

stigmatal plates are very coarsely punctate, while in *Dermacentor electus* they are very finely punctate.

The paper contains analytical keys to all of the known species of ticks.

The paper was discussed by Messrs. Schwarz, Ashmead, Howard, and Gill. Dr. Stiles also mentioned the curious resting stage of the ear tick *Ornithodoros megnini*, with figures illustrating it. It had, he said, once been described by an entomologist as an egg. Dr. Howard said that it resembled exactly the hypopus stage of Tyroglyphid mites.

JANUARY 9, 1902.

The 165th regular meeting was held at the residence of Dr. H. G. Dyar, 1512 Twenty-first street N.W. The President, Dr. Dyar, occupied the chair, and there were also present Messrs. Simpson, Benton, Patten, Morris, Ashmead, Mann, Pollard, Hay, Barber, Caudell, Hunter, Kotinsky, Gill and Currie. Dr. Dyar was elected Vice-President of the Washington Academy of Sciences for the Entomological Society of Washington.

President Dyar then delivered his annual address, as follows:

ANNUAL ADDRESS OF THE PRESIDENT.

THE COLLECTION OF LEPIDOPTERA IN THE NATIONAL MUSEUM.

By HARRISON G. DYAR.

I would ask your attention to the collection of Lepidoptera in the United States National Museum. It has been frequently pointed out in the annual reports of the Smithsonian Institution that it was eminently desirable that the United States Government should possess as complete a scientific collection as could be made, worthy of this large and prosperous country. Not insignificant in such a collection would come the insects, both from their relative abundance in species and the great economic importance of many of them. The order Lepidoptera forms a considerable part of the aggregate, and to the history and present

condition of the Governmental collection of this attractive order I would briefly invite your attention.

Before 1876, when the National Museum came into existence as a sequel of the Centennial Exposition at Philadelphia, the Smithsonian Institution was the depository of collections belonging to the Government. But it never amassed a collection of insects, nor had an entomologist on its staff. In the early years, when Townend Glover was acting as entomologist for the U. S. Government, some material was collected, and there came in from the surveys for a Pacific railroad, the Geological and Geographical Surveys and miscellaneous sources, sundry insects. This material became subsequently entirely dissipated. Some of it was reported upon in Government publications by Stretch, Packard, Strecker, Grote and others, but the majority of the material seems to have remained in the private collections of those so reporting. Certainly all that is at present left of the Lepidoptera in the Government's possession are a few specimens returned at a recent date by Dr. A. S. Packard.

In 1882 a department of insects was organized in the National Museum with Dr. C. V. Riley as honorary curator, without any assistance. The number of insects of all orders was estimated at 1,000, of which, perhaps, 200 may have been Lepidoptera, a most insignificant figure. More specimens than this could be taken by an active collector in a single day. We may well consider that at this date the national collection of Lepidoptera first began.

The first collection of any importance received was that of Dr. Riley. It was formally presented in 1885. It contained 17,000 specimens of Lepidoptera, besides 3,000 larvæ in alcohol and a few inflated larvæ. All the material was North American, with the most trifling exceptions, and principally amassed by Riley himself from the Southern States.

In 1886 Dr. J. B. Smith was appointed assistant curator. He brought with him his private collection, which was acquired by the National Museum by purchase. It contained a general collection of North American Lepidoptera most full in the family Noctuidæ, Dr. Smith's specialty. I find no exact record of the number of specimens in the collection, though it probably approached 15,000, and included the material of Mr. Meske, mostly collected about Albany, N. Y. During this time various smaller accessions

were being received, principally through the Division of Entomology of the Department of Agriculture, which has always been a steady, though never a copious, contributor to the collection. In 1886 the number of insects was estimated at 500,000. If one-fifth of these were Lepidoptera, the collection may have contained 100,000 specimens, including duplicates, at this date, and may be considered to have become fairly started, in charge of a Lepidopterist, under the direction of the entomologist to the Department of Agriculture, with apparently the most favorable auspices. The geographical range covered was, however, strictly North American, excluding Mexico.

An arrangement of the collection was begun by Smith and finished by Linell, who succeeded him in 1889, as far as the Microlepidoptera; but with the increase in the total number of insects in the collection, which kept up at the rate of 15,000 specimens a year, without any concomitant increase in the museum force, less and less attention proportionately was paid to the Lepidoptera. Linell was not a Lepidopterist, and, without assistance, could not be expected to do more than preserve the material from destruction. Consequently the collection fell into a state of virtual neglect.

In 1891 material began to be received from Dr. W. L. Abbott from Africa and Asia, and in 1892 the collection of G. Beyer, of New York, was received, 1,900 specimens, containing a series of European species. These were the first accessions of exotic material of any importance, and formed the nucleus of an exotic collection. It was not, however, arranged at this time.

There followed shortly the large collection of Japanese Lepidoptera through Prof. Mitsukuri, which had been on exhibition at the World's Fair at Chicago, further material from Dr. Abbott, and the collection of Mr. William Astor Chanler in East Africa, all of which remained stored in boxes and cupboards from lack of space to arrange it and of time by the single aid, Mr. Linell.

In 1895 Dr. Riley died and was succeeded by Dr. L. O. Howard as honorary curator. Dr. Howard had a lively interest in the national collection, and a reorganization of the Museum staff was effected,* whereby Messrs. Ashmead, Coquillett, Schwarz, and Currie were assigned to duty in connection with the insect collec-

* Noticed in *Can. Ent.*, xxvii, 334, 1895.

tions. None of them had, however, any direct duty in connection with the Lepidoptera, which remained with Mr. Linell as a side issue. The collection gradually relatively declined till it was surpassed by that of many a private collector. Still the number of specimens continued to gradually increase. From the 100,000 in 1886 it rose to about 117,000 in 1887, 119,000 in 1888, and 120,000 in 1889; but in 1894 the estimate is only a trifle over 121,000. The effects of the unavoidable deterioration and waste had begun to be felt, and were scarcely overbalanced by the accessions. During his administration, Dr. Smith had prepared an exhibition series of some extent with much care. This suffered the ultimate fate of all material exposed to the light, and so much of the Government's material disappeared. Other specimens were rendered worthless through sending them to the Tennessee Centennial Exposition in 1897. Besides, over half the number of specimens in the collection had all along consisted of duplicates, and some of these were naturally gradually disposed of.

Mr. Linell died in 1897, and the same year the writer was appointed custodian of the Lepidoptera. The collection was found in general well preserved, though many duplicates were seriously infested with museum pests and had to be thrown away. In number of specimens the aggregate probably did not greatly exceed that of 1894. For a while the custodian worked alone, but later Mr. A. N. Caudell was assigned to assist during afternoons. A separate room was provided by the Museum authorities for the collection of Lepidoptera, and a complete rearrangement was begun.

Very considerable accessions of material now began to come in. American collectors became aware that a Lepidopterist was again in charge and they could give scope to their natural patriotic desires to see the national collection increased with the expectation that their donations would be received with interest and promptly labeled and arranged. The custodian brought a collection of 15,000 specimens containing both native and exotic material with many inflated larvæ and an amount of alcoholic material. This latter we have never counted, for the reason that it is practically a dead loss. Larvæ in fluid soon become unrecognizable from shrinking, hardening and discoloration; the material is awkward to handle, dangerous to the collection from ac-

cidental loosening of the bottles, and troublesome to keep in order. All of the old Riley material, as well as the great number of bottles filled from time to time at the Department of Agriculture are likewise nearly useless. We have lately concentrated our efforts on preparing inflated larvæ, which, though more trouble to make at first, give ultimate satisfaction. Even for small larvæ this method is preferable and we intend to completely substitute it for the placing of specimens in any kind of fluid. Doubtless some alcoholic material must be received from uninstructed or hurried correspondents, and even from some others whose conservatism, or possibly a different experience, leads them to prefer this method of preservation.

In 1900, Dr. Ottmar Hofmann, of Regensburg, Germany, died. His collection consisted of two parts, his own material and a portion of the collection of Anton Schmid. Schmid had recently died, leaving his "Macros" to Mr. E. Frank, and his "Micros" to Dr. Hofmann. The Hofmann collection proper was picked over by Lord Walsingham, who took away what he wanted in his special families. But the remainder and the Schmid "Micros," intact, came to the United States National Museum through the offices of Prof. A. R. Grote. Prof. Grote obtained the collection for us at a low price, and it was so purchased by the Museum. Thus was obtained a very full collection covering the European fauna. The families which Lord Walsingham had taken from the Hofmann material were duplicated from the Schmid collection, with the exception of one family, the Psychidæ. These were formerly classified as "Macros," so Schmid's specimens did not go to Hofmann. On the other hand, Lord Walsingham took Hofmann's Psychidæ as they are now referred to the "Micros," his own special group. But, with this exception, the National Museum obtained by this very inexpensive purchase an admirable representation of the European Lepidoptera throughout, the smaller Tineids being as fully represented and as carefully mounted as the large butterflies. The collection numbered over 15,000 specimens. The sendings of Dr. W. L. Abbott continued, his last being from Lower Siam, comprising several thousand butterflies and moths of that region. These were gradually mounted and placed in their proper families. A large part of the butterflies were named, with the assistance of

the late Dr. Herman Strecker, but most of the moths yet await identification. Several thousand South American moths of the commoner species were given to the custodian by Mr. Wm. Schaus, and have been distributed, but not fully named. The collection, as a whole, has been arranged, the duplicates separated and all the named species catalogued by means of a card catalogue by specific names. The collection has the largest room of any of the orders of insects, and is the first one to be completely installed in the regular Museum drawers; thanks to the interest and help of the assistant curator, Mr. W. H. Ashmead. It is as well housed as can be expected in the present Museum building.

In the summer of 1901 I made an arrangement with Mr. Wm. Schaus whereby his large collection of American butterflies came into my possession and was placed on deposit in the Museum, with the intention of ultimately donating it. It contains 10,000 specimens and fills nearly 200 drawers. The butterflies of both North and South America are very fully represented, and it contains the types of 200 species described by Mr. Schaus, with those of a few described by Mr. Godman in the *Biologia Centrali-Americana*.

Thus at the end of the year 1901 the National collection of Lepidoptera at last begins to show respectable proportions. There are now 99,500 specimens representing 12,150 species, with about 18,500 more specimens in the duplicate collection, 3,490 inflated larvæ, the types of 1,246 species and varieties, besides a great mass of alcoholic larvæ, cocoons, eggs, etc.

As compared with older collections, like that of the British Museum, it naturally appears still in its infancy. Of the families *Syntomidæ* and *Arctiidæ*, recently catalogued by Sir G. F. Hampson, the British Museum contains fully 75 per cent. of the world species. Our museum cannot count over one-sixth as many. The same proportion doubtless holds throughout most of the families of the moths. The butterflies would show somewhat more favorably. It should be remembered that but little support has been accorded the collection in a financial way. There is no fund for the purchase of specimens, and the salaried custodians have always been too few. Fortunately the Department of Agriculture has lent a continued and very essential aid. We reciprocate by the loaning of material and the services of the custodian

in identification of insects, finding of synonymy, references to literature, etc.

The duplicate collection had, for a long time, contained half of the total number of specimens, and is still large. It is somewhat of a problem what to do with it. We have practically abandoned making exchanges, because of the poor condition of a majority of the specimens, since all the good material is in the regular collection. Most collectors will not receive what we have in exchange for their own fresh material, and many will not take it at all. Besides, the labor of making exchange lists and the time that would have been consumed would have largely prevented the work of installation that has been accomplished. The duplicates are gradually being made available by school teachers and others, and it is intended to prepare from them a respectable public exhibit collection, and keep this replenished from the same source. At present there is practically no such exhibit, at least arranged with any system, but with the present support it is impossible to prepare one.

The study and identification of the material has progressed to some extent, but the routine work of installation has prevented any very general work in that direction. Mr. August Busck, of the Department of Agriculture, has begun some studies on the American Tineids, which promise to be of material assistance to the collection. A catalogue of the Lepidoptera of North America is being prepared for publication, and it is intended to mark in this those species still lacking to the collection. We hope for considerable accessions from American collectors when they know exactly what is needed.

It will be noticed that the collection of Lepidoptera experienced a period of activity at the beginning, followed by a period of stagnation, now again succeeded by one of activity. These active periods were synchronous with the presence of a Lepidopterist in charge. The deduction is general, and shows it to be highly advantageous that each order of insects should have a custodian especially interested in it. Even with the best intentions, one whose training and activities lie in another field can scarcely do more than keep a collection in a condition of preservation, not to speak of planning for its extension and arrangement and the seizing of all possible opportunities to secure material and interest others in it.

In 1892, Dr. J. B. Smith, ex-curator and a Lepidopterist, visited London, and secured a promise from a well-known gentleman of the gift of his collection, probably the largest in the American fauna, as a whole, in existence. But Dr. Smith was no longer in charge of the collection at Washington, which was entering upon its period of stagnation. General confidence in the national collection as a fit repository for valuable material gradually waned. This was to a certain extent unjust, as the material was well cared for, though not actively elaborated. So, under advice of fellow entomologists, the promise lapsed and Mr. Schaus gave the whole of his non-American material to the American Museum of Natural History in New York. This museum had in charge a competent curator actively interested in Lepidoptera.

Within the last year only have Mr. Schaus' American butterflies been secured for Washington, but by an entirely new arrangement.

It may not be out of place to notice the collection of Orthoptera in the National Museum, because this so well illustrates in its present state the condition into which a collection falls without a specialist in charge. The Orthoptera are the only order of insects which have never been in charge of a specialist nor had any attention from a resident student. A part of the collection is in museum drawers, through the labors of Messrs. Linell and Currie at odd times, but most is still in the old dangerous double book boxes and Schmitt boxes belonging to the Department of Agriculture. Museum pests have been very generally excluded, but the moving and removing of the boxes out of the way of more active collections has caused specimens to become loosened and fall about, creating considerable damage. No opportunity for repairs has been offered. The collection is, as a whole, sadly disarranged. New material could not be incorporated from lack of time and from unfamiliarity with the classification of the order, so that each accession is separately placed in its drawer or set of boxes. Glaring errors in identification occur, species of different groups, superficially similar, being placed above the same label. There is no attempt at securing new material on a regular plan, the accessions being all by chance. What degree of order exists is mostly due to the study given certain groups by specialists to whom they have been loaned. But this method has disadvan-

tages. Most students keep material for an unconscionably long period during which the museum drawers are conspicuous by their emptiness. It is then subjected to the danger of damage or loss in transit, besides various vicissitudes while in the hands of the student, not to mention the occasional risk of unfair treatment at the hands of an overtrusted and presumably honest correspondent.

But the collection of Lepidoptera was never in so unfortunate a condition as this, and its future at present seems most promising.

To consider the present condition of the collection in somewhat more detail, it at once appears that the number of specimens now present, approximately 121,000, exclusive of alcoholic material, pupæ, eggs, etc., is not as much as would be expected from the figures quoted above. I have given 121,000 as the probable total in 1894, and since that date we have received over 50,000 specimens in four of the largest accessions, besides many smaller ones. What has become of them?

In the first place, the 121,000 of 1894 included alcoholic larvæ, as I suppose. Of these we have a great mass, as above stated, but probably not 50,000; 5,000 might be a conservative estimate. Secondly, the former estimates are probably grossly overstated.*

I learn that no actual count was made, but that the yearly accessions, as shown by the books, were added to the last year's estimate for that of the following year. This method is not even theoretically correct, as it makes no account of exchanges, by which a number of specimens, approximately equal to the accession, actually leave the collection. Practically, also, it is faulty, since a considerable proportion of unsolicited accessions find their way at once to the waste basket, besides which accidents and other unavoidable wastes occur. Thirdly, the estimates are given for the total number of insects, and I have taken one-fifth as the probable proportion of Lepidoptera. This is not unlikely too high a proportion for the latter years with the great increase in the col-

* There seems to be a general tendency to overestimate insect collections. The Neumægen collection, when actually counted by Mr. Doll, was but half of the supposed amount. Dr. Skinner estimates the Strecker collection at 200,000 (*Ent. News*, xiii. 2. 1902); but my own estimate, made in Dr. Strecker's presence, was 100,000, and I believe a very liberal one.

lection of Coleoptera. One-fifth was the proportion of Lepidoptera in the Riley collection, and it is the proportion that the number of types of Lepidoptera bears to the total number of types in the National Collection of Insects. But Riley was, by preference, a Lepidopterist, and therefore likely to have had more than a normal proportion of this order in his collection, while in the matter of types the Lepidoptera are possibly better off than other orders, owing largely to the generosity of Dr. J. B. Smith. It is proper to state that the last figures, now discussed, are based on an actual count, conducted by my assistant and myself.

The arranged collection is housed in 1,113 drawers; the unplaced material and duplicates are in miscellaneous boxes.

Excluding the duplicates and unworked material, which cannot be satisfactorily discussed, and excluding also the Schaus collection, which is intact, the butterflies comprise, in round numbers, 15,600 specimens of 2,400 species, with 290 inflated larvæ. There are but 29 types in this group. The North American fauna is well represented, especially in the larger species. The collection is poorest in the Lycænidæ and Hesperidæ. The Schaus collection, when added, will nearly double the total number of specimens. The Sphingidæ comprise 1,200 specimens of 250 species, 100 larvæ, but no types whatever. The Saturnians, 880 specimens of 168 species, with 220 larvæ and one type. The Arctians and allied families have 4,750 specimens, 860 species, 460 larvæ and 48 types. The Noctuidæ, 16,800 specimens of 2,370 species, with 550 larvæ and 509 types. The North American Noctuids in the National Museum are probably the best collection in existence in this field. One-half of the types belonging in the regular collection are in the Noctuidæ. The Lasiocampidæ, Liparidæ and allied small families have 3,400 specimens of 500 species, 690 larvæ and 17 types, being especially rich in inflated larvæ. The Geometridæ have 8,700 specimens, 1,200 species, 450 larvæ and 103 types. The North American species are well represented on the whole, though a considerable number are missing. The Sesiidæ, Limacodidæ and other allied small groups have 2,580 specimens, 470 species, 170 larvæ and 29 types. The Pyralidæ and Pterophoridæ have 9,200 specimens of 1,370 species, 110 larvæ and 47 types. A great many North American species are lacking in this group and the following,

probably 50%. The Tortricidæ have 4,900 specimens, 724 species, 77 larvæ and 33 types. The Tineidæ (sens lat.) have 12,150 specimens of 1,800 species, 56 larvæ, and 179 types. They are pretty well represented in some groups, though the series of specimens are too short. In larvæ they are very deficient, though fairly rich in types. Except in the European fauna, there are practically no exotic Tineids in the collection. Following is the census of the collection in tabular form:

Census of the Lepidoptera in the National Museum, December, 1901.

	Specimens.	Species.	Types.	Larvæ.
Butterflies	15,606	2,408	29	290
Sphingidæ	1,214	251	0	109
Saturniidæ	882	168	1	170
Arctiidæ, etc	4,756	863	48	402
Noctuidæ	16,807	2,367	509	545
Lasiocampidæ, etc	3,390	505	17	687
Geometridæ	8,727	1,233	103	449
Sesiidæ, etc	2,582	471	29	172
Pyralidæ, etc	9,216	1,366	47	111
Tortricidæ	4,940	724	33	77
Tineidæ	12,146	1,797	179	56
Hofmann moths in boxes	1,132	.....	.....	.....
Total regular collection	81,398	12,153	995	3,068
Schaus collection	10,000	.....	220	.....
Other unplaced material	8,134	.....	31	421
Duplicates	18,560	.....	.....	208
Add larvæ as above	118,092 3,697	12,153	1,246	3,697
Total specimens	121,789			

At the conclusion of the address, it was discussed by several members present.

Mr. Ashmead emphasized the necessity of having a custodian in charge of each order of insects. He paid a tribute to the faithful and zealous work of Mr. Linell in caring for the collections, and mentioned some of the difficulties and drawbacks under which he labored. Much of the time he worked entirely unassisted, and