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BIRDS OF WESTERN NEW YORK

BY

ELON HOWARD EATON

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BY ELON HOWARD EATON.

(*Read before the Academy, March 14, 1899.*)

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INTRODUCTORY.

REGION REPRESENTED.

The territory covered by this list is the western portion of New York State, extending eastward through the "Finger Lake" region. It will be seen upon inspecting a contour map of the state that this is a natural division consisting of three east and west belts. The southernmost of these is the northern extremity of the Alleghany Plateau, ranging from 1,500 to 2,000 feet in elevation, and drained southward principally by the Allegheny and Susquehana rivers. The high, rolling plains of the middle belt have a gentle slope toward the north, their lowest elevation of 1,000 feet being along an irregular line from Buffalo to Syracuse. These elevated plains are much cut up by the north and south valleys of ancient drainage channels, many of which were dammed at the close of the glacial period by the retreating ice sheet, and are now occupied by the central chain of lakes. The northern belt is a level or slightly undulating plain widening toward the east. Its lowest portion, lying along the southern shore of Lake Ontario, and about Oneida, Cayuga and Seneca Lakes, is below 500 feet in elevation. The drainage of the northern and middle belts is through the St. Lawrence system.

Faunal Areas.

Western New York lies principally in the Transition life zone, as mapped by Dr. Merriam (Bul. No. 10, Biological Survey, U. S. Dept. of Agriculture, and in the Geographic Distribution of Life in North America, Smithsonian Report, 1891).

This zone stretches across the northern portion of the United States and southern Canada, and is divided into the eastern, or humid, and the western, or arid, regions. The humid division, which is the one represented in western New York, is known as the Alleghanian faunal area, and there corresponds very nearly with the middle and southern belts defined above. This fauna includes the greater portion of our characteristic birds.

The Upper Austral life zone, which in general lies south of the Transition zone, has its humid division east of the 100th meridian. This is known as the Carolinian fauna, an extension of which stretches along the northern shore of Lake Erie, passing into western New York along the southern shore of Lake Ontario, widening toward the east and south through the central lake region, thus corresponding in western New York to the northern belt of low, undulating plains.

The Boreal region, which includes the transcontinental coniferous forest belt of Canada, passes southward along the mountain ranges of the United States, and reaches western New York near the southern line, in the counties of Steuben, Allegany and Cattaraugus, where the altitude rises above 2,000 feet.

The southern division of the Boreal region here represented is known as the Canadian zone. Thus the warmest life belt of our region lies farthest to the north, the coldest to the south,—the influence of altitude, and the modifying effects of the Great Lakes, combining to transpose the normal positions of the life zones.

To the Carolinian fauna belongs the greater portion of our summer visitants, and a goodly number of the summer residents of the northern belt of western New York mentioned above. Such representatives of this fauna as the king rail, worm-eating warbler, yellow-breasted chat, Carolina wren and blue-gray gnatcatcher are known to breed occasionally ; while the red-bellied woodpecker, green-crested flycatcher, orchard oriole, rough-winged swallow, Louisiana water thrush, hooded warbler and cerulean warbler breed more or less commonly in the central lake region, and in the western counties.

To the Boreal fauna belongs a large number of our transient and winter visitants. Many of the Boreal species breed with us occasionally, as is the case with the American merganser, blue-winged teal, Wilson's snipe, yellow-bellied flycatcher, winter wren, brown creeper, red-breasted nuthatch, hermit thrush, and olive-backed thrush. In the hilly regions of the south, especially at Springville, Olean and Branchport, as well as in some of the colder swamps, several of the Boreal birds are quite common breeders, among them the Canadian, mourning, Blackburnian, magnolia and black-throated blue warblers. The junco is also a common breeder at Springville, Olean, Naples, and in most of the hilly regions toward the south. In many localities the boreal and the Carolinian forms may be found breeding side by side. At Springville, for example, the hooded warbler and the red-bellied woodpecker breed in the same wood with the junco and the Blackburnian, black-throated blue, Canadian and mourning warblers. On Cananadaigua Lake the rough-winged swallow, Louisiana water thrush and Canadian warbler breed in close proximity with the generally distributed scarlet tanager, wood pewee and crested flycatcher.

Season of Occurrence.

The birds have been grouped according to the time of their occurrence, as *residents*, or those species which are with us throughout the year, like the great horned owl, ruffed grouse and downy woodpecker ; *summer residents*, or those which come to us in the spring, raise their young, and depart in the fall, as the red-winged blackbird, vesper sparrow and yellow warbler ; *transient visitants*, or those which make a short stay with us in the spring and fall, on their way to and from their breeding grounds which lie mostly to the north, such as the golden plover, ruby-crowned kinglet and myrtle warbler ; *winter visitants*, which are boreal or arctic species that spend a portion of the colder season with us, returning to their northern home on the approach of spring, e. g., the snowflake, tree sparrow, pine grosbeak ; *summer visitants*, or southern species, which appear for a short time during the heat of summer, but are not known to breed in this region, e. g., the American egret, glossy ibis and summer tanager.

Many species are difficult to classify under any one of the heads just given, as, for example, the robin, which is a summer resident and at the same time is often found throughout the winter, and hence might be classed as a resident; or the mallard, which is chiefly a transient visitant, but has been known to breed in this region, and also occurs throughout the winter in favored localities. In cases such as these, the bird is ranked according to the general, rather than the exceptional mode of occurrence, and the exceptions noted.

Relative Abundance.

It is practically impossible to take a census of the bird life of any region; nevertheless an attempt has been made to give a general idea of the comparative abundance of birds by adopting terms in ordinary use. The commonest birds, such as the robin, cat bird, song sparrow, etc., are called *abundant* species ; next in order come birds of *common* occurrence, such as the meadowlark, savanna sparrow and bobolink.

Fairly common birds are such as may be found in limited numbers at the proper place and season: for example, the loggerhead shrike, rose-breasted grosbeak and scarlet tanager.

The expression *uncommon* has been applied to birds, which, though by no means rare, are met so seldom that they can not be called fairly common ; they visit the region regularly, but in very limited numbers. Birds of *occasional* occurrence are those which are not found here regularly each season, but may be expected in each locality at intervals of a few years at most; the whistling swan, redpoll and snowy owl are examples.

The term *rare* is reserved for birds which have been recorded but a very few times in this region, but yet cannot be regarded as stragglers from their regular range or migration routes; to this class belong the Eskimo curlew, kittiwake and blue-gray gnatcatcher.

Accidental birds are those which are wanderers from their proper home, usually driven here by storms or unknown causes; here belong the petrels, tropic bird, black skimmer, Bullock's oriole and cinnamon teal.

In the residence and migration chart a closer approximation to the correct statement of relative abundance may be found graphically represented.

Migration.

The dates given for the appearance and disappearance of our commoner species of birds are the averages taken from records extending over periods of five years at Springville, six at Canandaigua, and four at Rochester. The dates of arrival and departure have been found practically the same at these three stations, as might be expected, when it is considered that Springville, though nearer the winter home of our summer birds, is on a higher level, and consequently is reached at a slightly later period than its latitude alone would lead us to expect.

Under normal circumstances, different species will be found to follow the dates recorded. But it must be borne in mind that exceptional weather conditions in March and April may hasten or retard for many days the arrival of early migrants, while the time of arrival of May migrants has been found to vary but few days at the most. The autumn movements of birds are more difficult to observe, but the figures given are the best that can be offered in the present state of our knowledge. For a graphic representation of the migration of all species which have been definitely recorded for this region, the reader is referred to the chart accompanying this list.

Habitat.

An attempt has been made in the list to indicate briefly the chosen habitat of each species. This while easy in the case of a bird like the marsh wren, is more difficult in the case of such birds as the robin, which is almost equally at home in the door-yard, orchard, field and forest.

Nesting Dates.

Just as in the case of the migration records, the breeding data are the result of many years' observations. The dates given are not absolute, but are subject to the same variation as those referring to migration, and noted under that heading. The earliest date given under each species, is that on which the nesting has begun on at least two different seasons, and the second date is the latest upon which, under ordinary conditions, freshly laid eggs may be found.

Economic Value.

Little has been said in this list regarding the food of the different species, but in the case of birds which are decidedly injurious or beneficial, mention has been made of such fact for the guidance of those not familiar with the food habits of the species, and also to serve as a possible stimulus for further interest along the line of bird protection.

For a detailed statement of the food of our common birds, reference is made to the bulletins of the Biological Survey, U. S. Dept. of Agriculture.

Incomplete Records.

Some of the species recorded in this list as occurring in Western New York are entered on the authority of persons who have been unable to furnish definite data regarding the time of capture. None of these records seem improbable, and in some instances the specimen upon which the record is founded is still in existence. Under this head should be placed the following :

Laughing gull,
Arctic tern,
Harlequin duck,
Greater snow goose,
American white-fronted goose,
Trumpeter swan,
Snowy heron,
Yellow-crowned night heron,
American avocet,
Prothonotary warbler,
Magpie,
Dickcissel,
Summer tanager,
Carolina chickadee.
Whooping crane,
Sandhill crane,
Clapper rail,
Purple gallinule.

The records for laughing gull, snowy heron, yellow-crowned night heron, clapper rail, magpie, dickcissel, summer tanager and Carolina chickadee, may possibly be due to error in observation, since in the case of these species we have found either no trace of the specimens or that they have been recorded only as having been seen. From our present knowledge, we should especially question the records of the night heron, clapper rail, magpie and Carolina chickadee.

In the case of Bullock's oriole, while the record of time and place is definite and reliable, the specimen itself has apparently disappeared. This species and the cinnamon teal are here reported for the first time as New York species.

Summary of Species.

Species definitely recorded,	297
Species with indefinite records,	18
Species here exterminated,	2
Foreign species introduced,	2
Abundant species,	38
Common species,	59
Fairly common species,	76
Uncommon species,	29
Occasional species,	22
Rare species,	54
Accidental species,	39
Residents,	23
Summer residents,	99
Transient visitants,	112
Winter visitants,	41
Summer visitants,	13
Species which regularly breed,	97
Species which occasionally breed,	43

Acknowledgments.

Credit has been given in the text for all contributions to the list for which the author is not personally responsible, but for services which cannot be thus recognized, thanks are due Louis Agassiz Fuertes of Ithaca; Egbert Bagg of Utica; James Savage of Buffalo, and A. W. Perrior of Syracuse.

Bibliography, Explanations.

The chief publications which have been consulted in the preparation of the list are as follows:

"A Revised List of the Birds of Central New York." Auburn, N. Y. 1879. Prepared for publication by Frank R. Rathbun.

"Annotated List of the Birds of Oneida County, N. Y.," etc., by Wm. L. Ralph, M. D., and Egbert Bagg.
[*From the Transactions of the Oneida Historical Society, III, 101; 1886.*]

"List of the Birds of Buffalo and Vicinity," 1889, by W. H. Bergtold, M. D.
[*Bulletin of the Buffalo Naturalists' Field Club, Vol. I, No. 7.*]

"Birds of Niagara County, N. Y.," by J. L. Davison.
[*"Forest and Stream," September, 1889.*]

"Catalogue of the Birds of Chemung County," by WM. H. GREGG, M. D. 1891.
[*Proceedings of the Elmira Academy of Sciences, Vol. I, No. 1.*]

"Birds of Western New York, with Notes," by ERNEST H. SHORT. Second Edition. 1896.
[*Published by Frank H. Lattin, Albion, N. Y.*]

"Provisional Check List of N. Y. Birds," 1898, by MARCUS S. FARR.
[*Bulletin of N. Y. State Museum.*]

"The Natural History of New York; Birds," by JAMES DE KAY. 1846.

"Our Birds in their Haunts," by J. H. LANGILLE.
[*S. E. Cassino & Co., Boston, 1884.*]

"Bulletin of the Nuttall Ornithological Club," 1876–1883.

"The Auk," 1884 to date.

"The Ornithologist and Oölogist."

"The Museum."

"The American Ornithologists' Union Check-List of North American Birds," second edition, 1895.

Chapman's "Handbook of Birds of Eastern North America," 1898.

Coues's "Key to North American Birds," etc., 1884.

Ridgway's "Manual of North American Birds," 1887.

The abbreviations used in the check-list referring to authorities may be easily understood by consulting the list of works mentioned above.

The numbers, classification and nomenclature used are those of the American Ornithologists' Union. For reference to the original description of genera and species, as well as a detailed statement of their distribution, the reader is directed to the A. O. U. check-list of North American birds.

Since this paper was presented before the Academy of Science, several species have been added to the list, some have been dropped, and many records of rare or uncommon birds have been inserted.

MIGRATION AND RESIDENCE TABLES.

In the following tables an attempt is made to give a graphic presentation of the times of occurrence and relative abundance of the birds definitely recorded for this region. The constant presence of a species is indicated by a continuous line, uncommon or occasional occurrence by a broken line, and rarity or accidental occurrence by a dotted line. A heavy line indicates greater abundance, and the culmination and decline in the numbers of any species is shown by a corresponding swelling and diminution in the width of its line.

It has been found impossible to use a series of lines which will show exactly the relative abundance of all species ranging between the English sparrow and the bald eagle ; but between birds of the same family or those of similar habits comparisons may be freely made. It must also be borne in mind that the lines are intended to show the presence of birds in their peculiar habitats, and consequently some water-fowl of limited distribution in this region are given quite as wide lines as birds of such universal distribution as the white-breasted nuthatch and vesper sparrow, although the latter are much more abundant when the whole number of birds throughout the region is taken into consideration.

The breeding range of each species has been stated as nearly as could be determined by reference to Dr. Allen's "Origin and Distribution of North American Birds" (Auk 10, 97–150); Dr. Merriam's publications already noted ; the A. O. U. revised check-list ; Chapman's Handbook, and Coues's Key.

The abbreviations refer to the Boreal, Austral and Tropical regions ; to the Arctic, Hudsonian, Canadian, Transition, Upper Austral and Lower Austral Zones ; and to the Alleghanian, Carolinian, Austroriparian and Sonoran faunal areas, recognized by Merriam and other writers. Those species which breed in all the regions are designated as North American (N. A. or E. N. A.), and those which belong to the sea or seacoast or interior are also designated by appropriate signs (pelag., mar., int.)

No attempt has been made to state *exactly* the breeding ranges of our birds, but only to give a general idea of their distribution for the benefit of those who are studying the faunal areas represented in eastern North America, and especially in western New York.

No.	Common Names.	Range.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
2	Holbœll's grebe,	Int. Bor.												
3	Horned grebe,	Bor.												
6	Pied-billed grebe,	N. & S. A.												
7	Loon,	Bor.												
11	Red-throated loon,	Bor.												
31	Brunnich's murre,	Bor. & Arc.												
35	Skua,	Arc.												
36	Pomarine jaeger,	Arc.												
37	Parasitic jaeger,	Arc.												
40	Kittiwake,	Bor. & Arc.												
42	Glaucous gull,	Arc.												
43	Iceland gull,	Arc.												
47	Gt. black-backed gull,	Arc.												
51	Herring gull,	Bor.												
51a	American herring gull,	Bor.												
54	Ring-billed gull,	Bor.												
60	Bonaparte's gull,	Bor.												
64	Caspian tern,	N. A.												
70	Common tern,	N. A.												
72	Roseate tern,	Aus.												
74	Least tern,	Trop. & Aus.												
75	Sooty tern,	Trop. & Au. Rip.												
77	Black tern,	Up. Aus. & Bor.												
80	Black skimmer,	Trop. & L. Aus												
98	Black-capped petrel,	Pelag.												
99	Scaled petrel,													
109	Wilson's petrel,	Pelag.												
112	Yellow-billed tropic bird,	Trop.												
119	Cormorant,	Mar. Bor. & Arc.												
120	Double-crested cormorant,	Bor.												
125	American white pelican,	Bor.												
129	American merganser,	Bor.												
130	Red-breasted merganser,	Bor.												
131	Hooded merganser,	N. A.												
132	Mallard,	Up. Aus. & Bor.												
133	Black duck,	Al. & Bor.												
135	Gadwall,	Up. Aus. & Bor.												
136	Widgeon,	Bor.												
137	Baldpate,	Bor.												
139	Green-winged teal,	Bor.												
140	Blue-winged teal,	Bor.												
141	Cinnamon teal.	W. Aus. & Can.												
142	Shoveller,	N. A.												
143	Pintail,	Trans. & Bor.												
144	Wood duck.	Aus.												
146	Redhead,	Bor.												
147	Canvasback,	Bor.												
148	American scaup duck,	Bor.												
149	Lesser scaup duck,	Bor.												
150	Ring-necked duck,	Bor.												

No.	Common Names.	Range.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
151	American golden-eye,	Bor.												
153	Bufflehead,	Bor.												
154	Old squaw,	Hud. & Arc.												
160	American eider,	Bor.												
162	King eider,	Arc.												
163	American scoter,	Arc.												
165	White-winged scoter,	Hud.												
166	Surf scoter,	Bor.												
167	Ruddy duck,	Trop. & N. A.												
172	Canada goose,	Bor.												
172a	Hutchins's goose,	Bor.												
173	Brant,	Bor.												
174	Black brant,	W. Bor.												
180	Whistling swan,	Arc.												
186	Glossy ibis,	Trop. & L. Aus.												
187	White-faced glossy ibis,	Son.												
190	American bittern,	Aus. & Can.												
191	Least bittern,	Aus.												
194	Great blue heron,	N. A.												
196	American egret,	L. Aus.												
201	Green heron,	Aus.												
202	Blk.-crowned night heron,	Aus.												
208	King rail,	Car.												
212	Virginia rail,	Al. & Can.												
214	Sora,	Al. & Can.												
215	Yellow rail,	Bor.												
216	Black rail,	Car.												
219	Florida gallinule,	Trop. & Aus.												
221	American coot,	N. A.												
222	Red phalarope,	Arc.												
223	Northern phalarope,	Arc.												
224	Wilson's phalarope,	Int. Trans.												
228	Amer. woodcock,	E. Aus. & Can.												
230	Wilson's snipe,	Bor.												
231	Dowitcher,	Bor.												
232	Long-billed dowitcher,	W. Bor.												
233	Stilt sandpiper,	Arc.												
234	Knot,	Arc.												
235	Purple sandpiper,	Arc.												
239	Pectoral sandpiper,	Arc.												
240	White-rumped sandpiper,	Arc.												
241	Baird's sandpiper,	Arc.												
242	Least sandpiper,	Hud.												
243a	Red-backed sandpiper,	Arc.												
246	Semipalmated sandpiper,	E. Arc.												
247	Western sandpiper,	W. Arc.												
248	Sanderling,	Arc.												
249	Marbled godwit,	Bor.												
251	Hudsonian godwit,	Arc.												
254	Greater yellow-legs,	Bor.												

No.	Common Names.	Range.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
255	Yellow-legs,	Bor.												
256	Solitary sandpiper,	Can.												
258	Willet,	E. Aus.												
261	Bartramian sandpiper,	E. N. A.												
262	Buff-breasted sandpiper,	Hud.												
263	Spotted sandpiper,	N. A.												
264	Long-billed curlew,	Int. Aus.												
265	Hudsonian curlew,	Arc.												
266	Eskimo curlew,	Arc.												
270	Black-bellied plover,	Arc.												
272	American golden plover,	Arc.												
273	Killdeer,	Aus. & Can.												
274	Semipalmated plover,	Arc.												
277	Piping plover	E. Aus.												
280	Wilson's plover,	L. Aus.												
283	Turnstone,	Arc.												
289	Bob-white,	E. Aus.												
300	Ruffed grouse,	Al.												
300a	Canadian ruffed grouse,	Can.												
315	Passenger pigeon,	N. A.												
316	Mourning dove,	Aus.												
325	Turkey vulture,	Trop. & L. Aus.												
326	Black vulture,	Trop. & L. Aus.												
331	Marsh hawk,	N. A.												
332	Sharp-shinned hawk,	N. A.												
333	Cooper's hawk,	Aus. & Can.												
334	American goshawk,	Bor.												
337	Red-tailed hawk,	E. N. A.												
339	Red-shouldered hawk,	E. Aus.												
342	Swainson's hawk,	W. N. A.												
343	Broad-winged hawk,	Aus.												
347a	Am. rough-legged hawk,	Hud.												
349	Golden eagle,	W. N. A.												
352	Bald eagle,	N. A.												
354b	Black gyrfalcon,	Hud.												
356	Duck hawk,	N. A.												
357	Pigeon hawk,	Bor.												
360	Amer. sparrow hawk,	N. A.												
364	American osprey,	N. A.												
365	American barn owl,	Car.												
366	Amer. long-eared owl,	Aus.												
367	Short-eared owl, U	Aus. & Bor.												
368	Barred owl,	Aus.												
370	Great gray owl,	Hud.												
372	Saw-whet owl,	Bor.												
373	Screech owl,	Aus. & Can.												
375	Great horned owl,	E. N. A.												
376	Snowy owl,	Hud. & Arc.												
377a	American hawk owl,	Hud.												
387	Yellow-billed cuckoo,	Aus.												

No.	Common Names.	Range.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
388	Black-billed cuckoo,	Aus. & Can.												
390	Belted kingfisher,	N. A.												
393	Hairy woodpecker,	Al. & Can.												
394c	Downy woodpecker,	Al. & Can.												
400	Arctic 3-toed woodpecker,	Bor.												
402	Yellow-bellied sapsucker,	Bor.												
405a	Nor. pileated woodpecker,	Can.												
406	Red-headed woodpecker,	Aus.												
409	Red-bellied woodpecker,	Car.												
412a	Northern flicker,	E. N. A.												
417	Whip-poor-will,	Aus.												
420	Nighthawk,	E. N. A.												
423	Chimney swift,	E. N. A.												
428	Ruby-th. hummingbird,	E. N. A.												
444	Kingbird,	Aus.												
452	Crested flycatcher,	Aus.												
456	Phœbe,	Aus. & Can.												
459	Olive-sided flycatcher,	Bor.												
461	Wood pewee,	Aus. & Can.												
463	Yellow-bellied flycatcher,	Can.												
465	Green-crested flycatcher,	Car.												
466a	Alder flycatcher,	Al. & Can.												
467	Least flycatcher,	Al. & Can.												
474	Horned lark,	Arc.												
474b	Prairie horned lark,	Al.												
477	Blue jay,	E. N. A.												
486a	Northern raven,	Bor.												
488	American crow,	N. A.												
494	Bobolink,	Al.												
495	Cowbird,	Aus.												
498	Red-winged blackbird,	E. Aus.												
501	Meadow lark,	E. Aus.												
506	Orchard oriole,	Car.												
507	Baltimore oriole,	E. Aus.												
508	Bullock's oriole,	W. Aus.												
509	Rusty blackbird,	Bor.												
511b	Bronzed grackle,	Int. N. A.												
514	Evening grosbeak,	W. Hud.												
515	Pine grosbeak,	Hud.												
517	Purple finch,	Al. & Can.												
521	American crossbill,	Bor.												
522	White winged crossbill,	Hud.												
528	Redpoll,	Bor.												
529	Amer. goldfinch,	U. Aus. & Can.												
533	Pine siskin,	Bor.												
534	Snowflake,	Arc.												
536	Lapland longspur,	Arc.												
540	Vesper sparrow,	U. Aus. & Can.												
542a	Savanna sparrow,	U. Aus. & Bor.												
546	Grasshopper sparrow,	Car.												

No.	Common Names.	Range.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
547	Henslow's sparrow,	Up. Aus.												
548	Leconte's sparrow,	Int. Aus.												
549[1]	Nelson's sparrow,	Int. Up. Aus.												
549[1a]	Acadian sparrow,	Mar. Can.												
554	White-crowned sparrow,	Hud.												
558	White-throated sparrow,	Bor.												
559	Tree sparrow,	Hud.												
560	Chipping sparrow.	E. N. A.												
563	Field sparrow,	E. Up. Aus.												
567	Slate-colored junco,	E. Bor.												
581	Song sparrow,	E. U. Aus. & Can.												
583	Lincoln's sparrow,	Al. & Bor.												
584	Swamp sparrow,	Al. & Bor.												
585	Fox sparrow,	Hud.												
587	Towhee,	E. Aus.												
593	Cardinal,	Car.												
595	Rose-breasted grosbeak,	Al.												
598	Indigo bunting,	E. Aus.												
608	Scarlet tanager,	E. Aus. & Can.												
611	Purple martin,	Aus.												
612	Cliff swallow,	N. A.												
613	Barn swallow,	N. A.												
614	Tree swallow,	N. A.												
616	Bank swallow,	N. A.												
617	Rough-winged swallow,	Car.												
618	Bohemian waxwing,	Bor.												
619	Cedar waxwing,	Al. & Can.												
621	Northern shrike,	Hud.												
622	Loggerhead shrike,	E. Aus.												
622a	White-rumped shrike,	Int. Aus.												
624	Red-eyed vireo,	Aus. & Can.												
626	Philadelphia vireo,	Bor.												
627	Warbling vireo,	N. A.												
628	Yellow-th'd vireo,	Aus. & Can.												
629	Blue-headed vireo,	Al. & Can.												
629b	Plumbeous vireo,	Rocky Mts.												
631	White-eyed vireo,	Car.												
636	Black and white warbler,	N. A.												
639	Worm-eating warbler,	Car.												
641	Blue-winged warbler,	Car.												
642	Golden-winged warbler,	Al.												
645	Nashville warbler,	Al. & Can.												
646	Orange-crown'd warbler,	W. Bor.												
647	Tennessee warbler,	E. Bor.												
648a	Nor. parula warbler,	Up. Aus.												
650	Cape May warbler,	E. Bor.												
652	Yellow warbler,	N. A.												
654	Black-th'd blue warbler,	E. Can.												
655	Myrtle warbler,	E. Bor.												
657	Magnolia warbler,	E. Can.												

No.	Common Names.	Range.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
658	Cerulean warbler,	Car.												
659	Chestnut-sided warbler,	Can.												
660	Bay-breasted warbler,	E. Bor.												
661	Black-poll warbler,	E. Bor.												
662	Blackburnian warbler,	E. Can.												
667	Black-th'd green warbler,	Can.												
671	Pine warbler,	E. Aus.												
672	Palm warbler,	W. Bor.												
672a	Yellow palm warbler,	E. Bor.												
673	Prairie warbler,	Car.												
674	Oven-bird,	E. Up. Aus. & Can.												
675	Water-thrush,	E. Bor.												
676	Louisiana water-thrush,	Car.												
677	Kentucky warbler,	Car.												
678	Connecticut warbler,	E. Bor.												
679	Mourning warbler,	Al. & Can.												
681	Maryl'd yel.-throat,	E. Aus. & Can.												
683	Yellow-breasted chat,	Car.												
684	Hooded warbler,	Car.												
685	Wilson's warbler,	Bor.												
686	Canadian warbler,	E. Can.												
687	Amer. redstart,	U. Aus. & Can.												
697	American pipit,	Arc.												
703	Mockingbird,	L. Aus.												
704	Catbird,	Aus. & Can.												
705	Brown thrasher,	E. Aus.												
718	Carolina wren,	Car.												
721	House wren,	E. Aus.												
722	Winter wren,	E. Bor.												
724	Short billed marsh wren,	E. Aus.												
725	Long-billed marsh wren,	E. Aus.												
726	Brown creeper,	E. Bor.												
727	White-breasted nuthatch,	Aus.												
728	Red-breasted nuthatch,	Can.												
729	Brown-headed nuthatch,	L. Aus.												
731	Tufted titmouse,	Car.												
735	Chickadee,	E. Up. Aus. & Can.												
748	Golden-crowned kinglet,	Bor.												
749	Ruby-crowned kinglet,	Bor.												
751	Blue-gray gnatcatcher,	Car.												
755	Wood thrush,	E. Aus.												
756	Wilson's thrush,	Al. & E. Can.												
757	Gray-cheeked thrush,	Bor.												
758a	Olive-backed thrush,	Bor.												
759b	Hermit thrush,	Bor.												
761	American Robin,	E. N. A.												
766	Bluebird,	E. Aus. & Can.												
	English sparrow.													
	Mongolian pheasant.													

ANNOTATED CHECK LIST.

Order **PYGOPODES**. *Diving Birds.*

Family **PODICIPIDAE**. *Grebes.*

2. **Colymbus holboellii** (Reinh.) Holboell's grebe.

Transient and winter visitant; uncommon. Oct. 20—May 4. Has been taken at Murray, Wilson, Buffalo, Springville, Branchport, Penn Yan, Canandaigua, Cayuga Lake and Utica. The last record, Canandaigua Lake, Oct. 20, 1900.

3. **Colymbus auritus** Linn. Horned grebe.

Transient visitant; common, especially in the spring. April 1—May 15, Oct. 1—Nov. 20. Occasional winter visitant. Found on lakes and ponds.

6. **Podilymbus podiceps**. (Linn.) Pied-billed grebe.

Summer resident; uncommon. April 4—Nov. 18. Common transient visitant. Breeds on the weedy margins of secluded ponds and streams.

Family **GAVIIDAE**. *Loons.*

7. **Gavia imber** (Gunn.) Loon.

Transient visitant; common. April 1—May 30, Sept. 15—Dec. 10. Occasional winter visitant. Found on lakes, ponds and rivers. Often seen migrating by day, singly or in small companies.

11. **Gavia lumme** (Gunn.) Red-throated loon.

Winter visitant; uncommon. Nov.—May. Has been taken on Niagara River, Lakes Erie, Ontario, Keuka, Owasco, Onondaga and Oneida. Last record, Canandaigua Lake, April 20, 1899.

Family **ALCIDAE**. *Auks, murres and puffins.*

31. **Uria lomvia** (Linn.) Brünnich's murre.

Occasional winter visitant from the North Atlantic coast. Formerly this bird was unknown here, but in recent years has been taken in considerable numbers. McIlwraith records nearly fifty captured in the Province of Ontario during the fall and winter of 1893. The following Western New York records are worthy of note: Buffalo, several taken during Nov. and Dec., 1894—James Savage. Booneville, Dec. 15, 1894; Utica, Dec. 24, 1894—Auk 12, 177. Johnstown, winter '94–'95—Auk 12, 290. Seneca Lake, Dec. 23, 1895; May, 1896; numbers, winter of 1896—Auk 14, 202. Penn Yan, Dec. 20, 1896—Verdi Burtch. Murray, Mar., 1897, and Kendall—Auk 16, 193. Canandaigua, Dec. 20, 1897. Cayuga Lake, winter of 1899. Rochester, Nov. 27—Dec. 2, 1900, four birds were captured near Cranberry Pond.

Order LONGIPENNES. *Long-winged swimmers.*

Family STERCORARIIDAE. *Skuas and jaegers.*

35. **Megalestris skua.** (Brünn.) Skua.

Accidental visitant. Niagara River spring of 1886—Auk 6, 331; and Berg. p. 3.

36. **Stercorarius pomarinus** (Temm.) Pomarine jaeger.

Transient visitant; very rare. Buffalo, two records—James Savage.

37. **Stercorarius parasiticus** (Linn.) Parasitic jaeger.

Transient visitant; very rare. Buffalo, one record—James Savage. Mouth of Niagara River, Sept., 1897—Harry Lansing.

Family LARIDAE. *Gulls and terns.*

40. **Rissa tridactyla** (Linn.) Kittiwake.

Winter visitant; rare. Seneca Lake,—Aub. p. 41. Oneida Lake, Nov. 9, 1890—Auk 11, 162. Buffalo, "tolerably common migrant"—Berg. p. 3.

42. **Larus glaucus** Brünn. Glaucous gull.

Winter visitant; rare. Buffalo, Jan. 29, 1895—Auk 12, 312.

43. **Larus leucopterus** Faber Iceland gull.

Winter visitant; rare. Cayuga Lake, winter of 1896–7—L. A. Fuertes. Peterboro, Feb. 1, 1884—Auk 1, 240.

47. **Larus marinus** Linn. Great black-backed gull.

Winter visitant; occasional. Lewiston, Feb. 1, 1886—J. L. Davison. Buffalo, Jan. and Feb., 1895—Jas. Savage. Branchport, April 18, 1898—C. F. Stone. Brockport—Short, p. 5.

51. **Larus argentatus** Brünn. Herring gull.

Specimens answering the description of this species are occasionally captured on the lakes. I have examined one bird from Lake Ontario which was decidedly *argentatus* and have seen several which intergrade between this species and the following.

51*a*. **Larus argentatus smithsonianus** Coues American herring gull.

Winter visitant; abundant in the spring and fall; common in winter: Aug. 13–May 20. Migrates by day, usually in small companies, high in air. Often taken on the smaller inland ponds and streams.

54. **Larus delawarensis** Ord Ring-billed gull.

Transient visitant; occasional. Seneca Lake—Aub. p. 41. "Occasional migrant"—Short, p. 5. Branchport, spring of 1894—Auk 16, 284. Canandaigua, Oct. 20, 1898.

58. **Larus atricilla** Linn. Laughing gull.

Accidental visitant. Buffalo,—Berg. p. 3.

60. **Larus philadelphia** (Ord) Bonaparte's gull.

Transient visitant; fairly common. April 10—June 10, Sept. 1—Nov. 20. Found on lakes, ponds and rivers. Sometimes seen coursing over plowed fields.

64. **Sterna caspia** Pallas Caspian tern.

Transient visitant; rather rare. Kendall, Sept., 1890—Auk 16, 193. Buffalo, late fall, 1893—Auk 12, 313. Canandaigua, April 28, 1895, 3 specimens. Buffalo, Sept. 20, 1899—Edward Reinecke.

70. **Sterna hirundo** Linn. Common tern.

Transient visitant; fairly common. May—June; Aug.—Oct. 10. Occasional in summer. Breeds near Buffalo—Ottomar Reinecke.

71. **Sterna paradisaea** Brünn. Arctic tern.

Accidental visitant. Buffalo—Berg. p. 3.

72. **Sterna dougalli** Montag. Roseate tern.

Summer visitant; accidental. Youngstown, Niagara River, May 31, 1886—J. L. Davison. Penn Yan,—Aub. p. 41.

74. **Sterna antillarum** (Less.) Least tern.

Transient visitant; occasional. Branchport, Sept. 6–11, 1896, Auk 16, 284; also Aug. 27—Sept. 8, 1899—Clarence F. Stone. New Hartford, Oneida Co.—R. & B., p. 104. Cayuga Lake—Aub. p. 41. Buffalo,—Berg. p. 4.

75. **Sterna fuliginosa** Gmel. Sooty tern.

Accidental visitant. Owasco Lake, Sept. 20, 1875—Aub. p. 41.

77. **Hydrochelidon nigra surinamensis** (Gmel.) Black tern.
Transient visitant ; fairly common ; frequently seen in summer. April 28—Sept. 20. Said to breed on the northern shore of Lake Ontario. Found on lakes, ponds and rivers.

Family RYNCHOPIDAE. *Skimmers.*

80. **Rynchops nigra** Linn. Black Skimmer.
Accidental visitant. Whitestown, Oneida County, fall of 1893—Auk 11, 162.

Order TUBINARES. *Tube-nosed swimmers.*

Family PROCELLARIIDAE. *Fulmars and shearwaters.*

98. **Aestrelata hasitata** (Kuhl) Black capped petrel.
Accidental visitant. Oneida Lake, Aug. 28, 1893—Auk 11, 162.

99. **Aestrelata scalaris** Brewst. Scaled petrel.
Accidental visitant. The type and only specimen of this bird was taken at Mt. Morris during the first week in April, 1880. Bul. Nutt. Orn. Club, 6, 91-97. Also Auk 11, 389–393. Also Farr, p. 219.

109. **Oceanites oceanicus** (Kuhl) Wilson's petrel.
Accidental visitant. Lockport, Oct., 1875—Auk 1, 294. Also Dav. No. 12.

Order STEGANOPODES. *Totipalmate swimmers.*

Family PHAËTHONTIDAE. *Tropic birds.*

112. **Phaëthon americanus** Grant Yellow-billed tropic bird.
Accidental visitant from the tropical seas. Knowlesville, Sept., 1876—Langille, p. 615. Also Bul. Nutt. Orn. Club, 5, 63. Also Short, p. 6. Also Farr, p. 219.

Family PHALACROCORACIDAE. *Cormorants.*

119. **Phalacrocorax carbo** (Linn.) Cormorant.
Transient visitant ; rare. Niagara River—Berg. p. 4. Oneida Lake, Nov. 15, 1877—Aub. p. 40. Onondaga Lake, 1883—A. W. Perrior. Oneida Lake, 1890—Egbert Bagg.

120. **Phalacrocorax dilophus** (Swain.) Double-crested cormorant.

Transient visitant ; uncommon. Aug. 14—Nov. 30. Has been taken near Buffalo, Branchport, Syracuse and Naples. Last record, Canandaigua, Nov. 7, 1899.

Family **PELECANIDAE.** *Pelicans.*

125. **Pelecanus erythrorhynchos** Gmel. American white pelican.

Transient visitant ; very rare. Buffalo, Oct. 5, 1894—Auk 12, 313.

Order ANSERES. *Lamellirostral swimmers.*

Family ANATIDAE. *Ducks, geese and swans.*

129. **Merganser americanus** (Cass.) American merganser.

Winter visitant ; common. Oct. 20—Apr. 20. Occasional summer resident. Found on lakes and rivers. Breeds near Buffalo, nest in hollow tree—Ottomar Reinecke ; also at "Blind Sodus Bay" —Aub. p. 40.

130. **Merganser serrator** (Linn.) Red-breasted merganser.

Winter visitant ; fairly common. Common transient visitant. Oct. 10—Apr. 30. Found on lakes and ponds.

131. **Lophodytes cucullatus** (Linn.) Hooded merganser.

Transient visitant ; fairly common. March 20—May 1 ; Oct. 15 —Nov. 25. Occasional summer resident. Rare in winter. Found along swampy streams, ponds and bays.

132. **Anas boschas** Linn. Mallard.

Transient visitant ; fairly common. March 15—April 30 ; Oct. 1 —Nov. 20. Occasionally met with both in summer and midwinter. Found along swamps, streams and lakes. Often alights in dry fields and oak groves to feed. Breeds, West Barre, May 10, 1899—James Savage.

133. **Anas obscura** Gmel. Black duck.

Transient visitant ; common. Winter visitant ; fairly common. Summer resident ; occasional. By far the commonest of the river ducks on Canandaigua Lake, remaining in considerable numbers through the coldest weather. Breeds in Tonawanda Swamp, Montezuma Marshes, West Barre and Niagara River.

135. **Chaulelasmus streperus** (Linn.) Gadwall.

Transient visitant ; less common than the mallard. March 20—April 30 ; Sept. 20—Nov. 1. More confined to the marshes than either the mallard or black duck.

136. **Mareca penelope** (Linn.) Widgeon.

Accidental visitant. Keuka Lake, March 25, 1899 — C. F. Stone.

137. **Mareca americana** (Gmel.) Baldpate.

Transient visitant; fairly common. March 20—April 25; Sept. 20—Nov. 10. Frequents the marshes and shallow bays.

139. **Nettion carolinensis** (Gmel.) Green-winged teal.

Transient visitant; fairly common. April; Sept.—Oct. Rare winter visitant. Said to have bred near Buffalo—Berg. p. 4. Found on marshy lakes, ponds and streams.

140. **Querquedula discors** (Linn.) Blue-winged teal.

Transient visitant; fairly common. April; Sept.—Oct. A rare summer resident. Found along the lakes, bays and streams.

141. **Querquedula cyanoptera** (Vieill.) Cinnamon Teal.

Accidental visitant. Mr. James Flahive of Penn Yan has in his collection a fine specimen of this bird, which was killed in Yates County on Seneca Lake in April, 1886.

142. **Spatula clypeata** (Linn.) Shoveller.

Transient visitant; not common. April; Oct.—Nov. Found on marshy streams and lakes.

143. **Dafila acuta** (Linn.) Pintail.

Transient visitant; common in the spring. March 15—April 15. Much less abundant in the fall, Sept. 25—Nov. 15. Frequents the flooded swamps, marshy streams and lakes.

144. **Aix sponsa** (Linn.) Wood duck.

Summer resident; fairly common. March 30—Nov. 15. Found on secluded, marshy streams and ponds. Less common than formerly on account of the destruction of its nesting sites.

146. **Aythya americana** (Eyt.) Redhead.

Transient visitant ; common. Sept. 25—Nov. 25; Mar. 20—April 30. Occasional winter visitant. Found on the lakes and larger ponds.

147. **Aythya vallisneria** (Wils.) Canvasback.

Transient and winter visitant; occasional. Fairly common on the smaller lakes during the winters of 1896—97, 1897—98, 1898—99. Nov. 15—March 20.

148. **Aythya marila** (Linn.) American scaup duck.

Transient visitant; common. Not uncommon in winter, Oct. 1—April 25. Found on all our larger bodies of water. Called "Lake Bluebill."

149. **Aythya affinis** (Eyt.) Lesser scaup duck.

Transient visitant; common. March 20—May 20; Oct. 1—Nov. 20. Often taken in winter and a few remain through the summer. Found on lakes, ponds and streams. Called "Marsh bluebill" and "Creek bluebill."

150. **Aythya collaris** (Donov.) Ring-necked duck.

Transient visitant; uncommon. I have never taken it. "Common on Lake Ontario"—Short, p. 7. Buffalo "Tolerably common migrant"—Berg. p. 5. Elmira, "to be met with at most all seasons"—Gregg No. 186.

151. **Clangula clangula americana** Faxon American golden-eye.

Winter visitant; common. Nov. 1—April 25. Found on all our lakes. Called "Whistler."

153. **Charitonetta albeola** (Linn.) Buffle-head.

Transient visitant; common. Oct. 10—Nov. 25; April 10—May 20. Frequently taken in midwinter. Found on all lakes and ponds. Called "Butterball."

154. **Harelda hyemalis** (Linn.) Old-squaw.

Transient visitant; common on lakes and ponds. Oct. 15—Nov. 20; April 1—25. Common on Niagara River in winter, and abundant in migration. Called "Coween."

155. **Histrionicus histrionicus** (Linn.) Harlequin duck.

Accidental visitant. Buffalo,—Berg, p. 5.

160. **Somateria dresseri** Sharpe American eider.

Winter visitant; rare. Branchport, Feb., 1873—Aub. p. 39. Buffalo, "occasional winter visitant"—Ottomar Reinecke.

162. **Somateria spectabilis** (Linn.) King eider.

Winter visitant; occasional. In November and December, 1877, was quite common near Buffalo—Auk, 1880, p. 62. Has been taken several times on Oneida Lake—See R. & B. p. 108. Also on Cayuga Lake—L. A. Fuertes.

163. **Oidemia americana** Swains. American scoter.

Transient and winter visitant ; fairly common. Rarely seen in spring (May) ; most common in October. Found on the lakes.

165. **Oidemia deglandi** Bonap. White-winged scoter.

Transient visitant; common for a short time in May and October. Found on the lakes.

166. **Oidemia perspicillata** (Linn.) Surf scoter.

Transient visitant; common in autumn. Oct. 1—Nov. 10. Old birds are of rare occurrence. Uncommon in the spring. Found on the lakes, rarely on small ponds.

167. **Erismatura jamaicensis** (Gmel.) Ruddy duck.

Transient visitant ; fairly common. March 25.—April 20 ; Sept. 25.—Oct. 30. Much more common in the fall than in the spring. Frequents the lakes and bays, but sometimes found on the smaller ponds.

169a. **Chen hyperborea nivalis** (Forst.) Greater snow goose.

Winter visitant ; rare. Chautauqua Lake,—See Bul. Buf. Soc. Nat. Sci., Vol. 4, page 34. Buffalo, "occasional winter visitor"—Berg. p. 6.

171a. **Anser albifrons gambeli** (Hartl.) American white-fronted goose.

Chautauqua Lake,—See Bul. Buf. Soc. Nat. Sci., Vol. 4, page 34.

172. **Branta canadensis** (Linn.) Canada goose.

Transient visitant ; common. Mar. 10.—April 25 ; Oct. 1.—Nov. 30. Sometimes seen in Dec. and Jan. Frequents our larger bodies of water, visiting meadows and wheatfields to feed.

172a. **Branta canadensis hutchinsii** (Rich.) Hutchins's goose.

Transient visitant ; rarely captured. Gaines, 1888—Auk. 16, p. 93.

173. **Branta bernicla** (Linn.) Brant.

Transient visitant ; rare. Cayuga Lake, Dec., 1877, and Nov. 26, 1878—Aub. p. 36.

174. **Branta nigricans** (Lawr.) Black brant.

Transient visitant ; rare. Oneida Lake, Lewis Point, Oct. 30, 1891—Egbert Bagg.

180. **Olor columbianus** (Ord) Whistling swan.

Transient visitant ; occasional. Has been taken near Buffalo, Lewiston, Medina, Oneida Lake and Utica. "Nearly every season a number of this species are taken in a wounded condition in Niagara River below the falls"—Dav. No. 36. Last record, Honeoye Lake, Apr., 1898, 3 birds observed.

181. **Olor buccinator** (Rich.) Trumpeter swan.

Accidental visitant. Cayuga Lake—Aub. p. 36. Buffalo, "Accidental—*Chas. Linden*"—Berg. p. 6.

Order HERODIONES *Herons, ibises, etc.*

Family IBIDIDAE. *Ibises.*

186. **Plegadis autumnalis** (Hasselq.) Glossy ibis.

Summer visitant ; very rare. Dunkirk, April, 1894—Auk 12, 393. Tonawanda Swamp, May, 1884—Auk 16, 193.

187. **Plegadis guarauna** (Linn.) White-faced glossy ibis.

Accidental visitant. Niagara River, Aug., 1884 ;—3d ann. rept. N. Y. state museum, p. 22; also Auk 4, 253.

Family ARDEIDAE *Herons, bitterns, etc.*

190. **Botaurus lentiginosus** (Montag.) American bittern.

Summer resident ; fairly common. April 18—Nov. 10. Found in swamps and marshes, more generally distributed than the least bittern. Breeds in secluded grassy marshes ; May 15—June 10 ; eggs 3-5.

191. **Ardetta exilis** (Gmel.) Least bittern.

Summer resident ; fairly common in grassy marshes. May 15—Sept. 15. Nest built of dead grass among sedges growing in shallow water ; June 10-25 ; eggs 3-5.

194. **Ardea herodias** Linn. Great blue heron.

Transient visitant ; fairly common. March 30—April 25; Aug. 1—Nov. 10. Locally a summer resident. The most noted breeding colonies are at Oneida Lake, Potter Swamp, Seneca River, Tonawanda Swamp, Lime Lake and Conewango Swamp.

196. **Ardea egretta** Gmel. American egret.

Summer visitant; uncommon. Usually taken late in summer. The following records are of interest; Penn Yan in the spring—Aub. p. 34. Medina—Short, p. 8. Springville, Aug. 10, 1881, young bird, two others seen. Kent, Orleans Co., July 27, 1883—Auk, 16, 193, three specimens; cf. Forest and Stream 24, 204. Herkimer in the spring of 1882, one taken and six seen; also at Deerfield and Marcy, 1889—Egbert Bagg. Olcott, Aug. 18, 1886—Auk 4, 159. Baldwinsville, Sept. 1895; also Skaneateles, Sept. 1895, adult—A. W. Perrior. Newark Valley, June 1, 1896—G. B. Sutton.

197. **Ardea candissima.** Gmel. Snowy heron.

Buffalo, "accidental—*Otto Besser*"—Berg. p. 6.

201. **Ardea virescens** Linn. Green heron.

Summer resident; fairly common. May 3 — Sept. 28. Found along streams and the borders of ponds. Nest in a low tree, May 15—June 20; eggs 3-5.

202. **Nycticorax nycticorax naevius** (Bodd.) Black-crowned night heron.

Transient visitant; rather uncommon, but of regular occurrence in the fall. Last records : Canandaigua, Sept. 30, 1899. Rochester, Sept. 1900. Ithaca, "regular spring and fall visitant" — L. A. Fuertes.

203. **Nycticorax violaceus** (Linn.) Yellow-crowned night heron.

Accidental visitant. Buffalo,—Berg. p. 7.

Order PALUDICOLAE. *Cranes, rails, etc.*

Family GRUIDAE. *Cranes.*

204. **Grus americana** (Linn.) Whooping crane.

Formerly transient visitant. Several years ago a specimen was killed on Cayuga Lake—Frank A. Ward.

206. **Grus mexicana** (Müll.) Sandhill Crane.

Formerly transient visitant. Buffalo,—Berg. p. 7.

Family **RALLIDAE**. *Rails, gallinules and coots.*

208. **Rallus elegans** Aud. King rail.

Summer resident; rather rare. Carlton, Aug., 1880—Langille, p. 400. Canandaigua, Oct., 1894. Springville, Sept., 1898, two seen and one captured. Mr. Ottomar Reinecke of Buffalo reports taking a fully formed egg from a bird killed there several years ago; and his son Edward took a set of ten eggs of this species near Buffalo, May 30, 1894.

211. **Rallus crepitans** Gmel. Clapper rail.

Accidental visitant. Two instances near Syracuse, J. A. Dakin, per A. W. Perrior. Perhaps *R. elegans* was mistaken for this species.

212. **Rallus virginianus** Linn. Virginia rail.

Summer resident; fairly common. April 20—Oct. 10. Frequents grassy swamps and margins of streams. Nest, in a swamp, concealed in the grass or under a brush pile; May 10—June 20; eggs 8-12.

214. **Porzana carolina** (Linn.) Sora.

Summer resident; common in grassy swamps and marshes. April 25—Oct. 18. Nest, a bunch of dead flags carefully concealed in the dense sedge-grass; May 26—June 15; eggs 6-11.

215. **Porzana noveboracensis** (Gmel.) Yellow rail.

Transient visitant; rather uncommon. Usually taken in the fall. Sept. 1—Oct. 15. Reported from Buffalo, Brockport, Murray, Penn Yan, Dresden, Utica and Rochester. Canandaigua, Oct. 4, 1894; also Sept. 1, 1896. Spring record: Murray, Apr. 21, 1894—Auk 16, 194.

216. **Porzana jamaicensis** (Gmel.) Black rail.

Summer visitant; very rare. Two instances recorded in the Auburn list, p. 35; Penn Yan, 1870; Watkins, spring of 1872. The second specimen is in the John B. Gilbert collection at Elmira College.

218. **Ionornis martinica** (Linn.) Purple gallinule.

Summer visitant; accidental. A bird of this species was captured some years ago by the Haight brothers near East Homer—G. B. Sutton.

219. **Gallinula galeata** (Licht.) Florida gallinule.

Summer resident; common in the large reed-covered marshes. April 28—Oct. 25. Nest, a heap of dead weeds and flags, in or near the water, concealed among thick grass; May 15—June 20; eggs, 10—14. Commonly called "mudhen."

221. **Fulica americana** Gmel. American coot.

Transient visitant; fairly common in the fall, less so in the spring. April 25—May 20; Sept. 10—Nov. 5. Found along reedy streams and marshy shores, usually swimming like a duck. Said to breed in the Montezuma marshes and along the shore of Lake Ontario. Also called "mud hen."

Order LIMICOLAE. *Shore birds.*

Family PHALAROPODIDAE. *Phalaropes.*

222. **Crymophilus fulicarius** (Linn.) Red phalarope.

Transient visitant; rare. Buffalo, Sept. 26, 1894; and Oct., 1892—Auk 12, 313. Oneida Lake, Oct. 4, 1889—Auk 7, 229. Penn Yan—James Flahive.

223. **Phalaropus lobatus** (Linn.) Northern phalarope.

Transient visitant; rather uncommon. Has been captured at Buffalo, Baldwinsville, Onondaga Lake, Westmoreland, Oneida Lake, Owasco Lake, and Penn Yan. Last record : Branchport, May 16, 1895—Auk 16, 285.

224. **Steganopus tricolor** Vieill. Wilson's phalarope.

Transient visitant; rare. Ithaca, fall, 1892—L. A. Fuertes. Onondaga Lake, Sept. 2, 1886—C. P. L. Noxon. Oneida Lake, Oct. 6, 1883—R. & B. p. 112. Penn Yan—Aub. p. 30.

Family RECURVIROSTRIDAE *Avocets and stilts.*

225. **Recurvirostra americana** Gmel. American avocet.

Summer visitant; accidental. Buffalo—Berg. p. 7.

Family SCOLOPACIDAE *Snipes, sandpipers, etc.*

228. **Philohela minor** (Gmel.) American woodcock.

Summer resident; fairly common in swampy alder and willow coverts. In fall often found in upland woods. Much less common than formerly. March 10—Nov. 15. Nest, on the ground; April 1—20; eggs 4.

230. **Gallinago delicata** (Ord) Wilson's snipe.

Transient visitant; common. April 9—May 10; Sept. 1—Nov. 25; rare in summer. Found in marshes and swampy meadows. Breeds: Springville, April 22—May 10; Bergen Swamp, May 30, 1899; Buffalo—Berg. p. 7 and Ottomar Reinecke; Branchport—C. F. Stone. Nest on a hummock in the midst of a marsh; eggs, 4.

231. **Macrorhamphus griseus** (Gmel.) Dowitcher.

Transient visitant; rather rare. Niagara River, Oct., 1892—Auk 12, 313. Oneida Lake, Sept., 1883; also in 1880—R. & B. p. 112. Auburn, Sept., 1875—Aub. p. 31.

232. **Macrorhamphus scolopaceus** (Say) Long-billed dowitcher.

Transient visitant; rare. Strawberry Island, Niagara River, Oct., 1892—Auk 12, 313.

233. **Micropalama himantopus** (Bonap.) Stilt sandpiper.

Transient visitant; rare. Penn Yan, Oct., 1875—Auburn List, p. 31. Buffalo, Sept. 16, 1893—Auk 12, 313.

234. **Tringa canutus** Linn. Knot.

Transient visitant; uncommon. Carlton, Sept. 9, 1897—Auk 16, 194. Oneida Lake, Aug. 26, 1891—Auk 11, 162. Syracuse, "rare visitant"—A. W. Perrior. Penn Yan, Oct. 15, 1874; also one in the Flahive collection—Aub. p. 32. Buffalo, "rare migrant"—Berg. p. 8.

235. **Tringa maritima** Brünn. Purple sandpiper.

Winter visitant; very rare. One specimen taken in winter on Seneca Lake,—Aub. p. 32.

239. **Tringa maculata** Vieill. Pectoral sandpiper.

Transient visitant; common in the fall; uncommon in spring. May; Sept. 1—Nov. 5. Found in marshes and along the shores of lakes and streams.

240. **Tringa fuscicollis** Vieill. White-rumped sandpiper.

Transient visitant; occasional. Sept. 29—Nov. 4. There are published records for Carlton, Branchport, Utica and Oneida Lake (several instances). Canandaigua, Oct. 17 and 25, 1895; Oct. 25 and Nov. 4, 1898; Sept. 30, 1899. Penn Yan, "eighteen years ago"—Flahive collection. This bird often escapes identification, which accounts for its apparent rarity.

241. **Tringa bairdii** (Coues) Baird's sandpiper.

Transient visitant ; occasional. Aug. 25—Nov. 20. Several records ; Waterport, Lakeside Park (several), Locust Grove, Verona Beach (two). Canandaigua, Nov. 20, 1895 ; and Oct. 6, 1900 (two). This bird like the preceding species is probably not as rare as is commonly supposed.

242. **Tringa minutilla** Vieill. Least sandpiper.

Transient visitant ; fairly common. May ; Aug. 20—Sept. 25. Found on sandy and marshy shores.

243a. **Tringa alpina pacifica** (Coues) Red-backed sandpiper.

Transient visitant ; common in fall ; seldom seen in the spring. May ; Sept. 25—Nov. 10. Found on marshy or sandy shores

246. **Ereunetes pusillus** (Linn.) Semipalmated sandpiper.

Transient visitant ; common. May ; Sept. 1—Nov. 5. Found on marshy or sandy shores.

247. **Ereunetes occidentalis** Lawr. Western sandpiper.

Transient visitant ; fairly common. May ; Aug. 20—Sept. 25. Found on marshy or sandy shores.

248. **Calidris arenaria** (Linn.) Sanderling.

Transient visitant ; fairly common. May 15—June 10 ; Sept. 1—Oct. 10. Found on muddy or sandy shores.

249. **Limosa fedoa** (Linn.) Marbled godwit.

Transient visitant ; rare. Syracuse, June 18, 1876—Auburn List, p. 32. Niagara River, occasional migrant—Lang. p. 554.

251. **Limosa haemastica** (Linn.) Hudsonian godwit.

Transient visitant ; rare. Onondaga Lake, Oct. 13, 1883—A. W. Perrior. Oneida Lake, Sept. 7, 1891 ; one other, later in the season—Egbert Bagg. See also Auburn List, p. 32.

254. **Totanus melanoleucus** (Gmel.) Greater yellow-legs.

Transient visitant ; fairly common. Apr. 20—May 10 ; Aug. 15—Nov. 5. Found in marshes and along the shores of ponds and lakes.

255. **Totanus flavipes** (Gmel.) Yellow-legs.

Transient visitant ; fairly common in fall. May 10–20 ; Aug. 15—Oct. 1. Found on marshy or sandy shores.

256. **Helodromas solitarius** (Wils.) Solitary sandpiper.

Transient visitant; fairly common. May 1–20; July 15—Sept. 20. Found along woodland ponds and streams.

258. **Symphemia semipalmata** (Gmel.) Willet.

Accidental visitant. "A regular migrant, three in fall of 1876—" Aub. p. 33. One killed at Canandaigua about 1878, in summer, by George Herendeen. Niagara River, occasional migrant—Lang. p. 526.

261. **Bartramia longicauda** (Bechst.) Bartramian sandpiper.

Summer resident; fairly common, but somewhat local in distribution. April 20—Sept. 10. Found in dry upland pastures, meadows and stubble fields. Nest, in slight hollow in the ground; May 20—June 10; eggs 4-5.

262. **Tryngites subruficollis** (Vieill.) Buff-breasted sandpiper.

Transient visitant; rare. Lockport, Aug. 31, 1886—J. L. Davison. Kendall, about 1885, and Gaines, fall of 1897—Auk 16, 194. Buffalo—Berg. p. 8. Penn Yan—James Flahive.

263. **Actitis macularia** (Linn.) Spotted sandpiper.

Summer resident; abundant. April 18—Sept. 10. Found along the streams and shores. Nest, concealed in the grass of a swamp or pasture; May 15—June 10; eggs 4. Beneficial.

264. **Numenius longirostris** Wils. Long-billed curlew.

Transient visitant; rare. Oneida Lake, Oct. 5, 1880—Ralph & Bagg List, p. 115. "Regular but somewhat rare"—Auburn List, p. 33. Canandaigua, Sept., 1885—A. P. Wilbur. Buffalo, "occasional"—Berg, p. 33.

265. **Numenius hudsonicus** Lath. Hudsonian curlew.

Transient visitant; occasional. Records for Murray, Sept. 1879—Auk 16, 195. Oneida Lake, Sept. 5, 1899—Auk 17, 177. Canandaigua, May 30, 1897. Also reported from Branchport, Auburn, Lockport and Buffalo.

266. **Numenius borealis** (Forst.) Eskimo curlew.

Transient visitant; rare. Otisco Lake, 1873—A. W. Perrior. Lockport, Oct. 2, 1879—J. L. Davison. Buffalo—Berg., p. 9.

Family CHARADRIIDAE. *Plovers.*

270. **Squatarola squatarola** (Linn.) Black-bellied plover.

Transient visitant; fairly common in the autumn, irregular in the spring. May 20—June 10; Aug. 20—Oct. 12. Found on the shores of lakes and streams.

272. **Charadrius dominicus** Müll. American golden plover.

Transient visitant; fairly common in fall; rare in spring. Aug. 15—Oct. 15. Frequents muddy and sandy shores.

273. **Aegialitis vocifera** (Linn.) Killdeer.

Summer resident; abundant; March 10—Nov. 15. Frequents pastures, shores of streams, ponds and lakes. Nest, in slight hollow in meadow or pasture, often long distances from water; April 15—May 20; eggs 4. Beneficial.

274. **Aegialitis semipalmata** Bonap. Semipalmated plover.

Transient visitant; fairly common in the fall. Aug. 20—Sept. 25. Uncommon in spring. Found on sandy or marshy shores.

277. **Aegialitis meloda** (Ord) Piping plover.

Transient visitant; accidental. Owasco Lake, Auburn, 1876—Auburn List, p. 30. Lockport, Aug. 20, 1885—J. L. Davison.

280. **Aegialitis wilsonia** (Ord) Wilson's plover.

Summer visitant; accidental. Penn Yan, spring, 1868—Auburn List, p. 30. Oneida Lake, 1880—Ralph & Bagg List, p. 115.

Family APHRIZIDAE. *Surf birds and turnstones.*

283. **Arenaria interpres** (Linn.) Turnstone.

Transient visitant; fairly common in spring. May 15—June 10.

This bird is known as the "black heart" on Canandaigua Lake, where it sometimes occurs in large flocks. Uncommon in autumn.

Order GALLINAE. *Gallinaceous birds.*

Family TETRAONIDAE. *Grouse, Partridges, etc.*

289. **Colinus virginianus** (Linn.) Bob-white.

Resident; fairly common, except in the colder, hilly and mountainous districts. Found in thickets, meadows and hedgerows. Occurs in bevies of 10-30, after the breeding season is ended. Nest, concealed in the grass, often at the foot of a small bush; May 25—June 15; eggs 10-20.

300. **Bonasa umbellus** (Linn.) Ruffed grouse.

Resident ; common in woodlands. It is making a good fight against extermination and will succeed if the laws are enforced. Nest on the ground at the foot of a stump or tree. April 15—May 10. Have found fresh eggs on June 5, the first nest probably having been destroyed ; eggs, 6–14.

300a. **Bonasa umbellus togata** (Linn.) Canadian ruffed grouse.

Resident ; occasionally met with in Erie County. Mr. L. A. Fuertes reports it from Ithaca, where it is sometimes found in the markets. Rochester, Nov. 29, 1900, a typical bird of their race was killed by Mr. A. E. Babcock.

Family PHASIANIDAE. *Pheasants, etc.*

310a. **Meleagris gallopavo fera** (Vieill.) Wild turkey.

Formerly resident ; long since exterminated. DeKay in his zoology of the state, 1846, reports it as still found in Allegany and Cattaraugus counties.

Phasianus torquatus Gmel. Mongolian pheasant.

This bird has been introduced with considerable success in western New York, especially in the Genesee valley and in the warmer counties which constitute the northern belt of the region. This pheasant survives the cold and snowy winters and is known to breed in several localities.

Order COLUMBAE. *Pigeons.*

Family COLUMBIDAE. *Pigeons.*

315. **Ectopistes migratorius** (Linn.) Passenger pigeon.

Formerly a transient in immense numbers, and an irregular summer resident. Now rare or accidental. A young bird three-fourths grown was taken by the writer at Springville, July 21, 1882 ; a few were seen in Ithaca, spring of 1892—L. A. Fuertes ; a flock in Lewis County, May 22, 1896—Auk 14, 88. An adult male killed, Canandaigua, Sept. 14, 1898—A. P. Wilbur.

The last great pigeon nesting in western New York was in 1868 near Ceres, about fifteen miles south of Olean, on Bell's Run. Mr. Fred R. Eaton of Olean, has furnished the following particulars; the height of the nesting season was reached about the tenth of May. The country occupied by the birds lay principally across the state line in Pennsylvania; and millions of birds were nesting in the hemlock, pine and hardwood trees, covering a strip of land about fourteen miles in length. In a large hemlock there frequently were 30 or 40 nests containing eggs or young. Both male and female birds took part in incubation and in feeding the squabs. The birds scattered mostly toward the north, to feed upon beech mast and all kinds of grain. Just before the laying they fed along the banks of streams and on low ground, when many were taken by the netters. There was a great flight of birds from the nesting grounds at dawn, consisting only of red-breasted cocks; and another "cock flight" about the middle of the afternoon of each day. The "hen flight" occurred about eleven in the forenoon.

During this nesting dozens of wagon-loads of squabs and old birds were often shipped in one day from Olean.

After the Ceres nesting the birds nested further south in McKean Co., Pennsylvania; but no remarkable nestings occurred after 1875.

316. **Zenaidura macroura** (Linn.) Mourning dove.

Summer resident; common. Mar. 20—Nov. 15. Found in orchards and woodlands, feeding in stubble-fields and coming to the shores and "watering holes" in pastures to drink. Gathers in flocks of 10–50 in autumn. Nest, in the orchard or woods on a low branch. April 20—June 10; eggs 2. Mainly beneficial.

Order RAPTORES. *Birds of prey.*

Family CATHARTIDAE. *American vultures.*

325. **Cathartes aura** (Linn.) Turkey vulture.

Summer visitant; occasional. Westmoreland, May, 1879—R. & B., p. 117. Kendall, May 23, 1884—Auk, July 1884. Phelps, July 3, 1891—Auk 8, 396. Clarendon, July 18, 1891—Auk, April, 1892. Maynard, Aug., 1896—Auk 14, 227. Penn Yan, "1885 and 1898"—James Flahive. Geneva, Aug., 1894; Stanley, Sept., 1895; Bristol, Dec. 28, 1897; Canandaigua, Aug. 13, 1899.

326. **Catharista urubu** (Vieill.) Black vulture.

Summer visitant; accidental. Shelby Center, May 28, 1892—Auk 16, 195. West Seneca, June, 1884, seen by Charles Linden—Berg. p. 10.

Family **FALCONIDAE.** *Falcons, hawks, eagles, etc.*

331. **Circus hudsonius** (Linn.) Marsh hawk.

Summer resident; fairly common. April 1—Oct. 20. Frequents low meadows and swamps, flying and perching low. Like all hawks, migrates by day. Nest, on the ground amidst the grass and low bushes of the marsh, May 5-20; eggs, 4-5. Rather more injurious than the red-tail, but destroys more mice than birds.

332. **Accipiter velox** (Wils.) Sharp-shinned hawk.

Summer resident. fairly common. Apr. 1—Nov. 10. Like the following species, rarely seen in winter. Frequents mixed woodlands. Nest, usually in evergreen trees, 12-40 feet from the ground, May 8—June 5; eggs, 3-5. Injurious; feeds almost exclusively on small birds, often visiting the orchard and farmyard.

333. **Accipiter cooperii** (Bonap.) Cooper's hawk.

Summer resident; fairly common. Apr. 1—Nov. 15; occasional in winter. Found in mixed woodlands, often coming into the fields, orchards and farmyards in search of birds. Nest, in the fork of a tree, 25-50 feet from the ground, May 1-20; eggs, 3-5. Injurious; feeds principally on birds and poultry.

334. **Accipiter atricapillus** (Wils.) American goshawk.

Winter visitant; uncommon. Oct. 21—Mar. 20. Many records. Found in woodlands of mixed evergreen and deciduous trees. Sometimes comes to the barnyard in quest of pigeons and chickens. Injurious; very destructive to game and poultry.

337. **Buteo borealis** (Gmel.) Red-tailed hawk.

Resident; common. More partial to rugged, hilly woodlands than the following species. Nest, in a tall tree, Mar. 15—Apr. 20; eggs, 2-4. This hawk is more destructive to poultry, game and small birds than our other "buzzards," but does much good by destroying mice and red squirrels.

339. **Buteo lineatus** (Gmel.) Red-shouldered hawk.

Summer resident; common. Mar. 1—Nov. 15. Occasional resident. Found in swampy woods. Nest, in the fork of a deciduous tree, 30-70 feet from the ground, Apr. 1—May 10; eggs, 3-5. Mainly beneficial; food, mice, frogs, insects, etc.

342. **Buteo swainsoni** Bonap. Swainson's hawk.

Accidental visitant. Brockport, Oct. 1, 1889—Short, p. 10.

343. **Buteo latissimus** (Wils.) Broad-winged hawk.

Summer resident; rather rare. Mar.—Oct. Found in low, open woods and swamps. Its nest has been found in Oneida Co., Apr. 24, 1883—R. & B., p. 118. Also probably breeds near Buffalo—Ottomar Reinecke. Beneficial.

347a. **Archibuteo lagopus sancti-johannis** (Gmel.) American rough legged hawk.

Winter visitant; fairly common. Oct.—Apr. Found in open country perching on isolated trees or hunting over swamps and meadows. Beneficial; food, mice and other small quadrupeds.

349. **Aquila chrysaëtos** (Linn.) Golden eagle.

Accidental visitant. Clinton, May, 1896—Auk 14, 227. Rochester, Oct. 25, 1900.—This bird evidently struck an electric light wire at night when dazzled by the light, on Clinton Avenue near St. Michael's church. Exhausted by long flight and fasting, and injured by the blow it had received, the bird was captured in the morning and is now in Seneca Park. Mr. C. E. Laney assures me that the bird bore no marks of previous confinement.

352. **Haliaeetus leucocephalus** (Linn.) Bald eagle.

Resident; uncommon. Most frequently seen on the shores of our lakes and along large streams. Apparently does not breed in Western New York except at Sodus Bay.

354b. **Falco rusticolus obsoletus** (Gmel.) Black gyrfalcon.

Winter visitant; very rare. Monroe Co., Oct., 1890—Auk 9, 203.

356. **Falco peregrinus anatum** (Bonap.) Duck hawk.

Transient visitant; rare. Ithaca, 1899—L. A. Fuertes. Grand Island, 1885—Berg. p. 10. Seneca Lake, winter of 1878—Aub. p. 27. Breeds in Hamilton Co.—Auk 14, 226.

357. **Falco columbarius** Linn. Pigeon hawk.

Transient visitant; rather uncommon. Apr., Sept.—Nov. Usually seen near the edges of woods or along the border of lakes and streams. Reported as breeding near Buffalo—Berg. p. 10; and Naples—Short, p. 11. Injurious; feeds mostly on small birds.

360. **Falco sparverius** Linn. American sparrow hawk.

Summer resident; common. March 15—Nov. 1. Occasionally remains all winter. Frequents isolated trees, telegraph poles and the borders of woods. Nest, in a hollow tree or a woodpecker's hole, 20–70 ft. from the ground; May 10–25; eggs 4–6. Mainly beneficial; food, insects, mice and birds.

364. **Pandion haliaëtus carolinensis** (Gmel.) American osprey.

Transient visitant; fairly common. April 12—May 15; Sept. 15—Oct. 20. Occasionally seen throughout the summer. Found along the lakes and rivers. Often visits small ponds far inland. Feeds almost exclusively on fish.

Family **STRIGIDAE.** *Barn owls.*

365. **Strix pratincola** Bonap. American barn owl.

Summer visitant; rather rare. Reported from Navy Island, Niagara River,—Langille, p. 607. Buffalo, July 5, 1890—Auk 7, 400; also July 18, 1895—Auk 12, 393. Cincinnatus, Sept. 13, 1891—Auk 10, 301. Marcy, Sept., 1898–Auk 17, 177. Canandaigua, June 18, 1900.

Family **BUBONIDAE.** *Horned owls, etc.*

366. **Asio wilsonianus** (Less.) American long-eared owl.

Resident; fairly common. Frequents evergreen woods and dense swamps. Nest, usually in an old crow's or squirrel's nest. Mr. C. F. Stone found its nest in Potter Swamp, Yates County, May 16, 1898, the eggs just hatching. Eggs 3–6. Mainly beneficial.

367. **Asio accipitrinus** (Pall.) Short-eared owl.

Winter visitant; fairly common in November and April. Not known to breed, although specimens have been taken May 20 and August 8. Found in grassy swamps, usually in small companies. Quite active by day, but hunts mostly at twilight. Mainly beneficial, a large portion of its food being mice.

368. **Syrnium nebulosum** (Forst.) Barred owl.

Resident; common in the more wooded districts. Nest, in a hollow tree or old crow's nest; eggs 2–4. Not as beneficial as the screech owl, nor as injurious as the great horned owl.

370. **Scotiaptex cinerea** (Gmel.) Great gray owl.

Winter visitant; rare. Three records; Marcy and White Lake, Oneida Co., and Painted Post, Steuben Co., all in February. R. & B. p. 120. Auk 5, 110; also 12, 301.

372. **Nyctala acadica** (Gmel.) Saw-whet owl.

Resident; rather rare in Western New York. "Not very uncommon" in Oneida Co., where it breeds in deserted woodpeckers' holes, March and April—R. & B. p. 120. Also Auk 7, 230. Beneficial.

373. **Megascops asio** (Linn.) Screech owl.

Resident; common. Frequents woods, orchards and shade trees. Nest often built near the house in a hollow tree; April 1—25; eggs 4–6. Mostly beneficial; food principally mice and insects, but destroys some insectivorous birds.

375. **Bubo virginianus** (Gmel.) Great horned owl.

Resident; common in wooded districts. By day it is found among evergreens in swamps and rugged ravines. Nest, in an old hawk's or crow's nest; Feb. 20—March 15; eggs 2–3. Injurious; destroys poultry, grouse, rabbits, skunks, etc.

376. **Nyctea nyctea** (Linn.) Snowy owl.

Winter visitant; occasional. Oct. 20—March. Some winters it is common, e. g., 1876–77.

377a. **Surnia ulula caparoch** (Müll.) American hawk owl.

Winter visitant; rare. Naples, two instances of its occurrence—Short p. 11. Onondaga Co., three records—A. W. Perrior. Niagara Co., "rare winter visitor"—Davison. Clark's Mills, Oneida Co., 1885—R. & B. p. 122. Holly—Auk 16, 195. Gorham, Nov., 1875—O. & O. 6, 13.

Order PSITTACI. *Parrots, etc.*

Family PSITTACIDAE. *Parrots.*

382. **Conurus carolinensis** (Linn.) Carolina paroquet.

Now extinct in this region. Formerly, according to Audubon, this species ranged as far north as the southern shore of Lake Ontario. See also Auk, 1891, pp. 369–379.

Order COCCYGES. *Cuckoos, etc.*

Family CUCULIDAE. *Cuckoos, etc.*

387. **Coccyzus americanus** (Linn.) Yellow-billed cuckoo.

Summer resident; fairly common. May 10—Sept. 15. Frequents groves, hedgerows and thickets, especially on the borders of swamps and streams. Nest, near the ground in a thick bush or vine; June 10–30; eggs 3–5, usually laid at intervals of a few days. Beneficial, fond of tent caterpillars.

388. **Coccyzus erythrophthalmus** (Wils.) Black-billed cuckoo.

Summer resident; common. May 10—Sept. 25. Found in groves, orchards and hedgerows. Nest, a few feet from the ground in a thick bush; June 1–30; eggs 2–5. Beneficial like the preceding.

Family ALCEDINIDAE. *Kingfishers.*

390. **Ceryle alcyon** (Linn.) Belted kingfisher.

Summer resident; common. Apr. 6—Nov. 1. Occasionally seen in winter. Found along streams and the shores of lakes and ponds. Nest, in a bank at the end of a hole 5–8 feet in length; Apr. 15—May 20; eggs 5–7. Destructive to young fish and tadpoles.

Order PICI. *Woodpeckers, etc.*

Family PICIDAE. *Woodpeckers.*

393. **Dryobates villosus** (Linn.) Hairy woodpecker.

Resident; fairly common. Frequents woodlands; sometimes visits orchards and shade trees. Nest, excavated in a dead limb or stub; Apr. 20—May 25; eggs 4–5. Beneficial, like all the woodpeckers, by destroying grubs, beetles, etc.

394c. **Dryobates pubescens medianus** (Swains.) Downy woodpecker.

Resident; common. Frequents woodlands and orchards. Nest, in a dead limb, 15–50 feet from the ground; Apr. 25—May 30; eggs 4–5.

400. **Picoides arcticus** (Swains.) Arctic three-toed woodpecker.

Winter visitant; rare. Tully, Feb. 27, 1880; and Syracuse, Dec. 25, 1883—Auk 7, 206. Ithaca, winter of 1895–96—L. A. Fuertes. Orleans County, 3 records—J. A. Davison.

402. **Sphyrapicus varius** (Linn.) Yellow-bellied sapsucker.

Transient visitant; common. Apr. 10—May 15; Sept. 15—Oct. 20. Occasional summer resident. Reported as breeding in Cayuga, Yates and Oneida Counties. Found in woods, orchards and shade trees during migration. Often does harm by girdling young trees to feed on the sap, 50–100 holes through the bark in a single ring being not uncommon. Otherwise beneficial.

405a. **Ceophloeus pileatus abieticola** Bangs. Northern pileated woodpecker.

Resident; occasionally found in the wildest and most secluded hemlock woods, especially in the counties of Erie, Cattaraugus and Allegany. According to Mr. Ottomar Reinecke it breeds in Tonawanda Swamp. At Springville I have known of only four birds of this species captured in ten years.

406. **Melanerpes erythrocephalus** (Linn.) Red-headed woodpecker.

Summer resident; common. May 5—Oct. 1. When beechnuts are abundant this species always remains throughout the year; otherwise migrates as above stated. Frequents woodlands, groves and telegraph poles. Nest, in a dry stub; May 15—June 20; eggs 4–5. Fond of cherries, berries and apples, but mostly beneficial.

409. **Melanerpes carolinus** (Linn.) Red-bellied woodpecker.

Resident, at least in Erie, Monroe and Ontario counties; not very uncommon. Found mostly in dry woodlands of beech and maple. Breeds, Springville, June, 1896. Also at Benton, May, 1898—Burdette Wright.

412a. **Colaptes auratus luteus** Bangs Northern flicker.

Summer resident; abundant. Apr. 10—Oct. 20. Occasionally found in winter. Frequents orchards and groves, often feeding on the ground in open fields and pastures. Nest, excavated in a dry limb or stub, 10–70 feet from the ground; May 10—June 30; eggs 5–7. Beneficial; destroys ants, grubs and beetles. Its fruit diet is mostly confined to wild cherries, poke berries, woodbine, etc.

Order MACROCHIRES. *Goatsuckers, swifts, etc.*

Family CAPRIMULGIDAE. *Goatsuckers, etc.*

417. **Antrostomus vociferus** (Wils.) Whip-poor-will.

Summer resident ; fairly common in secluded glens and woodlands. May 2—Sept. 15. Beneficial.

420. **Chordeiles virginianus** (Gmel.) Nighthawk.

Summer resident ; often seen in large towns and cities. May 10—Sept. 25. Common in August and Sept. about wide fields and open woods. Seen circling in air at early evening. Nest, usually on flat roof of large buildings ; eggs 2. Beneficial.

Family MICROPODIDAE. *Swifts.*

423. **Chaetura pelagica** (Linn.) Chimney swift.

Summer resident ; abundant. Apr. 25—Sept. 30. Practically seen only in the air. Nest, in chimney, rarely in gable of barn ; May 15—July 10 ; eggs 4–5. Beneficial.

Family TROCHILIDAE. *Hummingbirds.*

428. **Trochilus colubris** Linn. Ruby-throated hummingbird.

Summer resident ; common. May 10—Sept. 10. Found in dooryards, orchards and woods. Nest, on limb of apple, maple, beech or tamarack tree, 8–40 feet from the ground ; June 5—July 20 ; eggs 2. Beneficial.

Order PASSERES. *Perching birds.*

Family TYRANNIDAE. *Tyrant flycatchers.*

444. **Tyrannus tyrannus** (Linn) Kingbird.

Summer resident ; abundant. May 1—Sept. 1. Frequents orchards, fields and roadsides. Nest, usually in apple tree or thorn bush ; May 20—June 15 ; eggs 3–5. Mostly beneficial, sometimes destroys bees, but mostly drones.

452. **Myiarchus crinitus** (Linn.) Crested flycatcher.

Summer resident ; fairly common. May 6—Aug. 20. Found in groves and woodlands. Nest, in hollow tree or stump, or deserted woodpecker's hole ; May 30—June 15 ; eggs 4.

456. **Sayornis phoebe** (Lath.) Phoebe.

Summer resident; abundant. Apr. 5—Oct. 15. Found about dooryards and in vicinity of streams. Nest, in porches, eaves, sheds, bridges or overhanging banks; Apr. 20—June 15; two broods; eggs 3–5. Beneficial, like all the flycatchers.

459. **Contopus borealis** (Swains.) Olive-sided flycatcher.

Transient visitant; rare. Canandaigua Lake, Oct. 22, 1898. Orchard Park, 1885—Berg. p. 13. Lockport, "rare"—Davison. Penn Yan—Aub. p. 23.

461. **Contopus virens** (Linn.) Wood pewee.

Summer resident; abundant. May 15—Sept. 1. Found in groves, orchards and woodlands. Nest, saddled on limb of apple tree, hemlock or maple, June 5—July 20; eggs, 3–4.

463. **Empidonax flaviventris** Baird Yellow-bellied flycatcher.

Transient visitant; uncommon. Rare summer resident. Tully Lake, summer of 1884—A. W. Perrior, reporting the observation of J. A. Dakin. Buffalo, "breeds"—Ottomar Reinecke. Lockport, "rare"—Davison. Oneida Co., breeds, June 24, 1885—R. & B. p. 126. Hulberton, Orleans Co., May 26, 1890—Auk 16, 195.

465. **Empidonax virescens** (Vieill.) Green-crested flycatcher.

Summer resident; rather uncommon. May 12—August. Syracuse, tolerably common—A. W. Perrior. Auburn, "breeds"—Aub. p. 23. Buffalo, "breeds"—Ottomar Reinecke. Lockport, rare, nest found June 14, 1887—Davison. Ithaca, June 4, 1899—T. L. Hankinson.

466a. **Empidonax traillii alnorum** Brewst. Alder flycatcher.

Summer resident; rather uncommon. May 10—Aug. Reported as not uncommon and breeding at Buffalo, Ithaca, Auburn and Utica. The last record of its breeding is at Penn Yan, July 22, 1900, eggs hatching—Verdi Burtch.

467. **Empidonax minimus** Baird Least flycatcher.

Summer resident; common. May 6—Aug. 20. Found in orchards and groves. Nest, in apple tree or maple tree, May 20—June 30; eggs, 3–5.

Family ALAUDIDAE. *Larks.*

474. **Otocoris alpestris** (Linn.) Horned lark.

Winter visitant ; fairly common. Nov.—Mar. Associates with the prairie horned lark.

474b. **Otocoris alpestris praticola** Hensh. Prairie horned lark.

Resident ; abundant in spring and fall. Feb. 20—Apr. 10 ; Sept. 20—Nov. 10. Not common in winter. Found in meadows and plowed fields. Breeds Mar. 10—Apr. 10. Second brood often reared in May. Half-fledged young reported at Buffalo in February, —see "Forest and Stream," 14, 489. Eggs, 4. Beneficial.

Family CORVIDAE. *Crows, jays, magpies, etc.*

477. **Cyanocitta cristata** (Linn.) Blue jay.

Resident ; common in wooded districts. In fall and winter often visits orchards and cornfields. Nest, in a small evergreen tree, Apr. 1—May 10 ; eggs, 4–6. Injurious from its destruction of eggs and young of insectivorous birds.

486a. **Corvus corax principalis** Ridgw. Northern raven.

Rare or accidental visitant. Skeleton found in Wayne Co., 1875, is reported in the Auburn List. Specimen shot on Canandaigua Lake about 1885 is in the possession of Dr. Lot D. Sutherland of Canandaigua.

488. **Corvus americanus** Aud. American crow.

Resident ; abundant. In winter they roost in immense rookeries ; one near Canandaigua is frequented by many thousands ; by day scattering over widely extended country. Nest, 15–70 feet from the ground ; Apr. 1—May 15 ; eggs, 4–6. Does much good in the destruction of cut-worms, May beetles, grasshoppers, etc., but more harm, not merely in injuring newly planted crops, ripening grain, green peas, early apples, etc., but principally in destroying the eggs and young of smaller insectivorous birds.

Family ICTERIDAE. *Blackbirds, orioles, etc.*

494. **Dolichonyx oryzivorus** (Linn.) Bobolink.

Summer resident ; common. May 4—Sept. 15. Frequents meadows in early summer ; in fall, grassy swamps. Here it does not gather in the large flocks seen further south. Nest, on the ground, in the thick grass ; May 20—June 10 ; eggs 4–6. Beneficial with us, from destruction of insects and weed seeds.

495. **Molothrus ater** (Bodd.) Cowbird.

Summer resident; abundant. Mar. 20—Oct. 25. Occasional in winter. Found in pastures, orchards and hedgerows. In autumn gregarious like all blackbirds, feeding in grain fields and meadows. Entirely parasitic, a variety of hosts being selected, varying in size from yellow warbler to mourning dove. Warblers, vireos and the chipping sparrow usually chosen. This bird is a menace to the increase of our smaller insectivorous birds.

498. **Agelaius phoeniceus** (Linn.) Red-winged blackbird.

Summer resident; abundant. Mar. 10—Nov. 10. Frequents swamps and lowland pastures. Nest, over the water in the sedge grass or low bush; May 3—June 15; eggs 4–5. Large flocks in fall do much damage to the ripening grain; otherwise beneficial.

501. **Sturnella magna** (Linn.) Meadowlark.

Summer resident; common. Mar. 12—Nov. 20. Occasional in winter. Found in meadows, pastures and swamps. Nest, concealed in the grass; May 10—July 10 (probably a second brood); eggs 4–5. Beneficial.

506. **Icterus spurius** (Linn.) Orchard oriole.

Summer resident; rather uncommon. May 15—Aug. Reported from Holly, Gaines, Chili, Cayuga, Ithaca, Utica, and Port Byron. Has bred at Lakeside Park—Auk 16, 195; Buffalo—Ottomar Reinecke; Montezuma, May 27, 1899—Burdette Wright; Hamilton, May 26, 1899—Geo. C. Embody.

507. **Icterus galbula** (Linn.) Baltimore oriole.

Summer resident; abundant. May 3—Sept. 1. Frequents orchards and shade trees. Nest, usually suspended from the drooping branches of an elm, or the twigs of an apple or maple tree, 10–40 feet from the ground; May 15—June 10; eggs 4–6. Mainly beneficial, but sometimes destroys fruit buds, green peas and small fruits.

508. **Icterus bullocki** (Swains.) Bullock's oriole.

Accidental visitant. This western species was taken at Onondaga Valley, May 17, 1879, by J. A. Dakin—A. W. Perrior.

509. **Scolecophagus carolinus** (Müll.) Rusty blackbird.

Transient visitant; abundant in the fall; fairly common in the spring. April 1–30; Sept. 10—Nov. 15. Practically confined to the vicinity of water, and wades almost as well as any snipe.

511b. **Quiscalus quiscula aeneus** (Ridgw.) Bronzed grackle.

Summer resident; abundant. Mar. 12—Nov. 10. Feeds in pastures, plowed fields and along the borders of ponds and streams. Nest, usually in evergreens, often several in the same tree. Apr. 20—June 1. I have found the nest of this species in a deserted woodpecker's hole; eggs 4–5. Often destructive to newly planted corn and ripening grain.

Family **FRINGILLIDAE.** *Finches, sparrows, etc.*

514. **Coccothraustes vespertinus** (Coop.) Evening grosbeak.

Winter visitant; rare and irregular in occurrence. Reported from Buffalo, Medina, Lockport, Brockport, Gaines, Chili, Naples, Wayland and Ithaca in the winter of 1889–1890; from Brant and Buffalo, winter of 1886–87 (as late as Apr. 15); and from Marcellus, July 8, 1882—Auk, Oct., 1888; also at Clinton—Egbert Bagg.

515. **Pinicola enucleator canadensis** (Cab.) Pine grosbeak.

Winter visitant; like crossbills, of irregular occurrence. Found in small flocks feeding on fruit of mountain ash, black ash, tamarack, etc. Springville, Dec. 30, 1882. Lockport, Feb. 29, 1883—Davison. Bristol, Dec. 21–30, 1895. Yates Co., Mar. 15, 1896—Verdi Burtch. "Common, winter of 1895–96"—Short, p. 14.

517. **Carpodacus purpureus** (Gmel.) Purple finch.

Summer resident; fairly common; common as transient visitant. Mar. 25—Nov. 5. Found in orchards and groves. Nest, usually in evergreens 10–20 feet from the ground; May 10—June 15; eggs 3-5.

521. **Loxia curvirostra minor** (Brehm) American crossbill.

Winter visitant; irregular, but often fairly common. Nov.—May 12. Accidental in summer; Lockport, June 8 and July 28, 1888—Davison. Found among coniferous trees in small flocks.

522. **Loxia leucoptera** Gmel. White-winged crossbill.

Winter visitant; irregular. Found in flocks, feeding on seeds of coniferous trees. Auburn, Dec. 24, 1878—Aub. p. 17; Springville, Dec. 28, 1882; Holly, Feb., 1888—Auk 16, 195; Benton Centre, Feb. 28, 1897; also Penn Yan, Feb. 4—Apr. 19, 1900—Verdi Burtch.

528. **Acanthis linaria** (Linn.) Redpoll.

Winter visitant; of irregular occurrence. Cayuga Co., common, fall and winter of 1878–1879; Erie Co., common, winter of 1880-1881, Nov. 25—Apr. 6. Some years not found at all. Occurs in flocks, feeding on seeds of the birch, alder and weeds.

529. **Astragalinus tristis** (Linn.) American goldfinch.

Resident; abundant in summer, of irregular distribution in winter. Found in gardens, fields, orchards and hedgerows; swamps in winter. The latest of our birds to breed; July 5—Aug. 10. Nest, in bush or low tree; eggs 4-5. Beneficial.

533. **Spinus pinus** (Wils.) Pine siskin.

Winter visitant; rather irregular in distribution; sometimes abundant and sometimes not seen for years in a given locality. Nov. —Apr.

534. **Passerina nivalis** (Linn.) Snowflake.

Winter visitant; some years abundant. Oct. 25—Mar. 15. Travels in flocks, feeding on weed seeds in the open field.

536. **Calcarius lapponicus** (Linn.) Lapland longspur.

Winter visitant; rare. Several records. The last, Canandaigua, Jan. 27, 1898. Found in company with snowflakes.

540. **Pooecetes gramineus** (Gmel.) Vesper sparrow.

Summer resident; abundant. Apr. 2—Nov. 1. Frequents open fields and roadsides. Nest, on the ground among the grass; May 2—June 30; two broods; eggs 4-5. Beneficial, like all our native sparrows.

542a. **Ammodramus sandwichensis savanna** (Wils.) Savanna sparrow.

Summer resident; common. Apr. 10—Oct. 20. Found in open fields, prefers lower meadows than the vesper sparrow. Nest, on the ground among the thick grass, May 5—July 15; two broods; eggs, 3–5.

546. **Ammodramus savannarum passerinus** (Wils.) Grasshopper sparrow.

Summer resident; fairly common among rolling sand-hills, but by no means of general distribution. May 18—Oct. 5. Nest found at Maplewood, Monroe Co., June 1, 1893—Short, p. 15. Also at Phelps and Chili.

547. **Ammodramus henslowii** (Aud.) Henslow's sparrow.

Summer resident; rare. Syracuse, June 30, 1887—Auk 4, 350.

548. **Ammodramus leconteii** (Aud.) Leconte's sparrow.

Transient visitant; rare. Ithaca, Oct. 11, 1897—Auk 15, 189.

549. 1. **Ammodramus nelsoni** (Allen) Nelson's sparrow.

Transient visitant; rarely detected in its marshy habitat. Utica, Oct. 12, 1883—R. & B. p. 131. Canandaigua, Oct. 7, 1895. Hamilton, Oct. 8, 1898—George C. Embody.

549. 1a. **Ammodramus nelsoni subvirgatus** (Dwight) Acadian sharp-tailed sparrow.

Transient visitant; rarely seen. Penn Yan, Oct. 7, 1896—Auk 14, 93. Ithaca, Oct., 1897, several observed—L. A. Fuertes.

554. **Zonotrichia leucophrys** (Forst.) White-crowned sparrow.

Transient visitant; fairly common. May 5–25; Sept. 20—Oct. 15. Frequents hedgerows and shrubbery.

558. **Zonotrichia albicollis** (Gmel.) White-throated sparrow.

Transient visitant; abundant. Apr. 24—May 12; Sept. 15—Oct. 30. Found in scattered companies among briers and shrubbery.

559. **Spizella monticola** (Gmel.) Tree sparrow.

Winter visitant; abundant, especially in late fall and early spring. Oct. 20—Apr. 25. Found in small companies among weeds and shrubbery, along the edges of woods and swamps.

560. **Spizella socialis** (Wils.) Chipping sparrow.

Summer resident; abundant. Apr. 12—Oct. 25. Frequents orchards and shade trees. Nest, few feet from ground, in porch vines, shade trees, etc.; eggs 4–5.

563. **Spizella pusilla** (Wils.) Field sparrow.

Summer resident; fairly common. Apr. 10—Nov. 1. Found in bushy hillside pastures and open woods. Nest, on or near the ground; May 15—June 20; eggs 4–5.

567. **Junco hyemalis** (Linn.) Slate-colored junco.

Transient visitant; abundant. Mar. 25—Apr. 20; Sept. 25—Nov. 20. Occasional resident. Breeds in higher and cooler localities, regularly at Springville and Olean; May 10—June 15. Nest, in mixed woodlands on mossy banks; eggs 4.

581. **Melospiza fasciata** (Gmel.) Song sparrow.

Summer resident; abundant. Rare in winter. Mar. 10—Nov. 12. Frequents gardens, shrubbery, edges of fields and borders of streams. Nest, on or near the ground; May 1—July 20; two or three broods reared; eggs 4–5. Beneficial by destroying noxious seeds and insects.

583. **Melospiza lincolnii** (Aud.) Lincoln's sparrow.

Transient visitant; apparently rare. Last records: Ithaca, May 12, 1899—L. A. Fuertes; and Buffalo, Oct. 27, 1900—James Savage. Breeds in Herkimer Co.—Bul. Nutt. Orn. Club, 6, 246; also R. & B. p. 132.

584. **Melospiza georgiana** (Lath.) Swamp sparrow.

Summer resident; common. Apr. 15—Nov. 10. Frequents grass and tangled shrubbery of the marshes. Nest, on or near the ground; May 15—June 10; eggs 4–5.

585. **Passerella iliaca** (Merr.) Fox sparrow.

Transient visitant; fairly common. Mar. 25—Apr. 18; Oct. 10—Nov. 10.

587. **Pipilo erythrophthalmus** (Linn.) Towhee.

Summer resident; fairly common in bushy pastures and "slashings." Apr. 15—Oct. 20. Nest, on the ground at the foot of a small bush or stump; June 1–30; eggs 4.

593. **Cardinalis cardinalis** (Linn.) Cardinal.

Occasional visitant from the south; several instances recorded. Lockport, May 10, 1883; also twice in January—J. L. Davison. Onondaga Co., two records—A. W. Perrior. Bluff Point, Keuka Lake—James Flahive. Buffalo—Berg. p. 15.

595. **Zamelodia ludoviciana** (Linn.) Rose-breasted grosbeak.

Summer resident; fairly common in moist or swampy woods. May 7—Sept. 15. Nest, in a bush or tree, 8–20 feet from the ground; May 15—June 20; eggs 3–5, usually 4.

598. **Cyanospiza cyanea** (Linn.) Indigo bunting.

Summer resident; common. May 10—Sept. 30. Frequents the borders of woods, berry-patches and copses. Nest, in a low bush; May 30—July 20; two broods; eggs 3–5.

604. **Spiza americana** (Gmel.) Dickcissel.

Accidental summer visitant. Small flock seen at Tully in 1883 —A. W. Perrior.

Family **TANAGRIDAE**. *Tanagers.*

608. **Piranga erythromelas** Vieill. Scarlet tanager.

Summer resident; fairly common in woodlands. May 7—Sept. 30. Nest, on a horizontal limb 10–50 feet from the ground, May 20 —June 15; eggs, 3–4.

610. **Piranga rubra** (Linn.) Summer tanager.

Summer visitant; accidental. Two birds of this species recorded at Olean by Mr. W. V. Smith.

Family **HIRUNDINIDAE**. *Swallows.*

611. **Progne subis** (Linn.) Purple martin.

Summer resident; fairly common about towns and cities. Apr. 18—Aug. 30. Nest, in martin boxes or about the cornices of tall buildings; May 15—June 20. This species is diminishing in numbers, due to the occupation of its nesting sites by the English sparrows. Beneficial like all the swallows.

612. **Petrochelidon lunifrons** (Say) Cliff swallow.

Summer resident; common. Apr. 24—Sept. 8. Nests, almost invariably in the eaves of a large barn, in communities of 5–100; May 14—July 10; eggs 4–5; sometimes two broods. Before the autumn migration this species and the barn swallow, together with a few of other species, gather in countless numbers at chosen spots to roost in low willows. Near Springville is such a swallow roost. It is most populous about Aug. 20. The birds gather at sunset and scatter again at daybreak.

613. **Hirundo erythrogaster** Bodd. Barn swallow.

Summer resident; abundant. Apr. 15—Sept. 12. Migrates mostly by day. Frequents barns and sheds. Nest, on beams or rafters, sometimes under the eaves; May 5—July 30; two broods; eggs 4–6.

614. **Tachycineta bicolor** (Vieill.) Tree swallow.

Summer resident; fairly common. Apr. 2—Sept. 28. Often abundant in April and September. Migrates by day in large companies.

Nest, in a hollow stump, tree or bird-box ; May 25—June 15 ; eggs 5. More fond of living near the water than all other swallows, except the rough-winged species.

616. **Clivicola riparia** (Linn.) Bank swallow.

Summer resident ; abundant. Apr. 21—Aug. 25. Breeds, usually, in large communities in sandbanks ; May 15—June 20 ; eggs 4–6.

617. **Stelgidopteryx sterripennis** (Aud.) Rough-winged swallow.

Summer resident ; rather uncommon. Apr. 25—Aug. 10. Breeds in small communities along the shaly banks of the "Finger Lakes" and sometimes in the sides of gravel pits. Fresh eggs found June 15 ; eggs 6–8.

Family **AMPELIDAE**. *Waxwings, etc.*

618. **Ampelis garrulus** Linn. Bohemian waxwing.

Winter visitant ; occasional. Reported from Buffalo, Lockport, Penn Yan, Syracuse and Utica. Last record, Syracuse, Feb. 10, 1899—E. H. Johonnot per A. W. Perrior.

619. **Ampelis cedrorum** (Vieill.) Cedar waxwing.

Resident ; common. Somewhat erratic in winter, but many flocks survive the coldest weather, feeding on cedar and mountain ash berries. Nest, in orchards and shade trees ; June 1-20 ; eggs 5.

Family **LANIIDAE**. *Shrikes.*

621. **Lanius borealis** Vieill. Northern shrike.

Winter visitant ; fairly common. Oct. 25—Apr. 12. Frequents the borders of woods and isolated trees in wide meadows and pastures. Often enters the city in quest of English sparrows. Partly injurious, but the majority of its food is meadow mice.

622. **Lanius ludovicianus** Linn. Loggerhead shrike.

Summer resident ; fairly common. Mar. 25—Oct. 1. Frequents upland fields, pastures and hillsides, especially among scattered thorn-trees. Nest, in a low thorn-apple tree ; Apr. 20—May 15 ; eggs 4-6. A second brood (probably), June 30. Mostly beneficial.

622a. **Lanius ludovicianus excubitorides** (Swains.) White-rumped shrike.

What has been written about the preceding species may also be said of the white-rumped shrike, if the current descriptions of these species are to stand.

Family **VIREONIDAE**. *Vireos*.

624. **Vireo olivaceus** (Linn.) Red-eyed vireo.

Summer resident; abundant. May 11—Sept. 5. Found both in dooryards and woodlands. Nest, suspended from a twig about 5–10 feet from the ground; May 25—June 30; eggs 4. Like all the vireos, very beneficial.

626. **Vireo philadelphicus** (Cass.) Philadelphia vireo.

Transient visitant; rare in Ontario and Monroe counties. Onondaga Co., not common—A. W. Perrior. Niagara Co., rather rare—J. L. Davison. Buffalo, rare migrant—Berg. p. 17.

627. **Vireo gilvus** (Vieill.) Warbling vireo.

Summer resident; common. May 4—Sept. 15. Frequents shade trees, orchards and groves. Nest, usually in an apple or maple tree, 12–20 feet from the ground; May 18—June 10; eggs 3–4.

628. **Vireo flavifrons** Vieill. Yellow-throated vireo.

Transient visitant; common. Summer resident; occasional. May 5—Sept. 1. Nest, on a branch about 10–30 feet from the ground; May 25—June 15; eggs 4.

629. **Vireo solitarius** (Wils.) Blue-headed vireo.

Transient visitant; uncommon. May 5-30, Sept. 1-20. Sometimes found in summer above the 1,500-foot line of the Alleghany foot-hills.

629b. **Vireo solitarius plumbeus** (Coues) Plumbeous vireo.

Accidental visitant. One record for central New York, Peterboro, Madison Co., Sept. 24, 1893—Auk, Jan. 1894, 79.

631. **Vireo noveboracensis** (Gmel.) White-eyed vireo.

Summer resident; rare. Onondaga Co., "rare"—A. W. Perrior. Buffalo, "rare migrant"—Berg. p. 17. Penn Yan—Aub. p. 16. Breeds near Lockport—Lang. p. 254.

Family **MNIOTILTIDAE.** *Wood warblers.*

636. **Mniotilta varia** (Linn.) Black and white warbler.

Transient visitant; fairly common. Occasional summer resident. Apr. 28—Aug. 20. Found in woodlands, especially along the gullies of the "Finger Lakes."

637. **Protonotaria citrea** (Bodd.) Prothonotary warbler.

Accidental visitant. Buffalo, "rare migrant—*Chas. Linden*,"—Berg. p. 17.

639. **Helmitherus vermivorus** (Gmel.) Worm-eating warbler.

Summer resident; rare. Breeds at Branchport, June, 1896—C. N. Davis; also 1899—C. F. Stone. Chili, occasional migrant—Short, p. 17. Penn Yan, occurs regularly—Aub. p. 10. Also Lang. p. 604.

641. **Helminthophila pinus** (Linn.) Blue-winged warbler.

Transient visitant; rare. Reported in Auburn List, p. 10. Also in Bergtold's List, p. 17. Lockport, July 21, 1889—Davison. Elmira, May 22, 1867—Gregg, p. 21.

642. **Helminthophila chrysoptera** (Linn.) Golden-winged warbler.

Transient visitant; rare. Penn Yan, May, 1872—Aub., p. 11. Onondaga Valley, May, 1879—A. D. Brainard per A. W. Perrior. Buffalo, rare—Berg. p. 17. Elmira, May 22, 1867—Gregg, p. 21. Summer resident at Chili, Medina and Naples—Short, p. 17.

645. **Helminthophila rubricapilla** (Wils.) Nashville warbler.

Transient visitant; fairly common. May 4–16. Found in open woodlands, mostly among deciduous trees. Rare summer resident at Chili—Short, p. 17. Also at Holland Patent—R. & B. p. 137.

646. **Helminthophila celata** (Say) Orange-crowned warbler.

Transient visitant; rare. Syracuse, Oct. 2, 1886—Auk 4, 350. Utica, Sept. 16, 1880—R. & B. p. 137.

647. **Helminthophila peregrina** (Wils.) Tennessee warbler.

Transient visitant; rather rare. Auburn, Sept. 18, 1878—Aub. p. 11. Utica, Sept. 30, 1879—R. & B. p. 137. Lockport, Oct. 31, 1880—Davison. Ithaca, May, 1895—L. A. Fuertes. Chili, rare summer resident—Short, p. 17.

648a. **Compsothlypis americana usneae** Brewst. Northern parula warbler.

Transient visitant ; fairly common. May 10–30; Sept. 1–20. Found in orchards and woodlands. "Common summer resident"—Aub. p. 10, also R. & B. p. 137. "Rare summer resident"—Short, p. 18.

650. **Dendroica tigrina** (Gmel.) Cape May warbler.

Transient visitant ; uncommon. Syracuse, tolerably common—A. W. Perrior. Ithaca, May 10, 1899—L. A. Fuertes. Buffalo, rare migrant—Berg. p. 17. Penn Yan—Aub. p. 12. Oneida Co.—R. & B. p. 137.

652. **Dendroica aestiva** (Gmel.) Yellow warbler.

Summer resident ; abundant. May 1 — Sept. 25. Found in gardens, orchards and edges of groves. Nest, usually 5–8 feet from the ground ; eggs 4–5. Beneficial like all the warblers.

654. **Dendroica caerulescens** (Gmel.) Black-throated blue warbler.

Transient visitant ; common. May 10–25 ; Sept. 15—Oct. 12. Occasional summer resident; found breeding near Buffalo, Springville, Utica and Branchport. Nest placed amidst dense undergrowth ; June 1–15 ; eggs 3–5.

655. **Dendroica coronata** (Linn.) Myrtle warbler.

Transient visitant ; abundant. Apr. 24—May 18 ; Sept. 15—Oct. 25. According to Mr. Ottmar Reinecke it breeds near Buffalo. Usually found in small companies, frequenting thickets and woodlands.

657. **Dendroica maculosa** (Gmel.) Magnolia warbler.

Transient visitant ; common. Occasional summer resident. May 12—Sept. 25. Frequents mixed woodlands and found breeding at Springville, June 1, 1895 ; also Yates Co., June 4, 1899—C. N. Davis.

658. **Dendroica rara** Wils. Cerulean warbler.

Summer resident ; locally not uncommon. May 12—? . Breeds near Buffalo, Lockport, Chili, Penn Yan, Seneca River and Oneida. Auk 5, 430 ; also 17, 178.

659. **Dendroica pensylvanica** (Linn.) Chestnut-sided warbler.

Summer resident ; common. May 8—Sept. 5. Found in thickets and edges of woods. Nest, in a low bush, usually in berry patches ; May 15—June 10 ; eggs 3–4. Second brood sometimes reared, July 5.

660. **Dendroica castanea** (Wils.) Bay-breasted warbler.

Transient visitant; common in the spring of 1897 and 1898. Usually of fairly common occurrence. May 12–28; Sept. 15–30.

661. **Dendroica striata** (Forst.) Black-poll warbler.

Transient visitant; common. May 21—June 5; Sept. 10—Oct. 15. Found in orchards and groves.

662. **Dendroica blackburniae** (Gmel.) Blackburnian warbler.

Transient visitant; common. Occasional summer resident. May 8—Sept. 25. Breeds in the higher and cooler forests of hemlock, birch and maple, Springville, June 1, 1895; also in Tonawanda Swamp—Langille.

667. **Dendroica virens** (Gmel.) Black-throated green warbler.

Summer resident; fairly common. May 5—Oct. 15. Found in moist, mixed woodlands. Nest, 20–40 feet from the ground, usually in hemlock trees; June 1–20; eggs 4.

671. **Dendroica vigorsii** (Aud.) Pine warbler.

Transient visitant; uncommon. Ithaca, "not rare in spring and fall"—L. A. Fuertes. Lockport, "rare"—J. L. Davison. Syracuse, "rare"—A. W. Perrior. Breeds at Oneida Lake, 1889—Egbert Bagg.

672. **Dendroica palmarum** (Gmel.) Palm warbler.

Transient visitant; rather rare. Has been taken at Buffalo, Penn Yan, Lockport, and Utica. Last records, Holly, May 12, 1888—Auk 16, 195. Utica, several taken—Egbert Bagg.

672a. **Dendroica palmarum hypochrysea** Ridgw. Yellow palm warbler.

Transient visitant; uncommon. Apr. 18—May 10; Sept. 20—Oct. 15. Found among bushes and low trees, often feeding on the ground. Ithaca, "not uncommon in early spring"—L. A. Fuertes. Syracuse, rare migrant—A. W. Perrior.

673. **Dendroica discolor** (Vieill.) Prairie warbler.

Summer visitant; accidental. Penn Yan, two specimens collected by James Flahive. DeKay says it is abundant along the shores of Lake Erie.

674. **Seiurus aurocapillus** (Linn.) Oven-bird.

Summer resident ; abundant. May 4—Sept. 10. Found in all woodlands. Nest, on the ground, by a small bush or bunch of grass ; May 20—June 10 ; eggs 4–5.

675. **Seiurus noveboracensis** (Gmel.) Water-thrush.

Transient visitant ; fairly common. May 4–20 : Aug. 1—Sept. 20. Found in swampy woods. According to Bergtold, Short and Bagg, this species breeds. I have never had the fortune to find it in the breeding season.

676. **Seiurus motacilla** (Vieill.) Louisiana water-thrush.

Summer resident ; common in the gullies of the "Finger Lakes" and along many woodland streams. Apr. 20—Aug. 20. Nest, near the water among the ferns, roots and mosses ; May 20—June 15 ; eggs 4–6.

677. **Geothlypis formosa** (Wils.) Kentucky warbler.

Transient visitant ; rare. Not reported as yet in summer. Potter Swamp, Yates Co., Sept. 27, 1896—C. F. Stone. Chili, May, 1894—Short, p. 18.

678. **Geothlypis agilis** (Wils.) Connecticut warbler.

Transient visitant ; uncommon. Cayuga Co., Sept. 7 and 17, 1878—Aub. p. 13. Yates Co., Sept. 17, 1896—Verdi Burtch. Utica, Sept. 18, 1880 ; Sept. 8, 1881—R. & B. p. 141. Chili, Aug. 1893—Short, p. 18. Penn Yan, Sept. 4, 5 and 8, 1900—Verdi Burtch.

679. **Geothlypis philadelphia** (Wils.) Mourning warbler.

Summer resident ; fairly common. May 15—Sept. 20. Found in woodlands among brier patches and thickets. Nest, on or near the ground among ferns and briers ; May 30—June 20 ; eggs 4.

681. **Geothlypis trichas** (Linn.) Maryland yellow-throat.

Summer resident ; common. May 11—Oct. 10. Frequents swampy thickets. Nest, near the ground ; May 25—June 15 ; eggs, 3–5.

683. **Icteria virens** (Linn.) Yellow-breasted chat.

Summer resident ; rather rare. Has been taken at Lancaster, West Seneca, Shelby Centre, Penn Yan and Ithaca. Also found breeding at Chili, May 26, 1900—Oologist, Sept., 1892, and Short,

p. 19; Holland Patent, June 6, 1898—Auk 15, 331; Branchport, May 30, 1898, and June 13, 1899—Auk 16, 285; Penn Yan, July 8, 1900, second set and nearly ready to hatch—Verdi Burtch.

684. **Wilsonia mitrata** (Gmel.) Hooded warbler.

Summer resident; fairly common. May 12—Aug. 15. Found in rather dense woodlands, usually near the ground. Nest, in a low bush 18 inches from the ground; June 1–20; eggs 3–4.

685. **Wilsonia pusilla** (Wils.) Wilson's warbler.

Transient visitant; uncommon. May 10—30. Sept. 1—20. Frequents bushes and lower portions of trees.

686. **Wilsonia canadensis** (Linn.) Canadian warbler.

Summer resident of the higher and cooler districts. Common transient visitant. May 8—Sept. 15. Breeds in mixed woodlands (hemlock, beech, maple and birch) amid dense undergrowth. Nest, on or near the ground; May 30—June 10; eggs 4.

687. **Setophaga ruticilla** (Linn.) American redstart.

Summer resident; fairly common. May 10—Sept. 18. Migrates by night. Found in groves and woodlands. Nest, in a bush or on a low limb, usually in maples or beeches; May 20—June 15; eggs 4. Beneficial.

Family **MOTACILLIDAE**. *Wagtails.*

697. **Anthus pensilvanicus** (Lath.) American pipit.

Transient visitant; fairly common, especially in autumn. Sept. 25—Nov. 10; Apr.—May 15. Often seen migrating by day in small companies. Found in low meadows and on marshy shores in company with sandpipers and plover.

Family **TROGLODYTIDAE**. *Wrens, thrashers, etc.*

703. **Mimus polyglottos** (Linn.) Mockingbird.

Summer visitant; accidental. Buffalo, two records—James Savage. Olean—W. V. Smith.

704. **Galeoscoptes carolinensis** (Linn.) Catbird.

Summer resident; abundant. May 5—Sept. 30. Migrates by night. Found in gardens, hedges and thickets. Nest, in low, thick bush; May 15—July 5; 2 broods; eggs 3–5. Mostly beneficial.

705. **Harporhynchus rufus** (Linn.) Brown thrasher.

Summer resident ; fairly common. May 1—Oct. 10. Migrates by night. Found in bushy pastures and about copses and borders of woods. Nest, in a low, thick bush ; eggs 3–5 ; May 15—June 20. Beneficial.

718. **Thryothorus ludovicianus** (Lath.) Carolina wren.

Summer resident ; rare. Ithaca, "regular summer resident. Breeds"—L. A. Fuertes. Buffalo, Nov. 5, 1894—James Savage. Tully, Aug.—Dec., 1892—J. A. Dakin. Batavia, Dec. 24, 1894—Short, p. 19.

721. **Troglodytes aëdon** Vieill. House wren.

Summer resident ; formerly common, now becoming rare in many places. May 4—Sept. 20. Found in gardens, orchards and woods. Nest, in bird-boxes or hollow stumps ; May 15—July 5 ; eggs 5–9. Beneficial.

722. **Anorthura hiemalis** (Vieill.) Winter wren.

Transient visitant ; fairly common. Apr. 8—May 12. Sept. 25—Nov. 30. Migrates by night. Found in gardens and forests, among the shrubbery and brush piles, usually near water. Breeds at Ithaca, according to F. H. King, Bul. Mut. Orn. Club 3, 195; and Bergen Swamp—James Savage.

724. **Cistothorus stellaris** (Licht.) Short-billed marsh wren.

Summer resident ; apparently uncommon. Last date, Ithaca, Oct. 15, 1898—T. L. Hankinson. I have never found its nest, but according to the Buffalo, Chili, Auburn and Utica lists it breeds.

725. **Cistothorus palustris** (Wils.) Long-billed marsh wren.

Summer resident ; common. May 10—Oct. 20. Migrates by night. Found in reedy bogs and marshes. Nest, suspended in the tall grass; May 30—June 25 ; 1 brood ; eggs 5–8. Beneficial.

Family **CERTHIIDAE**. *Creepers*.

726. **Certhia familiaris fusca** (Barton) Brown creeper.

Transient visitant ; common. Mar. 15—May 1; Oct. 1—Nov. 10. Fairly common in winter. Occasional summer resident. Found breeding at Buffalo by Ottomar Reinecke. Occurs in orchards, shade trees and woods. Beneficial.

Family **PARIDAE**. *Nuthatches and tits.*

727. **Sitta carolinensis** Lath. White-breasted nuthatch.

Resident ; abundant. Found in orchards and woodlands. Nest, in hollow tree ; Apr. 18—May 15 ; 1 brood ; eggs 6–9. Beneficial.

728. **Sitta canadensis** Linn. Red-breasted Nuthatch.

Winter visitant ; fairly common. Oct. 1—Mar. 30. Occurs mostly in secluded woodlands. Breeds at Buffalo,—Berg. p. 20 ; at Holland Patent—Auk 7, 230.

729. **Sitta pusilla** Lath. Brown-headed nuthatch.

Summer visitant ; accidental. Elmira, May 24, 1888—Auk 5, 432.

731. **Parus bicolor** Linn. Tufted titmouse.

Accidental visitor from the south. Holly, March 17, 1899,—Auk 16, 196. Buffalo—Berg. p. 20. Elmira—Gregg p. 24.

735. **Parus atricapillus** Linn. Chickadee.

Resident ; abundant. Found in trees and shrubbery. Nest, in hollow stump or tree ; Apr. 18—May 25. Eggs 6–8. Beneficial.

736. **Parus carolinensis** Aud. Carolina Chickadee.

Accidental visitant. Lancaster—Berg. p. 20.

Family **SYLVIIDAE**. *Warblers, kinglets, gnatcatchers.*

748. **Regulus satrapa** Licht. Golden-crowned kinglet.

Transient visitant ; common. Occasionally found in winter. Oct. 1—Apr. 30. Migrates by night. Found in orchards, groves and woodlands.

749. **Regulus calendula** (Linn.) Ruby-crowned kinglet.

Transient visitant ; common. Apr. 15—May 7 ; Oct. 10—Nov. 1. Migrates by night. Found in copses and woodlands. Beneficial.

751. **Polioptila caerulea** (Linn.) Blue-gray gnatcatcher.

Summer resident ; rare. Canandaigua, June 3, 1886—Elias J. Durand. Lancaster—Berg. p. 20. Breeds, Coldwater, 1890—Short, p. 20.

Family **TURDIDAE**. *Thrushes, stone-chats, blue-birds, etc.*

755. **Hylocichla mustelina** (Gmel.) Wood thrush.

Summer resident ; common. May 6—Sept. 20. Migrates by night. Found in city parks, and in woodlands. Nest, usually in low tree or bush, but sometimes 30 feet from ground. May 20—June 15 ; Eggs, 3–4. Beneficial, like all the thrushes.

756. **Hylocichla fuscescens** (Steph.) Wilson's thrush.

Summer resident ; common. May 6—Sept. 10. Migrates by night. Found in copses and woodlands. Nest, on or near the ground, May 20—June 30. Eggs, 4–5.

757. **Hylocichla aliciae** (Baird) Gray-cheeked thrush.

Transient visitant ; fairly common. May and October. According to the Auburn List this species is more common than the olive-backed thrush in Cayuga Co.; but the writer has found it much less common in Springville, Rochester and Canandaigua.

758a. **Hylocichla ustulata swainsonii** (Cab.) Olive-backed thrush.

Transient visitant ; common. May 8–30 ; Sept. 20—Oct. 15. Migrates by night. Found in shrubbery of dooryards and in deep woods. Nest found in Yates Co., June 13, 1897, by Verdi Burtch.

759b. **Hylocichla aonalaschkae pallasii** (Cab.) Hermit thrush.

Transient visitant; common. Apr. 23—May 8; Sept. 25—Oct. 30. Migrates by night. Found in shrubbery of dooryards as well as in deep forests. Nest found in Yates Co., May 29, 1898, by C. F. Stone.

761. **Merula migratoria** (Linn.) American robin.

Abundant summer resident, rare in winter. March 3—Nov. 20. Migrates by day, usually in scattered companies. Found in dooryards, orchards and groves, feeding mostly in open fields. Nesting site varied, usually in a low tree. Apr. 15—July 5. 2–3 broods ; eggs, 3–5, usually 4. Fond of cherries but mainly beneficial.

766. **Sialia sialis** (Linn.) Bluebird.

Summer resident ; common. Mar. 5—Nov. 20. Migrates by day in small companies or pairs. Found in orchards, pastures and stump-lots. Nest, in a box or hollow tree ; Apr. 15—July 8 ; 2 or 3 broods ; eggs, 4–6. Beneficial.

Passer domesticus (Linn.) English sparrow.

Introduced. Strictly resident. Very abundant. Unworthy of a place among our birds. Gradually crowding out the wren, the martin, and the bluebird. Becoming a scourge to the grain fields and smaller garden fruits.

HYPOTHETICAL LIST.

Inasmuch as this paper is published chiefly for the use of bird students in western New York, it seems advisable to add a list of those species which may possibly be taken in this region. Many of these birds are more liable to be found here than the accidental species which have actually been captured. For example, the black-throated loon, Barrow's golden-eye, Forster's tern, Cory's least bittern, Richardson's owl, purple grackle, Kirtland's warbler and Hudsonian chickadee might more naturally be expected to occur than such birds as the scaled petrel, tropic bird, cinnamon teal and Bullock's oriole.

The authorities for all statements relating to the ranges and accidental records of the hypothetical species are the Auk, the A. O. U. Check-list and Chapman's Hand-book.

9. **Gavia arctica** (Linn.) Black-throated loon.

This species has been taken on Lake Erie and also off Toronto on Lake Ontario.

38. **Stercorarius longicaudus** Vieill. Long-tailed jaeger.

"Northern hemisphere; south in winter to the Gulf of Mexico."

62. **Xema sabinii** (Sab.) Sabine's gull.

"Arctic regions; south in winter to New York and the Great Lakes."

65. **Sterna maxima** Bodd. Royal tern.

"Tropical America; casually northward to Massachusetts and the Great Lakes."

69. **Sterna forsteri** Nutt. Forster's tern.

This species formerly bred on northern shore of Lake Erie and undoubtedly has occurred in this region,

128. **Fregata aquila** Linn. Man-o'-war bird.

Tropical regions; casually northward to Nova Scotia, Ohio and Wisconsin,

(138.) **Nettion crecca** (Linn.) European teal.

"Occasional in eastern North America."

152. **Clangula islandica** (Gmel.) Barrow's golden-eye.

"South in winter to New York." This species has been taken at Lorain, O., and Toronto, Can.

(168.) **Nomonyx dominicus** (Linn.) Masked duck.

Tropical America; accidental in Wisconsin, Lake Champlain and Massachusetts.

169. **Chen hyperborea** (Pall.) Lesser snow goose.
Western N. A.; casually eastward to New England.

169.1. **Chen caerulescens** (Linn.) Blue goose.
Interior N. A.; occasionally eastward to the Atlantic Coast.

173a. **Branta bernicia glaucogastra** (Brehm) White-bellied brant.
Arctic America; southward in winter.

188. **Tantalus loculator** Linn. Wood ibis.
Southern U. S.; casually northward to New York.

191.1. **Ardetta neoxena** Cory. Cory's least bittern.
This species has been taken several times and found breeding at Toronto; therefore it may be looked for in western New York.

200. **Ardea caerulea** Linn. Little blue heron.
Eastern U. S.; casually north to Massachusetts, New Hampshire and Labrador.

(217.) **Crex crex** (Linn.) Corn crake.
"Casual in eastern N. A."

226. **Himantopos mexicanus** (Müll.) Black-necked stilt.
Temperate N. A.; rare in the eastern states.

(227.) **Scolopax rusticola** (Linn.) European woodcock.
Occasional in eastern N. A.; has been taken in New Jersey, Pennsylvania and Rhode Island.

243. **Tringa alpina** Linn. Dunlin.
"Accidental in eastern N. A."

244. **Tringa ferruginea** Brünn. Curlew Sandpiper.
"Occasional in Eastern N. A."

(260.) **Pavoncella pugnax** (Linn.) Ruff.
"Occasional in eastern N. A." Has been taken at Toronto.

277a. **Aegialitis meloda circumcincta** Ridgw. Belted piping plover.
"Mississippi Valley—eastward to Atlantic coast."

278. **Aegialitis nivosa** Cass. Snowy plover.
Western U. S.; has been taken twice at Toronto.

301. **Lagopus lagopus** (Linn.) Willow ptarmigan.
Arctic regions; often straggles southward in winter. Has been taken at Watson, New York; and Whitby, Ontario.

327. **Elanoides forficatus** (Linn.) Swallow-tailed kite.
Interior U. S.; casually to Manitoba, New York and New England.

337b. **Buteo borealis calurus** (Cass.) Western redtail.
Western N. A. Has been taken at St. Thomas and Toronto, Ont.

353. **Falco islandus** Brünn. White gyrfalcon.
Arctic regions; wandering southward to Maine and Long Island.

354. **Falco rusticolus** Linn. Gray gyrfalcon.
Arctic regions; straggling southward in winter.

354a. **Falco rusticolus gyrfalco** (Linn.) Gyrfalcon.
Arctic regions; rarely south in winter to Massachusetts, Rhode Island, Long Island.

371. **Nyctala tengmalmi richardsoni** (Bonap.) Richardson's owl.
Arctic America; south in winter to northern U. S. Has been taken in western Pa.

378. **Speotyto cunicularia hypogaea** (Bonap.) Burrowing owl.
Western U. S.; accidental in N. Y. and Mass.

393a. **Dryobates villosus leucomelas** (Bodd.) Northern hairy woodpecker.
Northern N. A.; south to northern U. S.

401. **Picoides americanus** Brehm. American three-toed woodpecker.
Northern N. A.; resident in Herkimer and Lewis Cos., N. Y.

443. **Milvulus forficatus** (Gmel.) Scissor-tailed flycatcher.
Accidental in New Jersey, New England, Ontario and Manitoba.

447. **Tyrannus verticalis** Say. Arkansas kingbird.
Western U. S.; accidental in Maine, New Jersey and New York.

475. **Pica pica hudsonica** (Sab.) American magpie.
Indefinitely reported for western N. Y. by De Kay. The nearest recent record, Odessa, Ont.—Auk 15, 274.

484. **Perisoreus canandensis** (Linn.) Canada jay.
A common resident in Herkimer Co., but has not yet been noted in the region included in this list.

497. **Xanthocephalus xanthocephalus** (Bonap.) Yellow-headed blackbird.
Western N. A.; casually east to Mass., Penn., etc. This bird has been reported from Rochester, N. Y., but the record is an error.

511. **Quiscalus quiscula** (Linn.) Purple grackle.
Southern states north to Mass. and the Hudson Valley. Has not yet been reported with certainty from western New York.

527a. **Acanthis hornemannii exilipes** (Coues) Hoary redpoll.
Arctic regions; southward to northern U. S.

528a. **Acanthis linaria holboellii** (Brehm) Holboell's redpoll.
"South in winter to New York and Massachusetts."

528b. **Acanthis linaria rostrata** (Coues) Greater redpoll.
South in winter to New England and New York. Has been taken at Locust Grove, Lewis Co.

538. **Calcarius ornatus** (Towns.) Chestnut-collared longspur.
Interior N. A.; casually eastward to Massachusetts and Long Island.

552. **Chondestes grammacus** (Say) Lark sparrow.
Interior N. A.; casually east to Massachusetts, Long Island, New Jersey, etc.

597. **Guiraca caerulea** (Linn.) Blue grosbeak.
Southeastern U. S.; casually northward to New England. Mr. Rufus Stanley thinks he has seen it at Elmira, N. Y.

605. **Calamospiza melanocorys** Stejn. Lark bunting.
Western U. S.; casually east to Massachusetts, New York and South Carolina.

607. **Piranga ludoviciana** (Wils.) Louisiana tanager.
Western U. S.; casually east to Massachusetts, Connecticut and New York.

656. **Dendroica auduboni** (Towns.) Audubon's warbler.
Western U. S.; casual in Massachusetts and Pennsylvania.

663. **Dendroica dominica** (Linn.) Yellow-throated warbler.
Southern U. S.; casually to New York and Massachusetts.

670. **Dendroica kirtlandi** Baird. Kirtland's warbler.
This bird has been captured in Ohio, and Toronto, Ont.

740. **Parus hudsonicus** Forst. Hudsonian chickadee.
Northern N. A.; this bird is a resident in Herkimer Co. and at Remsen, Oneida Co.

757a. **Turdus aliciae bicknelli** (Ridgw.) Bicknell's thrush.
Mountainous parts of Eastern states. Dr. Merriam has recorded it for Lewis Co.

763. **Hesperocichla naevia** (Gmel.) Varied thrush.
Pacific coast; accidental in New York, Massachusetts and New Jersey.

765. **Saxicola oenanthe** (Linn.) Wheatear.
Greenland and Labrador; straggling southward to Maine, Long Island and Louisiana.

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PROCEEDINGS OF THE ROCHESTER ACADEMY OF SCIENCE
VOL 4, PP 65-66, PLATE 1.

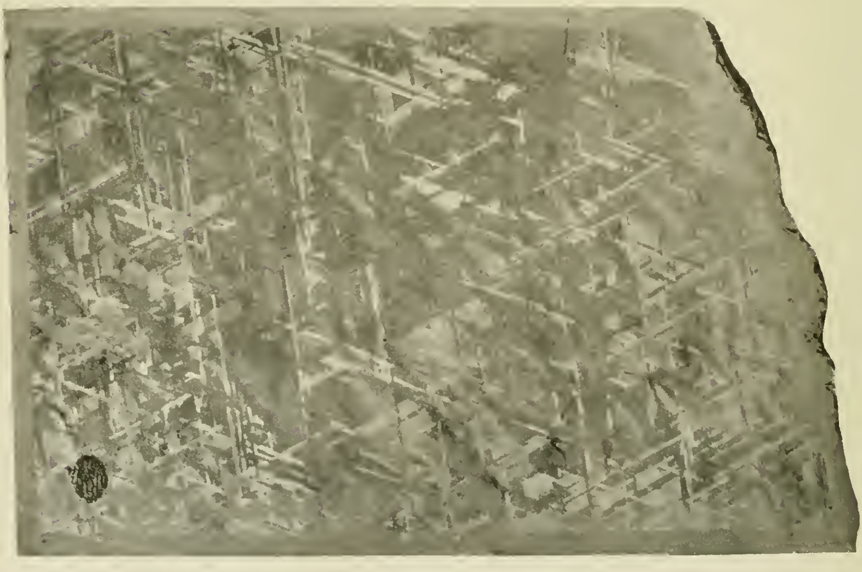
THE ST. GENEVIEVE METEORITE

BY

HENRY A. WARD

ROCHESTER, N. Y.
PUBLISHED BY THE SOCIETY,
NOVEMBER, 1901.

PHOTOGRAPH OF THE MASS. (About ¼ actual size.)



ETCHED SECTION. (Actual size.)

ST. GENEVIEVE METEORITE.

HENRY A. WARD.

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THE ST. GENEVIEVE METEORITE.

BY HENRY A. WARD.

The State of Missouri has furnished to science eight meteorites, of which two are aerolites, one is a siderolite, and five are siderites. They have been found in eight different counties and all of them are from the southern half of the state.

The first to appear was Little Piney, called after the stream of that name in Pulaski county. It fell in 1839. Cape Girardeau fell in 1846. Both these were aerolites. The irons were all found, not seen to fall. One of them followed in each decade until 1888. This latest iron, the subject of the present paper, was discovered in the autumn of 1888 in the extreme western portion of St. Genevieve county, at a point about one mile west of Punjaub, a little hamlet no longer existing. We have decided, in the lack of closer possible location, to give it the name of its county, whose county-seat of the same name lies some 15 miles to the eastward. It was found by Mr. Zeb. Murphy, a surveyor, who retained it in his possession for several years, showing it at county fairs, etc. It was subsequently bought from Mr. Murphy by Mr. F. P. Graves, the Secretary and Assistant Superintendent of the Doe Run Lead Co., whose headquarters are in the town of Doe Run, Mo. Mr. Graves has been a life-long collector of the minerals in this part of Missouri, and this St. Genevieve meteorite has been for some years past a crowning piece in his fine cabinet. From him it was obtained by the present writer in January of last year.

The shape of the St. Genevieve siderite is an elongated spheroid, considerably flattened upon one side, with a rudely crescent-shaped, shallow depression in its middle part. (See plate 1.) Its greatest length is 20 inches; its two other dimensions are each 15½ inches. Its weight, when I first obtained it, before any part had been cut from it, was 539 pounds.

The exterior of the mass shows no sharp, distinct pittings, although having several shallow depressions that appear to have been prior to the oxidation which has largely covered the surface and which has quite destroyed any trace of outer crust or skin, if such ever existed.

The present color of the mass is a dull, reddish brown, with patches of brighter iron showing here and there. By slicing the mass into a number of sections, the surfaces of which are about one foot by one foot four inches in diameter, there were revealed troilite nodules, few in number and of small size (from 4 to 9 mm. in diameter), but which lacked the border of schreibersite that so prominently surrounds these nodules in the majority of irons.

The Widmannstäten figures are brought out, by etching, sharp and clear, and are of very even character and size throughout the entire mass. They are typically octohedral. On the numerous plessite patches the alternating taenite and kamacite blades (Laphamite markings) are well developed, the taenite standing out prominently in relief.

The chemical composition of this meteorite has been determined by J. Edward Whitfield. His analysis is as follows:

Metallic Iron - - - - - - -	91.580
" Nickel - - - - - - -	7.980
" Cobalt - - - - - - -	0.290
Silicon - - - - - - - -	.023
Phosphorus - - - - - - -	0.200
Sulphur - - - - - - - -	trace
Carbon - - - - - - - -	none
	100.073

Specific gravity 7.756.

The main part of this great mass, weighing 106.56 kilos, has taken its final position in the Ward-Coonley Meteorite Collection, now on deposit in the American Museum of Natural History, New York City.

PROCEEDINGS OF THE ROCHESTER ACADEMY OF SCIENCE
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BACUBIRITO

OR

The Great Meteorite of Sinaloa, Mexico.

BY

HENRY A. WARD.

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BACUBIRITO

OR

THE GREAT METEORITE OF SINALOA, MEXICO.

BY HENRY A. WARD.

For more than a century the meteorites of Mexico have attracted attention and record. In his great work on La Nouvelle Espagne, published in 1811, Humboldt described in a broad and philosophical way the great field of the Toluca Irons and the size of some isolated masses in the States of Zacetecas and Durango. From that day until this, naturalists and travellers in Mexico have examined and described this product of the country, commenting particularly upon their frequence and their size.

Their frequence has been greatly overestimated. The total number credited to the Republic in Castillo's full catalogue, published in 1889, was twenty-seven. At the present day there are known thirty-two distinct localities, omitting the numerous points embraced in the distribution of the masses in two or three wide-spread showers. Leaving out one or two extra-limital localities, the Mexican falls have all been in a belt some 1000 miles in length, reaching from the 30th parallel of north latitude, south to the 17th parallel, and with an average breadth of about 280 miles. This belt of meteoric falls follows largely the central axis of the greal Mexican Plateau, reaching from the United States frontier-line obliquely south and east through the Republic to near the Pacific. In this tapering, truncated triangle, which encloses about 280,000 square miles, there occur thirty well distinguished meteorite falls. Comparison with other parts of the world shows that the relative number of Mexican meteorites is much less than seems to be generally supposed. Turning to the United States we measure a like area, though of a somewhat different form, with its major axis east and west, and enclosing the six continuous states of Kansas, Missouri, Kentucky, Tennessee, North Carolina and South Carolina. This area comprises 286,000 square miles and contains sixty-six meteorite localities, more than twice the number that we have seen in the Mexican belt. In India, in an area of similar extension, which includes its northwestern provinces, we find forty-eight meteorite localities, or one and one-half times the number in the Mexican belt. It would seem, then, that Mexico must vacate her claim, often asserted, to preëminence in meteoric localities.

Only, perhaps, the wide-spreadness of some falls, notably in the States of Coahuila and Toluca, may be distinctive; although this meets an approaching rivality in the dispersion of some which we consider identical falls of aërolites in Kansas and in Iowa.

It would be interesting to notice here the fact of the high elevation of these three meteorite belts or areas above the general altitude of the country at large. This is especially remarkable in Mexico and in India. Also the fact that the Mexican meteorite list shows 23 irons to 7 stones; the United States as a whole, 102 irons to 54 stones; while India gives 55 stones and only 2 irons. We cannot here digress to even guess at the possible cause of these phenomena.

The prominent character and preëminence of the Mexican meteorites is the vast size of many of them. In this matter of bulk they are unapproachable. Taking but ten of them—Chupaderos, San Gregorio, Casas Grandes, Concepcion, Charcas, Descubridora, Bacubirito, Zacatecas and Apolonia—we find a total weight of 86,744 kilograms (191,076 lbs.) or 95½ tons. This equals an average weight of 9 1-10 tons for each of these Mexican irons. If now we take the largest ten meteorites of the United States, (they are in the order of their weight Red River, Tucson, Long Island, Cañon Diablo, Mt. Joy, St. Genevieve, Sacramento Mts., Estherville, Brenham, and Kenton Co.,) we find their combined weight to be 8,365 lbs., or 8 1-3 hundredweight, as the average individual weight of the ten. In short, the Mexican masses weigh on an average 22½ times as much as our own. What may have caused this so vastly greater mass of Mexican meteorites we will not venture to define. Has the great height above sea level of the Mexican Plateau, with its drier air and drier soil, delayed the decomposition and wasting away of their irons? But Anighito in Greenland, Bemdego in Brazil and Cranbourne in Southern Australia, three giants, all lay close at sea-level, and all three were in exceptionally moist regions.

The Mexican Government has taken an active and enlightened part in the protection of her meteorites. Twelve years ago it expended the sum of $10,000 in bringing five of the largest to the capital, where they are mounted on huge iron pillars in the entrance court of the School of Mines.

Having during the last fifteen years paid visits to most of these Mexican meteorite localities, seeing most of the large masses before they had been removed from the spot where they fell, and where some of them had lain perhaps for many centuries, the writer acquired great interest in all that pertained to them. While in the capital a few months ago, studying and cutting some of the large pieces in the Museo Nacional, the writer sought almost in vain in scientific circles for substantiation and defining of stories which have long been current relating to an enormous iron meteorite existing in the State of Sinaloa, far in the northwest portion of the Republic.

The first and, so far as we can find, the only positive notice of this meteorite was in 1876. Then Señor Mariano Barcena, a noted Mexican scientist and astronomer, in a 5-page article in the Proceedings of the Philadelphia Academy of Sciences devoted to Mexican meteorites, notices "an enormous meteoric mass lately discovered in the State of Sinaloa." He says, "I can assure the Academy that its length was more than twelve feet." Many years later Castillo in his catalogue of Mexican meteorites refers to this same mass, giving its length at 3.65 metres; with 2 metres in height and 1.50 metres thick. Three years later, Eastman, of the United States Naval Observatory, taking the above measures as being correct, estimated its weight as 40,800 kilograms or about 42 tons. Brezina, Cohen and Wülfing speak of it as weighing 50 tons, and as being the largest meteorite in the world. But in all this there was no definite description of the mass, and no one who mentioned it claimed to have seen it. We were anxious to ascertain about all this. The Mexican savants were all interested in having this great celestial body investigated. One of them, Señor Jose C. Aguilera, the Director of the Instituto Geologico, a government institution, and the present headquarters of the Geological Survey of the Republic, aided us in obtaining from the Minister of State letters to the Governor of Sinaloa and to the Director of Mines in that State. We had decided to visit Bacubirito, for so the place and the meteorite itself were called, and see what was fact and what was rumor about it. So on the 2nd of April of the present year we started out to resolve the matter. Sinaloa is a hard State to reach from the City of Mexico. One must pass far around to the north through the United States, returning south through Sonora, a journey of over 2,000 miles, or go by the Pacific coast, a shorter but harder route. We took this latter, crossing by train and mule-back to Manzanillo, the sea-port of the State of Colima, and thence by steam up the coast for six hundred miles to Altata on the east coast of the Gulf of California; thence 60 miles by cars to the city of Culiacan, the capital of Sinaloa. Here we met the Governor of the State, and from him obtained letters to authorities further up the country. We also got an outfit of provisions, a carriage with four mules, and an American photographer who accompanied us with his camera. Bacubirito is 95 miles to the north and west of Culiacan. Our drive took three days, over a very rough road, crossing some streams and ravines, and gradually rising to and among the lower foot-hills of the Sierra Madre, the great Cordilleras chain which separates Sinaloa from the States of Chihuahua and Durango. Bacubirito itself, our goal in this search, is a small but very old mining town situated on the Rio Sinaloa in latitude 26 and in west longitude 107. The elevation above sea level is some 2,000 feet. The meteorite is seven miles nearly due south from there, near the hamlet called Palmar de la Sepulveda. Here we found it on a farm called Ranchito, which fills the narrow mountain valley or interval between two spurs of the foothills, running nearly north and south. It lay in a cornfield, close by the eastern edge of this vale, where the level ground began to raise against the hill-side. The valley and the field were of black vegetable soil, some two yards in thickness. In this soil the great meteorite lay imbedded ; its surface but little below the general surface of the field around it, but with one end slightly projecting above the level. The other end was so deeply imbedded in the soil, and so apparently undisturbed or even uncovered, that it was easy to see why the size and measures of the mass had been uncertain. It was a long, monstrous boulder of black iron, which seemed to be still burrowing to hide itself from the upper world. Its surface form was something that of a great ham. We could walk for many feet along and across its surface, surveying these dimensions as far as they were exposed, but knowing nothing of how far the mass penetrated the soil beneath. Our first work was excavation. For this there was no lack of help. We soon got no less than 28 stout, able-bodied, willing Peons who were delighted to work for us at fair wages. We undertook an excavation of about 30 feet on a side, with the great meteorite lying within. In a single day we passed down through nearly 4 feet of the soft, vegetable soil. At the end of that time the meteorite had assumed the appearance shown in photograph No. 1, its upper surface and one side being revealed. On this surface the characteristic "pittings" were well marked, covering the entire surface. They were very regular in size, about 2 to 3 inches across, with well defined walls, yet quite shallow. The general form of the mass seen from the side was that of one side or ramus of a huge jaw. The surface was very even, with no holes due to the destruction of Troilite nodules. Nor were there any points which showed the devastation of deep rust. The dryness of the soil and the large proportion of nickel in the meteorite's composition had doubtless impeded this. As often happens in such cases, the part which had been most above ground was best preserved, with a light oxydized crust, brown and somewhat bronze-like in appearance.

On one side there was a deep crack, running horizontally through nearly half the length of the mass. At one end this crack was too narrow to insert a knife-blade. Going toward the other end it increased to a fissure wide enough to first admit our hammer handle and finally our arm. This fissure at a distance of some three feet from the smaller end of the mass cut off the lower part from the upper, the latter extending beyond in diminished size for three feet further. Our Mexicans were astonished at the revelation of their own work; they marvelled alike at the size of the mass as their digging had developed it, and at our credulity in believing that it had ever fallen from space above. View *No. 2* gives a somewhat oblique view after further excavation. *No. 3* gives same view and shows the unequal weathering of the mass, the part most exposed being the least weathered. *No. 4* is another view taken from above and lengthwise of the mass. This shows on the right hand the fissure in the mass.

By the end of the second day we had carried our excavation to an average depth of about six feet on every side. The black vegetable soil was from three to four feet thick. Below it was a porphyry rock, common in this part of the country, much broken up by natural cleavages and a good deal decomposed *in situ*. The vegetable soil passed very gradually into this rock, and seemed to have unquestionably formed above it, as an operation of gradual change. Immediately around the meteorite we had dug much lower, leaving the great iron mass poised on a pillar or pedestal of the undisturbed rock. Finally we performed a feat of moving the great mass. To lift one end would have been a physical impossibility; all our men with the stoutest tackle in the district could not have done that; but it needed little mechanical aid to make the mass move itself. We attacked with our long iron bars one side of the supporting pedestal on which it was balanced. It was slow work, for the rock seemed to be here somewhat less decomposed. After long chiseling away one side of the pedestal, the center of gravity was reached, and with a slow, almost dignified movement the great meteorite sank at one end, and assumed the semi-vertical position which is brought out in the *No. 5* picture. In *No. 6*, the photographer is seen standing midway of the mass. Incidentally there is well shown the depth of our excavation, below the level of the cornfield. We upset the mass in an effort to ascertain, if possible, by the nature of the rock beneath it, the recent or the ancient fall of the mass. Was the soil already there when the meteorite fell, and did the latter by virtue of its weight crush through it to the rock? In the latter case it seemed probable that some of the soil should have been caught and held between the meteorite and its bed. A good deal to our surprise we found that this bed was a clean depression crushed into the rock with absolutely no trace of soil between it and the part where the full weight of the mass had fallen and lain. It would thus *seem* that the meteorite had fallen on the bare surface of this district at a period before the vegetable soil had begun to form here. This would be an interesting and astounding fact, carrying back the fall of our meteor to a remotely distant period, perhaps thousands of years. But there are other conditions which would need careful consideration before accepting such a momentous conclusion.

The wonderful preservation of the mass, with its little oxydation, and the clean, sharp-rimmed pittings which cover its surface, seem to point to a more modern sojourn within the destroying influences of our air and moisture. We leave this for future consideration.

It is an interesting fact that this, perhaps the largest and the heaviest meteorite mass yet discovered on our globe, should have fallen so near the present border of our own country. Interesting too, that Mexico with all its other extra large meteorites should have received this champion mass.

The extreme measures of Bacubirito, for so our meteorite from the first has been called, are :

Length, 13 feet and 1 inch.
Width, 6 feet and 2 inches.
Thickness, 5 feet and 4 inches.

Its form, as shown by the photographs, is extremely irregular, and though measures have been taken around the mass at many different points, its cubic contents can not be calculated with more than an approximation to accuracy.

The five largest meteorites known to Science to-day are :

Bemdego (Brazil), 5⅓ tons.
San Gregorio (Mexico), 11½ tons.

Chupaderos (Mexico), 15⅔ tons.
Anighito (Greenland), 50 tons.
Bacubirito (Mexico), 50 tons.

The former three are weights proven on scales. The latter two are thus far simple estimates. How far estimated weights, based on simple guessing, may differ from proven weights is well illustrated by the case of Chupaderos, one of the meteorites just cited. Fletcher, the noted mineralogist of the British Museum, says of it, "According to one recent estimate its weight is 15 tons, according to another it is 82 tons." Anighito, the great Greenland meteorite, has been guessed at all figures, from 30 to 100 tons. A late unofficial estimate of it, after careful measuring, puts its weight at 46⅓ tons.

Should the Mexican Government, as we some expect, move the great mass, as it has done all the others, to the capital, its exact weight will be finally and definitely known. Whichever mass shall, after accurate calculation, prove to be the heavier, it will ever remain of interest that the two largest meteorites known to our earth shall have fallen on the North American Continent, one far toward its northern end, the other toward its southern.

The inner structure of this meteorite is interesting as showing the octahedral system of crystallization in a very marked degree. We know of no other meteoric iron which shows this equally, unless it be that of Sevier Co., Tennessee, or San Angelo, Texas.

Fractured surfaces show crystallization plates with faces from 3 to 19 mm. in greatest diameter. Many of these faces are covered with fine films of taenite, which in most cases are of the characteristic bronze yellow color. Acid brings out the Widmanstätten figures in a most beautiful manner. From the coarse crystals on a fractured or a weathered face of this iron, we might anticipate that etching would reveal a large, wide pattern in its markings. As a fact, quite the converse is true. The figures, while very sharp and clear, are small in pattern and are composed of narrow blades of kamacite, which are but a fraction of a mm. in diameter. At intervals, these blades appear to be of more than double that thickness ; but when examined with a glass it is seen that these apparently broader plates are composed of what might be expressed as bundles of the narrow kamacite bands. The rhombic figures on the etched face will average from 1½ to 5 mm. in diameter, the two angles of same being 60° and 120°, while the triangular markings will generally range from 8 to 15 mm. with angles of 55°; 55° and 70°. Troilites are particularly scarce, but two or three small ones having shown on any of the sections made. The iron is essentially tough, although not more dense than in the majority of siderites.

The specific gravity of Bacubirito is 7.69. Its analysis has been made by Prof. J. E. Whitfield, of Philadelphia, as follows :

Iron,	88.944%
Nickel,	6.979%
Cobalt,	0.211%
Sulphur,	0.005%
Phosphorus,	0.154%
Silicon,	Trace

We succeeded after a long, protracted effort in detaching from the mass an already partly loosened piece of about 11 lbs. weight. This, polished and etched on one side, showing the beautiful Widmanstätten figures, has taken its place in the Ward-Coonley collection of meteorites now on display (on deposit) in the American Museum of Natural History in New York.

No. 1. ONE SIDE OF METEORITE UNCOVERED.

No. 2. AFTER FURTHER EXCAVATION.

HENRY A. WARD.

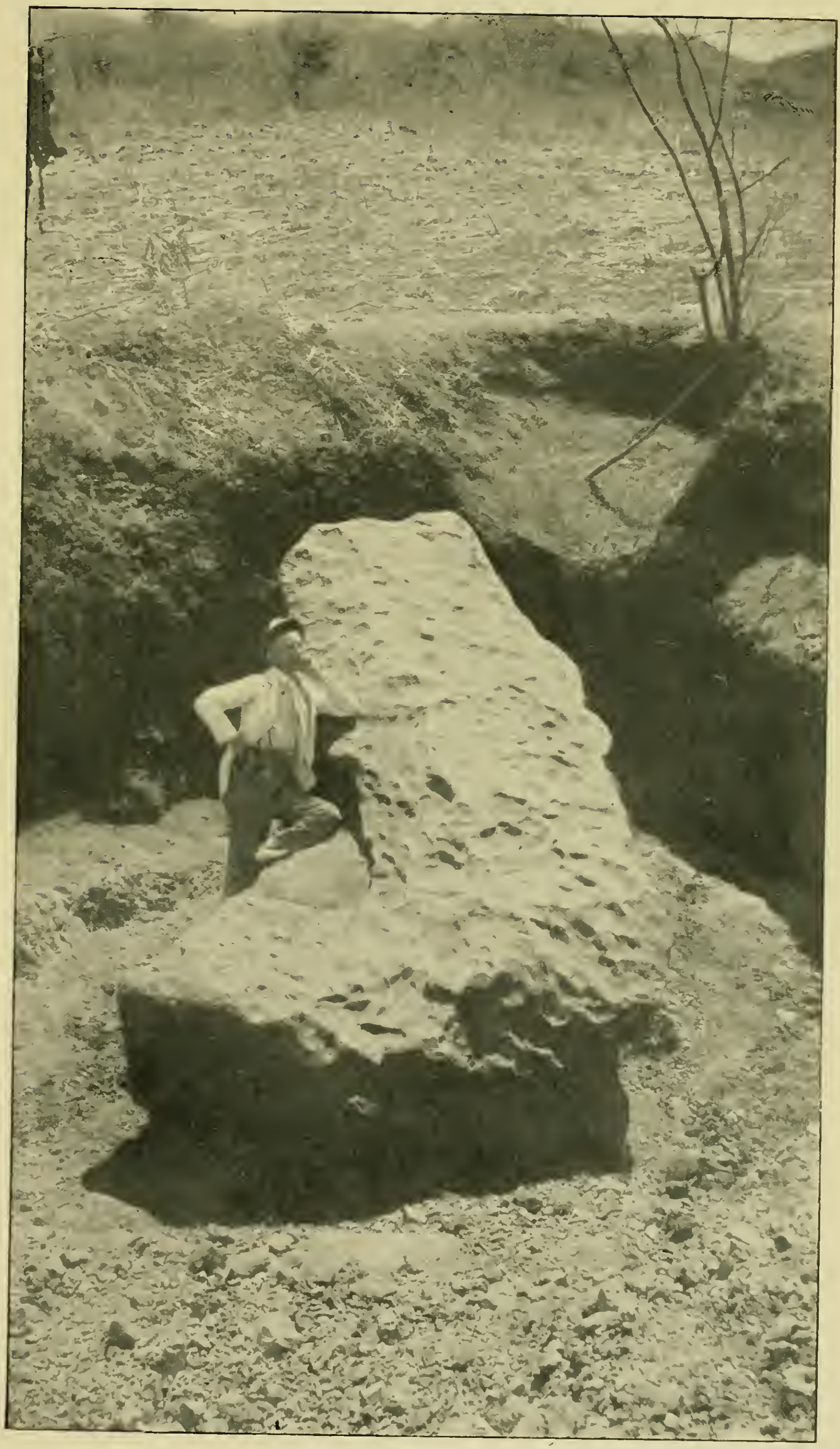
No. 3. UNEQUAL WEATHERING OF MASS

No. 5. METEORITE PARTIALLY UP-ENDED.

HENRY A. WARD.

No. 4. VIEW TAKEN FROM ABOVE AND LENGTHWISE OF THE MASS.
SHOWS AT RIGHT HAND THE FISSURE.

HENRY A. WARD



No. 6. THE METEORITE FINALLY UP-ENDED.

HENRY A. WARD.

PROCEEDINGS OF THE ROCHESTER ACADEMY OF SCIENCE
VOL. 4, PP. 75-78, PLATE 6.

FRANCEVILLE METEORITE

BY

H. L. PRESTON.

ROCHESTER, N. Y.
PUBLISHED BY THE SOCIETY,
NOVEMBER, 1902.

PROCEEDINGS OF THE ROCHESTER ACADEMY OF SCIENCE
VOL. 4, PP. 75-78, PLATE 6. NOVEMBER 26, 1902.

FRANCEVILLE METEORITE.

BY H. L PRESTON.

(Read before the Academy, October 13th, 1902.)

This meteorite was bought by Prof. F. W. Cragin, of Colorado College, Colorado Springs, Colorado, from Mr. David Anderson and wife, of Colorado Springs. The meteorite was found by Mr. Anderson about twelve years ago on government land in El Paso County, Colorado, one and one-half miles south-west of the home-ranch of Skinner and Ashley, which is east of Franceville. In Mr. Anderson's own words "It was totally above ground, and found no signs of any other. When I found the meteorite I simply pushed it with my foot, but found I could not move it. The following day I went back with a wagon and got it to the ranch. I do not think at the time the land was entered by anyone ; not near to any road."

The meteorite from the time at which it was found until purchased by Prof. Cragin was kept in the home of Mrs. Anderson in Colorado Springs, half forgotten, and when Prof. Cragin called to see it, was finally found beneath an old lounge. The meteorite entire was purchased from Prof. Cragin by Ward's Natural Science Establishment, Rochester, N. Y., in August, 1902.

From its external form it is one of the most interesting of the many meteorites that have been in their possession. It is a decidedly flattened, rhombic pyramid with a somewhat sharp ridge extending around the center of the mass on the four rhombic sides. The dimensions of the mass in these directions are 21 x 23 c. m., with a thickness of 11.5 c. m. On one side of this central axis the pyramid projects 6 c. m., on the opposite side 5.5 c. m., as seen in figure 2, plate VI.

The decidedly octahedral form of this iron seems unqestionably due to its separation along natural cleavage planes from a much larger mass. But it is surprising that the form should not have been much more distorted, by the erosion due to friction in passing through the atmosphere.

The whole iron is more or less mottled, ranging in color from a reddish brown to a brownish black, and is entirely covered with pittings on all sides. Those on what may properly be termed the upper side (figure 1, plate VI.) being much more distinct, owing to their size and depth, than elsewhere. Just below the medium ridge on one end there is an unusually large pitting, some 10 c. m. long and 2 c. m. deep. Two or three small but much deeper finger-like pittings, from which troilite has undoubtedly been weathered out, are on the mass.

Two small corners of the mass have been broken off and have the appearance of very old breaks, as the surfaces are entirely oxidized. These surfaces show markedly distinct octahedral cleavage.

Two small protuberences, one 2 c. m. and the other 1 c. m. in diameter, have been sawn off and the faces polished and etched. One of these is shown in figure 1, the other in figure 2, plate VI. Otherwise the mass was an entirely complete one, until sawed into sections by Ward's Natural Science Establishment; the probability being that not more than thirty grammes had been taken from it since it reached terra firma.

Upon slicing the mass but one troilite nodule of any size was found. This occurred on one end-piece and the adjoining slice, and was 14 mm. in diameter with two small patches of nickeliferous iron in its center.

The slices show more or less fractures extending across their surfaces along the natural cleavage faces, the edges of the kamacite plates, and in some instances (as in the San Angelo meteorite*) the rhombic form produced by the Widmanstätten figures are strongly outlined by these fissures.

Upon etching the iron the Widmanstätten figures are readily brought out by acids. These are particularly sharp and clear and of large size, as shown in figure 3, plate VI.

The kamacite plates average from 1 to 1.5 mm. in diameter, with an occasional one of 2 mm. They are unusual, from the fact that they extend in an unbroken line in many instances from 90 to 120

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*Am. Jour. Sci. Ser. 3, Vol. 5, pp. 269-272.

mm. in length. The tænite occurs in minute films between the kamacite plates.

The plessite patches are comparatively small for an iron of such coarse crystallization. Some of these patches show no structure when etched, except a slightly pitted surface, while others are prominently made up of alternate layers of kamacite and tænite, producing sharply the so-called Laphamite lines.

Schreibersite is not visible on the etched surfaces macroscopically, not even surrounding the troilite nodules as is usually the case.

Mr. John M. Davison, to whom was given 23.9 gms. for analysis, reports as follows:

"The specific gravity of this siderite is 7.87. An approximate "analysis gave :

"soluble in hydrochloric acid - - -	kamacite and tænite -	99.16%
	combined carbon, not deter.	....
"undissolved in hydrochloric acid	schreibersite	0.837
	graphite and silicates (trace)	.003
	platinum (from 23.9 gms.)	trace
		100.

"The analysis of kamacite and tænite together gave :

Fe.	91.92%
Ni.	8.13
	100.05"

The weight of this most interesting siderite is 41 pounds, 6½ ounces, or 18.3 kilograms.

Colorado has not been prolific in supplying meteorites to the scientific world. As far as noted, including the present iron, there have been but five. All of which are siderites.

Russel Gulch, Gilpin County, - - - - - - - -	found	1863
Bear Creek, near Denver - - - - - - - - - -	"	1866
Jefferson, 30 miles from Denver - - - - -	fell June,	1867
Franceville, El Paso County - - - - - - -	found	1890
Mount Ouray, Chaffee County - - - - - -	"	1894

I can find no account of one of these, the "Jefferson, (81 Shepard Collection) 30 miles from Denver, Colorado," listed as having fallen in June, 1867, except in the descriptive catalogue of the meteorite collection in the United States National Museum, Jan., 1902. It seems apparent that a mistake has been made in labelling this specimen, and it must be dropped as a distinct fall for the following reasons.

Bear Creek has been noted in most catalogues as having been found in Denver *County*, Colorado, also a mistake, as Colorado has no county by this name. It was first mentioned by Shepard* as found upon the eastern slope of the Sierre Madre Range of the Rocky Mountains. Again Henry† notes it as found in a deep gulch near Bear Creek, about 25 or 30 miles from Denver. Smith‡ in describing this meteorite gave it the name of Bear Creek. As Denver is on the boundary line between Arapahoe and Jefferson counties, and as there is a Bear Greek extending clear across Jefferson county from west to east, emptying into the Platte, according to Henry's description, this would bring the locality of the Bear Creek meteorite in the western central part of Jefferson county. Therefore, it seems likely that the iron noted in the Shepard Collection as "Jefferson, 30 miles from Denver," is in reality a portion of the Bear Creek meteorite labelled "Jefferson," meaning Jefferson county, and that the date of fall, June, 1867, is an error. Particularly so as the Bear Creek is described by Henry† as being "shattered on one end," so that small pieces could be readily detached.

Denver county has evidently been substituted for Denver city in many of the meteorite lists, as no county is given in any of the early reports of the Bear Creek meteorite. Moreover, the Sierre Madre Range is west of Denver, and Bear Creek is described as having been found on its *eastern slope*, which, in all probability, would bring it in Jefferson county. So it would seem best that "Jefferson" should be discarded entirely as a distinct fall and be called Bear Creek, and that Denver county in all meteorite lists should read Denver city. Thus we reduce the Colorado meteorites to four distinct falls.

*Am. Jour. Sci. Ser. 2, Vol. 42, pp. 250-251.
†Ibid Ser. 2, Vol. 42, pp. 286-287.
‡Ibid Ser. 2, Vol. 43, pp. 66-67.

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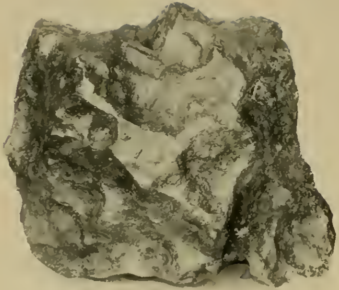

Fig. 1. UPPER SIDE, SHOWING PITTINGS. (Two-fifths actual size.)

Fig. 3. SECTION SHOWING WIDMANSTATTEN FIGURES. (Three-fifths actual size.)

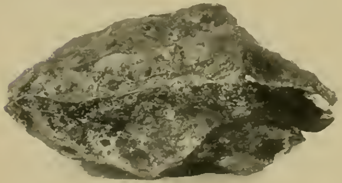

Fig. 2. SHOWING PYRAMIDAL FORM. (Two-fifths actual size.)

FRANCEVILLE METEORITE

H. L. Preston

PROCEEDINGS OF THE ROCHESTER ACADEMY OF SCIENCE
VOL. 4, PP. 79-88, PLATES 7-11.

DESCRIPTION OF FOUR METEORITES

ANDOVER
CUERNAVACA } New
ARISPE
BALD EAGLE, redescribed

BY

HENRY A. WARD.

ROCHESTER, N. Y.
PUBLISHED BY THE ACADEMY.
DECEMBER, 1902.

PROCEEDINGS OF THE ROCHESTER ACADEMY OF SCIENCE

Vol. 4, pp. 79-88, Plates 7-11. December 12, 1902.

DESCRIPTION OF FOUR METEORITES,

By Henry A. Ward.

(Read before the Academy November 10, 1902.)

THE ANDOVER METEORITE.

The State of Maine has long had three meteorites to its credit. Nobleboro 1823, Castine 1848, Searsmont 1871. All are stones, and all fell in the southern half of the State. We now give first public record to a fourth, also from south of the middle parallel of the State, and also an aerolite. We owe the first knowledge of this to Mr. Henry V. Poor, of Brookline, Mass., the present owner of the mass. This gentleman obtained the specimen from the original owner, on whose farm, adjacent to his summer residence in Andover, Oxford Co., Maine, it fell. Mr. Poor, with great liberality, placed it at my disposition for examination and description. I further received a letter from Mr. Lincoln Dresser, of Andover, who tells the whole story of its fall. Mr. Dresser says, "The meteor that fell near my house on the morning of Aug. 5th, 1898, was witnessed by me, and I was within 25 feet of it when it came down. It came from the north west at an angle of 75 degrees, and in all probability came from the constellation of Perseus. (!) It was accompanied by a loud noise resembling a buzz saw, and had a following of smoke. It was in intense heat when it struck a stone in the wall, grazing the stone. In its fall it passed down through the branches of an elm tree, cutting many of them off as clearly as if done by a sharp knife. I supposed at the time it was a gaseous ball of fire, and thought it exploded, but after examination I found where it imbedded itself in the earth to the depth of 2½ feet. I secured, by digging, a large piece weighing 7½ lbs., and two or three small ones which were broken by its striking the rock fence. The large piece was irregular in shape and had the appearance of having exploded in the air, as a large piece was lost from one side before it went into the ground.

The crust of this one on three sides had a blackened surface with shallow dents like finger points. The broken part shows a gray rock, looking like silver. The break was fresh, and on exposure to the air you could observe the iron coloring in it. It was of the finest of granite. People in the adjoining towns heard the peculiar buzzing noise, and heard a loud report, probably when it burst.''

In June, of the present year, I had the privilege of visiting the spot in Andover where the stone fell. A sharp dent in the granite wall still shows freshly where the stone struck at its first impact. In falling it had passed through thickly set, small branches of an elm tree directly above. Mr. Dresser tells me that it was seeing these branches fall, cut off by the stone, which had changed his first instant's impression that the latter was of a gaseous character.

By the aid of a ladder and a saw I obtained the portion of a branch two inches in diameter, half cut through by the meterorite. I also obtained two small pieces of the stone itself, one from Mr. Dresser, and another from Mr. E. M. Bailey, also a resident of Andover. Through the kind favor of Mr. Poor I am able to here present a cut of the large mass which weighs about 6½ lbs. (Fig. 1, plate VIII.)

In general shape it is an irregular lengthened polygon like a flattened triangle, with the three points largely truncated. The cut presents one side whose largest dimensions are 7¾ inches in length by 4 inches in greatest breadth. The opposite side which was broken off in the fall is of the same length, but 5½ inches in the measure at right angles. All other sides are well coated with a brownish black crust, relieved by occasional patches of lighter brown. The crust is roughened by little, slightly raised pimples, often connected with very short ridges, of the molten matter. On several sides are shallow pittings as large as the impressions of finger-ends. Some of these are separated, others confluent, the latter, as is to be expected, all on the same side of the mass, having their depressed rim in the same direction or aspect. The broken side of the mass shows an interior of a light gray color, and is granular, with a few chondri of much darker color. The whole mass is, in a fresh fracture, brilliant with points of nickeliferous iron sparsely interspersed with bronze-colored troilite. I have given the name of Andover to this meteorite from the proximity of its fall to the town of Andover, Oxford Co., Maine.

THE CUERNAVACA METEORITE.

In Castillo's catalogue of Mexican Meteorites (1889) he mentions, p. 3, "Meteorite of Cuernavaca, State of Morelos. It is a fragment of meteoric iron found, so it is said, on the road from Mexico (city) to Cuernavaca. It is in the National Museum of Mexico."

While in that capitol in April of the present year, and visiting the Museum, I was shown by the keeper of the mineral collections, Professor Manuel Villada, the specimen which lay in a lower compartment of one of their table cases. I promptly availed myself of permission to photograph it, and later on I was able to obtain, through the kind services of Professor Villada, permission from the Director of the Museum to cut the mass in twain and to carry away the smaller half.

The mass, as shown in the accompanying plate, (Fig. 1, plate VII) was entire, never having had further than a minute chisel-clipping, the common way of Mexican prospectors, who test all troven metal masses in their search for silver. The length of the mass was 480 mm. (about 19 inches) while its other diameters were about 130 mm. to 150 mm. (about 5 to 6 inches) varying in different parts of the mass. The form might be described as a square-sided, irregular column, with some protuberances and constrictions; and one of its extremities, much enlarged, projecting several inches forward of the main line of the mass in a sort of sub-cylindrical turban. The surface of the mass, though very uneven, with alternate elevations and depressions short and sharp in contour, is still smooth in texture, and is quite covered with a reddish brown crust which is of unusual thickness and continuity. This surface is impressed over the entire mass with indentations from ½ to 1½ inches long, like chisel-marks. The section of the iron (Fig. 2, plate VII) shows these indented lines to correspond with numerous straight, short seams of troilite, which cross the mass in all parts and at all angles. There are also several small troilite nodules, with one of 30 mm. in diameter. These nodules are surrounded and crossed by a narrow border of schreibersite. Etching brings out well marked Widmanstätten figures of the octohedral type. In these the kamacite blades vary much in both breadth and length, causing a coarser or finer pattern in different parts of the section. The plessite patches are seen to be generally composed of alternate layers of kamacite and tænite. The latter, although in fine films between the kamacite blades, show prominently from their brightness. The characters of the etched surface of this iron show much similiarity to those of the Bella Roca siderite.

The analysis of the iron as made by Professor J. E. Whitfield, of Philadelphia, gives:

Iron, - - -	88,982
Nickel, - -	10,300

The specific gravity is 7,725.

This Cuernavaca mass seems to have lain *perdu* since its finding, never having been described or analyzed. It has been claimed by Brezina and others as belonging to the group of Toluca irons. No one who has seen the mass in either its external or its internal features could make this mistake. Moreover, as Fletcher has shown (Mexican Meteorites, 1890, p. 79) Cuernavaca is far away, to the southeast, from the Toluca or Xiquipuco district. The two irons are as diverse in structure as they are distant in their localities.

THE ARISPE METEORITE.*

This most interesting siderite was found in the northeastern part of the State of Sonora, Mexico, in 1898. After various vicissitudes of rambling with changed owners, it became last year the property of Mr. A. F. Wuensch, a mining engineer of wide reputation in the western country, whose present residence is Denver, Colorado. Mr. Wuensch had encountered it while on a professional tour in Sonora. From this gentleman and a Denver newspaper of August 17 of the present year, I gather the following notice of the mass.

The meteorite was discovered first in 1898 by some Mexican mescalleros in the mountain some fifteen miles northwest of Arispe, Sonora. Finding the mass malleable and composed of a silver white metal, they regarded it as some form of silver ore, and secreted it near the place of its discovery until transportation for it could be secured. Other parties, however, followed up the trail, found the place of concealment and stole the supposed lump of silver. After some time and some strife, personal and in the courts, the mass was acquired by Senor Canizaris at Cucurpe in the Magdalena district. This gentleman had a hole half an inch in diameter and two and one-half inches deep drilled into it, to test its interior for precious metals. When these drillings showed no value in either gold or silver, the mass was laid aside. Its existence was subsequently referred to

*This description of the Arispe meteorite was presented to Academy November 24, 1902.

during a visit of Mr. Wuensch to that vicinity, and this expert promptly recognizing it as a genuine meteorite, he secured it and had it transported to his Denver home. From this owner the meteorite has, at last, come into my hands to be cut, studied and disposed of, he reserving a slice for the mineral collection of the Colorado Scientific Society.

The specimen, as it came to me, had nothing of remarkable interest in its exterior. It is as irregular and shapeless as are nearly all masses of meteoric iron, notably those from Mexico and our southwestern states, where prolonged decomposition has with most of them corroded and broken down the sharper angles. A view from one side shows a parallelogram about 16 inches long by 12 inches at one end and about 9 inches at the other. This surface shows no true pittings, but a few shallow concavities, one of them nearly an inch across, due to the deep decomposition which has ensued, doubtless, since its fall. On the opposite side the form is more trifid, as shown in plate IX, and measures 18 inches in greatest length, 13½ inches in greatest breadth, and 13 inches in thickness. Its surface is covered with evenly distributed shallow pittings, ranging from 1½ to 3 or 4 cm. in diameter. These are sharp in outline, this surface having been less worn or decomposed since the fall than have been the other sides of the mass. On one side is a large depression, nearly 3 inches in depth and in greatest width, semilunar in shape and with nearly vertical walls on two of its sides. This deep pit-like valley has on its bottom and sides, smooth surfaces, without either ridges or pittings, which give strong indication of the fact of the present vacancy having once been filled with matter which has been worn away or decomposed and fallen out, probably a great troilite nodule. This empty cavity is indeed the most striking feature of the outside of the mass.

On a section of the iron (Plate X) troilite nodules are quite abundant, some of them up to 30 mm. in diameter. In several instances within these nodules are small patches and angular fragments of the nickeliferous iron. (Plate XI Fig. 2.) These nodules are surrounded with an envellope of schreibersite. In two or three of the nodules were found masses of chromite from 4 to 5 mm. in diameter, and in one instance on the edge of one of the plates was chromite nodule 12 to 14 mm. in diameter. On some of the surfaces that have been polished or etched there have occured in groups of crystals in arborescent form some 10 x 18 mm. in diameter, what is apparently cohenite, the carbide of iron. Nothing is more striking in the composition of the iron than the numerous large masses of schreibersite scattered through it. Some of these average from 30 to 40 mm. in diameter, while others again occur in blades some 3 mm. in width and 45 mm. in length. The Widmanstätten figures are sharp and clear and of unusual size, picturing vividly the octahedral structure of the iron. The kamacite plates are of unusual width, averaging from 3 to 4 m m. in width, and in one instance extending in an unbroken line for 195 mm. The taenite films are comparatively small, but are noticeable from their difference in color as they lie between the kamacite plates. The iron is also characterised by almost the entire absence of what is called plessite, the "Fülleisen" of the German chemists.

There remains to notice a point in the structure or construction of the iron mass which is of the highest interest, and is, in some respects, quite unique. The section across the meteorite shows it to belong to the limited group of brecciated siderites (see Plate X.), and that its individual pieces, or soldered fragments, are by far the largest which have ever been recorded. It will be noticed that the surface of the section is crossed from one side to the other by a fissure. And from a point somewhat beyond the middle of this fissure a branch fissure leads off at right angles until it reaches the edge of the mass. The two together make a letter Y, dividing the surface into three areas. This fissure in parts of its course shows as a fine line with the sides tightly closed up, and in other parts there is a filling of the fissure with troilite in a broken vein varying in general width from 1 to 3 m m., but expanding at these points to twice that width. That this bifid fissure is a fracture of the original mass and that the troilite has subsequently gathered in it, seems apparent, although that the cracking and the filling shall have been closely allied in time is more than likely, particularly when we keep in view the fact of the low fusion point of the troilite. But the prominent and most novel feature of this siderite section is still to come, and is as follows. We have already mentioned the great length and distinctness of the kamacite plates. They form on the surface lines of orientation showing the structual growth of the area. As, now, we notice the union of any one of these areas with its two neighbors, we make the surprising discovery that these surface lines do not match or correspond in direction across the line of union—the fissure. (See Plate XI Fig 1.) In short, each area is quite distinct from each of the other two. The appearance is as if the whole mass had originally been of continuous structure clear across, that it had afterwards cracked into three pieces, and that these pieces had swung around and reunited with different sides together than those which at first existed. This must needs have been done at a time when the iron was still in a somewhat plastic state, and before the troilite had cooled to its fusion point. Whether such mobility is conceivable in a mass pressed inward from all sides is, perhaps, open to question. Another view is that each of these three divisions is an area of original crystalization.

In speaking of the above structure of Arispe, I should not omit mention of the fact that a somewhat similar changed-about (umgewandelt) phenomenon has been noticed in the iron meteorite Mukerop from southwestern Africa, and described by Prof. Frederick Berwerth in a paper read before the Imperial Academy of Sciences, of Vienna, on the 20th of February, 1902. In this paper, which is, unfortunately, unaccompanied by any cut or photograph, there are four distinct areas mentioned, each defined, as in Arispe, by differently directed figures. These are in two pieces, with sharp lines of demarcation, which, Berwerth says, "appear to be brought out by the changing of the system of lamellae on the plane of contact". Here then, are no fissures, as those in Arispe, which have once separated the mass into parts, but those are held by him to be a twinning of two supposed original crystals. The African and Mexican meteorite thus present two entirely distinct phenomena. Both undoubtedly owe their inner structural framework to the time when they existed as a crystalizing magma in some incandescent celestial body. The opportunities there present for variation in ultimate structure were large, and the outcome will be different in different masses, while all are held firmly in unison with primal laws of composition and of crystalization which have fashioned the phenomena of these earth-wandered fragments which we to-day have under our inspection. They announce no new laws, but they tell us new and unexpected stories.

Prof. J. E. Whitfield, of Philadelphia, has analyzed Arispe and finds :

Iron, - - - - - -	92.268
Nickel, - - - - - -	7.040
Specific Gravity, - - -	7.853

Mr. John M. Davison, of Reynolds Laboratory, of the University of Rochester, writes :

" I find a trace of platinum in the Arispe siderite. From as care-" ful a separation of schreibersite as time permitted, its percentage is " 1.84. This is the mean of two closely agreeing determinations made " on material caught from the sawing of small slices of the meteorite " with a hack saw. Had it been practical to collect sawings from " larger sections which seem to have larger patches of schreibersite " the percentage of that mineral would doubtless have been greater. " No other meteorite with which we are acquainted shows such a pro-" portion of this."

" Some black particles, picked from the centre of a troilite nodule, " prove to be chromite. They are insoluble in nitric acid, and give " chromium reaction. Cohenite appears to be present, but the material " at my disposal was too scanty to permit its certain identification."

As some chemical work in reference to the constituents of this most remarkable meteorite has not at the present moment been completed, the results will be published at a later date.

The largest outside surface (end-piece) together with the largest section, both as described in this paper, are taking their places in the Ward-Coonley Collection of Meteorites, now displayed (on deposit) in the main Geological Hall of the American Museum of Natural History in New York. The two pieces together weigh nearly 40 kilogrammes.

THE BALD EAGLE METEORITE.

This interesting siderite has been loaned to me for examination and cutting by Prof. Wm. G. Owens, of the Bucknell University, Lewisburg, Pa. Prof. Owens read a paper upon the specimen before the Chemical Society of the University, and this was, the following year (1892), published in Vol. 43 of the American Journal of Science. From this article of Prof. Owen's I take my facts as to the finding of the mass.

Bald Eagle Mountain, on the east side of which the meteorite was found, is seven miles south of Williamsport, Pa. The mountain comes down to the edge of the Susquehanna river, and on the border of the latter runs the Philadelphia and Erie Railroad. Numerous transverse depressions occur here in the mountain-side, some of which are filled with loose blocks of sandstone, large and small. "It was in one of these depressions, several hundred feet from the railroad track, that on or about Sept. 25, 1891, some Italians, while getting out stones for a stone-crusher, found in a bed of loose stones, about two meters deep, something which resembled a stone in appearance. It was covered with a fungus growth, as were the stones, but when picked up attracted the laborer's attention on account of its weight. He showed it to the Superintendent who tried to break it, and failing attempted to cut it with a cold chisel, when it proved to be soft iron. When several weeks later the owner of the crusher, Mr. George S. Matlock, came to the works it was given to him, and he, realizing its value, presented it to this university. It weighs 3.3 Kilos. (7 lbs. 1 oz.) In shape it resembles in general outline, a human foot. (Fig. 2, plate VIII.) The flat face, corresponding to the sole, measures 16.6 cm. (6½ inches) long, and 8 cm. (3⅛ inches) wide at the broadest place. From the extremity of the heel it projects upward 14 cm. (5½ inches), ending in a point. The surface is covered with a reddish brown iron rust. This easily scales off in many places, and at several points this covering is so thin that the bright metal shines through. It is pitted quite deeply in some places, and very irregular in outline. * * * * Its specific gravity is 7.06. It is quite soft compared with ordinary wrought iron. Chemical analysis gave Fe 91.36; Ni 7.56; Co. 0.70; PO .09; SO .06; Si. trace, = 99.77.

Nothing is known as to the time of its fall, though as it was found covered by several feet of stones which have not been moved sensibly since the Susquehanna valley has been inhabited by white men, it could not have been recent. As far as can be learned, this is the only specimen of the fall which has been found."

It has seemed to be desirable to add to this description by Prof. Owens a view of this most interesting iron. The picture (Fig. 2, plate VIII) is a half-tone taken from a photograph of the mass before cutting. Its resemblance to a human foot is very striking, despite the many rough notches and depressions which cover the surface. But few of these depressions are well defined pittings, seeming rather to be fractuosites, caused by the violent tearing of the iron from a parent mass, and the sharpness of the angles and crests reduced by the attrition to which the whole mass has been subjected. A portion only of the surface, all the upper part of the ankle, has a well smoothed surface, with a fine granulation akin to a skin or crust. On the back, above the heel, are two sharp depressions, one round and ⅜ of an inch in depth and in diameter, the other, half as deep, a paralellogram ¾ of an inch long and ⅓ inch wide. Both of these have vertical walls, and show clearly as cavities which have once been filled with softer matter, probably troilite nodules, which have since been eroded or decomposed away. On the top of the front part of the foot is a deep cavity, due to the folds in the iron, which passes nearly through to the sole. The sole itself is very flat, which has allowed a thin slice, ¼ of an inch thick and weighing 300 grammes, to be cut off, of same width from toe to heel, and like thickness throughout, like the sole of a shoe. The polished section is quickly etched by the use of dilute nitric acid, and the Widmanstätten figures produced are both sharp and peculiar. (Fig. 3, plate VIII.) The iron is typically octahedral. The etched surface is composed mainly of short kamacite blades, with an average thickness of about 1 mm. and from 5 to 10 mm. in length. These depart from the ordinary rule defining the usual angular figures by being largely curved or snake-like in form, giving a pattern like that of floss or tangled yarn. Many of these kamacite blades are club-shaped (rounded on both ends) as in the Augusta Co., Va., iron. The patches of plessite are minute, sometimes showing clearly the alternate layers of tænite and kamacite. The tænite plates lying between the kamacite blades are very narrow, but stand out in prominent relief on the etched surface, and are faintly distinguishable by their bronze yellow color from the tin-white kamacite.

Two fissures, each about 25 mm. in length and averaging from 1 to 2 mm. in width, cross the sole diagonally, and are filled with troilite. No rounded nodules of this mineral were to be seen in in the section made. Several patches of schreibersite, rudely representing cuneiform characters, are scattered throughout the etched surface. These are brighter and with denser surface than the troilite, the latter being granular and less lustrous. But the main peculiarity of this iron is the extremely winding, vermiform assembling of the kamacite plates, to which we have already referred. In this respect the Bald Eagle iron is quite unique.

FIG. 1. External form. One-fourth actual size.

FIG. 2. Section showing Widmanstättan figures. One-half actual size.

CUERNAVACA METEORITE.

HENRY A. WARD.

FIG. 1. ANDOVER AEROLITE.
About three-fifths actual size.

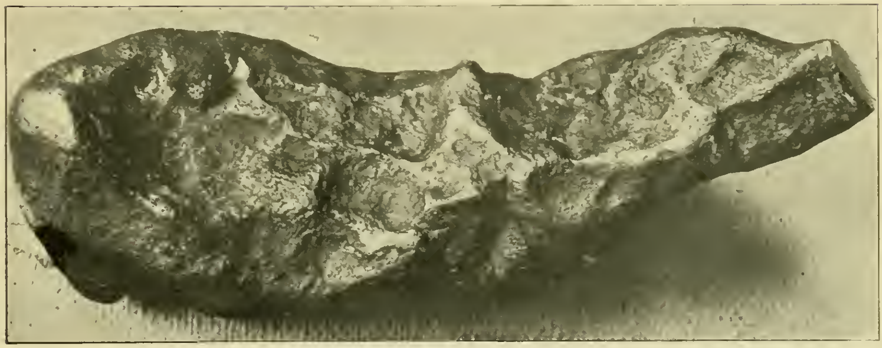

FIG. 2. BALD EAGLE METEORITE.
Showing the foot-like form with pittings. About three-fifths actual size.

FIG. 3. BALD EAGLE METEORITE.
Section showing Widmanstättan figures. Three-fifths actual size.

ANDOVER AND BALD EAGLE METEORITES.

HENRY A. WARD.

External form with pittings. One-third actual size.

ARISPE METEORITE.

HENRY A. WARD.

Section showing Widmanstättan figures. One-third actual size.

ARISPE METEORITE.

HENRY A. WARD.

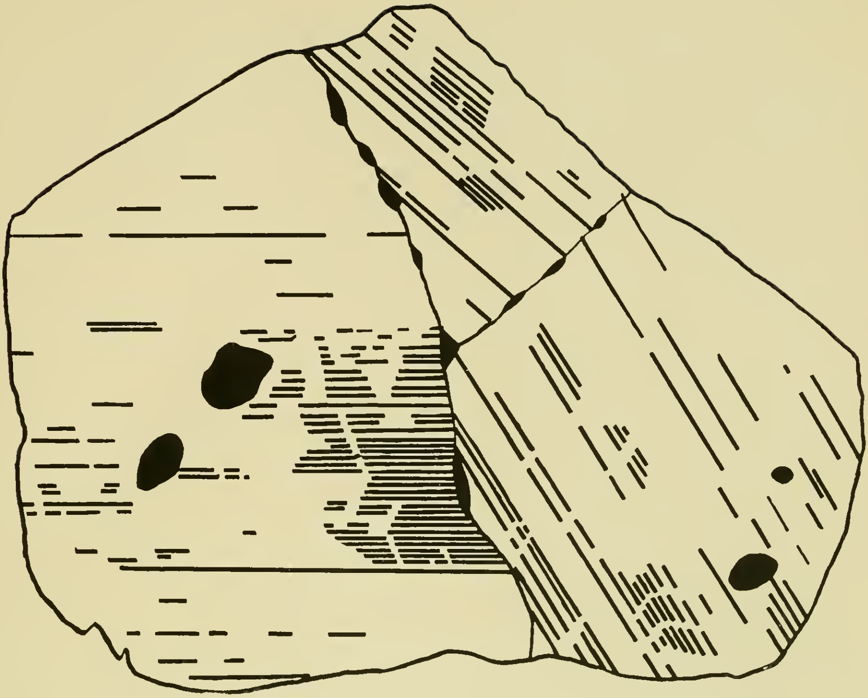

Fig. 1. Diagram of section, showing the tripartite structure. The lines represent plates of kamacite.

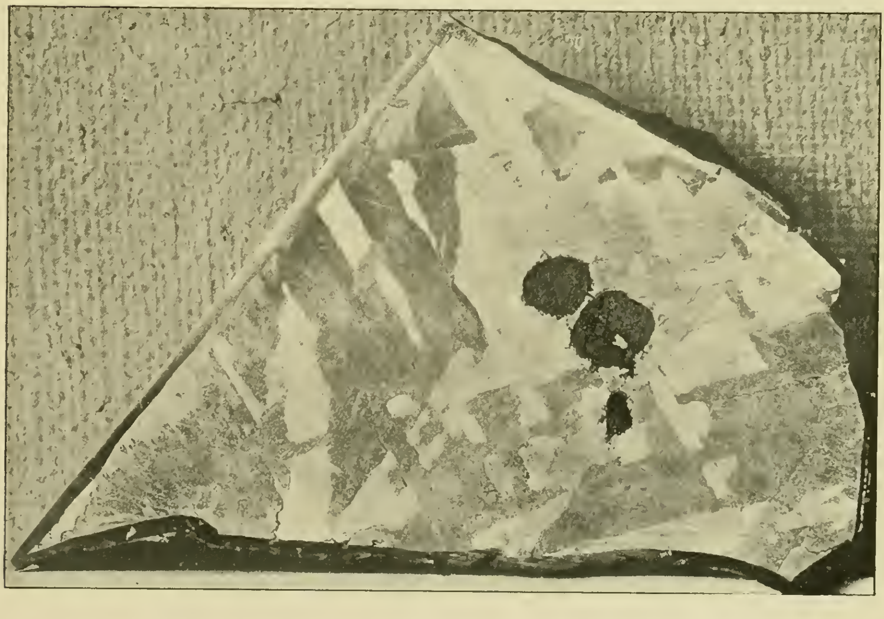

Fig. 2. Section showing the dark troilite nodules surrounded by the lighter schreibersite.

ARISPE METEORITE.

Henry A. Ward.

PROCEEDINGS OF THE ROCHESTER ACADEMY OF SCIENCE
VOL. 4, PP. 89-91, PLATE 12.

REED CITY METEORITE

BY

H. L. PRESTON.

ROCHESTER, N. Y.
PUBLISHED BY THE SOCIETY,
APRIL, 1903.

PROCEEDINGS OF THE ROCHESTER ACADEMY OF SCIENCE
VOL. 4, PP. 89-91, PLATE 12. APRIL 15, 1903.

REED CITY METEORITE.

By H. L. Preston.

(Read before the Academy March 9, 1903.)

For the early history of this meteorite I am indebted to Prof. Walter B. Barrows, of the Michigan State Agricultural College, and a clipping written by Prof. Barrows from the M. A. C. Record, published by the same institution.

This meteorite, according to Prof. Barrow's statement, was found by Mr. Ernest Ruppert, a small farmer and junk dealer, on his farm in Osceola County, near Reed City, Michigan, while plowing in September, 1895.

The meteorite was later displayed in a hotel window in Reed City, where Prof. Barrows saw it in December, 1898, and was told there had been a dispute as to the origin of the specimen, some claiming that it was a meteor from the skies, others that it was a lump of ordinary iron. Prof. Barrows saw at a glance from its general character that it was a genuine meteorite, and at that time made an unsuccessful effort to obtain it for the college museum. Other attempts were equally unsuccessful until recently, when the iron was purchased by the college.

In January of this year Prof. Henry A. Ward, of Chicago, visited Prof. Barrows to see if he could make arrangements to obtain a portion of the mass for the Ward-Coonley Collection of Meteorites now on deposit in the American Museum of Natural History in New York. In consequence of this visit the mass was sent to Rochester, N. Y., for slicing.

The meteorite on reaching Rochester, before cutting, was a semi-circular or ham-shaped mass, 10 x 21 x 26½ cm. in its greatest diameters, of which one side (Plate XII, Fig. 1) is a comparatively smooth convex surface showing no distinct pittings. The opposite side is much more irregular in form, slightly concave, with three prominent and numerous small characteristic pittings. On the upper edge of this face is a hackly fracture, oblong in shape, 4½ x 10 cm. in diameter, where a piece, less than a pound according to Prof. Barrows, was broken off by the finder in an effort to discover what made the "stone" so heavy. The surface of this fracture, like that of the entire mass, being much oxidized, so that the nickeliferous iron is not visible. On one edge there is a large irregular pitting some 10 cm. long and 5 cm. deep. The whole mass is of a reddish-brown hue, intermingled with large irregular patches of an ochreous-yellow color. On no part of the iron was the true crust observed. Its weight was 43 pounds 11 ounces, or 19.8 kilograms.

Following the directions of Prof. Ward a few cuts were made parallel to the upper left-hand edge of Plate XII, Fig. 1, showing the deep pitting mentioned above, and commencing just within the edge of this pitting. On polishing and etching these cut surfaces, we found that the iron was octahedral in structure, with well marked Widmanstätten figures. A feature of this iron is the fact that it etches so readily that the Widmanstätten figures were slightly outlined on an ordinary polished surface, without the use of acid or any other solvent.

The etched surfaces have numerous fissures from ½ to 1½ mm. in width and from 5 to 65 mm. in length, partly filled with troilite but mainly with schreibersite. These fissures occur at various angles toward each other, thus breaking, to some extent, the regularity of the Widmanstätten figures, and are invariably entirely surrounded by kamacite bands. The kamacite bands average from 1½ to 2 mm. in width, with the broadest bands generally surrounding the schreibersite filled fissures as seen in Plate XII, Fig. 2. The plessite patches which are quite prominent on the etched surfaces show clearly the alternating layers of kamaçite and taenite (so-called Laphamite lines), a feature that was first distinguished in another Michigan iron, that of Grand Rapids. On no section were rounded troilite nodules, so characteristic of iron meteorites, found.

The character of the etched surface of this meteorite in many respects resembles that of Cuernavaca, but the kamacite blades are much broader and longer than in Cuernavaca, thus making the figures much more prominent.

An analysis of this meteorite, made for Prof. Ward by Prof. J. E. Whitfield, of Philadelphia, gave the following results:

Fe - - - -	89.386
Ni - - -	8.180
The specific gravity - -	7.6

From the close proximity of the farm on which this meteorite was found to Reed City we will designate it as the "Reed City Meteorite."

The main mass of this iron was returned to the Michigan Agricultural College, while the smaller end and one slice weighing 2.9 kilograms, were added to the Ward-Coonley Collection of Meteorites.

Michigan has to the present time furnished but three meteorites to the scientific world as far as described:

Grand Rapids - -	Found 1883
Reed City - -	Found 1895
Allegan - - -	Fell July 10, 1899

The first two are Siderites, the last an Aerolite.

FIG. 1. Showing convex surface (three fifths actual size).

FIG. 2. Section showing Widmanstätten figures (three-fifths actual size).

H. L. PRESTON.

PROCEEDINGS OF THE ROCHESTER ACADEMY OF SCIENCE
VOL. 4, PP. 93-136.

CRATAEGUS IN ROCHESTER, NEW YORK

BY

C. S. SARGENT.

ROCHESTER, N. Y.
PUBLISHED BY THE ACADEMY,
JUNE, 1903.

PROCEEDINGS OF THE ROCHESTER ACADEMY OF SCIENCE

VOL. 4, PP. 93-136. JUNE 1, 1903.

CRATAEGUS IN ROCHESTER, NEW YORK.

BY C. S. SARGENT.

During a visit which I made in Rochester in the autumn of 1899, Mr. C. C. Laney, the superintendent of the parks of that city, called my attention to a number of forms of Crataegus which seemed unlike any of the described species and this hurried examination led Mr. Laney, his assistant, Mr. John Dunbar, and Mr. M. S. Baxter, to make a careful and systematic study of the group in the neighborhood of the city and in parts of the adjacent country. The results of these studies are found in this preliminary paper which serves to show the remarkable richness of the valley of the lower Genesee River in species of Crataegus. This segregation of forms seems to confirm the fact which I have long suspected, that the country surrounding Lake Ontario and the eastern end of Lake Erie and the valley of the St. Lawrence River, as far east at least as Montreal Island, is richer in forms of Crataegus and in the multiplication of individuals than any other part of the world, with the exception perhaps of the Red River valley in Arkansas. Thanks to the industry of Mr. Laney and his assistants, Crataegus has now been systematically and carefully studied at Rochester through three years. Many of the species are now well known at all seasons of the year ; others, however, are still imperfectly known, and the range of all the species beyond the immediate neighborhood of the city is still to be determined. This paper, therefore, must be considered as preliminary to a fuller description of the genus in the Lake Ontario country dependent on further field work.

In the limitation of species particular attention has been given to the number of stamens, the color of the anthers, and the character and time of ripening of the fruit. The sections in which the species are grouped are those which are adopted in the thirteenth volume of my Silva of North America.

§ CRUS-GALLI.

Fruit medium size, red, often slightly pruinose; nutlets 1-3, obtuse, prominently ridged on the back; corymbs many-flowered; stamens 10-20; anthers rose color; leaves subcoriaceous, dark green and lustrous.

Glabrous; leaves obovate-cuneiform to broadly ovate, their primary veins within the parenchyma; stamens 10; nutlets 2. *1. C. Crus-galli.*

Slightly villose; leaves oblong-obovate to oval, their veins without the parenchyma, prominent; stamens 10-20; nutlets 1-2. *2. C. persimilis.*

Crataegus Crus-galli, Linnaeus. Sargent, *Silva N. Am.*, iv. 91, t 128. Common.

Crataegus persimilis, *n. sp.*

Leaves oblong-obovate to oval, acuminate, narrowed and short-pointed or rarely rounded at the apex, gradually contracted from near the middle and cuneate at the narrow entire base, sharply and doubly serrate above, with glandular teeth; nearly fully grown when the flowers open and then thin but firm in texture, glabrous with the exception of a few caducous pale hairs on the upper side of the base of the midribs, dark green and lustrous above and light orange-green below; at maturity coriaceous, lustrous on the upper surface, dull and whitish on the lower surface, 4-6.5 cm. long, 2-3 cm. wide, with thin midribs and slender but prominent primary veins, dark orange colored early in the season, becoming pale yellow; petioles slender, wing-margined sometimes to the middle by the decurrent base of the leaf-blades, grooved, occasionally grandular, with minute scattered glands, at first sparingly villose, soon glabrous, 0.8-1.5 cm. in length; stipules linear, acuminate, furnished on the margins with minute glands, long, caducous. Flowers about 1.2 cm. in diameter on long slender slightly villose pedicels, in broad many-flowered thin-branched corymbs; bracts and bractlets linear, acuminate, glandular, mostly persistent until the flowers open; calyx-tube narrowly obconic, glabrous, the lobes long, slender, acuminate, coarsely glandular-serrate glabrous on the outer, villose on the inner surface, reflexed after anthesis; stamens 10-20; styles 2, rarely 1, surrounded at the base by a narrow ring of pale tomentum. Fruit on slender reddish pedicels in few-fruited drooping clusters, oblong to subglobose, full and rounded at the ends, dark crimson, lustrous, marked by occasional large dark dots, about 1.2 cm. long and 1.1 cm. wide ; calyx sessile, with a deep narrow cavity and elongated serrate acute lobes gradually narrowed from broad bases, villose on the upper surface, reflexed and closely appressed, often deciduous from the ripe fruit ; flesh thin, dry, pale yellow, of a disagreeable flavor ; nutlets usually 2, rarely 1, full and rounded at the ends, prominently ridged on the back, with a high rounded ridge, or sometimes deeply grooved, 8-9 mm. long, 5-6 mm. wide.

A shrub 5 or 6 m. in height, with intricately branched stems 2-2.5 dm. in diameter, covered with dull gray bark separating near their base into small scales, or rarely arborescent with spreading branches, and slender only slightly zigzag branchlets, dark orange-green and marked by many large pale lenticels when they first appear, light orange-brown and lustrous at the end of their first season, and pale gray-brown the following year, and armed with many slender nearly straight dark purple shining spines 3-4 cm. in length and long—persistent on the stems. Flowers the first week of June. Fruit ripens from the first to the middle of October and falls toward the end of the month, sometimes retaining its shape and color on the ground until the following spring.

Rochester ; moist rich soil ; rare ; Black Creek above B. R. & P. R. R. Bridge, *C. S. Sargent*, Sept. 16, 1901, Highland Avenue, near Clover Road, *C. S. Sargent*, September 19, 1899, *John Dunbar*, May 29 and June 8, 1901, East Avenue in creek lot east of Brighton, *C. C. Laney*, Oct. 1902.

This species is closely related to *Crataegus Peoriensis*, Sargent, of central and northern Illinois, with leaves of the same form and the peculiar orange colored branchlets of the first year. It differs from it chiefly in its fewer-flowered corymbs, coarsely and constantly serrate calyx-lobes much more villose on the inner surface, in its usually more numerous stamens, in its fewer styles, small fruits and larger nutlets.

§ PRUINOSAE.

Fruit medium size, red, often slightly five-angled, more or less pruinose, the calyx-lobes usually raised on a short tube; corymbs few or many-flowered; stamens 10-20; leaves thick or subcoriaceous, usually blue-green, glabrous or slightly villose while young.

Stamens 20.

ANTHERS PURPLE OR RED.

Leaves oblong-ovate, villose on the upper surface while young; corymbs many-flowered; anthers dark maroon color; fruit oblong to oblong-ovate, crimsom; nutlets 4-5. *3. C. beata.*

Leaves ovate to rhombic, slightly villose while young, yellow-green; corymbs many-flowered; anthers red; fruit ovate to oblong, dark crimson; nutlets 3-4. *4. C. Lennoniana.*

ANTHERS YELLOW.

Leaves broadly ovate, slightly hairy while young on the upper side of the midribs; corymbs few-flowered; fruit obovate to subglobose, dark green, becoming bright red and lustrous late in the season; nutlets usually 4; spines long and slender. *5. C. leiophylla.*

Leaves oblong-ovate, slightly hairy on the upper surface while young; corymbs many-flowered; fruit oblong or slightly obovate, scarlet; nutlets 4 or 5; spines short and stout. *6. C. formosa.*

Stamens 10 or less.

ANTHERS ROSE COLOR OR PURPLE.

Leaves oblong-ovate, slightly villose while young on the upper surface; glabrous at maturity; corymbs many-flowered; stamens 7-10; anthers dark rose color; fruit usually oblong-obovate, light cherry red; nutlets 3-4. *7. C. compta.*

Leaves ovate, hirsute while young and scabrate at maturity on the upper surface; corymbs usually few-flowered; anthers purple; fruit subglobose to short-oblong, scarlet; nutlets 4-5. *8. C. diffusa.*

Leaves oblong-ovate to oval, hirsute while young on the upper surface; corymbs few-flowered; stamens 10; anthers pale rose color; fruit subglobose and usually broader than high to short-obovate, crimson; nutlets 3-4. *9. C. opulens.*

Leaves usually ovate to deltoid, villose while young; corymbs many-flowered; stamens 10; anthers dark purple; fruit globose, scarlet, scarcely pruinose; nutlets 4. *10. C. Maineana.*

Crataegus beata, *n. sp.*

Glabrous with the exception of the hairs on the upper surface of the young leaves and petioles. Leaves oblong-ovate, acuminate, full and rounded or broadly concave-cuneate, or on leading shoots sometimes cordate at the entire base, sharply double serrate above, with straight gland-tipped teeth, and divided into numerous long narrow acuminate spreading lobes; when they unfold deeply tinged with red and villose on the upper surface, and about one-third grown when the flowers open, and then very thin, dark yellow, and still slightly hairy; at maturity thin but firm in texture, dark, dull blue-green and smooth above, pale blue-green below, 5-8 cm. long, 4-7 cm. wide, with stout yellow midribs and slender primary veins arching obliquely to the points of the lobes; petioles slender, slightly wing-margined at the apex, grooved, furnished with numerous small dark glands, sparingly hairy at first, soon glabrous, often rose color in the autumn, 2.5-4 cm. in length; stipules linear, acuminate, glandular, on leading shoots often lobed at the base, caducous. Flowers on long slender pedicels, in broad dense many-flowered compound corymbs; calyx-tube broadly obconic, the lobes separated by wide rounded sinuses, small, acuminate, entire or undulate or occasionally glandular on the margins, reflexed after anthesis; stamens 20; anthers large, dark maroon color; styles 4 or 5, surrounded at the base by a narrow ring of pale hairs. Fruit on slender pedicels in drooping many-fruited clusters, oblong to oblong-obovate, full and rounded at the ends, crimson, marked by many small pale dots, pruinose, 1.1-1.3cm. long, 9-10 mm. wide; calyx comparatively small with a very short tube, a broad shallow cavity, and slender spreading nearly entire lobes, dark red on the upper side near the base, their tips often deciduous from the ripe fruit; flesh very thick, dry and mealy; nutlets usually 5, full and rounded at the apex, gradually narrowed to the acute base, rounded and slightly grooved or irregularly ridged on the back, 6-7 mm. long.

A shrub 5 or 6 m. in height with numerous stems covered with dark gray bark, spreading into broad thickets, erect branches, and stout only slightly zigzag branchlets, dark orange-green tinged with red and marked by numerous small pale lenticels when they first appear, bright red-brown and very lustrous at the end of their first season, becoming light gray-brown the following year, and armed with many stout nearly straight bright red-brown shining spines 3.5-4.5 cm. long. Flowers from the 20th to the end of May. Fruit ripens at the end of September. In the autumn the leaves turn to a handsome lemon yellow.

Rochester, Highland Avenue, Beckwith farm, Float Bridge, Genesee Valley Park, *C. S. Sargent*, *John Dunbar*, September 19, 1900, and September, 1902, *John Dunbar*, May, September and October, 1901, on left side of Scottsville road at creek near Pennsylvania R. R. Round House ; Greece, *M. S. Baxter*, May, 1902.

Crataegus Lennoniana, *n. sp.*

Glabrous with the exception of a few hairs on the young leaves and their petioles. Leaves ovate to rhombic, acuminate, gradually narrowed and concave-cuneate at the entire base, deeply serrate above, with blunt gland-tipped teeth, and usually divided into 4 or 5 pairs of short broad acuminate lateral lobes ; nearly half-grown when the flowers open and then membranaceous, light yellow-green and furnished with a few soft pale hairs on the upper surface particularly toward the base of the midribs ; at maturity thin, dark dull yellow-green and slightly roughened above, pale and glabrous below, 4-5 cm. long, 3-5 cm. wide, with stout orange-colored midribs and 4 or 5 pairs of primary veins arching obliquely to the points of the lobes ; petioles slender, narrowly wing-margined at the apex by the decurrent base of the leaf-blades, slightly hairy toward the apex while young, soon glabrous, 1.5-4 cm. in length ; stipules linear, acuminate, glandular, mostly deciduous before the flowers open ; on vigorous shoots leaves broadly ovate, subcoriaceous, deeply lobed, truncate or slightly cordate at the base, 5-6 cm. long and usually as wide or wider than long, with stout winged glandular petioles usually about 2 cm. in length. Flowers 1.2 cm. in diameter on short slender pedicels, in compact many-flowered thin-branched compound corymbs ; calyx-tube narrowly obconic, the lobes abruptly narrowed from broad bases, slender, acuminate, entire, occasionally slightly serrate, reflexed after anthesis ; stamens 20 ; anthers small, red ; styles 3 or 4. Fruit on slender rigid reddish pedicels, in erect few-fruited clusters, ovate to oblong, full and rounded at the ends, dark crimson marked by occasional small pale dots, slightly pruinose, 1-1.2. cm. long, 8-10 mm. wide ; calyx prominent with a long calyx-tube, a deep narrow cavity, and spreading and closely appressed lobes, entire or slightly serrate toward the apex, dark red on the upper side near the base ; flesh thin, yellow, dry and mealy ; nutlets 3 or 4, full and rounded at the obtuse ends, ridged on the broad rounded back, with a low narrow ridge, 6 mm. in length.

A slender tree sometimes 7 or 8 m. in height, with a trunk branching one or two feet from the ground, and 1.5-2 dm. in diameter, and covered with ashy gray bark, small horizontal and ascending branches usually forming a broad symmetrical head, and slender zigzag branchlets dark green tinged with red and marked by large oblong pale lenticels when they first appear, bright red-brown and lustrous at the end of their first season, becoming dark gray-brown the following year and armed with many slender straight chestnut-brown or purplish shining spines 1.5-3 cm. in length, long persistent and occasionally compound. Flowers the first of June. Fruit ripens toward the end of October and does not entirely fall before the end of another month.

Rochester, *C. S. Sargent and John Dunbar*, October 15, 1901, September 24, 1902 ; Adams Basin, New York, *M. S. Baxter*, May 29, 1902; Buffalo, *John Dunbar*, October 6, 1902 ; Murray, *M. S. Baxter*, June 1, 1902.

This species is named for William Harvey Lennon, teacher of natural sciences in the Normal School at Brockport, New York, and a careful and enthusiastic student of the flora of Monroe County.

Crataegus leiophylla, *n. sp.*

Glabrous with the exception of a few hairs on the upper side of the midribs of young leaves. Leaves broadly ovate, acuminate, rounded, truncate or rarely cuneate at the wide entire base, sharply and doubly serrate above, with straight glandular teeth, and divided into four or five pairs of narrow acuminate spreading lateral lobes ; bright red as they enfold and about half-grown when the flowers open, and then thin and light yellow-green more or less tinged with red ; at maturity thick and firm in texture, dark dull blue-green on the upper surface, light yellow-green on the lower surface, 5-6 cm. long and broad, and often broader than long, with slender yellow midribs and 4 or 5 pairs of thin primary veins arching obliquely to the points of the lobes ; petioles slender, slightly wing-margined at the apex, grooved, 2.5-4 cm. in length ; stipules linear to lanceolate, glandular, turning red in fading, fugaceous. Flowers 2 cm. in diameter, and very flat when fully expanded, on short, slender pedicels, in compact usually 5-7-flowered compound corymbs ; bracts and bractlets linear, glandular, mostly deciduous before the flowers open ; calyx-tube broadly obconic, the lobes gradually narrowed from wide bases, small, acuminate, entire or slightly and irregularly glandular-serrate, reflexed after anthesis ; stamens 20 ; anthers pale yellow ; styles 4 or 5, villose toward the base and surrounded by a broad ring of matted white hairs. Fruit in few fruited erect or spreading clusters, obovate, full and rounded at the apex, gradually narrowed below into the thickened end of the short stout pedicel, dark green and pruinose until late in the season and when fully ripe bright red and lustrous, rather broader than long, 1.2-1.4 cm. in diameter ; calyx large and prominent, with a short tube, a broad deep cavity, and enlarged spreading and reflexed entire or sparingly serrate lobes often deciduous from the ripe fruit ; flesh thin, yellow, dry and mealy ; nutlets usually 4, full and rounded at the apex, gradually narrowed and acute at the base, prominently ridged, with a high broad ridge or rounded and slightly grooved on the back, 7-8 mm. long, 4-5 mm. thick.

A slender intricately branched shrub 3 to 5 m. in height with stems 6-12 cm. in diameter, covered with pale olive-green bark, dark and scaly toward the base, erect branches, and thin nearly straight branchlets olive-green tinged with red and marked by many small pale lenticels when they first appear, dull orange-green at the end of their first season, and dark gray or reddish brown the following year and armed with very numerous slender nearly straight bright chestnut-brown shining spines 4-6 cm. in length, and long persistent on the stems. Flowers at the end of May. Fruit ripens early in November and falls from the middle to the end of the month, often retaining its form and color until the following spring.

Rochester ; common on both sides of the Genesee River north of the city, *John Dunbar*, *Henry T. Brown* and *M. S. Baxter*, May, 1901, *C. S. Sargent*, *John Dunbar* and *M. S. Baxter*, October, 1902.

Crataegus formosa, *n. sp.*

Nearly glabrous. Leaves oblong-ovate, acuminate, full and rounded or cuneate or rarely truncate at the wide entire base, sharply and doubly serrate above, with straight glandular teeth, and slightly divided usually only above the middle into three or four pairs of narrow acuminate spreading lobes; more than half-grown when the flowers open and then very thin, light yellow-green and slightly hairy above along the midribs, paler and glabrous below; at maturity subcoriaceous, dark dull bluish green on the upper surface, pale on the lower surface, 5.5-7 cm. long, 4-6.5 cm. wide, with slender yellow midribs, 4 or 5 pairs of thin prominent primary veins extending obliquely to the points of the lobes, and somewhat conspicuous finely reticulated veinlets; petioles slender, usually slightly wing-margined at the apex, grooved, sparingly glandular early in the season, 1.2-2 cm. in length. Flowers 2-2.5 cm. in diameter on long slender pedicels, in broad usually about 10-flowered thin-branched corymbs; bracts and bractlets oblong-obovate to linear, glandular, mostly deciduous before the flowers open; calyx-tube broadly obconic, often furnished near the base with a few long white caducous hairs, the lobes gradually narrowed from wide bases, small, acuminate, entire or occasionally and irregularly glandular-serrate, reflexed after anthesis; stamens 20; anthers pale yellow; styles usually 5, surrounded at the base by a ring of pale tomentum. Fruit on long slender pedicels, in few-fruited spreading clusters, oblong or slightly obovate, full and rounded at the ends, scarlet, marked by large pale lenticels, pruinose, 1.2-1.5 cm. long, about 1 cm. wide; calyx prominent, sessile, with a broad deep cavity and enlarged spreading entire or serrate lobes, dark red on the upper side near the base, their tips often deciduous from the ripe fruit; flesh thin, yellow, dry and mealy; nutlets 4 or 5, thin, narrowed at the rounded ends, very prominently ridged on the back, with a high rounded often doubly groove ridge, 8-9 mm. in length.

A bush 3-5 m. in height, with stems branching from the base, often 1-1.2 dm. in diameter, and covered with dark olive-green bark, becoming dark gray-brown and scaly at the base, stout branchlets dark orange-green and marked by many large pale lenticels when they first appear, dull dark reddish brown or purple at the end of their first season, very dark brown the following year and armed with stout nearly straight red-brown shining spines usually not more than

3 cm. in length, long persistent on the stems, frequently becoming compound. Flowers about the 20th of May. Fruit ripens the middle of October.

Rochester ; common on both sides of the Genesee River north of the city, *J. Dunbar*, May 23, 1901, October 14, 1902, *C. S. Sargent*, September 29, 1902, *M. S. Baxter*, May, 1902; Buffalo, *J. Dunbar*, October 6, 1902.

Crataegus compta, *n. sp.*

Glabrous with the exception of the hairs on the upper surface of the unfolding leaves and young petioles. Leaves oblong-ovate, acuminate, gradually and abruptly narrowed and rounded or broad and subcordate at the entire base, sharply often doubly serrate above, with straight gland-tipped teeth, and slightly divided into three or four pairs of broad acute lateral lobes ; as they unfold tinged with red and sparingly villose on the upper surface, and when the flowers open about one-third grown and then light yellow-green and scabrate above and pale below; at maturity coriaceous, glabrous, very dark dull blue-green on the upper surface, pale and glaucous on the lower surface, 6-8 cm. long, 4.5-6 cm. wide, with slender yellow midribs slightly impressed on the upper side and often rose color in the autumn on the lower side, and very thin yellow primary veins extending obliquely to the points of the lobes ; petioles slender, wing-margined at the apex, grooved, sparingly glandular, with numerous deciduous bright red glands, at first villose, soon glabrous, often rose color late in the season, 3-4 cm. long ; leaves on vigorous shoots usually broader in proportion to their length, more deeply lobed, 6-7 cm. long and broad, with stout petioles wing-margined to below the middle, and glandular throughout the season, their stipules lunate, glandular-serrate, early deciduous. Flowers 1.4-1.6 cm. in diameter on slender pedicels, in compact many-flowered thin-branched compound corymbs ; bracts and bractlets linear to linear-obovate, acuminate, glandular, bright red, mostly deciduous before the flowers open ; calyx-tube narrowly obconic, the lobes slender, acuminate, glandular-serrate usually only above the middle, bright red toward the apex, reflexed after anthesis ; stamens 7-10 ; anthers dark rose color ; styles 3 or 4, surrounded at the base by a narrow ring of pale tomentum. Fruit on stout pedicels, in few-fruited drooping clusters, oblong-obovate to rarely oblong, full and rounded at the ends, light cherry red marked by small pale dots, covered with a glaucous bloom, 1.2-1.8 cm. in length, about 1.2 cm.

in width ; calyx sessile, with a deep narrow cavity and elongated distinctly oblanceolate lobes coarsely glandular-serrate above the middle, dark red on the upper side near the base, spreading and incurved, often deciduous from the ripe fruit ; flesh yellow, thick, firm and bitter ; nutlets usually 4, rarely 3, thick, acute at the ends, prominently ridged on the back, with a high narrow ridge, 8 mm. long.

A broad shrub with numerous stout stems covered with dark gray-brown bark, many ascending branches and stout erect branchlets, light orange-green when they first appear, light olive or reddish brown, lustrous and marked by many small pale lenticels at the end of their first season, becoming ashy gray the following year and armed with many stout straight or slightly curved light chestnut-brown shining spines 3-4 cm. in length ; winter-buds globose, about 5 mm. in diameter, covered with dark red lustrous scales. Flowers from the 20th to the 25th of May. Fruit ripens the middle of October.

Rochester ; common in the Genesee Valley, on rich heavy soil in open situations, *C. C. Laney*, May, 1900, *C. S. Sargent*, September, 1900 and 1902, *C. C. Laney* and *John Dunbar*, May, June and September, 1901 ; Rush and Avon, New York, *M. S. Baxter*, August, 1902; Buffalo, September, 1901 and Chippewa, Ontario, October, 1902, *John Dunbar*.

Crataegus diffusa, *n. sp.*

Glabrous, with the exception of the hairs on the upper surface of the young leaves. Leaves ovate, acuminate, full and rounded or broadly cuneate at the entire or glandular base, sharply and finely serrate above, with straight gland-tipped teeth, and divided into four or five pairs of short, broad acuminate lateral lobes ; tinged with red and covered on the upper surface when they unfold with short, rigid white hairs more or less persistent until the flowers open but then membranaceous, light yellow-green, and paler on the under than on the upper surface; at maturity thin but firm in texture, dark bluish green lustrous and slightly scabrate above, pale, blue-green below, 5.5-7.5 cm. long, 5-6.5 cm. wide, with slender yellow midribs often tinged with rose color toward the base late in the season, and thin primary veins, arching obliquely to the points of the lobes; petioles slender, wing-margined toward the apex by the decurrent base of the leaf-blades, grooved, glandular early in the season, with minute dark red scattered glands, 3-4 cm. in length. Flowers 1.6-2 cm. in diameter on long, slender pedicels, in wide 6-12-flowered thin-branched compound corymbs; bracts and bractlets linear to linear-obovate, glandular, mostly deciduous before the flowers open; calyx-tube broadly obconic, the lobes wide, acuminate, irregularly serrate usually only below the middle, reflexed after anthesis; stamens 10; anthers purple, styles 4 or 5, surrounded at the base by a broad ring of hoary tomentum. Fruit on elongated reddish pedicels, in drooping clusters, subglobose to short-oblong, flattened at the ends, scarlet, lustrous, slightly pruinose, marked by occasional small dark dots, 1-1.2 cm. in diameter; calyx sessile, with a wide shallow cavity, the lobes gradually narrowed from broad bases, coarsely glandular-serrate, dark red on the upper side toward the base, spreading and appressed, or erect and incurved, mostly persistent on the ripe fruit; flesh thick, tinged with red, sweet, dry and mealy; nutlets 4 or 5, thin, acute at the ends, ridged, with a broad low grooved ridge or rounded and slightly grooved on the back, about 8 cm. in length.

An intricately branched shrub often 5 or 6 m. in height, with numerous stems spreading into broad dense thickets, and stout only slightly zigzag branchlets, tinged with red when they first appear, bright red-brown, lustrous and marked by many small pale lenticels at the end of their first season, becoming darker and gray or reddish brown the following year, and armed with many stout, nearly straight or slightly curved bright red-brown shining spines 3.5-5 cm. in length. Flowers from the 20th to the end of May. Fruit ripens about the 10th of October.

Rochester; common north and south of the city along the river banks, *John Dunbar*, May, 1900, *C. S. Sargent*, September 19, 1900, *John Dunbar*, May and September, 1901, October, 1902; *Niagara Falls*, New York, *C. S. Sargent*, September, 1900.

Crataegus opulens, *n. sp.*

Glabrous, with the exception of the hairs on the upper surface of the young leaves and petioles. Leaves oblong-ovate to oval, acuminate, full and rounded or broadly cuneate at the entire base, sharply doubly serrate above, with straight gland-tipped teeth, and slightly divided into three or four pairs of broad acuminate spreading lobes; about half grown when the flowers open, and then very thin, light yellow-green and roughened above by short pale hairs and paler below; at maturity coriaceous, glabrous, dark bluish green and lustrous on the upper surface, very pale blue-green on the lower surface, 4-7 cm. long, 3-5 cm. wide, with thin yellow midribs sometimes tinged with rose-color in the autumn and four or five pairs of slender primary veins arching obliquely to the points of the lobes; petioles slender, more or less wing-margined at the apex, grooved, sparingly hairy when they first appear, with long white caducous hairs, occasionally glandular early in the season, with small scattered dark glands, 2-4 cm. in length; stipules linear to linear-falcate, acuminate, sometimes lobed at the base, glandular, mostly deciduous before the flowers open; leaves on vigorous leading shoots coarsely serrate, frequently three-lobed, the lateral lobes laterally divided into two or three pairs of secondary lobes, 6-8 cm. long and often as wide or wider than long, their petioles stout, usually about 2 cm. long and conspicuously glandular throughout the season. Flowers 1.2-1.4 cm. in diameter on long slender pedicels, in compact usually 5-8-flowered thin-branched compound corymbs; bracts and bractlets oblong-obovate to linear, acuminate, glandular, mostly deciduous before the flowers open; calyx-tube broadly obconic, the lobes gradually narrowed from the base, acuminate, tipped with minute dark red glands, sparingly glandular-serrate, usually only above the middle, or nearly entire, reflexed after anthesis; stamens 10; anthers pale rose color; styles 3 or 4, surrounded at the base by a narrow ring of pale hairs. Fruit on long slender reddish pedicels, in few-fruited drooping clusters, subglobose and rather broader than high to short-obovate, obscurely angled, crimson, slightly pruinose, lustrous, marked by few large dark dots, 1.3-1.5 cm. in diameter; calyx sessile, with a deep narrow cavity and erect or spreading entire or slightly serrate lobes, dark red on the upper side below the middle, their tips often deciduous from the ripe fruit; flesh thin, nearly white, dry, firm and sweet; nutlets 3 or 4, usually 4, full and rounded at the apex, gradually narrowed to the rounded base, prominently ridged on the back, with a high rounded ridge, 8-9 mm. long and often 6 mm. thick.

A shrub 3-5 m. in height, with dull olive-gray stems, ashy gray at the base, and slender only slightly zigzag branchlets, light red or green tinged with red and marked by small pale lenticels when they first appear, dark olive-brown and lustrous at the end of their first season, becoming light gray-brown the following year, and armed with many straight or slightly curved lustrous, purplish brown spines 3.5-5 cm. in length; winter-buds globose, 3-4 mm. in diameter, covered with bright red lustrous scales scarious on the margins. Flowers from the 20th to the end of May. Fruit ripens the middle of October. Late in the autumn the leaves turn dark red.

Rochester; only known along the banks of the river below Vincent Street, *John Dunbar*, May 28, 1900, *C. S. Sargent*, September 19, 1900, and September 29, 1902, *J. Dunbar*, May 23 and October 12, 1901; Buffalo, *J. Dunbar*, October 6, 1902.

Crataegus Maineana, *n. sp.*

Glabrous with the exception of the hairs on the young leaves. Leaves ovate to deltoid or rarely rhombic, acuminate, rounded or concave-cuneate at the wide crenulate base, sharply doubly serrate above, with straight gland-tipped teeth and divided usually only above the middle into short broad acuminate lobes ; more than half-grown when the flowers open and then very thin, light yellow-green and covered on the upper surface with short soft white hairs, and villose below along the base of the midribs and lowest veins ; at maturity suboriaceous, glabrous, dark deep blue-green above, pale bluish green below, 5-6.5 cm. long, from 4-6 cm. wide, with thin yellow midribs and usually 4 pairs of thin primary veins extending obliquely to the points of the lobes ; petioles very slender, narrowly wing-margined sometimes nearly to the middle, glandular with minute dark persistent glands, 3-4 cm. in length ; stipules linear, acuminate, glandular, usually deciduous before the flowers open; on vigorous leading shoots, leaves ovate, rounded, truncate or slightly cordate at the base, deeply divided into 3 or 4 pairs of lateral lobes, coarsely serrate, often 6-7 cm. long and wide and frequently wider than long. Flowers 2 cm. in diameter on long slender gladular pedicels, in broad compact many-flowered compound corymbs ; bracts and bractlets linear, acuminate, glandular, small, generally persistent until the flowers open ; calyx-tube broadly obconic, the lobes wide, acuminate, entire or occasionally furnished with small lateral stipitate bright red glands, reflexed after anthesis ; stamens 10 ; anthers dark purple ; styles 4, surrounded at the base at a broad band of pale tomentum. Fruit on elongated, reddish pedicels, conspicuously glandular, with large oblong dark glands, in few-fruited drooping clusters, globose, deeply depressed at the base at the insertion of the stalk, dark scarlet, lustrous, marked by occasional large light spots, scarcely pruinose, about 1.5 cm. in diameter ; calyx, cavity very broad and shallow, the bottom covered with a thick coat of hoary tomentum, the lobes nearly triangular from wide bases, bright red on the upper side below the middle, spreading and appressed ; flesh thin, yellow, sweet, firm and hard ; nutlets 4, prominently grooved on the back, with a narrow rounded groove, 6 mm. in length.

A treelike shrub often 4 or 5 m. in height with stout intricately branched stems covered with dark bark, spreading into wide thickets, small erect branches and slender slightly zigzag branchlets light orange-green and marked by small pale lenticels when they first appear, bright red-brown and lustrous at the end of their first season, becoming light reddish brown the following year and armed with very slender straight or slightly curved bright red-brown shining spines 4-6 cm. in length. Flowers from the 20th to the end of May. Fruit ripens the middle of October. The leaves turn to handsome bronze-red in the autumn.

Rochester; only in the northwestern part of the city, *John Dunbar*, October 10, 1900, May and September, 1901, October, 1902, *C. C. Laney*, October, 1902; Adams Basin, New York, *M. S. Baxter*, May 29, 1902; Buffalo, *John Dunbar*, October, 1902.

This species is named for Henry Clay Maine of Rochester, an interested observer of Crataegus in the valley of the Genesee River.

§ INTRICATAE.

Fruit medium size, orange-red or crimson; nutlets 2-5, ridged on the back; corymbs few-flowered; stamens 10 or less; anthers yellow.

Leaves oblong-ovate to oval; mature leaves smooth; stamens 10; fruit subglobose, orange-red.

11. C. Baxteri.

Leaves oblong to obovate; mature leaves scabrate; stamens 7; fruit oblong to oblong-obovate, crimson.

12. C. verecunda.

Crataegus Baxteri, *n sp.*

Glabrous with the exception of a few caducous hairs on the upper surface of the unfolding leaves and young petioles. Leaves oblong-ovate to oval, acuminate, concave-cuneate, rounded or on leading shoots sometimes truncate at the entire or crenulate base, finely doubly serrate above, with straight gland-tipped teeth, and divided into short broad acute lateral lobes; when they unfold furnished on the upper surface with a few long white caducous hairs and nearly fully grown when the flowers open and then membranaceous, nearly glabrous, dark yellow-green above, pale below; at maturity smooth and coriaceous, dull dark bluish green on the upper surface, pale on the lower surface, slightly concave by the infolding of the margins, 4.5-6.5 cm. long, 4-6 cm. wide, with stout midribs deeply impressed on the upper side and usually rose-colored below late in the season, and 3-5 pairs of thin primary veins arching obliquely to the points of the lobes ; petioles slender, more or less wing-margined at the apex by the decurrent base of the leaf-blades, grooved, sparingly hairy early in the spring, glandular, with numerous small dark persistent glands, 1.5-3 cm. in length. Flowers about 1.8 cm. in diameter on short stout pedicels, in narrow compact 3-10, usually 5 or 6-flowered compound corymbs ; bracts and bractlets oblong-obovate, acuminate, very glandular, large and conspicuous, often deciduous before the flowers open ; calyx-tube broadly obconic, the lobes gradually narrowed from wide bases, broad, acuminate, coarsely glandular-serrate, usually only above the middle, reflexed after anthesis ; stamens 10 ; anthers large, pale yellow ; styles 4 or 5, surrounded at the base by a broad ring of pale hairs. Fruit on short stout reddish pedicels, in few-fruited erect clusters, subglobose, flattened at the ends, concave at the base at the insertion of the stalk, bright orange-red, lustrous, marked by numerous large pale dots, about 1.5 cm. in diameter ; calyx prominent, with a broad deep cavity, and wide lobes gradually narrowed into the long slender acuminate glandular-serrate reflexed and closely appressed tips often deciduous from the ripe fruit ; flesh thin, hard and dry, greenish yellow ; nutlets 4 or 5, broad, obtuse at the narrowed ends, ridged and slightly grooved on the back, about 7 mm. long and 5 mm. high.

An intricately branched shrub 3 or 4 m. in height with numerous stout stems covered with dark scaly bark, and erect and spreading branches forming a broad round-topped head, and slender only slightly zigzag branchlets, orange-green and marked by numerous large pale lenticels when they first appear, light red-brown and lustrous at the end of their first season, becoming light gray the following year, and armed with many slender or stout nearly straight bright red-brown shining spines 2.5-4 cm. in length. Flowers from the end of May to the 10th of June. Fruit ripens the middle of October and does not fall until the last of October or the first of November. In the autumn the leaves turn a handsome yellowish red color and fall about the 1st of November.

Rochester ; common north of the city on both sides of the river, *C. C. Laney*, May 28, June and October, 1900, *C. S. Sargent*, September, 1900, and September, 1902, *John Dunbar*, October, 1901, 1902 ; Honeoye Lake, August, 1902, *M. S. Baxter;* common at

Chapinsville, New York, *C. S. Sargent*, October, 1902; Chippewa, Ontario, *John Dunbar*, October 15, 1902.

This distinct and handsome species which is particularly beautiful in spring when the branches are entirely covered with the abundant clusters of large flowers, is named for Milton Stephen Baxter, of Rochester, an enthusiastic and careful student of Crataegus.

Crataegus verecunda, *n. sp.*

Glabrous with the exception of the hairs on the young leaves and on the inner face of the calyx-lobes. Leaves oblong-obovate or rarely oval, acute or acuminate, gradually narrowed from near the middle, and concave-cuneate at the entire glandular or crenate base, finely doubly serrate above, with straight gland-tipped teeth, and divided above the middle into several short broad acute lobes; slightly tinged with red and sparingly villose on the upper surface as they unfold, and nearly fully grown when the flowers open and then very thin, nearly glabrous and dark yellow-green above and pale below; at maturity thin, scabrate, light bluish-green on the upper surface, pale on the lower surface, 5-6 cm. long, 3.5-4 cm. wide, with slender yellow midribs and 4 or 5 pairs of thin primary veins; petioles slender, more or less wing-margined by the decurrent bases of the leaf-blades, grooved, sparingly glandular, with minute mostly deciduous glands, from 1.5-2 cm. in length; leaves on vigorous shoots usually broadly ovate, acute, concave-cuneate at the base, deeply divided into 3 or 4 pairs of broad lateral lobes, 6-7 cm. long, from 5.5-6.5 cm. wide, with stout very glandular petioles usually wing-margined to below the middle and generally rose color in the autumn. Flowers about 1.4 cm. in diameter on long slender pedicels, in compact usually 6-10-flowered thin-branched compound corymbs; bracts and bractlets oblong-obovate to linear, acuminate, coarsely glandular-serrate, large and conspicuous, generally deciduous before the flowers open; calyx-tube narrowly obconic, the lobes abruptly narrowed at the base, long-acuminate, coarsely glandular-serrate above the middle, villose on the inner surface, reflexed after anthesis; stamens 7; anthers small, creamy white; styles 2 or 3. Fruit on slender drooping pedicels, in few-fruited clusters, oblong to oblong-obovate, about 1 cm. long and 7 mm. wide; calyx prominent, with a short tube, a deep narrow cavity, and reflexed lobes mostly deciduous from the ripe fruit; flesh thin, yellow, dry and mealy; nutlets 2 or 3, thick, acute at the ends, prominently ridged on the back, with a high rounded ridge, 7 mm. long.

A shrub rarely more than 1 m. in height with slender stems, erect branches and thin only slightly zigzag branchlets, dark orange-green and marked by numerous pale lenticels when they first appear, bright red-brown and lustrous at the end of their first season, becoming dull and darker the following year, and armed with slender slightly curved dark purple shining spines from 3.5 to 4 cm. in length and pointed toward the base of the branch. Flowers during the first week of June. Fruit ripens at the end of September or early in October. The leaves turn yellow and fall by the middle of October.

Rochester; known only in Seneca Park, east, *John Dunbar* and *H. T. Brown*, June 3, 1901, *John Dunbar*, October, 1901, *C. S. Sargent*, October, 1902, *C. C. Laney*, October, 1901.

§ PUNCTATAE.

Fruit large, oblong, red or yellow, conspicuously punctate; nutlets usually 5, prominently ridged on the back; corymbs many-flowered; stamens 20.

Leaves obovate-cuneiform; anthers rose color or yellow; fruit, red or yellow on different individuals.

13. C. punctata.

Crataegus punctata, Jacquin. Sargent *Silva N. Am.*, iv. 103, t. 84. Common.

The yellow-fruited form is

Crataegus punctata, β aurea, Aiton, *Hort. Kew.* ii. 170 (not *Crataegus aurea*, Marshall) (1789).

Crataegus crocata, Ashe, *Ann. Carnegie Mus.* i. 389 (1902). Genesee Valley Park, Rochester, N. Y.

§ MOLLES.

Fruit large, subglobose to short-oblong or pyriform, usually scarlet and lustrous, often edible; nutlets 3-5, thin, pointed at the ends, obscurely grooved, or slightly ridged on the back; corymbs generally wide and many-flowered, tomentose or villose; leaves broad, rounded, cuneate or cordate at the base.

ANTHERS ROSE COLOR.

Stamens 20.

Leaves ovate to oval, only slightly pubescent; fruit short-oblong; nutlets 4-5. *14. C. Fulleriana.*

Stamens 10,

Leaves oval, rounded or broadly cuneate at the base, their stipules persistent during the season; fruit oblong; nutlets 3-5. *15. C. Ellwangeriana.*

Leaves oval, thin, drooping and often convex; fruit oblong; dull dark red; nutlets 3-5. *16. C. Pringlei.*

Leaves oblong-ovate, broadly cuneate or rarely cordate at the base; corymbs very compact, few-flowered; fruit oblong to obovate; nutlets 4-5. *17. C. spissiflora.*

Crataegus Fulleriana, *n. sp.*

Leaves ovate to oval, acute or acuminate or rounded at the apex, rounded or cuneate at the entire base, very sharply serrate above, with straight gland-tipped teeth, and divided into numerous narrow acuminate spreading lobes; about half grown when the flowers open, and then membranaceous, roughened above by short pale hairs and pubescent along the midribs and veins below; at maturity very thin, dark yellow-green and scabrate or nearly smooth on the upper surface, paler and glabrous on the lower surface, 5-6 cm. long, 4-5 cm. wide, with thin midribs and primary veins; petioles slender, slightly wing-margined at the apex, grooved, densely villose early in the season, sparingly villose, or pubescent in the autumn,. 2.5-3 cm. in length; stipules linear, acuminate, sometimes lobed at the base, glandular, mostly deciduous before the flowers open; on vigorous leading shoots leaves broadly ovate, more deeply lobed than the leaves of fertile branchlets, often 8-9 cm. long and wide. Flowers 2 cm. in diameter on long slender densely villose pedicels, in wide compact many-flowered hairy compound corymbs; bracts and bractlets oblong-obovate, acute, glandular, large and conspicuous, mostly persistent until the flowers open ; calyx-tube narrowly obconic, covered with a thick coat of matted white hairs, the lobes abruptly narrowed from the base, slender, acuminate, entire, glabrous on the outer, deeply villose on the inner face, reflexed after anthesis ; stamens 20 ; anthers rose color ; styles 4 or 5, surrounded at the base by a narrow ring of pale tomentum. Fruit on slender elongated slightly hairy pedicels, in few-fruited drooping clusters, short-oblong, scarlet, lustrous, marked by large pale dots, 1.5-1.6 cm. long, about 1.2 cm. wide ; calyx sessile, with a broad shallow cavity and small linear spreading and appressed lobes villose on the upper surface ; flesh thin, yellow, dry and mealy ; nutlets 4 or 5, thin, acute at the ends, irregularly ridged on the back, with a usually high narrow ridge, about 7 mm. long.

A shrub or rarely a small tree 4-6 m. in height, with a stem occasionally 2 dm. in diameter at the ground, remote ascending branches, and slender only slightly zigzag branchlets densely villose when they first appear, soon becoming glabrous, dull red-brown and marked by numerous elliptical or oval pale lenticels at the end of their first season, dark brown tinged with red the following year, and armed with many very slender nearly straight dark purple shining spines 2-7 cm. in length. Flowers at the end of May. Fruit ripens at the end of September.

Rochester; Vincent Street bridge, east side of the river north of the city, *J. Dunbar*, May 28 and September 28, 1901, *C. S. Sargent*, September 29, 1902 ; Rush and Rochester Junction, common in rich soil, *M. S. Baxter and John Dunbar*, August, 1902.

This species is named for Joseph B. Fuller, long a careful and zealous student of the flora of the Genesee Valley, and curater in botany of the Rochester Academy of Science.

Crataegus Ellwangeriana, Sargent, *Bot. Gazette*, xxxiii. 1184 (1902); *Silva N. Am.* xiii. 109, t. 671.

A common species in Monroe and Ontario Counties.

Crataegus Pringlei, Sargent, *Rhodora*, iii. 21 (1901) ; *Silva N. Am.* xiii. 111, t. 672.

A few specimens are known north and south of the city.

Crataegus spissiflora, *n. sp.*

Leaves oblong-ovate, acute or acuminate, rounded, broadly cuneate or rarely cordate at the entire base, sharply doubly serrate above, with slender straight gland-tipped teeth, and deeply divided into numerous broad acute or acuminate lateral lobes ; when they unfold villose above and densely tomentose below, and about one-half grown when the flowers open and then roughened above by short rigid white hairs and pubescent below along the midribs and veins ; at maturity dark yellow-green and scabrate on the upper surface, glabrous on the lower surface, 7-8 cm. long, 4.5-8 cm. wide, with slender midribs and 4 or 5 pairs of prominent veins running obliquely to the points of the lobes ; petioles slender, more or less wing-margined at the apex by the decurrent base of the leaf-blades, slightly grooved, sparingly grandular, villose early in the season, becoming glabrous and rose color in the autumn, 2.5-3 cm. in length ; stipules lanceolate, glandular, often lobed at the base, 1-1.5 cm. long, usually deciduous before the flowers open ; on vigorous leading shoots leaves cordate or rarely cuneate at the base, deeply lobed, 1-1.2 dm. long, 8-10 dm. wide, with stout conspicuously glandular petioles and foliaceous lunate coarsely glandular-serrate stipules often 1 cm. in length. Flowers 1.2 cm. in diameter on short slender villose pedicels, in small very compact few usually 4-6 flowered thin-branched hairy corymbs; bracts and bractlets oblong-obovate, acuminate, glandular, mostly deciduous before the flowers open ; calyx-tube narrowly obconic, coated with long matted white hairs, the lobes slender, acuminate, finely glandular-serrate, glabrous on the outer, villose on the inner surface, reflexed after anthesis ; stamens 10 ; anthers dark rose color ; styles 4 or 5, surrounded at the base by a narrow ring of pale tomentum. Fruit on short reddish pubescent pedicels, in compact drooping clusters, oblong to oblong-obovate, scarlet, lustrous, marked by many small pale dots, 1.8-2 cm. long, 1.5 cm. wide ; calyx small, with a narrow shallow cavity and spreading sharply serrate lobes often deciduous from the ripe fruit ; flesh thick, yellow, dry and mealy ; nutlets 4 or 5, thin, acute at the ends, rounded and only slightly grooved on the back, 8 mm. in length.

A shrub with numerous erect stems 3-4 m. in height, covered with smooth pale gray bark, and forming a compact oblong round-topped bush ; branchlets stout, erect, slightly zigzag, dark red-brown and sparingly villose when they first appear, soon glabrous, bright red-brown, very lustrous and marked by many small pale lenticels at the end of their first season, becoming dark gray or gray-brown the following year, and armed with few stout spreading bright chestnut-brown shining ultimately gray spines 3-4 cm. long. Flowers about the 20th of May. Fruit becoming bright red at the end of August, does not ripen until the end of September or the beginning of October and then soon falls.

Rochester; banks of the Genesee River, Genesee Valley Park, *John Dunbar*, May, August and September, 1901, October 9, 1902, *C. S. Sargent*, September 29, 1902.

§ DILATATAE.

Fruit medium size to large, subglobose, scarlet; fruit-calyx much enlarged, the lobes dark red on the upper side toward the base; nutlets 5, ridged on the back; corymbs few or many-flowered; stamens 20; anthers rose color; leaves membranaceous, on vigorous shoots as broad or broader than long.

Leaves ovate; corymbs many-flowered, glabrous; fruit medium size, persistent until winter. *18. C. Durobrivensis.*

Crataegus Durobrivensis, Sargent, *Trees and Shrubs*, i. 3, t. 2 (1902).

Rochester; steep banks of the Genesee River north of the city; banks of the Niagara River, Niagara Falls, New York, *C. S. Sargent*, September, 1901; Buffalo, New York, *John Dunbar*, September, 1901.

§ LOBULATAE.

Fruit large, oblong, scarlet; nutlets 3-5, prominently grooved or sometimes ridged on the back; corymbs many-flowered, glabrous or villose; stamens 5-10; anthers rose color; leaves large, membranaceous.

Leaves oval to ovate, light yellow-green; corymbs sparingly villose or glabrous; stamens usually 5; nutlets 3. *19. C. Holmesiana.*

Leaves ovate-oblong, dark yellow-green; corymbs densely villose; stamens usually 5; nutlets 5. *20. C. acclivis.*

Leaves broadly ovate to oval, dark green; corymbs slightly villose; stamens 10; nutlets 2. *21. C. pedicellata.*

Crataegus Holmesiana, Ashe, *Jour. Elisha Mitchell Sci. Soc.* xvi. pt. ii. 78 (1900). Sargent, *Bot. Gazette*, xxxi. 10; *Silva N. Am.* xiii. 119, t. 676.

This species as it grows at Rochester and is common near Toronto and in the neighborhood of Montreal differs from Crataegus Holmesiana as figured in The Silva of North America in its sometimes slightly hairy corymbs, in its rather larger flowers and in its later-ripening and longer-hanging fruits. (See Sargent, *Rhodora*, v. 112 [1903]).

Rochester ; *C. S. Sargent*, October 19, 1902, *John Dunbar*, May and September, 1901, September, 1902, *C. C. Laney*, May and September, 1901, *M. S. Baxter*, May and September, 1901 ; Ogden, N. Y., *Henry T. Brown*, October 10th, 1902.

Crataegus acclivis, *n. sp.*

Leaves ovate-oblong, acuminate, broadly cuneate or rounded at the entire base, coarsely doubly serrate above, with straight gland-tipped teeth, and deeply divided into numerous wide-spreading acuminate lateral lobes ; when they unfold tinged with red, densely villose on the upper surface and pubescent along the midribs and veins below, and about half grown when the flowers open and then light yellow-green, slightly roughened above by short white hairs and pubescent along the midribs and veins below ; at maturity membranaceous, dark yellow-green and nearly smooth above, pale yellow-green and glabrous below, 6-7.5 cm. long, 4.5-6 cm. wide, with stout yellow midribs and 5 or 6 pairs of thin primary veins extending obliquely to the points of the lobes ; petioles slender, slightly wing-margined at the apex, grooved, glandular, with numerous small dark glands, densely villose early in the season, becoming puberulous or glabrous in the autumn, 3.5-5 cm. in length ; stipules linear, acuminate, glandular, mostly deciduous before the flowers open; on vigorous leading shoots leaves broadly ovate, acuminate, cordate at the wide base, deeply divided into wide acute lateral lobes often 10-11 cm. long and wide, their stipules foliaceous, lunate, coarsely glandular-serrate, 1-1.5 cm. wide, persistent through the season. Flowers about 1.6 cm. in diameter on slender densely villose pedicels, in broad lax many-flowered long-branched hairy compound corymbs, the lower peduncles from the axils of the upper leaves and often several-flowered ; bracts and bractlets lanceolate, glandular, large and conspicuous, persistent until after the flowers open ; calyx narrowly obconic, covered with a thick coat of long matted hairs, the lobes slender, elongated, acuminate, serrate, with occasional large gland-tipped teeth, glabrous on the outer, slightly villose on the inner surface, reflexed after anthesis ; stamens usually 5 ; anthers pink ; styles mostly 5. Fruit hanging on long slender slightly hairy pedicels, in many-fruited drooping clusters, short-oblong, full and rounded at the ends, yellowish red, glaucous, marked by occasional pale dots, about 1.5 cm. long and 1.2 cm. wide ; calyx sessile with a broad shallow cavity and usually erect, enlarged coarsely serrate lobes villose on the upper side and often deciduous from the ripe fruit ; flesh thick, yellow, rather juicy ; nutlets usually 5, acute at the ends, ridged with a high broad ridge or rounded and slightly grooved on the back, 7-9 mm. in length.

A tree 8-10 m. in height with a short trunk occasionally 1 dm. in diameter covered with smooth light gray bark, numerous erect branches forming an oblong open very irregular head, and stout slightly zigzag branchlets coated when they first appear with long matted pale hairs, light red-brown, lustrous, marked by small pale lenticels and pubescent at the end of their first season, becoming dull red or orange-brown the following year, and armed with stout straight or slightly curved bright red-brown shining spines from 3 to 5 cm. long. Flowers during the last week of May. Fruit ripens the middle of September and soon falls.

Rochester ; steep banks of the gorge of the Genesee River ; common, *C. S. Sargent*, September 19, 1900, *John Dunbar*, May and September, 1901, September, 1902 ; Rush, *M. S. Baxter*, June, 1902 ; Niagara Falls, New York, *C. S. Sargent*, September 21, 1900.

Crataegus pedicellata, Sargent, *Bot. Gazette*, xxxi. 226 (1901) ; *Silva N. Am.* xiii. 121, t. 677.

One of the largest and most beautiful Thorn-trees of the northern United States. Common throughout Monroe and Ontario Counties. Abundant at Chippewa, Ontario.

§ TENUIFOLIAE.

Fruit medium size, oblong, pyriform or rarely subglobose, crimson or scarlet, usually lustrous ; nutlets 2-5, generally ridged on the back ; corymbs usually many-flowered, glabrous or slightly villose ; stamens 5-20 ; anthers red, pink or rose color ; leaves membranaceous, rarely becoming thick in the autumn, usually villose on the upper surface while young, smooth or rarely scabrate at maturity.

Stamens less than 10.

Leaves oblong-ovate to oval, dark bluish green, becoming thick in the autumn ; stamens 5 ; anthers pink ; fruit oblong-obovate, crimson ; nutlets 2-5. *22. C. parviflora.*

Leaves ovate, dark green, conspicuously wrinkled ; stamens 7-10 ; anthers rose color ; fruit oblong, scarlet ; nutlets 3-4. *23. C. Streeterae.*

Leaves oblong-ovate, light yellow-green, glaucous on the upper surface at least while young ; stamens 7-9, rarely 10 ; anthers reddish purple ; fruit oblong, scarlet ; nutlets 3-4. *24. C. glaucophylla.*

Stamens 10.

Leaves oblong-ovate, dark blue-green ; anthers rose color ; fruit oblong, scarlet ; nutlets 2-4. *25. C. ornata.*

Leaves oblong-ovate, pale yellow-green, scabrate on the upper surface ; corymbs slightly villose ; anthers light rose color ; fruit oblong, scarlet ; flesh red ; nutlets 2-3. *26 C rubicunda.*

Leaves broadly ovate, dark blue-green, corymbs few-flowered ; anthers deep rose color ; fruit oblong-obovate ; nutlets 2-3. *27 C tenuiloba.*

Leaves oblong-ovate, deeply tinged with red while young, dark yellow-green at maturity ; anthers deep rose color ; fruit obovate, crimson ; nutlets 3-4. *28. C. colorata.*

Leaves ovate, dull dark bluish green ; anthers deep rose color ; fruit usually subglobose, crimson ; nutlets 5. *29. C. Beckwithae.*

Leaves ovate, dark yellow-green ; anthers rose color ; fruit oblong, crimson, ripening in August ; nutlets 3-4. *30. C. matura.*

Leaves ovate to oval or suborbicular, dark olive green, thick at maturity ; anthers rose color ; fruit subglobose, crimson ; nutlets 3-4. *31. C. Dunbari.*

Stamens 20.

Leaves oblong-ovate, dull dark bluish green and scabrate on the upper surface ; anthers red or deep rose color ; fruit oblong, dull scarlet ; nutlets 3-4, usually 4. *32. C. benigna.*

Crataegus parviflora, *n. sp.*

Glabrous with the exception of the hairs on the upper surface of the young leaves. Leaves oblong-ovate to oval and on vigorous shoots often deltoid, long-pointed and acuminate at the apex, gradually narrowed and cuneate or rounded at the entire base, sharply often doubly serrate above, with gland-tipped teeth and deeply divided, generally only above the middle, into 3 or 4 pairs of broad acuminate spreading lobes ; about one-third grown when the flowers open and then membranaceous, dark yellow-green and roughened above by short pale hairs and glabrous below ; at maturity thick, dark bluish green and smooth on the upper surface, pale and glaucous on the lower surface, 5-6. 5 cm. long, 4-5 cm. wide, with slender yellow midribs and 4 or 5 pairs of thin primary veins arching obliquely to the points of the lobes ; petioles slender, slightly grooved, 2-3 cm. in length. Flowers about 1 cm. in diameter on long slender pedicels, in wide loose many-flowered thin-branched compound corymbs ; bracts and bractlets linear, glandular, small, mostly deciduous before the flowers open ; calyx narrowly obconic, the lobes very slender, acuminate, entire or rarely sparingly serrate, reflexed after anthesis ; stamens usually 5 ; anthers small, dark pink ; styles 2 or 3. Fruit drooping on long slender pedicels, in many-fruited clusters, oblong-obovate, gradually narrowed and tapering below, crimson, lustrous, marked by numerous small pale dots, from 1.2-4 cm. long, about 1 cm. wide ; calyx small, with a narrow shallow cavity and erect incurved lobes, bright red on the upper side below the middle, usually persistent on the ripe fruit ; flesh thin, yellow, dry and mealy ; nutlets 2 or 3, broad full and rounded at the apex, gradually narrowed and acute at the base, ridged on the back, with a wide deeply grooved ridge, 7-8 mm. long.

A shrub or slender tree 6-8 m. in height with a stem occasionally 2-3 m. long and 1.5-2 dm. in diameter, covered with close scaly dull ashy gray bark, small erect and spreading branches furnished with many short spine-like lateral branchlets, forming a somewhat oblong head, and slender nearly straight terminal branchlets, light orange-green and marked by numerous small pale lenticels when they first appear, dull orange or reddish brown at the end of their first year, becoming dark gray the following season and armed with occasional stout nearly straight bright red-brown shining spines 2.5-3 cm. in length, rarely persistent on old stems. Flowers at the end of May and during the first week of June. Fruit ripens toward the middle of October and falls about the end of the month.

Rochester, *C. S. Sargent*, *John Dunbar*, *C. C. Laney*, September, 1900, *John Dunbar*, June 3 and October 15, 1901, *C. S. Sargent*, September 29, 1902 ; Rush, New York, *M. S. Baxter*, September, 1902.

Crataegus Streeterae, *n. sp.*

Leaves ovate, acuminate and often long-pointed at the apex, rounded, truncate or abruptly cuneate at the wide entire base, sharply and often doubly serrate above, with long slender spreading gland-tipped teeth, and slightly divided into 3 or 4 pairs of small acuminate lobes; more than half grown when the flowers open and then very thin, light yellow-green and roughened on the upper surface by short white hairs; at maturity thin, conspicuously wrinkled, dark green and scabrate above, pale and glaucous below, 3.5-5 cm. long, 3-4.5 cm. wide, with very thin midribs and primary veins; petioles slender, slightly grooved, pubescent when they first appear, soon glabrous, 2.5-3 cm. in length; on vigorous leading shoots, leaves long-pointed, cordate at the base, often 6 cm. long and broad, their petioles short and stout, conspicuously glandular throughout the season. Flowers 1.2-1.4 cm. in diameter on long very slender puberulous pedicels, in compact many-flowered thin-branched compound corymbs; calyx-tube narrowly obconic, the lobes slender, acuminate, entire, glabrous on the outer, slightly villose on the inner surface, reflexed after anthesis; stamens 7-10; anthers small, rose color; styles 3 or 4, surrounded at the base by narrow ring of pale tomentum. Fruit on slender pedicels, in drooping many-fruited clusters, oblong, full and rounded at the ends, scarlet, lustrous, marked by many small pale dots, about 1 cm. long and 8 cm. wide; calyx sessile, with a broad shallow cavity, and only slightly enlarged reflexed and closely appressed lobes, their tips often deciduous from the ripe fruit; flesh thick, yellow, dry and mealy; nutlets 3 or 4, wide, full and rounded at the ends, conspicuously ridged on the back, with a broad high ridge, 6.5-7 mm. long.

A dense shrub with numerous stems covered with smooth, dull gray bark, the lower horizontal, the upper ascending, and slender nearly straight branchlets, tinged with red when they first appear, dull gray or reddish brown and marked by numerous small pale lenticels at the end of their first season, becoming ashy gray the following year, and armed with few slender, slightly curved, dark red shining spines 3-4 cm. in length. Flowers about the 20th of May. Fruit ripens toward the end of September or the first of October and then remains on the branches for several weeks.

Rochester; Oak Hill, *John Dunbar*, May, September and October, 1901, along the river banks, Genesee Valley Park, *M. S. Baxter* and *John Dunbar*, August, 1902.

This species is named in memory of Mary Elizabeth Streeter, to whose enthusiasm and persistent labors the now important botanical section of the Rochester Academy of Science largely owes its existence.

Crataegus glaucophylla, Sargent, *Rhodora,* v. 140 (1903).

Rochester; common on both sides of the Genesee River, *John Dunbar,* June and September, 1901, September and October, 1902, *C. S. Sargent,* September, 1902.

Crataegus ornata, *n. sp.*

Leaves oblong-ovate, acuminate, gradually narrowed and rounded or broadly cuneate at the entire or crenulate base, sharply and doubly serrate above, with straight gland-tipped teeth, and deeply divided usually only above the middle into numerous narrow acuminate spreading lobes; tinged with red and covered on the upper side with short, rigid shining hairs when they unfold, and more than half grown when the flowers open and then membranaceous, light yellow-green and scabrate on the upper surface, and pale and glabrous on the lower surface; at maturity thin but firm in texture, dark blue-green and smooth above, pale bluish green below, 5-7 cm. long, 4-6 cm. wide, with thin midribs and primary veins; petioles slender, grooved, sparingly glandular, 4-6 cm. in length; stipules glandular, usually caducous before the flowers open; on vigorous leading shoots, leaves broadly ovate, cordate at the base, deeply divided into numerous broad acuminate lateral lobes, often 8-10 cm. long and 7-8 cm. wide, their stipules foliaceous, lunate, very coarsely serrate, early deciduous. Flowers about 1.2 cm. in diameter on long very slender glabrous pedicels, in wide many-flowered compound corymbs; bracts and bractlets linear, glandular-serrate, usually deciduous before the flowers open; calyx narrowly obconic, glabrous, the lobes slender, acuminate, entire or slightly crenulate on the margins, usually red at the apex, reflexed after anthesis; stamens 10; anthers rose color; styles 2-4, surrounded at the base by a ring of long pale hairs. Fruit on long slender pedicels, in wide lax drooping showy many-fruited clusters, oblong, full and rounded at the ends, scarlet, lustrous, 1.2-1.4 cm. long, 9-10 mm. broad; calyx sessile, with a narrow shallow cavity and much enlarged, erect or slightly spreading lobes usually persistent on the ripe fruit; flesh thin, yellow, dry and mealy; nutlets 2-4 broad, rounded and obtuse at the ends, prominently ridged on the back, with a high rounded ridge, 7 mm. in length.

A broad much branched shrub 4 or 5 m. in height, with numerous erect stems and branches covered with dull gray bark, and very slender virgate branchlets, light orange-green when they first appear, dull light gray-brown at the end of their first season, becoming pale gray-brown the following year, and armed with few slender straight, or slightly curved dark chestnut-brown shining spines 4-5 cm. long; winter-buds globose, appearing pale by the production of the light yellow inner scales beyond the bright red-brown lustrous outer scales, rarely more than 1.5 mm. in diameter. Flowers from the 20th to the 25th of May. Fruit ripens at the end of September and does not fall until after the middle of October.

Rochester, *John Dunbar*, May 24, 1900, *C. S. Sargent*, September 18, 1900, May, September and October, 1901, October, 1902; La Salle, New York, *John Dunbar*, September, 1902.

Crataegus rubicunda, *n. sp.*

Leaves oblong-ovate, long-pointed and acuminate at the apex, concave-cuneate or rounded at the entire base, sharply doubly serrate above, with gland-tipped teeth, and deeply divided into 4 or 5 pairs of lateral lobes: more than half grown when the flowers open and then roughened above by short pale hairs and glabrous below; at maturity thin, light yellow-green and scabrate on the upper surface, paler on the lower surface, 5-6 cm. long, 4-4 5 cm. wide, with thin yellow midribs and primary veins; petioles slender, slightly grooved, pubescent, soon glabrous, occasionally glandular early in the season, tinged with red in the autumn, 2-2.5 cm. in length. Flowers 1.2-1.4 cm. in diameter on long, slender, slightly hairy pedicels, in wide loose many-flowered thin-branched compound corymbs; bracts and bractlets linear, glandular, with minute dark glands, small, mostly deciduous before the flowers open; calyx-tube narrowly obconic, reddish, sparingly hairy toward the base, the lobes slender, acuminate, irregularly glandular-serrate or entire, bright red toward the apex, reflexed after anthesis; stamens 10; anthers small, pinkish purple; styles 2 or 3. Fruit on elongated reddish pedicels, in many-fruited drooping clusters, oblong, full and rounded at the ends, scarlet, lustrous, marked by numerous small pale dots, from 1.2 to 1.4 cm. long, about 8 cm. wide; calyx prominent with a broad shallow cavity and reflexed and closely appressed lobes bright red on the upper side near the base, their tips mostly deciduous from the ripe fruit; flesh thin, juicy, red; nutlets 2 or 3, full and rounded at the apex, gradually narrowed and acute at the base, prominently ridged on the back, with a high narrow rounded ridge, 7-8 mm. long.

A shrub 2-4 m. in height with slender much-branched stems covered with pale gray very smooth bark and thin slightly zigzag branchlets more or less deeply tinged with red, when they first appear light red-brown, very lustrous, and marked by numerous minute pale lenticels at the end of their first season, becoming reddish gray the following year and armed with many stout much curved bright red-brown shining spines 3-4 cm. in length. Flowers at the end of May. Fruit ripens the middle of September.

Rochester; river Banks, Oak Hill, Genesee Valley Park, *John Dunbar*, May 31, 1900, May, 1901, September, 1902; Buffalo, *John Dunbar*, October, 1902.

Crataegus tenuiloba, *n. sp.*

Glabrous with the exception of the hairs on the upper surface of the young leaves. Leaves broadly ovate, acuminate, rounded, truncate or cuneate at the entire base, sharply doubly serrate above, with slender gland-tipped teeth and deeply divided into numerous acuminate spreading lateral lobes; about half-grown when the flowers open and then very thin, light yellow-green and covered on the upper surface with short white hairs; at maturity thin but firm in texture, dark bluish green, pale and glaucous below, 4-5 cm. long, 3-4 cm. wide, with slender yellow midribs and 3 or 4 pairs of primary veins; petioles slender, grooved, occasionally glandular with minute dark scattered glands, 1.5-2.5 cm. in length; on vigorous leading shoots leaves much thicker and more deeply lobed than the leaves of fertile branchlets, often cordate at the base, 6-7 cm. long and usually as wide, with short stout conspicuously glandular petioles wing-margined to below the middle and frequently rose-colored in the autumn. Flowers 1.5 cm. in diameter on long slender pedicels, in narrow few, usually 4-6-flowered thin-branched compound corymbs; calyx narrowly obconic, the lobes elongated, very slender, acuminate, entire or very slightly serrate, tipped with minute dark glands, reflexed after anthesis; stamens 10; anthers dark rose color; styles 2-4. Fruit on slender reddish pedicels, in drooping few-fruited clusters, oblong-obovate, full and rounded at the apex, gradually narrowed to the base, scarlet, lustrous, 1.2-1.4 cm. long, 1 cm. wide; calyx sessile, with a narrow shallow cavity and enlarged erect and incurved lobes usually persistent on the ripe fruit; flesh thin, yellow, dry and mealy; nutlets usually 2 or 3 thick, acute at the ends, prominently ridged on the back, with a broad rounded deeply grooved ridge, about 7 mm. long.

A shrub 3 or 4 m. in height with numerous erect stems covered with smooth pale gray bark, fastigate branches forming a narrow pointed head, and slender only slightly zigzag branchlets light red-brown when they first appear, dark reddish brown, lustrous, and marked by numerous small pale lenticels at the end of their first season, becoming dark reddish brown the following year, and armed with many stout, straight or slightly curved bright red-brown shining spines from 3.5-4 cm. in length and frequently long persistent ; winter-buds appearing pale by the production of the light yellow inner scales beyond the brown outer scales. Flowers during the first week of June. Fruit ripens in October and falls toward the end of the month.

Rochester ; open pastures and hillsides south of city, *John Dunbar*, *C. C. Laney*, *M. S. Baxter*, May and October, 1901, September, 1902, *C. S. Sargent*, September 1902.

Crataegus colorata, *n. sp.*

Glabrous with the exception of the hairs on the upper surface of the young leaves. Leaves oblong-ovate, acuminate, full and rounded or abruptly cuneate at the entire base, coarsely doubly serrate above, with straight gland-tipped teeth, and slightly divided into 4 or 5 pairs of short acuminate spreading lobes, deeply tinged with red and villose on the upper surface, with short white hairs when they first appear, and about half-grown when the flowers open and then very thin, light yellow-green more or less tinged with red, aud still slightly hairy above ; at maturity thin but firm in texture, dark yellow-green, smooth and lustrous on the upper surface, pale bluish green on the lower surface 6-8 cm. long, 5-6 cm. wide, with slender yellow midribs and 4 or 5 pairs of thin primary veins arching obliquely to the points of the lobes ; petioles slender, slightly wing-margined at the apex, grooved, sparingly glandular, from 3 to 4 cm. in length ; bracts and bractlets lanceolate to oblong-obovate, acute, glandular, bright red, large and conspicuous, mostly deciduous before the flowers open ; on leading vigorous shoots leaves broadly ovate, accuminate, rounded or slightly cordate at the base, more coarsely serrate and more deeply lobed than the leaves of fertile branchlets, often 8-9 cm. long and wide, with very stout glandular petioles, becoming reddish toward the autumn, and large foliaceous lunate acuminate coarsely serrate persistent stipules. Flowers 1.5 cm. in diameter on long slender pedicels, in wide many-flowered thin-branched compound corymbs ; bracts and bractlets lanceolate to linear, glandular, with small stipitate glands, large, usually persistent until after the flowers open ; calyx-tube narrowly obconic, bright red, like the slender elongated acuminate entire or slightly serrate lobes, tipped with large dark red glands, reflexed after anthesis ; stamens 10 ; anthers small, dark rose color ; styles 3 or 4. Fruit on elongated slender reddish pedicels, in few-fruited drooping clusters, obovate, crimson, lustrous, marked by small pale dots, usually 1.2-1.5 cm. long and 1.2 cm. wide ; calyx prominent, with a broad deep cavity and spreading entire or slightly serrate lobes bright red on the upper side below the middle and usually persistent on the ripe fruit ; flesh thin, yellow, soft and succulent ; nutlets 3 or 4, broad, full and rounded at the apex, gradually narrowed to the acute base, ridged on the back, with a high rounded ridge, 7 mm. long.

A shrub 3 or 4 m. in height with numerous intricately branched stems, branches furnished with many short spine-like lateral branchlets, the lower horizontal and spreading, the upper ascending, and slender very zigzag terminal branchlets, bright red when they first appear, red-brown, lustrous and marked by numerous small pale lenticels at the end of their first season and dark red-brown the following year, and armed with numerous stout or slender straight or occasionally slightly curved dull chestnut-brown spines 3-3.5 cm. in length. Flowers from the 20th to the end of May. Fruit ripens at the end of September and falls gradually through October.

Rochester ; common in the Genesee Valley, *John Dunbar* and *H. T Brown*, 1900, *John Dunbar*, May, September and October, 1901, *C. S. Sargent*, September, 1902 ; Murray, New York, *M. S. Baxter*, October 11, 1902 ; Buffalo, October 6, 1902 ; Chippewa, Ontario, October 7, 1902, *John Dunbar*, near Toronto, Ontario, *D. W. Beadle*, May 20, 1902.

Crataegus Beckwithae, *n. sp.*

Leaves ovate, acute or acuminate, rounded, truncate, rarely cuneate, or on leading shoots subcordate at the wide entire or glandular base, sharply doubly serrate above, with gland-tipped teeth, and slightly divided into 3 or 4 pairs of short acuminate lateral lobes ; more than half grown when the flowers open and then membranaceous, light yellow-green, roughened above by short white hairs and glabrous below ; at maturity thin but firm in texture, dull dark bluish green, glabrous and smooth on the upper surface, pale bluish green on the lower surface, 4-6 cm. long and wide and often wider than long, with slender yellow midribs deeply impressed above and 3 or 4 pairs of thin primary veins extending very obliquely to the points of the lobes ; petioles stout, wing-margined sometimes nearly to the middle by the decurrent bases of the leaf-blades, grooved, conspicuously glandular, 1.5-3 cm. in length. Flowers about 1.8 cm. in diameter on long slender pedicels, in wide many-flowered thin-branched glabrous compound corymbs; calyx-tube broadly obconic, the lobes wide, acuminate, glandular-serrate, glabrous on the outer, slightly villose on the inner face, reflexed after anthesis ; stamens 10 ; anthers dark rose color ; styles usually 5, surrounded at the base by a broad ring of hoary tomentum. Fruit on stout hairy pedicels, in compact few-fruited drooping clusters, subglobose and flattened at the ends to oblong or rarely to obovate, dark crimson, lustrous, marked by few small pale lenticels, 1.2-1.4 cm. in diameter ; calyx-cavity deep, comparatively narrow, the lobes elongated, gradually narrowed from broad bases, acuminate, coarsely glandular, dark red on the upper side below the middle, reflexed and closely appressed, their tips often deciduous from the ripe fruit ; flesh thick, sweet, dry and mealy, tinged with red ; nutlets 5, broad, rounded at the obtuse ends, conspicuously ridged on the back, with a high rounded ridge, 7 mm. long.

A shrub, or occasionally a tree 4-6 m. in height, with numerous intricately branched stems covered with pale gray bark, tortuous branches, and slender zigzag branchlets, dark red, marked by many pale lenticels and furnished with a few long pale caducous hairs when they first appear, bright red-brown and lustrous at the end of their first season, becoming dark red or gray-brown during their second season, and armed with numerous very slender nearly straight light red-brown shining spines usually about 5 cm. in length, and very persistent. Flowers at the end of May or early in June. Fruit ripens the middle of October and falls the first of November.

Rochester ; west side of river above Elmwood avenue and along feeder bank, Wolcott Road, *John Dunbar*, June 6, 1901, October 15, 1902.

This species may in its name be properly associated with Miss Florence Beckwith, one of the authors of *Plants of Monroe County, New York, and Adjacent Territory*, published in the third volume of the *Proceedings of the Rochester Academy of Science.*

Crataegus matura, Sargent, *Rhodora*, iii. 24 (in part) 1901 ; v. 144.

Rochester; common in rich soil in Monroe and Orleans counties, *J. Dunbar*, May and August, 1901, August, 1902.

Crataegus Dunbari, *n. sp.*

Leaves ovate to oval or suborbicular, acute or acuminate, rounded or rarely cuneate at the entire base, sharply doubly serrate above, with straight or incurved teeth tipped with large dark glands, and slightly divided above the middle into short spreading acute lobes; when they unfold slightly tinged with red and roughened by short white hairs, and more than half-grown when the flowers open and then very thin, dark yellow-green and scabrate on the upper surface, and pale yellow-green on the lower surface; at maturity becoming thick and firm in texture, dark olive-green and smooth or still slightly rough above, light yellow-green below, 5-6 cm. long, 4-6 cm. wide, with slender yellow midribs and 4 or 5 pairs of primary veins deeply impressed on the upper side; petioles stout, wing-margined at the apex, grooved, sparingly glandular, 1 5-2.5 cm. in length. Flowers 1.6 cm. in diameter on long slender slightly hairy pedicels, in compact usually 10 to 14-flowered thin-branched compound corymbs; calyx-tube broadly obconic, glabrous, the lobes separated by wide rounded sinuses, slender, acuminate, coarsely glandular-serrate below the middle, glabrous on the outer, villose on the inner surface, reflexed after anthesis; stamens 10; anthers rose color ; styles 3 or 4, surrounded at the base by a broad ring of pale tomentum. Fruit on stout reddish pedicels, in drooping many-fruited clusters, subglobose but often rather broader than long, crimson, lustrous, marked by minute dark dots, from 1.2 to 1.4 cm. in diameter; calyx small, with a very short tube, a narrow shallow cavity, and reflexed closely appressed lobes, gradually narrowed from broad bases, glandular-serrate below, entire above the middle, dark red-brown on the upper side toward the base, their tips often deciduous from the ripe fruit ; flesh nearly white, thin, sweet, dry and mealy ; nutlets 3 or 4, thin, acute at the ends, obscurely ridged and sometimes slightly grooved on the rounded back, 7 mm. long.

A round-topped shrub from 3-4 m. tall and broad, with numerous stout intricately branched spreading stems and slender nearly straight branchlets, marked by few small pale lenticels, light olive-green during their first season, becoming bright red-brown and lustrous the following year and ultimately dull gray, and armed with stout curved light red-brown shining spines 3-5 cm. long, usually pointed downward toward the base of the branch, and often long-persistent on the old stems.

Rochester; bluffs of the gorge of the Genesee River north of the city, *C. S. Sargent*, September 19, 1900, September, 1902, *John Dunbar*, October 10, 1900, *John Dunbar*, May and October, 1901, October, 1902; Adams Basin, *M. S. Baxter*, October, 1902; Delaware Park, Buffalo, *John Dunbar*, October 6, 1902.

This species, which is easily recognized by the olive-green color of the branches in their first year, is placed temporarily with the Tenuifoliae. The leaves, however, become much thicker late in the season than the leaves of the other species of this group, and in their form approach those of *Crataegus Durobrivensis*, Sargent, and it may be desirable to consider *Crataegus Dunbari*, a type of a new section of the genus, characterized by flowers with 10 stamens and rose-colored anthers, subglobose fruit with a small fruiting calyx, and by thick ovate or semiorbicular leaves. This handsome plant is named for Mr. John Dunbar, the assistant superintendent of the parks of Rochester, untiring in labor in making known the remarkable group of Crataegus found in the valley of the Genesee River, who first pointed it out to me.

Crataegus benigna, *n. sp.*

Glabrous with the exception of the hairs on the upper surface of the young leaves and their petioles. Leaves oblong-ovate, acuminate, abruptly concave-cuneate or rounded at the wide crenate or entire base, sharply doubly serrate above, with straight gland-tipped teeth, and slightly divided into 4 or 5 pairs of short broad acute or acuminate lobes; when they unfold covered on the upper surface with short rigid pale hairs and more than half grown when the flowers open and then very thin, light yellow-green and still slightly hairy or scabrate above; at maturity thin but firm in texture, dull dark bluish green and still slightly roughened on the upper surface, pale bluish green below, 5-6 cm. long, 4.5 cm. wide, with stout orange colored midribs and 4 or 5 pairs of thin primary veins extending obliquely to the points of the lobes; petioles slender, slightly wing-margined at the apex, grooved, sparingly glandular, villose along the upper side early in the season, soon glabrous, 2-3 cm. in length; on vigorous leading shoots leaves broadly ovate and cordate, or the uppermost sometimes ovate or narrow-ovate, acuminate, concave-cuneate and gradually narrowed to the stout petioles, broadly wing-margined nearly to the base, deeply lobed, very coarsely serrate, 9-10 cm. long and 4.5-5.5 cm. wide, their stipules foliaceous, lunate, acuminate, coarsely glandular-serrate, persistent through the season. Flowers about 1.5 cm. in diameter on slender pedicels, in wide lax many-flowered thin-branched compound corymbs ; bracts and bractlets linear, acuminate, mostly deciduous before the flowers open ; calyx broadly obconic, the lobes separated by wide rounded sinuses, gradually narrowed from the base into long slender acuminate entire tips, reflexed after anthesis ; stamens 20 ; anthers small, red or deep rose color ; styles 3 or 4, surrounded at the base by a narrow ring of pale tomentum. Fruit on slender pedicels, in abundant drooping many-fruited clusters, oblong, full and rounded at the apex, depressed at the insertion of the stalk, dull scarlet, marked by occasional dark dots, 1.2-1.4 cm. long, 8-9 mm. wide ; calyx sessile, with a narrow shallow cavity and only slightly enlarged reflexed and appressed lobes dark red on the upper side near the base, their tips often deciduous from the ripe fruit ; flesh thick, yellow, rather juicy, of a disagreeable flavor ; nutlets 3 or 4, usually 4, thick, full and rounded at the ends, ridged on the back with a high narrow ridge, 7 mm. long.

A shrub from 2 to 4 m. in height, with ascending and spreading stems covered with rough scaly dull gray bark, and slender zigzag branchlets, light red-brown and marked by many small pale lenticels when they first appear, pale brown at the end of their first season, becoming ashy gray or gray tinged with red the following year, and armed with many stout curved or slender nearly straight bright red or purple shining spines, from 4 to 5 cm. in length. Flowers during the first week of June. Fruit ripens at the end of September and does not entirely fall until after the middle of October.

Rochester ; not common ; both sides of Genesee River south of the city, *C. S. Sargent*, September, 1900 and 1902, *John Dunbar* and *C. C. Laney*, October 10, 1900, *John Dunbar*, May, June and October, 1901, September and October, 1902.

§ COCCINEAE.

Fruit medium size, subglobose, scarlet or crimson ; nutlets 3-5, conspicuously ridged on the back ; corymbs many or few-flowered, villose or glabrous ; stamens 10-20 ; anthers rose color or yellow; leaves subcoriaceous or thin, dark green.

Stamens 10.

ANTHERS PINK.

Leaves obovate to rhombic, subcoriaceous, lustrous, scabrate on the upper surface ; corymbs many-flowered, slightly villose ; fruit globose to short-oblong, scarlet ; nutlets 3-4. *33. C. cupulifera.*

Stamens 20.

ANTHERS YELLOW.

Leaves obovate to rhombic, ovate or oval, thin, dull dark green and scabrate on the upper surface ; corymbs few-flowered, glabrous ; fruit subglobose to short-oblong, crimson ; nutlets 4-5. *34 C. Macauleyae.*

Crataegus cupulifera, *n. sp.*

Leaves obovate to rhombic, acuminate gradually narrowed from near the middle to the acute entire base, sharply doubly serrate above, with straight gland-tipped teeth, and laciniate above the middle, with many narrow acuminate lobes, tinged with red, sparingly villose on the upper side and glabrous below when they unfold, and about half grown when the flowers open and then membranaceous, light yellow-green and still slightly villose ; at maturity subcoriaceous, dark yellow-green, lustrous and scabrate above, pale yellow-green below, 5-7 cm. long, 4-5 cm. wide, with slender yellow midribs deeply impressed above, and 4 or 5 pairs of thin primary veins arching obliquely to the points of the lobes ; petioles slender, wing-margined at the apex by the decurrent base of the leaf-blades, grooved, often slightly glandular, generally rose color in the autumn toward the base, 2-3 cm. in length ; stipules linear to narrowly obovate, acuminate, glandular, reddish, usually deciduous before the flowers open ; on vigorous leading shoots leaves ovate, concave-cuneate and gradually narrowed below into broadly winged very glandular petioles, deeply lobed, 8-10 cm. long, 6-8 cm. wide, their stipules foliaceous, lunate, coarsely serrate, usually early-deciduous. Flowers cup-shaped, 1.5 in diameter, on long slender pedicels, in wide many-flowered thin-branched slightly villose corymbs ; bracts and bractlets linear, acuminate, glandular on the margins, with minute dark red stipitate glands ; calyx-tube broadly obconic, the lobes separated by wide rounded sinuses, broad, acuminate, glandular-serrate, glabrous on the outer, villose on the inner surface, reflexed after anthesis ; stamens 10 ; anthers small, pink or light rose color ; styles 3-4, surrounded at the base by a narrow ring of pale tomentum. Fruit on slender pedicels, in wide many-fruited pendulous clusters, globose to short-oblong, scarlet, lustrous, marked by few minute dark dots, about 1 cm. in diameter ; calyx very prominent, with a broad shallow cavity, and much enlarged coarsely serrate reflexed villose lobes, dark red on the upper side near the base, often 8 mm. in length, and frequently persistent on the ripe fruit ; flesh yellow, thin, dry and mealy ; nutlets 3 or 4, thin, obtuse at the ends, ridged with a broad grooved ridge or rounded and only slightly grooved on the back, 7 mm. long.

A shrub occasionally 6 or 7 m. in height with numerous stems often 1.5 dm. in diameter, covered with dark brown scaly bark, spreading into broad dense thickets, small erect or spreading branches forming an irregular open head, and slender zigzag branchlets light orange-green and glabrous when they first appear, bright red-brown, very lustrous and marked by few large scattered pale lenticels at the end of their first season, lustrous and light grayish brown the following year, and armed with numerous slender straight or slightly curved light red-brown or purple shining spines, 3-5 cm. in length ; winter-buds conspicuous, globose, covered with bright red lustrous scales, 8 mm. in diameter. Flowers at the end of May or early in June. Fruit ripens the middle of October.

Rochester, *C. S. Sargent*, September 19, 1899, September, 1900, *John Dunbar*, May 28 and October 11, 1900, May, June and October, 1901, October, 1902 ; Honeoye Lake and Rush, *M. S. Baxter*, May and September, 1902 ; Buffalo, *John Dunbar*, May, 1902.

Crataegus Macauleyae, *n. sp.*

Leaves obovate, rhombic, ovate or oval, acute or acuminate or occasionally rounded at the apex, gradually narrowed to the concave-cuneate entire base, finely and doubly serrate above, with straight incurved glandular teeth and slightly and irregularly lobed above the middle ; about half grown when the flowers open and then thin, dark yellow-green and scabrate above, pale below, slightly villose along the midribs on both surfaces and often in the axils of the primary veins below ; at maturity thin but firm in texture, glabrous, dark dull green and slightly roughened on the upper surface, pale on the lower surface, 4-6 cm. long, 3.5-5 cm. wide, with slender yellow midribs and 4 or 5 pairs of very thin primary veins extending obliquely to the points of the lobes ; petioles slender, wing-margined at the apex, grooved, slightly villose, occasionally glandular on the upper side early in the season, soon glabrous, usually tinged with red in the autumn, 1.2-2 cm. in length ; on vigorous leading shoots leaves usually ovate, abruptly long-pointed, rounded or cuneate at the base and often 7-8 cm. long and broad, their petioles stout, broadly winged, with foliaceous lunate acuminate glandular-serrate persistent stipules. Flowers 1.6-1.8 cm. in diameter, on long slender pedicels, in compact few-flowered thin-branched glabrous corymbs ; calyx nearly obconic, glabrous, the lobes wide, elongated, acuminate coarsely glandular-serrate, glabrous on the outer, villose on the inner surface, reflexed after anthesis ; stamens 20 ; anthers small, pale yellow ; styles 4 or 5. Fruit on slender reddish pedicels, in few-fruited drooping clusters, subglobose to short-oblong, dark crimson, lustrous, marked by numerous large pale lenticels, 1-1.2 cm. in diameter ; calyx prominent, with a short tube, a broad deep cavity and coarsely serrate nearly glabrous reflexed and closely appressed lobes ; flesh thin, yellow, dry and mealy ; nutlets 4 or 5, thin, full and rounded at the apex, gradually narrowed to the base, ridged on the back, with a broad grooved or with a narrow rounded ridge, or rounded and only slightly grooved on the back, 6-7 mm. long.

A tree 5-6 m. in height, with a tall trunk 1.5 dm. in diameter, covered with pale olive-green bark, slender somewhat pendulous branches and thin nearly straight branchlets, light red-brown marked by many pale lenticels when they first appear, light red-brown and very lustrous at the end of their first season, becoming dark gray-brown the following year, and armed with few straight slender light red-brown and shining usually dark gray spines, 2.5-3 cm. in length. Flowers at the end of May. Fruit ripens early in October and falls before the middle of November.

Rochester ; Genesee Valley Park, *John Dunbar* and *C. C. Laney*, October 12, 1901, June 3, 1902, October 6, 1902 ; *C. S. Sargent*, September 30, 1902.

This species is named for Miss Mary Elizabeth Macauley, one of the authors of *Plants of Monroe County, New York, and Adjacent Territory*.

§ TOMENTOSAE.

Fruit small or medium size, pyriform, subglobose or short-oblong, orange-red or scarlet; nutlets 2-5, penetrated on each of the inner faces by a longitudinal cavity; corymbs many-flowered, villose or glabrous; calyx-lobes glandular-serrate; stamens 10-20; anthers rose color or yellow; leaves thin or coriaceous, more or less pubescent or rarely glabrous on the lower surface.

ANTHERS ROSE COLOR.

Stamens 20.

Leaves ovate to ovate-oblong, thin, densely pubescent below; fruit pyriform, small, orange-red; nutlets 2-5. *35 C. tomentosa.*

Leaves elliptical, acute at the ends, puberulous along the under side of the midribs and veins; fruit globose, becoming soft and succulent at maturity; nutlets 2-3. *36. C. succulenta.*

Leaves broadly oval to obovate, coriaceous, pubescent below; fruit subglobose to short-oblong, becoming soft and succulent at maturity; nutlets 2-3, usually 3. *37. C. gemmosa*

Stamens 10.

Leaves ovate, thin, glabrous; fruit subglobose to short-oblong; nutlets 2-3, usually 3. *38. C. Deweyana.*

ANTHERS YELLOW.

Leaves broadly obovate to elliptical or oval, coriaceous, pubescent below along the midribs and veins; fruit small scarlet, erect; nutlets 2-3; spines long and slender. *39 C. macracantha.*

Leaves rhombic to oval or obovate, coriaceous, puberulous below along the midribs and veins; fruit subglobose to short-oblong; nutlets 2; spines stout. *40 C. ferentaria.*

Leaves oval to oblong-obovate, thin, puberulous along the midribs and veins below; fruit subglobose, dark orange-red; nutlets 2-4. *41. C. Laneyi*

Crataegus tomentosa, Linnaeus. Sargent, *Silva, N. Am.* iv. 101, t. 183.

Rochester; Common.

Crataegus succulenta, Link. Sargent, *Silva N. Am.* xiii. 139, t. 131.

Rochester, *C. C. Laney*, May 31, 1900, *C. S. Sargent*, September 18, 1900, *John Dunbar*, June and October 1901; Niagara Falls, *C. S. Sargent*, September 1900; Rush, N. Y., *M. S. Baxter* and *John Dunbar*, June 1902.

Crataegus gemmosa, Sargent, *Bot. Gazette*, xxxiii. 119 (1902); *Silva N. Am.* xiii. 141, t. 686.

Rochester; rare; Genesee Valley Park, *John Dunbar* and *C. C. Laney*, June and October, 1901.

Crataegus Deweyana, *n. sp.*

Leaves ovate, acuminate or abruptly long pointed at the apex, abruptly narrowed and concave-cuneate at the entire often unsymmetrical base, coarsely doubly serrate above, with straight or incurved gland-tipped teeth, and slightly divided often only above the middle into several pairs of small acuminate spreading lobes; about a third grown when the flowers open and then membranaceous, dark yellow-green and covered with short lustrous white hairs on the upper surface and light yellow-green and glabrous on the lower surface; at maturity thin, yellow-green and scabrate above, pale below, 8-10 cm. long, 5-7 cm. wide, with stout orange colored midribs deeply impressed on the upper side, and 6 or 7 pairs of thin primary veins arching obliquely to the points of the lobes; petioles stout, wing-margined at the apex by the decurrent base of the leaf-blades, deeply grooved, sparingly villose along the upper side, soon glabrous, glandular with occasional minute dark glands, usually dull orange color in the autumn, 2-3 cm. in length; on vigorous leading shoots more deeply lobed and more closely serrate than on fertile branchlets, subcoriaceous, often 10 cm. long and 9 cm. wide, gradually narrowed into stout broadly winged coarsely glandular petioles, their stipules foliaceous, stipitate, lunate, sharply lobed, glandular-serrate, with minute dark red glands, sometimes 1.5 cm. long, persistent through the season. Flowers 1-1.2 cm. in diameter, on slender pedicels in wide lax many-flowered thin-branched slightly villose compound corymbs; calyx narrowly obconic, often villose at the base, glabrous above, the lobes slender, elongated, acuminate, finely glandular-serrate usually only above the middle, dark green and glabrous on the outer surface, villose on the inner surface, reflexed after anthesis; stamens 7-10, usually 10 ; anthers small, dark rose color ; styles 2 or 3, usually 2. Fruit on long slender puberulous pedicels, in wide many-fruited drooping clusters, subglobose to short-oblong, full and rounded at the ends, scarlet, lustrous marked by occasional large pale lenticels, 1 1-2 cm. in diameter ; calyx sessile, with a narrow deep cavity, the lobes elongated, glandular-serrate, dark red on the upper side near the base, usually erect and incurved, mostly persistent on the ripe fruit ; flesh when fully ripe thick, yellow and sweet ; nutlets usually 2, occasionally 3 ; 8-9 mm. long, 6-7 mm. wide, full and rounded at the ends, rounded and conspicuously ridged on the back, with a broad low doubly grooved ridge, the ventral cavities broad and shallow.

A tree 7-8 m. in height with a tall stem sometimes 2.5 dm. in diameter, covered with light gray bark, becoming rough and scaly near the base, slender branches, the lower horizontal and wide spreading, the upper ascending and forming a wide open irregular head, and stout zigzag branchlets dark orange-brown and marked by many large oblong pale lenticels when they first appear, deep red-brown and lustrous on the upper, gray-brown and lustrous on the lower side during their first winter, becoming gray slightly tinged with red the following year, and armed with numerous stout curved chestnut-brown or purple spines 4-5 cm. long, occassionally persistent on old stems. Flowers during the last week of May. Fruit ripens from the first to the middle of October and falls about the end of the month.

Rochester ; Hagaman Swamp, *John Dunbar*, October 12, 1901, September 1902, *C. S. Sargent*, September 30, 1902 ; Rush, New York, near Five Points, *M. S. Baxter*, June, 1902.

This handsome tree is named in memory of Chester Dewey, a native of Sheffield, Massachusetts, and for more than thirty years a citizen of Rochester where he was Principal of the Rochester Collegiate Institute and subsequently professor of chemistry and natural philosophy in the University of Rochester. By botanists he will be remembered by his studies of the genus Carex, commenced in 1824, by his *History of the Herbaceous Plants of Massachusetts*, prepared under the auspices of that state, and by his *Catalogue of Plants and Time of Flowering in and about the City of Rochester for the year 1841*, published by the Regents of the University of the State of New York.

ANTHERS YELLOW.

Stamens 10.

Crataegus macracantha, Koehne. Sargent, *Silva N. Am.* xiii. 147, t. 689.

Sparingly on both sides of the Genesee River north and south of Rochester, N. Y.

Crataegus ferentaria, *n. sp.*

Leaves rhombic to oval or obovate, acute, short-pointed or rounded at the apex, gradually narrowed to the entire often unsymmetrical base, sharply doubly serrate above, with straight gland-tipped teeth, and slightly divided above the middle into numerous small acute lobes; more than half grown when the flowers open and then very thin, dark yellow-green and slightly villose on the upper surface particularly on the midribs, and lighter colored and pubescent below along the midribs and principal veins; at maturity coriaceous, dark yellow-green, very lustrous and smooth above, pale snd still puberulous below on the stout midribs, deeply impressed on the upper side and often rose color on the lower side late in the autumn and on the 6 or 7 pairs of slender primary veins extending obliquely to the points of the lobes, 5.5-9 cm. long, 4-6 cm. wide; petioles stout, wing-margined at the apex by the decurrent bases of the leaf-blades, deeply grooved, slightly villose early in the season, soon glabrous, occassionally glandular, often rose color in the autumn, 1-2 cm. in length; on vigorous leading shoots leaves usually oval, full and rounded or sometimes concave-cuneate at the base, mostly abruptly short-pointed at the apex, often 10 cm. long and 7-8 cm. wide. Flowers 1.5 dm. in diameter on slender pedicels, in wide many-flowered thin-branched villose compound corymbs; bracts and bractlets narrow-obovate to linear, acuminate, glandular mostly deciduous before the flowers open; calyx broadly obconic, glabrous, the lobes wide, acute, glandular-serrate, with large bright red glands, glabrous on the outer, villose on the inner surface, spreading after anthesis; stamens 10; anthers pale yellow; styles 2. Fruit on elongated slender reddish pedicels, in broad lax drooping clusters, subglobose to short-oblong, crimson, very lustrous, about 1-2 cm. in diameter, marked by occasional large pale dots; calyx prominent, with a broad shallow cavity and much enlarged coarsely glandular-serrate lobes, villose above, dark red toward the base on the upper side, somewhat erect or spreading, usually persistent on the ripe fruit; flesh, thick, yellow, sweet and succulent; nutlets 2, rounded at the obtuse ends, 6 mm. long and wide, ridged on the back, with a broad usually grooved ridge, remarkably thin-walled, the ventral cavities deep and narrow.

An intricately branched shrub 3-4 m. tall, with erect and spreading stout stems covered sometimes to the height of 2 m. with very rough dark ashy gray bark, and stout zigzag branchlets, dark orange-green and marked by many large pale lenticels when they first appear, light red-brown and very lustrous at the end of their first season, becoming dark gray-brown the following year, and slightly armed with stout nearly straight bright red-brown or purple lustrous shining spines, long persistent and ultimately ashy gray, 3.5-5.5 cm. long. Flowers during the first week of June. Fruit ripens at the end of September and soon falls. The leaves turn yellow and fall very early in the autumn.

Rochester ; common on both sides of river south of the city, *John Dunbar*, May, September and October, 1901; Conesus Lake, *M. S. Baxter*, September, 1902.

Crataegus Laneyi, Sargent, *Trees and Shrubs*, i. 5, t. 3 (1902).

Rochester ; low moist banks of the Genesee River in Genesee Valley Park, *C. C. Laney*, June, 1899, *John Dunbar*, June and October, 1901, *C. S. Sargent*, September, 1901.

C. oxyacantha, Linnaeus **and C. monogyna**, Jacquin, cultivated species from Europe are sparingly naturalized throughout Monroe County, N. Y.

There are, besides the above list of Crataegus growing without cultivation, about sixty species planted in the parks and park nurseries at Rochester.

Arnold Arboretum,
Jamaica Plain, Mass.

PROCEEDINGS OF THE ROCHESTER ACADEMY OF SCIENCE
VOL 4, PP 137-148, PLATES 13-18.

WILLAMETTE METEORITE

BY

HENRY A. WARD

ROCHESTER, N. Y.
PUBLISHED BY THE SOCIETY
MARCH, 1904.

End view of meteorite.

WILLAMETTE METEORITE.

Henry A. Ward.

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THE WILLAMETTE METEORITE.

BY HENRY A. WARD.

(Presented before the Academy, March 14, 1904.)

This most interesting meteorite, noble in size and wonderful in physical features, was found near the border of Clackamas County, Oregon, in the autumn of 1902. At this point in its course the Willamette River, 80 miles south of its junction with the Columbia, runs between high banks of sedimentary rocks. At Oregon City, 16 miles south of Portland, these banks come as cliffs down close to the river, which on the western side they follow southward for three and one-half miles to the town of Willamette. This meteorite having been found two miles from this town (to north-west) I have given it the name, as above, of Willamette Meteorite. Its exact locality is Lat. 45° 22′ N, Long. 122° 35′ W. The region immediately surrounding is a series of hills, distant foot hills of the Cascade Range, with their steeply sloping sides cut into by streamlets flowing into the Willamette. One of these streams is the Tualitin. On a hill-side, three miles above the mouth of the Tualitin, fell, apparently centuries ago, the Willamette siderite, the third largest iron meteorite in the world. The region is a wild one, covered by a primeval forest of pines and birch, little visited and largely inaccessible. Here, on the spur of the hill in a small level area, lay the great iron mass, lightly buried in soil and the carpet of accumulated vegetable debris. In the valley, half a mile away, there lives with his family, a humble, intelligent Welshman, Mr. Ellis Hughes. He had formerly worked in Australian mines. He had with him in 1902, a prospector named Dale, and together they roamed over the hills seeking minerals. One day a blow on a little rock projecting from the soil showed it to be metal. They dug and found its great dimensions; also that it was iron. It was on land which they learned belonged to a land company. For some months they kept the find a secret, hoping to buy the land on which the "mine" was located. Some months later they ascertained, in some way, that their supposed iron reef, which they had found to be but ten feet long and a yard or more deep, was a meteorite. They became more secretive than ever, and covered their find most carefully.

In August of 1903, Mr. Dale in the meantime having left the country, Mr. Hughes conceived the idea of bringing the great iron mass to his house, a distance of nearly three-fourths of a mile. This seemed an almost impossible task, he having only his son of 15 years and a small horse as motor power. But he was an old miner, full of mechanical resources, and also full of pluck and energy. With infinite pains he fashioned a simple capstan with chain to anchor it, and a long braided wire rope to roll up on it, as his horse traveled around it as a winch. Then he fashioned an ingenious car with log body-timbers and sections of tree trunks as wheels; also some heavy-double-sheaved pulleys. By wearisome blocking-up and leverage he succeeded in capsizing the great mass directly upon the car and lashing it securely. (See plate 13). Then he stretched out his hundred-foot hauling wire-rope, attached one end of it to the car and the other to his staked-down capstan, and started his horse going round. The sequence of effect to cause followed; so did the meteorite. The great mass moved slowly, for the ground was soft, and, even with boards put under them and constantly changed, the wheels sank deep into the mud. Some days they moved little more than the length of the car (which was that of the mass itself); on others they passed over ten, twenty, or (one day) fifty yards of their toilsome road. At last, after three months of almost incessant toil, the giant meteorite reached Hughes' own land, where it now rests. It was a herculean struggle between man and meteorite, and the man conquered. It is unpleasant to have to record what followed.

The Hughes, father and son, had for these months worked unobserved in the dense forest. Their nearest neighbors, a mile away, do not seem to have been aware of what they were doing. But when the great find was announced, people came trooping up the little valley, first from near-by Willamette, then from Oregon City, and then from Portland, to see the celestial wonder. News soon came to the Portland Land Company, and they promptly claimed the meteorite as having been taken from their land. Hughes refused to give up possession, which latter, he believes, is a strong point in the matter. So a suit at law has commenced, with all prospects of a stoutly fought legal battle. The suit should come off during the coming spring, but it may likely be delayed. Public opinion is divided as to the probable outcome; but sympathy lies mainly with Hughes, the finder of the mass, and the only man recorded in common life or among scientific collectors as having run away with a 14-ton meteorite.

The newspapers of our country had for several months of the past autumn and winter noted this Oregon meteorite in a desultory manner, but their stories seemed exaggerated, and were not generally credited. In February I decided to visit the distant locality and investigate the matter. A four days' railroad trip put me upon the ground. To make my further description more clear I must say that before my arrival Mr. Hughes had unloaded his car, tipping off the great meteorite over upon its side. Thus the first three cuts in this present article are from photographs which were taken when the meteorite was in its vertical position, still standing upon the car. I have every reason to believe that they were accurate in every way. Notwithstanding every favor extended to me by Mr. Hughes, the fullest scrutiny of the great mass was attended with great difficulties. The weather was wet, a cold rain falling every day that I was there. The mass was in the woods without shelter, and the deep mud and slush around it made kneeling to examine the lower surfaces almost impossible. My first work was to take full measures. These I will give in connection with its general outline as shown in the several cuts which illustrate this paper. Plate 13 (frontispiece) presents well the general truncated cone, or dome-like form of the mass. The measures which I took, and which apply to this, are as follows:

The extreme length of the mass, 10 ft. 3½ inches.
The extreme breadth across base, 7 ft.
The extreme vertical height from base to summit of dome, 4 ft.
The total circumference of the base is 25 ft. and 4 inches.

It will be seen by noting plate 13, that while the upper dome is a circle in its section, this is not true of the lower part, which from mid-height expands before and behind into an oval form. This is observable in plate 14, where the lengthening of the base into an oval becomes quite clear, with the rapid slope of the right-hand end and a more gentle slope of the left. But regarding the mass at a right angle to this, or an end view, the sides of the central dome part are seen to come to the base almost vertically, and with very little enlargement or flaring.

The meteorite has thus the form of a huge abbreviated cone, having its base on two sides so prolonged as to produce an oval, whose long diameter is one-third greater than is its transverse diameter. There are no angular outlines to the mass as a whole ; all, whether in vertical or horizontal section, is bounded by broad curves. At this point I may stop to say that as the meteorite lay buried in the ground, its base was uppermost ; in other words, the reverse of the position it held upon the car as shown in plates 13 and 14. This position, with the apex of cone buried below, is unquestionably the one which it held as it came through our atmosphere during its immediate fall. That the great mass changed sides as it lay in the ground on the flat area where it fell is not to be conceived for a moment. Its front face in its flight was the apex of the cone. All features of the surface harmonize with this view. The upper half of this apex as shown in plates 13, 14, is devoid of any striæ such as so often occur on the *Brustseite* of a stone meteorite. Nor are there here any well defined pittings. If these have ever existed, they are now completely effaced. This part of the great mass seems to have undergone but one change since it entered our atmosphere and there met the trials of intense atmospheric friction. The denuding influence of this may well be considered as having induced the generally round and even character of the upper cone, though no fine polish or striation remains. The one effect noticeable on all this area is the presence of little spots or patches from one to three or four centimetres in length, of material which seems more dense, and of a faintly deeper shade of color from that of the main mass. These appear over all the surface in question, sprinkled indiscriminately, without order or allineation. They stand slightly elevated above the surface, and might in loose terms be called scabs I am disposed to think of these as representing flows of melted matter, which were once more wide-spread or continuous, but now show simply as patches. I will not enlarge upon this appearance, for the conditions under which I saw the mass were most unfavorable.*

Proceeding to examine the lower half of the cone, we have to notice three things : First there is a large border area, a border averaging eighteen or twenty inches wide, entirely around the mass, which is quite covered with the pittings (Pezographs) which are so common a feature on both iron and stone meteorites. These pittings

*I may be permitted to again remind the reader that, as I saw the meteorite after it was tipped off from the car, the cone end was down, and I could study it only while kneeling in the mud, holding an umbrella over my head in a heavy fall of rain and sleet, and with a temperature too cold to comfortably hold a pencil. The day will come when this cone—as indeed the whole meteorite—will be studied under more favorable circumstances.

are well defined and continuous, but are shallow. They are usually oval in form, with a greater diameter of from three to eight centimetres. They appear to have no distinct form or allineation; and they meet and merge into each other with but a fuller, slightly pronounced crest between them.

A second feature in this lower half of the great cone is the series of round bore-holes, sprinkled irregularly all around it and more generally near the lower border. These holes, which are so notable a feature on the Cañon Diablo siderite, as also in the Tazewell and in the Youndegin (Australian) masses, are here beautifully sharp and well defined. They are usually nearly circular in section, one to three inches in diameter, and in depth ranging from three or four inches to an undefined depth. These holes, notably those of smaller diameter, are sometimes materially larger in their inner portions than they are at their outer orifice. This feature, observable also in the holes in the Cañon Diablo masses, seems to militate strongly, if not conclusively, against any theory of their existence being caused primarily by the boring action of the air in the meteorite's downward flight. They are undoubtedly due to the former presence of lengthened cylindrical nodules of troilites or some other sulphuret which have subsequently yielded to decomposition, and have generally dropped out. An interesting specimen in the Ward-Coonley meteorite collection is a mass, some 15 inches in diameter, of Cañon Diablo iron, with such a circular hole; its orifice being open, while all the lower part is occupied by the still remaining troilite nodule. In our Willamette iron no less than nine of these holes pierce the mass from its upper surface quite through to the base below.

The third feature of this upper (brustseite) face of the Willamette iron is one which now makes it the most remarkable meteorite known to science. This is the existence of deep, broadly open basins and broad furrows or channels cutting down deeply into the mass. The basins are distributed alike over the lower cone area. The furrows reach vertically quite across this belt to the lower edge or base of the mass, whose border they break with deep channelling. These deep bowl-like cavities and furrows exist more upon one of the sides of the meteorite (the right hand side as the mass is seen from the rear in plate 14, figure 2) than upon the other. And, as fate would have it, that was the side upon which the mass, tumbled from the car by Hughes, lay when I visited it. But plate 14 gives a good idea of the surprising size of these cavities. I was able (working from below) to get a view of the somewhat heart-shaped and double cavity so prominent in plate 14, figure 2. Its length was about 19 inches, its breadth about 14, and its depth about 5 inches at deepest part.

Other cavities (some from their form might be called basins, others caverns) were of various diameter at mouth, 5 to 10 inches, and varied in depth from 4 to 12 inches. In all cases these cavities had their widest expansion or opening toward the apex of the cone, in the line of flight of the meteorite. At the right hand in figure 2, plate 14, are visible two huge furrows or channels. One of these, the smaller, I was able to reach as the meteorite now lies, partly by sight, partly by feeling. Its length was 26 inches, its average breadth 5 inches, with a depth increasing from front backward from 3 to 5 inches. The parallelism of these furrows, as well as the allineation of the holes before mentioned, is an observable fact; while equally observable is their pointing from every side of the mass toward the apex of the cone. Nothing can be clearer than that this has been produced by the tremendous friction of the densely compressed air through which the meteorite passed on its way to our earth.

The air, which was compressed in front of the mass to a density comparable to that of some solid substance, has flown back past the apex and the sides of the cone with a friction force almost inconceivable in its intensity. The air crowded in front of a meteorite having a velocity of 60 miles per second has furthermore been shown by physicists to have, by reason of its compression, a heat of over 5000 degrees Centigrade (9,000° Fahr.) a heat calculated to melt away any surface which it enveloped. It is to the melting, rubbing and chiseling effects of this air compression, with its following air-stream, that we may attribute all the glazing, pitting, hollowing and channeling which we have observed on the front side of the cone and on the flanging base of our great meteorite. That the melting should be more powerful on the upper (forward) part of the cone is easily conceivable. Also it is clear that the boring and channeling power of the air should be most exercised on the basal flanges, on which it more directly impinged. The effects are here colossal, and words would feebly express the emotion induced in seeing the great cone, with its torn, excavated sides. It seems impossible in theory, but the whole is made easily credible in seeing and studying the effect. With it all comes forcibly the thought of how "Reason will lead where Imagination does not dare to follow".

It would be a serious omission not to call attention to the possibility, and even strong probability, that the great mass has contained great nodules or even long cylindrical inclusions of some mineral softer and more easily yielding to attrition than is the iron of which it seems to be wholly composed. We know that inclusions of troilite are frequent in siderites, in some of which, as for instance, Toluca, Youndegin, Cañon Diablo and Bella Roca, they occur in masses of some volume. We suspect that the Willamette may contain such troilite inclusions, and that they may have both determined the position and have greatly enlarged these excavations. This is particularly true of the long furrows, two of which are so prominent in plate 14. In these, the upper part of the wall hangs over as a rim, leaving the tube or gutter, as seen from the side, larger within than in its outside exposure. These furrows, as well as one of the holes, gouge deep recesses out of the otherwise continuous border of the mass. As is noticeable in plate 13, the lower part of the cone rolls smoothly around to join its base.

At this point in our paper we leave the cone or brustseite of our meteorite; repeating here that the three cuts taken before our arrival show the mass upright; nearly the reverse of the way we saw it. Plate 15, figures 1 and 2, taken from either end, show well the relation of the great meteorite cone to its base. With them, notably figure 2, is first revealed the second series of wonders of our most wonderful and absolutely unique meteorite.

On the base of the mass we shall see added phenomena. Plate 16 shows the full surface of the base of the great meteorite—its length, ten feet; its breadth, seven feet. It will be seen that its original surface was slightly crowning: also that this surface was covered with well-developed normal pittings of great similarity of character in all its parts. The remaining areas of this surface are in every case thus covered. Furthermore we observe the striking manner in which the base of our mass was drilled and bored by the clean, round holes which we have already noticed as existing in moderate numbers on the brustseite. Counting only those which are of limited diameter, there are over thirty of them, varying from a half inch to two and one-half inches across, and from three or four inches to an unmeasurable depth. Indeed, quite a few of them which are near the periphery, pass completely through the mass, as we noted when describing the other side. One of these perforating vertical bores or drill-holes is seen at the base of the figures; the other two are visible toward the extreme left. The position of these upon the base, the rear side of the meteorite, argues strongly for their origin being due to pre-existent troilite cylindroid nodules. The inner trend of some of these bores is quite irregular, and the surface roughened with sharp, tortuous ridges. Some few of the holes join each other below, anastomosing, as may sometimes be seen in sections of long troilite nodules in the face of a section of siderite. In the frequency of these long round holes and their general distribution over all sides of the mass, our present meteorite quite resembles, though it surpasses in this feature, Cañon Diablo.

But our attention is strongly drawn away from these aerial features, to so call these effects which were created and completed by the attrition and erosion of the mass as it flew through our atmosphere in its fall to our earth. For we have before us, as shown in plates 16 and 17, and plate 15, figure 2, a most singular and astonishing group of concavities and caverns. Nothing can exceed the labyrinthine and chaotic outspread of these. They cross the mass from side to side and end to end. Yet they have no regularity of distribution or system of allineation. They make a confusion of kettle-holes ; of wash-bowls ; of small bath-tubs ! One of the latter, crossing the mass diagonally, is three feet long by ten to fifteen inches across, and with an average depth of sixteen inches. Another, nearly circular, is two and one-sixth ft. in diameter and eighteen inches in deepest part. This one is quadrifid in its bottom ; each of the four areas being a distinct basin, swelling gently up from its center to the sharp crest running between it and its neighbors. Plate 17, giving views of either end of the mass, show well the depth and the *scooped* appearance of these caverns. The rim of the meteorite on one side has been broken into by their continuation outwards. Plate 17, figure 1, shows how one channel passes through, opening a hole from one side of the great mass to the other. To describe these caverns individually would be impractical as well as useless. We recognize at once that we are not treating of an ordinary meteorite phenomenon. We are observing an action or effect of *decomposition*, carried to its most extreme degree. We are reminded of the deeply water-worn surfaces of limestone in certain caves. Of eroded blocks of gypsum ; or, most of all, of the cragged protuberances of old coral rock. *These excavations in our meteorite are clearly due to the action of water.* This has not been an erosion, as have been the deep holes and channels of the other side of the mass. There are here no lines of flow, no connections in the nature or the trend of the depressions. We have to seek a different cause and a different mode of action. This is not difficult to find. It has been seen that this meteorite lay in its original bed, as it fell, with the conical end down, and the flat base upwards and quite level ; that it lay just below the surface of the ground in a soil highly charged throughout with vegetable matter, the accumulation of centuries under the falling leaves and branches of a primeval forest. Finally we remember that western Oregon is a region marked as a rain-belt ever since it has been known at all. Every condition was favorable to the decomposition of this great mass of iron, so situated that its surface was ever soaked with abundant water, and that water was heavily charged with carbonic acid, due to vegetable decomposition Under such conditions the oxidation of the mass would go on rapidly. The depressions would soon be initiated; these would fill with water, and thenceforth the work of dissolution of the mass would go on rapidly and with ever increasing area of surface and power of action. This is an action in which there has been no intermittence and no minimizing; for while the frosts of the short winter may have for a time yearly lessened the chemical action, the increased mechanical effects of freezing and thawing would have quite compensated in accomplishing the destructive work. It is especially noticeable in studying these caverns how certain portions of the surface of the mass have been left unaffected, holding to-day not only the original superficial level, but also retaining in fullest degree the pittings and all other markings which the mass had when at close of its flight it reached its bed. These areas of original surface stand as islands in the waste depressions of decomposition; and in the majority of cases the decomposition which has made the caverns, has also undermined these intervening areas. These latter thus stand on pedestals or bases which are hour-glass in form, dwindling from top downwards and from below up. Thus it occurs that many of the round borings noticed before and which are so prominent a feature in the view of the base of the meteorite now pass quite through with a short passage from the old surface into the latter formed basin or cavern. Incidentally we may mention that the corroding progress of this decomposition has eaten holes, usually quite irregular in shape and often large in diameter, through the walls between the several basins. No less than ten of these, varying from two to eight inches in diameter, may be counted. The most casual view of the sides and bottom of these basins show the entire difference of surface texture between them and the inside of the great holes and furrows on the brustseite of the meteorite. These basins have a rough, sandy surface, not for a moment to be compared with the rubbed-down, semi-polished inner wall of the air-worked hole. The difference of appearance is as palpable and somewhat similar to that which exists between a glaciated rock and a sawed or ground rock surface. Here is again the occasion to express the opinion that probably this immense and profound caverning of the lower sides of the meteorite has been in some important measure determined and intensified by the presence in the body of the mass of some softer and more easily decomposed material. Such, too, would be, as in the other case, considerable masses of troilite. Before, we invoked its erosive quality; now we think of the rapid *decomposition* of a sulphid in comparison to that of a mass of dense iron.

This great meteorite has shown itself to be quite unique in the distinct and essentially diverse phenomena which it presents. On one side, it offers us the greatest known instance of aerial erosion, helped by fusion. No such holes and furrows due to aerial attrition have been offered by any other meteorite, whether of the iron or stone class. While on the opposite side it gives us a case of discrete decomposition of aqueous cause, far beyond anything before registered on these celestial bodies.

It is a truly interesting thing to see these two phenomena, each so potent, yet each so different in nature and in origin, connected with the same mass of matter, acting upon it at two different epochs, yet producing results having such general likeness in appearance. In the presence of these marks of cosmic power, all other features of our meteorite seem to dwindle. Even its great size loses some of its impressiveness. The measures of Willamette which I have given indicate its great size and give it place in this respect with the three largest meteorites known to science, a compeer of Peary's Anighito and of the Bacubirito, although not of the length of the latter nor of the cubic contents of either. It is interesting to note that all the largest meteorites have been irons. It is doubtful whether a mass of stone of such great volume could have come to our earth retaining its cohesion and integrity through the destructive agencies attending its atmospheric passage.

In a study made many years ago by Reichenbach in which some problems of meteorite flights are elaborated, it is shown that a meteorite passing with a lessened velocity of 20 miles per second through our atmosphere, with its computed density at the height of ten miles above our earth, would undergo a pressure of 7,700 pounds upon each cubic inch of its front surface. Only iron would sustain such pressure, and even this, as in the beautiful instance of Cabin Creek, is irresistibly affected.

To the light given forth by the glowing melted surface, with that of the stream of ignited particles flowing away behind the flying mass, must be added the enormously greater light of pro- ambient air, itself heated by the compression mentioned. The light thus given out can be almost as little conceived of, as described. It is well known that the apparent size of any meteorite in its aerial flight is very much greater than is the real diameter of the solid mass. Numerous instances will be readily recalled where a meteorite (the part that fell) was but a few inches in diameter, while the same in its passage through the heavens appeared as a globe of several feet in diameter. Thus we have the astonishing light effects in well observed meteorite falls where the whole country for miles on either side of its course is illuminated with the light of mid-day. The Athens meteor (Oct. 18, 1863) is said to have thus momentarily lighted all Greece. How great and dazzling and wonderful was probably the illumination within a radius of many hundred miles when Willamette fell. With what aerial commotion, explosion and pyrotechnics must this great mass have traversed the atmosphere and screechingly sought its final home, "losing itself in the continuous woods where rolls the Oregon."

The weight of the mass remains to be determined. Its shape makes its cubing a little difficult; and the difficulty is notably increased by the many and voluminous hollows. Assuming the average depth of these in the base at 10 inches, we may assume the total weight of the mass is probably lessened by fully one-fourth by reason of them. The mean of several careful computations, based upon numerous measures taken around the mass, and with knowledge of the specific gravity of the iron, makes the meteorite weigh about 27,000 lbs. or 13½ tons. Before many months have passed we may probably have the great mass on scales, and thus know its exact weight. If our above estimate is correct, Willamette ranks in weight as the fourth among meteorites known to science, the larger of the two masses of Chupaderos weighing about 15½ tons.

An etched section of the Willamette iron shows it to belong to the octahedral group and to that division (No. 56) which is designated as Broad Octahedrite Og. But this structure is somewhat dimmed by numerous small flakes of a very much brighter and more lustrous iron than are the kamacite blades, and seeming to have no regular or definite form—the largest of them having a diameter of not more than 6 to 7 mm. These plates, at least in part, are apparently hexahedral, as some of the larger ones show Neumann lines on their etched surface. The patches of plessite are decidedly small, but occasionally show the alternating layers of kamacite and plessite formerly known as "Lapham Markings." The taenite lines are plainly visible along the edges of the kamacite plates. There are numerous small troilite nodules from 1 to 3 mm in size scattered promiscuously throughout the section, and a few rod-shaped ones 1 mm in width, and in some instances up to 15 mm in length. The largest troilite nodule found in several sections was 28 mm in diameter. It incased several small patches of the nickeliferous iron. No schreibersite is apparent to the eye, nor would it be expected from the small amount of phosphorus found in the analysis of the iron. The exterior of the mass in our possession is of a dull reddish brown color, much oxidized, with a tendency to scale in small flakes. The fractured surface of this iron is much more coarsely granular in structure than is that of any iron with which I am familiar.

Perhaps more about the inner structure of the iron may be developed as the mass is further sectioned.

The above observations on the structure of the Willamette iron are made by my assistant, Mr. H. L. Preston, who has had my small mass (a few kilogrammes) in hand, in Rochester, for section.

Two analyses of the Willamette iron have been made for me; one by Mr. J. M. Davison of the University of Rochester; the other by J. J. Whitfield of Philadelphia. We give these below:

DAVISON		WHITFIELD	
Iron, - - - -	91.65	Iron, - - - -	91.46
Nickel, - - -	7.88	Nickel, - - -	8.30
Cobalt, - - -	.21		
Phosphorus - -	.09		

The specific gravity of the iron is 7.7.

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FIG. 1. Side view, showing hole piercing the base.

FIG. 2. End view, showing eroded holes and furrows.

WILLAMETTE METEORITE.

HENRY A. WARD.

FIG. 1. North end view, meteorite capsized.

FIG. 2. South end view, meteorite capsized.

WILLAMETTE METEORITE.

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FIG. 1. Full view, lower side of meteorite.

FIG. 2. Full view, lower side of meteorite.

WILLAMETTE METEORITE.

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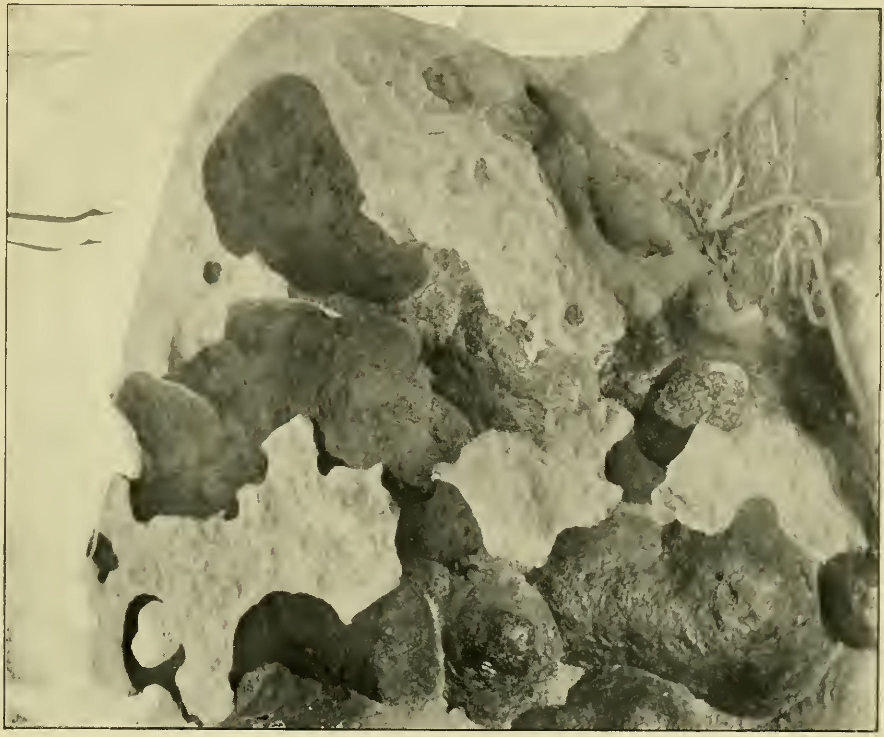

FIG. 2. Area of north part of base.

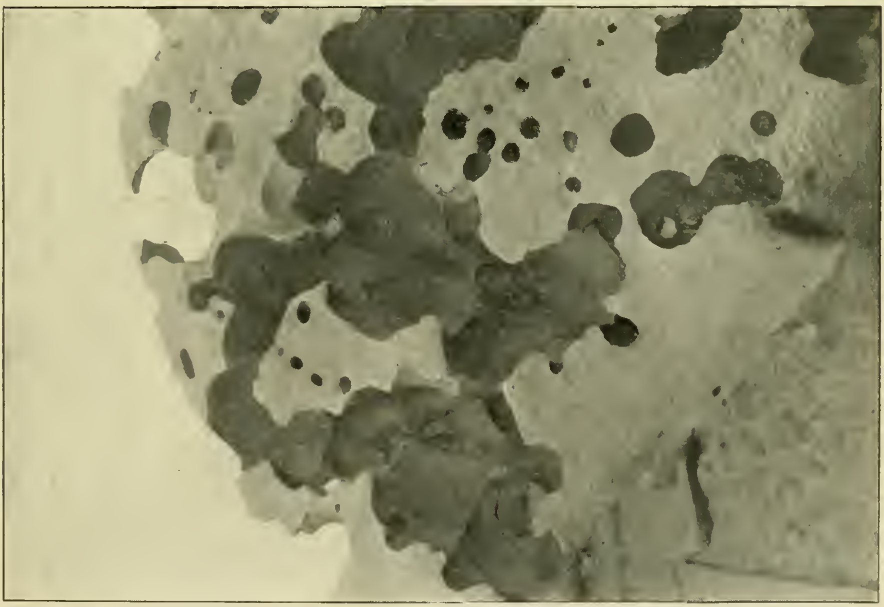

FIG. 1. Area of south part of base.

WILLAMETTE METEORITE.

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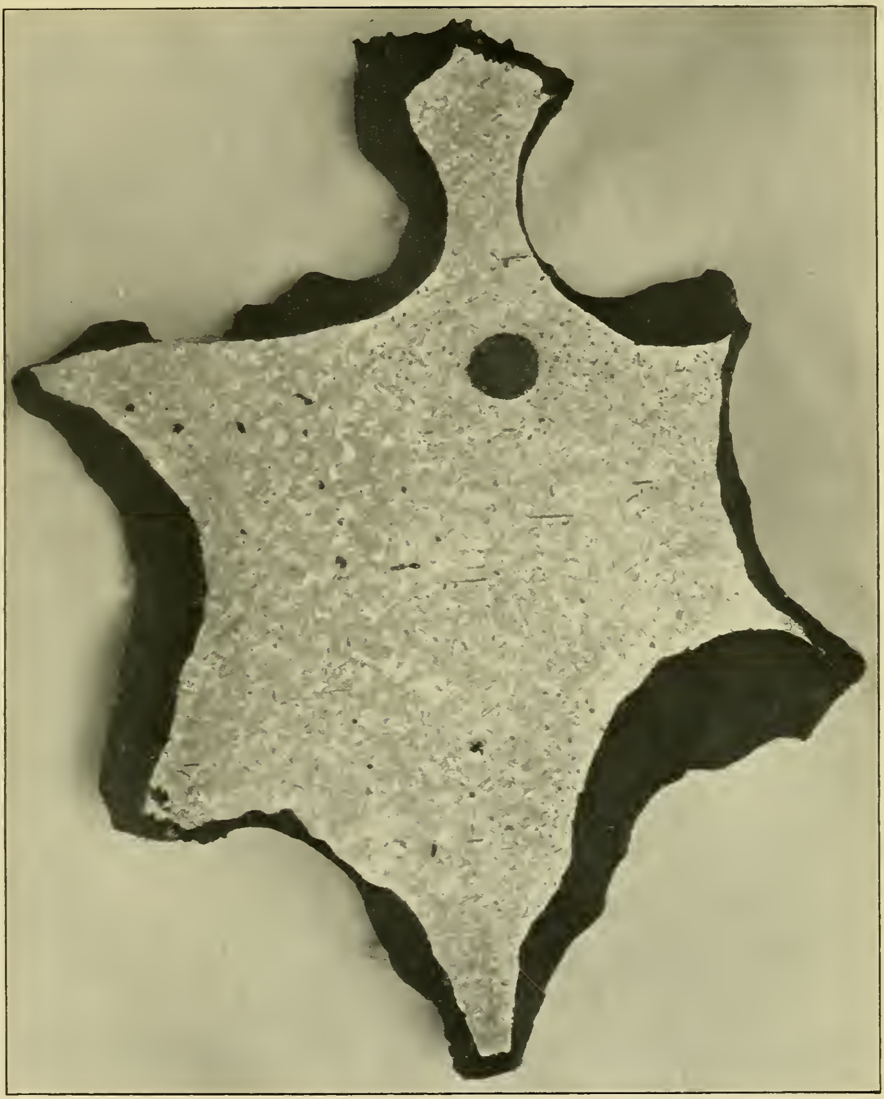

Etched section, ½ actual size.

WILLAMETTE METEORITE.

HENRY A. WARD.

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GREAT METEORITE COLLECTIONS AND THEIR COMPOSITION

BY

HENRY A. WARD.

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One of the seven cases of the Ward-Coonley Meteorite Collection.

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GREAT METEORITE COLLECTIONS; SOME WORDS AS TO THEIR COMPOSITION AS AFFECTING THEIR RELATIVE VALUES.

BY HENRY A. WARD.

(Presented before the Academy, October 10, 1904.)

The great attention which is at the present time being given to the study of meteorites, and especially the activity which is being shown in their gathering and in the increasing of meteorite collections, both public and private, is a notable feature in the view over this field of inorganic study. The time seems thus a favorable one for consideration of some of the material features of the subject—both in past time and in the present.

A retrospect through the pages of meteorite lore is instructive and of practical interest in this connection. We find, to our surprise, that meteorites and their fall are among the earliest of recorded facts. The ancient Chinese chronicles are full of these. So also in the archives of Phœnician, Grecian and Roman peoples, where the fall of these celestial bodies is recorded with many attendant circumstances, the whole usually crusted over with mythical and religious lore. There are now extant in the European numismatic collections—according to Brezina, who has made an exhaustive study of the matter—no less than two hundred medals in silver, bronze and iron, which were cast in record of falls of meteorites in these lands. The worship of these Betyls (Beth-El : House of God) was an extensive one, while their superstitious reverence among aboriginal folk has ever been a universal feature of primitive man.

Meunier, one of a trio (Brezina, Cohen, Meunier) of European leaders in meteorite study, cites 32 meteorite falls commencing with 1478 B. C. and continuing down to 6 B. C. Of these, 28 are so exact and circumstantial in their recording that he considers them as reliable historical occurrences, although none of the masses have been preserved. Several of them, notably the "Image which fell down from Jupiter" at Ephesus (Acts 19: 35), and the much more definitely determined ones of Aegopotamus and the Ancyle, have been seriously sought after within the present century. The traveller Brown, in 1810, sought the former in Thrace, and all excavators of the Roman ruins have in mind the possible finding of the Ancyle. This iron—so called from its shield shape—is reported by Plutarch to have fallen from heaven in the eighth year of the reign of Numa Pompilius (about 705 or 704 B. C.), taken to Rome and there cared for by one of Numa's Salishan priests. Meunier further enumerates 161 meteorite falls commencing with 106 A. D., and continuing till 1799 A. D. Of these he accepts 142 as being well authenticated. We have thus a total of about 170 falls in 30 centuries preceding the year 1800, or about 19 falls in each century. The number is meager, but we bear in mind the insufficiency of written record in those early ages. Of those which fell since the commencement of our era and preceding 1800, but 35 are positively known to exist in collections to-day. If now we add the 135 meteorites known to have been lost, to the 680 to-day known in collections, we have about 815 individual kinds of these heavenly bodies known and recorded as having been held in human hands. Of the many more hundreds of meteorites which have fallen and been handled in these past centuries of which we know by a process of sure induction, it is beyond our purpose to speak here. Our present theme is

THE STATE OF METEORITE COLLECTIONS TO-DAY, WITH THEIR EARLY ORIGINS.

Doubtless the earlier meteorites were too rare an occurrence, too little understood and too sparsely distributed, that they should have been brought together to any "collection." They were often —perhaps usually—taken to some temple, where they were preserved with reverence, often on a pedestal and under a roof of their own. It would be facetious to note the case of the Ancyle and its 11 *fac-similes.* But when we read that a meteorite was preserved in the Lyceum at Girgenti, we have a curious thought of others which may possibly have been there preserved and displayed with it. If so, that was our initial collection !

It may here be the place to call attention to the fact that the conception of meteorites—that they fell from space—was more universal and unchallenged in earlier centuries than it became in times nearer our own. This because probably all that were recognized were seen to fall. Further, because the phenomena of an extra-terrestrial origin had not any exactness of the definite physical knowledge of those days to clash with. They were Heaven-born (Beth-El); they were sacred; and no questions of gravity or other physical incongruities were allowed to trouble the popular verdict. Still, a short time before the close of the eighteenth century, as more and more of them were found and they were more spoken of, there arose a widespread doubt of their cosmic character. And perhaps it should not surprise us that the more highly educated led among the doubters.

The two oldest meteorites which we to-day possess—Elbogen and Ensisheim—had fallen, one in Bohemia in about 1400, the other in the Rhine valley in 1492. One was an iron, the other a stone; both of them were duly taken off to the church, where all material marvels (as these sky-stones, mastodon bones, etc.) were wont to be gathered to be joined to the other less material priestly conundrums.

In 1753, when Tabor fell in Bohemia, it met before long with some doubts. Born, in 1772, in his mineral work called "Lithophylactum Bornianum," says of this stone: "e cœlo pluvisse creduliores asseverant." And although in 1794 Chladni—the earliest and profoundest meteorite historian—had described the great Pallas meteorite from Siberia and had given cogent reasons for the cosmic character—as opposed to the terrestrial—of this and many other meteorites which he enumerated, the incredulity still continued. Indeed, Chladni, in his great, parent meteorite work in 1819, speaks of many which had been *thrown away* in his day because the directors of museums were ashamed of their presence; with the implied belief in their celestial character. Most strange is it that the French savants should have been slowest of all Europe to acknowledge meteorites. While Chladni had made many converts in Austria and Prussia, French savants still held aloof. When in July, 1790, a shower of stones—more than 100 in number—fell near Barbotan in S. Western France, a full account thereof was prepared by a committee of citizens who observed the fall, and this document, signed by the municipal chief, was sent to the authorities at Paris. This report was presented to the Academy of Sciences by Bethelon, the notable chemist and physicist. Its reception by the Academy is shown by notes in their Transactions and by a paper at the same time by Berthelon in a Journal of Science. We quote from it two sentences: "How must we grieve to-day to see an entire municipality join in giving serious credence to popular tales which can but excite the pity, not only of physicists, but of all reasonable people. What shall we say of this seriously presented report, what reflections come to the philosophical reader in perusing this evidently false attestation of a phenomenon physically impossible." We find recorded no modification of unbelief as to meteorites in France until 1803, when on the 26th of April another great meteorite fall occurred at l'Aigle, in Normandy. Then the Minister of the Interior sent the celebrated physicist, Biot, to the spot to investigate. Biot did his work thoroughly and his report presented on his return to the National Institute at Paris, was overwhelming and conclusive as to the truth of the fall from space of these stones, many of which he had brought back with him. Thenceforth the extra-terrestrial nature of meteorites has not been challenged in France.

In the early part of the last century there are on record nearly a score of meteorite collections. The Vienna Royal Cabinet, which seems to have had its first meteorite in 1747, had, when Schneider took charge of it in 1805, eight specimens. The British Museum had in 1807 four or five specimens. Berlin Museum had in 1810 about twelve specimens. The Paris (Jardin des Plantes) Museum crowned the century with a 9 kilo Ensisheim presented by Faucroy, an Elbogen and a Tabor, and in 1803 was materially increased by numerous specimens of l'Aigle and of several other French meteorites, so that it recorded early in the century nearly a score of meteorites. These were, however, held for a long time in the mineral collection without further classification.

Previous to 1825 we find noted the existence of some 23 or 24 public meteorite collections, notably in the cabinets of the Royal Museums. There were also a considerable number of collections of these bodies held by private collectors. The earliest of these was that of Sir Charles Greville, which in 1810 passed into the possession of the British Museum. That of Chladni, numbering over 50 specimens, which at his death went to the Berlin Museum; and that of Born, which seems to have been distributed through many museums; Heuland, Neville, Sowerby, Klaproth, Bergman, Rammelsberg, Reichenbach, Wöhler, the Marquis de Dace, the Duc de Luynes, and many others. We find record of meteorite exchanges going on between these museums and between private collectors as early as 1817, with the usual activities and rivalries.

Travellers, too, brought them from their distant wanderings. Humboldt, from Mexico; Bousingault, from the Upper Valley of the Magdalena; Woodbine Parish, from Buenos Ayres, etc., etc.

We cannot undertake to note the increase of collections from then on through the century which has just closed. We have on our list nearly two hundred of these in Europe alone. Twelve of them, in the order of their numerical importance, are: Vienna, 560; London, 557; Paris, 490; Berlin, 470; Buda-Pesth, 390; Greifswald, 358; Stockholm, 245; Göttingen, 210; Tübingen, 200; Museum of Practical Geology (London), 200; Dorpat, 175; and Strasburg, 135.

Of private meteorite collections in Europe there are but four prominent ones: Dr. Brezina and Prof. Friedrichs of Vienna, Marquis de Mauroy of Wassy, France, and Max J. Neumann of Gratz, Austria. Each of these lies in numbers of kinds between 200 and 250. The struggle to increase their number of specimens is very great; yet for an evident, if not a commendable reason, these large museums do not share specimens with each other. It would be an easy matter for any two of the larger museums of Europe to increase their collections any day by thirty or more specimens (a normal growth of two or three years) by each giving to the other of its duplicate material in exchange for such kinds as it lacks. It would seem that this action would accord with a true spirit of science.

The issuing of catalogues of the contents of the meteorite collections of Europe is a matter of old standing, commencing with Chladni in 1817, and has increased with the growth of the collections themselves. These catalogues are to-day a prominent feature of every collection, to be repeated every second or third year. Most of these are simply enumerative, giving the names and localities of the specimens with their individual weight and size. But many of the catalogues—particularly from the great museums—are almost treatises on the subject by reason of the attention paid to the classification adopted, the remarks on the character of individual specimens, the correction and extension of geographical dispersion, and the introduction of latest and widest views of the whole subject. The introduction by Brezina to his catalogue (1895) of the Vienna collection, that of Fletcher of the British museum, of Klein of Berlin—and, still more, the whole contents of Meunier's catalogue (1898) of the Paris collection, is a real treatise and text-book of the science. In short, both in the activity of collecting, the prices paid for individual specimens, and the issuing of catalogues of the specimens, the European meteorite collections have far outrun the rest of the world. Vienna, the birthplace of meteorite study, has continued to be the headquarters of meteorite collecting and distribution.

The *high prices* paid for meteorites, particularly for those of small size and rare—preferably, too, for those of European origin—are most notable, and a constant surprise to the layman. It suffices that the extreme rarity of a meteorite be known to make it command an extraordinary price. We read that after the L'Aigle meteorite shower, just a century ago, Mr. Lambertin, a mineral dealer in Paris, did a large business in selling many hundred specimens throughout Europe at ten francs (two dollars) per ounce. This is not very far from what Pultusk—also a great shower—sells for to-day. But many others sell at prices ranging up from fifty cents to one dollar, two dollars, or even five dollars per gramm, the latter being seven times its weight in gold. This comes from the gradual diminution and dispersion through an entire century.

Instances of the highest-priced would be those meteorites of which the original amount was small—perhaps only one or two pounds—and the greater part went at once into some public or royal collection, whence no influence or persuasion will bring any out. There are probably twenty meteorites of each of which two or three gram pieces might be sold, if they would be given up, for ten dollars per gram—*fourteen times their weight in gold!* This touches the extreme side of the question—the fancy of eager competing collectors. With these there is the effort, amounting to a true struggle, to obtain a fragment of every known kind. It is the apotheosis of the collecting mania—not surpassed by postage stamps or orchids. Such a collector would probably give a hundred dollars for a gram of the Kaaba could he get it and prove its authenticity.

Various causes contribute to a meteorite's value. Among these are some peculiarity in fall or time of fall, some peculiarity of composition or structure, some historical character, its being worshipped, its being pre-historic, etc. Some, too, have marked an epoch in the science or a factor in classification. In most of these cases there has been but a small amount of the meteorite, so that at best very few can have it. It is like a piece of the true Cross.

Certainly, if we could have but three meteorites in our collection, we should wish one to be an Iron ; another a Stone ; the third a Siderolite, mingling iron and stone in its composition. But of the Irons we should want three or four of the most marked kinds, as shown mainly by inner structure and composition. In the same way, with the Stones we should want those of varied mineral composition, varied inner structure, varied outward structure, and phenomena of appearance. These wants would soon increase to a desire to have one kind which best shows each one of the many mineral elements known in meteorites. A collection thus may induce great study—which is the highest, truest aim in any collecting. It would contain many common meteorites; but also there would be need of rare ones like Bishopville, Lograno, Orgueil, Indarch, Veramin, etc. Historical falls, such as Elbogen, Ensisheim, L'Aigle, etc., would claim prominent place in such a collection.

Meteorites are now collected eagerly in all countries of the earth. Exchanges are active. So specimens are growing individually smaller, but the number of kinds in each collection, as well as the number of collections, is rapidly increasing. In the middle of the last century but three or four collections numbered a hundred kinds. Now there are about twenty noted in catalogues, which are over three hundred in number. Four of these are in the United States.

These meteorite collections are fast becoming one of the leading adjuncts to a large museum, and by reason of the activities of collecting, and the distribution, study and comparison of the catalogues, the question is brought up which has long been considered as to libraries, picture galleries, and others, that is : Which is the most valuable collection, and what are the reasons ?

We are disposed to answer this question abstractly by a careful consideration of some of the most prominent

FACTORS OF VALUE OF A COLLECTION OF METEORITES.

1. Number of distinct, well-authenticated kinds—" Falls " and " Finds."

2. Average weights and sizes of the individual specimens of the collection, including also the possession of one or more great masses.

3. The proportion of specimens of interest in the growth of the science. Also type-specimens.

4. The proportion of specimens showing leading points in meteorite classification—either chemical or petrographical.

5. The proportion of specimens of great rarity—usually the mass small at the outset.

6. The completeness of original exterior structure, with crust, pitting, orientation, etc.

7. The proportion of specimens of traditional or of historical value.

8. The proportion of *old* falls in the collection.

9. The extent to which the specimens have been treated by cutting, polishing, etching, etc., to show inner structure.

10. The broad geographical distribution of the specimens.

11. All Siderites or Siderolites ever *seen* to fall.

We will notice briefly some of the merits of each of these factors.

NUMBER OF DISTINCT, WELL-AUTHENTICATED KINDS—"FALLS AND FINDS."

It is here understood that the localities are quite distinct—not repetitions of each other under different names. Nearly all collections contain specimens—outliers of falls and bearing different names—which are really of one and the same fall, and should thus count as one locality. Most falls have some outliers of this kind. Pultusk, Mocs, Toluca, Coahuila, and others have each many of them. These may be used, and often are so, to swell a collection, where their presence attains redundance, without usually adding an element of value.*

In other cases the number of kinds in a collection is increased by the introduction of those practically undetermined and often unmeteoric. Such unauthentic specimens have no standing or rating in a collection. *They should be weeded out*, for their presence is detrimental.

If, then, all the specimens or kinds are genuine, a great number of them is a great factor of value. The more of them that there are, the more is the opportunity, or even the likelihood, that the other conditions of merit in the collection are met.

It might be that in a collection consisting of 200 meteorites out

*Pultusk (Poland, Jan., 1868) was a shower over an area of about four by six miles. The villages or hamlets included have added the following names to encumber nomenclature and render deceptive the numbers in meteorite collections, useful as they may be in some other ways: Pultusk, Psaly, Obryte, Zambski, Sokolowo, Gorstkowo, Sielce Nowry, Sielce Stary, Rozan, Ciolkowo, Rowy, Zastruzny, Rozdialy, Rchwnie, Mrozy, Daborowka, Clrzonny, Ochulenka. All these fell in a period of one minute between Pultusk and Ostrolenka, and are one meteorite—Pultusk.

of a possible 600, the whole 200 should be of the most inferior kind, although in fact this would rarely be true. But if there were 400 kinds, several of the other conditions of excellence would be necessarily met. In actual fact—as meteorite collections are ordinarily made—the presence of a very high number of kinds is a very certain index of other excellence. In a practical way the presence of a great number of kinds in a meteorite collection vastly facilitates comparisons and scientific study of the whole. The earnest efforts of the largest museums—controlled by sober, sensible scientists—to increase to the highest attainable point the number of their localities, is an index of the general appreciation of the value of numbers as a factor of merit. Large numbers show effort, study, and money outlay. The argument is practically a sure one that excellence has resulted. In a word, the factor of number of kinds will always take a high, leading position in rating a meteorite collection.

AVERAGE WEIGHTS AND SIZES OF THE INDIVIDUAL SPECIMENS OF THE COLLECTION.

The ideal of a meteorite collection might be that each specimen should be undivided—the entire bolide as it existed in space. It is unnecessary to tell how, from the inherent conditions of the subject, this in actuality cannot be. By far the greater number of the falls are accompanied by explosions of the mass in the air or by its breaking in reaching the earth. In the largest collections—as in the smaller ones—fully seven-tenths of the specimens are pieces taken from the larger masses, or are masses with smaller pieces taken from them. The exceptions are more commonly cases where several—sometimes many—bolides have fallen in the same meteoric shower. With these latter, the collector must accept them as they fell—large or small. Of pieces broken or cut from larger masses, the collector's desire will be to get a piece so large that it will show well all the features both of outer and of inner structure. A piece with surfaces of several square inches' superficies is none too large for this purpose. And with great masses of one or more feet in diameter, there is ever something additional to be seen. Furthermore, there is something imposing and impressive in the size itself of the Great Thunderbolt. A certain number of these great masses are cherished and placed prominently in the large collections which are fortunate in possessing them. Purely as a matter of scientific interest—setting aside the *entire* bolides—a fragment of moderate size of either an iron or a stone meteorite will show its character fully. When these fragments are above one or two inches on a side, and one of the sides has an original surface or crust, it matters little from a rigidly scientific point of view whether they are of said size or are twice or thrice as large.

But often, when a very rare meteorite is under consideration, only a very small fragment—perhaps only five or ten grammes, or even less—is obtainable. Such fragments, though insignificant in appearance, have still a very material value, showing at least the color and petrographic character of the meteorite. No collection can despise or omit to give place to such specimens. The Royal Museum of Vienna has recorded in its catalogue twenty-seven meteorites weighing one gramme each, and sixty-four specimens weighing five grammes or under. The British Museum has fifty-two kinds weighing not over five grammes each. It may be given as a negative factor of value of a meteorite collection, that it contains few very small bits. Yet to omit these altogether would take important material from a collection.

It merits notice that the larger the meteorite collection the greater will be the number of these small specimens. Their scientific value is acknowledged, their minuteness is a feature which is unavoidable. Octibbeha is a siderite with a most exceptional quantity (62 per cent.) of nickel in its composition, and furthermore, is prehistoric. Small pieces (one or two grammes) of this may be obtained with much difficulty and expense. But a hundred thousand dollars would not supply a two-ounce piece. We will not omit Octibbeha because it must appear as a minute specimen.

Finally, while *small* specimens—of a very few grammes—are often an index of the especial wealth of a meteorite collection, there may be, and are, many cases where many score of kinds are represented by these fragments, when with time much larger pieces of the same fall would be attainable.

For all these reasons it is correct to consider the *average weight* of the specimens as an important factor in the value of a meteorite collection.

But it often happens that a collection may possess a few pieces of very large size, several hundred pounds in weight. To relieve the estimate of this highly vitiating feature in computing average weight, we would limit the estimate *so as to include only fifty pounds—say, twenty-five kilograms—of any one meteorite kind.*

N. B.—It is, of course, to be remembered that after a collection of meteorites passes the number of three hundred or three hundred and fifty kinds, every added kind will—in almost every case—materially reduce the average weight of the pieces forming the whole collection. Here an excellence in one factor will be the deterioration of another.

THE PROPORTION OF SPECIMENS OF INTEREST IN THE GROWTH OF THE SCIENCE—ALSO TYPE SPECIMENS.

In a collection of material representing any subject, there will be some objects which mark points where new views of the subject had their birth. With meteorites this has been a specimen showing a crust, another showing pittings, another orientation, another chondri, another Widmanstätten figures, another new mineral combinations, another alteration of structure by the addition or the substitution of an element of its composition or by the apparent conditions of its origin.

With the observing of each of these features has come an added growth in the science itself. Hence the value of these growth-registering specimens. The number of these is not large, and they are distributed in many collections. There they exist as *type-specimens* of high interest and value.

THE PROPORTION OF SPECIMENS SHOWING LEADING POINTS IN METEORITE CLASSIFICATION, EITHER CHEMICAL OR PETROGRAPHICAL.

The former factor noted features which were discovered *seriatim* and progressively. The present one results more from close study at a later period of large series of specimens. In this many divisions are formed, each one based upon a specimen of a definite composition or an especial structure, which thus becomes a *type* of its kind. Again, a specimen newly studied comes to modify or to destroy a plan of classification previously adopted. In all this, as in the preceding division, the original specimens have the very highest value as type specimens, to be forever preserved and referred to as controlling types.

Two great collections—Vienna and Paris—possess these in the main, and thus far they are unapproachable by others. Vienna, from Partsch's first essay of classification in 1862 to the present day, has built taxonomical structures; the last of these—that of Brezina, 1904—being composed of 74 groups. Paris classifications were led by Daubree in 1867. Meunier has been more prolific—with

62 groups. A representation, so far as possible, of *each one of these groups* is, for evident reasons, a desirable feature in any collection.

N. B.—It is interesting to notice that all of Brezina's 42 groups of aerolites contain at least one stone *seen to fall*.

The same is also true of Meunier's 28 aerolite types.

THE PROPORTION OF SPECIMENS OF GREAT RARITY—USUALLY THE MASS SMALL AT THE OUTSET.

This is a factor whose merit is evident. Rare specimens of any natural object are ever valued. But there are still several kinds of rarity, one higher than another in value.

1. There are a very limited number of meteorites which are represented by only a single specimen, and that a small one. The chance of this specimen ever being cut into and distributed is very small indeed. These are and will remain *uniques*. There are a few —hardly more than a score—of these ; Paris, London and Vienna have the greater part. In other instances the small original has been divided into but three or four individuals, which have gone into as many different collections, and will stay there undisturbed. In some cases the individual mass was large ; but it has been lost, and there are but small fractions—and these, small pieces—existing in collections. All the above are practically unattainable by other than the favored collection possessing them, and then they confer very especial merit on that collection. As a rule, only the very largest public collections possess specimens of this category of merit.

2. There is another kind of rarity less interesting to consider. This is where there was a large mass at the outset—enough to supply all collections. But it has been the policy of the museum or of the amateur collector into whose hand this mass came, to hoard it, refusing its distribution. In this case the meteorite is artificially rare, and the collection has attained an increased value by the selfish course pursued.

The proportion in any collection of meteorites possessing either of these two classes of rarity gives that collection signal value. The size and weight of such specimens is an important item in the valuation.

THE COMPLETENESS OF ORIGINAL EXTERIOR STRUCTURE, WITH CRUST, PITTING, ORIENTATION, ETC.

While nearly every meteorite—whether iron or stone—shows itself clearly to be a fragment torn originally from a larger mass, it is often of interest to have that mass just as it reached our earth, bearing all the features which it acquired by the way, however trivial some of these may be. It seems to be more a unit, and that we have everything which it ever taught. This feeling, which is very often an exaggerated one, has some moiety of merit. It is certainly a distinct loss when the surface has been rudely marred or chipped here and there. The presence of a crust over a stone tells by its density the fusibility of the rock and suggests the duration of its passing through our air. The pittings and furrowings also tell of its experience in transit, while these and thread-like flows of metal matter tell of the orientation or line of travel of the mass. It is true that some small broken surface is most essential and desirable as showing its inner structure, unaffected by external treatment. But a piece of an aerolite showing only the inner structure with none of the imposed crust, is clearly incomplete. Often this must be—particularly in small fragments—but the possession of an area of original surface adds great value.

SPECIMENS OF HISTORICAL OR TRADITIONAL VALUE.

A great point of interest in a collection of any class of objects, is that it possesses objects which are connected with events—usually of distant date—which are of historical or traditional value. Instances of this as touching books, paintings, statuary, armors, dress, furniture, etc., are too evident to require any examples. Among meteorites—comparatively few as are the number of kinds—there are still some which have this merit. Elbogen, the Pallas Iron and Ensisheim each are notable in the history of an early province, of travel, and of war, as well as being each the oldest preserved of its class. Barbotan and Tabor tell of early incredulity; L'Aigle, of incredulity dispelled. Medwedewa, Campo del Cielo, Rasgata, and Toluca tell of the early distant voyages of Pallas, Rubin de Celsis, Bosingault and Humboldt. The Cape York meteorites (Anighito, etc.) told us first by Ross and later much more fully by Peary of the use of a heaven-born iron by a tribe of polar people. Red River and Weston first pointedly called American attention to meteorites. San Gregorio (El Morito) and Zacatecas first awoke Mexican attention. Casas Grandes, mummied in a cave of Chihuahua, and Charcas, before an old temple in San Louis Potosi, are instances of early worship of meteorites by aboriginal Mexicans. Iron Creek, on a hill of British America, Anderson and Octibbeha, in prehistoric graves in our Western and Southern states, the Kaaba in Mecca and Kesen in Japan, all these meteorites and a few others are instances of man's wonder at Nature's display of the apparently supernatural. They give character to the collection in which they are found.

THE PROPORTION OF OLD FALLS IN THE COLLECTION.

These, whether historical or not, whether or not of any especial scientific value, have still the well recognized merit of age. They are, in their sentimental character, like old books. But unlike these, they have nothing in their structure, composition, or other features, to differentiate them from the falls of to-day. There are about 35 of these in collections whose fall antedates the 19th century; two of them include Elbogen and Ensisheim—in the 14th century. We enumerate them in foot-note.*

The list, of course, takes no note of the much greater number of those which have been *found* even in the last 50 years, of which some at least may be older of date of fall than any dates which we have preserved. Indeed, there are five (Octibbeha, Anderson, Till Porter, Casas Grandes and Lujan) which are prehistoric,—the last, in fact, of geologic (Pliocene) age.

These old falls in our collections have not only the sentimental value of age, but by reason of time elapsed having brought their division and distribution, they are of greater intrinsic value. Few old aerolites are in *large pieces* to-day.

THE EXTENT TO WHICH THE SPECIMENS HAVE BEEN TREATED BY CUTTING, POLISHING, ETCHING, ETC., TO SHOW THEIR INNER STRUCTURE, AS ALSO TO PRESERVE THE MASS.

It is evidently a point of prime merit that a meteorite collection should possess sizeable pieces of all available falls. This is a basic, fundamental factor of value. But just as the value of a specimen is increased by a label telling of its name, locality, etc., so any treatment of the specimen which tells more about it than it shows in its natural state, is an enhancing of its value. A small cut surface of a stone meteorite will when polished show the structure of the mass, whether homogenous or heterogenous in composition—whether brecciated, fragmentary, chondritic, granular, compact or crystaline; also whether it has veins, fissures or

* Meteorites fallen or found prior to 1800, and now preserved: Elbogen, 1400 (?); Ensisheim, 1492; La Caille, 1600 (?); Morito, 1619; Tucson, 1650; Vago, 1668; Schellin, 1715; Ploschkowitz, 1723; Ogi (Hizen), 1744; Medwedewa, 1749; Hraschina, 1751; Steinbach, 1751; Luponnas, 1753; Tabor, 1755; Senegal, 1763; Alboreto, 1766; Luce, 1768; Mauerkirchen, 1768; Sena, 1773; Descubridora, 1780; Campo del Cielo, 1783; Bendego, 1784; Toluca, 1784; Adargas, 1784; Eichstädt, 1785; Charkow, 1787; Barbotan, 1790; Zacatecas, 1792; Cape of Good Hope, 1793; Sienna, 1794; Wold Cottage, 1795; Bjelaja-Zerkow, 1796; Pranbanan, 1797; Salles, 1798; Benares, 1798.

inclusions. The irons, too, when cut, polished and etched first reveal all the many teachings of their inner part. The Widmanstätten figures—present in four-fifths of them—tell many genetic stories, besides serving as a certain index of identification of the fall. Gustave Rose, the great chemist, while director of the Royal Prussian collection of meteorites, announced to the Berlin Academy in 1865, "I have caused the whole series of stone and of iron meteorites to be cut and the latter (the irons) to be etched, because only thus can there be obtained an insight to the composition of the first and structure of the latter."

There is an immense amount of work involved in this preparation of a meteorite collection—incidentally, too, in the preparation of its siderites so that they shall not rust when exposed to damp atmosphere.

A collection thus enhanced and conserved has a great added factor of value.

THE BROAD GEOGRAPHICAL DISTRIBUTION OF THE SPECIMENS.

While the rapid revolution of our globe, and its fleet flight through space prevents any constancy of external action upon any single part of it, the possession in a collection of meteorite specimens from wide-spread localities is still a point of great interest. The showing of the absolute lack of regularity of distribution, and of all things relating thereto, is a negative teaching which it is interesting and valuable to have manifest in the collection. The similarity of three irons falling respectively in Arabia, Australia, and in Kansas, or the difference in two others falling in the same county of one of our states, is a matter of the highest interest and value to record. Only a great collection can possess this merit. Wide distribution of the sources of the specimens is thus an important factor of value.

ALL SIDERITES OR SIDEROLITES EVER SEEN TO FALL.

Of the 334 aerolites known to science, all but 41 have been seen to fall. The fall having been seen, thus loses its nature of novelty or peculiarity by its frequency. Their frequence leads us to more readily accept those which are simply *found*, long years or centuries after they fell. Furthermore, their structure and their material gave some apparently plausible ground to the idea, which was formerly frequently advanced, that they are a segregation of material in the air or in space.

With irons such a theory seems less plausible, while their general similarity to terrestrial iron has led their cosmical character to be more often doubted. Thus it is a matter of the greatest satisfaction that a few irons have been seen to fall—their fall well attested. These are 10 in number, the first being Hraschina (Agram), Hungary, in 1751, and the last N'Goureyma in the Sudan, Africa, in 1900. It is interesting to note that these 10 irons belong to no less than 5 out of the 23 groups of known siderites, thus authenticating, as it were, nearly one-quarter of all. These fall-seen siderites have ever been sought for in collections. The same interest attaches itself to the 4 siderolites (Barea, Estherville, Marjalahti, and Veramin) which—out of a total in the group of 29—have been seen to fall.

It is evident from the above that the factors of value in a large meteorite collection are numerous and of very different degrees of value; also, that they so link with and control each other that the value of certain ones depends upon the value possessed by certain others. Thus, for instance, if a collection is small—say of 200 or 250 kinds only—its size will become of less account as a factor of excellence than would be the fact of its having a great proportion of rare specimens, or of those showing leading points of classification. In this case, too, the extent to which specimens have been prepared for study (factor 9) will become of more account than will factor 7—the proportion of specimens of traditional or historical value.

The writer has had in mind in expression of relative values of factors of excellence the consideration of *a collection of the greatest size.* In this case the factor of number of kinds is given the leading place (factor 1) for the reason that it almost surely and of necessity *includes all the other factors.* And thus factor 2—the average weights and sizes of the individual specimens—becomes, as it otherwise surely would not, the second condition of value of the collection.

It is evident that different persons will have different judgments as to the relative points of value in the different factors which have been given, according to their own views, and possibly according to their success of management of their own collection.

Further elucidation of this subject by others would be of great interest and advantage to all who are interested in this restricted, yet at the same time broad, subject.

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THE PYRENOMYCETEÆ OF ORLEANS COUNTY, N. Y.

BY

CHARLES E. FAIRMAN.

ROCHESTER, N. Y.
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THE PYRENOMYCETEÆ OF ORLEANS COUNTY, NEW YORK.*

BY CHARLES E. FAIRMAN.

(Read by title, February 13th, 1905.)

The Pyrenomyceteæ or Black Fungi belong to the division Teleomycetæ of Saccardo. They are also called perfect or higher fungi, in contradistinction to the metagenetic or imperfect fungi, whose relationship to the higher fungi is in some instances known, but for the most part remains unknown. By means of culture and inoculation experiments, this relationship has been more thoroughly worked out by mycologists among the Uredineæ or Rust Fungi, and there is a pressing need and an opening field of work in tracing the form relatives of the Black Fungi. Often the presence of deuteromycetous forms in association with the pyrenomycetous has led to the assumption that they are in some manner connected. While the life history of some black fungi, from secondary to perfect forms, has been traced, the demand of the present is for less assumption and more direct experiments by the scientific method.

The pyrenomycetes are parasitic or saprophytic. The parasitic forms belonging to the mildews have often been treated by themselves in local floras of parasitic fungi, as, for instance, by Prof. T. J. Burrill in Parasitic Fungi of Illinois, and Dr. J. J. Davis, in his Parasitic Fungi of Wisconsin. Less attention has been given in local lists to the more numerous saprophytic pyrenomycetes. The present enumeration embraces both parasitic and saprophytic forms.

There may be many roads into the field of pyrenomycetology,

*EDITORIAL NOTE.—The present paper is the fourth of a series by Dr. Fairman on the cellular cryptogams of our region, the three previously published being entitled "Fungi of Western New York" (Vol. I, pp. 44-54 of these Proceedings), "Hymenomyceteæ of Orleans County" (Volume II, pages 154-167), and "Puff Balls, Slime Moulds and Cup Fungi of Orleans County" (Proc., Vol. III, pp. 206-220). The numbering of the species is consecutive throughout these articles.

but the following, which the author travelled, has been ever full of opening vistas, pleasant surprises and happy work. He started on his mycological trip in the autumn, among the mildews. In autumn we often find the leaves of living plants overrun by the white mycelium of mildew. If we examine a leaf thus infected, closely and with a lens, we may find, scattered among the mycelial fibres or on the surface of the leaf, minute black dots like grains of black pepper. If we wet such a surface with dilute alcohol, to free from air bubbles, and transfer one or two of these black specks and a bit of the accompanying mycelium to a drop of water on a slide; and cover with a cover glass, then examine under a microscope, we shall see a globe-like body surrounded by appendages. This fruiting globe-like body is called the perithecium. If with gentle pressure upon the cover glass we crush a perithecium we may see it burst asunder and some oval sac-like bodies, called asci, escaping from the rent. Within these sacs we may also see some rounded forms which are the spores,—ascospores they are called from being contained in asci. They are also termed sporidia. As we continue our study of other forms of mildew we shall find variations in mycelium, perithecia and appendages, asci and sporidia. After we have studied the various forms of parasitic pyrenomycetes during the fall and winter months we shall be in a position to consider the saprophytic members upon wood, bark, dead stems, and decaying vegetation, the following March and April, months especially favorable for their collection. We shall find that the saprophytic pyrenomycetes also have perithecia, asci, and sporidia, differing in structure from the forms we observed in the mildews, and from other saprophytic forms. While some are superficial, many are immersed in bark or wood, or in a special matrix, called the stroma, from which they may erupt. Thus little by little we shall advance in our knowledge. The following represent the morphological features whose variation and resemblances we seek to study in descriptive pyrenomycetology :

1. Mycelium and subiculum.
2. Stroma.
3. Perithecium.
4. Asci.
5. Paraphyses.
6. Sporidia.

The apparatus and materials necessary for the study are not extensive. There are needed :

A microscope.

The optical combination which the author uses contains a Gundlach $\frac{1}{4}$ obj. of 75°, a separable $\frac{2}{3}$ds, and a Bausch and Lomb $\frac{1}{12}$ homogeneous immersion.

An accurate micrometer.

Camera lucida.

Pocket lens.

Sharp knives.

The following books are valuable :

Ellis and Everhart's North American Pyrenomycetes.

The Reports of the State Botanist of N. Y., Charles H. Peck.

Saccardo's Sylloge Fungorum.

Berlese, Icones.

Farlow and Seymour's Host Index.

The statement of Cooke remains true, viz. :

"The life-history of the majority of species has still to be read, and the prospects of new discoveries for the industrious and persevering student are great. All who have as yet devoted themselves with assiduity have been in this manner rewarded. The objects are easily obtainable and there is a constantly increasing infatuation in the study."

In the present list the numbers run on consecutively from the author's lists previously published in the Proceedings of the Rochester Academy of Science. At the time of their collection the following numbers had not been reported from the state, viz., 224, 228, 235, 236, 237, 246, 252, 261, 271, 272, 276, 283, 284, 295, 298, 299, 302, 304, 305, 309, 313, 325, 326, 330, 331, 334, 336, 339, 347, 348, 349, 352, 353, 354. Some of the above have been reported in Prof. Peck's reports, since their collection. The following numbers are the new species of Pyrenomyceteae found here, viz., 237, 252, 283, 295, 302, 309, 331, 336, 347, 348, 349, 353 and 354.

In the present list the following are the proposed new species, viz., 336, 348, 349, 353, 354.

PYRENOMYCETEÆ Fries.

Fam. I. PERISPORIACEÆ Fries.

Subfam. I. ERYSIPHEÆ Lev.

I. AMEROSPORÆ. Sporidia ovoid, continuous, hyaline.

SPHÆROTHECA Léveillé 1851.

200. **Sphærotheca castagnei** Léveillé. Pk. 25 Rep. page 94. Sacc. Syll. p. 4. Burrill, Parasit. Fung. Ills., p. 400. Also in N. A. Pyr., p. 8. On *Bidens frondosa.* 1885.

201. **Sphærotheca humuli** (D. C.) Burrill. Burrill, Par. Ills. p. 400 and N. A. Pyr. p. 5. On *Agrimonia eupatoria.*

202. **Sphærotheca mors-uvæ** (Schw.) B. & C. Burrill, Par. Fung. Ills., p. 399 and N. A. Pyr., p. 7. On cultivated gooseberry, forming "gooseberry mildew."

ERYSIPHE Hedwig 1851.

203. **Erysiphe communis** (Wallr.) Fr. Pk. 22 Rep., p. 101. Burrill, Par. Fung. Ills., p. 402 and N. A. Pyr., p. 10. *Erysibe polygoni* Schroeter, 1893, sec. Feltgen in his Vorstudien zu einer Pilz-Flora des Grossherzogthums Luxemburg, 1 Theil, Ascomycetes, no. 1095. On *Ranunculus abortivus*, in woods, July 1886. On *Delphinium elatum*, Bee Larkspur, July 1886.

204. **Erysiphe cichoracearum** DC. Burrill, Par. Fung. Ills., p. 404 and N. A. Pyr., p. 12. *Erysiphe lamprocarpa* in Pk. 23 Rep. p. 65. On *Aster macrophyllus*, July, 1886. The form which has been called *Erysiphe phlogis* Schw. was found, July 20, 1886, on leaves of cultivated Phlox.

205. **Erysiphe graminis** DC. Burrill, N. A. Pyr., p. 15. *Erysibe*, Feltgen no. 1100. Only the conidial stage, *Oidium monilioides* Lk., was found on grass leaves, June, 1886.

UNCINULA Léveillé 1851.

206. **Uncinula necator** (Schw.) Burrill. Burrill, N. A. Pyr., p 15. *Uncinula ampelopsidis* Peck in Trans. Alb. Inst., VII, p. 216; Pk., 25 Rep., p. 96. On leaves of *Ampelopsis quinquefolia*, Aug. 2nd, 1886. The form on grape leaves, sometime designated *Uncinula americana* Howe, was found Oct. 1885.

207. **Uncinula macrospora** Peck. Peck, Trans. Alb. Inst., p. 215, Vol. VII. and 25 Rep., p. 96. Burrill, Par. Fung. Ills., p. 408

and N. A. Pyr., p. 18. On leaves of some species of *Ulmus*, Aug. 3, 1886.

208. **Uncinula flexuosa** Peck. Peck, Trans. Alb. Inst., VII, p. 215. Burrill, Par. Fung. Ills., p. 408 and N. A. Pyr., p. 16. On leaves of horse chestnut, *Æsculus hippocastanum*, Oct., 1885.

209. **Uncinula circinata** C. & P. Erysiphei of U. S. in Jour. Bot., 1872. Peck, 25 Rep., p. 96. Burrill, Par. Fung. Ills., p. 408 and N. A. Pyr., p. 17. On leaves of *Acer*, Oct., 1886.

210. **Uncinula clintonii** Peck. Peck, Trans. Alb. Inst., VII, p. 216 and 25 Rep., p. 106. Burrill, N. A. Pyr., p. 15. On leaves of *Tilia americana*, Sept. 26, 1886.

211. **Uncinula salicis** (DC.) Winter. Burrill, N. A. Pyr., p. 19. Feltgen, Ascom. no. 1111. *Uncinula adunca* in Pk., Rep. 23, p. 65. On leaves of *Salix* sp., Oct. 1, 1891.

PODOSPHÆRA Kunze 1823.

212. **Podosphæra oxyacanthæ** (DC.) DeBary. Burrill, Par. Fung. Ills., p. 413 and N. A. Pyr., p. 21. In Europe this is often referred to *Podosphæra tridactyla* DeBary, e. g. Feltgen, Asc. no. 1092. On leaves of cultivated cherry.

MICROSPHÆRA Léveillé 1851.

213. **Microsphæra russellii** Clinton. 26 Rep. N. Y. State Mus. p. 80. Burrill, Par. Fung. Ills., p. 415 and N. A. Pyr., p. 23. On leaves of the yellow wood sorrel, *Oxalis*, Aug., 1886. Rare.

214. **Microsphæra alni** (DC.) Winter. Burrill, Par. Fung. Ills, p. 421 and N. A. Pyr., p. 27. Feltgen No. 1109. Several forms found which have been referred by botanists to different species.

(*a*). On maple-leaved *Viburnum*, Aug., 1886. This is what Howe published as *Microsphæra viburni* in Torrey Bull., V, p. 43, and is probably the same as *Erysiphe viburni* Duby.

(*b*). On leaves of *Fagus americana*, Aug. 1886. Often called *Microsphæra penicillata* Lev.

(*c*). On leaves of *Syringa vulgaris*. This is the form denominated *Microsphæra friesii* Lev.

(*d*). On leaves of cultivated *Lonicera*, July, 1886. This form has been referred to *Microsphæra dubyi* Lev. In our specimens the appendages are longer than stated in the books. Feltgen refers the mildew which occurs on *Lonicera xylosteum* in the Grand Duchy of Luxemburg to *Microsphæra lonicerœ* Winter (Feltgen No. 1106), and the form on *Lonicera tartarica* to *Microsphæra ehrenbergii* Lév., (Feltgen No. 1110). Not having these European forms for examination we leave our specimens where Prof. Burrill placed them in N. A. Pyr.

215. **Microsphæra diffusa** C. and P. Pk., 25 Rep., 95. Burrill, N. A. Pyr., p. 24. On leaves of *Desmodium*, Oct 10th, 1891.

216. **Microsphæra grossulariæ** (Wallr.) Léveillé. Burrill, N. A. Pyr., p. 24. *Microsphæra vanbruntiana* Ger., in Pk., 28 Rep., p. 64. Feltgen, No. 1108. On leaves of *Sambucus canadensis*, Aug. 4, 1886.

217. **Microsphæra quercina** (Schw.) Burrill. Burrill, Par. Fung. Ills., p. 324 and N. A. Pyr., p. 28. Peck, 28 Rep., p. 64. On leaves of some *Quercus*, Sept. 1900.

PHYLLACTINIA Léveillé 1851.

218. **Phyllactinia suffulta** (Reb.) Saccardo. Burrill, N. A. Pyr., p. 20. On leaves of *Celastrus scandens*, Oct. 1, 1891 (Miss L. A. Weld), and on leaves of *Carpinus*. On leaves of *Ulmus* and *Hamamelis*, Oct. 1900. Common.

Subfam. II. PERISPORIÆ Sacc.

EUROTIUM Link.

219. **Eurotium herbariorum** (Wigg.) Link. Peck, 23 Rep., p. 65. E. & E., N. A. Pyr., p. 57. *Mucor h.*, Wigg., 1780. *Aspergillus herbariorum* Schroeter, 1893, in Feltgen, Asc. No. 1130. On mouldy plants.

Fam. II. SPHÆRIACEÆ Fries.

Sect. I. ALLANTOSPORÆ Sacc.

Sporidia continuous, cylindrical, allantoid or sausage-shaped, hyaline.

FRACCHIÆA Sacc.

220. **Fracchiæa callista** (B & C.) Sacc. *Sphæria callista*, Pk., 28 Rep., p. 77 and 34 Rep., p. 58. *Fracchiæa* in E. & E., N. A. Pyr., p. 244. On bark of *Cornus*. Also reported from Western New York in Saccardo's Sylloge (Buffalo, Clinton).

QUATERNARIA Tulasne 1862.

221. **Quaternaria quaternata** (Pers.) Schroeter 1897. In Peck's 25th Rep., p. 103 called *Valsa quaternata*. *Quaternaria*

persoonii Tul. in Sacc. Syll., I., p. 106. *Valsa quaternata* Pers., E. & E., N. A. Pyr., p. 480. Ellis, N. A. F. 175. Feltgen, No. 498. On *Acer* and *Cornus*.

VALSA Fries 1849.

222. **Valsa nivea** (Hoff.) Fries. Pk., 22 Rep., p. 98. N. A. Pyr., p. 484. N. A. F. 869. Feltgen, No. 541. On dead branches of *Populus*. April, 1888.

223. **Valsa linderæ** Peck. Pk., 29 Rep., p. 59. N. A. Pyr., p. 470 and p. 739. On dead branches of *Benzoin*, April, 1889.

224. **Valsa ligustri** (Schweinitz) Schroeter 1897. *Sphæria ligustri* Schw. 1835. *Valsa cypri* Tul. in N. A. Pyr., p. 482. *V. ligustri*, Feltgen, No. 187. On dead branches of California Privet, *Ligustrum ovalifolium aureum*, June 1895. Sporidia only 7-10 μ long. Not to our knowledge reported from the State.

225. **Valsa ambiens** (Pers.) Fries. Pk., 25 Rep., p. 102. N. A. Pyr., p. 476. Feltgen, No. 567. On dead limbs of apple trees. Also on fallen branches of some undetermined tree in woods. Oct., 1900.

226. **Valsa salicina** (Pers.) Fries. Pk., 24 Rep., p. 98. N. A. Pyr., p. 477. Feltgen, No. 578. On dead limbs of *Salix*, Yates, N. Y., Oct., 1900.

227. **Valsa fraxinina** Peck. N. A. Pyr., p. 481. On dead branches of *Fraxinus* in brush piles, Yates, Orleans County, N. Y., Oct. 1900.

228. **Valsa variolaria** Schw. N. A. Pyr., p. 468. On fallen branches of basswood, *Tilia*, Oct., 1900. Not previously reported from this state. Sporidia longer and narrower than stated by Stevenson.

EUTYPELLA Nitschke, 1867.

229. **Eutypella ailanthi** (Sacc.). Only the spermogonial stage found. It oozes out in long red tendrils. On dead *Ailanthus glandulosus*.

230. **Eutypella stellulata** (Fr.) Sacc. N. A. Pyr., p. 489. Valsa, Feltgen 579. On dead branches of *Cratægus*, March, 1888.

231. **Eutypella innumerabilis** (Peck.) Sacc. *Valsa innumerabilis* Peck, 30 Rep., p. 65. Included by E. & E. under *E. stellulata*. On dead branches of *Robinia*, Ridgeway, N. Y., Sept., 1891.

232. **Eutypella cerviculata** (Fr.) Sacc. N. A. Pyr., p. 491. On *Carpinus*, July, 1890.

EUTYPA Tulasne 1862.

233. **Eutypa spinosa** (Pers.) Tulasne. E. & E., N. A. Pyr., p. 500. Widely effused on stumps and logs in woods, Ridgeway and Yates, Orleans County, N. Y., June, 1886.

234. **Eutypa velutina** (Wallr.) Sacc. Fairman, Jour. Mycol., V., p. 79. N. A. Pyr., p. 500. On dead wood.

235. **Eutypa flavovirescens** (Hoff.) Tul. Fairman, Notes on New or Rare Fungi from Western New York in Journal of Mycology, V., page 79. N. A. Pyr., p. 504. *Valsa flavovirescens* Winter in Feltgen, No. 586. Easily recognized by taking a thin horizontal slice from the black surface when the characteristic greenish-yellow color of the interior stroma will be revealed. Ellis says, N. A. Pyr., loc. cit., "On decorticated limbs, Lyndonville, N. Y., (Fairman), Carolina (Ravenel). Probably not uncommon, but the specc. quoted are the only ones we have seen." Feltgen gives as hosts for this species, *Prunus spinosa*, *Prunus cerasus*, *Cratægus*, *Quercus*, *Salix caprea*, *Corylus*, *Carpinus*, *Rosa canina*, *Vitis vinifera*, *Juniperus communis*. Lyndonville specimens were on beech or maple.

CRYPTOVALSA Cesati and DeNotaris 1861.

236. **Cryptovalsa eutypæformis** Saccardo. Syll. 5907. N. A. Pyr., p. 517. Peck, 54 Rep., p. 157. On dead, decorticated branches of maple, in ditches by the roadside. August.

DIATRYPE Fries 1849.

237. **Diatrype cornuta** E. & E. N. A. Pyr., p. 568. The original specimens upon which Ellis and Everhart founded this species were found by the author on bark of dead *Ailanthus* limbs, Lyndonville, N. Y.

238. **Diatrype stigma** (Hoff.) DeNot. Peck, 23 Rep., p. 98. N. A. Pyr., p. 565. Feltgen, No. 487. Common on dead branches of various trees.

239. **Diatrype virescens** (Schw.). Pk., 23 Rep., p. 63. N. A. Pyr., p. 569, and plate 34. Common on dead limbs of *Fagus*.

240. **Diatrype platystoma** (Schw.). Pk., 26 Rep., p. 85 N. A. Pyr., p. 566 and plate 34. On dead limbs.

241. **Diatrype albopruinosa** (Schw.). N. A. Pyr., p. 570. On dead limbs of *Fagus?*

DIATRYPELLA Cesati and DeNotaris, 1861.

242. **Diatrypella frostii** Peck. Pk., 38 Rep., p. 103. Pk., Bot. Gaz., III., p. 35. N. A. Pyr., p. 593. On dead limbs of *Acer*, June 28, 1890.

243. **Diatrypella favacea** (Fr.) Nitschke. N. A. Pyr., p. 585. Feltgen, No. 495. On dead limbs of *Betula*, Oct. 11, 1891.

Sect. II. PHÆOSPORÆ Saccardo.

Sporidia continuous, ovoid, brown or fuliginous.

CHÆTOMIUM Kunze 1817.

244. **Chætomium comatum** (Tode) Fries. Sacc. Syll., 793. Feltgen, No. 1021. On dead stems and old, damp, papers of garden seeds, left on the ground in my garden.

245. **Chætomium elatum** Kunze. N. A. Pyr., p. 122. On dead herbaceous stems.

HYPOCOPRA Fuckel.

246. **Hypocopra fimicola** (Rob.) Sacc. *Sordaria f.* in N. A. Pyr., p. 127 and Feltgen No. 1023. On decaying potato. Mr. Ellis, in a letter to me, called this form *tubericola*. In N. A. Pyr., loc. cit., Ellis and Everhart say, "On decaying potato, Lyndonville, N. Y. (Fairman). Winter in Die Pilze makes the spore bearing part of the asci 120–140 x 17–19 μ. The form on potato has asci (p. sp.) 120–134 x 12–15 μ."

ROSELLINIA Cesati and DeNotaris 1847.

I. EUROSELLINIA.

247. **Rosellinia byssiseda** (Tode) Schroeter. *Sphæria byss.* Tode, 1791. *Rosellinia byss.* Feltgen, No. 975. *Sphæria aquila* Peck, 23 Rep., p. 63. *Rosellinia aquila* in N. A. Pyr., p. 163. On decaying branches and limbs.

248. **Rosellinia subiculata** (Schw.) Sacc. *Sphæria subiculata* Peck, 32 Rep., p. 51. *Rosellinia sub.* in N. A. Pyr., p. 165. On rotten wood.

II CALOMASTIA.

249. **Rosellinia mammiformis** (Pers.) Winter. *Sphæria mammiformis* Persoon, 1801. *Rosellinia mastoidea* Saccardo. *R. mammiformis* in N. A. Pyr., p. 166 and Feltgen, No. 977. On dead branches.

IV. CONIOMELA.

250. **Rosellinia pulveracea** (Ehr.) Fuckel. *Sphæria p.*, Ehr. 1801. *Sphæria millegrana* Schw. *Sphæria pulveracea* Peck, 25 Rep., p. 105. *Rosellinia p.* N. A. Pyr., p. 169 and Feltgen No. 982.

V. CONIOCHÆTA.

251. **Rosellinia ligniaria** (Grev.) Fuckel. N. A. Pyr., p. 172. Feltgen No. 982.

ANTHOSTOMELLA Saccardo 1875.

252. **Anthostomella eructans** E. & E. Fairman, Proc. Roch. Acad. of Science, 1890, p. 50, plate 4, fig. 7–8. N. A. Pyr., p. 420. Rare. The original specimens were found at Lyndonville several years ago, and we have not found any since that time. On decorticated wood (*Acer?*).

ANTHOSTOMA Nits.

253. **Anthostoma dryophilum** (Curr.) Sacc. N. A. Pyr., p. 581. On fallen branches (Oak?). Autumn of 1900.

XYLARIA Hill 1773.

254. **Xylaria clavata** (Scop.) Schrank. *Valsa clavata* Scopoli 1772. *Sphæria polymorpha* Persoon, 1787. *Xylaria polymorpha* Peck, in 22 Rep., p. 97. N. A. Pyr., p. 665. Underwood, Moulds, Etc., plate IV., figs. 11 & 12. *X. clavata*, Feltgen, No. 459. The Lyndonville plant is the var. *pistillaris* Nits.

255. **Xylaria corniformis** Fr. Peck, 24 Rep., p. 97 and 28 Rep., p. 87. N. A. Pyr., p. 668.

USTULINA Tulasne 1861.

256. **Ustulina maxima** (Haller) Schroeter. *Sphæria maxima* Haller 1768. *Hypoxylon ustulatum* Bull., Peck, 22 Rep., p. 97. *Ustulina vulgaris* Tulasne in N. A. Pyr., p. 662. Feltgen, No. 462. At the base of old stumps.

HYPOXYLON Bulliard 1791.

257. **Hypoxylon coccineum** Bull. N. A. Pyr., p. 629. Feltgen, No. 470.

258. **Hypoxylon fuscum** (Pers.) Fr. Pk., 22 Rep., p. 98, N. A. Pyr., p. 633. Feltgen, No. 469.

259. **Hypoxylon multiforme** Fr. Pk., 22 Rep., p. 98, & 22 Rep., p. 103. N. A. Pyr., p. 634.

260. **Hypoxylon cohærens** (Pers.) Fries. Peck, 22 Rep., p. 98. N. A. Pyr., p. 635. Feltgen, No. 467.

261. **Hypoxylon turbinatulum** (Schw.) E. & E. N. A. Pyr., p. 636. Our specimens are the form sometimes called *Hypoxylon bagnisii* Sacc., which in N. A. Pyr. is called a synonym.

262. **Hypoxylon sassafras** (Schw.) Berk. Peck, 28 Rep., p. 71. N. A. Pyr., p. 641.

263. **Hypoxylon perforatum** (Schw.) Fr. Peck, 24 Rep., p. 98. N. A. Pyr., p. 645. Feltgen, No. 475.

264. **Hypoxylon serpens** (Pers.) Fries. Peck, 22 Rep., p. 98. N. A. Pyr., 653.

DALDINIA DeNotaris 1863.

265. **Daldinia tuberosa** (Scop.) Schroeter. *Valsa tuberosa* Scopoli 1772. *Hypoxylon concentricum* Pk., 24 Rep., p. 97. *Daldinia concentrica* (Bolt.) Ces. and DeNot., in N. A. Pyr., p. 660 and Syll., 1515. *D. tuberosa*, Feltgen, No. 463. On *Quercus*, Oct., 1900.

Sect. III. HYALOSPORÆ Sacc.

Sporidia ovoid, oblong or fusoid, continuous, hyaline or sub-hyaline.

CERATOSTOMELLA Saccardo 1878.

266. **Ceratostomella pilifera** (Fr.) Winter. *Sphæria p.* Fries 1822 and Pk., 27 R., p. 100. *Ceratostoma*, N. A. Pyr., p. 192. Feltgen, 967. Underwood, Moulds, Mildews and Mushrooms, plate IV., figs. 17 and 18. Found on decaying acorns and is probably what Feltgen calls form *dryina*.

BOTRYOSPHÆRIA Cesati and DeNotaris 1861.

267. **Botryosphæria quercuum** (Schw.) Sacc. *B. fuliginosa*, N. A. Pyr., p. 546 and plate 36. On various dead branches. A variable species.

Sect. IV. HYALODIDYMÆ Sacc.

Sporidia ovoid, oblong or fusoid, uniseptate, hyaline or subhyaline.

MYCOSPHÆRELLA Johanson 1884.

268. **Mycosphærella punctiformis** (Pers.) Johanson. Feltgen, 864. *Sphærella*, N. A. Pyr., p. 265. On old leaves.

269. **Mycosphærella asterinoides** (E. & E.). *Sphærella*, Journal of Mycology, IV., p. 98 and N. A. Pyr. p. 281. Peck, 54 Rep., p. 157. On dead stems of wild teazel, *Dipsacus*, May. The outline of the sporidia reminds one of a foot-print. Originally collected at Clyde by O. F. Cook, Jr.

270. **Mycosphærella verbascicola** (Schw.) Spermogonial stage found on dead stems of *Verbascum thapsus*.

DIDYMELLA Saccardo 1878.

271. **Didymella rauii** (E. & E.) Sacc. N. A. Pyr., p. 316. *Sphæria rauii* E. & E., in Bull. Torr. Bot. Club, X. p. 90. Fairman. Notes on New or Rare Fungi from Western New York, Jour. Mycol., V., p. 79. On dead stems of wild rose.

272. **Didymella** sp. Found on dead branches of spice bush, *Benzoin*. Journal of Mycology, V., p. 79. Sporidia fusoid, hyaline, quadrinucleate, 18–20 x 4–5 μ. Originally designated in a personal communication to us as *Didymella linderæ* E. & E., but we find no publication.

BERTIA DeNotaris 1844.

273. **Bertia moriformis** (Tode) DeNotaris. *Sphæria moriformis* Tode, 1841. Peck, 24 Rep., p. 104. *Bertia m.*, N. A. Pyr., p. 180 and Feltgen No. 993. On decaying wood of maple, Ridgeway, N. Y. In N. A. Pyr. reported as having been found at Canandaigua, N. Y., by Edgar Brown on old *Dædalea unicolor*. Sartwell also found it at an early date in this state.

HERCOSPORA Tulasne.

274. **Hercospora tiliæ** (Fr.) Tul. *Sphæria tiliæ* in Peck, 24 Rep., p. 99? N. A. Pyr., p. 525, as *Melanconis tiliacea* (Ell.). *Valsaria tiliæ* DeNot., sec. Feltgen, No. 512. We have specimens from Prof. John Dearness of London, Ontario, which are the same as our fungi. On dead *Tilia*, basswood, Oct., 1900.

DIAPORTHE Nitschke 1867.

275. **Diaporthe salicella** (Fr.) Sacc. *Sphæria*, Peck, 25 Rep., p. 104. *Diaporthe*, N. A. Pyr., p. 435. *Gnomonia*, Feltgen, No. 676. On dead branches of *Salix*.

276. **Diaporthe sociata** (C. & E.) Sacc. *Valsa*, C. & E. in Grevillea, VI., p. 11. *Diaporthe*, N. A. Pyr. p. 435. On dead branches of spice bush, *Benzoin*, Oct., 1900. Not previously reported from the state.

277. **Diaporthe aculeata** (Schw.) Sacc. N. A. Pyr., p. 452. On dead stems of *Phytolacca decandra*.

278. **Diaporthe obscura** (Peck) Sacc. Peck, 28 Rep., p. 73. N. A. Pyr., p. 441. On dead stems of *Rubus*, cult.

279. **Diaporthe bicincta** (Peck) Sacc. *Valsa*, Pk., 29 Rep., p. 64. *Diaporthe*, N. A. Pyr., p. 429. On dead branches of butternut, *Juglans cinerea*.

280. **Diaporthe acerina** Peck. *Valsa acerina*, Peck, 28 Rep., p. 74. N. A. Pyr. 424. On dead *Acer* sp.

281. **Diaporthe carpini** (Pers.) Fuckel. N. A. Pyr., p. 425, where the authors say, "the specc. from Dr. Fairman have asci and sporidia corresponding to the smaller dimensions in the foregoing diagnosis, which is taken from Saccardo's Sylloge." On dry branches of *Carpinus americana*.

Sect. V. PHÆODIDYMÆ Sacc.

Sporidia ovoid, oblong or fusoid, uniseptate, fuliginous or olivaceous.

DIDYMOSPHÆRIA Fuckel 1869.

282. **Didymosphæria accedens** Sacc. Sacc. in Fairman, Mycology of Western N. Y., Proc. Roch. Acad. Sc., 1890, p. 48, plate IV., fig. 12. N. A. Pyr., p. 330. On dead branches of *Fraxinus*, April–May, 1889. Evidently rare.

283. **Didymosphæria oblitescens** (B & Br.) Sacc. *Sphæria oblitescens*, B. & Br., Ann. N. H. n. 887, pl. 11 fig. 32. Cooke, Handbook, No. 2675. *Didymosphæria* in Syll., No. 2992. "Perithecia covered by the epidermis, depressed, somewhat large, ostiolum obscure; sporidia oblong elliptical, obtuse at the ends, uniseptate, moderately constricted, 12–13 μ long." Sylloge, loc. cit. On dead branches of *Cornus*, associated with *Metasphæria fiedleri*. Not to our knowledge reported heretofore from the United States.

OTTHIA Nitschke 1869.

284. **Otthia aceris** Winter. N. A. Pyr., p. 249. Feltgen No. 960. On bark of dead *Acer*.

285. **Otthia morbosa** (Schw.) E. and E. *Sphæria morbosa* in Peck 31 Rep. p. 60. *Plowrightia m.* in Sylloge, 5295. *Otthia* in N. A. Pyr., p. 251. On limbs of plum trees, forming the disease called "black knot."

VALSARIA DeNotaris.

286. **Valsaria insitiva** Ces. and DeNot. N. A. Pyr., p. 555. If this is the same as the *Sphæria rubricosa* Fries (1829) and the genus *Myrmæcium* of Nitschke (1869) holds, there would seem to be good reason for changing the name of this species to *Myrmæcium rubricosum* (Fr.) Fuckel (See Feltgen I., p. 163. No. 483). On bark of various trees.

Section VI. PHÆOPHRAGMIÆ Sacc.

Sporidia oblong or fusoid, 2–multiseptate, olivaceous, brown or fuliginous.

MASSARIA DeNotaris 1847.

287. **Massaria inquinans** (Tode) Fries. N. A. Pyr., p. 400. Feltgen, No. 700. Berlese, Icones Fungorum, Tab. XIII., f. I. On dead limbs of *Acer* and of maple-leaved *Viburnum*.

288. **Massaria platani** Ces. N. A. Pyr., p. 403. Berlese, Icones, Tab. XIV., fig. 2. On dead *Platanus*.

LEPTOSPHÆRIA Ces. and DeNot. 1861.

289. **Leptosphæria conoidea** DeNot. Berlese, Icones, Tab. XLVII., fig. 6. On dead stems of plants.

290. **Leptosphæria doliolum** (Pers.) DeNot. N. A. Pyr., p. 355. Feltgen, No. 776. Pk., 23 Rep., p. 64 (*Sphæria*). On dead branches of *Ailanthus glandulosus*. Asci 100 x 10 μ, sporidia 23 x 4 μ.

291. **Leptosphæria dumetorum** Niessl. N. A. Pyr., p. 357. Berlese, Icones, page 54 and plate XL., fig. 5. On dead stems of *Lonicera*.

CARYOSPORA DeNotaris.

292. **Caryospora putaminum** (Schw.) DeNot. N. A. Pyr., p. 209 and plate 24. Underwood, Moulds etc., plate 4 fig. 15.

Berlese, Icones, Tab. XVI., fig. 1. On old peach stones on the ground.

SPORORMIA DeNotaris 1848.

293. **Sporormia minima** Auerswald. N. A. Pyr., p. 34 and plate 18. Berlese, Icones, Tab. 38, fig. 4. Sacc. Syll., 3317. Feltgen, No. 1038. On cow dung.

PSEUDOVALSA Ces. and DeNot. 1861.

294. **Pseudovalsa irregularis** (DC.) Schroeter. *Sphæria irregularis* DC., 1815. *Valsa profusa* Fr. in Peck, 25 Rep., p. 105. *Ps. profusa*, N. A. Pyr., p. 538. *Aglaospora profusa*, (Fr.) in Syll. 3346. *Ps. profusa*, Berlese, Icones, Tab. XXXIV., fig. 6. *Ps. irregularis*, Feltgen, No. 523. On dead branches of *Robinia pseudacacia.*

295. **Pseudovalsa fairmani** E. & E. Fairman, Proc. Roch. Acad. Sci., 1890, p. 51, plate 3, fig. 1, 2, 3, 10, 11. On dead hickory limbs.

296. **Pseudovalsa hapalocystis** (B. and Br.) Sacc. N. A. Pyr., p. 538. Berlese, Icones, Tab. XXXVI., fig. 1. Feltgen, No. 526. Specimens from the Lyndonville collection were furnished for distribution in N. A. F. and the drawings by Berlese were made from No. 2119 of N. A. F. (doubtless from our specimens). On dead *Platanus occidentalis.*

MELOGRAMMA Fries 1849.

297. **Melogramma bulliardi** Tulasne 1862. N. A. Pyr., p. 553, plate 36. Feltgen, No. 485. *M. vagans*, Syll., 3381. *M. vagans*, Berlese, Icones, Tab. XXXVII, fig. 2. On dead *Carpinus.*

Section VII. HYALOPHRAGMIÆ Sacc.

Sporidia oblong or fusoid, 2–pluriseptate, hyaline.

METASPHÆRIA Sacc.

298. **Metasphæria leiostega** (Ellis) Sacc. N. A. Pyr., p. 383. Ellis, Bull. Torr. Bot. Club, 8, p. 91. On dead stems of wild Rose.

299. **Metasphæria fiedlæri** (Niessl) Sacc. *Letosphæria Fiedlæri* Niessl. *Cryptosphæria F.*, Niessl, 1874. Feltgen, No. 809. "Perithecia semi-immersed, covered or partially exposed, coriaceous-

carbonaceous, at length depressed, ostiolum minute ; asci clavate, 100–110 x 18 μ, attenuated below, rounded at the apex, surrounded by numerous filiform paraphyses, 8–spored : Sporidia uniseriate or biseriate, fusoid cylindrical, curved, 26 – 32 x 6 – 7 μ, triseptate and constricted at the septa, greenish hyaline.'' According to Niessl, the pycnidial stage is *Hendersonia Fiedlæri* Rabenhorst. On dead branches of *Cornus*, associated with *Didymosphæria oblitescens* (B. & Br.) Sacc. Feltgen reports this species as occurring in Luxemburg upon *Cornus*, *Ligustrum vulgare*, and *Ulex Europæus*. He describes the perithecia as sunken in the matrix up to their papilliform ostioli and the measurements as follows : Asci 106 – 120 x 15 – 18 μ; sporidia 24 – 26 x 6 μ, hyaline. New to the United States.

LASIOSPHAERIA Ces. and DeNotaris, 1861.

300. **Lasiosphæria hirsuta** (Fr.) Ces. and DeNot. *Sphæria*, Fr. 1822. N. A. Pyr., p. 144. Pk., 25 Rep., p. 104, (*Sphæria*). Feltgen, No. 1008. On rotten *Carpinus*, Oct., 1891. Also found in Sept., 1900, associated with *Orbilia leucostigma* Fr. on rotten wood.

301. **Lasiosphæria spermoides** (Hoff.) Ces. & DeNot. N. A. Pyr., p. 148. *Sphæria*, Peck, 29 Rep., p. 61. *Leptospora*, Feltgen, No. 990.

302. **Lasiosphæria ovina** (Pers.) Fuckel., *var. aureliana*. The Orleans County variety of *L. ovina*. Fairman, Some new Fungi from Western N. Y., Jour. Mycology, Sept., 1904, page 229. *Sphæria ovina*, Pers., 1801. Peck, 22 Rep., p. 99. *Lasiosphæria*, N. A. Pyr., p. 150. *Leptospora*, Feltgen, No. 991. Perithecia scattered or gregarious, but not crowded, large, ovate globose, clothed mostly at the base with long, brown, bristle-like, septate hairs which are 6 μ in diameter, simple or branched, straight or reflexed and flexuous at the tips, covered with a persistent grayish white tomentum, all excepting the protruding papilliform ostiolum which is bare. Inner substance of the perithecia when crushed upon the slide pale greenish-yellow (flavovirescent). Asci straight or curved, oblong sub-fusoid or arcuate, with an occasional shining oil drop in the rounded, hyaline apex, 100 x 10 – 12 μ. Sporidia imperfectly biseriate or fasciculate, abruptly bent at the lower fourth, at times straighter and flexuous in the middle, continuous, hyaline, 40 x 5 μ. The sporidia are at times furnished with a short (about 6 μ) acute hyaline tip, at one or both ends, which appendages however are usually absent or indistinct. These appendages are mostly seen in young sporidia and may become absorbed with age.

There are small oblong conidia and larger, 40 x 6 μ, multiseptate fusiform spores found on the basal threads. The paraphyses are indistinct. On the surface of wood (basswood?) under moist bark. Lyndonville, N. Y., Oct., 1900. *Lasiosphæria sulphurella* Sacc. is seated on a sulphur-colored subiculum and the appendages of the sporidia are 25–30 μ long. *Lasiosphæria viridicoma* (C. & P.) is clothed with a dense greenish tomentum and *Lasiosphæria mutabilis* has a yellowish-green tomentum which turns brown and disappears. The flavo-virescent color of the crushed perithecia and the occasional appendages of the sporidia render our species different from the type of *L. ovina* (Pers.). At first we considered it a new species (*Lasiosphæria aureliana* Fairman, in herb.) but Mr. J. B. Ellis, the veteran American pyrenomycetologist, to whom specimens were submitted, thought that the color of the crushed perithecia did not entitle it to specific rank. It is to be noted, however, that in *Eutypa flavovirescens* (Hoff.) Tul. and *Lecanidion indigoticum* (C. & P.) Sacc. the interior color of the fungus is a diagnostic feature.

303. **Lasiosphæria hispida** (Tode) Fuckel. N. A. Pyr., p. 145.

ACANTHOSTIGMA DeNotaris.

304. **Acanthostigma decastylum** (Ck.) Sacc. N. A. Pyr., p. 155 and plate 9. *Sphæria* (*Zignoella*) *cariosa* C. & E., Grev., VI., p. 94 and tab. 100, fig. 28. *Zignoella*, Sacc. Syll., 3630. On rotten wood, May, 1889. Our specimens have triseptate, fusoid sporidia, 3–4 nucleate and 18 – 20 x 3 – 4 μ.

Section VIII. DICTYOSPORÆ Saccardo.

Sporidia ovoid, oblong or sub-fusoid, transversely and longitudinally septate (muriform or clathrate), brown, or rarely hyaline.

PLEOMASSARIA Spegazzini 1880.

305. **Pleomassaria carpini** Fuckel. N. A. Pyr., p. 407. Sacc. Syll. No. 3710. On dead branches of *Carpinus*. The only station for this in the United States, so far as reported. According to Ellis and Everhart, "asci and sporidia in the New York specimens are smaller than the measurements given by Dr. Winter (170–220 x 35–42 μ and 45–65 x 17–21 μ.)."

306. **Pleospora herbarum** (Pers.) Rabh. *Sphæria herbarum*, Pers., 1801. Pk., 30 Rep., p. 67. *Pleospora*, N. A. Pyr.,

p. 335. *Pleospora subsulcata* E. & E., in Fairman, Mycology of Western N. Y., Proc. Roch. Acad. Science, Aug. 1890. p. 44 and Plate 4, figs. 1 and 2 is probably a synonym. On dead herbaceous stems (probably of Onion) which had remained out of doors all winter.

CUCURBITARIA Gray 1821.

307. **Cucurbitaria elongata** (Fries) Greville. Peck, 23 Rep. p. 64 (Sphæria). *Sphæria e.*, Fries 1822. *Cucurbitaria e.*, N. A. Pyr., p. 238, Sacc. Syll. 3938, and Feltgen, No. 943. On dead branches of *Robinia pseudacacia.*

FENESTELLA Tulasne 1862.

308. **Fenestella fenestrata** (B. & Br.) Schroeter 1897. *Valsa fenestrata* B. & Br. *Fenestella princeps*, Tul., N. A. Pyr., p. 543, Sacc. Syll. 3995, Feltgen, No. 531. On dead limbs of *Salix.* Our plant is the form *Salicis vitellinæ* of the Sylloge.

309. **Fenestella amorpha** E. & E., Jour. Mycol., IV., p. 58, Proc. Acad. Nat. Sci., Phil., July 1890, p. 239 and Proc. Roch. Acad., August, 1890, p. 48, N. A. Pyr., page 543 and plate 35. Fairman, Journal of Mycology, vol. V., page 79—Notes on new or Rare Fungi from Western New York. On fallen branches of *Carya*, in the spring. The development of the sporidia of this fungus is considered in Fairman, "Observations on the development of some fenestrate sporidia", Journal of Mycology, vol. VI., p. 29 and plate 1. Several years observation of this fungus enables me to confirm an interesting instance of accurate scientific prediction. The original specimens, which I sent to Mr. J. B. Ellis for identification, were upon decorticated branches of hickory. After a careful examination Mr. Ellis said (Journ. Mycol., vol. IV., p. 59), "the specimens examined were apparently superficial, but it is probable that the fungus grew while the limb was still invested with the bark through longitudinal cracks in which the ostiola penetrated." I have since then found several specimens growing on branches with ostiola protruding through deep longitudinal fissures.

Section IX. SCOLECOSPORÆ Sacc.

Sporidia filiform, hyaline or yellowish, sometimes guttulate or septate.

OPHIOBOLUS Riess 1853.

310. **Ophiobolus porphyrogonus** (Tode.) Sacc. *Sphæria porphyrogona*, Tode, 1791. *Sphæria rubella*, Pers., also Peck, 25 Rep., p. 104. *Ophiobolus* in N. A. Pyr., 393, Sacc., Syll., 4017 and Feltgen, No. 715. On dead herbaceous stems.

311. **Ophiobolus anguillides** (Cooke.) Sacc. Sacc. Syll., 4029. N. A. Pyr., p. 397. On dead herbaceous stems.

Fam. III. HYPOCREACEÆ DeNot.

Section III. HYALODIDYMÆ Sacc.

Sporidia uniseptate, hyaline.

NECTRIA Fries 1849.

312. **Nectria cinnabarina** (Tode.) Fries. Sacc. Syll., 4662. N. A. Pyr., page 93. Feltgen, No. 1071. Peck, 22 Rep. p. 98. Common on dead limbs.

313. **Nectria offuscata** B. & C. N. A. Pyr., p. 95, Sacc. Syll., 4688. On *Hibiscus syriacus*. Hitherto reported from North Carolina.

314. **Nectria pezizæ** (Tode.) Fries. N. A. Pyr., p. 105. Pk., 24 Rep., p. 98. Feltgen, 1080. On decaying wood in woods, Ridgeway, Oct., 1900, and on wood in wood piles, Lyndonville, same date.

315. **Nectria episphæria** (Tode.) Fr. Sacc. Syll., 4740. N. A. Pyr., p. 108. Pk., 27 Rep , p. 108. On *Hypoxylon*.

HYPOCREA Fries 1849.

316. **Hypocrea citrina** (Pers.) Fr. N. A. Pyr., p. 85. Feltgen, No. 1056. Peck, 22 Rep., p. 97. On moist decaying log in woods, Oct., 1900.

Section V. PHRAGMOSPORÆ Sacc.

Sporidia oblong or fusoid, multiseptate.

GIBBERELLA Saccardo, 1877.

317. **Gibberella pulicaris** (Fr.) Sacc. N. A. Pyr., p. 120. Pk., 30 Rep., p. 76. Feltgen, No. 1063. On old corn stalks.

Section VI. DICTYOSPORÆ Sacc.

Sporidia ovoid or sub-oblong, septate, muriform, hyaline.

PLEONECTRIA Sacc.

318. **Pleonectria berolinensis** Sacc. N. A. Pyr., page 115 and plate 12. On dead stems of *Ribes*.

Section VII. SCOLECOSPORÆ Sacc.

Sporidia filiform, frequently multiseptate.

OPHIONECTRIA Sacc.

319. **Ophionectria cerea** (B. & C.) N. A. Pyr., p. 118. On old *Diatrype stigma*.

Fam. IV. DOTHIDEACEÆ Nits. and Fuckel.

PHYLLACHORA Nitschke 1869.

320. **Phyllachora graminis** (Pers.) Fuckel. (*Sphæria graminis*, Pers 1796.) N. A. Pyr., p. 599 and plate 40. Pk., 23 Rep., p. 64. Feltgen, No. 429. On grass leaves.

321. **Phyllachora trifolii** (Pers.) Fuckel. N. A. Pyr., p. 597. Feltgen, No. 431. On leaves of *Trifolium*.

DOTHIDEA Fries 1818.

322. **Dothidea ribesia** (Pers.) Fr. *Plowrightia*, Sacc. Syll., II., p. 635. N. A. Pyr., p. 611. Feltgen, No. 446. Peck, 24 Rep., p. 99. On dead stems of *Ribes*.

323. **Dothidea collecta** (Schw.) N. A. Pyr., p. 613. On dead twigs of *Maclura*, Oct. 1900.

RHOPOGRAPHUS, Nitschke.

324. **Rhopographus filicinus** (Fr.) Fuckel. N. A. Pyr., p. 618 and plate 40. *R. Pteridis*. Winter, sec. Feltgen, No. 453. On some undetermined fern.

Family VI. LOPHIOSTOMACEÆ Sacc.

Section IV. HYALOPHRAGMIÆ Sacc.

LOPHIOTREMA Sacc.

325. **Lophiotrema auctum** Sacc. N. A. Pyr., p. 233. Berlese, Icones, Tab. III., fig. 10. On dead stems of wild rose. In

N. A. Pyr., it is stated that the specimens from Lyndonville differ from the diagnosis in Sylloge "in having the asci and sporidia smaller: asci 75-90 x 12-15 μ : sporidia 25-35 x 6-7 μ, 6-7 septate, only slightly constricted and obscurely appendiculate."

326. **Lophiotrema littorale** Speg. Sacc., Syll. 5423. Berlese, Icones, Tab. IV., fig. 6. On decorticated willow twigs, deposited by, or, at least, subjected to the action of water, under willow trees along the flats of Johnson Creek. Not before reported from U. S.

LOPHIOSTOMA (Fr.) Ces. and DeNot.

327. **Lophiostoma macrostomum** (Tode.) Ces. and DeNot. *Sphæria m.*, Tode, 1791. Pk. 28 Rep., p. 76. N. A. Pyr., p. 221. Sacc. Syll., 5490. Feltgen, No. 914. Berlese, Tab. VIII., fig. 7. On bark (maple?) in the woods.

328. **Lophiostoma prominens** Peck. Peck, 31 Rep., p. 50. N. A. Pyr., p. 224. On decorticated branches of *Cornus*, Oct. 1900.

329. **Lophiostoma triseptatum** Peck. Peck, 28 Rep. p. 76. N. A Pyr., p. 224. A common species and somewhat variable. Ellis and Everhart in N. A. Pyren. say "differs from *L. quadrinucleatum* Karst. in its smaller sporidia, constricted at the apex". *L. triseptatum* Peck, should probably be referred to *L. quadrinucleatum* Karst, as a small spored variety. In the diagnoses of Lophiostomas published in the Sylloge, there are a number of small spored forms, in length from 15 to 25 μ, which are difficult to separate. The forms we enumerate here as *L. triseptatum* occur on various habitats. Two of them have been examined by Prof. Peck and pronounced to be his species, viz.: On fallen branches of *Fraxinus*, with the bark still on and the perithecia erumpent, July 25, 1890. On decorticated, fallen, branches of *Acer*, Oct. 8, 1891. Normally this fungus has triseptate sporidia, but occasionally one or both of the terminal cells are divided by a septum and we have forms 4–5 septate, enumerated as *Lophiostoma rhopaloides* Sacc., var. *pluriseptata*, n. var., in Fairman, Fungi of Western, N. Y., Proc. Roch. Acad. Sc., Vol. 1, page 49 and in Farlow and Seymour's Provisional Host Index of the Fungi of the United States, Part III., page 192, (sub *Acer*, sp. indeter.) These should be cancelled and the form known as *Lophiostoma triseptatum* Peck, var *pluriseptatum*, E. & E. Ellis and Everhart remark, loc. cit. page 225, "var. *pluriseptatum* E. & E., on decorticated maple limbs, Lyndonville, N. Y., (Fairman 134) has asci p. sp. 70–75 x 10–12 μ. Sporidia irregularly biseriate or oblique, oblong or oblong-clavate, 3

septate and constricted at the septa, obtuse, brown, 15–20 x 5–6 μ. In well developed specimens, one or both the terminal cells are again divided by a septum, making the sporidia 3–5 septate". Another form collected on decorticated *Salix* limbs, Sept. 1900 has triseptate brown sporidia, constricted, 17 x 6⅔ μ. Here the sporidia are not uniformly transversely septate but occasionally *obliquely septate*. These forms for convenience may be called *L. triseptatum var. diagonalis* Fairman, *n. var.* On decorticated maple twigs, Oct., 1900 another form was found in which the sporidia were *uniseriate*, brown, triseptate, 20 x 6–7 μ, but the sporidia are very *acute at the ends*, and may be known as *var. acuta*, Fairman, *n. var.*

330. **Lophiostoma quadrinucleatum** Karst. Sacc. Syll. No. 5451. Feltgen, No. 906. On dead branches of *Hamamelis virginiana*, October 2, 1900. Sporidia 3–5 septate, nucleolate, 18–24 x 7 μ. On *Cornus*, Oct., 1900, sporidia brown, 18 x 6–7 μ, quadrinucleate when young.

331. **Lophiostoma pruni** E. & E. Journal of Mycology, iv., p. 64. Proc. Roch. Acad., Vol. I, p. 49 and plate 4, figs. 10–11. Berlese, Icones Fungorum, Fasc. I, part I, tab. VI., fig. 3. N. A. Pyr., page 225, plate 25. On *Prunus serotina*. Lyndonville, April 1888. This is another one of the small, perplexing, triseptate Lophiostomas. The sporidia are mostly 4 in the ascus, and measure 18–22 x 6–8 μ. Berlese says, "affine *L. quadrinucleato*, (a quo loculis eguttulatis præcipue differt) et *L. pseudomacrostomo*, sed sporidiis raro 4–5 septatis, et longitrorsum divisis."

332. **Lophiostoma vagans** Fabr. Berlese, Icones, tab. VI., fig. 8. (*L. pseudomacrostomum*, Sacc. in N. A. Pyren., pages 225–226.) On dead branches of *Lonicera*.

333. **Lophiostoma insidiosum** (Desm.) Ces. et DeNot. (*Sphæria i.*, Desm. 1841.) Feltgen, No. 915. Berlese, Icones, p. 12 and tab. VI., fig. 6. On dead stems of *Tanacetum*. On dead stems of wild raspberry, Ridgeway, N. Y., Sept., 1900. Sporidia brown, 5–6 septate, 20–27 x 7 μ, armed with acute hyaline appendages.

334. **Lophiostoma rhizophilum** (B. & C.). To this species we have provisionally referred the small triseptate forms found on exposed roots of maple, sumach, etc., and which are hard to separate from *L. triseptatum*, except by the different habitat. On roots we find them with sporidia 3–5 septate, or 3 septate, nucleolate, ends acutely pointed with hyaline tips and at times surrounded with mucus. They embrace characters common to *L. triseptatum*, *quad-*

rinucleatum and desmazierii. An examination of the original specimens of B. & C., if they are in satisfactory condition, would throw light upon these small triseptate forms. If, as we suspect, they are the same as *L. triseptatum*, the question of priority of publication would come up.

335. **Lophiostoma cephalanthi** Fairman. Journal of Mycology, Vol. X., page 230. On decorticated area of branch of *Cephalanthus occidentalis*, Ridgeway, N. Y., Aug. 1904. This should probably be referred to *Lophiostoma prominens*, Peck.

336. **Lophiostoma imperfecta** Ellis and Fairman, n. sp. On dead stems of *Asclepias*? Lyndonville, N. Y., Sept. 1904, (Fairman coll.). Perithecia superficial, scattered on blackened areas of the stem, hemispherical, collapsing to plane or shallow cup-shaped, about one-half millimeter in diam. ; ostiolum slightly compressed, minute ; asci clavate-cylindrical, stipitate, paraphysate, 40–50 x 6–8 μ ; sporidia uniseriate, or biseriate above, oblong-elliptical, narrowed at the ends, brown, triseptate, scarcely constricted, straight or curved, 12–18 x 6–7 μ. The sporidia in many of the asci are imperfectly developed, and appear shriveled and of a darker color.

Section VI. DICTYOSPORÆ Sacc.

Platystomum Trevisan.

337. **Platystomum compressum** (Pers.) Trev. *Sphæria c.*, Pers., 1801. *Lophidium compressum* in Sacc., Syll., No. 5531., N. A. Pyren, p. 234, and Berlese, Icones, tab. X., fig. 4. *Platystomum c.*, Feltgen, No. 917. According to Feltgen, *Platystomum* was founded by Trevisan in 1877 and *Lophidium* by Saccardo in 1878. Hab. on decorticated logs and limbs.

Family VII. HYSTERIACEÆ Corda.

Section III. HYALODIDYMÆ Sacc.

Glonium Muhl.

338. **Glonium simulans** Gerard. Sacc., Syll., 5602. N. A. Pyren., p. 683. On old wood.

339. **Glonium nitidum** Ellis. Sacc., Syll., 5605. N. A. Pyren., p. 683. On the inner surface of loosely hanging bark of cedar fence posts.

Section V. PHÆOPHRAGMIÆ Sacc.

HYSTERIUM Tode.

340. **Hysterium prostii** Duby. Sacc. Syll. Pyr., No. 5644. N. A. Pyren., p. 697. On bark of *Ulmus*. When fresh, resembles a discomycete.

Section VI. HYALOPHRAGMIÆ Sacc.

DICHÆNA Fries.

341. **Dichæna faginea** (Pers.) Fr. Common on bark of living beech trees. We have never seen it in fruit.

Section VIII. PHÆODICTYÆ Sacc.

HYSTEROGRAPHIUM Corda.

342. **Hysterographium fraxini** (Pers.) DeNot. Sacc. Syll. Pyr., No. 5758. N. A. Pyr., p. 701. Feltgen, 418. Common on branches of *Fraxinus*.

343. **Hysterographium gloniopsis** (Gerard). N. A. Pyr., p. 708. *Gloniopsis Gerardiana*, Sacc. Syll., 5747. On dry hard wood of deciduous trees.

344. **Hysterographium mori** (Schw.) On dead Sumach, Ridgeway, April, 1904.

Section IX. SCOLECOSPORÆ Sacc.

LOPHODERMIUM Chev.

345. **Lophodermium arundinaceum** (Schrad.) Chev. Sacc. Syll. Pyren., 5823. N. A. Pyren., p. 719. Feltgen, 405. On dead stems of some undetermined grain.

HYPODERMA, DC.

346. **Hypoderma rubi** Schroeter. *H. virgultorum* in Sacc. Syll., 5792 and in N. A. Pyr., p. 711. According to Feltgen this species was first described by Persoon, in 1796, as *Hysterium rubi*, and *H. virgultorum* was published in 1815. Feltgen, No. 393. We have never found it mature but only in the spermogonial state, known as *Leptostroma virgultorum*, Sacc. On dead stems of *Rubus* sp., Ridgeway, N. Y.

ADDENDA

Since this paper was written, the following additional species have been found.

347. **Amphisphæria granulosa** E. & E. Ellis and Everhart, Journal of Mycology, vol. X., page 169. On old oak barrel staves, lying on the ground. Sept., 1900.

"Perithecia erumpent-superficial, globose or depressed-globose, granular-roughened, about ½ mm. diam., quite evenly and thickly scattered; ostiolum minute, papilliform. Asci cylindrical short-stipitate, 65–70 x 4 μ, obscurely paraphysate. Sporidia uniseriate, oblong, uniseptate, scarcely constricted, pale-brown, slightly narrowed at each end, 10–12 x 3–3½ μ.

A. confertissima E. & E. has rather smaller perithecia and broader sporules. *A. conferta* Sz. has the perithecia seated on a radiate-fibrose mycelium but is otherwise much like this." loc. cit.

348. **Valsaria acericola** Ellis and Fairman, n. sp. On *Acer rubrum*, Ridgeway, N. Y., April, 1904. (Fairman, 1904–5.) Stroma cortical, valsoid, about 2 mm. diam.; perithecia circinate, small, ½ mm. buried in the inner bark, and not surrounded by any circumscribing line, their necks converging and their tips united in a small, black disk erumpent and raising the bark into small subconical pustules closely embraced by the ruptured epidermis; asci cylindrical, p. sp. 250 x 15–18 μ; paraphyses ?; sporidia uniseriate, oblong-elliptical, brown, uniseptate, constricted at the septum, rounded at the ends, 33–40 x 15–18 μ. The ascigerous pustules are accompanied by smaller ones containing stylospores, *Dothiorella* sp.

349. **Anthostoma acerinum** Ellis and Fairman, n. sp. On bark of maple, Lyndonville, N. Y., April, 1904. Stroma valsoid, 1 mm., buried in the bark; perithecia 4–6, globose, small (¼ mm.), with converging necks, crowned with the minute, papilliform ostiola erumpent in a small, tuberculiform disk which pierces the bark in a little tubercle; asci cylindrical, paraphysate; sporidia uniseriate. oblong, brown, continuous, 7–10 x 4–5 μ.

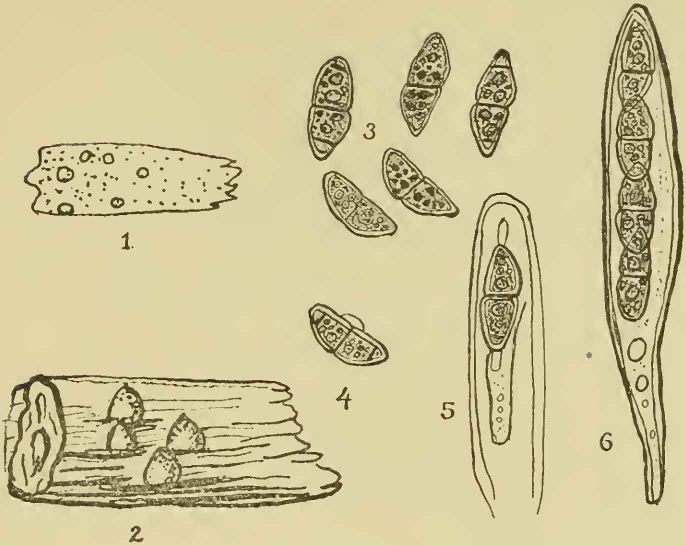
350. **Diatrypella cephalanthi** (Schw.) N. A. Pyren., page 591. On dead stems of *Cephalanthus occidentalis*, Ridgeway, Oct., 1904.

351. **Herpotrichia pezizula** (B. & C.). N. A. Pyren., page 160. On inner surface of moist, decaying bark, Ridgeway, autumn, 1904.

352. **Cryptosporella niesslii** (J. Kunze) Sacc. Sacc., Syll. 1812. *Cryptospora Nieslii* Kunze, Hedw., 1878, page 46. On maple bark, D. Clark's woods, Lyndonville, N. Y., Sept., 1904. Not to our knowledge reported before from this country. Pustules corticolous, elevating the bark. Stroma yellowish, or honey colored, and surrounded with a small black circumscribing line; perithecia several (3 to 5) in a stroma, mostly around the outer edges; asci oblong-cylindrical, 50 x 7 μ; sporidia uniseriate, hyaline, oblong cylindrical with rounded ends or sub-navicular, 2–4 guttulate, 12–13 x 3–4 μ. In the Sylloge the asci are given as 36 x 9 μ.

353. **Melanomma juniperi** Ellis & Everhart, n. sp. Perithecia superficial, the base slightly set in the bark, globose, black, large, scattered over wide areas of the bark, or occasionally very slightly clustered, with a small, slightly prominent, sub-mastoidal ostiolum; asci cylindrical, straight; sporidia fusoid, brown, 3–5 septate, the two middle cells larger, the end cells smaller, 40 x 10–12 μ. On loosely hanging bark of red cedar, *Juniperus virginiana*, on fence posts at Blood's Bridge over Johnson's Creek at Lyndonville, N. Y., April, 1904. I have drawn up the description from the specimens originally collected. The sporidia resemble those of *Melanomma hydrophilum*, (Karst.), according to the fig. in Berlese, Icones Fungorum, Tab. XXIV., f. 4, but are larger and of a different color.

354. **Caryospora cariosa** Fairman, n. sp. Perithecia large, conic, black, superficial, or with base slightly immersed in the wood, scattered or gregarious; ostioli small; asci oblong cylindrical, 150 x 20 μ. (p. sp.), surrounded by numerous filiform paraphyses, 2–8 spored; sporidia overlapping uniseriate, hyaline at first, then brown and finally almost opaque, uniseptate, with occasional additional septa near the ends, making them 1–3 septate, granulose guttulate (with opaque rounded granular contents), constricted at the middle septum, broad fusoid to biconical, ends sub-obtuse, 36–43 x 13–17 μ. The sporidia are at times hyaline mucronate at the ends, or have a projection from the side of a bubble of mucus, and the halves of the sporidia are sometimes curved on opposite sides. On very hard blackened areas in carious cavities of beech firewood (*Fagus*). Lyndonville, N. Y., Oct., 1904.



EXPLANATION OF THE FIGURES.

Fig. 1. A piece of beech with the fungus, *Caryospora cariosa*, Fairman.
Fig. 2. The same enlarged.
Fig. 3. A group of sporidia.
Fig. 4. A sporidium with mucus bubble.
Fig. 5. A mucronate sporidium.
Fig. 6. An ascus with 4 sporidia.

Figures 1 and 2 were drawn from nature by Miss L. A. Weld.
Figs. 3, 4, 5 and 6 by the author, with camera lucida.

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BATH FURNACE AEROLITE

BY

HENRY A. WARD.

Rochester, N. Y.
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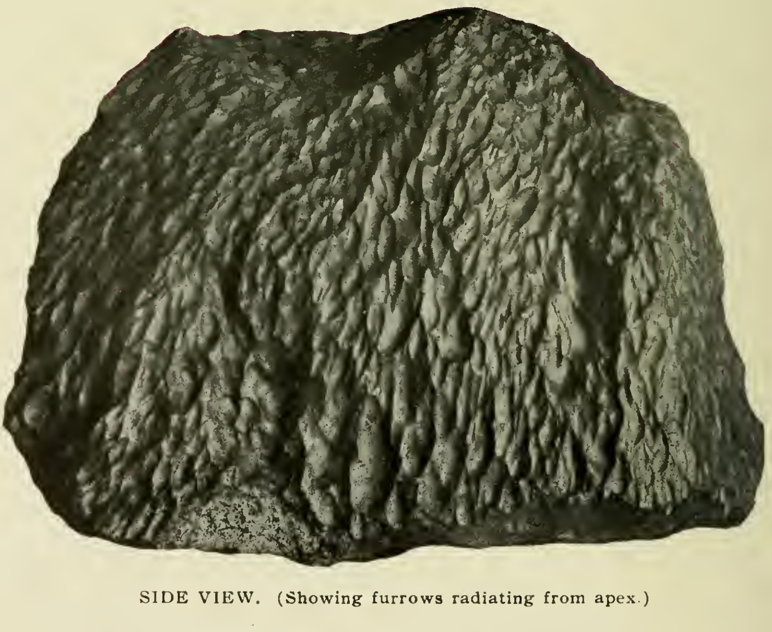
FRONT VIEW OF THE MASS.



SIDE VIEW. (Showing furrows radiating from apex.)

BATH FURNACE METEORITE (No. 3.)

HENRY A. WARD.

PROCEEDINGS OF THE ROCHESTER ACADEMY OF SCIENCE
VOL. 4, PP. 193-202, PLATE 19. AUGUST 21, 1905.

NOTES ON THE BATH FURNACE AEROLITE.

By HENRY A. WARD.

(Read by title before the Academy February 13, 1905.)

The passage of this meteor was first signalled in the early evening of November 15, 1902, high above northern Tennessee and Kentucky, and was seen as far north as Columbus, Ohio. Its course was north, 81 degrees east until its final fall in Bath county, eastern Kentucky, about 50 miles east of Lexington. Prof. Arthur M. Miller of the State College of Kentucky at Lexington, who recorded the fall in "Science" August 21, 1903, tells us that "The few residents of the region where the pieces struck seem to have been much startled by the blinding light and the heavy detonations accompanying the fall. They speak of the singing of the fragments, as they flew through the air, and of the sound made by their striking the ground, or hitting the timber on the knolls."

There were three distinct falls (noting only those of which pieces were found) all doubtless occurring simultaneously, but found at different times at points slightly separate.

The piece first found fell at 6:45 P. M. in the road in front of the house of Buford Staten, near old Bath Furnace, some five miles south of Salt Lick, and was found by him the following morning. It had cut a furrow east and west in the hard road about a foot long and five inches in greatest depth. It was about 8½x6x4 inches in dimensions, and weighed 12 lbs 12½ ounces. This piece was bought for me through the good services of Prof. Miller; and after cutting to show its inner structure, it was put in the Ward-Coonley Meteorite Collection.* Mr. Staten writing me of this fall said: "It sounded like a great buzz-saw ripping through a thick plank, and coming at me through the air."

The second piece was found one hundred yards west of No. 1.

*For description of this mass, see Am. Journal of Science (4th Ser.) Vol 16, pp. 316-319.

It was 2½x1½x¾ inch in dimensions, and weighed 223 grams. It was crusted over the entire surface, one side and one end being primary (original) crust, the other faces having a secondary coating, showing aerial fracture. This piece was cut through the center, and one-half went to the Field Columbian Museum at Chicago, the other to the museum of the State College of Kentucky.

The third piece (see Plate XIX) was found near the middle of May, 1903, about one and three-quarters miles south of the other two pieces, by a squirrel hunter, Jack Pegrem, whose attention was drawn to a scar on a white oak tree, some fifteen feet from the ground. Looking around he found, a few yards further on at the foot of a larger tree, broken roots and a hole beneath. Searching here, he found the great aerolite buried less than two feet, its apex crowded in among the roots, some of which had been cut through by the impact. Two other saplings in this vicinity, respectively about 100 and 300 yards farther east, were broken off by missiles coming from the west, and it is therefore probable that there were several other pieces besides the three here recorded, although search for them has been unsuccessful. This third piece has gone through the ordeal of a suit at law brought by the owner of the land upon which it fell, against the man who found it. The suit was compromised by the payment of several hundred dollars to the finder, in consideration of his relinquishing his claim. The mass was subsequently purchased by me, and is now one of the most notable specimens in the Ward-Coonley Collection.

It would be interesting to find the other pieces above mentioned whose existence is suspected, especially to see whether by shape or surface they would match either of the three known masses. None of these three are battered or bruised in any way by striking the earth, which is particularly surprising in the case of the largest, No. 3, which grazed the trunk of one tree and cut the roots of another before it came to rest in soft ground. But it is on this mass that the breaking off of pieces while still in the air is most noticeable. Several of these pieces must have weighed from one to three or four kilograms each. They came from two sides of the triangle, and were three inches in greatest thickness, and at least four in number. All three of the original masses of this aerolite are quite covered with a dense, black crust which is of two degrees—primary and secondary. The primary crust covers the entire surface of mass No. 1, two sides of No. 2, and all but one of the sides of No. 3, with the exception of the parts where, as mentioned, pieces have chipped off. These last faces or scars have, indeed, a crust quite covering them, but it is much thinner than the other, and through it appears the texture of the broken surface beneath. These areas of secondary crust attest to a breaking of the stone in the air while it yet had great velocity, and while it had still so great distance to fall that there was time for a second crust to form.

The base of mass No. 3, the largest single surface, has the usual thick crust which characterizes the rear, or Rückseite, of all well oriented aerolites. It has been protected from the pitting and furrowing effect of the rushing air, while all the results of melting have remained, not being swept away. On the opposite point or prominence of the front or Brustseite there is (as is usual on this form of aerolites) a very thin crust and bare of all pittings.

This third mass of the Bath Furnace is one of the most completely furrowed and definitely oriented aerolites known to science. We know no stone of American fall which equals it in this respect. The furrowing of the front side is most complete. These furrows radiate from the apex in all directions, covering that surface and streaming back upon and over all the sides. The regularity of their trend is most interesting as showing the steadiness of the mass in the air and the constancy of its axis in an orientation which doubtless was promptly taken after it entered our atmosphere and was retained throughout its whole flight. It owed this steadiness to the fact that the shape of the mass accorded with the center of gravity, or the mass was well centered, and thus it was gripped and held firmly with no shiftings or rotation. We may note here that the aerolites of a more or less spherical form have the pittings and the orientation less marked. It is well known that meteorites, both stone and iron, almost without exception show themselves to be fragments of most irregular shape, torn from larger masses of the same material, but always having their corners more or less rounded. But these same masses primarily were angular in shape and often with sharp thin edges. When these struck our air and met its resistance, they doubtless *wobbled* much to right and left before erosion wore them into poise and a steadiness of gait. We have all noticed the ricochetting of shooting stars in the upper heavens. This has been generally attributed to their glancing, due to irregularity and flatness of form. Very soft is the extremely attenuated air into the upper layer of which a meteorite plunges in its downward flight, as it leaves the realms of outer space; but after the first fraction of a second the mass is opposed by great density of the air through which it cleaves its way only by its momentum and with ever increasing friction. No longer is the mass passing through a gas, for its flight has changed the air by compression into a virtually solid substance. The enormous pressure exerted upon a flying body by its compression of the air through which it passes has been estimated by physicists. They tell us that a body traveling 20 miles a second through the lower atmosphere would have upon it a pressure of 77 cwt. per square inch. Reichenbach, Jr., has shown that the air crowded in front of a meteorite with a velocity of 40 miles per second would have, by reason of its compression, a heat of over 7000 degrees Fahrenheit—a heat calculated to melt away any surface which it enveloped. It is to the melting, rubbing and chiselling effect of this air compression that we may attribute all the glazing, pitting, hollowing and channelling which we find on the front and sides of meteorites. As may be expected, the iron meteorites have been less rapidly eroded than the stones. They, too, are apt to be in large pieces. Only iron would withstand such a pressure, stones breaking with the tension. The extent of this erosion will depend much upon the composition of the stone, also upon its form. The worn-off particles fly off, making at the same time great streams of sparks. Probably by far the larger number of the masses are entirely worn away. The wonder is that any part of the stone remains.

It is probable that the external combustion of a meteorite ceases before it wholly loses its cosmic impulse; its incandescence and luminosity ceasing also. This great heat is confined to the exterior of the mass from which the melted particles are instantly brushed away as they form. It thus results that the fiery, flaming mass is in fact mainly cold. It brings with it the temperature of the celestial spaces, which has been estimated at 504 degrees (Fahrenheit) below zero. The aerolite Dhurmsala in India, Pegu in Burmah, and Lissa in Bohemia were thus cold when they reached the earth. In the Pultusk meteorite shower which fell during a snowstorm in January, 1868, one of the stones weighing four pounds was found covered with light snow ten minutes after the fall. Orgueil, although carbonaceous, did not have its interior in the least affected. The heat of meteorites at moment of fall has ever been greatly exaggerated in common narration. It is a most frequent thing to have a record of their being too hot to handle even several hours after the fall. An examination of meteorite literature in the publications of the past century has shown me but two cases among the irons—Agram and Mazapil—where a heat making it difficult to handle the mass at time of falling has been recorded; and in but two cases that I have found in the description of nearly two hundred aerolites has any claim to more than simple warmth at time of fall been made. One might expect this from an aerolite of very loose texture, which would allow rapid penetration of the heat enveloping it when in air; or from an iron with its more ready conductivity. With trivial exceptions these accounts of hot meteorites belong to sensational newspaper stories. There has certainly been heat in melting intensity on the outer surface of the mass, but it has been kept from penetrating by the intense cold of the interior. The Widmannstätten figures of irons would have been destroyed by intense heat. Cohen explains in this way the change of N'Goureyma siderite from an octahedral iron to an ataxite.

There remains to be noticed the breaking up of the stone in the air. Everything, astronomical inductions as well as physical facts, certifies to the greatly varied size of the cosmic fragments which enter our atmosphere. These variations doubtless existed primarily. But while still in space, circulating in cometary orbits of long extent, there must have been many collisions both among members of the same stream and with those of other streams, and probably, too, with some of the streams coming, as has already been noted, from opposite directions with opposite course around the sun. Darwin (Geo. H.) has graphically described these streams as hastening ever onward with the same profuse variety of fragments,—great boulders, smaller ones like cobblestones, pebbles, gravel, and even sand—as may be collected at the foot of a rocky cliff. When such a stream chances to come within our earth's attraction and fall into our atmosphere, friction commences with ensuing attrition, heat, and luminosity. The myriad finer particles are promptly reduced to such comminution that they henceforth fall slowly, reaching our earth with imperceptible fall as cosmic dust. The smaller fragments flash out as shooting stars, none of which, says

Herschel, have a nucleus much larger than cherries or chestnuts. All these are in the upper air, from 70 to 100 miles above us. The larger masses pass on and undergo the terrible ordeal of heat and erosion; under which the largest pieces are promptly reduced to smaller ones, perhaps not one tenth of their original size, and the smallest pieces are worn out and dissipated entirely. Probably no aerolite which entered our air smaller in size than the human head ever reached our earth. The siderites have unquestionably resisted better the forces of attrition, but of all the many million meteorites (scientists' estimates range from ten to twenty million) which enter our atmosphere daily, probably less than a score reach our earth, either as large or as small pieces. We do not sufficiently recognize the beneficent service to us which is performed by the cushion of protecting atmosphere above our heads. It may be said incidentally that the meteorites, both iron and stone, which reach our earth and have been collected run in size from tiny bodies no larger than peas all the way up with almost even gradation to blocks two or three feet in diameter. The latter is the limit of the stones, the largest one on record being the Long Island, Kansas, which is nearly three feet long and weighs with all its fragments 1244 lbs. The present specimen, Bath Furnace No. 3, is believed to be the third aerolite in weight (177¼ lbs.) ever found on our hemisphere. Iron meteorites run much larger. The two largest which have been weighed are the Mexican Chupaderos weighing 15½ tons, and the Cape York Anighito, weighing 36½ tons. Bacubirito, an iron meteorite, still lying in a valley of the Cordilleras in the State of Sinaloa, Mexico, is longer and wider than either of the preceding, but not so thick as the Greenland mass. When this Sinaloa mass is weighed, it will be known which country, Mexico or Greenland, has to its credit the heaviest meteorite so far known on our earth.

Once more let us look at our meteorites in the upper heavens. They have entered our atmosphere as rough, angular masses which would at first, for a short section of their flight, have a rotating movement imposed upon them by the air's resistance.. Then, their angles and their projections being worn away and their center of gravity established, their course becomes direct, and is marked by a long, unbroken stream of light, with sparks flying through and out of it. The head of this stream is larger than the part which follows, and all are greatly larger than the meteorite kernel which they enclose and conceal. The size and the brightness of this trail of fiery sparks is indicative of the immense erosion and reduction which the solid meteorite is undergoing. The greater size of the front or head of the trail is due to the piling up in front of air heated by compression to a state of incandescence. At intervals, sometimes rare, sometimes frequent, but never regular, there are what both the eye and the ear lead us to call explosions, a sudden throwing off of sparks in all directions accompanied by a loud detonation. The explanation commonly given of this phenomenon is misleading, if not wholly incorrect, namely, that the breaking of the mass with violent detonation results from the intense heat upon the outside due to the friction, together with the extreme cold of the inner portions, thus causing unequal expansion, and a cleaving away of the outer portion from the inner, thus breaking up the mass. As a theory this may be reasonable, since we see such superficial flakings in intensely heated blocks of granite and other dense rocks. But there are reasons for seeking other explanations of these detonations. As a fact the pieces of aerolites which show fracture in the air have not at all the form of flakes or conchoidal plates. On the contrary they show almost invariably as pieces broken more or less through the middle of a larger mass. This is true of the hundreds of pieces in a meteorite shower, as of Mocs, Pultusk, or Winnebago Co., where the surfaces bearing a secondary crust show clearly the fracture through the middle of the mass. Further, in the case of the Butsura (India) aerolite the several pieces falling one or two miles apart were found to fit together, and the fractures were deep through the mass, not superficial. In short, the explosion theory for meteorite aerial dismemberment is not sustained by the facts registered on the fragments themselves.

Our explanation is based on what has been said above of the great compression of the air by the stone passing through it. This compression generates a resistance and a density of air comparable or even superior to that of the stone itself. To this resistance the stone often yields and breaks, as would a stone crowded increasingly against an immovable and impenetrable wall. In the breaking of the meteorite the air in front falls into the vacuum following behind with instantaneous effect, and thus the detonation follows immediately on the breaking. In other and probably frequent instances the meteorite turning in the air, owing to change of form by erosion, allows the vacuum behind it to fill suddenly, and detonation ensues. In none of these instances can the phenomenon be properly called an explosion. Scientists would seem to be agreed that in describing this breaking or bursting of a meteorite in its course, it shall not be called an explosion in the sense of being due to a force acting on the mass from within outward. But they have not come to an agreement as to how the dismemberment and detonation are really caused. We do know that the final bursting is a phenomenon in that part of the meteorite's course where cosmic velocity is retained, for the fragments then thrown off have still time to acquire surfaces of secondary crust, which would almost surely not occur during any distance of gravitational fall. This means, then, a height of at least 30 miles, a height indeed which is accorded to the horizontal path of many bursting and detonating meteors. There has been a curious speculative theory originated by Haidinger, and practically accepted by Brezina and Doss, that there is a point "Hemmungs-punckt" as he calls it , where the falling meteorite finally loses its cosmic velocity, reaches for an instant a "Stillstand," and thence-forth is left solely obedient to the power of gravity. Galle who also accepts this theory adds to it a corollary, that the greater the original cosmic velocity of a meteorite the less the gravitational velocity with which it finally reaches our earth. It should be added that this point of loss of cosmic impetus will be largely determined by the angle between our earth's surface and the path of the bolide, and the consequent amount of aerial resistance which is to be overcome. We leave this subject with the single additional observation that in any clearly seen fall of a meteorite the detonation comes usually some seconds, often indeed, several minutes, after the fall, the sound coming at only 1100 feet per second, while the meteorite has traveled much faster. We have also the curious fact that when there have been several successive detonations it is the last one of these which is heard first, and so on back in the series.

The force with which meteorites strike the earth is quite variable, as we should expect from previous consideration of their relative motions. Meteorites have been known to strike on thin ice and rebound without breaking either the ice or themselves; while a 500 pound siderolite that fell at Estherville, Ia., on May 10, 1879, penetrated a stiff, clayey soil to a depth of eight feet. Another piece of the same meteorite, weighing 170 pounds, fell two miles distant and penetrated dry soil to a depth of only four and a half feet.

Recalling the date of its fall we observe that Bath Furnace is one of the Leonid shower of meteorites, whose stream the earth encounters yearly on November 14th and 15th. Although we seem to have been deprived of the main group of this stream which for many centuries passed us at intervals of 33 years and was due in 1899, but which some astronomers tell us has been permanently diverted by the pull of Jupiter, we still have a smaller yet respectable number appearing at the proper time. Possibly during the past 33 years the largest cluster of the stream has been dissipated and by attenuation more evenly distributed along its track. In any case it is interesting that so large a meteorite should have come to us in a star-shower so feeble as that of Mid-November 1902.

The rarity of a periodical star-shower furnishing meteorites to our earth, or the rarity of a meteorite fall occurring at the same date as the shower, has been frequently commented upon. The Lyrids and Perseids have indeed given no case of this concurrence. But the Andromedes gave us, Nov. 27, 1885, the siderite Mazapil. The Leonids had already three meteorite falls to their credit (Werchne Tzchirskaja, South Russia, 1843, Trenzano, Italy, 1856, Saline Township, Kansas, 1898), when on November 15th, 1902, Bath Furnace came hurtling down in a triple shower in the woods of eastern Kentucky. Prof. Farrington in describing Saline Township had drawn attention to the fact of its similarity in the leading features of its composition to the two previously fallen Leonids. And now we add a fourth, Bath Furnace, which, like its three predecessors is also a spheroidal Chrondrite, although of an intermediate type. The fine inductive work of Schiaparelli nearly half a century ago discovered the close and unquestionable relationship of the several periodic star-showers with different comets of known orbits. Thus the Andromedes are linked with the Biela comet, following its track and dropping off, as we have seen, the Mexican meteorite Mazapil as it came near our earth in 1885. And in same manner the Leonids are linked to Tempel's comet, and have dropped us four samples of the same in the last 61 years. H. A. Newton and others have pointed out the fact that all the comets had originally long, elliptical orbits, and that most of them came to us from interstellar space. Tempel's comet of 1866, which is responsible for our Bath Furnace aerolite, belongs now strictly to the solar system, having, as Kirkwood informs us, its entire orbit in the space between those of Mars and Jupiter. It was, however, originally of interstellar source, and has been captured by Jupiter and tied up to a shorter and more circular orbit, as have other comets to the number of nine. Whence the comet has brought this meteorite it would be interesting to surely know. If, as is most reasonable, from interstellar space, then our meteorite is indeed most wonderful. Interesting, too, that like one of our foreign steamers, it should have come into port exactly on the appointed day.

Returning to our aerolite itself we find on examination that its composition is a base of fine, compact olivine and enstatite, both silicates of magnesia, with abundant sparkling points of nickel iron. It also has numerous white and gray spherical chondri of like material distributed through it and breaking firmly with the mass. Its component minerals are thus allied to those of terrestrial volcanic rocks; but in common with other aerolites it shows nothing of the melted slag structure of lavas.

Stony meteorites apparently show us unchanged minerals from inner parts of the parent cosmic body, as suggested by their constantly anhydrous character and their feeble oxidation. That they bring us no new mineral elements would seem to point to their earthly origin. But spectrum analysis of the rays from other heavenly bodies indicates a similarity of composition of all bodies both from the solar system and from interstellar space. The varied direction of meteorites as they enter our atmosphere, notably the fact that some of them have an orbital motion contrary to that of the solar system, points to extra-solar origin.

A review of the chemistry of meteorites teaches us that they yield only those elements which we know to exist on our globe, and as they have not offered us a single new element we may justly conclude that the most distant regions in stellar space contain only a repetition in varying proportions and combinations of the same elementary substances as obtain upon our earth.

PROCEEDINGS OF THE ROCHESTER ACADEMY OF SCIENCE
VOL. 4, PP 203-214.

ARTHROPYCUS AND DÆDALUS OF BURROW ORIGIN

PRELIMINARY NOTE ON THE NATURE OF TAONURUS

BY

CLIFTON J. SARLE.

ROCHESTER, N. Y.
PUBLISHED BY THE SOCIETY,
FEBRUARY, 1906.

PROCEEDINGS OF THE ROCHESTER ACADEMY OF SCIENCE
VOL. 4, PP. 203-210. FEBRUARY 12, 1906.

ARTHROPHYCUS AND DÆDALUS OF BURROW ORIGIN*

BY CLIFTON J. SARLE.

The conclusion reached by the writer regarding the nature of the problematic genera *Arthrophycus* Hall and *Dædalus* (Rouault) is the result of a study of *Arthrophycus alleghaniensis* (Harlan) [*A. harlani* (Conrad), *Harlania halli* Goeppert] and *Dædalus archimedes* (Ringueberg), as they occur in the outcrop of the Medina (basal Silurian), in the Genesee gorge at Rochester, N. Y.

A. alleghaniensis is known as simple or branching vermiform ridges having numerous transverse corrugations and a median longitudinal depression. The form here called *D. archimedes* occurs as rugose plates which may be flat, vertical, and roughly U- or tongue-shaped in outline, or crimped into irregular shapes, or may form inverted archimedean spirals. One of the spirals was described by Dr. Ringueberg as *Spirophyton archimedes*. In Europe the genus is known as *Vexillum*, but finding this name preoccupied, I have adopted the name *Dædalus*, which was used by Rouault, the founder of the genus *Vexillum*, for some forms which he at first regarded as generically distinct from it.

Arthrophycus has been considered as the cast of a seaweed, a worm, the trail of various animals, branched passages, and as the result of purely mechanical forces. Its appearance has even suggested the arms of an ophiuroid. *Dædalus* has been considered as a seaweed, a sponge, and as the result of mechanical forces, for example; eddying water and rills.

The writer finds that *Arthrophycus* has a structure very similar to that of *Dædalus*, and has concluded that both are the result of the burrowing of animals.

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*This is an abstract of a paper forming part of a thesis accepted by the faculty of Yale Graduate School for the degree of Doctor of Philosophy. It was read before Section E of the American Association for the Advancement of Science, at Syracuse, July 21, 1905. The published paper will be fully illustrated.

In the Genesee gorge, *D. archimedes* occurs through the upper 30 feet of the Medina ; *A. alleghaniensis* is restricted to the lower 14 feet of this zone. The rock is a sandstone. The upper portion is argillaceous and homogeneous. The bedding planes are not pro-

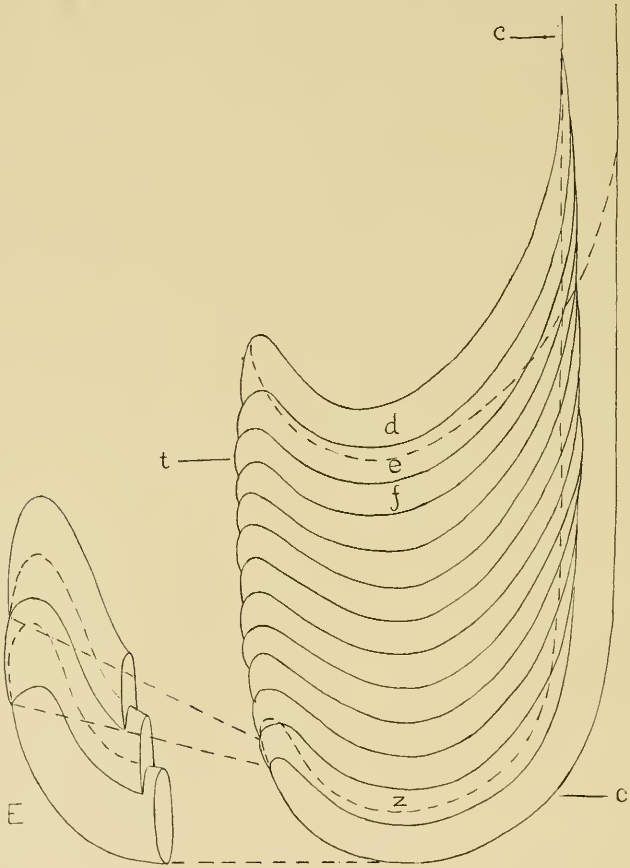

Fig. 1.—Diagram showing the general mode of formation of *Dædalus*.
The upper dotted line represents the lower side of the burrow in its first position ; the lower dotted line, the upper side of the cylinder, or burrow, in its last position ; *d*, *e*, *z*, the strips, or packings made as the burrow was shifted ; *t*, the thin edge ; E, lower portion of the last two packings and the cylinder, enlarged, showing the caplike terminations of the strips, one fitting up into another and the last ensheathing the end of the cylinder.

nounced and weathering carries the ledge back with an even face. In the lower portion, the rock is purer sandstone and the layers are separated by seams of shale which are more or less arenaceous. This portion exhibits such features as bars, cross-lamination, oblique layering, current-crests, current-channels, erosional, ripple-marked, and

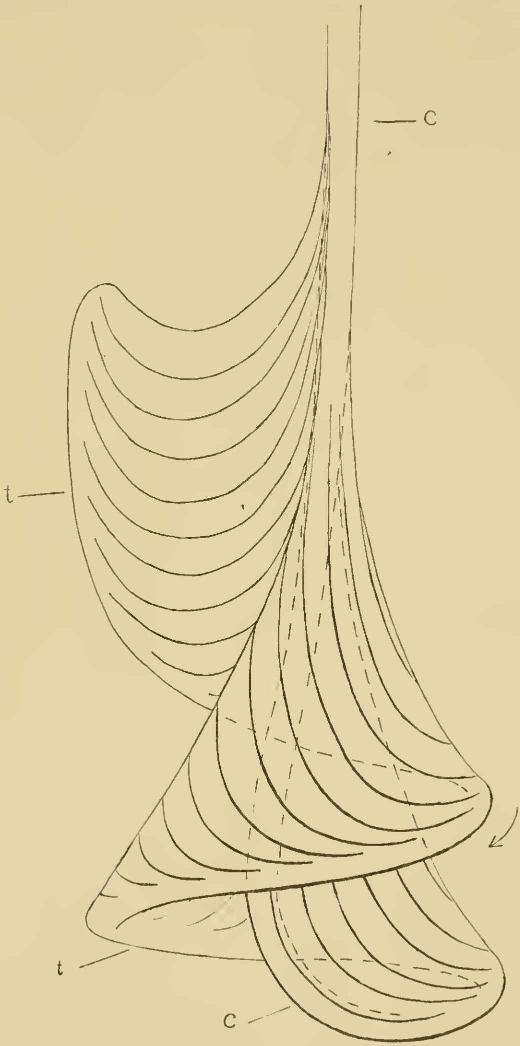

Fig. 2.—Diagram showing gradation from the vertical form of *Dædalus* to the spiral. *c*, cylinder; *t*, thin edge.

sun-cracked surfaces, and occasionally surfaces covered with brecciated matter or rolled balls of clay, indicating shallow water of fluctuating depth, in which the conditions were probably virtually estuarine. Remains of the characteristic life of the Paleozoic are completely absent.

The ridges by which *A. alleghaniensis* is known are found on the under surface of sandstone layers resting in shaly partings. They vary in width from $\frac{1}{16}$ to $\frac{3}{4}$ of an inch and in relief from almost nothing to as much as 2 or 3 inches. Usually they disappear into the sandstone at either end. In length they vary from an average of 5 or

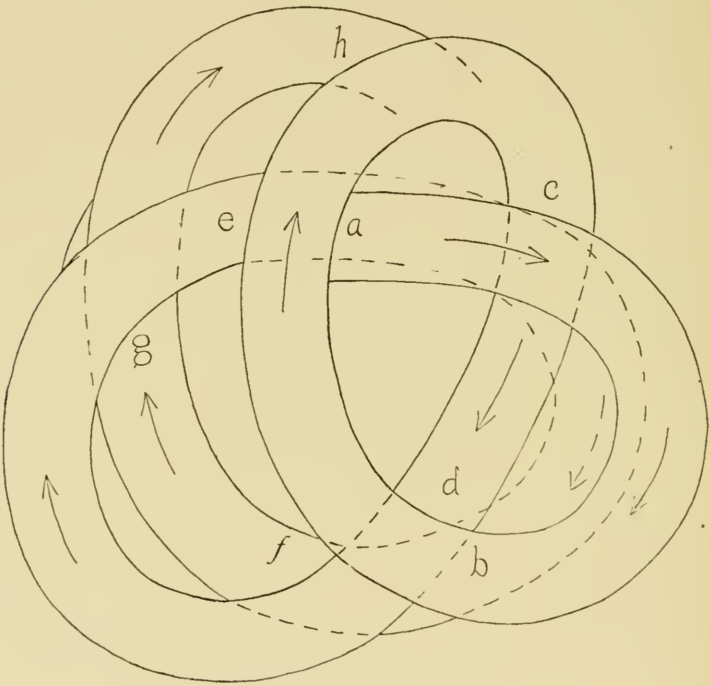

Fig. 3.—Diagram of base of a specimen of $4\frac{1}{4}$ volutions, showing self penetrations. Natural size.

The oldest portion preserved is at *a*; the direction of formation was from *a* to *b*, to, *c* to *d*, and so on.

6 inches to 40 or 50 in rare cases. Their surface is marked by regular, shallow, transverse corrugations. In addition to these, the best preserved material shows fine parallel or interfering wrinkles extending in the same direction. Usually there is a median longitudinal depression. The ridges cross and cut one another at every conceivable angle, sometimes forming flabellations.

When ridges in higher relief are examined from the side the edges of many closely appressed curved elements may be seen bearing traces of the same transverse corrugations as the base and ascending obliquely from it. Sometimes these elements can be traced some distance into the sandstone. In well weathered specimens they are found to be distinct and separable, lunate in section, the under side the convex, and generally bearing the transverse corrugations and longitudinal groove. They usually appear as branches from the upper side of the basal ridge. This ridge, however, is not a one-piece cast, but is formed of the overlapping lower ends of the elements as they thin out successively. In many instances the elements do not lie regularly one above the other, but a little to one side, so that two or

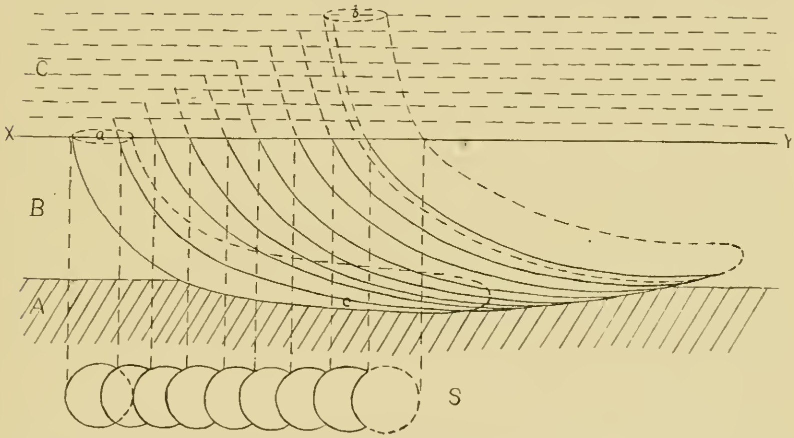

Fig. 4—Diagram showing the general mode of formation in *Arthrophycus*.
A, clay stratum; B, layer of sand in which burrowing began; C, sand deposited while the burrow was occupied. In this, the structure is more or less completely obliterated, probably because of the less stable nature of the sand near the surface. *a* and *b*, first and last positions of the burrow. The curving lines between indicate the edges of the strips, or packings, made as the burrow was shifted. S, transverse section along the line XY, showing the form and arrangement of the packings and their relation to the burrow; *c*, ridge on the under surface of a sandy layer, formed when the burrow penetrates an underlying clay stratum.

more may be at almost the same level, thus producing a thickening. Again, the displacement may be so pronounced toward the upper end as to produce flaring fascicles. These structures are found as frequently in the sandstone as projecting on its under surface. The upper parts are very rarely preserved and then, but poorly.

Frequently the study of these compound structures is complicated by their cutting through one another. Sometimes the cuttings take place in such a way that the ridges made by the bases appear to branch, and it is not unusual to find a number of them closely approximated and radiating from their intercepting ends. The casts can be separated, showing one continuous through the other. The cuttings afford the means of determining the relative ages of the structures, for the one cut had to exist before the other could cut it.

D. archimedes occurs in the sandstone and sometimes in the more arenaceous partings. The flat forms stand vertically in the rock, the rounded end down (see Figure 1). They are frequently 12 to 14 inches in depth, and at the same time rarely exceed 4 inches in breadth and ½ inch in thickness. Both faces are crossed by a series of sagging ridges ascending higher at one end than the other. The edge at which the upper ends terminate is the thicker. The ridges are the edges of curved strips, lunate in section, which saddle one upon the other. At their upper ends they thin out and lap upon a marginal cylinder so as to partially enclose it. The cylinder extends around the base, terminating in a blunt point at the thin edge. At this edge the end of each strip forms a conical cap which partially ensheathes the one beneath, the lowest capping the tip of the cylinder. In many specimens traces of corrugations like those of *Arthrophycus* occur upon the cylinder and the edges of the strips. Sometimes they are so well defined as to impart a crenulated appearance to the surface of the plate. They do not, however, occur upon the contiguous surfaces. Where a base projects into an underlying shale, it may show even the fine wrinkles.

Although many of the plates are practically flat, others are crimped and contorted into an infinite variety of shapes. Many specimens which are flat in the upper portion, have in the lower, the form of an inverted archimedean spiral (see Figure 2), either dextral or sinistral, each volution having from the side the appearance of an oblique cone with its apex in the cavity of the one above. The margin of the spiral is formed by the thin edge. At the base the cylinder appears as the continuation of this edge, rounds upward, and passes through the center of the structure. The curving strips, which in the flat plates have a general transverse direction, turn upward from the margin.

As in *Arthrophycus*, penetration of one structure by another is of constant occurrence. In the spirals the cutting of one portion by another portion is also very common. One specimen preserving 4¼ volutions in nearly the same plane, cuts itself 9 times. Several of these cuttings are represented in Figure 3 of its base.

The self-penetrations by giving the relative ages of different parts of the spirals, enable us to determine the direction of formation in *Dædalus*. Examination of specimens showing such cuttings establishes the cylinder as the terminal element and shows the direction to be a general downward one. In the flat plates the descent is direct, but in the flexuous and spiral forms it is more or less gradual or there may be none.

The cylinder is always present, but the number of component strips varies with the length. If we should in imagination trace the development of a plate back to its beginning, we should expect a continually lessening number of strips as it became shorter and shorter, until at last only the cylinder would remain. Such isolated cylinders are found. They are roughly J-shaped and at the lower end taper to a blunt point. The corrugations are limited to the under half of the surface.

In *Arthrophycus*, the direction of formation was just the reverse of that of *Dædalus*, and the last strip fitted to an overlying cylinder. Isolated cylinders having a more open curvature than those referred to *Dædalus* are sometimes associated with them.

The clue to the nature of *Arthrophycus* and *Dædalus* is given by the penetrations. They show that these objects were not organisms. The structures or portions of structures cut were in all cases casts. The spirals which penetrate themselves were already casts as far down at least as the point of penetration, while still in process of formation. Casts, of course, could exist only in the sediment.

In my opinion the isolated cylinders are the casts of simple burrows. The plates of *Dædalus* were formed by repeated packings of sediment in the upper side of the lower portion of a J-shaped burrow while it was being shifted. Each of the curved lamellæ represents a packing. The cylinder represents the burrow in its final position (see Diagram 1). The packings were made largely in disposing of sediment sifted into the burrow by tidal currents and other agencies. The direction which the shifting took adjusted the length of the burrow to the growth of the occupant. The most rapid increase in length was effected by the direct descent seen in the flat plates. The lateral shifting which generated the flexuous plates, and when uniform in direction, the spirals, became less and less effective in lengthening the burrow as the rate of descent diminished. For example, in one specimen collected, in which there are between 8 and 9 volutions and probably in the neighborhood of 800 packings, the descent is only 3½ inches. The directness of descent was undoubtedly affected to some degree by the conditions at the surface. If denudation was going on, the destruction of the upper portion of the burrow would need to be offset; if on the other hand, sediment was accumulating over the spot, the aperture would be raised and the rate of descent would be retarded according to the rapidity of deposition. Variations in the factors governing the direction of shifting resulted in the formation of plates which are flat in one portion and flexuous or spiral in another. Deviations in the direction often led to the burrow's cutting through some portion of the earlier packings which it could do just as it could through the surrounding sediment or a neighboring cast.

In *Arthrophycus* the insifting sediment, instead of being packed against the upper side of the lower portion of the burrow, appears to have been distributed along the entire under side, thus producing a progressive shifting of the whole burrow (see Figure 4).

With each shifting the lower end was extended, and this tended to keep the burrow at about the same depth and inclination; it maintained the length or increased it, the amount needed, as in *Dædalus*, depending upon the amount of sedimentation. In many cases the animal is seen to have shifted laterally, first one way then the other. From the flabellations it appears that it sometimes drew out from a burrow and made a new one beside it; for usually the cuttings show that the different series of packings comprising a flabellation were formed successively from one side of the group to the other.

The packings in *Arthrophycus* and *Dædalus* were probably made by pressure exerted by the animal's body. From their distinctness it seems likely that they were separated by some secretion, like a film of tenacious, quick-hardening mucus, added to make the material packed more cohesive. By the same pressure by which the creature compacted the insifting material on one side, it crowded itself into the sediment on the other. When this was silt, it took an impression of the minutest details of the body.

The animals which formed these burrows were probably sedentary Polychæta.

PROCEEDINGS OF THE ROCHESTER ACADEMY OF SCIENCE
VOL. 4, PP. 211-214. FEBRUARY 12, 1906.

PRELIMINARY NOTE ON THE NATURE OF TAONURUS.

BY CLIFTON J. SARLE.

Read before the Academy December 11, 1905.

Among problematic genera probably none has aroused more general interest and discussion than *Taonurus*. This genus was created in 1858 by Fischer-Ooster for fossils from the Flysch of Switzerland. To it are referable the fossils known under the names *Spirophyton* Hall, *Alectorurus* Schimper, *Physophycus* Schimp., *Cancellophycus* Saporta, and *Glossophycus* Saporta and Marion. It should also include some of the forms placed under *Taonichnites* (*Medusichnites*) Matthew, as well as those under the older genus *Zoophycos* Massalongo which do not agree with the type species *Z. caput-medusæ* in being cespitose.

As thus comprehended, *Taonurus* ranges from early Cambrian to late Tertiary and appears to be world-wide in its occurrence. It is found in both shallow and deep water deposits. Often it is so abundant as literally to make up great thicknesses of strata which may otherwise be practically barren.

The prevailing opinion among writers regarding the nature of *Taonurus* has been that it is a plant, the majority referring it to the algae, a few to the aquatic hepaticæ. It has also been regarded as an anthozoan, as the coprolite of a mud-eating animal, possibly of a holothurian, and as a mere surface marking produced by the tentacles of some creature. Other views are that it is of purely mechanical origin, produced by running or swirling water and by forces acting during or after solidification of the beds. One writer is of the opinion that different forms may have originated in different ways, namely, by the action of swirling water, by the action of waves upon attached plants, and by the movements of worms upon the surface of the sediment. Another has advanced the view, first, that it was formed by the filling of a system of branched passages, later, that it represents a spiral cavity, which he is inclined to think served as a repository for eggs rather than as a dwelling. In this connection he points out a resemblance between the form of *Taonurus* and that of the spirally enrolled spawn bands of certain gastropods. More recently he has attempted to show by experiments in blowing through a slender tube upon fluid clay, that structures analogous to *Taonurus* might be produced by various physiological movements.

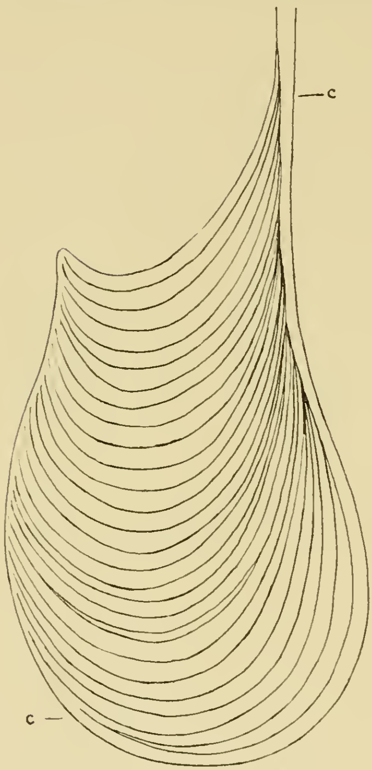

Fig. 1.—U-shaped form of *Taonurus*; *c*, cylinder.

The explanation of the nature of *Taonurus*, presented here in brief, was suggested in a recent study of *Dædalus* (Rouault)* by the general resemblance of *Taonurus* to that form. The material upon which this explanation is based is from the Esopus and Hamilton formations of the middle Devonian in New York. In collecting it special pains were taken to note the position of the fossil in the beds.

Taonurus may be described as thin plates occurring nearly horizontally in the rock, from which they are frequently separable. These may be roughly U-shaped or suboval in outline (see Figure 1) or irregularly lobate, or may form inverted archimedean spirals, either dextral or sinistral, in which the successive volutions increase in size downward (see Figure 2). An individual volution has the appearance of a flat cone with the apex directed upward. Many of the spirals are more or less lobed in outline. Both faces of these plates are marked by a series of curving lines or ridges. In the U-shaped

* "*Arthrophycus* and *Dædalus* of Burrow Origin"; Proc. Rochester Acad. of Sci. vol. 4; 1906, pp. 203-210.

or oval plates, beginning at one side they cross with a curvature nearly the same as that of the base and ascend along the other. The edge of the plate is formed by a narrow border, usually flat, but sometimes in better preserved specimens, distinctly cylindric. In the spirals the ridges radiate outward from the apex in sickle-shaped curves to meet the margin at a low angle, recalling the lines of sparks given off from a pin-wheel. In many spirals, however, at the upper end of the top volution, they are arranged in such a way as to suggest the form and appearance of one of the U-shaped plates. The free edge of the spiral is formed by the marginal cylinder, which at the base of the structure rounds in and upward and passes through the center. In some well-weathered specimens preserved in sandstone, the curved ridges are seen to be the edges of strips which are

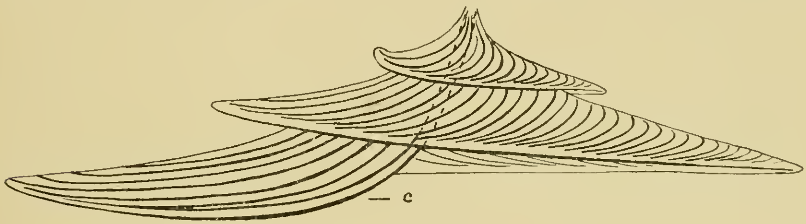

Fig. 2.--Spiral form of *Taonurus; c*, cylinder.

lunate in section and saddle one upon the other, the last of the series partially enclosing the cylinder.

Frequently these structures are found passing through others, or one part of a spiral may pass through another part. These penetrations could not have occurred had these structures been organic. The self-penetrations are always the cutting of an upper volution by a lower. This indicates downward formation. It also shows that these structures originated in the sediment, for the portions cut were casts, and as such could exist only in the sediment.

As intimated above the key to the nature of *Taonurus* was given by a study of *Dædalus*. That genus comprises simple J-shaped cylinders and U-shaped, irregularly flexed, and spiral plates, much thicker than those of *Taonurus* (see Figures 1 and 2, pages 204, 205 of this volume.) The U-shaped plates stand vertically in the rock instead of reclining, and the volutions of the spirals generally form acute cones, instead of depressed, and are practically uniform in size in the same spiral. These plates have essentially the same structure seen in *Taonurus*,—a series of curved lamellæ, lunate in section, and a marginal cylinder. They also penetrate one another and themselves, and like it were formed downward. A comparison of the two genera makes unavoidable the conclusion that they originated in the same way, that is, that *Taonurus* like *Dædalus* was formed by successive packings of sediment along the radial side of a curved burrow which was shifted with each packing, the aperture as a rule remaining stationary. The packings are represented by the lamellæ, the burrow by the marginal cylinder. The distal end of the cylinder was formed by successive fillings in the blind end of the burrow, the ascending portion, by the filling finally of the burrow itself. The burrow extended nearly horizontally in the sediment instead of nearly vertically, as in *Dædalus*. When the packing was principally in the lower portion, an elongated plate, U-shaped in outline was formed, the burrow gradually lengthening with each shifting. When the material was distributed along the side of the burrow for the greater part of its length, the displacement became lateral as well as longitudinal and resulted in the formation of a spiral plate of increasing dimensions, the burrow rounding in at the base being the generatrix of the volutions and axis of the structure. Variations in the way in which the sediment was disposed of produced corresponding variations in outline. Sometimes in the spirals the deviations in direction led to the burrow's passing through some portion of its former path, producing the self-penetrations described.

It seems likely, as in *Dædalus*, that the animal which produced these structures was a sedentary polychætous annelid.

Dictyodora liebeana Weiss, which has been compared to, *Taonurus* (*Spirophyton*) and *Dædalus*, is probably of the same nature as these.

The forms included under *Taonurus* by Saporta and others, and now recognized as belonging to the genus *Rhizocorallium* Zenker (*Glossifungites* Lomnicki), were produced by the packing of sediment along the radial side of a reclining U-shaped burrow of two openings, as it was repeatedly shifted and lengthened. The species described as *Arenicolites duplex* Williams was produced in the same way, instead of by the filling of grooves in the surface of the mud.

PROCEEDINGS OF THE ROCHESTER ACADEMY OF SCIENCE
VOL. 4, PP. 215-224, PLATES XX-XXII.

NEW OR RARE PYRENOMYCETEÆ FROM WESTERN NEW YORK

BY

CHARLES E. FAIRMAN.

ROCHESTER, N. Y.
PUBLISHED BY THE SOCIETY,
MARCH, 1906.

PROCEEDINGS OF THE ROCHESTER ACADEMY OF SCIENCE
VOL. 4, PP. 215-224. MARCH, 1906.

NEW OR RARE PYRENOMYCETEÆ FROM WESTERN NEW YORK.

CHARLES E. FAIRMAN.

Presented by title February 12, 1906.

The species here enumerated were collected at Lyndonville, N. Y., unless other locality is given. The numbers run on consecutively from the list of Pyrenomyceteæ of Orleans County, printed as pages 165-191 of this volume, to which this paper is supplementary.*

Among the Ophioboli are some species distinguished by having curved sporidia. The curves may occur at any point in the sporidium, from one-third to one-half its length. Some are straight while in the ascus, becoming curved only when free. Some of the species with curved sporidia have, also, one or more of the joints swollen, at a point varying with the species. Most of the species of this genus occur upon dead stems, and but rarely upon leaves. Hence the following species is deemed worthy of mention, inasmuch as it combines the features of curved sporidia, swollen joints, and foliicolous habitat.

355. **Ophiobolus sceliscophorus** Fairman, n. sp.

Perithecia minute, black, seated upon dead arid spots on the leaves ; asci clavate-cylindrical, mostly bent, but occasionally straight, the curvature corresponding to a similar bend in the sporidia, 90-100 x 10 μ; paraphyses not seen ; sporidia filiform, curved, 10-11 septate, the joint at a distance of 30 μ from the end, (one-third the length), slightly swollen, hyaline, about the length of the ascus, 90 x 2½ to 3 μ. (Plate XX., Fig. 1.)

On leaves of *Phlox drumondii*, in garden, Lyndonville, N. Y., 1905. Etym. from Gr. skeliskos, a little leg, and pherein, to bear.

*In reference to number 285 of the first list, *Otthia morbosa* (Schw.) E. & E., Professor P. A. Saccardo writes from Padova Nov. 11, 1905, "J'observe que vous referez d'apres votre illustre am. Ellis le *Plowrightia morbosa* au genr. *Otthia*, mais si vous pensez qu'il est un vrai parasite hypertrophisant vous resterez convencu qu'il est un type tres-distinct."

Number 331, *Lophiostoma pruni* E. & E., was found on decorticated branches of *Salix* on the beach of Lake Ontario at Shadigee, Orleans Co., Nov. 18, 1905. Det. Rehm. This is a *new habitat* for this species.

356. **Hypoderma ptarmicola** Fairman, n. sp.

Perithecia erumpent longitudinally, 1-4 mm. long, open when fresh, when dry almost closed, margin entire, regular, but sometimes curved, black externally, the interior reddish-brown to brown, and becoming sub-olivaceous when dry ; asci clavate-cylindrical, narrowed at the apex and tapering to a long filiform stipe, 74-125 x 10-13 μ, (averaging 80-90 x 10 μ.); sporidia oblong, straight or curved, generally acutely pointed at one end, 33-35 x 2-3 μ, nucleate at each end, and spuriously uniseptate from endochromatic division. (Plate XX., Fig. 2).

On dead stems of *Achillea ptarmica*, lying on ground in garden, Lyndonville, N. Y., 1905.

As a rule there are eight small nuclei in each end of the sporidium, but it can not be said that this is a constant feature. The asci are shaped like a tadpole.

This can not be the *Schizothyrium ptarmicæ*, common in Europe, upon Achillea, nor *Phacidium ptarmicæ* Schröter, which, sec. Feltgen, Vorstudien, I. Theil, No. 381, page 128, is a synonym of *Schizothyrium ptarmicæ* Desmazieres, for this is said to have oval spores, 10 μ in diam., but may be the hysteriaceous representative found in this country.

357. **Leptosphæria physostegiæ** Fairman, n. sp.

Perithecia small, black, conical, erumpent, scattered or gregarious; asci oblong cylindrical, 80-85 x 10 μ ; sporidia overlapping uniseriate, 3-5 septate, slightly, or not at all constricted at the septa, light brown, oblong fusoid, nucleolate, 20-26 x 6-7 μ.

On dead stems of *Physostegia virginiana* Benth., False Dragon-head, cultivated, in garden, Lyndonville, N. Y., Sept., 1905. The end cells are apt to be smaller and binuclear, and the middle cells larger and mononuclear.

358. **Sporormia leguminosa** Fairman, n. sp.

(Plate XXI., Figs. 1, 2, 3, 4, 5.)

Perithecia gregarious, elevating the surface of the pod into sub-hemispherical pustules, which are concolorous with the pod, and pierced at the summit by the ostiola, which vary from a sub-acute to a broad sub-compressed form ; asci clavate-cylindrical, surrounded by numerous interwoven filiform paraphyses, 140-150 x 15-16 μ ; sporidia brown, when young marked by light colored longitudinal bands, or streaks, which may be invisible in the older and opaque ones, quadrilocular, irregularly biseriate, straight, or curved, involved in mucus, 43-47 x 10 μ; end cells ovate, 13 μ long, middle cells barrel shaped, 10 μ long. On the inner surface of pod of locust, *Robinia pseudacacia* L., lying on the ground, under shrubbery, in garden, Lyndonville, N. Y., October 3, 1905. This can not be referred to *Sporormia intermedia*, var. *lignicola* Ph. et Plow., for the asci are not as broad, the sporidia are smaller, and the ostiola are different, according to the description in Sylloge, and Berlese, Icones Fungorum, Tab. XXIX., Fig. 3. The light colored bands of the young sporidia are peculiar, we think, to this species.

A distinct group of fungi inhabiting dung has been proposed, the *Fimicoli*, yet it is well known that species of *Sordaria*, *Sporormia*, etc., are occasionally, even if rarely, found on decaying vegetable tissues. Among the species of *Sporormia*, described in Sylloge, volumes II. and IX., 44 species, only 5, or eight and eight-tenths per cent. are mentioned as occurring on plants. *Sporormia lignicola* Ph. & Plow., Sacc., Syll., II., p. 128, No. 3330 is on *Fraxinus*, and has sporidia 60 x 14 μ. *Sporormia ulmicola* Pass. & Winter, Sacc., Syll., II., p. 128, is on elm and is provided with sporidia 38 x 8 μ, while form *quercina*, with sporidia 40-50 x 10 μ, is different from our specimen, in habitat and ostiola. *Sporormia gigaspora* Fuckel, on wood, Sacc., Syll., II., p. 132, No. 3342, has 8-celled sporidia. *Sporormia ticinensis* Pirotta, Sacc., Syll., II., p. 132, No. 3343, is on *Populus*, and is also 8-celled. *Sporormia brassicæ* Grove, Sacc., Syll., IX., p. 818, No. 3332, on putrescent stalks of cabbage, *Brassica* sp., has sporidia 25–35 x 4–5 μ. The "Sporormia spec.", on *Brassica*, described by Feltgen, in Vorstudien, I. Theil, Ascomycetes, p. 341, No. 1043, resembles Grove's species somewhat, having sporidia 25–27 x 7 μ. Thus it appears that *Sporormia leguminosa* is, at least, different from non-fimicolous Sporormiæ, which have been described.

359. **Amphisphæria bertiana** Fairman, n. sp.

(Plate XX., Figs. 3 and 4.)

Perithecia gregarious in indefinite clusters, or rarely, scattered, large, 300–500 μ diam., globose or ovate-globose, dull black, coarsely tuberculate-roughened, pierced by the prominent conical ostiola, which are lustrous polished black; contents of the crushed perithecia white; asci octosporous, narrow clavate-cylindrical, tapering to a very long filiform stipe, surrounded by numerous filiform paraphyses, 125–150 x 5–6 μ: sporidia uniseriate, uniseptate, the septum being very broad and dark brown, elliptical, ends obtusely rounded, not constricted at the septum, with a single large nucleus in each cell (which is very plainly seen in the young smoky-hyaline sporidia, but also observable in older specimens, by close inspection of the cell contents, which are lighter than the very dark brown septa and external cell walls), brown or olivaceous, 10–12 x 3–4 μ. In moist cavities on the end of a rotten log, in the woods, Lyndonville, N. Y., Oct., 1905. Etym. bertiana from the resemblance of its perithecia to the rough tuberculate ones of *Bertia moriformis* Tode (DeNot). I have re-examined the specimens of *Amphisphæria granulosa* E. & E., in the original collection, and find that *Amphisphæria bertiana*, while having sporidia about the same size, differs in larger, more closely gregarious perithecia, larger, shining ostiola, in long stipitate asci, and in sporidia not narrowed toward the ends, in equal cells, not constricted, and having, also, nuclei. It differs from *A. bispherica* (C. & E.), in larger, blacker perithecia, and prominent ostiola, and in long stipitate asci, and sporidia not constricted. It was associated with *Helotium citrinum* (Hedw.), and a *Nectria* with scattered perithecia having uniseriate, oblong-elliptical, uniseptate sporidia, 13 x 5–6 μ. On the blackened surface of the wood on which the fungus grew there were found many of the dark, evidently discharged sporidia of the *Amphisphæria*, and a hyphomycetous fungus with septate, branching, hyaline hyphæ, 6 μ wide, bearing at the tips, hyaline to smoky-hyaline conidia, which are oblong elliptical, 2-septate, 20 x 6–7 μ, which may be provisionally designated *Dendryphium* (?) *intermixtum*. Plate XX., Fig. 3.

360. **Leptospora stictochætophora** Fairman, n. sp.
(Plate XX., Figs. 5 and 6).

Perithecia scattered or gregarious, small, clothed with bristles which are light brown when young, becoming darker, and which are straight, not denticulate, acute tipped, with a light streak through the center of the hairs, (due, probably, to a parting or cleft in the hair, or formation of a channel, thereby giving the appearance of a stinging hair of a plant, or the sting of a bee (*Bombus*) and its poison channel), 150-250 x 7-13 μ (measurements of the hairs); asci broad fusoid-oblong, 8-spored, short stipitate, 80-90 x 10-13 μ; paraphyses indistinct in the crushed cell contents, which are white; sporidia irregularly biseriate, straight or curved, cylindrical or large allantoid, ends sub-obtusely rounded, with a large oblong-elliptical nucleus in each end, hyaline, 20-27 x 4-6 μ. Ostiolum concealed by the dense tomentum, but not ribbed. Etym. stictochætophora, bearing stinging bristles, from Greek, stizein, to puncture or prick, chaite, (N. L., chæta,) a bristle, and Gr. pherein, to bear. On hard surface of decorticated maple twig, on ground, in woods, Lyndonville, N. Y., 1905. The sporidia resemble those of *Lasiosphæria stupea* E. & E., N. A. Pyr., p. 150 and plate 19, but are *hyaline* and much smaller, the asci are also smaller, and there was no appearance of ribbed ostiola, so that all these points, and the peculiar structure of the hairs, entitle the species to specific rank.

361. **Trichosphæria interpilosa** Fairman, n. sp.

Perithecia scattered, minute, ovate-globose, sparingly clothed with dark brown hairs, which are lighter at the tips, with a minute papilliform ostiolum, asci clavate-cylindrical, 77-93 x 10 μ ; sporidia obliquely uniseriate, oblong oval to ovate, continuous, granular, occasionally assuming a sub-sigmoid form from pressure in the asci, hyaline, 13-14 x 6-7 μ. On rotten wood, Lyndonville, N. Y., Oct., 1905. The fungus occurs on lighter areas of the wood, and seems to rest upon a thin brownish subiculum, and the surface of the wood is covered with erect brownish hairs, whence the specific name, interpilosa. On the same stick, on blacker areas, were to be seen perithecia with blackish hairs, and having asci oblong clavate, paraphysate, 83-85 x 12-13 μ, sporidia fusoid, hyaline, 27 x 4-6 μ, with no visible septa. This was considered to be an immature form of *Acanthostigma decastylum* (Cooke), which Dr. William G. Farlow in Bibliographical Index of North American Fungi, Vol. I., Part I., page 3, refers to *Acanthostigma perpusillum*, DeNot.

362. **Amphisphæria abietina** Fairman, n. sp.

Perithecia scattered, or very loosely gregarious, minute, depressed sub-hemispherical, thin, when young and immature elevating the surface of the bark into light brown or concolorous pustules, when maturer becoming sub-erumpent, black at the apex, and readily removable from the surface, leaving therein a depression with flattened base, having the same color as the interior of the bark ; ostiola minute, papilliform ; asci oblong cylindrical, 100-110 x 20 μ ; paraphyses filiform, nucleolate ; sporidia 7-8 in an ascus, irregularly biseriate, elliptical, rounded at the ends, slightly or not at all constricted at the septum, when young smoky hyaline, nuceolate or granular, becoming brown, 23-28 x 6-10 μ, and uniseptate. On smooth areas on bark of hemlock, *Tsuga canadensis* Carr., in woods, Lyndonville, N. Y., Nov., 1905. This species is ambiguous between *Didymosphæria* and *Amphisphæria*. At first it is covered and wholly like *Didymosphæria* but with age becomes more superficial, and is partially denuded, with sporidia not broadly elliptical, nor as dark as Didymosphæria, but narrow-elliptical and smoky-hyaline to brownish in color.

363. **Diaporthe ailanthi megacerasphora** Fairman, n. var.

Perithecia in a yellow stroma, formed of the scarcely altered substance of the wood or bark, valsoid, black, with very long, 2-4 mm., black, simple or branched, spreading, flexuous or contorted, tuberculate roughened, sub-spinous ostiola, which are sometimes knobbed, but generally narrowed to a sub-acute, translucent, light brown tip, and which pierce the bark singly, or in erumpent fascicles of 1 to 20; asci clavate oblong, 45 x 11-12 μ; sporidia irregularly biseriate, hyaline, oblong fusoid, acute or rounded at the apices, at times sub-constricted (at length, uniseptate?), 4-guttulate, usually with one half a little larger than the other, 10-13 x 3 μ.

Etym. from Greek, megas, long, and cerasphora, horn-bearing, from the fungus bearing very long ostiola. On dead and rotting limbs of *Ailanthus glandulosus* Desf., Lyndonville, N. Y., Oct., 1905. The perithecia leave a deep excavation in the wood when picked out, and the contents are white, and waxy when fresh, and sometimes push up the bark above them and underlie it. No distinct black circumscribing line was noticed around the stroma. In the description of *Diaporthe ailanthi* Sacc., in North Am. Pyrenomycetes, Ellis and Everhart say the ostiola are quite variable and are "sometimes ½ mm. long." In our variety they are very much longer. In the Sylloge, Vol. I, p. 621, it is stated that the nucleus is yellow, that of var. *megacerasphora* is white. The peculiar tuberculate-roughened ostiola, with hyaline to light brown apices, and great length of the ostiola render this a well marked variety. The surface of the wood is covered with a thin, plane black crust. An interesting phenomenon was noticed in this species in the ejection of the sporidia. Normally these are ejected through the ostiola, at the apex, after escaping from the ascus during rupture, or *ascorhexis* (askos, a sac or ascus, and rhexis, a rupture of a vessel or organ). The ejaculation of the sporidia has received various names, according to the language of the observer. It is called ejection, or ejaculation of the sporidia, herausschleuderung, etc. A name is here proposed which is universally applicable, viz., *sporobolia* (Greek, sporos, and bolia from bole). Following Zopf, in Die Pilze, we may divide this into, *a*, simultaneous sporobolia, *b*, succedaneous sporobolia. A small piece of the black crust, and a long ostiolum were removed from the wood and placed in a drop of water on the slide, when the microscope revealed the curious fact that the sporidia were escaping from the lower, or cut end of the ostiolum, and not from the tip. This retropulsion of the sporidia, or *retrosporobolia*, was probably caused by endosmosis taking place, and the hydrostatic pressure forcing the sporidia stored up in the ostiolum to escape along the lines of least resistance, by way of the cut lower end of the ostiolum, which was larger, and, presumably, more pervious. Plate XX., Fig. 7 shows a branched ostiolum and the act of retrosporobolia, which was succedaneous.

364. **Amphisphæria æruginosa** Fairman, n. sp.

(Plate XXII., Figs. 1, 2, 3, 4.)

Perithecia scattered, or gregarious, minute, about 80 to 100 μ diam., depressed hemispherical, erumpent, black, with a minute papilliform ostiolum ; asci cylindrical, 4–8 spored ; sporidia uniseptate, overlapping uniseriate, straight or curved, narrow-elliptic, scarcely constricted at the septum, ends sub-obtuse, smoky-hyaline at first, becoming pale brown, 13–15 x 2½–3½ μ. On old board (*Tilia*) lying on the ground in school yard, Lyndonville, N. Y., Nov., 1905. Many of the sporidia are shrivelled, and the lower cell is contracted, so that a club-shaped effect is produced. The surface of the board is brown, not black as in *A. atrograna* (C. & E.), and the interior of the wood is stained green, as if caused by *Chlorosplenium æruginosum*. Specimens were submitted to Dr. H. Rehm, Neufriedenheim, München, and he writes, "wächst offenbar auf grünfaulem Holz durch *Chlorosplenium æruginosum*, und steht der *A. atrograna* (C. & E.), zunächst, verschieden besonders durch kleinere Perithecien. Ist als nova species zu erachten, und von Ihnen zu veröffentlichen." The following species were sent to Dr. Rehm for identification, and found to be new. He has kindly allowed me to publish them :

365. **Didymella arthoniæspora** Rehm, n. sp.

Perithecia sessilia, gregaria, hemisphærica, vix papillata, ostiolo perspicuo pertusa, nigra, ad basim hyphis nonnullis brevibus, fuscis obsessa, c. 100 μ diam., parenchymatice fuscidule contexta, sicca collabentia ; asci oblongi, apice rotundati, sessiles, 35 x 15 μ, 8-spori ; sporæ sub-clavatæ, medio septatæ, vix constrictæ, cellula superiore latiore, utraque 1 magniguttata, hyalinæ, 18-20 x 6-7 μ, distichæ ; paraphyses articulatæ, hyalinæ, 2.5 μ cr. (*Didymella stenocarpi* Tassi-Sacc. Syll. XVI. p. 480-proxima, sporis majoribus et paryphysibus distinctis diversa). On bark of some fallen tree in the woods, Lyndonville, N. Y., autumn of 1905, C. E. Fairman, coll.

366. **Amphisphæria polymorpha** Rehm, n. sp.

Perithecia dispersa, primitus innata, dein emergentia, globoso-conoidea, plus minusve elongato-papillata, atra, glabra, 0,5 mm. diam., ad basim hyphis crebris, ramosis, fuscis, 3-4 μ cr. obsessa, parenchymatice contexta, subcarbonacea ; asci elongato-fusiformes, apice rotundati, crasse tunicati, 210-250 x 30-35 μ, 4-8 spori ; sporæ fusiformes, rectæ, primitus utrinque acutissimæ, episporio crasso instructæ, medio septatæ, vix constrictæ, utraque cellula guttulis oleosis dilute flaveolis repletæ, hyalinæ, demum brunneolæ, versus apices minus acutatæ, medio paullum constrictæ, evanidis guttulis oleosis, 75-80 x 12-20 μ, distichæ ; paraphyses ramosæ, septatæ, hyalinæ, 2 μ cr. ("Polymorpha propter" formam et colorem variantem juvenilem ad senilem. Diversa ab *A. botulispora* (Cooke) *Sacc.* cellulis sporæ æqualibus, ab *A. closterophora* B. & Br., peritheciis multo minoribus, sporis medio vix constrictis). On bark of fallen log (probably *Ulmus*), in a wooded, marshy ravine, Lyndonville, N. Y., autumn of 1905, C. E. Fairman coll. The Latin diagnoses were furnished by Dr. Rehm.

367. **Rosellinia linderæ** Peck.

Peck, 49th Rep., 1896, page 24. On dead stems of *Lindera benzoin* Blume, Oct. 14, 1905. Asci long cylindrical, long stipitate, with filiform paraphyses ; sporidia uniseriate, oblong elliptical, brown, 10 x 3 μ. The very thick walls of the perithecia have a layer of brown cells in the interior.

368. **Hypoxylon rubiginosum** (Pers.) Fr.

On birch chips, *Betula lutea*, on the ground in the woods, Oct., 1905. Asci clavate-cylindrical, 83-85 x 7-8 μ ; sporidia uniseriate, elliptical, continuous, brown, when young binucleate, 10 x 4 μ.

369. **Nummularia clypeus** (Schw.) Cke.

E. & E., N. Am. Pyren., page 627. On trunks of fallen trees in the woods, Ridgeway, N. Y., autumn of 1905. Det. Peck.

370. **Ceratostomella cirrhosa** (Pers.) Sacc.

E. & E., N. Am. Pyr., page 196. On rotten limbs on the ground in woods, October 24, 1905. Perithecia surrounded by septate brown hairs, and provided with a long cylindrical ostiolum ; asci cylindrical, short stipitate, straight or curved, 53-57 x 6-7 μ; sporidia narrow oblong cylindrical, continous, greenish hyaline, 10-12 x 2-3 μ.

371. **Zignoella pulviscula** (Curr.) Sacc.

On chips of *Betula lutea* Michx. Woods, Oct., 1905. Probably a variety of *Zignoella ovoidea* (Fr.), which in Lindau, Hilfsbuch für das Sammeln der Ascomyceten, is given as the species found in Germany on *Betula*. Perithecia minute, black, hemispherical, minutely roughened ; asci clavate cylindrical, short stipitate, paraphysate, straight or curved, 73-80 x 10 μ (some were found long tapering stipitate, 110 x 10 μ); sporidia overlapping uniseriate, or irregularly biseriate, fusoid, straight, or curved, uniseptate, occasionally granular and nucleolate, 25 x 3-4 μ, hyaline.

372. **Cryptospora caryæ** Peck.

Peck, 38th Rep., p. 106, tab. 2, Figs 28-31. N. A. Pyr., p. 536. On dead branches of *Carya*, Oct. 13, 1905. Asci 100-120 x 12-13 μ, clavate cylindrical ; sporidia granular nucleate, spuriously septate, hyaline, 37 x 6-7 μ, a little smaller than Ellis states. Needs to be studied in all its stages of growth, so as to be compared with *Pseudovalsa fairmani* E. & E.

373. **Hypomyces insignis** B. & C.

E. & E., N. A. Pyr., p. 76. Syn. *Hypomyces transformans* Peck, in 39th Rep. N. Y. State Museum, page 57. On *Cantharellus*, in the woods, August, 1905. In our specimens the sporidia are hyaline, uniseptate, apiculate at each end, 33 x 6-7 μ. Ellis says 37 μ long, but Peck makes them 33-38 μ long.

374. **Hypocrea contorta** (Schw.) B. & C.

Syn. *H. Schweinitzii* (Fr.) in N. A. Pyr., p. 79. On dead branches, in the woods, 1905. Det. Peck.

375. **Hypocrea gelatinosa** (Tode) Fr., var. *viridis* Tode.

E. & E., N. A. Pyr., p. 84. On rotten log, woods, Autumn, 1905. The stroma, at first, is of a light transparent color, which turns yellow, then becomes pulverulent green on the surface, from the greenish sporidia. Accompanied by *Trichoderma viride* Tode, conidial state.

376. **Gibberella saubinettii** (Mont.) Sacc.

On dead grass stems, in the woods, Sept. 7th, 1905. Perithecia conoid, bluish when crushed; sporidia triseptate, slightly constricted at the septa, hyaline, 20-27 x 4 μ.

377. **Lophiostoma cæspitosum** Fuckel.

On dry corticated branches of *Ulmus*.

378. **Lophiostoma simillimum** Karst.

Syn. *Leptosphæria achilleæ* Sacc., *Lophiostoma bicuspidatum* Cooke. Sacc., Syll., vol. II., p. 707, Berlese, Icones Fungorum, Fasc. I., p. 12 and Tab. VII., Fig. 5. On dead stems of cultivated *Helianthemum mutabile*, on the ground, in garden, Sept. 15th, 1905. The fungus blackens the stems wherever it appears. Asci elongated, clavate-cylindrical, 75 x 12 μ; sporidia 5-septate, straight, or curved, armed at each end with a hyaline appendage, brown, 20 x 6-7 μ.

379. **Hysterographium variabile** (C. & P.) Sacc.

On dead wood. Det. Peck.

380. **Hysteropatella prostii** (Duby) Rehm, var. *vixvisibilis* Gerard. Rehm, Discom., p. 267. Cfr. Shear, New York Fungi, 183.

On bark in the woods, Autumn, 1905. Det. Rehm.

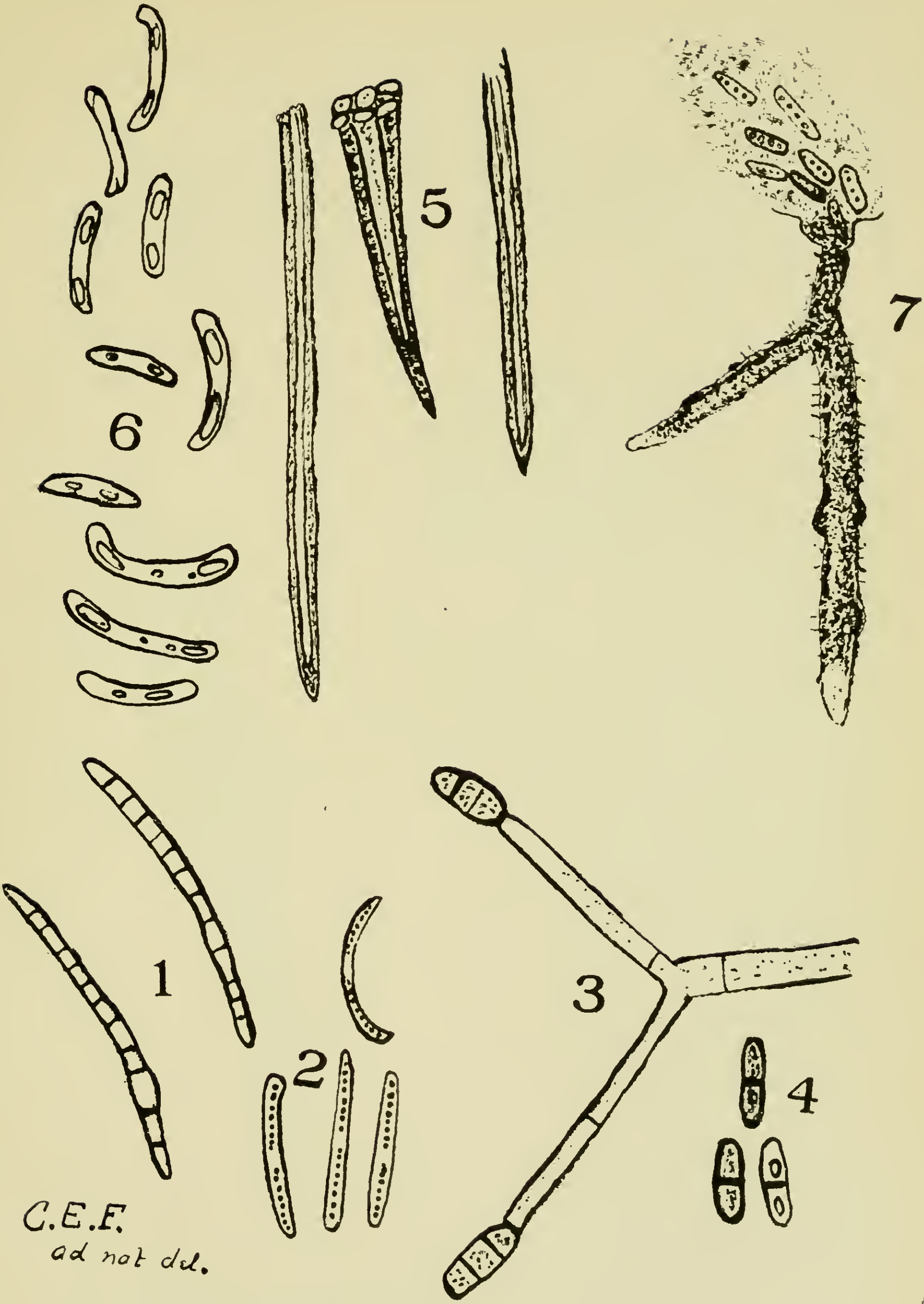

Fig. 1.—Sporidia of *Ophiobolus scetiscophorus*.
Fig. 2.—Sporidia of *Hypoderma ptarmicola*.
Fig. 3.—Hyphomycetous growth accompanying *Amphisphæria bertiana*.
Fig. 4.—Sporidia of *Amphisphæria bertiana*.
Fig. 5.—Hairs of the perithecia of *Leptospora stictochætophora*.
Fig. 6.—Sporidia of the same.
Fig. 7.—Ostiolum of *Diaporthe ailanthi*, illustrating retropulsion of the sporidia

PYRENOMYCETEÆ.

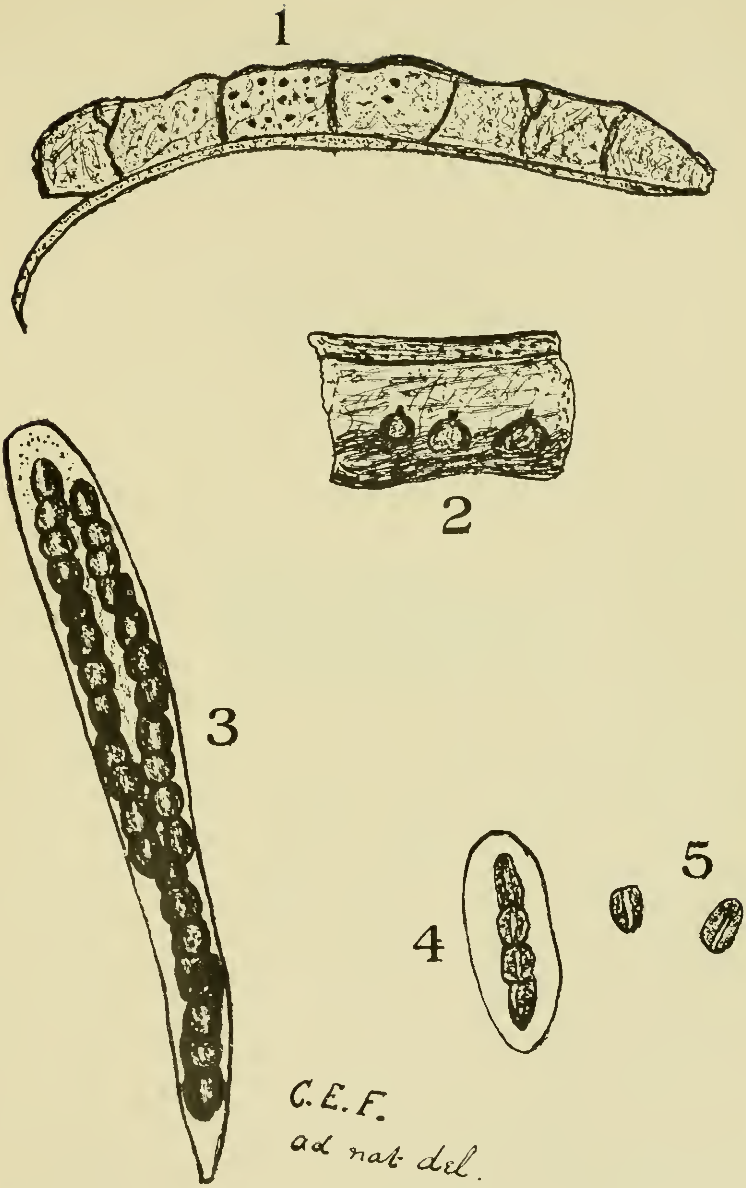

Fig. 1.—Pod of *Robinia* with the fungus, *Sporormia leguminosa*.
Fig. 2.—Portion of the same more highly magnified.
Fig. 3.—An ascus and sporidia.
Fig. 4.—A sporidium, involved in gelatine.
Fig. 5.—Two cells of the sporidium showing the light-colored bands across the face.

SPORORMIA LEGUMINOSA.

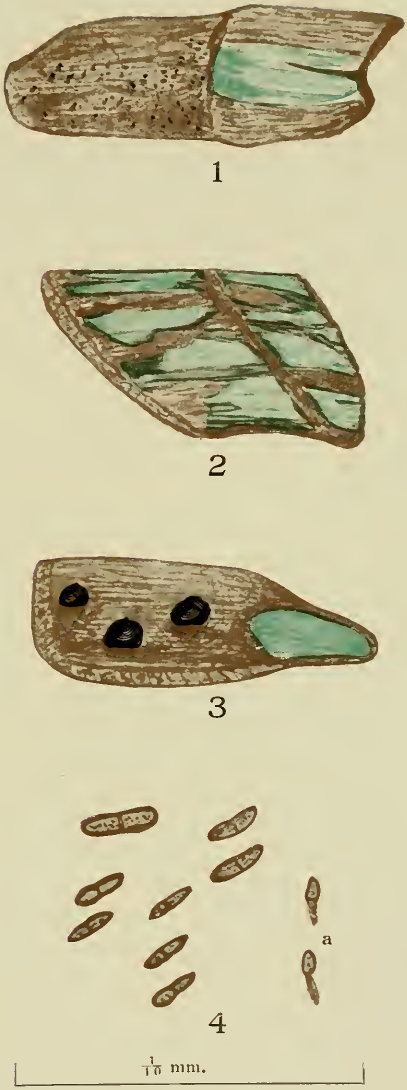

Fig. 1. Section of basswood board, showing perithecia. Natural size.
Fig. 2. Under surface of the same board, showing the green discoloration.
Fig 3. Fragment, highly magnified.
Fig. 4. Sporidia of the fungus, showing at *a* some dessicated and shrivelled specimens, somewhat club-shaped.

AMPHISPHÆRIA ÆRUGINOSA FAIRMAN.

PROCEEDINGS OF THE ROCHESTER ACADEMY OF SCIENCE
VOL. 4, PP. 225-231, PLATES XXIII-XXV.

THREE NEW CHILIAN METEORITES

BY

HENRY A. WARD.

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THREE NEW CHILIAN METEORITES.

BY HENRY A. WARD.

Read by Title, January 22, 1906.

During a visit in the spring of 1905 to places along the coast of Chili, from the southern border of Peru southward to Valparaiso, with inland excursions, the writer had the pleasure of examining a number of interesting meteorites. Three of these being new to science, he takes the present occasion to put them upon record with a preliminary description. We first notice the siderite

ILIMAES.

This most interesting pallasite is in the mineral collection of the Lyceo, at the small city of Copiapo, Chili. We first saw it there in 1889; a huge, dirty mass on the floor under a table. My efforts to obtain a specimen piece by exchange, were met by the remark that it would require a year of correspondence with the authorities at Santiago. In late years there has been a change in the administration of the Lyceum. It now possesses, as an important adjunct, a School of Mines (Escuela de Minas), of which the able director is Señor Casimiro Domeyko, son of the well-known Ignacio Domeyko, geologist and naturalist, celebrated in the scientific annals of Chili during the middle half of the last century. The meteorite is now mounted on a stand, and adorns a central part of the fine Museum. Its label records that it came from Imalaes (sic) 12 leagues southwest from Taltal, Department of Taltal, Province of Atacama. Its weight is given as 95 kilograms. It measured about 16 x 10 x 8 inches, and appeared to be an entire boloid, with the exception of a few corners which had been cut from one side by Professor Domeyko in the effort to obtain a polished surface.

The main portion of the exterior was covered by a thick coating of melted matter, or crust, which was broken by several areas, of several square inches each, where masses of almost clear olivine, held but slightly together by the iron network, lay grouped usually at a little lower level than the general surface. Through the kind favor of Professor Domeyko, aided by a satisfactory exchange, we were allowed to take the mass to the Railroad Machine Shops at the port of Caldera, 40 miles away, and there in several days of heavy work, cut off a piece weighing 16.7 kilograms, or about 37 pounds. Plate 23 shows the two masses after the cutting. The form of the entire original boloid is thus evident. On the upper piece (the one now in the possession of the writer) the deep melting and flowing of the crust is very apparent. The whole surface is not only changed in texture and blackened, but it appears as if rubbed down under heavy pressure. The thickness of this crust is from 0.3 to 0.5 mm., being thicker above the stony than above the iron part of the mass. It is, in the main, tightly adherent, but in a few places it may be flaked off. The section (Plate 24, fig. 1) shows it as a molten slag, or mixture of metal and stone, with the metal more settled in its lower, inner surface. At some places in its thin mass there are fine points of bright metal, doubtless pure nickel iron. The upper surface is of a dull black color, matt, and in places having a certain bloom appearance. Quite exceptional among all the pallasites with which the writer is acquainted, although approximated by Marjalahti, is the thickness and firm investment of this outer crust. Within, the constituents and structure of the mass are not less interesting. It is a combination of nickel iron and of silicates, with the usual pallasite grouping, the iron making cells which are filled by the latter. A polished surface shows a broad, stout network of bright iron surrounding cells which are polygonal in form, with walls more angular than curved, enclosing polyhedral crystals of stony matter, partly broken and the fragments sometimes partly separated by blades of the iron. In this feature Ilimaes belongs to the Rokicky Group of Brezina, taking its place with Brahin (Rokicky), Admire, and Eagle Station. In this it differs from pallasites of the Imilac and the Krasnojarsk group, where the cells have almost uniformly rounded walls, conformed to the rounded, instead of angular olivine crystals. The olivine in Ilimaes is a bright, clear yellow and greenish yellow color, in crystals which vary from small grains to pieces from 5 to 10, and even 15 mm. across. Sometimes these are bunched together in areas from 3 to 5 cm. in either diameter, with no intervening iron. In Plate 20 one of the patches of olivine is visible on the surface at left hand of the upper mass; and two of them show in the lower mass.

Plate 24 presents a slice of Imilac below a slice of Ilimaes, showing well the different cell-structure of the two pallasites.

By careful separation of the olivine from the iron particles in 200 grams of the matter, as it fell from the machine in the cutting, we found the former to be 70 grams and the latter 130 grams; a ratio of 54 per cent. of the olivine to the iron. In volume there are 10 parts of olivine to 8 per cent. of iron, assuming specific gravity of the mass as 7.7 and that of the olivine as 3.4. In the Ilimaes the coarse structure of the olivine crystals makes great contrast with the almost flour-like grain of much of either member of the Imilac group, Imilac or Marjalahti. In the latter of these, in all the peripheral portion of the mass, it is so uniformly fine that it has the semblance of having been crowded into the cells as a powder. Borgström ventures the surmise that the crystaline olivine has been brought to this mealy state by the sudden shock received by the heavy mass as this meteorite struck the rock on which it fell. We are pleased to interrupt our brief description of Ilimaes by giving in full a letter, at this moment received from Dr. Aristid Brezina, of Vienna, to whom we, some weeks ago, had sent a small slice of the iron. Dr. Brezina writes:

"The section weighing 127 grams of a pallasite labeled Ilimaes which you sent me is at hand. It shows the following microscopic and macroscopic particularities.

"The olivines of brown color measure usually from 3 to 17 mm. in length and 2 to 13 mm. in breadth; rarely they appear as small particles of 0.5 to 2 mm. in diameter. They show in general polyhedral edges; very rarely they have rounded edges, which occurs in the smallest individuals only. Schreibersite occurs abundantly, and in three forms (respective ages) *a*, individuals of 1-4 mm. following immediately after the olivine; *b*, small veins between the grains of wrapping kamacite, and *c*, microscopic grains and crystals in kamacite near its boundaries against taenite, apparently as products of cohesion of this latter. Wrapping kamacite is rather broad, from 0.5 to 4 mm. in thickness. Taenite is 0.05 to 0.2 mm. thick ; its borders to kamacite are often corroded and replaced by chains of small schreibersites. The plessite fields show in general a confused mixture, rarely crystalline deliquifying. The olivine fills 58% of the cut face, nickel iron 38.7%, schreibersite 2.5%. The volumes calculated with the cubes of the square roots of these numbers and the specific gravities 3.4, 7.8, 7.2 respectively give the percentage of weight of olivine 41.5, nickel iron 50.8, schreibersite 7.7. The position of this pallasite in the system is intermediate between the Imilac group and the Rokicky group.

"Imilac and Marjalahti both show polyhedral olivine, but differ from Ilimaes by their double boundaries of taenite and by their crushed olivines, while in the new pallasite the olivines seem wholly or nearly entire. Rokicky and Admire have polyhedral olivines, which in Rokicky are entire as in Ilimaes, while in Admire they are broken and dislocated, with nickel iron filling the distance between the parts.

"Thus the nature of the olivine puts Ilimaes nearer to Rokicky than to Imilac. The nickel iron ón the contrary resembles more that in Imilac ; the strong development of wrapping-kamacite, its puffy borders against the fields, the lack of central skeletons, as well as the mode of occurrence of schreibersite is the same in both meteorites.

"With the pallasites of the Krasnojarsk group it holds few or no relations ; of these pallasites only Alten (Finmarken) shows polyhedral olivines besides rounded ones.

"In summary, the new pallasite Ilimaes seem to be a distinct fall, appertaining to the Rokicky group."

With this important contribution from Dr. Brezina, we close our notice of the structure and contents of the Ilimaes pallasite. We wish to add a word as to the provenance of the meteorite in question. We have at the outset noticed the label upon the Copiapo mass with the locality Imalaes, as there given. A fortnight later, however, we met in the office of the Director of the School of Mines in the capital city, Santiago de Chili, Señor Don Emeterio Moreno, introduced as the finder of the pallasite in question, and as its donor to the Copiapo Museum. Señor Moreno told me of having himself found the meteorite about 1874 or 1875, at Ilimaes, on the desert of Atacama, about 12 leagues to the south of Taltal. This point corresponds closely with the locality of the Copiapo specimen, given me (in letter now before me) by Professor Domeyko—"Latitude 26°, longitude 70°," though he has labeled the mass Imalaes. Further, it is satisfactory to find, in a description of an iron meteorite acquired for the Vienna Museum in 1870, that Professor Tschermak notes that "the only information as to its locality was given on a label, which stated that it was brought by Herman Schneider, a student from Valparaiso, from Ilimae, about 26° S. latitude and 70° W. longitude." Now, as this locality is geographically the same, it is undoubtedly, as Fletcher has noticed, a question of misspelling.

The distance to Imilac from Ilimaes is about 170 miles in a northeasterly direction. Other pallasite fragments of the Imilac group have been found still further north and northwest. A meteorite was, indeed, found in 1861, at Vaca Muerta, which is about 40 miles west-of-north of Ilimaes, and another in 1875, at Taltal, which is nearly the same distance to the north. But the former of these was a mesosiderite of the Grahamite group, and the other an aerolite, of which little is known. This still leaves the Ilimaes meteorite isolated by 160 or 170 miles from any other recorded pallasite locality. This distance, too great for the probable limits of a straggling member of a meteorite fall, adds further support to the differences in microscopical character, as before noticed, in considering our meteorite as distinct from Imilac, and calling it from its place of find,—Ilimaes.

COBIJA.

In a short visit to the School of Mines in Santiago de Chili, in April of 1905, I was shown by Señor Julio Laso, the Mineralogist and Custodian of the Collections, two meteorites, a stone and an iron, which he informed me were new to science, having never been closely examined or described. One of these was found by Professor Laso himself, in February, 1892, on the pampa of Santa Barbara, in the Department of Antofogasta, a short distance eastward from the town of Cobija. The mass (Plate 25, fig. 1), which had the shape of a lengthened sphere, was about 14 x 12½ x 11 cm. in length, breadth and thickness, or about the size of a child's head. One side of the sphere was flattened, so that sections of the mass were of a certain horseshoe shape. One end is also flattened. Half of its surface, with a narrow strip leading along at right angles on one side, has a well-developed crust with a granulated pitting. The exterior surface of the main spherical portion of the mass shows a tendency to flake or shell off, although still firm in texture. This character is also manifest on the flat end, where a portion 50 mm. in thickness has at some time been removed, naturally or by applied force. The whole exterior of the mass is of a dark brown color, slightly tinged with reddish hue at the more oxidized places. The color of the crust is somewhat darker and less dull than the balance. In fact, this crust is quite shining or varnished at places. The fractured stone is of a very even granular structure, with no separate or distinct crystalline surfaces, but it is lightened everywhere by very minute shining points which, even to the naked eye, show themselves as grains of bright metallic iron. Among these are other less bright points of troilite. Both are myriad in number, and together they constitute fully one-third in volume and more than one-half in weight of the whole mass. The silicates are bronzite and olivine, closely blended and chondritic in character. These chondri, clearly apparent only with a glass, are so crystalline and firmly united that they break with the mass. This compactness is somewhat enhanced by a slight oxidation which has the effect of binding all closely together, and at the same time of obscuring the visible structure. We place Cobija unhesitatingly among the crystalline chondrites Ck. It very closely resembles both Klein Menow and Pipe Creek, but differs from the former in being more compact and from the latter in not being veined.

The weight of the original mass of Cobija was 3,690 grams. The largest remaining piece, weighing 1,805 grams, is in the Ward-Coonley Meteorite Collection.

CHANARAL.

In the mineral collection of the School of Mines at Santiago de Chili, is a small siderite which is especially interesting by reason of its form and perfection of surface markings. I owe to Professor Julio Laso, the able and courteous custodian of the collections, the privilege of photographing the specimen, together with a fragment for analysis and for my own collection. Professor Laso informed me that this iron was found in 1884 by Don Roberto Bugde on the desert of Atacama, a short distance in the interior from the Port of Chanaral. This is latitude 26° 30′ S. and between longitude 70° and 70° 30 W. In fact, it is very near to the locality before given for the pallasite Ilimaes. The meteorite

(Plate 25, fig. 2) is in the shape of a sickle, with a main arm five centimetres wide, tapering thence along its curve to a sharp point. Its length across the curve is 12.7 cm., and vertically 7.8 cm. Its average thickness is $3\frac{1}{2}$ cm. Its weight is 1,207 grams.

This is singularly well preserved, with no signs of oxidation and without marks or bruises upon one of its faces. That face is sculptured over its entire area by a series of shallow cavities or pittings, which are in general rudely circular and about 1 cm. in diameter, but a few of them along the outer curve of the mass are so lengthened and confluent that they produce two shallow valleys 1 cm. in width and prolonged for 6 cm., with a sharp crest about 8 mm. high between them. These valleys are in their turn replete with many small folds or wrinkles not more than 2 mm. in height. A crust or skin of a fine black color covers this entire face. The opposite face is covered over its upper or peripheral portion with pittings which are somewhat larger (8 to 10 mm.) across, with proportional depth, and in all cases with circular rims. The lower half of both limbs is, upon this rear side of the mass, worn or decomposed away, the pittings being dimmed or entirely obliterated. The small fragment which I possess of this iron shows on its etched face of 3 square centimetres, well-marked Widmannstäten figures with lamellae running very evenly 1 mm. in breadth, thus giving this iron place as a medium octahedrite in Brezina's classification. An analysis made by Professor Henry W. Nichols, chemist of the Field Museum of Natural History of Chicago, gives:—Nickel, 5.37 per cent., Iron, 95.97 per cent.

One-fourth natural size.

ILIMAES METEORITE.

Henry A. Ward.

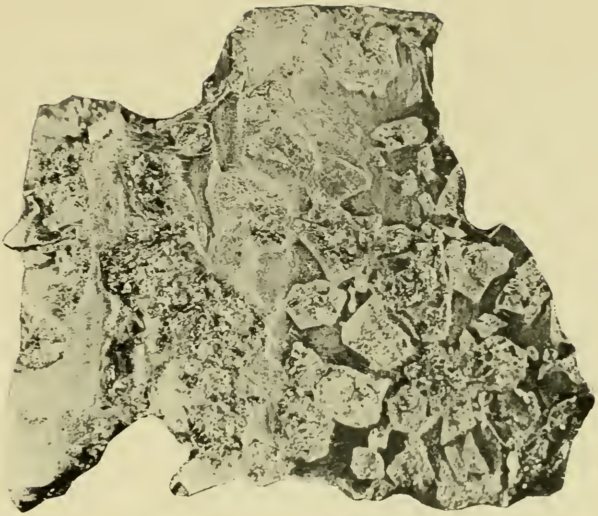

FIG. 1. SECTION OF ILIMAES.

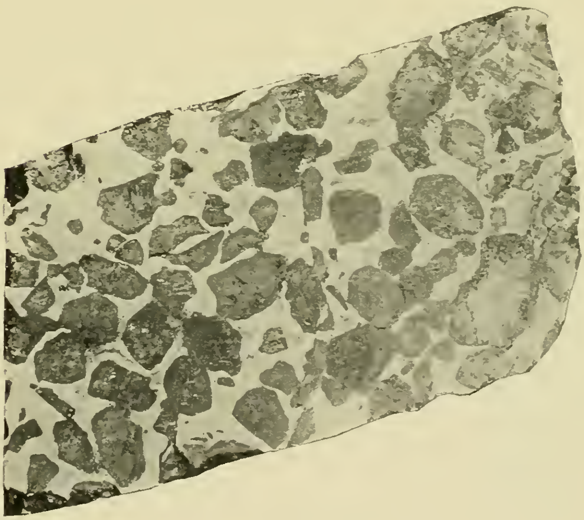

FIG. 2. SECTION OF IMILAC.

SECTIONS OF ILIMAES AND IMILAC METEORITES.

HENRY A. WARD.

FIG. 1. COBIJA METEORITE.
Two-thirds natural size.

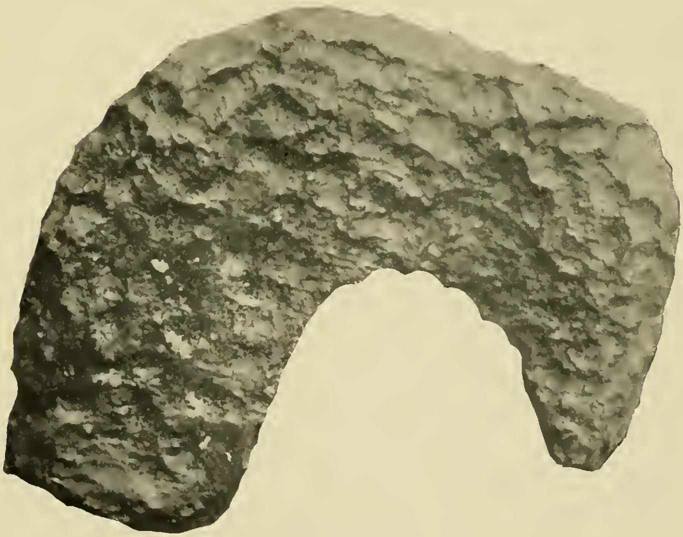

FIG. 2. CHANARAL METEORITE.
Two-thirds natural size.

COBIJA AND CHANARAL METEORITES.

HENRY A. WARD.

PROCEEDINGS OF THE ROCHESTER ACADEMY OF SCIENCE
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OF

VOLUME 4.

OFFICERS, MEMBERS, LIST OF PAPERS,

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ROCHESTER, N. Y.
PUBLISHED BY THE SOCIETY,
MARCH, 1911.

LIST OF PAPERS READ BEFORE THE ACADEMY.

DATE.	AUTHOR	PAPER.
1902		
Jan. 14,	H. L. Fairchild,	"Our Society; It's Retrospect and Prospects."
Feb. 11,	Geo. W. Goler,	"Smallpox in and about Rochester."
Mar. 10,	Henry C. Maine,	"Long Distance Weather Forecasting."
Oct. 13,	Harry L. Preston,	"The Franceville Meteorite."
Oct. 27,	Mary E. Macauley,	"Flowering Plants and Ferns in and around Hyannis, Mass."
Oct. 27,	Wm. D. Merrell,	"Causes of the Autumnal Colorations of Leaves."
Nov. 10,	H. L. Fairchild,	"Glacial Lakes of Western New York."
Nov. 24,	W. V. Ewers,	"The Relation of Mosquitoes to Malarià."
Dec. 8,	E. Howard Eaton,	"Birds and Bird-nests."
1903		
Feb. 9,	L. B. Elliott,	"Some Technical Features in the Manufacture of Photographic Lenses."
Mar. 9,	H. L. Preston,	"A New Meteorite."
Mar. 9,	J. E. Putnam,	"Electrolysis in Rochester."
Mar. 23,	L. B. Elliott,	"Recent Developments in Projection Apparatus and Methods."
Apr. 13,	Irving P. Bishop,	"Through Scotland with a Camera."
May 11,	Otis A. Gage,	"Spectra and their Applications."
May 25,	S. P. Moulthrop,	"Footprints of our Predecessors."
June 8,	G. W. Goler,	"Relation of Food to Health."
Nov. 9,	J. Y. McClintock,	"Unique Possibilities of Water-power Development through New York State."
Nov. 23,	E. H. Eaton,	"This Year's Migration of Shore and Water Birds near Rochester."
Dec. 14,	J. H. Schmitz,	"Switzerland."
1904		
Jan. 25,	W. D. Merrell,	"The Real Food of Plants."
Mar. 14,	H. L. Fairchild,	"European Notes."
Mar. 28,	H. L. Ward,	"The Willamette Meteorite" (read by H. L. Preston).
Apr. 11,	J. E. Woodland,	"Thermit."
Apr. 28,	C. W. Dodge,	"Hemlock Water and its Sanitation."
May 12,	H. G. Dorsey,	"The Water Bucket Forge" and the "Nernst Lamp."
May 26,	H. L. Fairchild,	"Theories and Problems in the Glacial History in this Region."
June 9,	E. H. Eaton,	"Birds nesting in this vicinity."
Oct. 13,	H. A. Ward,	"Great Meteorite Collections" (read by title).
Oct. 27,	J. E. Woodland,	"Geological Forces at Work."
Nov. 14,	H. L. Fairchild,	"Glacial Erosion and the Finger Lakes."
Nov. 28,	Henry A. Ward,	"Meteorites."
Dec. 12,	John M. Clarke,	"The Commercial Invasion of Niagara Falls."

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Jan. 16,	Albert P. Brigham,	"Geographic Influences in American History."
Jan. 23,	John Dennis,	"Inductive Lecture on the Telephone."
Feb. 13,	C. E. Fairman,	"The Pyrenomyceteæ of Orleans Co., N. Y." (by title).
Feb. 13,	H. A. Ward,	"The Bath Furnace Aerolite" (by title).
Feb. 13,	Wm. G. Parkes,	"The Philippine Islands, their People and Products."
Feb. 27,	Norman H. Stewart,	"In the Canadian Woods."
Mar. 13,	B. W. Law,	"Lantern Lecture on Cuba."
Mar. 27,	Ezra M. Sparlin,	"The Yellowstone Park."
Apr. 13,	G. O. Shields,	"Timber that grows at Timber-line."
Apr. 28,	Chas. F. Binns,	"History and Development of the Potters' Art."
May 8,	H. D. Minchin,	"The Kinetic Theory."
May 22,	Florus R. Baxter,	"Petroleum."
June 12,	Chas. T. Howard,	"Metamorphosis of Insects."
June 12,	F. W. Ross,	"Pupation of Vanessa in Detail."
Oct. 23,	Franklin Hanford,	"Beacons of the Sea."
Nov. 20,	H. L. Fairchild,	"The Drumlin Hills of Western New York."
Dec. 11,	C. J. Sarle,	"The Clinton Formation at Rochester."
Dec. 11,	C. J. Sarle,	"Arthrophycus and Daedalus of Burrow Origin."
Dec. 11,	C. J. Sarle,	"Preliminary note on the Nature of Taonurus."
Dec. 11,	E. H. Eaton,	"The Birds of Mount Marcy."
1906		
Jan. 22,	Henry A. Ward,	"Three New Chilian Meteorites."
Jan. 22,	Albert S. Osborn,	"Questioned Documents and Detection of Forgery."
Feb. 12,	C. W. Dodge,	"A Proposed Biological Survey of New York State."
Feb. 12,	Arthur Rathjen,	"Building Stones of Rochester."
Mar. 12,	Arthur S. Walls,	"The Growth of the Ceramic Art and its Importance to Electrical Industry."
Apr. 5,	W. C. Dudley,	"The Colors of Animals."
Apr. 23,	Wm. M. Bennett,	"The Rainbow."
Nov. 12,	Myron T. Bly,	"Southern Mountaineers."
Nov. 27,	H. L. Fairchild,	"Coon Butte ; Meteor Crater."
Dec. 18,	H. L. Fairchild,	"Recent Discoveries in Glacial Lake History of Western New York."
1907		
Jan. 15,	E. P. Felt,	"The Gipsy Moth and other Important Leaf-feeders."
Feb. 12,	C. W. Dodge,	"Jamaica."
Feb. 26,	E. H. Eaton,	"Life Forms of New York State as shown by Avifauna."
Mar. 11,	Mary Macauley,	"Chattanooga and Vicinity."
Mar. 25,	G. H. Chadwick,	"Spiders."
Apr. 9,	Wm. D. Merrell,	"Similarity of Primary Animal Motion to the Movements of Plants."

DATE.	AUTHOR.	PAPER.
1907.		
Apr. 22,	RAYMOND H. ARNOT,	"New Zealand."
Feb. 26,	CHAS. S. SARGENT,	"Crataegus of Ontario" (by title).
May 13,	H. A. CARPENTER,	"The Modern Theory of Solution."
May 27,	JOSEPH P. O'HERN,	"Norway, Iceland and Spitzbergen."
Oct. 28,	S. H. DEVIRIAN,	"Oriental Rugs."
Nov. 25,	H. L. FAIRCHILD,	"Glacial and Marine Waters of Northern New York."
Dec. 9,	THOS. P. CAROLAN,	"Rapid Motion Photography."
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Jan. 27,	MILTON B. PUNNETT,	"Various Color Processes of Photography."
Feb. 10,	JULIAN B. COCHRANE,	"A Yankee Traveler in Japan."
Feb. 24,	C. W. DODGE,	"The Maine Wilderness."
Mar. 9,	NORMAN W. CARKHUFF,	"The Ozobrome Method of Picture Making."
Mar. 30,	S. H. DEVIRIAN,	"Life in Asiatic Turkey."
Apr. 27,	JULIAN M. COCHRANE,	"Pelee and other Volcanoes I have known."
May 11,	HENRY C. MAINE,	"Life History and Topography of the Moon."
May 25,	RALPH S. PADDOCK,	"Local Bird Studies with the Camera."
Nov. 9,	H. L. FAIRCHILD,	"Results of Last Summer's Field Work."
Nov. 23,	C. W. DODGE,	"Biology of Insects."
Dec. 21,	CARLOS E. CUMMINGS,	"Alaska and its Glaciers."
1909		
Jan. 11,	H. L. FAIRCHILD,	"New Facts Relating to Disappearance of the Ice Sheet from New York State."
Jan. 25,	CHAS. W. HARGITT,	"Some Problems of Animal Behavior."
		Darwin Memorial Meeting—
Feb. 22,	C. W. DODGE,	"Life and Work of Darwin."
	H. L. FAIRCHILD,	"Darwin and Geology"
	WM. D. MERRELL,	"Darwin and Botany."
Mar. 8,	H. L. FAIRCHILD,	"Origin of the Valleys of Western and Central New York."
Apr. 12,	E. A. RUMBALL,	"Life among the Newfoundland and Labrador People."
Apr. 26,	H. E. LEE,	"Porto Rico and its People."
June 4,	STORRS B. BARRETT,	"Recent Work in Astronomy at the Yerkes Observatory."
Nov. 22,	H. J. SIDDONS,	"Egypt and the Mediterranean."
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Jan. 24,	H. L. FAIRCHILD,	"The Lakes of Western New York."
Feb. 14,	H. L. FAIRCHILD,	"Trip to Alaska and the Canadian Rockies."
Feb. 28,	F. L. LAMPSON,	"Irrigation in Western New York."
Apr. 11,	C. W. DODGE,	"Nervous Activities of Plants."
Apr. 25,	JULIAN M. COCHRANE,	"Americanizing the Filipino."
May 9,	H. D. MINCHIN,	"Comets."
May 23,	CHAS. C. ZOLLER,	"A Talk on Color Photography."

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