artist's work, especially in a piece of this kind. How well it stands it others must be left to judge; for my own part and in my humble opinion it represents to a line, to a feather, a startled grouse as he regards from the bough of a tree the object that has alarmed him. The balance, with upper wing slightly lowered, with tail flatly outspread, raised ruffs, and eager look, the position of the feet—indeed the entire poise is admirable throughout.

In order to show how well some of the other species of our grouse have been preserved I chose the two shown in Plate LXVII, Figs. 1, 2, either of which are as good as they can be made. It would have been an easy matter here to have selected a dozen or more mounted specimens of grouse from the collection that would have shown how bad these birds



LIGHT BRAHMA COCK.
(Cat. No. 106043, U. S. N. M.)



LIGHT BRAHMA HEN.
(Cat. No. 106044, U. S. N. M.)

can be mounted when they fall into the hands of the unskilled. It is better, however, I think to forget and forgive all that has been done in the past, provided we continually strive to copy nature as closely as possible in the future. To this end I reproduced as many good models as possible, and have given only a few showing how taxidermy ought not to be done. Examples of the "how-not-to-do-it" kind have been introduced here and there only as warnings.

Our wild turkey seems always to have given trouble to the old-time taxidermists, and some perfect frights are made to do duty for that noble fowl in the collection. Some of these are so badly prepared that they are downright hideous, while in some respects they fail to give any idea of the bird or its appearance in nature. The taxidermy of the turkey, moreover, presents difficulties that are to be encountered only in a limited number of birds in any avifauna. Chief among these problems is the proper preservation of the practically featherless head. This is not only without feathers, as we know, but in life is highly colored, corrugated, and wattled below. Whoever it was that prepared the turkeys in former times that now disgrace the cases of the ornithological department I do not pretend to know, any more than I know the reason why such miserable fifth-class pieces of work are retained there, unless it be something after the order of Chinese ancestry worship, and an opposing of the methods of the moderns.

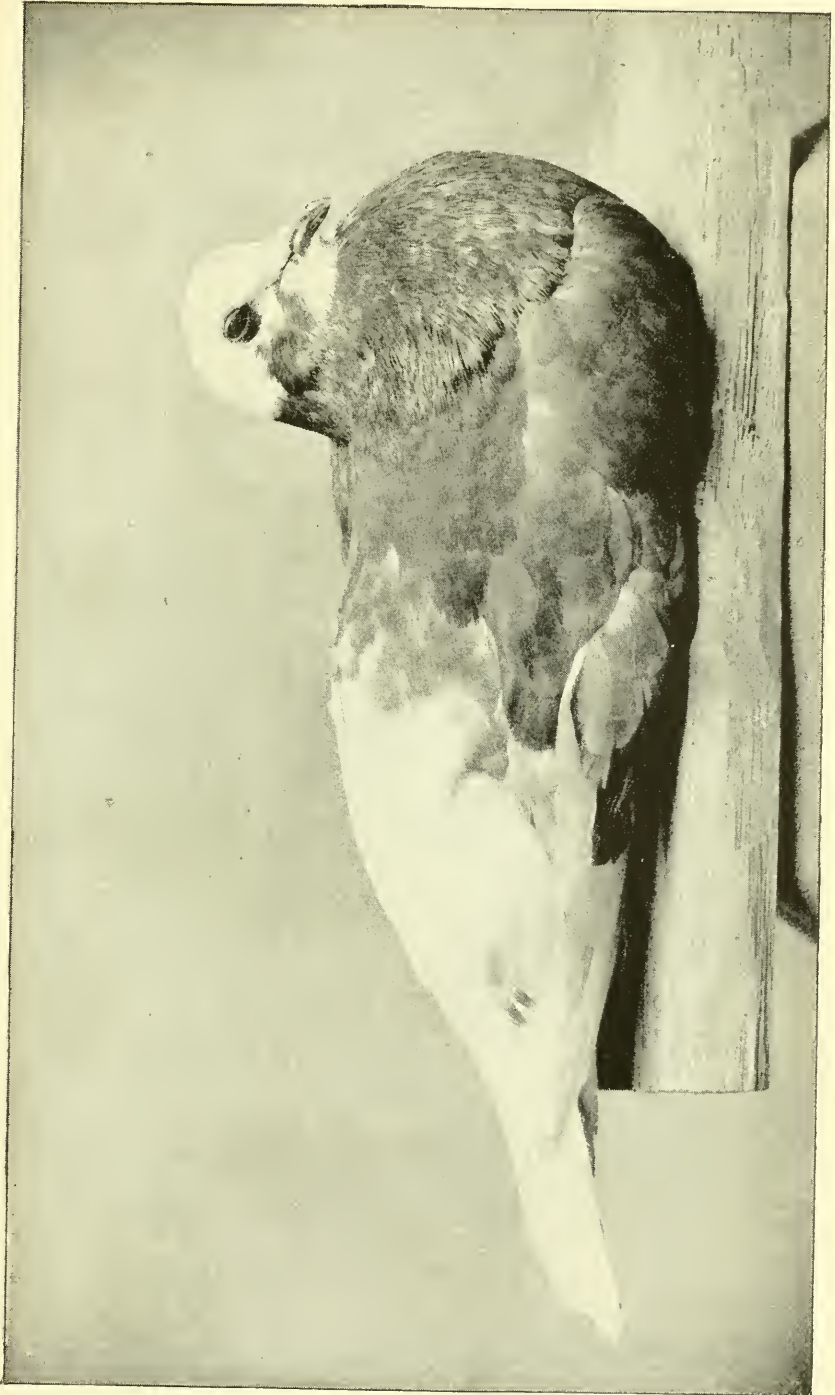
To condemn the bad and to recommend every result that reproduces nature is my object here, and this thought was uppermost in my mind when the comparison made in Plate LXIX was undertaken. As one looks at this plate the left-hand head shows how wretchedly bad meleagrine taxidermy may be done sometimes. The wattle-like comb has had no pains whatever taken with it, and appears more like a curved, semi-erect, filamentous horn than anything else; the skin of the head has been stretched down an inch lower than it belongs, rendered possible by the "stuffer" eliminating all the corrugations that naturally occur in it; then the feathers that belong on the back of the neck are twisted round to the front. After it was dry he further insulted the poor bird by blotching his neck all over with red, white, and blue paint—patriotic, but a villainous practice notwithstanding.

Compare this with the second head in the same plate. In the first place it is perfect in form, and all the parts are naturally disposed. This bird's head is restored in wax—that, is the skin of it is, together with the comb and antero-inferior wattles. In this the proper colors have been so adroitly incorporated that the effect produced is life-like in the highest degree. Even the little hair-like feathers have been by a process of the art normally scattered in their places over the head. The remainder of the bird is prepared quite in keeping with this truly beautifully preserved specimen. An old gobbler of this species is shown in Plate LXVIII. He is mounted in the act of strutting, and the models for it have been furnished principally by the act as it is performed by

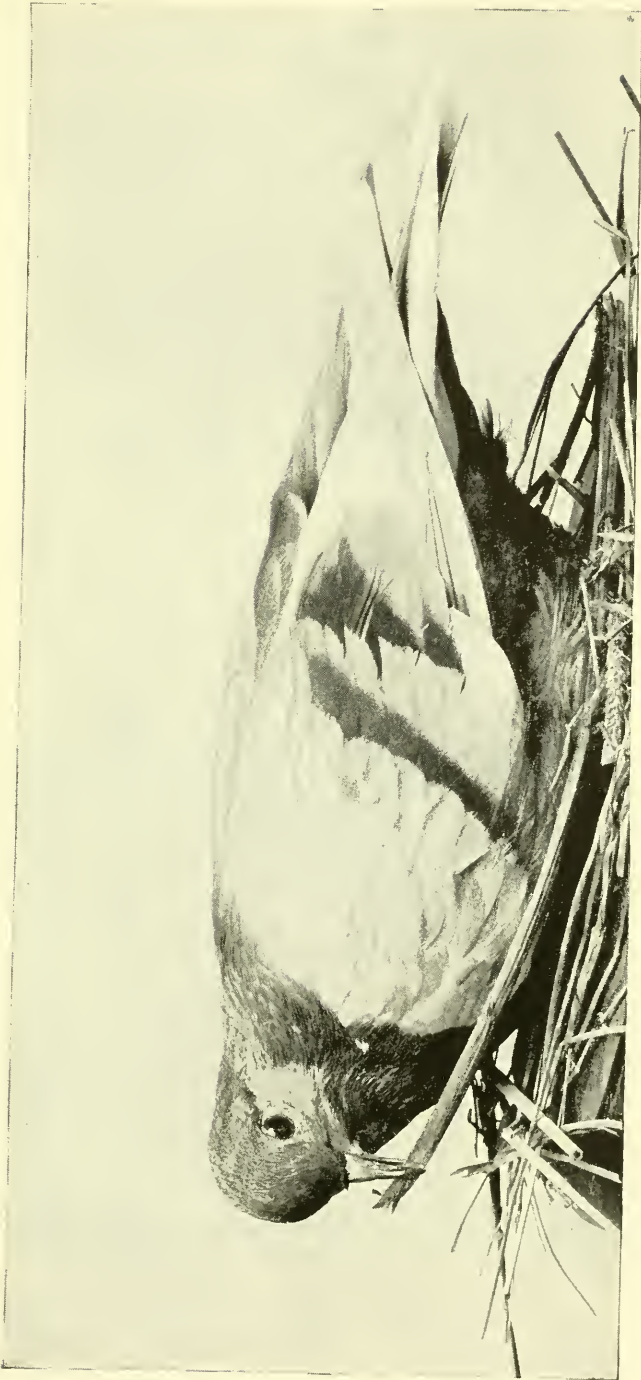
the domesticated bird. I consider this to be one of the finest pieces of modern taxidermy, so far as birds are concerned, in the museum. The arrangement of the exceedingly profuse plumage is perfect; the markedly oblique tilting of the spread tail, a feature that it is difficult to appreciate in the plate, is most truthfully rendered. This bird's head was prepared after the usual methods, but I understand it is contemplated to model it in wax, like the one just described above. When this is done I believe the National Museum will possess the finest specimen of a mounted wild turkey in existence.

Owls have not only given a great many artists infinite trouble to correctly portray, but they have likewise been placed upon the black list of a perfect host of taxidermists. Literature illumed by plates of birds goes to show that many an ornithologist who could draw and paint nearly every other kind of bird failed when owls were essayed. So, too, there are taxidermists who can mount most all birds correctly, who fail to a large extent when they take any of the *Striges* in hand. Wilson, the American ornithologist, used to complain bitterly of his inability to figure any of these birds exactly to his liking, and even the master, Audubon, shows a little weakness sometimes in such directions. Now, in my first attempts at the photography of birds, owls were the subjects, and one might think, inasmuch as they quietly roost and doze nearly all day, that is, the strictly nocturnal species, they would be easy subjects, but this is by no means always the case. A number of years ago, in New Mexico, I frequently tried specimens of Aiken's Screech owl (*Megascops asio aikenii*), but the results obtained were never entirely satisfactory to me. I have kept many kinds of American owls alive in my lifetime, and these screech owls have a habit, common to some other species during their dozing hours during the day, of drawing themselves up in an erect attitude, with all the feathers compressed against the body, and with the plumicorns erected to their fullest extent. But when we come to try and photograph one in such a desirable attitude, we must, to get him anything like life size, get the camera within a very few inches of his owlship, and this almost invariably alarms him, and he will flatten out his plumicorns, puff himself up, and then, after a second's idiotic stare, fly to some other part of the room. Photographing them at a longer distance makes the figure of him too small.

I was once a whole day here at Takoma endeavoring to secure a photograph of one of our Common Screech owls (*Megascops asio*) in my room—and then failed. He would jump up on top of my camera, emit a loud, rolling whistling note of disapproval of the procedure, dash off and finally nearly brain himself by bumping into the mirror of my wardrobe. I'd hypnotize him, stand him on the perch, and disappear for half an hour, and on my return he would be standing up as straight as a rocket in just the position I wanted him, but all my efforts to sneak up to the camera and remove the cap and make the necessary exposure failed



COMMON DOVE-COTE PIGEON. (Dozing.)



COMMON DOVE-COTE PIGEON.

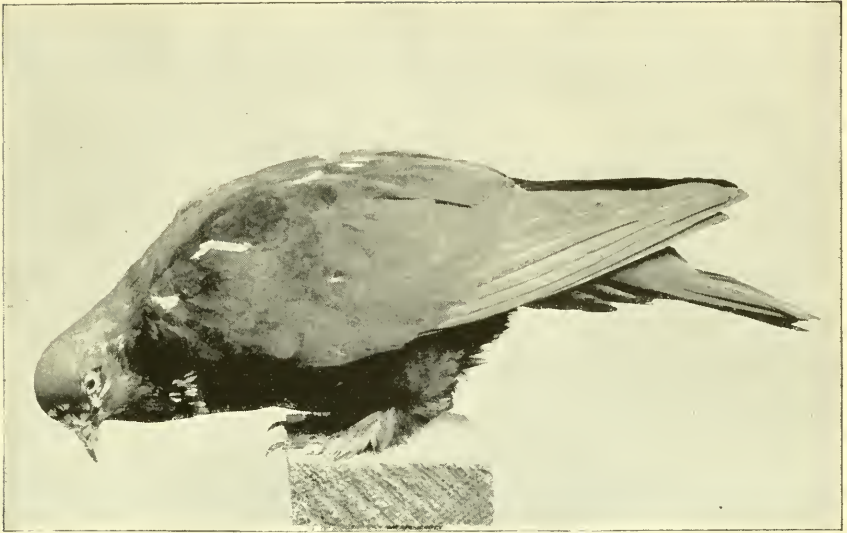


Fig. 1. PIGEON. BLACK OUTSIDE TUMBLER, ♂.
(Cat. No. 106100, U. S. N. M.)



Fig. 2. DOVE-COTE PIGEON. (Act of preening.)

utterly, for he would reenact the same performance I have just described. Finally I tied a piece of strong pack thread to his leg and took him out of doors, took him in the broiling glare of the sun, and giving him a blotting-paper background and a pretty perch, I went at him again. After numerous attempts I secured the fairly good result shown in Plate LXX. When obtained he was staring his eyes out at a chicken that was making a disturbance not far away, and with a pin-hole diaphragm in, I gave him an exposure of at least ten seconds, during which time he never moved. His right foot exhibited an old dislocation, and its twisted position is evident in his picture. I am indebted to Master Richard Lay, of Takoma, D. C., for the loan of this bird, for which and for his trouble in capturing it for me I desire here to express my grateful acknowledgments. It is my intention to experiment with the photography of owls until I succeed in getting a fine series of them in all possible poses, with the hope that when duly published they will prove useful to both artist and taxidermist. On a former page I have invited attention to the picture of the owl shown in Plate LXXII. It is a plate made from a photograph of a drawing that was accurately copied from the original photograph of the bird, and is a good result and ought to prove useful both to the artist and to the taxidermist. This pluffing up of the feathers in *Bubo* is common practice with them, and the act, to a moderate degree, has been well rendered in the exceptionally fine mount of one of the bubonine owls which I offer in Plate LXXI. It shows the bird in what might be called the first stage of observant defiance, or when something, evidently not of a pleasing nature, has attracted his attention and he is "getting on a ready" to repel it. The original has but to be seen to be admired, for it is remarkably well done.

There is not much encouragement to the taxidermist if the ever present fact is before him that the work with which he has taken so much pains, and given so much of his labor, is at last to be but poorly exhibited; that is, his birds are to be huddled together in small and unsuitable cases, and those in an illy-lighted hall. Unfortunately this is just what exists in the ornithological department now in the old Smithsonian Institution building, where certainly 50 per cent of the room space is particularly not of the proper kind wherein to exhibit birds. This subject, though not altogether foreign to the present report, is in reality one that should be far more extensively dealt with than I will be enabled to do in this connection.

Of all the departments of the art of taxidermy none can exceed, and I doubt any can quite equal, the talent required to properly preserve mammals. This is due to the fact that in a vast majority of them the hair is sufficiently short to exhibit the anatomical contours of the body, head, and limbs, while in some the hair is practically entirely absent, and this very much increases the difficulty. The proper handling of the mouth and associated structures, of certain special organs, and of

the feet and ears, etc., all conduces to this. And so, of a consequence, it especially devolves upon the taxidermist of the class of the vertebrata to provide himself with accurate drawings and with photographs of mammals, also with casts and figures of the skinned bodies and parts of bodies of his subjects. This is just what the sculptor is obliged to do in his art, and I remember very well, years ago, when I enjoyed the rare opportunity of watching Mr. John Rodgers at work in his studio. I have known him to carefully measure as many as thirty well-formed horses and take the average of those measurements so as to get at the data to model a handsome animal for a statuette of Washington. Not content with this, he had also in his room a complete series of plaster casts of the superficial muscles and other structures demonstrating equine morphology.

Further, all the principles I have referred to in the taxidermy of birds apply, almost without exception, to the class now to be considered. Groups are of especial interest where mammals are the subjects, and the National Museum has some of the grandest of them now on exhibition as a part of her mammalian series known to any institution of the present time. Take, for example, the group of American opossums in the collection. This was mounted by Mr. Hornaday, who has described it in the following words in his work on taxidermy. He says:

The case which incloses the entire group is 4 feet long, 3 feet wide, and 3 feet high. The frame of the case is as light as possible, and all four sides and the top are of glass. On the side of a sloping bank stands the base of a small gum tree, with the roots on the lower side exposed by the crumbling away of the bark. Of course the trunk rises to the top of the case, where it is cut squarely off. At the bottom of the sloping bank between two of the roots is an opening, which is recognized at once as the doorway to the opossum's home. The burrow winds upward between the roots of the tree, and finally turns off to the left into the bank, where, after running through a passageway of 2 or 3 feet in length, the nest itself is found. It is in a pocket-like excavation, and a circular section is cut out of the front of the bank so as to make an opening through which the nest can be seen.*

The nest is lined with dead leaves, in which lies an opossum curled up and sound asleep. At the back of the case a sectional view of the bank is represented, and by means of an opening cut here and there the course of the burrow is plainly seen. In the foreground is an old mother opossum with several young ones riding on her back, clinging to her gray coat, while the head of another protrudes from her pouch. This represents the manner in which the opossum carries her young after they have reached a certain age. From a small branch hangs another opossum, suspended by its prehensile tail, sprawling in midair. This specimen is a female, and shows the size and location of the wonderful marsupial pouch.† Another individual

* This I take to be the only real defect in this otherwise masterly piece of taxidermic art. That cut, subcircular as it is, is constantly being mistaken for the real entrance made by the animal to its burrow, and what is the true opening between the roots of the tree often overlooked. The false cut should have been made on the end of the bank, where the side glass covers its supposed section, and we could have seen into the burrow through it. This can easily be remedied.

† This individual does not appear in the group as it is now exhibited, but forms a separate piece.



Fig. 1. GAMBEL'S PARTRIDGE (*C. gambeli*, ♂).
Act of preening and elevating of plumage. (From photograph of living bird.)



Fig. 2. QUAIL (*Colinus*, ♀).
Elevation of feathers prior to shaking herself. (Cat. No. 112923, U. S. N. M.)

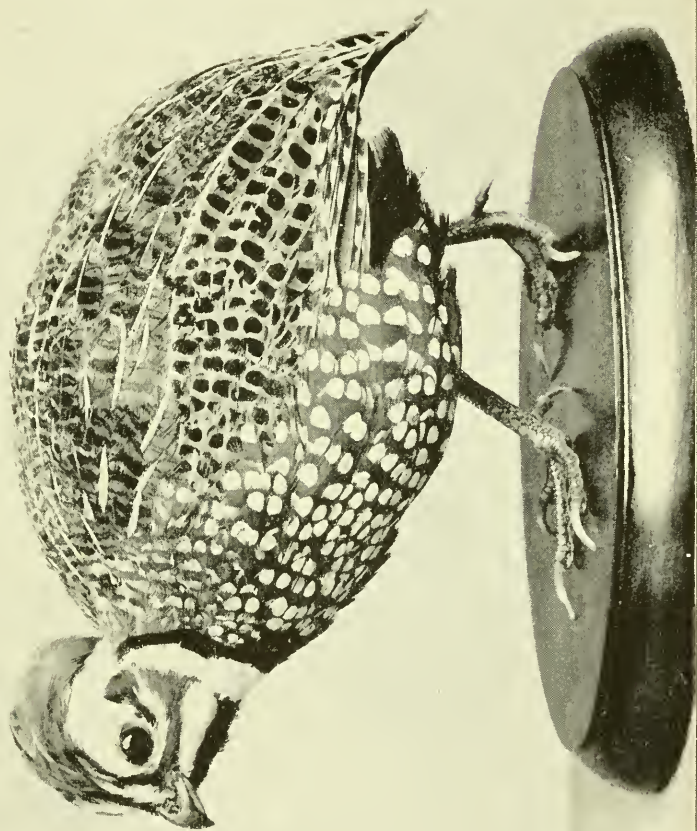


GAMBEL'S PARTRIDGE (*Callipepla gambeli*, ♂).
(From photograph of living bird.)

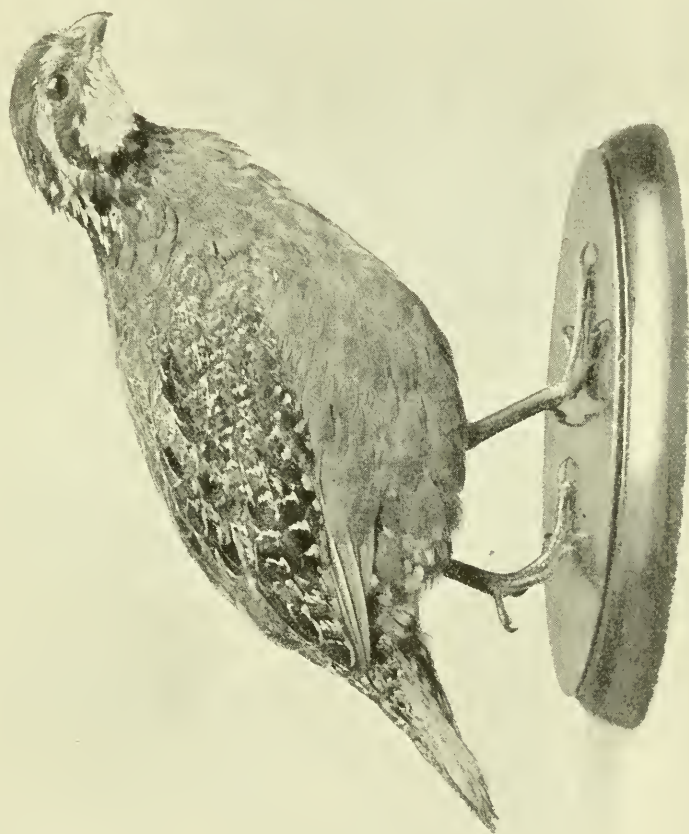


CALIFORNIA PARTRIDGE (*Callipepla californica*, ♂).

Reduced. (Cat. No. 107407, U. S. N. M.)



MASSENA PARTRIDGE (*Cytocypus montezumae*, ♂).
Reduced. In act of walking. (Cat. No. 136502, U. S. N. M.)

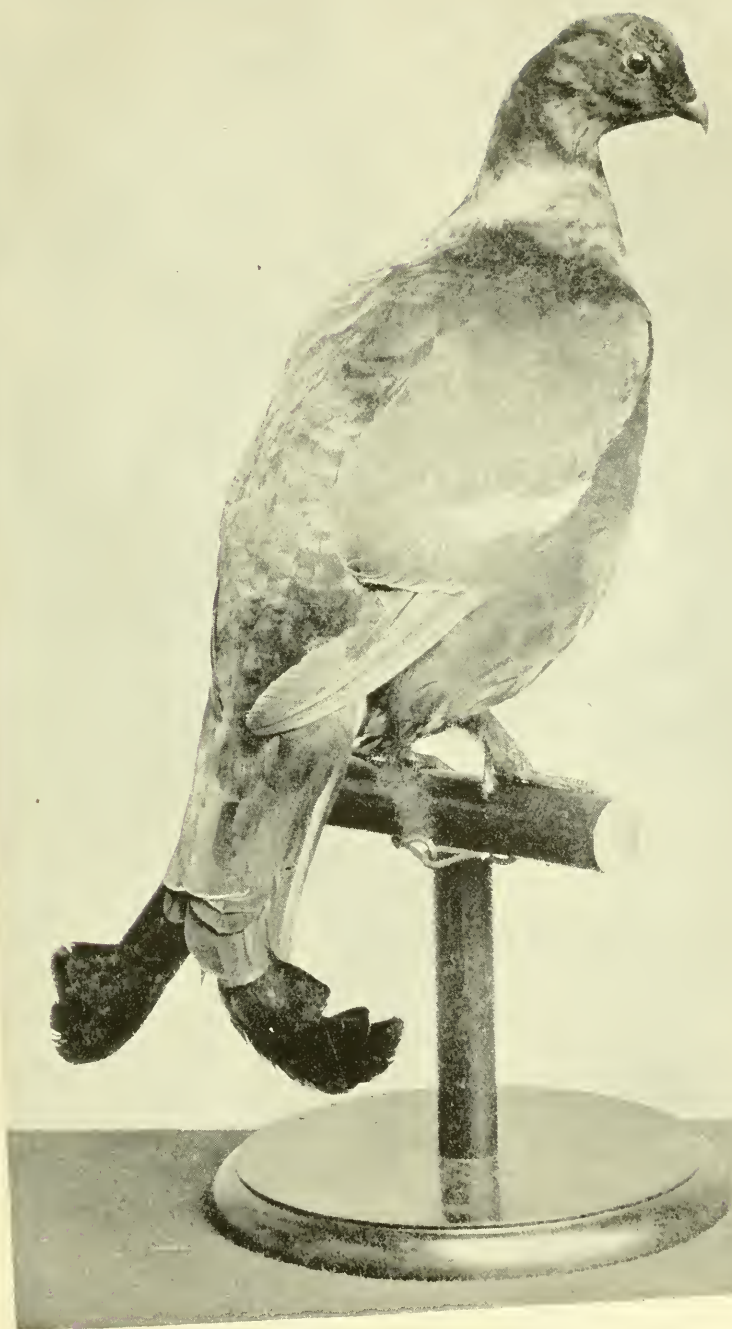


QUAIL (*Colinus* sp., ♂).
Slightly reduced. In act of walking. (Cat. No. 81927, U. S. N. M.)



ENGLISH PHEASANT.

On elevated station, surveying objects below. (Cat. No. 116855, U. S. N. M.)



MOOR COCK (*T. tetrix*, ♂).
Reduced. (Cat. No. 126574, U. S. N. M.)



RUFFED GROUSE (*Bonasa umbellus*).
On bough. Reduced. (Cat. No. 87097, U. S. N.M.)

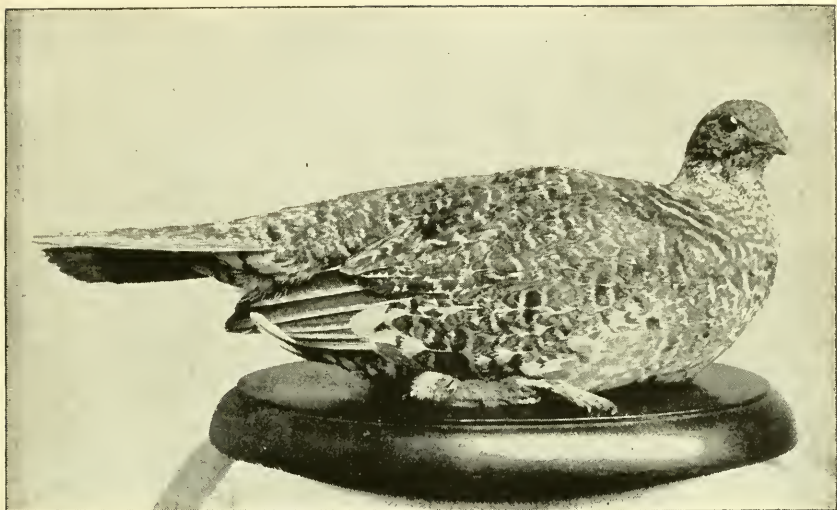


Fig. 1. DUSKY GROUSE (*Dendragapus obscurus*).
Reduced. (Cat. No. 112682, U. S. N. M.)



Fig. 2. RICHARDSON'S GROUSE (*Dendragapus canadensis richardsoni*).
Reduced. (Cat. No. 126345, U. S. N. M.)



WILD TURKEY (*Meleagris gallopavo*).
Reduced. (Cat. No. 117389, U. S. N. M.)



HEADS OF WILD TURKEYS (*Meleagris gallopavo*).
Examples of good and bad taxidermy. (Cat. Nos. 126113 and 68120, U. S. N. M.)



is climbing up the trunk of the tree. A fourth specimen, which has been disturbed by another, is pausing to protest with widely opened mouth, while in the act of creeping into the mouth of the burrow.

Please notice the number of facts that are taught by this simple little group. It shows that the opossum is a marsupial, and the female carries her young in a pouch in her own body; that when the young reach a certain age they ride upon the mother's back, clinging to her fur; that the animal is arboreal in habit and has a prehensile tail, by which it is capable of suspending itself; that it burrows in banks in dry situations, and sleeps curled up like a ball in a bed of dry leaves. It also shows the full size of the adult, the young of the previous year, and the recent brood. But for an unfortunate accident, which has yet to be repaired, it would also show the number born at one birth. Of course in this group the grass and moss are properly represented, and there are artificial leaves on the tree branches which enter the group (pp. 240, 241).

Very truly Mr. Hornaday further remarks in the succeeding paragraph:

Groups of this class can easily be made to show the ordinary nesting and breeding habits of the animals represented. Now it happens that animals of some species make a variety of nests, according to circumstances or caprice. In 1889 we prepared a group in three sections, each of which shows one of the habits of the gray squirrel in nesting. Each is composed of an actual nest, and in the identical tree in which it was built by Bunny himself. One represents a nest in a hollow beech tree, in which a pair of gray squirrels bred for years. Another is what might be called a summer nest, made of cedar bark, in the top of a cedar tree. The third section represents an outside nest of green oak leaves, placed on a branch of an oak tree. These three groups are exhibited in one case, but while each is separated from the others by a plate of heavy tinted glass, it is made apparent that they all illustrate the habits of the same animal. The specimens composing the three groups were all collected within a radius of 10 miles of the city of Washington. Besides teaching what the nesting habits of the gray squirrel are, it also impresses upon the observer the very important fact that the habits of different individuals of a given species are capable of wide variation.* They show how dangerous it is for a student or scientific investigator to generalize too freely from one or two facts, and that it is dangerous for anyone to say what an animal will not do (p. 242).

Another scientifically mounted marsupial in the collection is seen in the single specimen of the great Rock Kangaroo (*Macropus robustus*) (Plate LXXIV). This piece of work was done by Mr. Jenness Richardson, then holding the position of taxidermist of the American Museum of Natural History of New York City, N. Y., where he produced some avian and mammalian groups quite worthy of his distinguished instructor, the artist from whom I have just been quoting. This large and thoroughly life-like specimen, placed in an attitude so natural to it, and with every structural detail so perfectly preserved, is decidedly the best kangaroo in the museum, and being so good, it has the effect of still further depreciating the specimens of bad taxidermy of animals of the same

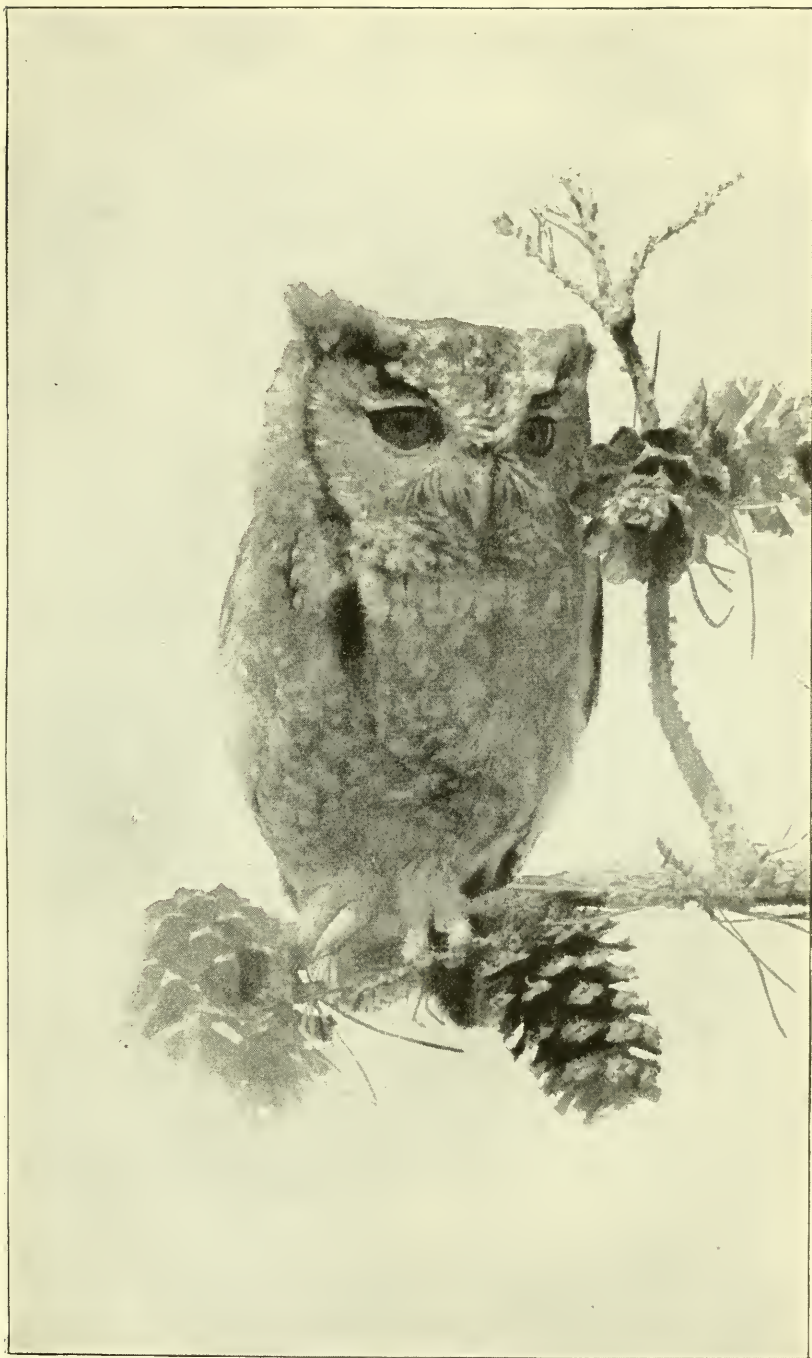
And what is quite as important, the species, as it occupies a very limited geographical area. Had the place where these squirrels were collected been in an unknown locality, and recently explored, one naturalist might have come away with specimens and one set of notes on breeding habits, and another, and a third, come away with different accounts, none of the three of which would have agreed in this particular.

family kept in its proximity in the mammal hall. Some of these are so bad that they have been ordered into the workshops for remodeling. Such a one is shown in Plate LXXV, and it is a very good example of how kangaroos ought *not* to be mounted.

About as near perfect as mammalian groups can be made is another one in the collection seen in the armadilloes (Plate LXXVI). This has three animals preserved in it, all in different positions, while the surroundings, as plants, cacti, etc., are originals that have been collected in the section where these interesting animals are found. So far as its taxidermy is concerned, it may be said that the form of the armadillo is more or less fixed, yet it presents problems to the taxidermist which are quite as difficult to deal with as is the fitting the skin of a hairy mammal to its manakin. If I remember (for the group has at the present writing gone on to the World's Fair at Chicago), some of the accessories in it, as the cacti, are casts, but their reproduction is so perfect, spines and all, that it is simply impossible to distinguish them from the plants as they occur in nature. Speaking of cacti and this group of armadilloes reminds me of a conversation that I had with Mr. William Palmer, who is now doing such admirable work in the taxidermy of mammalian groups at the Museum, in regard to the reproducing in some group a specimen of the giant cactus of our extreme southwestern territorial districts. It may be introduced with great effect in some one of a variety of ways, either in the mammal or the ornithological department, and it is to be hoped that that will be done some time in the near future. Mr. H. W. Henshaw once remarked to me that he found a species of our pigmy owls breeding in holes in the giant cactus, and a group embodying this idea would certainly be one of great value and interest.

A group of mammals requiring an entirely different kind of handling from any we have thus far noticed is seen in the Cetaceans. Papier-maché is here the material to reproduce its various species in the most satisfactory manner, and a very fine example of this is seen in the cast of *Prodelphinus plagiodon* (Cope), shown in Plate LXXVIa. Here much depends upon the skill of the colorist, and the smooth surface of the material used offers a beautiful ground to him whereupon to reproduce the exact natural tints of the animal as it is seen in nature. Mr. Shindler, of the Museum, is an adept at much of this, and examples of his skill are best shown in some of the fishes which were noticed upon a preceding page of this report. Incidentally it may be said that to the zoölogist this species of Dolphin is a very interesting one, and its characteristics and relationships have been set forth by Mr. F. W. True in Bulletin No. 36 of the U. S. National Museum publications, entitled "Contributions to the Natural History of the Cetaceans, a Review of the Family Delphinidæ" (p. 66). By all odds the papier-maché cast is the most effective way in which to reproduce the cetaceans for museum exhibitions.

I desire now, at this point, to invite attention to one of the larger



SCREECH OWL (*Megascops asio*).

Reduced. (From a photograph of a living specimen by the author.)



GREAT HORNED OWL (*Bubo virginianus*).
Greatly reduced. (Cat. No. 119367, U. S. N. M.)



GREAT HORNED OWL (*Bubo virginianus*).

Reduced. (Reproduction of a drawing from a photograph of a living specimen.)



BALTIMORE ORIOLE (*Icterus galbula*, ♀).
Somewhat reduced. (Cat. No. 103212, U. S. N. M.)

groups of mammals on exhibition at the Museum, and I will select that magnificent piece of taxidermic work seen in the moose group. A number of these massive cervidine animals have actually been mounted with the most perfect surroundings of their natural habitat in one great interesting collection, all under a single glass case. They are, probably without exception, altogether the finest series of mounted moose in this or any other country.

The act of the young buck riding down a sapling has been questioned by some, but I believe that the practice of the animal to accomplish that feat in order to reach the delicate foliage of the tree can be well substantiated.

Hornaday has said of this piece in his *Taxidermy* (pp. 246, 247):

The setting represents a section of the moose woods of upper Canada, in which the larger animals are browsing on the tender twigs of the white birch. The animals have come together at the edge of a bog, which is growing full of a gigantic species of grayish moss peculiar to that locality. The time represented is the middle of autumn. The few leaves that remain on the maple saplings have been painted with October's most gorgeous tints of crimson and yellow, mixed with green, and the leaves of the white birch have turned pale yellow. The ground is plentifully strewn with leaves of bright tints, through which the green moss of moist banks shows in patches here and there.

Of the animals, the three largest—and huge beasts they are, truly—are feeding upon the birch twigs. A yearling calf is licking the head of a tiny brown-coated younger brother, while a two-year-old bull is in the act of “riding down” a stout birch sapling in order to get at the branches of its top, which would otherwise be beyond his reach.

Three of these fine specimens were collected by Col. Cecil Clay, of Washington, and by him presented to the Museum for this group, together with the trees, moss, and other accessories, which he collected with infinite labor and care in the moose woods. He also furnished us with field notes and critical advice throughout, which had much to do in making the group what it is—a monument to Col. Clay's skill and prowess as a sportsman, and to his deep interest in *Alces malchis*. It is to be sincerely hoped that other sportsmen will follow the colonel's admirable example, and aid the museums in which they are most interested to secure some attractive groups. There can be no doubt whatever as to the perfectness in which these animals are mounted and preserved, and they are apparently in their external forms very true to nature. While we have the taxidermy of the Cervidæ under consideration, however, it would appear to be as well to refer to one great common defect that we have frequently observed made by taxidermists in them, and that is the lack of care that is sometimes evident in the proper handling of the lacrymal depression in these animals, or in other words, the pit which occurs in so many of them just anterior to the distal canthus of the eye. I have seen plenty of deer heads which, from an artistic standpoint were otherwise very creditable pieces of work, but in which this fossa had been almost or quite obliterated. It

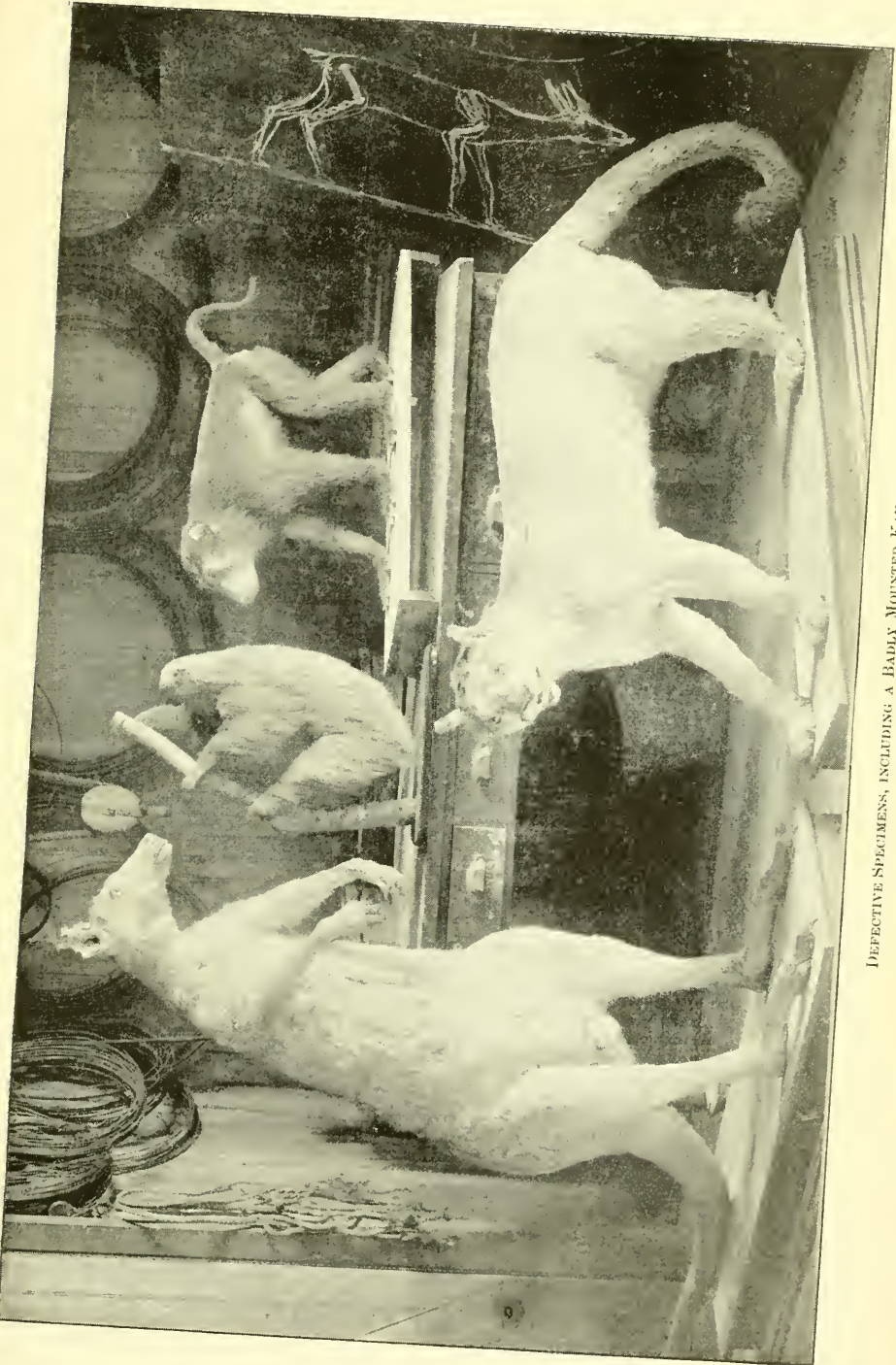
is to the strict attention to such anatomical details that very often the success and reputation of a taxidermist depends, and he can do no better than to see well to it that no such flaws creep into his performances.

This group of moose is about the only notable thing of the kind that the National Museum has for the Cervidæ at present, but this does not mean to imply that a general poverty exists in so far as that family is concerned. There are a goodly number of individual pieces of deer, some of which, however, are deplorable-looking objects, and fitting relics of those days when taxidermy had not reached to what it can do so well in these times. Among the better specimens we observe a fine piece in that representative of the antelope group known as Thomson's Gazelle (*Gazella thomsonii*), Plate LXXVIII. It has been entered as No. 18964 of the collection of the Museum, and has been recently described by Mr. True in his "An Annotated Catalogue of the Animals Collected by Dr. W. L. Abbott in the Kilima-Njaro Region, East Africa." (Proc. U. S. Nat. Mus. v, xv, p. 473., Pl. LXXVII, 1892). The faults in the mounting of this specimen are of so trivial a nature that it is not worth my while to enumerate them here, and were all the deer and their kin preserved as well as this specimen is, it would be far more of a pleasure to the sensitive naturalist to gaze upon them, who is now pardonably often shocked upon viewing some of his favorites in the museum cases.

But to return to the groups, we have now to notice perhaps one of the very finest accomplishments that the art of taxidermy has produced in this country. I refer to the case containing the several specimens of our now nearly extinct bison or American buffalo. This triumph in the preservation of mammals of ponderous proportions is almost entirely due to the consummate skill and perseverance of Hornaday, who has popularly described it in many places. This latter fact, taken in connection with the fine Plate (LXXIX) I have been permitted to give of it, renders it obviously unnecessary for me to dwell upon the general appearance of this life-like herd of bovines. They are all true to the life, preserved by all the most efficient methods of modern taxidermy, and, what is not generally known by people who are, or have been, privileged to see this case, that the very sod upon which these animals now stand was brought for the purpose all the way from Montana, being shipped direct from the buffalo ranges of that territory to Washington. This applies also to the sage-brush which is made to appear to be actually growing therein; and the broom-sedge, and the cacti. The skulls and other bones of the buffalo lying about were gathered in the same place; indeed, as a whole, it is a strip of a Montana prairie of an old range of these animals, picked up piecemeal, and now again unfolded in the case at the Museum just as it occurred in nature. Even the very buffalo tracks seen about the pool of water in the case were made by using a real buffalo's hoof for the stamp to make the impressions. No



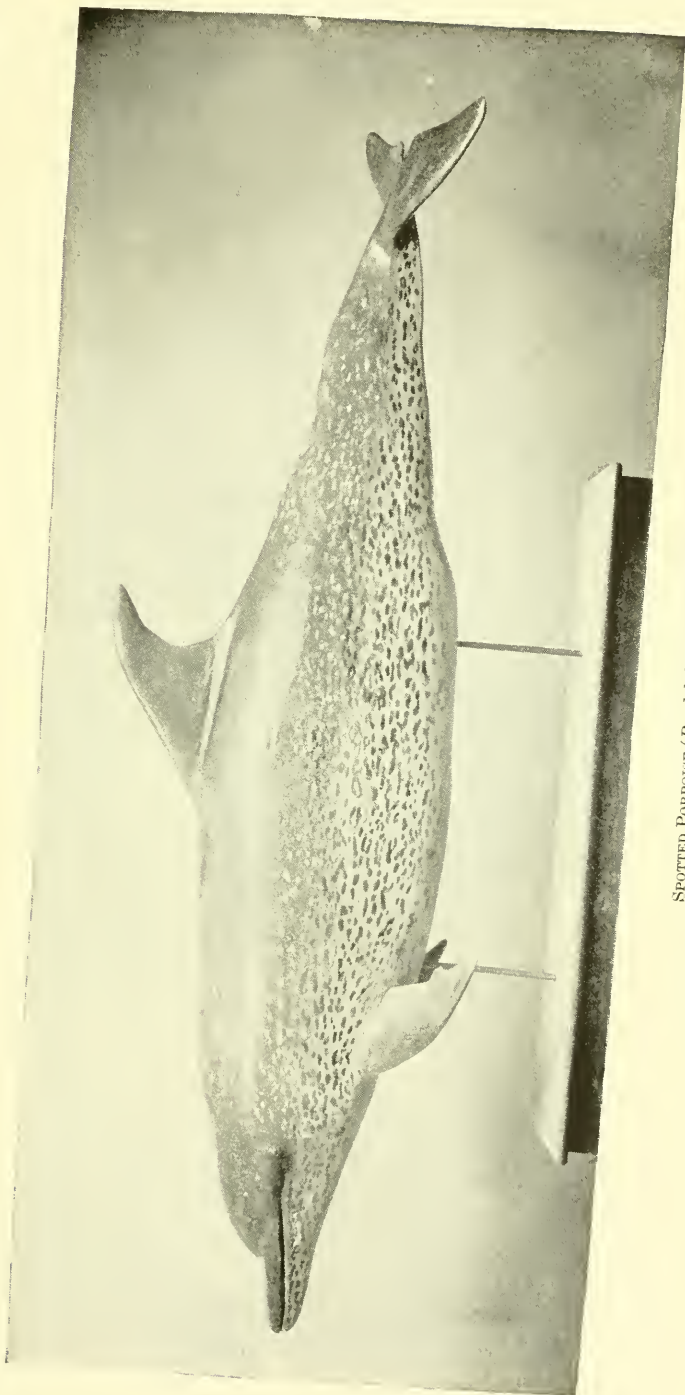
GREAT ROCK KANGAROO (*Macropus robustus*, ♂).
(Cat. No. 13265, U. S. N. M.)



DEFECTIVE SPECIMENS, INCLUDING A BADLY MOUNTED KANGAROO.



GROUP OF ARMADILLOS (*Tatusia novem-cincta*).



SPOTTED PORPOISE (*Prodelphinus plagiodon*).
From a papier-maché cast; greatly reduced. (Cat. No. 22017, U. S. N. M.)



FLYING LEMUR, OR COLUGO (*Galeopithecus volans*).
An example of bad taxidermy. (Cat. No. 3946, U. S. N. M.)

art known to me has ever accomplished a grander feat than this, and it is as fully worthy of our unstinted admiration as is any form that has ever materialized beneath the chisel of an Angelo or a Hiram Powers. And were I to choose between being the author of Paul Potter's bull and these buffalo, I should without a moment's hesitation decide in favor of the latter.

They will be standing in as good order as they are at this writing, long after the former has faded away from off its canvas.

Many fine groups of mammals were by the National Museum sent on to the World's Columbian Exposition at Chicago to form a part of the Smithsonian exhibit. Most of these were as fine things of the kind as have ever been seen in this country, and the writer of this report enjoyed the unusual privilege of seeing many of these in the course of their mounting. This was accomplished by a corps of skillful workmen, including such men as Mr. Joseph Palmer, William Palmer, George Marshall, and others, the whole being under the direction of Mr. F. W. True, curator of mammals.

It would be quite out of the question to even enumerate, not to say describe, all of the groups or single pieces of mammals that now enrich the collections of the U. S. National Museum. We can at the best put in a word here and there about the most notable of them and the good or bad points they offer us. Among those as yet unnoticed is the fine case containing the three specimens of *Oribos moschatus*, the musk oxen, and I have heard various criticisms in regard to the forms that were bestowed upon those animals by the taxidermist who preserved them. Never having seen the animal alive, I hardly feel competent to judge in the matter, but that the group is a most pleasing one there can be no question. They are represented standing upon barren rock which has recently been overlain by a light fall of snow. This last has been admirably rendered by a composition compounded of starch, the pulp of white blotting paper, and plaster-of-Paris—an invention of Mr. Joseph Palmer's that has produced a very realistic effect.

Perhaps the best mounted specimen of a Musk Ox now extant is the one in the possession of E. V. Skinner, esq., of the Canadian Pacific Railroad Company, and valued at \$2,500.

Mr. Frederic S. Webster published an account of this animal in *Forest and Stream*, of New York, in its issue of January 26, 1893, and gave a figure of the Ox. Through the kindness of Mr. Skinner for the waiving of copyright and loan of the electro of that figure we are enabled to reproduce it here in Plate LXXX. Mr. Webster's article in *Forest and Stream* was entitled "An Arctic Rover," and ran as follows:

The musk ox (*Oribos moschatus*) is considered by naturalists one of the rarest of our North American mammalia. In a clime of almost perpetual winter, within the Arctic Circle, this animal lives and thrives. In a land which has been so fascinating and so fatal to the many explorers who have sought to solve the mysteries of

these desolate rocky ice-bound fields, in which no animal, it would seem, could exist, the hardy musk ox roams at will during the entire year. The ability to stand the rigors of such a climate is a striking feature of its interesting life history.

The musk ox is at present found only in the most northern parts of North America, where it ranges in small bands on the barren grounds between the sixtieth parallel and the shores of the Arctic Sea. Its southern range is gradually contracting, and it is no longer met with west of the Mackenzie River. It is found through the Parry Islands and Grinnell Land to North Greenland, reaching on the west coast as far south as Melville Bay. It was met with by all the polar exploring expeditions, including the De Long, Hall, and Greely parties. Lieut. R. E. Peary in his late Greenland journey secured several specimens of various ages, and reports it comparatively abundant. The German polar expedition of 1869-70 found it at Sabine Island on the east coast. In former times the musk ox roamed in other parts of the world. Its fossil remains, or those of an allied species, have been found in northern Siberia and the plains of Germany and France. It has also been found in the gravel beds in several parts of England, as Bromley, Bath, and Freshfield, and also in the brick earth of the Thames Valley at Crayford, Kent.

In size the musk ox equals the smaller varieties of Scotch and Welsh cattle, but in structure and habits it is more like the sheep; and the combination of characteristics is well expressed by its generic name, *Oribos*. It is gregarious in habit, going in herds of 20 or 30 head, and sometimes 90 or 100 have been observed. The bands contain one or two full-grown bulls. Notwithstanding their short legs, they run with considerable speed. When frightened, they gather together like a flock of sheep, and follow a leader as sheep do an old ram. This habit makes the total extermination of a herd an easy task, when it is the desire of its destroyers to accomplish it. When thoroughly alarmed they easily ascend precipitous slopes, their curved, sharp-edged hoofs greatly aiding them in gaining a foothold.

The name of musk ox is given on account of the musky odor exhaled by the animal. The odor does not proceed from any special gland, as in the case of the musk deer and other animals which secrete a musky odor. The cause of this peculiar odor has not been satisfactorily explained.

According to Sir John Richardson, "when the animal is fat its flesh is well tasted and resembles that of caribou, but has a coarser grain." According to other authorities the flesh of the bulls is highly flavored, and both bulls and cows, when lean, smell strongly of musk. This odor does not seem to be confined to either sex, or to any particular season of the year. At times the flesh of some of the animals is said to be tender and very well flavored.

The carcass of a good-sized male will weigh 300 to 350 pounds. In summer they accumulate considerable fat, and during winter use up this fatty tissue. The males are considerably larger than the females. The cows calve about June 1, giving birth to one young one. The animal is also known as musk buffalo and musk sheep, both very expressive names.

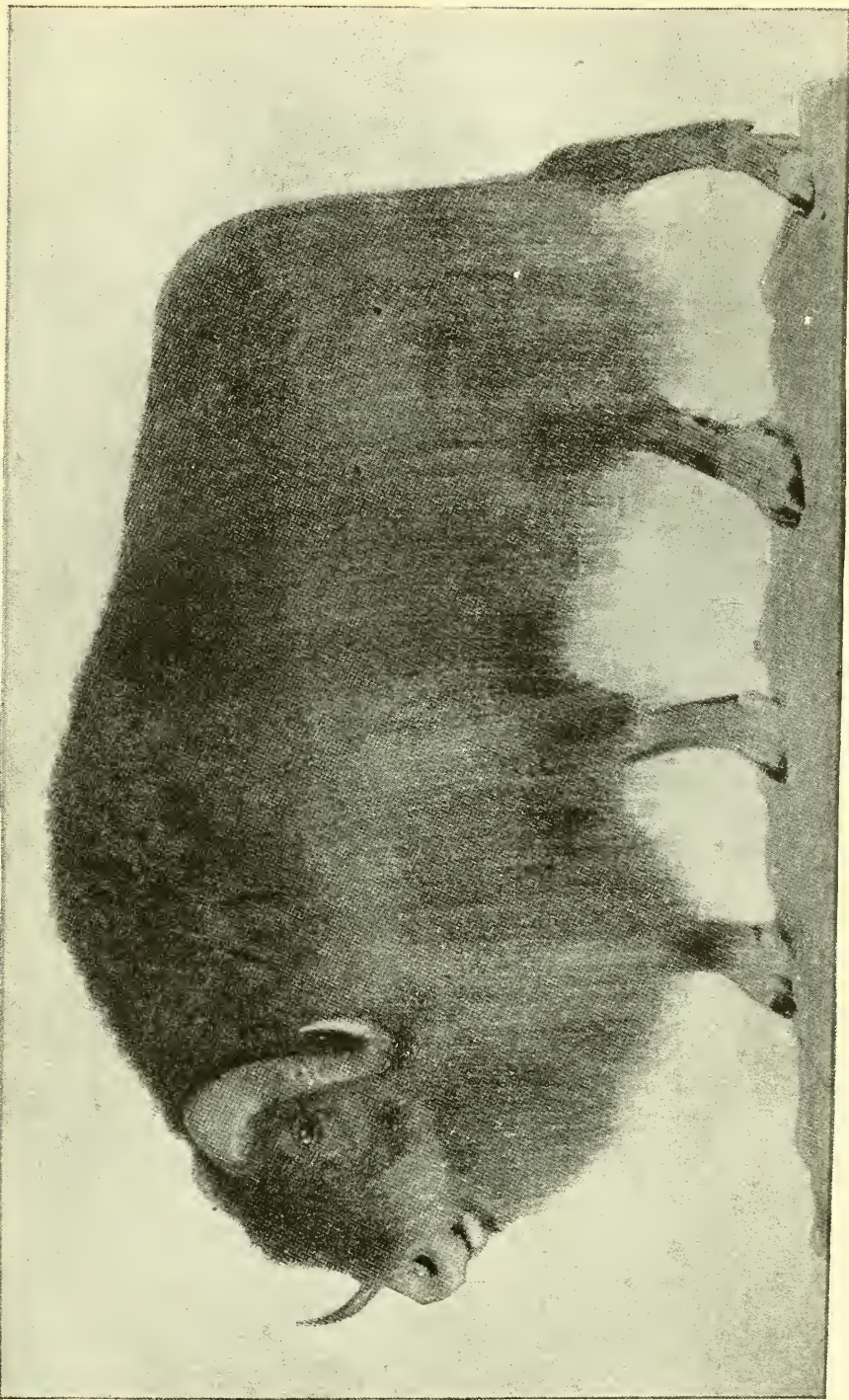
The animal has a very prominent tendency to a hump. The dorsal processes of the vertebral column, as shown in the skeleton, indicate this. The dense, long, and somewhat stiff bunch of hair over the shoulders plainly proves that the animal possesses a hump. All specimens which have been heretofore mounted do not show this feature of the animal. The head is large and broad. The horns in the old males are extremely broad at the base, meeting in the median line and covering the whole top of the head. They are directed, at first, slightly outward, and then suddenly downward by the side of the head, and then they turn upward with a graceful curve, and forward, ending in the same plane as the eye. The horns at the base are rough, but gradually grow smooth from the center to the tips, which are round, glossy, and black. At the base they are a dull white. The horns of the females are much smaller, and at their base the space between them is much broader in the middle of the forehead. The ears are small and are concealed in the hair. The space between the nostrils and the upper lip is covered with a short, close hair, as in goats and



THOMSON'S GAZELLE (*Gazella thomsonii*, Günther).
(Cat. No. 18064, U. S. N. M.)



GROUP OF AMERICAN BISON (*Bison americanus*).
(Cat. Nos. 15697, 15703, 15503, 15685, 15686, 15694, U. S. N. M.)



Musk Ox (*Oribos moschatus*).
(Published by permission of E. V. Skinner, esq., of the Canadian Pacific Railroad Company.)



HEAD OF ZEBRA (*Equus burchellii*).
(Cat. No. 15130, U. S. N. M.)

sheep, and has no trace of the bare "muffle" of oxen. The general color of the hair is a rich brown, shading into black. It is long, matted, and rather curly at the neck and shoulders. On the back and hips the hair is long and straight, on the sides of the body exceedingly long, so long as to hang below the middle of the legs. In some specimens which we have measured the longest hairs have been 20 inches long. In the center of the back there is a patch of soiled brownish white, termed the saddle.

There is a closely-matted short under wool, exceedingly soft and fine of texture, and so dense that it is impervious to snow and rain. On the chest the hair is long and straight, and hangs down gracefully like fringe. The tail is short and hidden in the long hair on the hips. On the legs the hair is short, stiff, and without any underwool. The hoofs are much curved and larger than those of the caribou, which they resemble in shape, and the eye of a skilled hunter would be taxed to detect the difference between the tracks of the two species in the snow. The bones of the animal are very dense; those of the legs have the weight and appearance of ivory.

The food of the musk ox is similar to that of the caribou, and consists of grass at one season and lichen at another. The curved hoofs enable the animal to scrape away the deep snows which cover their scanty food. Their sense of smell is very acute. The illustration of the musk ox here given represents the character of the animal. The specimen from which it is taken is the largest in this country or Europe. The skin of this specimen was obtained by E. V. Skimmer, esq., of the Canadian Pacific Railroad, and placed in the hands of Messrs. Sowdon and Webster, of 14 East Forty-second street, this city, who have prepared it, as faithfully represented by the plate. Through the kindness and by the permission of Mr. Skinner we have the pleasure of placing before our readers this handsome likeness.

This specimen was sledded by natives over 1,400 miles near Fort Franklin, and was received here in fine condition. The order for it was given three years since and the specimen has been in transit most of this time. The few measurements may serve to impress the reader with the proportions of this particular specimen. The animal stands at the shoulder 4 feet 5 inches; the length from nose to stern is 6 feet 7 inches; height at the rump, 3 feet 10 inches; length of head from base of skull to end of nose, 24 inches; length of horn from median line, following the outside curve to tip, 24 inches; width of both horns at base, 12 inches; diameter of horns at base, $9\frac{1}{2}$ inches; breadth of muzzle, $4\frac{3}{4}$ inches; circumference of muzzle, 14 inches; circumference of hoof of front leg, 17 inches; circumference of hoof of hind leg, 13 inches.

There are but four other mounted specimens of the musk ox in this country. One is at Harvard College, Cambridge, Mass., and three compose a group at the U. S. National Museum, Washington, D. C. Of these, one is a male, one a female, and one a two-year-old, none of them superior specimens.

Among the mounted species of the *Equidae* at the National Museum none can, in my estimation, in any way approach the specimen of Burchell's zebra (Plate LXXXI). The animal has been given an attitude indicative of moderate movement, with the evident idea in its mind of making an attack or standing at bay, in which he will use his teeth to bite—a habit so familiar to us in some cases of vicious horses. The short mane is semierect, the ears are thrown back, the eye looks the owner's intent, while the quivering and nearly rigid lips drawn apart show the glistening upper "nippers" and the crowns of the lower ones; the nostrils are somewhat closed by the elevation of the superior lip; finally, the entire rendering of the whole animal is most perfect in all particulars. I am enabled to present herewith the left lateral view of the head of this zebra, so its excellence may be the better appreciated.

But the climax of the taxidermist's ambition is reached when he can mount a hairless mammal, large or small, that is at once a perfect reproduction of the original, and will keep indefinitely uninjured by the ordinary ravages of time and pests. Of this kind of work the Museum has several notable examples, and none of these can exceed in beauty of design, and consummate skill and knowledge in workmanship the now famous African elephant "Mungo" (Plate LXXXII). Chief among the factors of success in mounting an animal of this kind is the fact that the skin is laid over a thick coat of clay, which latter overspreads the manikin. Through this ingenious device, after the skin is on and the taxidermist essays to model the form to copy the live animal in every particular, it is seen that all the depressions, wrinkles, lines, and pits, and protuberances can be exactly reproduced by the proper simple instruments by working them on the skin through the agency of the yielding clay beneath it. I have compared most critically this specimen "Mungo" with photographs of living elephants in my collection, and find that in each and every particular it is anatomically correct, and that the attitude is most perfect. Another piece which shows equally well the master hand is the specimen of the hairless Mexican terrier (Plate XC). This dog had no hair at all apparently, and his skin was as thin as ordinary writing paper, but through the aid of a plaster cast of his entire body as a model and the use of the clay-covered manikin, a most remarkably fine thing has been produced. This specimen has also been delicately tinted where it became necessary, and as now preserved will last without change for an indefinite length of years. Hornaday mounted both "Mungo" and this terrier. The first received the silver specialty medal awarded "for the best piece in entire exhibition" at the New York exhibition of the Society of American Taxidermists in 1883, which prize was nearly wrested from it by the judges and given to the terrier, which had been entered in competition against it. This process of using clay has also been employed by its introducer in mounting the bison, polar bear, Burchell's zebra, the tiger, and the puma, figures of each of which illustrate this paper and are the work of the same illustrious taxidermist.

Speaking of comparing "Mungo" with photographs of living elephants brings up the use of the camera again as applied to mammals. Now, I entirely dissent from Mr. Hornaday's opinion as to the necessity of taking photographs of all the mammals we can. I believe in photographing them in all positions, every possible species, wild and domesticated, living and dead. In his *Taxidermy* (pp. 21, 22) he remarks:

To the taxidermist and collector, photographs of dead animals are of very little value, unless it be a large picture of the head of a large specimen, such as a moose, but that photographs of live animals, taken "broadside on," as the sailors say, are extremely valuable aids in mounting; but these you get only in the zoölogical gardens. I never took a camera into the field with me, and have always been glad of it, for it would not have repaid the trouble it would have involved.



AFRICAN ELEPHANT "MUNGO" (*Elephas africanus*, juv.),
(Cat. No. 13418, U. S. N. M.)



Fig. 2. WESTERN "PRAIRIE DOG" (*Cynomys columbianus*, ♂).



Fig. 1. WESTERN "PRAIRIE DOG" (*Cynomys columbianus*, ♀).

(From photographs.)



JACK RABBIT (*Lepus callotis callotis*, ♂).
(From a photograph by Dr. R. W. Shufeldt.)

When a person writes in such a strain as this I am convinced he has not made himself master of the instrument, and knows but very little about its capabilities. Why, even my very earliest attempts in this line, in the photography of living and dead mammals in the field, I still claim are of some use, while others of them are highly suggestive. Take the *Cynomys* or Prairie dog, shown in Plate LXXXIII, Figs. 1 and 2. I made that photograph while the animal stood at the very entrance of his burrow. It was in New Mexico. The relative position of the eye, the ear, and the nose are well shown in Fig. 1, while the prominent cheeks are clearly defined in Fig. 2. Whoever it was that mounted the group of these animals at the National Museum I do not now just remember. It may have been Mr. Hornaday, but whoever it was he did not appreciate this prominence of the cheeks in *Cynomys*, and I must believe that such a figure as here given would have enlightened him on the subject.

There is another structure that I have noticed that is rarely well preserved, and that is the ears of large hares. These appendages, as I have studied them in most museum specimens of *Lepus*, always to me appear to be more or less shrunken. This especially applies to the ears of the American Jackass Rabbits (Plate LXXXIV), and the proper preservation of the form, size, and coloration of these is, of course, very important. All these particulars are well shown in the plate, although it is only a dead animal, it being a photograph I made of one of those hares immediately after I shot it. Another example of the kind is seen in my photograph of a dead Badger (Plate LXXXVIII). The attitude here shown corresponds exactly with one which, among others, it assumes while in the act of burrowing, and many a person whom I have shown this picture has been deceived by it to the extent of mistaking it for a live specimen. It gives a first-rate idea of the form of the badger's head, position of ears, etc. Had a full series of even such photographs as these been available, or had it been possible for the explorers in foreign climes to have taken with them one of the many highly convenient forms of cameras now manufactured, and used it intelligently, I am quite confident that, had the older taxidermists the ability to avail themselves of the pictures obtained in this way, we should not have had so many abominable things to look at in the cases of our museums, and be told on the labels that this represented that animal, and that this, and so on. Things, for example, like the flying lemur, shown in Plate LXXVII. Horrid is not the name for such work as it represents, and it is a pity that that taxidermist did not have a good photograph of the head of a *Galeopithecus*, living or dead, when he started in on the specimen. Apart from the head, we see feet that seize nothing, shriveled ears, protruding wires, distorted form—and those eyes!

There is still another class of cases wherein the camera can be made to do great service, and this is where we meet with an animal given to building for its home a large and cumbersome nest, such as is seen in the *Neotoma* group in the collection. With the enterprise now exhibited

upon the part of museum collectors and taxidermists, the feat of transporting such a structure from the wilds of the Southwest to the mammal hall of the National Museum would be considered perfectly feasible. But before disturbing such a nest in any way where the rats had originally built it, it would most assuredly be the thing to do to make a good photograph of it, so that, in the event of having to restore or arrange parts of it after its transportation and arrival, we would have the photograph as a model, and the best that could be procured. Indeed, with the material at hand the entire nest could be again rebuilt by it, as for the matter of that.

From the standpoint of the introduction of groups of mammals, illustrating habits, etc., such a nest as this presents the problem of devoting a large piece of valuable space to a very small animal. But we contend here, most emphatically, that the lesson it teaches is fully worthy of it, and these are the very kinds of objects that we should devote our very best pains to introduce, with a strict fidelity to nature, into our zoölogical museums. I would go farther; I would go to the extent of giving many square feet of museum space, and faithfully illustrate in the very best possible manner, a group of beavers and the dam they build. These animals are now being rapidly exterminated in our country, and ere they are gone entirely it is surely our bounden duty to entertain such an idea with the view of carrying it out. Typical beaver dams are quite as scarce as the builders of them, but one should be sought at an early date, photographed from various points of view, and, cost what it may, reproduced at the National Museum.

Few, at the best, realize how rapidly many of our mammals in this country are being forever swept away. We are fortunate at the National Museum in having preserved, in the very best manner, a number of them, but there yet remain a great many more demanding our attention, and, in some cases, our immediate attention. It is the Government's first duty to see to this matter, and Government aid should not be withheld for a moment where such enterprises are on foot, but should, on the contrary, not only propose them, but encourage the undertaking in every possible way. I have always entertained the idea that the education of the people of any country is one of the best, if not the best investment that that country can make, and surely none of us will question but what zoölogical and other museums are great educators. We stand very much in need of a zoölogical museum in connection with our other Government museums, one large building devoted exclusively to everything in the animal series below man. We have no such building at present. We have been very generous to ourselves in these matters on a number of occasions in the past, but the income from it has well repaid us each time, and the benefit therefrom as a whole is simply incalculable. The time is near at hand again when we should think of repeating one of those wise acts, one of those well-put investments.



WHITE OR POLAR BEAR (*Thalassarctos maritimus*).
(Cat. No. 13361, U. S. N. M.)

There is another, and now exceedingly rare animal, it being on the very verge of extinction, which our museum is exceptionably fortunate in obtaining a specimen, before the destructive and thoughtless hand of man eliminated it entirely. I refer to the walrus. This animal's status is now pretty well known to the reading public, through the publications of the National Museum, those of Mr. H. W. Elliot, of William Palmer, and the daily press incidentally to the general question of the seal-fishery problem. The Museum walrus was mounted in the light of all the improvements and skill modern taxidermy could bring to bear upon the undertaking, and the success was complete. It constituted when finished one of the grandest subjects the Smithsonian sent on to the Government exhibit at the Columbian Exposition, where at the present writing it is. On Plates LXXXVI, Figs. 1 and 2, and LXXXVII I am permitted to give a series of figures from photographs taken at various times during the preservation of this colossal mammal. These so clearly represent what I intend they should that special explanation of any one of them becomes unnecessary. The series are destined to be illustrations of the very highest interest for ages to come, and ere another century rolls by, people will regard them with wonder, and that men actually preserved such a brute, in the flesh, will read far more like fiction than a reality. At a far remote period it will be classed with such ideal scenes as prehistoric man engaged in slaying a mammoth or rudely carving upon the tusks of one.

Some of the seals and other marine mammals in the Museum are very fine in every particular, while, on the other hand, some of them sadly need reduplicating, as they, too, are soon to be exterminated. This applies also to the bears, of which there are some very handsome representatives, but none more so than the Polar Bear (Plate LXXXV), of which there is not a finer mounted specimen in the world. He is represented as walking up an ice floe at a slight incline, and from the free upper margins of which hang many icicles. Ice is often wonderfully well counterfeited by using a moderate coat of paraffin over sheet glass, or even wood, and we gain the proper effect through its transparency. The icicles are of glass, of course, and made especially for the purpose, while the *tout ensemble* of the effect is perfect.

When another commodious zoölogical building is added to the present group of Government institutions, I am of the opinion that the correct idea is to not only show groups of animals composed of one species, but to a certain extent faunal groups, wherein can be worked with the greatest advantage many other natural productions of the country where the animals occur, as plants, topography, etc. Now these large groups, if arranged round the wall space, with a varying depth of 5 to 25 feet, may in some cases be made to advantageously merge into each other—that is, to a certain extent, show regional groups and their mergences. For instance, one large case might be cou-

structed to represent an arctic realm, carried down in the foreground and to one side to the seashore, and upon another rocks, glacial ice, sheet ice, and what not, as representing the higher land. Then the foreground should be merged with the background by a skillful artist, so as to carry with it great depth, and offer the opportunity to show peculiarities of a sky perhaps, and the effect of distance, as well as to add other accessories, as a distant shore covered with seals, or, higher up, a herd of caribou. Such a case could be made to contain an entire marine mammalian fauna, and be made far more instructive and imposing than single specimens uncomfortably huddled or scattered through the various cases, absolutely ignoring any zoological arrangement.

We have the power and the understanding now to carry out such bold designs, and it is high time that we were about it. The whole tendency is in just such directions, and all it requires is skillful handling. What an object lesson or lessons such groups would be, and this broad and deep country of ours, including every kind of a fauna and flora from Alaska to Florida, thriving in every variety of climate, includes the very series of zones, realms, and areas that should by just such means be illustrated. It would represent ideas and groups of ideas, and ideas are what we want. It would powerfully illustrate literature as the biologist now makes it for us, and in an orderly manner show our people what we mean by faunal areas, Arctic realms, geographical ranges, variations of animals under varying conditions of altitude, desert areas, and shore lines. Museums, among other things, are made to educate the people of a nation; but a favored few of the people can study such things in nature. So it is the business of the museum to bring whole living sections of nature within its walls, where it can be studied and where books and labels are displayed in abundance to help show how it ought to be studied.

When we can make such animals and groups of animals as those shown in Plates LXXXIX, or LXXIX, or LXXXI, there can be no question in the world but what the more extensive groups can be combined with more telling effect. But to be successful in the highest sense of the word there must be no cheap designers, cheap modelers, cheap artists, or cheap anything employed; all must be of the very best that the United States affords—and we have it in both talent and material. Especially for the painted backgrounds should an artist of the very highest ability be employed, with a staff of others to assist in the introduction of distant animals, forests, or marine effects. If refinement, knowledge, science, and art are wholesomely combined in such efforts there is not one bit of danger of either producing a cheap museum effect, much less anything that savors of the scenery of the theatrical stage. In one sense it would be far more economical, in the same proportion that it is far more so to make one large case of animals than it is to build up six or eight small ones.

Then the space throughout the Museum halls, apart from the regional

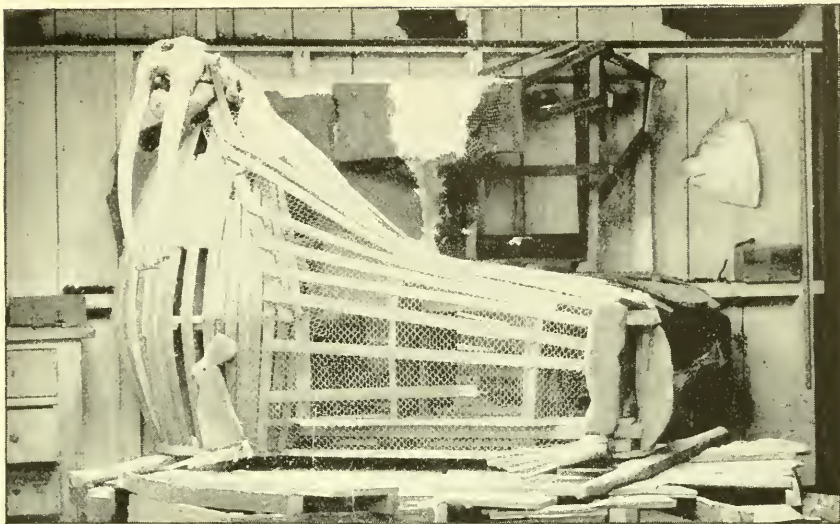


Fig. 1. MANIKIN FOR A WALRUS.
(Partly completed.)

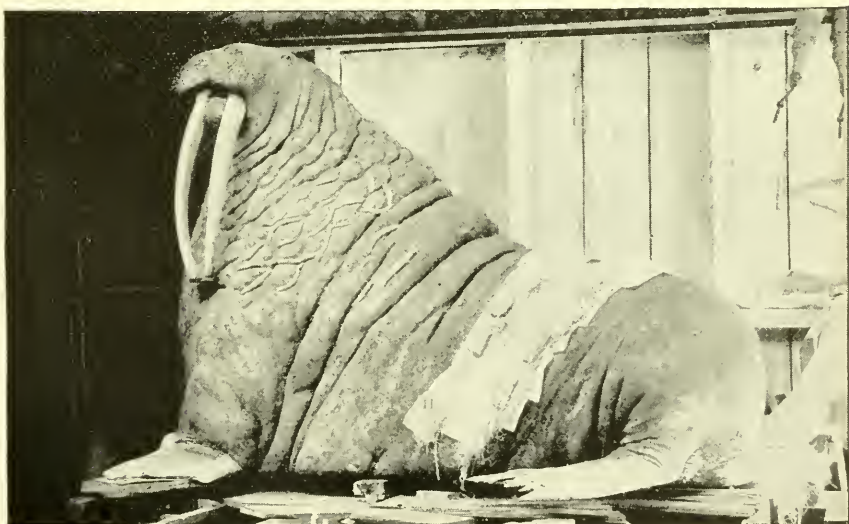


Fig. 2. WALRUS (*Odobenus obesus*, ♂).
Nearly completed. (Cat. No. 19245, U. S. N. M.)



WALRUS (*Odobenus obesus*, ♂).
In course of completion. (Cat. No. 19245, U. S. N. M.)

groups occupying the walls, could be advantageously devoted to cases of the smaller species groups, single pieces, and other specimens.

Coming to the *Felidae* in the collection of the Museum we find it represented by specimens similar to those in the other groups, in other words by the good, by the bad, and by the indifferent, and these are the most undoubted examples of every genus of this provisional classification. We see a specimen of the last-mentioned kind in the lynx shown in Plate XC, wherein faults about the mouth, slightly wrinkled ears, and some minor points debar it from the category of the best specimens of taxidermy. While on the other hand the grand specimen of a tiger, the head and fore part of which is given in Plate XCI, has not its peer for that species in any public museum in the United States. The Puma is also another admirable preserved specimen of this group.

Of this group Hornaday has said that the "large *Felidae* (tiger, lion, leopard, etc.) are the finest subjects for the taxidermist that the whole animal kingdom can produce. They offer the finest opportunities for the development of muscular anatomy, and the expression of the various higher passions." (Taxidermy, p. 171.) This may be very true, but in my opinion the pieces left by this talented artist to commemorate his name after his connection with the Museum was severed, and the ones which will most surely pass his name down into history as a most masterly taxidermist of his time, are the group of American bison, and "Mungo" the African elephant, though his Bengal tiger, to gain a similar place, be stepping in the very footprints of the latter as he leaves them.

One who has not seen the feat performed in one of our larger museums can have but little conception of the skill required in handling the facial expression and all the structures that enter into the mouth parts. The skinning of a tiger's tongue and preserving it so as to make that organ resemble the original as it appeared in the living subject; the cleaning of the teeth; the blending of the black part of the lips with the delicate pink gums inside; to make the animal grin and not smile, and to lend to the eyes the flash of anger, are all accomplishments that demand of the artist his best judgment, knowledge, skill, and, what is more, his infinite patience.

I agree with him when he says:

Some of the old-fashioned taxidermists have the habit of smearing a lot of nasty lampblack in the eyes of every mounted mammal [and a variety of birds, too], for what purpose no one knows, but possibly in imitation of actresses, some of whom have the same unaccountable trick, and a hideous one in its results in both cases. There is only one point in its favor: it is the easiest way in the world to give an animal a black eye. (*Ibid.*, pp. 177, 178.)

Many groups of monkeys and the higher apes now adorn the cases in the mammal department of the U. S. National Museum. Some of these are among the best groups of the kind in the hands of the institution. Among them is the now famous group of Orang-utans, too

well known to require description in this place; and there are others of equal beauty and interest.

Of recent years a great deal of well-directed energy and skill has been brought to bear to reproduce various races of men, and these attired in their native costumes and represented in the pursuit of various employments. They are, as a rule, the size of life, and so real in the majority of instances as to excite the wonder and admiration of all who chance to behold them for the first time. But this subject has been found too extensive to handle in the present connection, and it will no doubt furnish the material for another writer at some time in the near future. If ever the Museum indulge in the mounting of such groups, the propriety of which seems to be questionable, as Jules Verreaux's "Arab courier attacked by lions," or John Wallace's famous "Horseman attacked by tigers," and similar efforts, why this would appear to be the more proper place for them, rather than any department of zoölogy. If not showing too much or great activity, or otherwise not too sensational, some such compositions are quite instructive, and to the public always interesting.

So far as I am aware at present, the Museum has never undertaken to preserve man, by any other process than the ones now employed, of clothed manikins, the faces and heads being obtained by casts or other means. That the direct preservation of man's body intact has been elsewhere attempted, however, there can be no doubt, and with some measure of success. On page 14 of Capt. Brown's little work on taxidermy, I read:

Numerous have been the attempts of mankind to preserve the skin of their fellow-creatures. The very best of these have been most disgusting deformities, and so totally unlike the "human form divine" that none of them have found a place in collections, with the exception of some parts of man, which form part of the European anatomical collections. In the museum of the Jardin du Roi, at Paris, there is one of the best things of this kind which we have seen, a human head injected and preserved in spirits of turpentine. This curious preparation was the production of Rintel, a Dutch physician, highly celebrated for his pathological skill. The precise manner this interesting preparation was originally preserved is not known. However, it retains to the present day, all the original and natural colors. In winter, the cold affects the spirit so much, in which it is preserved, that the head can not be distinguished, until the return of warm weather, which dispels its cloudy appearance. The New Zealanders have a method of drying and preserving the heads of their chiefs, with the flesh entire. Many of these are to be found in museums; but they are of little use, and by no means calculated to produce pleasurable sensations.

We may safely predict that no method will ever be discovered, by which man can be preserved so as to be fit for placing in a museum. (1870.)

Could Capt. Brown but see the host of thoroughly lifelike Indians, Africans, Japanese, Samoan, Aino, Esquimaux, and Caucasian figures, of all ages, and both sexes, that Prof. O. T. Mason now marshals in his department, he could have but one opinion about it, and that is that the necessity therefor had gone by.

As I closed upon a former page of this paper what I had to say about the taxidermy of birds, I passed a few brief remarks upon the



AMERICAN BADGER (*Taxidea a. americanus* Boddaert).
(From a photograph of a dead specimen.)



A GROUP OF COYOTES (*Canis latrans* Say).
(Cat. Nos. 15491, 15707, 15708, U. S. N. M.)

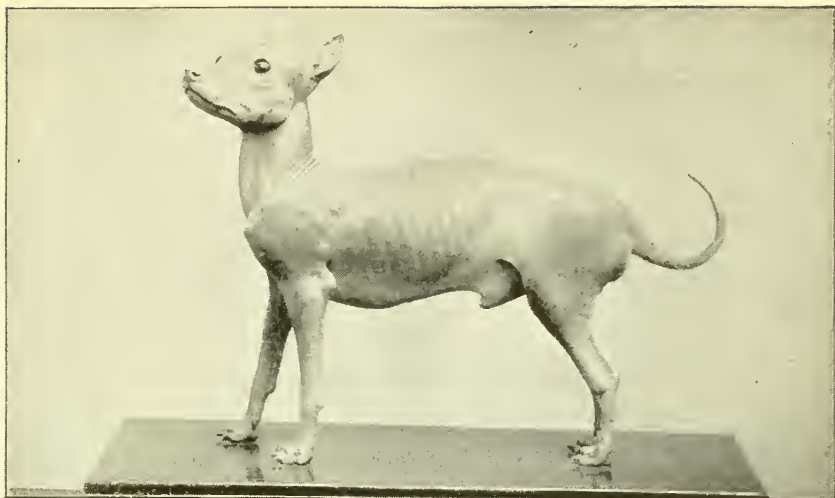


Fig. 1. HAIRLESS MEXICAN TERRIER.
(Cat. No. 116718, U. S. N. M.)



Fig. 2. LYNX (*Lynx rufus*).



HEAD OF TIGER (*Felis tigris*).
(Cat. No. 15386, U. S. N. M.)

hall in which their cases were exhibited. In this particular the mammal department is far better off. It being in the National Museum building proper, a comparatively more modern structure, it is both well lighted and well ventilated. The casings are of the most recent improved kinds, and set off their subjects very satisfactorily. An object of great interest, and suspended from the roof, is the vertical mid-section of a hollow papier mâché whale, into which has been placed a skeleton of the same species *in situ*. It renders a fine idea of the position of the osseous framework of this huge marine mammal.

CONCLUSIONS.

In writing out the account of my observations and in giving my opinions for this report on the present status of the art of taxidermy, and what may be hoped for it in the future, I have been very largely influenced by what I have seen and been enabled to study in the collections of the U. S. National Museum and Smithsonian Institution at Washington, D. C. When my labors were first undertaken it was the intention to incorporate herein descriptions of methods and work, with the appropriate plates illustrating it, of many other museums, both here and in Europe. In some few instances this has been accomplished, while from one reason or another it has failed in others. Often institutions of the kind we speak are more or less sensitive on the point of submitting their work for an impartial criticism, and so withheld it: while in others such a very large proportion of the work was so far below the standard of what taxidermy ought to be in these days, that for very obvious reasons it has been placed aside without notice. Looking broadly over the field and taking the subject as a whole, I am of the opinion that there is, even in many of our first-class museums, very wide room for improvement in such matters. My aim has been throughout this entire paper to accord full praise where it appeared to be justly merited, and in those cases where the work was below what it ought to be I have endeavored to keep myself above mere fault-finding by simply indicating the only too apparent errors. We are to be congratulated that the art is making such very satisfactory progress among us, and that at the present writing, in our most advanced institutions, Government and otherwise, there is to be found so much to be praised and recommended and so little to be condemned.

Much might be said here on the subject of suitable museums for the exhibition of scientific collections of preserved animals, but this phase of the question will be, as has been said, dealt with in another place. Be it enough to say here in passing that our Government museums are as yet very faulty in this particular and far behind some of the better institutions in, for example, England and elsewhere. The old ornithological hall in the Smithsonian building is already crowded to overflowing, and is at the best but illy suited for the purpose, a large

proportion of the recesses being so very dark that the specimens can not be properly seen, much less studied. The National Museum building is better fitted for the exhibition of ethnological and other material than it is for zoölogical. We stand in need, very much in need, of a scientifically constructed zoölogical museum, for, in the first place, to properly exhibit the superb collections that have within comparatively recent times grown up here, and, second, to relieve the buildings already in use. As the British Museum threw off its South Kensington Department of Natural History, so has, and from like causes, the time come for us to make a similar step.

I have called attention to the fact that taxidermists should be thoroughly educated men, fully trained in all the technique of their art in its broadest sense, as pointed out in the body of the paper; that with respect to the art itself, the main factors of success to be observed are the using of every means at our command to reproduce nature in every particular, not only in the case of the specimens themselves, but in the accessories used in connection with them; that they should be so prepared as to resist in every way the ravages of time, or the attacks of pests; that they should, in addition, not only show the appearance of the animal itself, but aim to give a chapter in its life history, drawing therefor either upon its habits or its habitat; that everything that in any way whatever partaking of the grotesque or fanciful or extravagant innovations should be promptly and forever discountenanced.

My studies have led me to believe that the art of taxidermy has had a singular evolutionary growth peculiarly its own, the various phases of which have, in one place or another, been pointed out in the foregoing pages, and that of recent years the strong tendency in our leading museums has been to group animals, and for a variety of purposes. I am convinced that in the future museums will carry this idea still further, and that these groups will be so combined as not only to exhibit single species, showing some of their habits and surrounding in their natural haunts, but also to a very large extent to show faunal regions, and the animal and plant life of various geographical areas. When thus presented in the museums of large cities, and showing in that way the distribution of the animal and plant life of the region wherein the particular city may be situated, or for the country at large in our Government museums, the ever-present lesson they will present for study to the thousands of men, women, and children who may see such an exhibition during the course of a year will in its practicable value be simply beyond all calculation. By such arrangements the eye will be enabled to take in and the mind appreciate the aspect and the biologic forms of any particular region of the United States almost at a glance.

For the sake of economy, both for the present and the future, we should employ only the very best materials in our work, and, what is quite as important, secure the services of only the most skillful and advanced artists in the country. Not mere plodders for pay, but men thoroughly

in love with their work and possessing talents fully capable of improvement and desirous of seizing upon each and every advance made in the art. To this end, whenever proper opportunity offers, facilities to inform themselves in all that directly relates to their work should be extended to them.

In closing, I but acquit myself of a duty and a pleasure at once when I extend my thanks to Prof. G. Brown Goode, long in charge of the National Museum, not only for the advantages that have come to me in the way of studying the material for this paper but for the pleasure it has been for me to write it, and for the many courtesies I have received at his hands.

To Mr. F. W. True I am especially indebted for the assistance he has so freely given me upon every occasion. As the curator-in-charge of the Museum, it has lain within his power to further my labors in numerous ways, and this throughout has been done with such marked kindness, promptitude, and cheerfulness that I find it difficult for me to express to him the gratitude I experience for it and so thoroughly feel.

My own work will have been amply repaid if it result in the further encouragement and stimulation of the progress of the art of taxidermy, now so firmly placed on foot in so many quarters of the civilized world.

APPENDIX.

After the manuscript of this paper had been completed, and had been transmitted to the Museum for publication, there were received for incorporation in it, through the kindness of Dr. J. A. Allen, of the American Museum of Natural History, New York City, five photographs for plates. These photographs represent groups in the collections of the American Museum of Natural History, in which institution Dr. Allen has charge of the departments of ornithology and mammalogy. They came too late to be inserted in the body of this paper, but owing to their general excellence and interest, and to the great courtesy of their sender in submitting them, as well as to the trouble which he had taken to write out their histories, it was decided to have them engraved and placed together at the end of the paper. The first of these added plates (Plate XCII) represents a group of Pied Ducks (*Compelaimus labradorius*) which were designed and prepared by Jenness Richardson in 1889 at the American Museum of Natural History. The birds were mounted by Mr. H. C. Denslow.

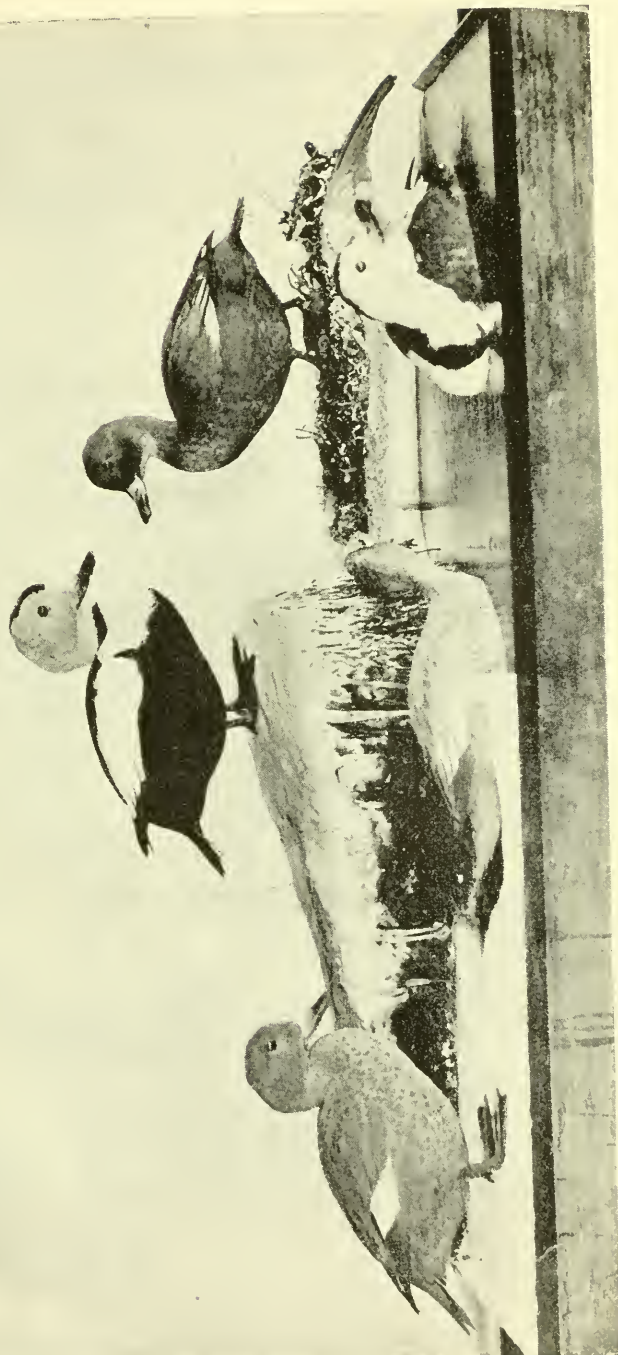
The group which is represented in the second plate of this series (Plate XCIII) is a more or less elaborate piece of work, also designed and prepared by Mr. Richardson at the American Museum of Natural History in 1886. It represents very faithfully the side elevation of a bank, part way down in which a pair of Louisiana water thrushes (*Siturus*

motacilla) have built their nest. The male and female birds are seen approaching it, as they leisurely hop along the roots and twigs of plants which protrude from the side of the bank.

Of all the specimens on exhibition in the collections of the American Museum, none have a greater attraction for the observer and visitor there than the admirable series of bird groups, and one of the most life-like of these is the beautiful subject of the third plate in this series (Plate XCIV). It represents a pair of robins (*Merula migratoria*) with their nest in an apple tree, the latter being in full bloom of early summer.

The fourth plate in the supplemental series (Plate XCV) represents a group of opossums (*Didelphis virginiana*), male, female, and a number of young ones. In many respects it resembles the similar groups of these animals which are to be seen in the U. S. National Museum, and which have been described in the body of this paper. The group represented in this plate was prepared and designed by Mr. Jenness Richardson at the American Museum of Natural History in 1891. It is an especially fine piece of work, and although it does not contain as many specimens as the National Museum group, it is hardly the less instructive on that account.

In so far as the larger mammals are concerned, there is probably not a piece in the entire collection of the American Museum of Natural History that can in any particular compare with the superb specimen of the huge pachyderm shown in Plate XCVI. It is the Indian rhinoceros "Bombi" (*Rhinoceros unicornis L.*). This specimen was mounted at the American Museum of Natural History in 1890 by Mr. Richardson and his assistants. The data for the work consisted in measurements taken from the animal when alive, and also from a photograph obtained at the same time. After having been mounted, it was properly colored after a living specimen in the Zoölogical Gardens of Philadelphia. It is probably one of the best mounted specimens of this species in the United States.



GROUP OF LABORER DUCKS (*Campylorhynchus laboratorius*).
(From an electrotype lent by the American Museum of Natural History, New York City.)



A PAIR OF LOUISIANA WATER THRUSHES (*Siurus molacilla*) AND NEST.
(From a group in the American Museum of Natural History, New York City.)

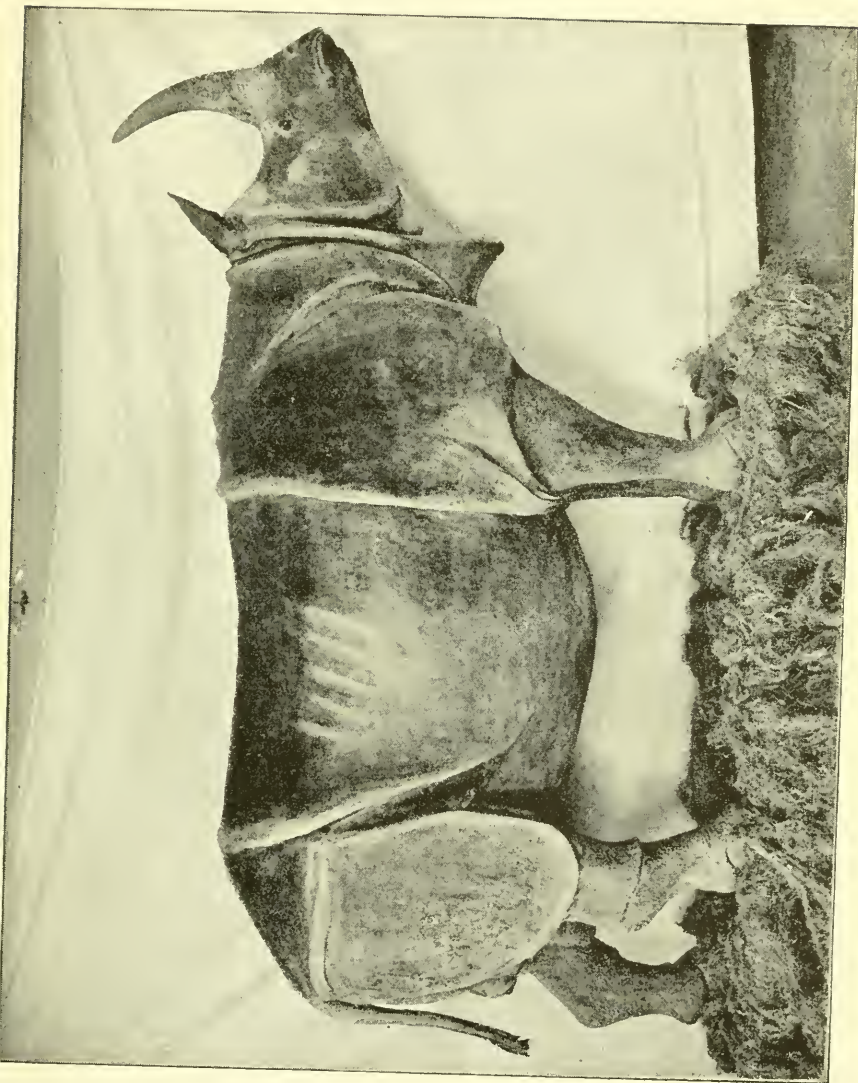


GROUP OF ROBINS IN THE AMERICAN MUSEUM OF NATURAL HISTORY, NEW YORK CITY.



GROUP OF OPOSSUMS.

(From an electrotype lent by the American Museum of Natural History, New York City.)



INDIAN RHINOCEROS "BAMBI". (*Rhinoceros unicornis*, L.)
(From a photograph of the specimen in the American Museum of Natural History, New York City. Mounted by
Jenness Richardson and assistants in 1890.)