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BULLETIN

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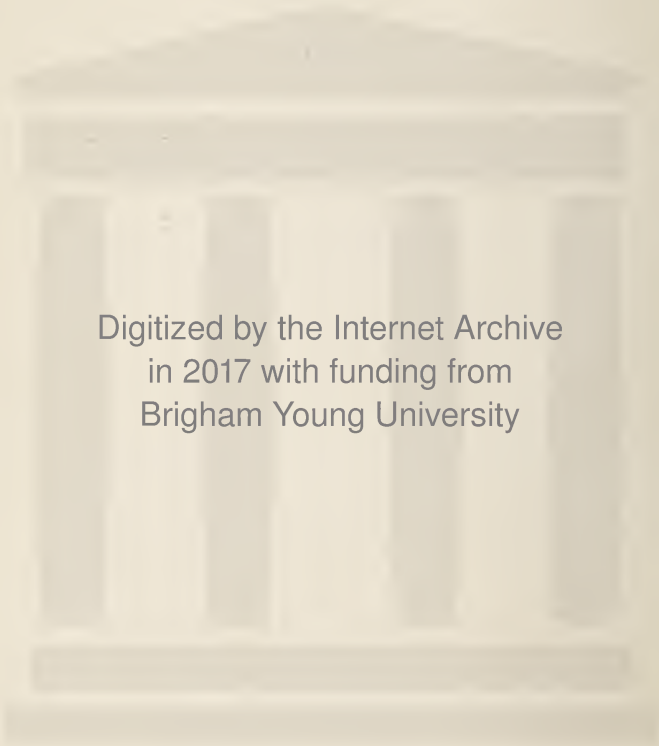

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BULLETIN

OF THE

ESSEX INSTITUTE.

VOL. 25. SALEM: JAN., FEB., MAR., 1893. NOS. 1, 2, 3.

A CURIOUS AINO TOY.

BY EDWARD S. MORSE.

Takashiro Matsura of Tokio, an antiquarian of some note and author of several works on Yezo, the Ainos and Japanese Antiquities, has a miscellaneous collection of old things, comprising stone objects, old Buddhists' desks and specimens of bows, clubs and other objects from Yezo.

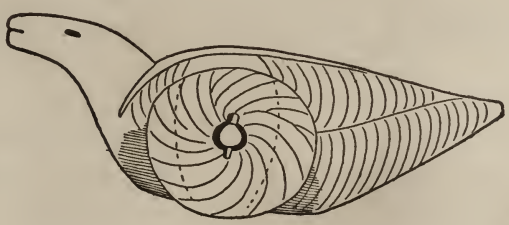


FIG. 1.

In this collection I found a curious wooden toy brought from the Ishikari valley, Yezo, and believed to be an Aino toy. This toy was in the form of a bird on wheels (figs. 1, 2). Such an extraordinary object, as one provided

with wheels, made by savages, led me to make a somewhat careful sketch of it. The object bore the marks of considerable age.

Mr. Matsura believed it to be two hundred years old, upon what grounds I did not clearly learn. The body of the bird had a uniform thickness of 30^{mm}; apparently as if it had been cut out of a board or plank. The head and neck only were roughly modelled, tapering from the base of the neck which was 18^{mm} in thickness to half that thickness at the end of the bill. The extreme length of the toy was 195^{mm}. The back and sides of the body had a series of curved lines cut upon their surfaces to represent feathers,

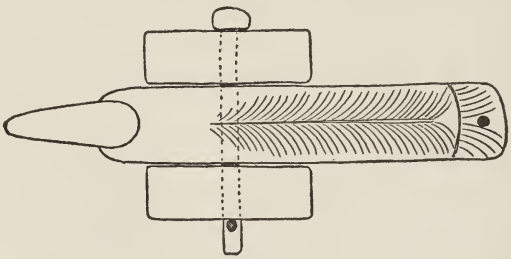


FIG. 2.

an area (indicated by the dotted lines in the figure) hidden by the wheels, being left plain. There was no hole or constriction in the neck to which a string might be attached for the purpose of dragging the toy; in the tail, however, was a small hole running through from above, evidently for this purpose. In this case the toy must have been dragged backward. The wheels were thick and clumsy, and irregularly ovate rather than circular. This form of the wheel would cause the bird to hop up and down when being dragged. The axle holding the wheels passed through the body near the centre and consisted of a simple wooden pin having a thick head at one end and a perforation at the opposite end into which a small pin could

be inserted. The toy bore all the appearance of having been made by the Ainos. Its rough vigorous make, the manner of cutting the lines for decoration, the clumsy, irregular wheels, all precluded its having been made by the Japanese, though the idea of wheels so foreign to savagery must have been derivative and could have come from the Japanese, but this form of toy I do not remember having seen among the innumerable kinds of toys in Japan.

It was not until several years after that I found another bird toy on wheels. This specimen was in the collections

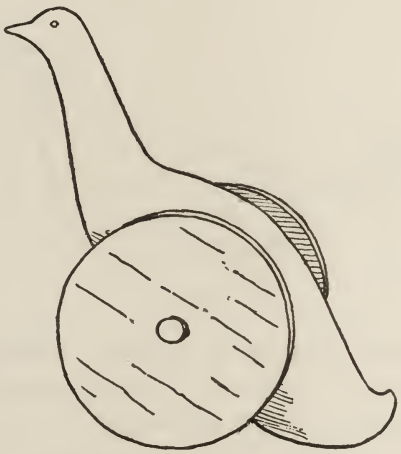


FIG. 3.

of the Ethnological Museum in Berlin. Recalling the Aino toy I made a hasty sketch for comparison. The form of the bird differed somewhat in having a longer neck, a better defined head and the wheels of the toy being circular. This specimen was labelled *Yakuts, Yena, Siberia.* Unfortunately I made no measurements of the specimen though the rough sketch here presented (fig. 3) gives its general appearance in outline. My attention was not again

called to another example of this toy until I found one figured by Mr. W. M. Flinders Petrie, in his interesting work describing his excavations and discoveries in Hawara, Beahmu, and Arsinoe, in Fayum, Egypt (Plate XIII, Fig. 21). In the cemetery of Hawara, dating back not later than the first century of our era, he found a miscellaneous collection consisting of numbers of workmen's tools, bronze knives, wooden lock-bolts, etc. Associated with these various objects he found a wooden toy in the form of a bird on wheels. Its form more nearly approaches that of the Yezo specimen. It is made from a flat piece of wood, and

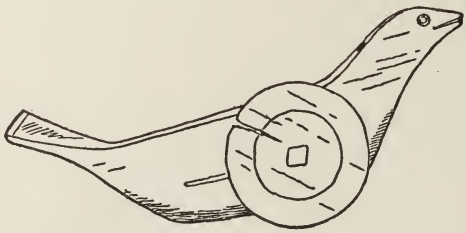


FIG. 4.

a hole, through which a string was probably tied, runs through the toy vertically, as in the Yezo specimen, though in the Egyptian specimen this hole was in the neck and not in the tail. The object is now preserved in the Ashmolean Museum, Oxford.

The three wooden toys above cited, though very simple, are identical in construction. Are they identical also in origin? The ancient specimen exhumed at Hawara by Mr. Petrie is pronounced by him as "very curious."

This toy might naturally have originated among a civilized people like the Egyptians, who portray wheeled chariots in their early rock sculpture. The Egyptian chariots are figured with wheels of four and eight spokes. The

earliest Egyptian wheel had four or six spokes. Professor Sayce shows that the Hittite chariots had wheels of four spokes. Dr. Schliemann discovered toy wheels at Mycenæ of four spokes, and the Swiss Lake Dwellers had wheel-like ornaments of four spokes. In Asia Minor rough disks of wood (such as these bird toys are provided with) have served as wheels for their vehicles from time immemorial.

With the absence of a wheel in savagery it is impossible to conceive of a low savage race like the Ainos originating a wheeled object of any kind. It is quite easy to understand how the Ainos might have derived the idea of this toy from the Yakuts in Siberia, as Kamschatka and the Kuriles, or Eastern Siberia and the Island of Saghalien formed avenues of communication with Yezo. Did the idea of the toy originate with the Yakuts or were they in turn indebted to their Turkish progenitors in the past for this odd plaything? We are told by philologists that the Yakuts are a distinct Turkish stock preserving many of the Turkish characteristics so strongly that, according to Peschel, it has been said, though with some exaggeration he admits, "that an Osmanli from Constantinople can make himself intelligible to a Yakut on the Yena, but it is certain that the branches of the Turkish language separated by this enormous distance are strangely alike." Is it possible that the remote ancestors of the Yakuts in Turkey derived the idea of this toy from the same people whose ancient villages in Fayum have been brought so clearly to light by Mr. Petrie? Certainly, unless it can be shown that any kind of an object provided with wheels originated among a savage people, it does not seem an absurd conjecture to suggest the common origin of this toy even among peoples so widely removed in space and time as those above mentioned.

An analogous case has lately come to light in a curious wooden object found in a tumulus in Norway. In this case, however, the object is more complex in character. In the *Bergens Museums Aarsberetning* for 1890 is a paper by Gabriel Gustafson, curator of the Antiquarian department in the Bergens Museum, entitled "A Strange Wooden Object found in a Norwegian Tumulus." The tumulus in question contained the skeleton of a man associated with weapons, large pieces of dress, remains of belts, with bronze mountings, brooch-clasps of silver, a gold solidus of Roman origin, etc., objects peculiar to a group of grave-finds which occur in western Norway. The period is supposed to be somewhere between the sixth and eighth centuries. The peculiar point of interest was the finding on the breast of the skeleton a curious wooden object carved out of a single block and made in such a way that it could be opened to form a square, or closed by the various elements shutting up on each other after the manner of interclasping fingers. Whether this object had a mystical meaning or was simply a puzzle, was a matter of conjecture. It was important, however, to seek for some similar object with which to compare. The extraordinary fact is that its counterpart was finally found in the South Kensington Museum labelled as coming from Persia and of modern origin. The Persian specimen differed somewhat in unessential details, but the principle of interlocking, its being wrought from a single block of wood, its closing up in precisely the same way were coincidences of such an extraordinary nature that Mr. Gustafson felt justified in making a somewhat extended discussion of the subject. It seems incredible that two such complex and peculiar objects so closely resembling each other could have originated independently. Mr. Gustafson comes to the conclusion that these objects must have had a common origin.

An observant traveller in Northern Scandinavia will see many things to remind him of Oriental people. If he be fresh from Japan and China he will be impressed with the many features common to both peoples, and realize the survival to-day of many oriental facies. From a zoölogical standpoint one might attribute these similarities to the fact that the east and the west shores of the old world are not separated by an almost impassable barrier; the people are connected by a continuous stretch of continent, and a circumpolar distribution, seen in the case of animals and plants, might also apply with equal force to man and his products. If, however, one considers the ramifications of early Eranians he will see how twigs of this stock penetrated into Scandinavia and thus render explicable the occurrence of this curious puzzle in the far north. Dr. Hans Hildebrand, the Royal Antiquary of Sweden, in his interesting book on *Scandinavian Arts* (South Kensington Handbook) shows that "there once existed during a period of some length a continued intercourse between Mahomedan Asia and Scandinavia." Coins of the Mahomedan States of Asia have been dug up by thousands in Sweden. In an ancient tomb in Gottland was found a bronze fibula, associated with shells from the Indian Ocean, and Dr. Hildebrand says "to a Swede it is quite natural to direct his attention in the first place towards the East." Of greater interest is Dr. Hildebrand's efforts to establish a standard of weight of the ancient ring money, the ornaments of a certain weight and the weights themselves. He says "not to speak of other things, even the weights found in Scandinavia (as well as in Russia) and the manner in which the multiples of the unit are indicated, show the most complete analogy with some oriental weights found in Persia."

GEOLOGICAL AND MINERALOGICAL NOTES: NO. 5.

BY JOHN H. SEARS.

The following notes on some of the granitic and crystalline rocks of Essex County, Mass., preliminary to a more extended paper, have been prepared in order to record the more important results of my field work during the autumn and winter of 1891–92, which throw much light on the perplexing questions of classification of the endless variety of forms which our volcanic, plutonic and sedimentary rocks assume.

(*A*) *Augite-Syenite.* (Vom Rath.) Within the city limits of Gloucester, bounded on the north by Warner St., and extending several hundred yards on Prospect St. to the south and southwest, is a large mass of this typical augite-syenite. Occasional outcrops are also seen south of this in East Gloucester, near Bass Rocks, and in the cove in Gloucester harbor west of Ocean pond, which embraces the larger part of Eastern Point and in a westerly direction there are outcrops near Goose cove, Annisquam. One large dome-shaped mass near the corner of Quarry St., Bay View, is of a coarser texture and greener in color, and resembles the augite-syenite of Essex and Manchester. From this last named outcrop to the northeast side of Plum cove, Lanesville, there are numerous outcrops in old

deserted quarries, and one especially good section of this syenite is seen by the roadside opposite Young Avenue, Lanesville. The trend or strike of all of the outcrops is in the usual direction, N.N.E. to S.W.

This entire outcrop is some twelve miles long and from a few rods wide in Hamilton to six miles in Essex and Manchester, the latter width continuing across Gloucester from Lanesville to Eastern Point.

This rock has been recorded as granite by the earlier authors and as granitite by more recent ones. A large part of the granite area mapped by Professor W. O. Crosby in Hamilton, East Wenham, Essex, Manchester and West Gloucester is this typical augite-syenite. Specimens of this rock, which I collected near the terminus of the Essex branch railroad in 1887, were determined by Prof. W. O. Crosby as one of the members of the syenite group, and at that time he advised a careful examination of the rocks of the whole region, which has been done with the above results.

The determinations of the minerals in this rock, studied in thin sections with the polarizing microscope, are as follows:—Orthoclase, brown hornblende, red mica (probably phlogophite), much titanite, numerous fine sections of augite, several small crystals of apatite, a few small zircons, one section of microcline in one of the slides, Baveno twin crystals of orthoclase which show the intergrowth of albite as microperthite The augite is often surrounded by magnetite, and dust-like inclusions of magnetite in the orthoclase give this syenite its dark color. In some of the sections from the outcrop at Prospect St., Gloucester, there are some quartz blebs, but the rock as a whole is poor in quartz and resembles the syenites of Charnwood, England, described by Prof. T. G. Bonney and Rev. Edw. Hill (Quart. Jour. Geol. Soc. Vol. 34, 1887, p. 215).

(*B*). *Granophyre* (H. Rosenbusch) : *Granulite.* Occupying the region between Freshwater Cove Village and the West Gloucester railroad station, and extending in a

southwesterly direction across Magnolia, Manchester and to the Beverly shore, is an outcrop of granophyre which appears again as a typical granulite in the west cove of Moulton's Misery Island in Salem harbor. To the north this formation cuts the hornblende-granite and augite-syenite from Eastern Point to the shore line at Bass Rocks. From Rocky Neck, East Gloucester, to Bass Rocks, the contact of this granophyre and the hornblende-granite is strongly marked and easily followed. Across Little Good Harbor beach and opposite Salt Island to the inner point of Briar Neck, there are numerous tongues of this rock intruding into the hornblende-granite, while the main mass of the rock is seen on the outer side of Salt Island. It reaches the main land on the shore in the middle of Long beach where it divides, one part following the shore line to Cape Hedge and Emerson's Point, and reaching across to the west side of Loblolly Cove, while the other mass cuts across the granite to Gap Head and Straitsmouth Island, and appears in numerous outcrops from Whale Cove to the town of Rockport. Between Freshwater Cove Village and West Gloucester, this granophyre has the appearance of a massive flow, and it has a similar character where it crosses Eastern Point from Rocky Neck to Bass Rocks. On Emerson's Point and Gap Head, however, it is seen in dome-shaped masses a few feet in diameter, clearly embedded in granite and also varying from this to extensive eruptive forms. It is probable that this entire formation has a massive, intrusive, granitic structure, which has in places widened out into dome shapes, while in others it has become contracted into dike-forms from a few inches to a number of feet in width. It is clear that some of the rounded masses are seen as surface outcrops by the erosion of the surrounding granite at a comparatively recent date.

The microscopic structure of this rock, as shown by a selection from the numerous thin sections which I have prepared from different outcrops is as follows:

(1). From Eastern Point; midway between Bass Rock and Brace's Cove: Orthoclase, quartz, chlorite, uralite, magnetite, numerous small grains of titanite. With a high power objective, under crossed nicols the feldspar and quartz present the appearance of a mosaic. The feldspars are microperthite intergrowths of albite and orthoclase.

(2). From the outer side of Salt Island: Micropegmatitic quartz and feldspar grains, the feldspar grains being tabular Carlsbad twins (always microperthite), augite, green hornblende, some biotite, magnetite, iron pyrite, and large sections of colorless garnets in the micropegmatitic quartz and feldspar areas. With high power objectives, even the smallest feldspar grains are seen to be microperthite. There are, also, some micro-zircons as inclusions in the feldspars The entire section shows that the rock has been subjected to great strain, for much of the hornblende, and some of the feldspars are crushed and broken. Decomposition in the hornblende has produced feathery-formed glaucophane.

(3). Near Brace's Cove, southeast: Quartz feldspars, hornblende, chlorite, glaucophane, limonite. The quartz and feldspars are arranged as in the other slides. The orthoclase which is microperthite, micropegmatically arranged, has inclusions of hornblende, limonite and quartz grains. The evidence of great strain and crushing force, sufficient to separate the quartz grains from the feldspars, is easily detected. In many cases a rim of chlorite surrounds each grain, while in some instances the limonite surrounds the quartz and feldspar grains, giving the section the appearance of a clastic rock, usual in all of the granulites.

Many micro-sections of this rock from various outcrops have been studied, and the results all point to the conclusion that this extensive formation in the Cape Ann hornblende-granite area has a granitic structure, and has crystallized from the magma in an aggregate of small grains, partially metamorphosed by plastic deformation subsequent to solidification, a secondary metamorphism having taken place through great pressure and strain from causes yet to be determined, but probably due to faulting as shown on the coast line in this contact, and which gives the rock its granulitic structure.

C. Remains of Ancient Rocks of Sedimentary Origin on Cape Ann.

(1). The principal and largest mass of this sedimentary rock, referred to in my previous paper on the stratified rocks of Essex County (Bull. Essex Inst. Vol. XXII No. 1, 2 & 3, p. 45, Min. and Geol. Notes 2), is seen on the shore at the westerly side of Folly Point, east of Langford's Cove, in Lanesville. This outcrop varies in width from 10 to 30 feet; the strike is N. 40° E. to S.W.; the length of the outcrop, exposed between low water and the covering of drift on the hillside, is about 100 yards.

The microscopic structure is: Well rounded grains of quartz and feldspar, scales of biotite, some titanite, garnets with irregular outline and some magnetite. The larger feldspars have inclusions of muscovite, quartz and epidote and are surrounded by chlorite. This rock is clearly a mica-schist, metamorphosed from a sandstone.

(2). Another outcrop of this mica-schist, which is interbedded with a granitic gneiss and chert, is seen in an abandoned quarry in the Bay View region. It has the same dip and strike as the outcrop at Lanesville. This gneiss has the same microscopic characters as the gneiss of Boxford and Andover, and farther investigation will undoubtedly show that this rock belongs to the lower Cambrian sediments, thus placing the so-called archæan-gneiss, found in the large tract in the northern part of the county, in this group.

(3). On both sides of Brace's Cove, Eastern Point, Gloucester, is a clearly metamorphosed sedimentary rock of irregular outline, and of considerable extent, with a strike N. and S. to N.E. and dip nearly vertical, and which is also seen as inclusions in the hornblende-granite of the region. The microscopic structure is: Rounded and irregular grains of quartz and feldspars cemented in a groundmass of chlorite and limonite.

At the suggestion of Dr. J. E. Wolff, a comparison was made between thin sections of this rock and some from the Penokie Gogebic Series (Michigan and Wisconsin) of Van Hise. (Am. Jour. Sci., 3d Ser., Vol. 31, 1886, p. 453.) The resemblance is marked, although Prof. Van Hise finds the rock in limited quantities, and in a very different region, geologically. These rocks appear to belong to the same series, which in the case of our rock is clearly Cambrian.

(4). Another extensive outcrop of these metamorphosed sedimentary rocks is seen in Essex, in the valley between White and Powder House hills and extending across Essex to Conomo Point. Here the slates, which are distinctly interbedded with granitic gneiss and quartzites, are in places filled with garnets varying from microscopic size to one-fourth of an inch in diameter, thus these slates have been metamorphosed into garnetiferous gneiss, a form not before noticed in our Essex County rocks excepting in boulders on Cape Ann and Nahant. As the two regions last named are in direct line with the variations of the glacial striæ on the surface of the rocks throughout the county, it may be presumed that these isolated boulders are remnants of glacial material originating in this outcrop in Essex.

It seems important to call attention to these points, especially in regard to the first two deposits (A and B), which occur in large areas on Cape Ann, for they are confounded with the hornblende-granite in the report on the Geology of Cape Ann (U. S. Geol. Surv., Ninth Rep., 1887–88).

Peabody Academy of Science, Aug. 13, 1892.

FOLK SPEECH OF YORKSHIRE AND NEW ENGLAND.

BY H. M. BROOKS.

Some two or three years ago Mr. William Andrews, the noted Antiquary of Hull, England, sent me a book on the "Folk speech" of East Yorkshire.[1]

Upon an examination of this volume I was struck with the fact that there were a great number of words and sayings, said to have originated in, or to have been in use in Yorkshire, which are common in New England. My present purpose is not to make particular reference to the peculiar dialect of old Yorkshire but merely to note some of the words and phrases that we use in common every day conversation, which would appear to have come to us from Yorkshire originally.

Among the common East Riding Yorkshire similes, I will mention the following which it will be seen are more or less in use in *our* Folk speech.

As black as a Craw (crow).

As blind as a bat.

As bright as a button.

As cawd (cold) as ice.

As clean as a whistle. — Clean here means complete, perfect or clear, and refers to the sound and not to the

[1]The Folk speech of East Yorkshire.--By John Nicholson (Hon. Librarian Hull Literary Club. 12mo. London. Simpkin Marshall & Co. 1889.

whistle itself. Just as in "as clear as a bell" the word clear refers to the sound and not the instrument causing the sound.

As dark as pitch.

As deead as a deear nail. (In Piers' Plowman, As dead as a door nail.)

As deead as a herrin. (As dead as a herring.)

As deeaf as a yat stowp (gate post).

As fat as a pig.

As flat as a pan-keeak (cake).

As full as a tick.—A *tick* is a sheep-louse, which has always a full bloated appearance.

As good as ivver (ever) stepped upo' shoe leather.

As good as they mak' 'em.

As green as gess (grass).

As grey as a badger.

As green as a yellow cabbage—Used when any one assumes innocence or ignorance.

As happy as the day is lang (long).

As heavy as leead (lead).

As holla as a dhrum (as hollow as a drum).

As keeal as a coo-cummer (as cool as a cucumber).

As leet (light) as a feather.

As mad as a March hare.

As mischievous as a monkey.

As mony (many) lives as a cat.

As pawky as you please.—*Pawky* means impudent.

As poor as a chotch moose (church mouse).

As sharp as a needle.

As snug as a bug iv (in) a rug.

As still as a mouse.

As stunt as a mule—*Stunt* means obstinate or dogged.

As sweet as a nut.—Here sweet means sound and wholesome.

As thin as a wafer.

The dialect of East Yorkshire contains in abundance words expressing fighting or quarrelling. Mr. Nicholson calls them "Bellicose words."

I will mention a few words that are common here.

Baste—meaning to beat or flog such a person, we say—"Ought to have a good basting."

Bat—a rap or blow. "Give him a bat over the head for his impudence."

Bung up—to close as with a bung, "Bung his eyes up."

Catch it—to meet with punishment, "He'll catch it when he gets home."

Chip—a slight quarrel, "Knock that chip off of my shoulder."—boys used to say.

Crack—a stunning blow, "I fetched him a crack."

Cuff—a blow with the cuff or fore arm. "Cuff him over the head."

Dab—a stroke in the face. "Give him a dab."

Dhrissin (dressing)—a flogging. "Give him a good dressing."

Dhrub (drub)—to flog. "He got well drubbed."

Dig—to poke with a stick, etc. "He gave me a dig in the ribs."

Dust—a quarrel. "To kick up a dust."

Fetch—to deliver a blow.

Hammer—to flog severely with some instrument. "Hammer him well."

Haze—to beat. "He got a hazing."

Hiding—a flogging on the *hide* or back.

Lam—to beat. "A good lamming."

Let Dhrave (drive)—to strike with full force.

Lick—a chastisement. "If he don't look out he'll get a licking."

Plug—to strike with the fist. "Plug up his mouth, or nose."

Pummel—to strike with the fist.

Rap—a quick blow.

Set teeah (a set to)—a regular fight.

Spank—to flog. "If she'd had a good spanking when she was young, she would have been better."

Thresh or Thrash—to beat.

Thump—to strike heavily on the back.

Wale—to beat with a stick or cowhide sufficiently hard to make "wales."

Whack—to beat.

Whipe—a stinging, sliding blow.

A FEW OTHER WORDS.

Bent—determined. "He's bent on doing wrong."

Black and blue—discoloured by an injury.

Bluther (blubber)—to cry.

Botch—work of an unskilful workman. "Jack is a regular botch."

Cap—to surpass. "Capped the climax."

Clack—noise, gossip, persistent talk. "Hold your clack."

Flay—to frighten, to make afraid.

Full Smack—head long, heavily, with determination.

Grease—gain, profit, advantage.

Grub—to toil, to delve.

Heeap (heap)—a great number of persons or things.

Leave—soon, rather. "I'd as leave do this as that."

Possessed—held, controlled. "I don't know what possessed me."

Purchass—leverage, advantage. "I must get a good purchase upon it before I can lift it."

Render—to make run, to melt.

Sag—to bend, to droop.

Settle—bench with a high back, used in front of an open fireplace, generally in old kitchens.

Shanks—ankles, legs. "Now then, spare shanks (thin legs) get out of the gate."

Smatch (smack)—a flavor or taste.

Snape (snub)—to check, to correct, etc.

Spigot—a vent peg, in liquor barrels.

Stagger—to bewilder. "It staggers me, when I think of what he is doing."

Swap—to exchange; to barter.

Swill—to swallow greedily. "He *swills* down the coffee and makes a *swill*-tub of himself with the food."

Tend—"tends pigs, cows, etc., tends store."

Tickle or *Ticklish* —a delicate matter or job. "It is rather a ticklish thing to do."

Tree—anything made of wood, as cross-tree, boot-tree, axle-tree, etc.

Ugly—horrible, dreadful, disagreeable. "An ugly place to drive in."

Some of these words may be said to be common anywhere, but they are all used in East Yorkshire, and must of course have been used there before they were used here. I have not pretended to look very closely into the subject but hope this may induce some one with more ability to follow it up and give us a carefully prepared article. The object of this is simply to call attention to the connection of our folk speech with that of England.

BULLETIN

OF THE

ESSEX INSTITUTE.

VOL. 25. SALEM: APRIL, MAY, JUNE, 1893. NOS. 4, 5, 6.

REPORT OF COMMITTEE ON COLUMBIAN EXPOSITION.

On Monday, December 21, 1891, at a regular meeting of the Essex Institute, the subject of making an exhibit at the World's Columbian Exposition at Chicago was discussed and the Historical Committee was empowered to ascertain what arrangements could be made with the Massachusetts Commissioners in relation to it. At a meeting of the committee, January 9, 1892, it was voted that all preliminary arrangements in relation to having the Institute represented at the exposition should be left to a sub-committee of ten, and at a subsequent meeting two more members were added.

On January 15, 1892, Mr. E. C. Hovey, Secretary of the Board of Massachusetts Commissioners met by request with the Institute Committee, described the Massachusetts State building and approved of the plan of the Institute to furnish one room. On March 30, 1892, Mr. Hovey was present at a meeting of the Committee and exhibited the architect's plan of the Massachusetts State building and offered the main reception room to the Institute, the Committee to have full charge of furnishing it.

December 17, 1892, Prof. F. W. Putnam was invited to address the Institute with a view of awakening an interest in the Exposition. His subject was "The Scientific Side of the Columbian Exposition," and he gave a full account of the Ethnological and Archæological exhibits to be under his charge.

Owing to various causes no active steps were taken in relation to the Institute's exhibit until January 9, 1893, when, at a meeting of the Committee, it was voted to issue the following circular:

ROOMS OF THE ESSEX INSTITUTE,

JAN. 20, 1893.

"The Essex Institute has been offered the privilege of furnishing one of the Reception Rooms in the Massachusetts State Building at the Columbian Exposition at Chicago, and the undersigned have been appointed a committee to procure such articles as are needed, and to make all arrangements for the Institute exhibit.

The size of the room allotted for this exhibition precludes the possibility of having a very large collection, but the articles selected should be of the highest historic and artistic interest. The committee therefore appeal to all who may be interested in this matter, and ask for the loan of furniture, old china, historic relics and documents, and for contributions of money, to aid in properly carrying out their plans.

The furniture offered should be choice examples of the genuine colonial style, and the articles loaned should, first of all, be of interest from their connection with Massachusetts history.

Any person desiring to aid the committee, by the loan of articles, is invited to send a description of them to the rooms of the Institute, when some member of the committee will examine them at an early day and report on their fitness for the exhibit.

All articles accepted will be insured, and every effort will be made to protect them from injury. They will be returned, in due time, without charge to the contributors. As it is necessary to have the entire exhibit arranged before the end of March it is desirable that contributors should notify the committee of proposed loans without delay.

The desirability and importance of having at Chicago a characteristic exhibit from Salem, both from the historic fitness of things and from the standpoint of present business interests, have impressed all those who have considered the matter, and the committee hope that our citizens will join in making this exhibit, which will be so well located for public inspection, just what it should be.

There will be a considerable expense involved in providing frames for pictures, for preparing copies of portraits, etc., and for many items connected with placing the collection in a proper condition for exhibition, and contributions to this expense fund will be very gratefully received, as the Institute has no means which may properly be used for the purpose.

Subscriptions to the expense fund can be sent to the Secretary of the Institute, by check or otherwise, when a suitable acknowledgment will be made."

It was also voted at the same meeting to arrange for an excursion to the Exposition and on February 1, 1893, the committee sent out the following circular:

"In response to many requests the Essex Institute has arranged with Messrs. Raymond & Whitcomb to run one of their special trains of Pullman Palace cars directly from Salem to the Exposition grounds, at Chicago. These trains, comprising both sleeping and dining cars, are of the best class and have every attainable appointment for the safety and comfort of travellers. The Salem party will be guests at the new hotel, the Raymond and Whitcomb Grand, situated on Washington and Madison Avenues and fronting the Midway Plaisance, and near one of the main entrances to the Fair grounds. This hotel has been built specially for the Raymond & Whitcomb parties, and is in every way a modern, first-class house. It is fire proof, only four stories high, and has with the rooms, connecting bath and toilet arrangements. Oscar G. Barron, of White Mountain fame, is the manager, which is a guarantee for the best of table service and general management. The date of departure from Salem will be Saturday, A. M., May 27; Sunday will be passed at Niagara Falls,— and Chicago will be reached Monday, at 6 P. M.

Tickets for the entire trip are one hundred and twenty-five dollars, which includes a whole sleeping berth, half a section in

Pullman car, meals in dining car each way, transfer of person and baggage to the hotel, twelve admissions to the Fair, and seven days at the Raymond & Whitcomb Grand. Returning, the party leaves Chicago June 5, at 3 P. M., reaching Salem the 7th. Visitors to the Exposition in the Raymond & Whitcomb parties have many advantages over the ordinary traveller: Transit on Pullman cars, meals at regular hours in dining cars, alighting at a private station, transfer at once to the hotel near by, a room pre-engaged and ready for occupancy, and freedom from the annoyance and crowd incident to ordinary travel on occasions of public interest.

Only a limited number can be accommodated, and early application for places is necessary. Plan of Pullman cars may be seen and circulars of the trip obtained at the Institute rooms.

The Essex Institute has no pecuniary interest in this excursion, and it assumes no responsibility in any way. All the details are under the well known management of Messrs. Raymond & Whitcomb, and may be safely left in their care."

On February 27, 1893, Mr. Alfred Stone, of Providence, was invited to lecture before the Institute. This lecture was given at Academy Hall, admission to which was had by tickets distributed at the rooms of the Institute. The subject was "The White City." It was fully attended and was illustrated by beautiful lantern pictures giving views of the buildings at Jackson Park and many architectural details, etc. Mr. Stone's lecture was so graphic and entertaining and his enthusiasm in regard to the artistic beauty of the buildings was so genuine that he awakened the first real practical interest in the exhibition and the public became somewhat aroused in regard to it.

At a meeting of the Committee on March 17, 1893, the general plan of the exhibit was agreed upon as follows:

(1) An exhibit in connection with the Peabody Academy of Science in the Marine Division of the Transportation Department.

(2) An exhibit of the publications of the Society in the Department of Liberal Arts.

(3) To aid as far as possible the Government Exhibit in the Department of Justice.

(4) To furnish the Reception Room in the Massachusetts State Building with portraits, paintings of old houses, collection of Salem views suitably bound in albums, furniture of the early and later colonial periods, cases of historical relics illustrating as far as possible the different departments of the historical work and collections of the Institute.

Mrs. Grace A. Oliver and Mrs. H. M. Brooks were appointed a committee, with power to add to their number, for the purpose of aiding the regular committee in soliciting articles for exhibition, etc.

The collection of pictures, consisting of original paintings, copies by Mr. Ross Turner, photographs, etc., making up the Transportation exhibit was put on public exhibition at W. H. Gardner's, Essex St., and attracted instant and widespread attention. It was followed by an exhibition, at the same place, of the portraits for the State Building; these also were received with public favor. The articles were boxed and packed under the supervision of Mr. Treadwell, janitor of the Peabody Academy of Science, and Messrs. Ross Turner, A. R. Stone and J. R. Treadwell took charge of arranging and installing the exhibits at Chicago.

Whether or not, the committee has succeeded in getting an exhibit worthy of the city and county, illustrative of our local history, and redounding to the credit of the Society, a visit to the Exposition alone can tell. The committee present this catalogue somewhat hastily prepared, as a report of its doings. It cannot, however, close without a word of appreciation of the earnest work done by one of its number, Mr. F. H. Lee, to whom was relegated the most ungrateful of tasks, that of collecting contributions of money. His enthusiastic labors in season

and out, the giving so freely of his time and energy to this task have been a constant incentive to the remainder of the committee, whose burdens have been much lighter, and whatever of merit the exhibit may possess the rest of the committee feel is largely due to him.

Robert S. Rantoul, *Chairman.*

Daniel B. Hagar,	John Robinson,
Ross Turner,	Eben Putnam,
David M. Little,	Thomas F. Hunt,
Francis H. Lee,	Walter J. Stickney,
Winfield S. Nevins,	George M. Whipple,

Henry M. Brooks, *Secretary.*

CATALOGUE.

TRANSPORTATION BUILDING.

Marine Division—Section E Gallery, Col. 32.

MARINE EXHIBIT.

The Essex Institute and Peabody Academy of Science united in making this exhibit. Lt. A. C. Baker, in charge of the Marine Division of the Transportation Department of the World's Columbian Exposition visited Salem and made a careful examination of the cabinets and collections of both institutions and at his suggestion the committee arranged to exhibit in this Division. The contributions of the Peabody Academy of Science, consisting largely of photographs of its ethnological collections, were made with the view of showing the methods employed in its museum for displaying the marine architecture and means of transportation of different nations. The Institute exhibit was in the line of its local historical work, giving an idea of the style of vessels engaged in the commercial interests of Salem from 1765 to the present day. To this were added certain pictured representations typical of events which happened in the marine history of Salem.

"Salem may justly be proud of her Commercial History. No other seaport in America has such a wonderful record. Flying from the mast of a Salem ship the American flag was first carried into the ports beyond the cape of Good Hope. Her

vessels led the way from New England to the Isles of France, India and China, and were the first from this country to display the American flag and open trade at St. Petersburg, Zanzibar, Sumatra, Calcutta, Bombay, Batavia, at Arabia, Madagascar and Australia, and at many other distant ports. Well may she proudly inscribe on her city seal 'Divitis Indiae Usque ad Ultimum Sinum.'" C. S. Osgood, Hist. of Essex County: Salem: p. 63.

EXHIBIT OF THE PEABODY ACADEMY OF SCIENCE.

Ship "America." Oil painting. Artist unknown.

The America was built for George Crowninshield and Sons by Retire Becket in 1804. She registered 450 tons. Cut down and fitted as a privateer during the war of 1812, she was noted for her great speed and good fortune. She made four cruises, the first under command of Joseph Ropes, the third and fourth under command of James Cheever, Jr. She brought in prizes to the value of upwards of one million of dollars.

Ship "Margaret." An oil painting by Benjamin West, a local artist of Salem; made about 1838 from an original picture.

The Margaret was built by Retire Becket in 1800 and registered 295 tons. Owned by George Crowninshield and Sons and commanded by Samuel Derby she was the first Salem and second American vessel to visit Japan where she went with the Dutch East India Company's freight from Batavia in 1801. Mr. George Cleveland the clerk of the ship published a most interesting narrative of this voyage. The Margaret was lost under peculiarly distressing circumstances in 1810.

Ship "Hazard." An original water color by E. Corné painted in 1805.

This was the second vessel bearing the same name and was built by Retire Becket for J. & R. Gardner in 1799. She proved one of the best ships built in Salem at the time and was engaged in the East India trade.

Ship "Propontis." Owned by Tucker Daland of Salem in 1844.

A characteristic model of vessels of that period. She was engaged in the Zanzibar trade.

Ship "Panay." A photograph of the ship leaving port.

The Panay was built in 1877 for Silsbee and Pickman and registered 1131 tons. She was engaged in the Manila trade and was lost a few years since in that region.

Photographs of models of the hulls of European vessels of the fifteenth and sixteenth centuries, including one of the vessels of the fleet of Columbus.

Photograph enlarged from an early print, and retouched in India ink, of the "Sovereign of the Seas," built at Woolwich, England, in 1638, representing a vessel of the seventeenth century.

Photograph of the model of the hull of a Venetian vessel of the eighteenth century, showing the broadside, bow and stern.

Solar print, five by four feet, enlarged from a photograph made by Mr. A. W. West, of the Marine Trophy in the East Hall of the P. A. S. (end view), showing full rigged models of the U. S. frigate "Constitution" presented to the East India Marine Society of Salem by Commodore Isaac Hull in 1813 and which was repaired, as shown by a receipted bill in possession of the Academy, by "British Prisoners of War" who in 1814 were confined near Salem; the ship "Friendship" built in 1797; the brig "Camel" a prize of the war of 1812; brig "Rising States" owned by William Gray in 1802, old and modern fishing schooners, etc. Also models of an African "slave dhow" and a New Zealand war canoe; a full size North American Indian birch bark canoe and Esquimaux "Kyak," besides other vessels not well shown in the photograph. On the floor beneath rests a palanquin used in Calcutta, a gift to the Museum from four merchant captains who met in that city and obtained it in 1803.

Photographs giving side views of Marine Trophy in East Hall of the P. A. S.

Photograph of models of Chinese vessels in the collection of the P. A. S. showing old style "Junk," Formosa fishing boat, war boat of old class, trading and house boats.

Photograph of models of vessels from Polynesia, India, Philippine Islands, Japan, etc., in the collection of the P. A. S. showing Fiji double war canoe, a trading boat,

trading vesels of Manila, Singapore "fast boat," Travancore racing boat, Japanese trading junks and smaller craft.

Photograph of Brazilian "catamarans" in the collection of the P. A. S. Several forms of these raft-like vessels peculiar to the region of the Amazon.

Framed document—a pass permitting the American schooner "Jack" to enter the Mediterranean sea in 1797, signed by President John Adams, etc.

Clearance paper.

Dimensions of the frigate "Essex" made out in the hand writing of Enos Briggs, the builder, in 1799.

Bark "Glide." An oil painting. *Loaned by Mr. James B. Curwen.*

The "Glide" was built in Salem in 1861 for Messrs. John Bertram, Curwen and others, and was engaged in the Zanzibar trade.

Brig "Mexican," attacked by pirates. An oil painting by George Southard. *Loaned by Mr. John Battis.*

In August, 1832, the brig "Mexican" left Salem for Rio Janeiro having on board $20,000 in specie. On Sept. 20 she was captured by the piratical Spanish schooner "Pinda," rifled of her specie, her crew fastened between decks and fire set to the vessel. The crew of the "Mexican" managed to get on deck and extinguish the fire, repair damages, and Oct. 12 reached Salem. Aug. 27, 1834, the H. B. M. "Savage" arrived at Salem with sixteen of the pirates as prisoners. Five of them were hanged June 11, 1835. The owner of this painting, Mr. John Battis of Salem, is one of the thirteen men who formed the crew of the "Mexican." The "Mexican" was built in Salem in 1824 by Elijah Briggs for Joseph Peabody and registered 227 tons.

Ship "Mt. Vernon," off Gibraltar. An original water-color painted in 1799. *Loaned by Messrs. Ropes Brothers.*

The "Mt. Vernon" was built by Retire Becket in 1798 for Elias Haskett Derby and registered 398 tons. Equipped with twenty guns and a crew of fifty men, under the command of E. H. Derby, Jr., sailed from Salem with a cargo of sugar. Off Cape St. Vincent she was attacked by a fleet of French vessels from which she escaped by superior sailing and fighting qualities. She returned from Naples in 1800 with a cargo of wines and silks. See Osgood's Commerce of Salem, Hist. Essex Co., Vol. I.

Ship "Mt. Vernon" escaping from the French fleet. *Loaned by Messrs. Ropes Brothers.*

Coasters in Salem Harbor. A water-color sketch by Miss Mary K. Robinson. *Loaned by Mr. John Robinson.*

During the continuance of an easterly gale coasting schooners put into Salem as a harbor of refuge, where they remain for favorable wind and weather. The sketch represents a fleet of such vessels getting ready to sail on a morning after a storm.

"*Chesapeake*" and "*Shannon*." Painted by Ross Turner. *Loaned by Mr. T. F. Hunt.*

This pastel sketch was made by Mr. Turner as a study for a more important painting of the contest between the "Chesapeake" and "Shannon." This engagement took place June 1, 1813, so near the shores of Salem that many persons witnessed it from the heights in the vicinity. The Chesapeake was captured and taken to Halifax from which place the body of her young commander, Lawrence, and that of Lieutenant Ludlow were brought to Salem and buried with great honors. The dying message of Com. Lawrence, mortally wounded in the progress of the fight, "Don't give up the ship," has become historic.

Circle. By Gambey, Paris. *Loaned by Mr. W. J. Stickney.*

A nautical instrument used in getting the sun's altitude.

EXHIBIT OF THE ESSEX INSTITUTE.

WATER COLORS.

Ship "Erin." Original painting.

The "Erin" was engaged in the India and China trade about 1819 at which date she brought cargoes to Salem to Henry Pickering.

Ship "Sally." Original painting.

The "Sally" was owned by George Crowninshield and Sons and was engaged in the India trade in 1803.

Schooner "Baltick," in 1765. Painted by Ross Turner from the original in possession of the Institute.

Felt says the name of schooner originated in Gloucester in 1709. No mention of the Baltick occurs in Osgood's Commercial History of Salem, but she was engaged in trade with the West Indies.

Brig "Gov. Endicott." Painted by Ross Turner from original in possession of the Institute.

The "Gov. Endicott" was built in Salem in 1819 by Elijah Briggs for Pickering Dodge. Originally rigged as a ship and dismasted on her first voyage she was repaired as a brig.

Bark "Eliza." Painted by Ross Turner from original in possession of the Peabody Academy of Science.

She was built in 1822 by Thomas and David Magoun for Joseph White. She was sold to David Pingree in 1832 and again to Michael Shepard in 1846. This vessel was one of the earliest engaged in the California trade, being the first vessel of her size, 240 tons, to ascend the river to Sacramento. Capt. Augustine S. Perkins was in command at the time; she remained as a store ship at Sacramento and was sold and broken up in 1868.

Ship "Margaret." Painted by Ross Turner from the

original, drawn to scale, in possession of the Peabody Academy of Science. (For full account of the "Margaret" see previous pages.)

She sailed for Sumatra Nov. 19, 1800, with $50,000 in specie, 12 casks of Malaga wine and 2 hogsheads of bacon.

Ship "Friendship." Painted by Ross Turner, from original, in possession of the Peabody Academy of Science.

The "Friendship" was built in Salem in 1797 by Enos Briggs for Messrs. Pierce and Waite. Capt. Israel Williams commanded her on several noted voyages to China, Batavia, etc. She registered 342 tons. This ship was always very fortunate and cleared $200,000 on an investment of 50,000. (See also full rigged model shown in solar print.)

Ship "Prudent." Painted by Ross Turner from original in possession of the Peabody Academy of Science.

She registered 214 tons and was built in Salem in 1799 by Ebenezer Mann for Nathaniel West and others. While commanded by Capt. Benjamin Crowninshield the "Prudent" was captured by a French man of war and vessel and cargo confiscated. In 1803 the "Prudent" entered Salem from Messina with 11,406 gallons of red wine, 6,413 gallons of white wine, 4,303 gallons of brandy and 9,810 pounds of soap.

Frigate "Essex." Painted by Ross Turner from original in possession of the Peabody Academy of Science.

She was built in Salem, through a popular subscription from Salem merchants in 1799, by Enos Briggs. She registered 850 tons, mounted 32 guns and was in command of Captain Preble. She proved the fastest vessel in the U. S. Navy and captured property to the value of 2,000,000. The late Admiral Farragut was a midshipman on the "Essex." It is said that the original of this picture, which is signed "Joseph Howard," is the only one now extant of the "Essex." See full account of the "Essex," Hist. Coll. Essex Inst.

Ship "George." Painted by Ross Turner from original in possession of Peabody Academy of Science.

The "George," 328 tons, was built in 1814 for a privateer by an association of ship carpenters thrown out of employment by the war with Great Britain. She was bought by Joseph Peabody and made twenty voyages to Calcutta and return between 1815 and 1837. She was very fast, and very fortunate, never having lost a spar or met with an accident while owned by Mr. Peabody who made more than half a million dollars in this one vessel. In a manner she was looked upon as a nautical academy, many of Salem's young men shipping in her before the mast and graduating from her as mates and masters.

Ship "John Bertram." Painted by Ross Turner from original in possession of Peabody Academy of Science.

The "John Bertram," 1100 tons, built at East Boston in 1850, by Elwell and Jackson for Glidden and Williams, Capt. John Bertram and others. She is said to have been the first American clipper ship built *expressly* for the California trade. She was pronounced one of the finest modelled and most thoroughly constructed vessels that ever floated on our waters. She was built and launched in sixty days.

PHOTOGRAPHS.

Ship "Mindoro."

960 tons, built at East Boston 1864, owned by Pickman, Silsbee and Allen. Last full rigged ship hailing from Salem. Now engaged in the Manila trade.

Topsail-Schooner "Plato." From a painting made in 1835, in possession of Peabody Academy of Science.

Built by Enos Briggs for Isaac Cushing and others 1816. Dimensions 78 2-12 x 22 10-12 x 8, 125 tons.

Ship "John." From original painting in possession of Essex Institute.

The "John" 258 tons, built by Enos Briggs for Elias Haskett Derby. She was ketch rigged at first and altered into a ship in 1799. Her dimensions were as follows: length of keel 75 feet, beam 25 feet, depth of hold 9 1-2 feet. Engaged in the India trade 1796, Sumatra trade 1807, and bought by George Crowninshield & Sons in 1812 for a privateer.

Launch of Ship "Fame." From original painting in possession of Essex Institute.

The "Fame" built in 1802 by Retire Becket for George Crowninshield & Sons 363 tons burden. In 1804 she visited the coast of Cochin China in search of sugar.

Crowninshield's Wharf. From painting by Geo. Ropes in possession of Essex Institute.

Showing Crowninshield's fleet at the wharf during the first embargo.

Whaling Scene in South Atlantic. From painting by Benj. F. West in possession of Essex Institute.

Showing bark "Richard," of Salem, and other vessels engaged in whale fishing.

Models of English Frigates. From the original models in possession of the Essex Institute.

Made by American prisoners at Dartmoor prison.

Ketch "Eliza." From the original model in possession of Essex Institute.

"Eliza" built by Enos Briggs in 1794 for Elias Haskett Derby. Dimensions 93 x 25 x 9, 184 tons burden. First vessel to arrive at Salem direct from Calcutta Oct. 8, 1795 with a cargo of sugar. Dec. 22, 1794, she sailed for the East Indies with a cargo consisting of forty-eight casks of brandy, twenty-two barrels naval stores and one hundred and six pairs silk stockings.

Instrument for getting ship's reckoning by the North Star.
Instrument for taking lunar observations.
Style of quadrant in early use.
Sextant used by Nath'l Bowditch.

} From the originals in possession of the Essex Institute.

MANUFACTURES AND LIBERAL ARTS BUILDING.

Department of Liberal Arts Gallery E, Sec. I.

PUBLICATION EXHIBIT OF ESSEX INSTITUTE.

Proceedings of the Essex Institute. Six volumes, 1848 to 1868, containing account of meetings of Society and scientific papers.

Bulletin of the Essex Institute. Twenty-four volumes, 1868 to 1893, a continuation of the Proceedings; contains reports of meetings and specially prepared papers of scientific value.

Historical Collections. Twenty-eight volumes, containing papers of historical, genealogical and biographical interest, town and church records, anniversary addresses, memoirs of distinguished persons, etc.

Bound in cloth and leather, the leather especially prepared by Alphonse Mouthuy, Salem.

Also among other special publications and reprints of the Essex Institute, the following:

HISTORICAL.

Commemorative exercises on the fifth half century of the landing of Endicott.

Salem Town Records 1634–1659, 8vo.

Salem: Historical sketch by C. S. Osgood and H. M. Batchelder.

Adams, Herbert B. Commons and commoners of Salem, parts 1–6.

Blodgette, George B. Early settlers of Rowley.

Blodgette, Geo. B. Records of deaths in first Church, Rowley.

Bentley, Wm. Parish lists of deaths, 1765–1819.

Emmerton, J. A. and Waters, H. F. Gleanings from English Records about New England families.

Emmerton, J. A. Notes and extracts from Records of First church in Salem.

Emmerton, J. A. Salem baptisms in the eighteenth century.

Goodell, A. C. Centennial address, Oct. 5, 1774.

Hawkes, N. M. Gleanings relative to the family of Adam Hawkes.

Northend, W. D. Address before the Essex Bar association.

Rantoul, R. S. Fifth half century of the arrival of Winthrop.

Rantoul, R. S. Contribution to the history of the ancient family of Woodbury.

Rantoul, R. S. Some material for a history of the name and family of Rentoul,—Rintoul,—Rantoul.

Stone, E. F. Address on Gov. Andrew.

Stone, E. F. Cushing, Choate and Rantoul.

Upham, W. P. Records of the First church in Salisbury.

Upham, W. P. An account of the Rebecca Nurse monument.

Waters, H. F. Gedney and Clark families of Salem.

Waters, H. F. Notes on the Townsend family.

Waters, H. F. Newhall family of Lynn, Part I.

Whipple, George M. Musical societies of Salem.

Whipple, George M. Sketch of Salem Light Infantry.

Willson, E. B. Memorial of J. C. Lee.

Willson, E. B. Memorial of C. T. Brooks.

SCIENTIFIC.

Fewkes, J. W. On the myology of Tachyglossa hystrix.

Fewkes, J. W. Aid to a collection of the Cœlenterata and Echinodermata of New England.

Gill, T. Primary subdivisions of the Cetaceans.

Gill, T. Prodrome of a monograph of the Pinnipedes (Seals) 1866.

Garman, S. North American Reptiles and Batrachians.

Garman, S. On West Indian Iguanidæ and on West Indian Scincidæ in M. C. Z., Cambridge, Mass.

Goode and Bean. A list of the fishes of Essex Co., Mass.

Kingsley, J. S. Carcinological notes, No. 5.

Kingsley, J. S. On the development of the Crangon vulgaris (2d paper).

Morse, E. S. Gradual dispersion of certain mollusca in New England.

Morse, E. S. Ancient and modern methods of arrow release.

Morse, E. S. Notes on the condition of zoölogy fifty years ago and to-day.

Putnam, F. W. Remarks on some chipped stone implements.

Putnam, F. W. Notice of an interesting relic of Mexican sculpture.

Putnam, F. W. Indians of California.

Robinson, John. Flora of Essex County, Mass.

Robinson, John. Notes on the woody plants of Essex County.

Robinson, John. Our trees.

Upham, William P. History of the art of stenography.

Upton, Winslow. Lecture on the eclipse of 1878.

Wright, George F. Indian Ridge and its continuations.

Wright, George F. The glacial phenomena of North America.

ART.

Heliotype illustrations of Prof. Edward S. Morse's Japanese Pottery room, letter press description by Sylvester Baxter.

Putnam, F. W. Conventionalism in ancient American art.

Silsbee, Edward A. An informal talk on architectural and art topics.

Rantoul, Robert S. Notes on the authenticity of the portraits of Governor Endicott.

White, G. M. Etchings of the following places of historical interest in Salem and its vicinity:

The Old First Church.
Hawthorne's Birth-place.
Views from Beverly Bridge.
Views of Beverly shore.
Peabody Academy of Science.
The "House of the Seven Gables."
North Bridge.
The Head-quarters of General Gage.
View from Winter Island.
Essex Institute.
Pickering House.
Dr. Grimshawe House.

Gallows Hill.
Harmony Grove Arch.
George Jacobs' House.
Salem Custom House.
Roger Williams House.
North Church.
Baker's Island.
Rebecca Nurse House.

The Exchange list of the Peabody Academy of Science having in 1893 been united with that of the Essex Institute, and the scientific library of the former incorporated with that of the Institute the following publications of the Peabody Academy of Science are exhibited:

Memoirs, two volumes.

Reports, one volume.

Miscellaneous papers, one volume.

American Naturalist, nine volumes, 1867 to 1875.

With these are shown a collection of cards, notices and forms used by the Institute, and itineraries, guides, circulars of information, etc., issued for the benefit of visitors to Salem.

GOVERNMENT BUILDING.

Department of Justice.

At the request of Mrs. J. Ellen Foster, special agent of the Department of Justice, the committee had photographs made on plates 11 × 14 inches, of documents relating to the early history of Salem and the Colony of Massachusetts Bay, as follows:

Charter or Indenture under signature of Lord Sheffield, Jan. 1, 1623, to Roger Conant and others, from the original in possession of the Essex Institute.

The Endicott Charter. Charter March 4, 1629, from Charles I to Governor and Company of the Massachusetts Bay in New England from the original duplicate charter sent to Endicott, now in possession of Salem Athenæum.

Page of the first book of Records of Deeds, Essex Co., 1641, from the original at the Clerk of Courts office, Salem.

Roger Conant's will (first page) January 1, 1677.

Roger Conant's will (showing signatures).

Examination of Martha Corey for witchcraft, Mar. 21, 1692, from original document in possession of Essex Institute.

Examination of Rebekah Nurse for witchcraft, Mar. 24, 1692, from original at Clerk of Courts office, Salem.

Depositions of Ann Putnam and Ann Putnam, Jr. against Rebekah Nurse and others, May 31, 1692, from original in possession of the Essex Institute.

Indictment against Abigail Hobbs of Topsfield for "covenanting with the Devil;" in Casco Bay, 1688, from original in possession of Essex Institute.

Trial of George Jacobs. From the painting by Mattison in possession of the Essex Institute.

Appointment of Bartholomew Gedney, William Brown, John Hathorne and Jonathan Corwin as Justices of Inferior Court of Common Pleas, Oct. 16, 1696, William III; signature of Lt. Gov. Stoughton.

LEATHER AND SHOE TRADES BUILDING.

New England Shoe and Leather Department.

EXHIBIT MADE BY ESSEX INSTITUTE AT REQUEST OF MR. CLINTON COLLIER, SUPT.

First shoe pegged by machinery.

First patent granted a shoe pegging machine given Mar. 8, 1833, to Samuel Preston, Danvers, Mass. This machine was arranged to put two rows of pegs upon each side of the shoe at the same time. It did not come into general use but the principle involved is found in all later machines.

Shoe and patten, made in London 1780 and worn in Salem soon after.

Shoe worn by a Salem belle at a Salem party about 1800.

Pair of slippers made in Salem in 1824.

Slippers, French style, purchased in Salem, 1819.

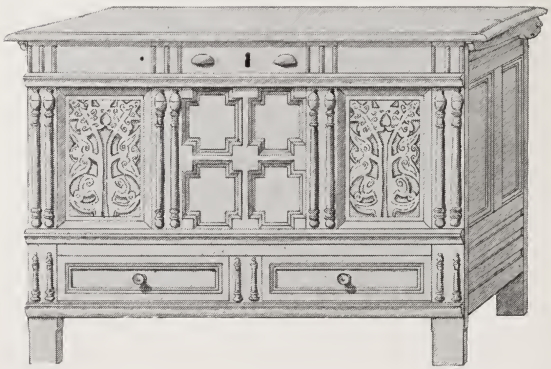
Patten, used before the introduction of rubber overshoes.

Infant's shoe, 1756.

Shoe worn by boy on Salem streets at a date prior to the Revolution.

Shoe worn by children of the present generation in mining district, Lancashire, England. Loaned by the Peabody Academy of Science.

Pocket book made and used in Salem prior to 1730.



"HEPPELWHITE"

"QUEEN ANNE."

"OAK CHEST."

MASSACHUSETTS STATE BUILDING.

Reception Room.

Mr. E. C. Hovey, the Secretary of the Massachusetts Board of World's Fair Managers, gave the Essex Institute full charge of fitting up and furnishing the main reception room in the state building. After consultation with him the committee decided to have the furniture illustrative of the period from the time of the first settlement of Salem until its commercial period at the beginning of the present century; also to place upon the walls portraits of men whose names were familiar in state, commerce, law, science and literature. In addition, to have a display of historical relics which would, in a measure, show some of the historical work of the Institute and also give an idea of the directions in which it was hoped its collections would be increased. To these were to be added volumes relating to local history, albums of Salem views, and several volumes of the publications of the Essex Institute.

PORTRAITS.

John Endicott. Copy by Frederick P. Vinton, from the original portrait in possession of Hon. Wm. C. Endicott, of Salem. *Loaned by Mr. Wm. Endicott, Jr., Beverly.*

Endicott was born in Dorchester, England, 1588; arrived at Salem in the ship "Abigail," Sept. 6, 1628, as "Governor of the Plantation." In 1630, succeeded by Winthrop and took his seat as one of the Assistants. 1636, appointed Magistrate to hold the Salem Court, also Col. of Militia. In 1637, made one of the Standing Council for life. In 1641, Deputy Governor. In 1644, chosen Governor and served as such almost continuously until his death. In 1645, made Sergeant Major General, the highest military officer of the colony. In 1652, established a mint. Died in Boston, March 15, 1665. Location of his residence in Salem not accurately known, but was not far from the present corner of Washington and Federal streets. His farm in Danvers with pear tree planted by himself is still in possession of his lineal descendants.

Simon Bradstreet. Copy by Joseph DeCamp from the portrait in the Senate Chamber, State House, Boston. *Loaned by the City of Salem.*

Born in England, 1603; died in Salem, March 27, 1697. Came to Massachusetts in 1630 as one of the Assistants. Made Deputy Governor in 1673. Governor in 1679. Served until 1686 when the charter was made void. Upon Sir Edmund Andros being deposed by the people in 1689, Bradstreet was again chosen Governor and continued in office until 1692. His house in Salem, taken down in 1755, stood upon the present site of the Armory of 2d corps of Cadets, Mass. V. M.

George Peabody. Painted by A. B. Schell. *Loaned by Mr. S. Endicott Peabody.*

Banker and philanthropist, born in So. Danvers, now Peabody, Feb. 18, 1795; died in London, Nov. 4, 1869.

Joseph Peabody. Painted by James Frothingham. *Loaned by Mr. S. Endicott Peabody.*

Born in Middleton, Mass., Dec. 9, 1757; went to Salem at the age of eighteen and joined the privateer "Bunker Hill" owned by E. H. Derby. Followed the sea for many years until 1791 when he began his mercantile career. Was engaged in the India, China, Straits and European trades as well as the West Indies and Spanish Main. Built eighty-three vessels. Died at Salem, Jan. 5, 1844.

John Bertram. Copy by Miss H. Frances Osborne from the painting by Dr. Edgar Parker, in possession of the Peabody Academy of Science. Essex Institute.

Born in the Isle of Jersey, Feb. 11, 1796. Came to this country in 1807 and settled in Salem. Followed the sea until 1832. Engaged in general commercial business. Especially interested in the Zanzibar, Madagascar, Arabian and California trades. Latter part of his life largely interested in the development of western railroads. Noted for his munificent gifts to local charities.

Manasseh Cutler, LL.D., M. C. 1800 to 1802. Copy by Miss A. W. Woodbury from the original portrait in possession of the Essex Institute.

Clergyman and botanist at Ipswich Hamlet (Hamilton); born in Killingly, Ct., in 1742 and died in Hamilton, 1823. Chaplain in Revolution; started the first party of emigrants to the Ohio. Made the first scientific description of the plants of New England.

Nathan Dane. Copy by Miss A. W. Woodbury of portrait in possession of Essex Institute.

Eminent jurist and statesman. Born in Ipswich, Dec. 27, 1752; died in Beverly, Feb. 15, 1835. Harvard University, 1778. Member of Congress, 1785–8. Held various state offices. Member of the Hartford Convention, 1814. Framer of the celebrated ordinance of 1787 for the Northwest Territory. Founder of the Law School at Cambridge.

William Gray, Jr. Solar print from portrait in possession of Peabody Academy of Science.

Born in Lynn, June 27, 1760. Entered counting room of Richard Derby at an early age. Became one of the largest ship owners in Salem; at one time said to be the largest in America. In 1807, owned fifteen ships, seven barques, thirteen brigs, one schooner, or one-quarter of the tonnage of Salem. Took great interest in politics and after removal from Salem became Lieut. Gov. of Mass.

Sir Richard Saltonstall. Engraving from the portrait by Rembrandt painted in Holland 1644 and now in possession of his lineal descendants. *Loaned by Mr. F. H. Lee.*

Saltonstall was born in Halifax, England, 1586; died in England, 1658. One of the grantees under the Council for New England. Came to this country with Winthrop.

Elias Haskett Derby. Copy by Joseph De Camp from portrait in possession of Peabody Academy of Science. Essex Institute.

Born in Salem Aug. 16, 1729; died Apr. 8, 1799. One of Salem's most eminent merchants. His vessels were the first from New England to engage in the India and China trade.

Nathaniel Bowditch. Copy by Miss A. W. Woodbury from portrait in possession of Peabody Academy of Science. Essex Institute.

Learned mathematician, born in Salem 1773. President of a Marine Insurance Co. in Salem 1804 to 1823, when he became Actuary of Massachusetts Hospital Life Insurance Co.; died in 1838 in Boston.

Joseph Story. Copy by Joseph De Camp from portrait in possession of Essex Institute.

Noted jurist and writer. Justice of United States Supreme Court. His law work comprises sixty-one volumes. Published a volume of poems in 1804. Born in Marblehead. Practised law in Salem many years. Died, 1845, in Cambridge, aged 66.

Nathaniel Hawthorne. Painted by Miss H. Frances Osborne from photograph taken at request of Mr. James T. Fields. Essex Institute.

Author of Scarlet Letter, Twice Told Tales, etc. The most distinguished writer of Romance in America. Surveyor of Salem 1846–1850. In Boston Custom House 1838 to 1841. Born in Salem July 4, 1804; died at Plymouth, N. H., May 19, 1864.

Dr. William Paine. Photograph from painting. *Loaned by Mr. F. H. Lee.*

Physician in Salem and Worcester. Loyalist. During the Revolution absent in England. Introduced to George III. at Court in the costume in which portrait was painted.

Joseph B. Felt. Engraving. Essex Institute.

Born in Salem 1789; died there Sept. 8, 1869. Historian. Author of the Annals of Salem, History of Ipswich, History of Essex, Life of Hugh Peters, etc.

William Hickling Prescott. Engraving. Essex Institute.

Born 1796; died 1859. Author of the History of Ferdinand and Isabella Conquest of Mexico and many other works. Born on site of Plummer Hall.

With this is framed an autograph letter, a photograph from engraving of his birthplace, and a photograph of Plummer Hall which now occupies the site of his birthplace.

Timothy Pickering. A miniature by George Southard after original by Gilbert Stuart. *Loaned by Mr. F. H. Lee.*

Born at Salem 1745; died there 1829. A prominent military and political character. Served through the Revolutionary War under Washington, and at its close was Secretary of War and Secretary of State. Was member of Congress and of the Massachusetts Legislature and held also various minor offices. One of the leaders of the Federal Party and noted for his honor and probity.

With this is framed a photograph of his birthplace, Broad St., Salem, built in 1651; an autograph when he was town clerk 1774; one when he was Secretary of State 1795, and a letter when member of Congress 1815.

Timothy Dexter. Engraving. Essex Institute.

Newburyport merchant, somewhat eccentric; called himself "Lord Timothy Dexter;" wrote pamphlets. Made a fortune by sending warming pans to the West Indies. Leather dresser by trade.

With this is framed a photograph, from engraving, of his residence and grounds with decorations, an autograph, and a reprint of his book, "Pickles for the knowing ones."

Henry Wheatland. Photograph. *Loaned by Mr. John Robinson.*

Born Jan. 11, 1812; died 1893. President Essex Institute. Distinguished for scientific, genealogical and historical knowledge.

Capt. George Curwen. Photogravure. *Loaned by Mr. John Robinson.*

Born in England 1610; died 1685. Old merchant, first of the name in this country. Lived in the Roger Williams house. Earliest of Salem merchants, was in the London trade previous to 1658; had four warehouses and two wharves in Salem and was owner of the ketches "George," "Swallow," "John," and "William."

Rev. George Curwen. Photogravure. *Loaned by Mr. George R. Curwen.*

Minister of First church, born 21 May, 1683; died 23 Nov., 1717; son of Capt. Geo. Curwen.

Abigail (Curwen) Hawthorne. *Loaned by Mr. George R. Curwen.*

Daughter of Capt. George Curwen. Ancestress of James Russell Lowell.

Maj. Stephen Sewell. *Loaned by Mr. George R. Curwen.*

Born Baddesley, England, 19 Aug., 1657; died 17 Oct., 1725. Clerk of the Courts at trial of the witches. Register of deeds for many years.

Margaret (Mitchell) Sewell. *Loaned by Mr. George R. Curwen.*

Wife of the above.

Samuel Curwen. Photogravure. *Loaned by Mr. Geo. R. Curwen.*

Distinguished Tory of the Revolution. Lived in London 1775 to 1784; author of Curwen's Journal and Letters written in London during his expatriation.

Charles W. Upham. Engraving. Essex Institute.

Born 1802; died 1875. Distinguished as clergyman, Member of Congress. Author of History of Salem Witchcraft. Well known as a political and historical writer.

Robert Rantoul, Junr. Lithograph. Essex Institute.

Born 1805; died 1852. Lawyer, member of Congress, political writer.

John Carnes. Photographed from the original portrait in possession of Essex Institute.

Commander of a Privateer during the Revolution.

Washington. From the original picture in possession of the Nichols family, Salem. *Loaned by Mr. F. H. Lee.*

Silhouettes. *Loaned by Mr. Chas. P. Bowditch, Boston.*

Merchants, lawyers, and divines of Salem, etc., viz.:

Mr. Jonathan Waldo.

Druggist and merchant in Salem; built, in connection with Wm. Stearns, the "Old Corner" building in 1792.

Col. Timothy Pickering.

Thomas Cushing, Esq.

Mr. Nathaniel West.

Merchant in Salem.

Judge Samuel Sewall (Marblehead).

Lawyer of distinction born in Boston 1757; died at Wiscasset, Me., 1814. Member of State Legislature. M. C. 1797–1800. Judge of Supreme Court and Chief Justice Nov. 1813.

Rev. Dr. John Prince.

Minister of First church from 1775 to 1836.

Mrs. Prince.

Wife of Rev. John Prince.

Jonathan Tucker, Esq.

Merchant.

Mrs. Tucker.

Mr. Bowditch.

Rev. Dr. Lucius Bolles.

Baptist minister in Salem 1805; born 1779; died 1844.

Rev. Dr. T. Barnard, Jr.

(T. Barnard, Senr., was of the First church.) First minister North church, 1772 to 1814. Born 1748; died 1814.

Jonathan P. Saunders.

Surveyor and many years town clerk of Salem.

Rev. Dr. Bentley.

Minister East Church 1783 to 1819. Born 1759, died Dec. 29, 1819. Editor Essex Register. Harvard University 1777; tutor there. Distinguished as a theological and political writer. Much interested in antiquarian matters.

Rev. Mr. Fisher.

Rector of St. Peter's church; died in 1813.

Benjamin Pickman, Esq.

Born 1763; died 1843. Harvard University, 1784. Medical College, 1809-11. Merchant in Salem. Noted Federalist writer.

Mr. Joseph Peabody.

Distinguished merchant in Salem, from 1791 to 1844.

John G. King, Esq.

Lawyer and scholar, first President of Common Council.

Rev. Dr. Daniel Hopkins.

Minister South Church 1776. Born 1834; died 1814.

John Punchard, Esq.

Held various offices in Salem. Drummer at West Point, time of capture, of Maj. André, 1780.

PAINTINGS OF OLD HOUSES, ENGRAVINGS, PHOTOGRAPHS, BROADSIDES, ETC.

Narbonne House. Pastel, by Ross Turner. Essex Institute.

This house, built prior to 1680, still stands at 71 Essex Street and is a good illustration of the architecture of that period showing the lean-to roof.

Ward House. Pastel, by Ross Turner. Essex Institute.

This house built by John Ward about 1684 and still standing on St. Peter street shows the overhanging second story, which romance attributes to being used as a protection against the Indians. It is, however, an old country type of building brought over by the early settlers and was for the practical benefit of increased room in second story.

Cabot House. Water color, by Ross Turner. Essex Institute.

House built by Joseph Cabot about 1748 showing good example of gambrel roof. A fine illustration of the colonial type.

Nichols House. Water color, by Ross Turner. Essex Institute.

Colonial house designed by McIntire, local architect.

Emmerton House. Pastel, by Ross Turner. Essex Institute.

House built 1817, and remodelled in 1886, shows good example of colonial spirit in modern architecture.

Roger Williams (Witch House). Water color, by Ross Turner. Essex Institute.

Owned in 1635–6 by Roger Williams. Familiarly called "Old Witch House," it being occupied in 1692 by Jonathan Corwin one of the judges in the witchcraft trials, and tradition has it that preliminary examinations of witnesses were held here. It is the oldest house in Salem or vicinity.

Derby Mansion. Heliotype. *Loaned by Mr. F. H. Lee.*

House built in 1799 by Elias Haskett Derby the eminent merchant. Present market house now stands on its site.

East Church. Lithograph. *Loaned by Mr. F. H. Lee.*

Building in which the famous Dr. William Bentley preached from 1783 to 1819.

East Church, interior. Lithograph. *Loaned by Mr. F. H. Lee.*

Pickman House. Lithograph. *Loaned by Mr. F. H. Lee.*

Built by Col. Benjamin Pickman, 1750. Still standing though defaced by shops in front. It is said that the term "Codfish Aristocracy" arose from the fact that the end of each stair in the hall of this house was ornamented with gilded codfish, Col. Pickman's fortune being derived from the fisheries.

Derby House, Washington St. Lithograph. *Loaned by Mr. F. H. Lee.*

House built in 1764. John P. Derby the humorist, and John Rogers, sculptor, both born in this house.

A corner in old Salem. Charcoal. *Loaned by the artist, Miss S. E. C. Oliver.*

View on Summer St. giving a characteristic bit of some of the old types of houses now fast disappearing.

Stairway in Cook House. Charcoal. *Loaned by the artist, Miss S. E. C. Oliver.*

House on Federal St. owned by Capt. Samuel Cook, a noted sea captain. The figure, winding the clock, is that of Henry K. Oliver the well known educator and writer.

An old Salem garden. Oil. *Loaned by the artist, Miss S. E. C. Oliver.*

Roger Williams House. Photograph from original sketch in possession of Essex Institute. See Witch House.

Bradstreet House. Photograph from original sketch in possession of Essex Institute.

House built by Emanuel Downing and occupied by Gov. Bradstreet. Stood on the site of the present Cadet Armory building.

Timothy Lindall tombstone. Photograph. *Loaned by Mr. John Robinson.*

Curious old tombstone erected to the memory of Timothy Lindall, a merchant in Salem. Can be seen in Charter St. cemetery.

Stage coach. Lithograph. *Loaned by Miss Laura E. Foye.*

Said to be first stage driven over Forest River road.

Battle of Bunker Hill. Engraving. *Loaned by Mr. F. H. Lee.*

Price Act. Essex Institute.

List of prices put in force to prevent monopoly and oppression in the town of Ipswich at a meeting of the selectmen and committee of correspondence, Feb. 10, 1771.

Resolves of Provincial Congress. Essex Institute.

Resolves of provincial congress, Watertown, June 16, 1775, against profanation of the Lord's Day.

Elephant handbill. *Loaned by Mr. John Robinson.*

Ship America of Salem, Capt. Jacob Crowninshield, brought an elephant from Bengal to New York, Apr. 19, 1796. First elephant brought to this country. It sold for $10,000 and was exhibited throughout the country, this show bill being used in Boston a year later.

Commission to Joseph Sprague. Essex Institute.

Commission signed by the "major part of the council of Massachusetts Bay in New England" to Jos. Sprague, major in First Reg't Militia, Feb. 14, 1776.

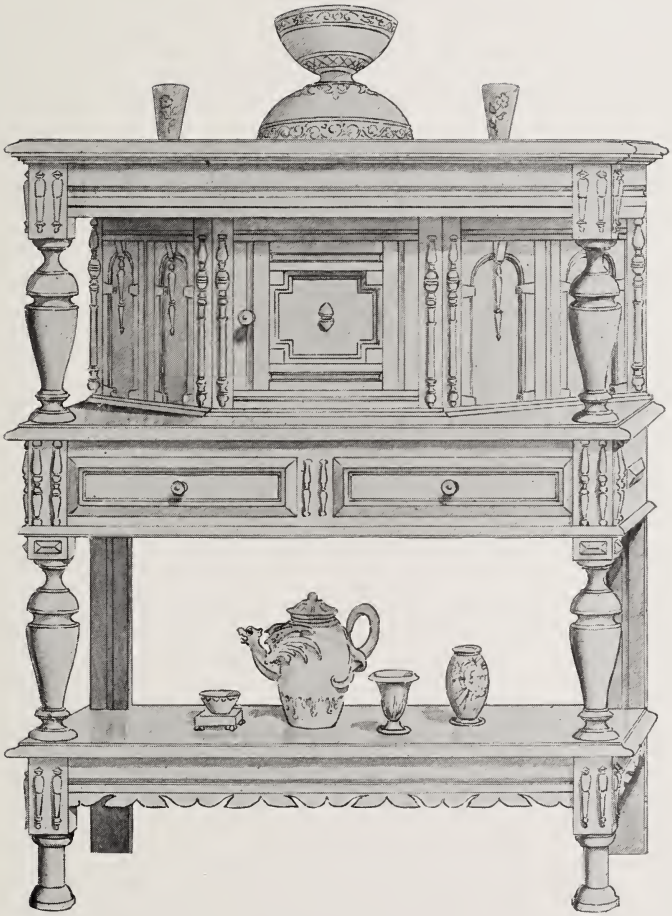
John Little will. *Loaned by Mrs. Grace A. Oliver.*

Photographic reproduction of will made 1764, showing signatures, etc.

FURNITURE.

Court cupboard (Early Colonial period). *Loaned by Mr. Wm. C. Waters.*

Pictured in Lyon's Colonial Furniture Fig. 15. Doctor Lyon says Court Cup-



"COURT CUPBOARD."

boards were in use in England as early as 1586. In New England as well as the mother-country the Court Cupboard was found in the hall, the parlor or the chambers of the chief magistrates, the clergy, and other persons of wealth and social position. One is mentioned in the inventory of Wm. King, of Salem, 1654. There is here, as in England, a style of cupboard having its upper part enclosed. The part below was left open to receive the precious vessels of silver, glass and faïence, which were also displayed from the cupboard's head.

Oak chest (Colonial period). Essex Institute. In use in Newburyport.

Doctor Lyon says the fashion of making chests with drawers underneath sprang up in England some time in the first half of the 17th century. They are more numerous in New England than those without drawers. The black applied ornamentation shows a later period than plain oak.

Secretary, mahogany (Pre-revolutionary period).

These Scrutoires, or Scrntoirs with bookcase, begin to be mentioned about 1710. One very much like the example shown is pictured by Lyon's Fig. 51, his bearing date 1737. The Institute example was in use in Salem for years. Note the finish of interior, secret drawers (so called), etc.

Sideboard, mahogany (Pre-revolutionary period). Essex Institute.

This style of sideboard came in later than the buffets and are probably products of the Chippendale (1753) and Heppelwhite (1780) designs. This example comes from a Maine family and has been traced to Revolutionary times, it having been in the family of Gen'l Knox at the time of the Revolution.

Corner cupboard. Essex Institute.

Corner Cupboards are mentioned in New England in 1719, and Doctor Lyon thinks they differed from the Beaufat or Buffet. These were built generally into the corner, but movable buffets of mahogany were made in Philadelphia. They were used for the display of glass and china.

Black oak chest (Early Settler period, about 1650–1680). *Loaned by Mr. Jos. Hudson, Newburyport.*

The carving on this chest besides the usual conventional design has for a central ornament the Judgment of Solomon.

Clock (black oak case). *Loaned by Mr. Jos. Hudson, Newburyport.*

Tall clock cases were probably not known much before 1680 (Dr. Lyon). This case is older than the works. The door carving represents Adam and Eve driven from the garden of Eden. The base, Moses in the bulrushes. The works are by Lister and Bromley, Halifax, England.

Oak table (Massachusetts Bay Colony period). *Loaned by Mr. W. J. Stickney.*

Tables of this description are mentioned in inventories in 1669. These were favorites in New England in the seventeenth century.

Small table (Witchcraft period).

The real use of this table is in some doubt. Doctor Lyon, the authority in colonial furniture, does not mention any of this kind. It has been in a family whose

ancestors were connected with the witchcraft delusion and the tradition is that it came down from that period. It has every appearance of being a genuine example and it was obtained through Mr. J. C. Casey, a well known dealer.

Table chair (about 1654). *Loaned by Mr. W. J. Stickney.*

These chairs were used for tables and when not in use were set at the side of the room. They are quite rare. Doctor Lyon, in Figs. 94 and 95, shows one very similar to this example.

Reading chair (Colonial period). *Loaned by Mr. W. J. Stickney.*

Two high-backed chairs (Witchcraft period). *Loaned by Mrs. Wm. C. Waters.*

These chairs came from the Rebecca Nurse house and tradition says date back to the Bishop family.

Settle (Revolutionary period). Essex Institute.

This settle comes from one of the old houses of Salem. It was originally in use in the living room but afterwards was removed to the porch.

Arm chair and four fan-backed chairs. *Loaned by Peabody Academy of Science.*

These chairs of the "Windsor" style belonged to the East India Marine Society and were used by the merchants and ship-masters at the banquets of the society about 1804.

Six painted chairs. Essex Institute.

These chairs about 1810 and later, were in use in the "best" rooms of Salem houses.

Two high-backed oak chairs (Renaissance). *Loaned by Mr. and Mrs. J. T. Moulton, Lynn.*

Two shield-backed mahogany chairs (Heppelwhite). *Loaned by Mr. W. J. Stickney.*

High-backed walnut chair (Early Colonial). *Loaned by Mr. W. J. Stickney.*

Two walnut chairs (Queen Anne). *Loaned by Mr. W. J. Stickney.*

Two maple chairs (Chippendale style). *Loaned by Mr. W. J. Stickney.*

Four Windsor chairs (about 1750). *Loaned by Mr. W. J. Stickney.*

Hall clock. *Loaned by Mr. John Robinson.*

Clock by "Nathaniel Mulliken, Lexington" in solid mahogany case. The works

were originally in a cherry wood case of older style and doubtless they were running in some mansion in the neighborhood of Concord or Lexington at the time the British regulars were marching through these towns on the eventful April 19, 1775. Nathaniel Mulliken made clocks from 1751 to 1767. His sons continued the business until the factory was burned by the British Troops on the night of April 19.

Andirons. Ball pattern. *Loaned by Mr. John Robinson.*

Andirons, and fire set. Oval pattern. *Loaned by Mr. W. J. Stickney.*

CHINA, GLASS, ETC.

Corner Cupboard.

Ridgway plate. Beauties of America. South Boston Insane Hospital. Loaned by Mr. W. J. Stickney.

Staffordshire plate, Clews. Peace and Plenty. Loaned by Mr. W. J. Stickney.

Staffordsh re plate. State House, Boston. Loaned by Mr. W. J. Stickney.

Rogers plate. State House, Boston. Loaned by Mr. W. J. Stickney.

Enoch Wood plate. Com. McDonough. Loaned by Mr. W. J. Stickney.

Ridgway pitcher. State House, Boston. Loaned by Mr. W. J. Stickney.

Nahant Hotel plate. Loaned by Mr. W. J. Stickney.

Harvey plate. English. Loaned by Mr. W. J. Stickney.

Platter, Old Italian Majolica. Loaned by Mr. W. J. Stickney.

Platter, Toft-ware. Staffordshire 1675, slip decoration. Loaned by Mr. W. J. Stickney.

English plate. Formerly belonged to Tobias Lear, Portsmouth, Washington's private secretary. Loaned by Mr. W. J. Stickney.

Nankin plate. Loaned by Mr. W. J. Stickney.

Nankin plate. " " "

Canton plate. " " "

Tuscan rose plate, English. Loaned by Mr. W. J. Stickney.

Cup and saucer, American ware. Delaware. Loaned by Mr. W. J. Stickney.

Delft plate. Loaned by Mr. W. J. Stickney.
" " " "
" " " "

Liverpool plate. Herculaneum. Loaned by Mr. W. J. Stickney.

English plate. Loaned by Mr. W. J. Stickney.

Jackson plate. Clyde. Loaned by Mr. W. J. Stickney.

Liverpool plate. Loaned by Mr. W. J. Stickney.

Old Delft plate. " " "

Cup and saucer. State House, Boston. Loaned by Mr. W. J. Stickney.

Old English pitcher, used by Miss Susannah Ingersoll at "House of Seven Gables." Essex Institute.

Old China pottery teapot. "House of Seven Gables." Essex Institute.

Staffordshire pepper pot, 1825. Essex Institute.

Pewter pot, pint. "

Ridgway pitcher. Tam O'Shanter 1832. Loaned by Mr. John Robinson.

Silver cream jug. Marriage pitcher of Susannah Ingersoll and Daniel Bray, 1680, descended through family of Philip English to Susannah Ingersoll occupant in Hawthorne's time of so-called House of Seven Gables. Mark $_{D}{}^{B}{}_{S}^{*}$ Loaned by Mr. John Robinson.

On Sideboards, Mantels, etc.

Teapot, blue decoration. Essex Institute.

Face mug. " "

China punch bowl. " "

Delft punch bowl. " "

Teapot. " "

Sugar bowl. " "

Pitcher, snake pattern. " "

Delft pitcher. " "

Pitcher. Boar's head. " "

Pitcher, Liverpool ware, ship ornamentation. Loaned by Mr. W. J. Stickney.

Two glass decanters, about 1800. Loaned by Mr. W. J. Stickney.

Six brass candlesticks. Loaned by Mr. T. F. Hunt.
Plate, English, blue printed ornamentation. Loaned by Mr. T. F. Hunt.
Plate, English, gray printed ornamentation. Loaned by Mr. T. F. Hunt.
Pitcher, Liverpool ware, Masonic emblems. Loaned by Mr. W. J. Stickney.
Ginger jars. Old style. Loaned by Mr. T. F. Hunt.
Mug. Bacchus. " " "
Teapot, English ware, blue decoration. Loaned by Mr. T. F. Hunt.
Two liquor jugs, decorated glass. Loaned by Mr. T. F. Hunt.
Coffee pot, Old Canton ware. Loaned by Mr. T. F. Hunt.
" Old blue " plates, Canton ware. Loaned by Mr. J. Robinson.
Three grog tumblers. Loaned by Mr. W. J. Stickney.
Soup tureen, "Old Blue" Canton ware. Loaned by Mr. J. Robinson.
Vegetable dishes, " Old Blue " Canton ware. Loaned by Mr. J. Robinson.
Coffee pot, " Lowestoft." Loaned by Mr. J. Robinson.
Teapot, " " "
Engraved grog tumbler. " "
Engraved grog tumbler with handle. Loaned by Mr. J. Robinson.
Grog tumbler, plain. Loaned by Mr. J. Robinson.
Bowl, blue decoration. Loaned by Mr. J. Robinson.
Bowl, Liverpool ware. " "
Teapot, Liverpool ware. " "
Sugar bowl, blue decoration. Loaned by Mr. J. Robinson.
Two silver plated candelabras. In use at South church, Salem, 1804. Loaned by Mr. John Robinson.

Publications of the Essex Institute and books of local historical interest in Reception Room. These books are bound in leather made in Salem.

Visitor's Guide to Salem.
Historical Sketch of Salem. Osgood and Batchelder.
Old Naumkeag. Mr. W. S. Nevins.

Naumkeag Directory. Mr. H.M. Meek.
Salem Witchcraft in Outline. Mrs. C. E. Upham.
Witchcraft in Salem Village. Mr. W. S. Nevins.
Our Trees. Mr. John Robinson.
Salem Light Infantry. Mr. Geo. M. Whipple.
Records of Town of Manchester.
Records of Town of Gloucester.
Morse's Japanese Pottery. Sylvester Baxter.
Arrow Release. Mr. E. S. Morse.
History of Marblehead. Mr. S. Roads, Jr.

Eight volumes consisting of gleanings from the Historical Collections and Bulletin of the Essex Institute.

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Methodism in Salem. Almy.

Cruises.

Cleopatra's Barge. Crowninshield.

Early California Voyage. Eagleston.
Commission of a Salem Privateer. Crowell.
Sea Journal of Caleb Foote, Sr., compiled by Caleb Foote.
First Cruise of Frigate Essex. Preble.

Genealogy.

Genealogical Gleanings in England. Waters.
Henry Silsbee. Emmerton.
Richardson and Russell. Kimball.
Prince Family, Danvers. Putnam.
Allen Family, Manchester. Price.
Perkins Family. Perkins.
Records of First Church. Emmerton.
Salem Baptisms. Emmerton.

Nine albums of photographic views. These were selected from the series of Art Views of Historic Salem published by Mr. Frank Cousins, placed on special mounts and consist entirely of buildings, sites, architectural studies, etc., that can be seen by visitors in Salem to-day.

Salem Streets and Business Buildings.

Chestnut St. west from Summer.
Boston St. and "Big Tree."
Essex St. west from Essex Institute.
Old Bakery, High St., built about 1700.
Foot of Creek St.
Washington St. west side, and Railroad Station.
Essex St. east from Washington.
Essex St. west from Museum.
Essex St. near St. Peter St., site of William Gray's garden.
North St. north from Bridge St.
William Gray's Counting-room.
Joseph Peabody's Counting-room.
Forest River Lead Mills, 1832.
Naumkeag Steam Cotton Mills.
Salem Electric Lighting Co., 1890.
Frisbee's Boat Yard, off Derby St.

Derby Wharf (built about 1760), 1890.
Phillips Wharf and Wilkesbarre Coal Elevators.
Essex House, William Gray's residence in 1800.
Bank Building, Central St., about 1816.
Asiatic Building, Washington St., 1854.
Northey Building, Washington and Essex Sts., 1873.
Odell Building, Washington St., 1891.
Peabody Building, Washington St., 1892.
Gardner Building, Essex St., 1892.

Salem: Public Buildings.

Custom House, Derby St., 1818; also Old Ladies' Home, 1816.
Post Office, Washington St., 1882.
Court Houses, Federal St., 1840 and 1892.
Court House (1892), Law Library, east.
" " " " " west.
Salem Jail, St. Peter St., 1813 and 1884.
Hamilton Hall, Chestnut and Cambridge Sts., 1805.
Mechanic Hall, Essex St., 1832.
Boston and Maine Railroad Station, 1845.
Armory, Salem Cadets, Essex St. (Francis Peabody Residence 1818).
Armory, Salem Cadets Essex St. Officers' quarters.
" " " " " Drawing-room.
" " " " " Mantel in drawing-room.
" " " " " Doorway " " "
" " " " " " " reception "
" " " " " Mantel in banquet hall.
" " " " " Banquet hall, north.
Town Hall and Market, 1816.
City Hall, Washington St., 1838.
" " Indian Deed of Salem, 1686.
Steamer House of Fire Department, Church St.
Alms House 1816 and Insane Asylum 1884, Salem Neck.
Plummer Farm School, Winter Island.
Franklin Building, Washington Square, 1860.
Salem Hospital, Charter St. (Bryant House 1815).
Old Men's Home, Derby St. (Waters' residence 1815).

Children's Friend Society, Home on Carpenter St., 1878.
Woman's Friend Society, Elm St. (Residence about 1804).
City Orphan Asylum, Lafayette St. (Roman Catholic).

Salem: Old Houses.

Pickering House, Broad street, 1651.
Narbonne House, Essex street, 1680 (west).
" " " " 1680 (east).
" " " " 1680 (rear).
John Ward House, St. Peter street, 1684.
Old Bakery, Washington street, 1680.
Cromwell House, rear of Derby street, about 1680.
An old "cent shop," Essex street, about 1780.
Barton House and studio, Washington square, about 1740.
Old Derby Mansion, Derby street, 1762.
Residence, Hon. W. C. Endicott (Cabot House), Essex street, 1748.
Miles Ward House, Herbert street, about 1760.
Fitch-Derby mansion, Lafayette street, about 1780.
Derby Mansion, Washington street, 1764.
Hodges House, Essex street, 1780.
Old Assembly Hall, 1769. Now residence of Mrs. John Bertram. Lafayette entertained here Oct. 29, 1784, and Washington Oct. 29, 1789.
Nichols House, Federal street, about 1798 (front).
" " " " 1798 (rear and court yard).
"The Studio," Chestnut and Summer street, 1826, showing spire of South church, 1805.
Peabody and Lord residences, Washington square, about 1818.
Residence of Mrs. Geo. R. Emmerton, Essex street. Restored colonial architecture.
Andrew House, Washington square, 1818.

Public Grounds, Walks, etc.

The Common, western gate.
The Willows and Juniper Point.
" " (planted 1802), Salem Neck.
Wharf at Willows.

Baker's Island (Salem Harbor), Government Lights.
" " The Cliffs.
" " Point of Rocks.
Charter street cemetery, Old Burying Point, 1635, entrance.
" " " Oldest headstone, 1673.
" " " Old headstone, 1688.
" " " Mary Corey headstone, 1684.
" " " Timothy Lindall headstone, 1698.
" " " Old headstones.
Broad street cemetery, Gen. Fred Lander's tomb.
" " " Sewall children headstone.
" " " Timothy Pickering tomb.
Harmony Grove " near entrance.
" " " Jesse Smith monument.
" " " John Bertram "
" " " Geo. Peabody "
Greenlawn " The Lake.
Floating Bridge, 1802, on turnpike to Boston.
Endicott pear tree, planted 1630, Danvers.
Francis Peabody Mansion, built prior to 1770 by Robt. Hooper, Danvers.
Whittier's Danvers Home, built by W. A. Lander, 1842.
Geo. Jacobs House, 1690, Danvers. Jacobs taken from this house and tried for witchcraft, 1692.
Rebecca Nurse monument, Danvers.
Old Powder House, 1775, Marblehead.
Lee Mansion, 1768, Marblehead.
Stairway in Lee Mansion, 1768, Marblehead.
Door in Story House, about 1743, Marblehead.

Salem: Historical Sites and Portraits.

Roger Williams House, 1634. Residence of Judge Corwin, 1692; also known as the "Witch House."
The same, showing older portion only.
Shattuck House, Essex street. Bridget Bishop accused of bewitching a child here.
Residence of A. C. Goodell, Jr., Esq. Site of and contains timbers of Witchcraft Jail of 1692.

Gallows Hill. Site of witchcraft executions in 1692.

North Bridge. Site of "Leslie's Retreat," Feb. 26, 1775.

Joshua Ward House. Gen. Washington passed the night here Oct. 29, 1789.

Birthplace of Nathaniel Bowditch, Mar. 26, 1773, and of Rev. Samuel Johnson, Oct. 10, 1822. House removed from Brown street.

Residence of Rev. Dr. William Bentley and place of his death, 1819, Essex street.

Residence of Judge Joseph Story, 1811—. Birthplace of W. W. Story, 1819. Visited by Lafayette, 1824.

Doorway of Custom House, 1805, Central street.

Essex Bridge, 1788. Inspected by Washington, 1789. Site of Winthrop's landing, 1630, in foreground. Beverly at distance.

Allen pear tree, Hardy street. Planted in 1640.

Nathaniel Hawthorne, 1804–64. From Mayall daguerreotype.

Hawthorne's birthplace, July 4, 1804, Union street. "Built about 1680."

Rear of Hawthorne's Herbert street residence from birthplace on Union street. "My old accustomed chamber" is in this house.

Dr. Nathaniel Peabody's residence, 1838. "Dr. Grimshawe's House," "cornered on a graveyard." Charter street.

Porch of Dr. Peabody's residence, 1838. "Affording a glimpse up and down the street through an oval window on each side." Charter street.

Hawthorne's Chestnut St. residence, 1846. "The birds do visit our trees in Chestnut St."—Mrs. Hawthorne's letter.

Hawthorne's Mall street residence. "The Scarlet Letter" was written here in 1849.

Ingersoll House, about 1670, often called "House of the Seven Gables." Turner street.

Gov. John Endicott, 1588–1665. From portrait in Essex Institute, Salem.

Gov. Simon Bradstreet, 1603–1697. From portrait in Essex Institute. Original in Mass. State House.

William Pyncheon. "An dom 1657," "ætat. 67." Portrait at Essex Institute.

Mrs. Deborah Clarke, grandmother of Lord Bryan Fairfax. Portrait at Essex Institute.

Mrs. Annie (Brown) Fitch. From picture by Copley at Essex Institute.

Alexander Hamilton, 1757–1804. From picture by John Trumbull at Essex Institute.

Judge Joseph Story, 1779–1845. From portrait by Charles Osgood at Essex Institute.

Leverett Saltonstall, 1783–1843. From portrait by Charles Osgood at Essex Institute. First Mayor of Salem.

Nathaniel Bowditch, 1773–1838. From portrait by Charles Osgood at Peabody Academy of Science. Mathematician.

Elias Haskett Derby, 1739–1799. From portrait by James Frothingham in Peabody Academy of Science.

Jacob Crowninshield, 1770–1808. From painting by Robert Hinkley in Peabody Academy of Science.

William Gray, 1750–1825. From painting after Gilbert Stuart at Peabody Academy of Science.

Joseph Peabody, 1757–1844. From painting by Charles Osgood at Peabody Academy of Science.

Nathaniel Silsbee, 1773–1850, U. S. Senator. From painting by A. Hartwell after Chester Harding at Peabody Academy of Science.

Capt. John Bertram, 1796–1882. From painting by Edgar Parker at Peabody Academy of Science.

George Peabody, 1795–1869. From painting at Peabody Institute, Peabody, Mass.

George Peabody, 1795–1869. From marble bust at Peabody Institute, Peabody, Mass.

Salem Schools and Churches.

State Normal school, Broad and Summer streets.

High school, Broad street. 1856.

Oliver (Primary) school, formerly old Latin school, Broad street.

Bentley (girls grammar and primary) school, Essex street. 1861.

Bertram (Primary) school, Willow avenue.

First church (Unitarian) corner Essex and Washington streets. 1826, remodelled 1874.

East church (Unitarian), Washington square. 1846.
Tabernacle church (Orthodox Congregational), Washington street. 1854.
North church (Unitarian), Essex street. 1835.
" " " " " interior.
South church (Orthodox Congregational), Chestnut street, spire by McIntire.
Independent church (Unitarian), Essex street. 1824.
Friends' Meeting House, Pine and Warren streets. 1832.
St. Peter's church (Episcopal), St. Peter street. 1833.
Grace church (Episcopal), Essex street. 1858, remodelled 1889.
First Baptist church, Federal street. 1806, remodelled 1868 and 1878.
Central Baptist church, St. Peter street. 1826. Remodelled 1877.
Advent Christian church, North street. 1890.
Universalist church, Rust street. 1808. Remodelled 1888.
Immaculate Conception (Roman Catholic) church, Walnut street. 1857. Remodelled 1880.
Immaculate Conception (Roman Catholic) church, interior.
St. Joseph's (French Roman Catholic) church, Lafayette street. 1883.
Lafayette Street (Methodist) church, Lafayette and Harbor streets. 1853.
Wesley (Methodist) church, North street. 1888.
New Jerusalem church (Swedenborgian), Essex street. 1871.
Marine Society's Bethel (non-sectarian), Turner street. 1890.

Salem Literary and Scientific Societies.

Salem Public Library (Bertram Mansion) Essex street.
" " " Entrance.
" " " Delivery desk.
" " " Delivery room.
" " " Reading room.
" " " Reference room.
Peabody Academy of Science (East India Marine Hall 1824), Essex street.

Peabody Academy of Science (East India Marine Hall 1824), rear view, Essex street.

Peabody Academy of Science Zoölogical collections. Birds.
" " " " " Corals.
" " " Essex Co. " Turtles.
" " " " " Minerals.
" " " Marine trophy: East Hall.
" " " South gallery: "
" " " North " "
" " " Relics East India Marine Society.

Essex Institute (Daland Mansion) Essex street.
" " Entrance.
" " Reception room.
" " Historical room (portrait Dr. Henry Wheatland).
" " Antiquities, historical room.
" " Old China, "
" " First Puritan Meeting House. 1634.

Essex Institute. Interior First Puritan Meeting Home showing Hawthorne, Bowditch and Gray desks.

Essex Institute. "Ship Rock" near Salem, the property of the Institute. Weight 1100 tons.

Plummer Hall, Essex street.
" " interior, Salem Athenæum.

Salem: Halls, Stairways and Mantels.

Narbonne House, Essex street, interior, corner-cupboard, 1680.
" " " " star shutters, 1680.
Hubon " Charter street, stairway, 1780.
Hodges " Essex street, stairway, 1780.
" " " newel post, 1780.
Lindall " " stairway, 1740.
Brown " Summer street, stairway, about 1780.
" " " " turn, about 1780.
Nichols " Federal street, interior, 1798.
" " " " 1798.
" " " stairway, 1798.
" " " stair landing window, 1798.

Washington Hall, Washington street, fireplace, 1792.

Lindall House, Essex street, mantel 1740.
Fitch–Derby Mansion, Lafayette street, mantel, about 1780.
Old Ladies' Home, Derby street, mantel, 1816.
" " " " 1816.
Kimball House, Pickman street, mantel, about 1804.
" " " " " "
Clifford Crowninshield House, Washington square, mantel McIntire, 1805.
Woman's Friend Society, Elm street, mantel, 1804.
" " " " " 1804.

Salem: Doorways.

Robert Stone House, Walnut street, about 1700.
Twenty-three Summer street, about 1780.
Miles Ward House, Herbert street, about 1760.
Fifty-two Essex street, about 1790.
Z. Silsbee House, Washington square, about 1800.
Stearns House, Essex street, Flint street door, about 1800.
Eighty-one Essex street, about 1800.
Nineteen Margin street, about 1760.
Osgood House, Essex street, about 1765.
Cabot-Endicott House, Essex street (1748). Doorway restored, 1875.
Ives-Court House (Pine apple), about 1750.
Six Downing street, about 1750.
Nine Federal street, about 1804.
Browne House, Summer street (about 1780). Doorway about 1804.
Eighty-five Essex street, about 1800.
Home for aged men, Derby street, Turner street doorway about 1815.
Lord House, Washington square, Oliver street doorway, 1817.
Derby street about 1799: "Decayed gentility."
Stearns House, Essex street, about 1800.
Nichols House, Federal street, 1798.
Ropes House, Essex street, about 1750. Doorway, 1835.
Cook House, Federal street, about 1802. Fence posts from Elias Haskett Derby Mansion, Essex street, 1799.

Kimball House, Pickman street, about 1804.
Nathan Robinson House, Chestnut street, 1804. Remodelled by Mr. Little, 1887.
Francis Peabody House (Cadet Armory), Essex street, about 1818.
Forrester House (Geo. Peabody), Washington square, 1819.
Pickman House (Benj. Shreve), Chestnut street, 1816.
Pickering Dodge House (Dr. Shreve), Chestnut street, 1817.
Emmerton House, Essex street (Pickman house, 1817), remodeled, 1886.
Emmerton House, Essex street, Western end and yard, 1886.
John C. Lee House, Chestnut street, 1848.
Clifford Crowninshield House, Washington square, 1805.
White House (D. Pingree), Essex street, about 1817.
Tucker House, Essex street, about 1818.
Andrew House (W. O. Safford), Washington square, 1819. doorway altered about 1860.
Whipple House, Andover street, restored colonial.

HISTORICAL RELICS IN THE TABLE CASES.

Case 1. The coins and paper currency of Massachusetts Bay in New England during the Colonial and Revolutionary periods covering issues from 1650–1788. A tablet in the centre of this case contains the coins all of which are in fine condition, as follows :—

New England Shilling: Obv. "N. E.," rev. "XII." Minted at Boston in 1650, and considered the earliest as well as one of the rarest of the coins of the American colonies. *Loaned by Mr. F. H. Lee.*
Six Pine Tree Shillings, 1652.
Three Oak Tree Shillings, 1652.
Two Pine Tree Six-pences, 1652.
Three Pine Tree Three-pences, 1652.
Three Oak Tree Two-pences, 1662.
Four Massachusetts or "Indian" cents, 1787 and 1788.
Four half-cents as above.
Loaned by Messrs. H. M. Brooks and F. H. Lee.

The "Pine Tree" silver is the most interesting as well as the best known of the Colonial money. It was minted from 1652 to 1680 but always bore the date 1652, it is said, to prevent the authorities in England from checking this assumed right of coining money in Massachusetts. The twopenny pieces, however, bear date 1662. John Hull, the mint-master, lived at the present Pemberton Sq., Boston, his house later being occupied by Judge Samuel Sewell who received a dowry with his wife, Hull's daughter, of her weight in Pine Tree shillings; but this dowry has been placed by some writers at £30,000, rather a heavy weight, however, for even the stout daughter. Many of the dies for these coins were cut by Joseph Jenks, then connected with the Iron works at Saugus, the earliest to cast iron ware in the country. Immense quantities of the Pine Tree coins were minted but all varieties are now rare.

The dies for the copper cents and half cents of 1787–8 were made by Joseph Callender, whose place of business was at "Half square State St.," Boston, or where Brazier's Building now stands, and later by Jacob Perkins of Newburyport. Joshua Witherle was the mint-master, popularly known as "the cent maker," and lived and had his mint on the land now numbered 1132–44 Washington St., at E. Waltham St., Boston. The building was of wood 20 by 40 feet. (See exhaustive account of the Massachusetts coins in Crosby's Early Coins of America.)

The paper currency illustrates the issues from 1690 to the merging of the state in the nation, and includes many very rare and interesting specimens of these old bills. Among these are the "Pine Tree" and the "Sword in hand" issues. In addition to the currency are two State notes.

The collection in detail is as follows :—

1690, bill of 5 shillings.

1713–1740, bill of 1 shilling.

1744, bill of 2 pence.

1740, "A Crown."

1737, 1, 3, and 5 pence.

1776, June 18, 1 and 4 shillings.

1776–1778 (Pine Tree bills), 3 pence, 8 pence, 1 shilling, 1 and 6 pence, 2, 3, 4, 5 shillings, 4 and 8 pence, 5 and 4 pence.

1776–1778 (Pine Tree), bills of 2 and 6 pence and 3 shillings uncut, as printed together on one sheet.

1775–1776 (Sword-in-hand bills), 1 and 4 pence, 8, 12, and 48 shillings.

1776, an old counterfeit bill of 4 dollars.

1780, Massachusetts Bay, Continental Currency series with set to show backs 1, 2, 3, 4, 5, 6, 7, 8 and 20 dollars.

A bundle $2,000, of cancelled $20 bills preserved in the original package.

Treasury note 44 pounds 3 shillings Dec. 1, 1777, to Josiah Hemmenway.

War Committee note for 10 pounds March 11, 1777.

Case 2. Early new England press-work, broadsides, almanacs, etc., selected from the collections of the Essex Institute.

Eighteenth-century almanacs including interleaved almanac with manuscript notes of family and local happenings, an old colonial custom.

Engraving, by Paul Revere, and in original frame, of the Boston Massacre, March 5, 1770.

Broadside: ballad on the death of General Wolfe, Sept. 13, 1759.

Pamphlet: abstract of Massachusetts criminal laws, printed in 1704, containing the famous "Scarlet Letter" law.

Pamphlet: relating to the Maule controversy; "Persecutors mauled with their own weapons."

Salem and Boston eighteenth-century newspapers: Essex Register, N. E. Courant, Sentinel, Gazette, Post Boy, including one in mourning announcing the death of George Washington.

Lottery tickets, loaned by Mr. Henry M. Brooks: United States lottery to recoup war expenses 1776; State of Massachusetts to procure funds 1781; Harvard College for educational purposes 1795; a church at Bristol, R. I., for church funds, 1802.

Case 3. Old-time needlework.

Sampler wrought by Mary M. Peele, 1778.

Basket of flowers, Kensington stitch, about 1790.

Sampler wrought by Ruth Gray, 1804.

Sampler wrought previous to 1628 by Anne Gower, the first wife of Gov. John Endicott.

Sampler wrought by Martha C. Fitzhugh, of Virginia, 1793.

Pocket-book wrought by Eliza Willard, 1760.

Pocket-book wrought in 1765.

Sampler wrought by Sarah Courtis, 1770.

Case 4. Art in the home in old times in New England.

Colored engraving of Nelson's victory 1798.

Painting on glass: girl before a monument and weeping-willow.

Needlework and water-color combination picture. *Loaned by Mrs. H. M. Brooks.*

Colored engraving: "The Royal Ann."

Pastel: head of a girl, by William Blythe, Salem, early present century.

Case 5. Manuscripts: early theological; witchcraft.

Sermon preached by Rev. Mr. Pickman, 1644.

Sermon preached by Rev. Mr. Diman of the East church, Salem, in 1756.

Sermons preached by Rev. Mr. Sewall, 1727–1744.

Sermon preached by Rev. George Curwen at First church Salem, Aug. 23, 1716, for successes of Geo. I over the Pretender.

Volume of sermons preached by Rev. Mr. Henry Gibbs, 1695.

Deposition of Mrs. Ann Putnam and Ann Putnam Jr., before magistrates Hathorne and Corwin, May 31, 1692, against Rebekah Nurse and others who were hanged for witchcraft in 1692.

Indictment of Abigail Hobbs of Topsfield for "covenanting with the devil," 1692.

Deed of Land signed by Bridget Bishop 1679, acknowledged before William Hathorne (ancestor of Nathaniel) and John Hathorne one of the witchcraft judges. She was executed for witchcraft in 1692 — the first victim. Her residence was near the present corner of Church and Washington streets, Salem: the house in which "the puppets" were said to have been found.

Case 6. Manuscripts: early commercial.

Philip English's account book 1678–1690, with a photograph of his house from an old drawing.

Autograph letter of instructions by Elias Haskett Derby, 1779.

Parchment deed: Charles Downing to Thorndike Proctor, 1700.

Autograph of Retire Becket, one of Salem's noted ship builders.

Bill of Lading, schooner "Volant" Nov. 30, 1749, Timo. Orne, Jr.; shipping articles 1749, schooner "Hampton."

Autograph, Judge Benj. Lynde, 1751.

Bill of exchange, Elias Haskett Derby, 1784.

Underwriters' policy of insurance £1000, schooner "Volant," 1748.

Autograph, Wm. Gray Jr. (bill for tea), 1788.

Tax bill, Jos. Sprague (£80.10.6), 1781.

Case 7. Manuscripts: official.

Autograph letter of Benjamin Goodhue, New York, Feb. 7, 1790. The first member of Congress from the Essex District.

Commission of Joseph Hiller, first U. S. Customs Collector, signed by George Washington, Aug. 4, 1789.

Resolution of the Continental Congress at Philadelphia directing General Washington to raise troops in New Hampshire, signed by John Hancock, President, and Charles Thompson, Secretary.

Autographs of Nathan Dane and Rufus Putnam on an order of Capt. Joshua Ward for "a whale boat," Salem, June 8, 1785.

Botanical note book of Manasseh Cutler (VIII 1787–1798); "Descriptions of American Indigenous Plants, signed by him in 1787.

These last three autographs of Dane, Putnam and Cutler are memorials of the settlement of Ohio and the "freedom of the north-west territories."

License of Brigantine "Cicero" signed by Joseph Hiller, the first United States Customs Collector under Washington.

Instructions in regard to the British "Orders in Council" signed by James Munroe, Secretary of State, Aug. 28, 1812.

Case 8. Silhouettes, medals, seals, etc.

Silhouettes. Joseph S. Cabot, Salem merchant, horticulturist;

John Clarke Lee, Salem merchant, banker; Joseph Peabody, Salem merchant; Daniel Dutch, deputy sheriff; all full length, contributed by Mr. F. H. Lee. Capt. Samuel Cook, silhouette, *loaned by Miss S. E. C. Oliver.*

Lithographs. Nathan Reed, inventor, member of Congress; Gen. James Miller, "the hero of Lundy's Lane" and originator of the famous term "I'll try, Sir;" William Oakes (1799-1848) of Ipswich, eminent botanist.

Silhouette. Leverett Saltonstall, first Mayor of Salem. *Loaned by Mr. F. H. Lee.*

Composition bas-relief, head of Alexander Hamilton.

French engraving, head of Timothy Pickering.

In the centre of this case on a tablet are the following coins, medals and seals:

Medal, Benjamin Franklin, Deplesus, Paris 1787. *Loaned by Mr. F. H. Lee.*

Bronze medal, Daniel Webster.

Copper medal, William Pitt.

Copper medal, George Whitefield, the preacher.

Bronze medal, Washington before Boston. *Loaned by Mr. John Robinson.*

Bronze medal, American Liberty 1776. *Loaned by Mr. John Robinson.*

Small medals: Washington, General American Armies, 1789; Washington, President, 1792; Washington, success to the United States; Washington, "he is in glory, the world in tears." *Loaned by Mr. F. H. Lee.*

Collection of gold mounted seals, Cabot family of Salem, engraved stone seals, etc. *Loaned by Mr. F. H. Lee.*

Engraved stone seals: head of Pitt, head of Nelson. *Loaned by Mr. John Robinson.*

Case 9. Old-time objects of household use.

Tinder box with flint, steel and tinder.

Tinder box in the form of a "flint-lock."

Door-latch about 1800.

Bolt from a pew door, East Church 1718.

Spoon mould and pewter spoon.

Pewter porringer and pewter pepper-pot.

Two pewter platters.

Tongs used in taking coals from wood fires for lighting pipes.

Steelyards used in 1738.

Gold-dust scales used by merchants early in present century.

Pitch-pipe used for "setting the tune" in church choirs and in singing schools.

Pottery dish with partition through the centre pierced with a hole, made in Danvers, Mass., about 1780, used for "Indian pudding and baked beans."

Silver plated snuffers and tray, Hodges family, Salem, about 1798. *Loaned by Mr. John Robinson.*

Small iron shovel with long handle formerly belonging to and used by Benjamin Franklin. Used for taking coals from wood fires for lighting pipes. This was given the present owner by a member of a family with whom Franklin lived in Boston. *Loaned by Mr. A. R. Stone.*

Spanish coins current in New England during the early part of the present century for 20, 25, 12½ and 6¼ cents respectively, and known locally as pistareen, Spanish quarter, nine pence (pronounced "nimepunce") and four-pence-half-penny (pronounced "fo-pun-sapeny"). *Loaned by Mr. H. M. Brooks.*

Case 10. Old-time objects of adornment and personal use.

Dutch tobacco box, 1482.

Old tobacco box.

Snuff boxes, seven in number, ornamented with designs in color. *Loaned by Mr. F. H. Lee.*

Snuff boxes, the tailor; engraved figures, Charles X. *Loaned by Mr. W. J. Stickney.*

Snuff boxes: "wood and copper of the 'Royal George' sunk 1789, raised 1839" and "united we stand, divided we fall" Revolutionary period, belonging to Rev. Eliab Stone, of North Reading. *Loaned by Mr. John Robinson.*

Spectacles, eye-glasses, paste shoe buckles and two pairs of knee buckles, early present century.

Lady's pocket-book with figure. *Loaned by Mr. F. H. Lee.*

Pocket-book, leather, "Cape Breton 1745."

Patch box: to contain the little court plaster squares used by ladies in the old times.

A paper of pins: Revolutionary period.

Pounce box containing "pounce" used to give a surface where erasures were made on paper in the quill-pen period.

Buttons, 1692 and 1798. *Loaned by Mr. H. M. Brooks.*

Washington buttons. *Loaned by Mr. F. H. Lee.*

Large tortoise shell combs.

Pair of pattens, the forerunner of rubber shoes.

Pair of old "Para gum shoes," the first lined rubber shoes used.

Lady's shoes about 1800.

SALEM EXHIBITS.

Desiring that this pamphlet should contain a list of all the exhibits from Salem and their location at the Fair, in order to render it more valuable for use and reference, the committee advertised in the daily papers for a description of such exhibits, responses to which appear below. It is understood, however, that a number of Salem manufacturers whose names do not appear here, are represented at the Exposition, and also that the parochial schools have fine exhibits. Their location can without doubt be easily found in the official catalogue.

SALEM PUBLIC LIBRARY.

Location: — U. S. Government building, Bureau of Education.

Exhibit: — Building and methods of a public library in a city of 30,000 inhabitants, located in a building altered from a dwelling house.

Specifications: — Six oak frames, about 24 x 30 in., containing three water-color sketches of building, one exterior, two interior, also plans of present building with proposed enlargement.

Six volumes bound in full crushed levant, being an album of photographs of building and furniture, scrap-book of blanks and cards, and the regular publications of the library; also samples of regular styles of binding, etc.

THOUGHT AND WORK CLUB, SALEM, MRS. KATE TANNATT WOODS, PRESIDENT.

Location: Woman's Building. Department of Federated Clubs of America.

New book of Proverbs, selected and original by members of Salem Thought and Work Club.

JAMES F. ALMY.

Window ventilator for ensuring current of pure air without draughts. To be seen in operation at Office of Prof. F. W. Putnam, Department of Ethnology.

SALEM PRESS PUBLISHING AND PRINTING COMPANY.

Location: Gallery Liberal Arts Building.

Examples of binding and press work, genealogical tables, genealogical and other publications. See Essex Institute and Salem Public Schools Exhibits for specimens of binding.

EXHIBITS OF SALEM PUBLIC SCHOOLS.

Location: Manufactures and Liberal Arts Building, Gallery, Massachusetts Schools Section.

1. An exhibit of work done by the boys in the Curwen Industrial School, during the last school year.

2. Twenty-one bound volumes of scholars' work taken from their annual examination papers of June 1892 and comprising work in all the grades of the several grammar schools, and all classes in the High school.

3. Ten bound volumes containing written papers from all the grades of all the grammar schools, showing one *illustrative lesson* designed to exhibit methods of teaching in geography, language and arithmetic.

4. *The Salem Historical Album.* This album is wholly the work of the pupils in the High school. It contains photographs of historic buildings, sites, streets, historical tablets, and other matters of interest, illustrating the history of Salem. All of these photographs were taken by pupils in the High school, and finished completely by them. The pictures are accompanied by descriptive text, which altogether give a graphic history of Salem from 1626 to the present time. These descriptions were written entirely by the pupils and by them have been copied upon the typewriter, the whole being bound (in leather, made in Salem) in one large quarto volume by the Salem Press Publishing and Printing Company.

5. A set of twenty photographs, representing the school-houses of this city. These photographs exhibit not only the exteriors of the school buildings, but interior views, showing various rooms during the school session, with the pupils at their regular class work.

6. A set of large photographs exhibiting the art embellishments of school rooms at the Phillips school. These pictures have been taken under the direction of Mr. Ross Turner, and show clearly the character of this new art movement, and the real appearance of the rooms as thus decorated.

7. Catalogue High school library.

KEPPEL COLLECTION OF ENGRAVINGS AND ETCHINGS.

Location: Woman's Building.

Etchings by Miss H. Frances Osborne.

Chestnut street, Salem, Mass.
Solitude.
View from Derby wharf, Salem.

EBEN PUTNAM, PUBLISHER AND PRINTER, SALEM.

Location: Department Liberal Arts; with Essex Institute and Salem Press Publishing and Printing Company exhibit.

Putnam's Monthly Historical Magazine.
Visitor's Guide to Salem.
History of the Putnam Family in England and America.
Ancestral Charts. Genealogical and Historical works.

PARKER BROTHERS, PUBLISHERS, SALEM.

Location: Manufactures and Liberal Arts Building, Northeast portion of Gailey, Group 110, Class 693, Dept. 519.

Games for children and adults.

BULLETIN

OF THE

ESSEX INSTITUTE.

VOL. 25. SALEM: JULY, AUG., SEPT., 1893. NOS. 7, 8, 9.

ANNUAL MEETING, MAY 15, 1893.

THE annual meeting was held in Plummer Hall, this evening, at 7.30 o'clock, Vice-President A. C. Goodell, jr., in the chair. The record of the last annual meeting was read by the Secretary.

The reports of the Secretary, Treasurer, Auditor and Librarian were read, accepted and ordered to be placed on file.

The report of the committee on nominations was presented by Mr. C. S. Osgood, and it was

Voted, to proceed to the election of officers for the ensuing year. Messrs. Edes, Welch and Theodore Brown were appointed by the chair to distribute, collect, assort

and count votes. This committee reported the following list of names as receiving all the ballots, and these officers were declared unanimously elected:

PRESIDENT:

EDMUND B. WILLSON.[1]

VICE-PRESIDENTS:

ABNER C. GOODELL, JR., DANIEL B. HAGAR,
FREDERIC W. PUTNAM, ROBERT S. RANTOUL.

SECRETARY: HENRY M. BROOKS.

TREASURER: WILLIAM O. CHAPMAN.

AUDITOR: GEORGE D. PHIPPEN.

LIBRARIAN: CHARLES S. OSGOOD.

COUNCIL.

WILLIAM H. GOVE, EDWARD S. MORSE,
THOMAS F. HUNT, DAVID PINGREE,
DAVID M. LITTLE, EDMUND B. WILLSON,
FRANCIS H. LEE, GEORGE M. WHIPPLE,
RICHARD C. MANNING, ALDEN P. WHITE.

REPORT OF THE SECRETARY.

Since the last annual meeting there have been twenty-one meetings of the society and three meetings of the directors, besides fourteen meetings of committees.

Only one field meeting was held the past year; this was at North Beverly near Wenham Lake, on September 21. A number of persons who took the forenoon train were entertained at the house of Mr. W. S. Nevins.

[1] Mr. S. Endicott Peabody was first elected but declining to serve, Rev. E. B. Willson was chosen at a regular meeting, June 19, 1893.

Most of the party went on the 1.25 train from Salem. The meeting in the afternoon was in the vestry of the Congregational church. It was considered successful, although the attendance was not large.

Mr. Rantoul gave an interesting account of the Beverly cotton factory established by George Cabot and others. He showed conclusively that this was the first *American* cotton factory. It was located near the place of meeting. It has been claimed that the Pawtucket factory was the first of this kind, and that was started by Slater in 1790, but the Beverly factory was in operation two or three years earlier. General Washington visited it when he was here in 1789; and advertisements of the goods of the company appear in the *Salem Gazette* of 1788.

Prof. E. S. Morse and Mr. John H. Sears also spoke at this meeting, the former accompanying his remarks with graphic chalk illustrations.

During the past winter, papers have been read before the society in Plummer Hall by the following:

Prof. F. W. Putnam, of Cambridge, on the "Scientific side of the Columbian Exposition."

Prof. E. Charlton Black, of Harvard College, Cambridge, on "Heinrich Heine—Poet, Humorist and Reformer."

W. A. Mowry, Ph.D., on "The Inauguration of the New Government, or Washington as a Statesman."

Sidney Perley, Esq., on "The Geological Evolution of Essex County."

Alfred Stone, Esq., of Providence, R. I., on "The Great White City." This lecture was given in Academy Hall and was illustrated by lantern views.

Mr. Arthur L. Averill, on "How the Independence of the United States was obtained."

W. S. Nevins, Esq., on "The Career of Gen. H. W. Halleck."

Rev. G. T. Flanders, D.D., of Rockport, on "A Study of Martin Luther."

Reports of all these lectures have appeared in the daily papers.

Informal papers and talks have been given at our regular meetings at the rooms, by Professor Morse, Mr. Gardner M. Jones, Mr. Robinson, Mr. Phippen, Mr. Nevins, Mr. Sears and Mr. Hines.

There have been the past year 1173 donations to the cabinets from 127 different donors. These donations have been acknowledged through the mail and in the *Salem Gazette*.

The old meeting-house of the First Church continues to attract visitors. More than 8000 have visited it during the year.

Twenty persons have joined the society this year and nine members have died, as follows:

Samuel P. Andrews,
E. Frank Balch,
Gardner Barton,
James Emerton,
Miss Mary Eliza Gould,
J. T. Moulton of Lynn,
Nathaniel Ropes,
Mrs. James O. Safford,
Dr. Henry Wheatland.

Two of our honorary members have also died, viz.: Rev. Dr. Andrew P. Peabody and John G. Whittier.

It seems hardly necessary for me to remind members of the society of the great loss we have sustained in the death of our venerable and honored president Dr. Wheatland. As he had been incapacitated by sickness from taking an active interest in our affairs for more than two years, his absence from our rooms is not now as much felt as it was when he was first taken from his work; but in certain ways we shall feel his loss more and more as years go by. This is not the place, nor am I the person, to pronounce any eulogy on the character of our late president.

You all know his devotion to the interests of this society, always the first and last in his thoughts.

Having known him intimately for nearly *half a century*, I have felt that I could do no less than say these few inadequate words. In this connection I will add that a memorial meeting in honor of Dr. Wheatland was held in Academy Hall, on Monday evening, April 17, at which appropriate addresses were made by Vice-Presidents Goodell and Rantoul, Prof. Edward S. Morse, George D. Phippen, Esq., and Rev. Dr. E. C. Bolles of New York. A large number of letters were received from distinguished persons at that time, — all of these with the several addresses will be printed in a memorial volume.

On the Sunday succeeding the death of Dr. Wheatland, the Rev. E. B. Willson preached a sermon in the North church on the character of our late president. This sermon has been printed by the society, and any member who has not already received a copy can have it upon application to the secretary.

Our membership is not increasing as fast as we could wish. We now number about 325 active members, but in a place of the size and reputation of our city we ought to have 1000 members, and these could probably be obtained if each member would do all he could to increase the number. Several have already aided materially in this way and we wish others could be persuaded to give their influence to this work.

The collections of the historical department continue to increase and it is a pity we have not the room to make a proper display of all our acquisitions. So much has been said on this point in the last two reports that it seems hardly necessary now to do more than refer to it again with the hope that our expectations may in the near future be realized, through donations or bequests enabling us to make the necessary additions to our buildings.

To-day we have received notice of a legacy from Joseph Henry Stickney of Baltimore, Md., of $1,000. Mr. Stickney had often visited our rooms during his summer visits in this vicinity and was much interested in historical matters.

Something has been accomplished the last year in the arrangements of the manuscripts. Although our collection is a large one, like Oliver Twist, we are always asking for more, and we trust no member will be foolish enough to allow ancient MSS. of any kind, even old bills, account books, letters, etc., to be cast into the fire or otherwise destroyed if he can possibly prevent it. All this may sound very funny to some people and perhaps silly to others; but it is really a very serious matter sometimes to have old papers destroyed without an examination by judicious persons.

There is many a poor person to-day, who would perhaps be well off if some of the family papers relating to French claims had been preserved.

The committee on the Columbian Exposition at Chicago have done an efficient work during the year toward making a creditable exhibit in behalf of the Institute; but, as its labors have not yet ceased, the committee is not ready to make a report of its doings at present.

Respectfully submitted,

HENRY M. BROOKS,

Secretary.

Report of the Librarian.

The additions to the library for the year (May, 1892 to May, 1893), have been as follows:

By Donation.

Folios,	79
Quartos,	195
Octavos,	1,470
Twelvemos,	651
Sixteenmos,	238
Twenty-fourmos,	292
Total of bound volumes,	2,925
Pamphlets and serials,	13,211
Total of donations,	16,136

By Exchange.

Folios,	7
Quartos,	21
Octavos,	230
Twelvemos,	33
Sixteenmos,	28
Twenty-fourmos,	28
Total of bound volumes,	347
Pamphlets and serials,	1,909
Total of exchanges,	2,256

By Purchase.

Quartos,	1
Octavos,	41
Twelvemos,	3
Total of bound volumes,	45
Pamphlets and serials,	644
Total of purchases,	689
Total of donations,	16,136
Total of exchanges,	2,256
Total of purchases,	689
Total of additions,	19,081

Of the total number of pamphlets and serials, 7,416 were pamphlets and 8,348 were serials.

The donations to the library for the year have been received from two hundred and nine individuals and one hundred and eleven societies and governmental departments. The exchanges, from twelve individuals and two hundred and nine societies and incorporated institutions, of which one hundred and one are foreign; also from editors and publishers. Several hundred volumes have been received from the library of our late president, Dr. Wheatland, and the foreign exchanges of the Peabody Academy of Science, many of them extremely rare and valuable, have been added to our library. An appeal has been made during the year to the different towns of Essex County to complete our sets of town reports and the responses have been very satisfactory.

These statistics show the continued growth of the library which now numbers about 60,000 bound volumes and about 175,000 unbound volumes including pamphlets.

But while the library grows steadily, our facilities for taking care of the books have not increased. It is becoming, indeed it already is, a serious question, What shall we do to provide additional room for the storage of our books?

We have kept in mind the plan suggested in a previous report with regard to marking out special lines of work for the Public Library and the Essex Institute.

Our full collections of public documents, which would prove very valuable if properly arranged and indexed, we would like to deposit with the Public Library and confine the work of the Institute largely to local history, genealogy and kindred subjects.

But the Public Library is rapidly outgrowing its present quarters; and, until more accommodations are provided, which must be in the near future, has no room which it can use for the reception of the documents.

Even with this relief the library of the Institute would still want more room.

The only sufficient remedy would seem to be the building of a fire-proof addition, or stack room, in the rear of our present building, and this should be done as soon as the necessary funds can be obtained.

Another pressing need is some sort of a catalogue or finding-list of the library. A card catalogue of the volumes in the different rooms would be a great help to those using the library and a good foundation for a complete catalogue.

To do all this we are sadly in need of funds.

The first great need of the Institute is money, and the second is more money. Without this little can be done. With it the power of the Institute for good can be extended almost indefinitely. It is with no selfish motives that we appeal for aid. The more assistance we have the better the Institute can serve the community for whose benefit it was established and is maintained.

The use of the library, notwithstanding these drawbacks, has been very satisfactory and students in special branches of research find a large fund of material at their disposal.

With our society, as with all others, time brings about the inevitable changes, and death has stricken from our roll of membership the name of our honored and lamented president, Dr. Wheatland.

It remains for us to carry forward the good work for which he laid so secure a foundation, and the most fitting tribute we can pay to his memory, and the one he would most desire, is to strive to enlarge the usefulness of the Institute to which he gave so many years of unselfish devotion.

CHAS. S. OSGOOD,

Librarian.

Treasurer's Report.

While it may be said that the duties of the Treasurer of any institution are to take care of what funds that institution has, it may not be out of place for me to call the attention of the members and through them, the attention of the general public, to the urgent need of the Essex Institute, for a larger yearly revenue, to be devoted to the *general work* of the institution, which as we all know is founded on a remarkably broad basis, and will in future years prove of priceless value to those who follow us.

I have made a few comparisons of the figures at hand, and find that the expenditures exceed the income by a yearly average of about $1000, and it may be the best thing for the Institute in the long run, that they do. For, if we were running along smoothly and paying our way each year, the feeling might be that we were not in need of any more funds. But, on the other hand, if it is generally known and commented upon, that we are doing a little more each year, depending on the generosity of our kind friends to help us out, it seems to me that our confidence will not be misplaced, and that the necessary funds will be forthcoming.

Receipts and expenditures of the past year (condensed from the account presented).

RECEIPTS.

Balance from last year's account,		$ 515 90
Assessments of members,	$ 836 00	
Sales of publications,	542 54	
Income of invested funds,	3,813 96	
Income from other sources,	1,129 50	
		$6,322 00
Interest from Five Cents Savings Bank to be funded,		62 24
		$6,900 14

EXPENDITURES.

Salaries of secretary, assistant librarians and janitor,	$2,177 00	
Cost of books, periodicals and binding,	392 26	
" " publications and printing,	1,204 03	
" " fuel,	202 50	
" " gas and water,	48 88	
" " repairs,	457 77	
" " insurance,	429 75	
" " interest on note,	150 00	
" " labor, etc., on the grounds and buildings,	182 80	
" " Athenæum expenses (our proportion),	258 18	
" " express, postage and miscellaneous,	296 36	
Annuities,	660 00	
		$6,459 53
Interest added to manuscript fund,	54 98	
" " " North Bridge monument fund,	7 26	
		62 24
Balance of cash on hand,		378 37
		$6,900 14

May 15, 1893.

Respectfully submitted,
WILLIAM O. CHAPMAN, *Treasurer.*
Examined and approved,
(Signed) GEORGE D. PHIPPEN, *Auditor.*

INVESTMENT OF FUNDS.

For income,	$71,717 75
" Essex Institute building,	28,370 69
" Ship Rock and land,	100 00
Total investments,	$100,188 44

Salem, May 15, 1893.

Examined the above account with the securities and found them correct.
(Signed) GEO. D. PHIPPEN, *Auditor.*

LECTURES.

Friday, Jan. 6, 1893.—Prof. E. Charlton Black, of Harvard University, lectured on "Heinrich Heine,—Poet, Humorist, Reformer." In introduction, Mr. Black spoke in a general way of Heine, his work as bearing upon the world, his character, his keen wit and perception and the chief facts of his strange, sad, significant life. He then gave a brief sketch of his life, and of his parents, how

his mother was well educated, and from her he inherited all his finer qualities, while from his father was due the less desirable side of his character. He touched upon his school life at a convent, telling several anecdotes of his difficulty with irregular verbs and other boyish perplexities.

His early life was much influenced by the power of Napoleon, then at its height. His whole life was greatly dominated by the French point of view, and in this connection he touched upon his song "The Two Grenadiers," so beautifully set to music by Schumann. At this point he dwelt at length on the inadequacy of translators to do him justice, and the general bad piece of work they made of it, but added that after all even a poor translation is better than none.

On leaving school at sixteen he went into a banker's office, but through the kindness of a wealthy uncle was sent to college to become a lawyer. He attended the universities of Bonn, Gottingen and Berlin, doing but little real study, although in 1825 he took his degree and at the same time was baptized a Christian as a necessary means for his practising his profession; this act subjected him to severe criticism by both Jew and Christian, his friends and his enemies, and placed him in a most unfortunate situation. During his residence in Berlin he occupied a strong position socially both among the Jews and the others as a literary genius. One of the phases of his life was his engagement to a cousin who, during his university career, married another man and in so doing deeply affected his sensitive nature.

His keen wit was shown in several illustrations, one of the best being his description of his old college town of Gottingen, which was a satire of phariseeism and littleness, and another his handling of a certain college professor who railed at Napoleon.

He visited England and was disgusted, ridiculing everything he saw. His Paris life was brilliant and famous until 1848, when he had a sort of paralytic stroke that left him half lame and blind. His last days were sad, pathetic and most unhappy. His description of what his old age would be, as pictured to his German eyes, is most touching, being very tender in its allusions. He died February 16, 1856, and was buried at Montmartre, his resting-place being marked with the simple inscription — Heinrich Heine.

Monday, Jan. 16, 1893.—A series of informal meetings for members only was begun in the library rooms. Mr. Gardner M. Jones opened the literary exercises by some interesting remarks on the library of the Institute, historical and statistical, and also in relation to its needs in order to increase its usefulness. He closed by calling attention to a number of books taken from the shelves, illustrating the work of celebrated book-makers and printers and covering the whole period of printing from 1486 to the present time. Mr. C. S. Osgood followed endorsing what Mr. Jones said as to the needs of the library and stating that had the Institute the necessary funds, the library committee would do practically what had been suggested. Prof. E. S. Morse spoke of the collecting of books and kindred matters and referred to persons well known in science, suggested by some of the books. After informal remarks by several other members the meeting adjourned.

Monday, Jan. 23, 1893.—William A. Mowry, Ph.D., of Salem, lectured on "The Inauguration of the New Government, or Washington as a Statesman." Dr. Mowry first spoke of the period of the formation of the first Con-

tinental Congress representing the thirteen original colonies, at the beginning of the Revolution, and the difficulties it labored under. He said it was a marvel that the war was successfully carried out under such conditions as then existed, with our little colonies poorly equipped, with a scarcity of supplies and with but little experience and want of training against the fearful odds of the large armies and supplies of England. Our victory was not due to superior fighting, but more than anything else to the sagacity and wonderful ability of General Washington. Then came the necessity for a new order of things; the articles of confederation of 1777 had no power to tax the states or do anything of a positive nature; business was ruined and amendments were proposed repeatedly which could not be passed, owing to the antagonizing state of feeling and jealousy between the states. It was the most critical period in our history. In 1787 a general convention was held in Philadelphia, a new constitution drawn up, discussed, amended and signed, and after a long and excited discussion in the several states, was adopted in the course of the next year. Rhode Island, however, did not adopt it until the beginning of 1790. Party spirit ran as high at this time as it ever has since.

The lecturer made some reference to the position of Patrick Henry on the new constitution and to the misstatements about the life of that patriot. In conclusion he spoke at some length of the national power and growth of our country with its possibilities and undeveloped powers and of the exigencies that have never yet been met by any nation, but will of necessity arise.

Monday, Feb. 6, 1893.—Mr. John Robinson gave an informal talk on the old houses of New England. It was an interesting sketch of the houses of our forefathers from

the time of the settlers in 1628–30, when the old lean-to was universal, up to 1700 when the hip roof was prevalent. This style lasted until about 1750 at which time and up to 1780 came the elegant structure of which Judge Endicott's and the Peabody house in Danvers are good illustrations as was also the Pickman house on Essex street. After this came what is wrongfully called the colonial, the fine square house with its graceful doorway, windows and much interior decoration, of which there are many fine types in Salem. In illustration he cited houses in Salem, Boston, Newburyport and Portsmouth. The different periods of architecture referred to were not drawn in arbitrary lines, but overlapped each other.

Monday, Feb. 13, 1893.—Sidney Perley, Esq., of Salem, lectured on "The Geological Evolution of Essex County." Mr. Perley traced the gradual development of this county into a habitable place through the earliest geological periods, giving scientific causes for and the origin of the different sorts of rocks which are found in the county. He stated that New England was probably the oldest part of this continent, as well as of the earth. Illustrating the various stages of development, he quoted the pockets of lead at Newbury and the earthquake at the same place in 1727.

Plum Island, he said, was a perfect example of the formation of islands by sand bars. The rocking stones of Gloucester he accounted for by the erosion of frost and water. Speaking of the bog iron deposits, he stated that iron was first worked from these bogs in Lynn in 1642–3, in Boxford, 1668, and Amesbury in 1728.

The surface formation of Essex county, as it now exists, was largely caused by the action of the glaciers, they having brought and deposited here large quantities of sand,

gravel and rocks and having moved the surface soil from place to place. In this connection the lecturer mentioned the gravel ridges extending from Andover to Beverly as being caused by the settlement of the moraines of the glacier, also many hills in Boxford and other places and other deposits of boulders, etc. The course of the Merrimac river was also claimed to have been changed from its original direction by the deposit of similar moraines or ridges of gravel and sand beginning at Lawrence.

Mr. Perley suggested that the members of the Essex Institute interest themselves to a greater extent in the study of geology, and that they cause to have made a surface survey of this section of the country.

Monday, Feb. 27, 1893.—Mr. Alfred Stone, of Providence, lectured in Academy Hall on "The Great White City; or an Architect's View of the World's Exposition Grounds and Buildings." His remarks were illustrated by a series of stereopticon views taken from the buildings now completed and also under process of construction. Mr. Stone first showed a plan of Jackson Park as it was, a desolate swamp, and then a map of the grounds and locations as they have been arranged for the exposition.

He then proceeded to describe and show by his views the principal buildings. The Administration building he termed one of the finest examples of architectural art. The Manufacturers and Liberal Arts building he described fully; said that Bunker Hill monument set down in the main aisle, would not reach to the top of this building; at the time of the dedication exercises, 90,000 were seated in this building. The other buildings were shown and described. He spoke enthusiastically of the proposed exhibit by the Institute at the fair, to be in the Massachusetts building, regretting that he was unable to show a picture of that building.

Monday, March 6, 1893.—Mr. W. S. Nevins gave an informal talk illustrated by photographs and books, on "Famous Madonnas." He said "The first mention of worship of the Virgin Mary occurs in the work of Epiphanus who died in 403, who mentions a sect of women with whom it was customary to offer cakes of meal and honey to the Virgin Mary. It was about the year 431 that the first representation of the Virgin and child appeared in the Egyptian type of Iris. About this time the Empress Eudoxia sent home from the Holy Land a picture of the Virgin holding the child, alleging it to be an authentic portrait."

The lecturer referred to a Madonna in Constantinople, said to have been carried to St. Mark's, Venice; to the Madonnas of the coronation type, the mercy type and of the Mater Dolorosa, and made mention of the famous masters, Raphael, Murillo, Van Dyke, Guido, Rubens, Angelo and De Vinci. Reference was made to the models from whom the most famous Madonnas were made and a comparison was made between the artists and their works.

Monday, March 13, 1893.—Mr. Arthur L. Averill, of this city, lectured on "How the Independence of the United States was obtained." In introduction, he outlined the condition of affairs of this country prior to the great revolutionary struggle. The American army, with its free enlistment and patriotic feeling, was more than an equal for an even larger force of hired and perfunctory soldiers. He cited several instances of the losses of the British through faults of their own commanders in indulging in proffered hospitality or in gambling. Those who have always been brought up in luxury do not make as good officers as those who enter the army from principle or with a set purpose. This he illustrated with the life of Napoleon.

He then began an outline of the war from the very start, describing every important event, with side issues of the many naval engagements and the horrors and injustices of the "press gang." He dwelt on the privations and suffering of the cold winters, which our army bravely endured.

He then referred to the able administrations of the early presidents and the growth of the country under their careful guidance, and then spoke of the famous naval engagements of the war of 1812, in our second struggle for independence with Great Britain and the splendid victories that were fought at very uneven odds, showing the superiority of the American seamen.

Monday, March 20, 1893.—Mr. Ezra D. Hines, of Danvers, gave an exceedingly interesting account of the correspondence that he had with persons in Virginia and North Carolina, which finally resulted in his procuring through the kindly assistance of Mr. T. F. Hunt and Mr. Frank Cousins, fine photographs from the original portraits of Mr. and Mrs. William Browne of Browne Hall fame, he having built that mansion on "Folly Hill" in Danvers. The portraits were formerly at Rosewell, the old Page homestead in Gloucester county, Virginia.

Mr. John H. Sears of the Peabody Academy of Science, read a paper on the geological formation of the neighborhood of Cape Ann. Interesting remarks were made by Mr. John Robinson and Professor Morse, complimentary to Mr. Sears, as showing the valuable work done in Essex County by him.

Monday, March 27, 1893.—Winfield S. Nevins, Esq., of this city, lectured on "General H. W. Halleck." Mr. Nevins said that it was quite remarkable that one man who had had so little military experience as General Halleck,

should have been called to the position of General-in-Chief and continued in that office for nearly two years. General Halleck was born in Waterville, N. Y., Jan. 15, 1815, and died in Louisville, Ky., Jan. 9, 1872, at the age of fifty-seven. He was graduated from West Point in 1839 and served in various minor capacities in the army until 1854, when he retired and practised law in California. Upon the breaking out of the civil war he was made Major-General in the regular army and assigned to command in the west. The speaker proceeded to give some account of a few of the movements in the war, including victories by various generals as those of Grant, Pope and Buel and thought that Halleck was more to blame for slowness in movements of the Army of the Potomac than McClellan; he also made him responsible for the defeats of Burnside at Fredericksburg and Banks at Red River. He said he made these statements on the authority of government official records.

Monday, Apr. 3, 1893.—Mr. George D. Phippen spoke of the spring flowers and made some interesting and instructive remarks on cultivated fruits and of the importance of turning scientific investigations to practical account.

Monday, Apr. 17, 1893.—A memorial meeting in honor of Dr. Henry Wheatland, the late president, was held in Academy Hall. Vice-President Abner C. Goodell, Jr., presided and addresses were made by His Honor, Mayor Robert S. Rantoul, Mr. George D. Phippen, Prof. Edward S. Morse and Rev. E. C. Bolles, D.D., of New York. Mr. Goodell introduced each speaker with appropriate remarks.

A full account of this meeting is to be printed in a separate pamphlet.

Monday, Apr. 24, 1893.—Rev. G. T. Flanders, D.D., of Rockport, lectured on "A Study of Martin Luther." The speaker summed up the subject as follows:—Luther was social, affectionate and fond of relaxation and fun. Carlyle says,—"one of the most lovable of men, great as an Alpine mountain, so simple, honest and spontaneous; not setting up to be great at all, but here for quite another purpose than being great." The lecturer said "Luther's system of theology is dying out, but his sturdy blows for a free Bible and free thought will long ring adown the ages, and the verdict of the remotest posterity will be that taken, for all in all he was the grandest man Germany has produced." Mr. Flanders gave a comprehensive review of the famous man's life, and an analysis of his character.

Necrology of Members.

Samuel P. Andrews, son of John H. and Nancy (Page) Andrews, was born in Salem, Dec. 8, 1813; elected a member of the Essex County Natural History Society, Mar. 12, 1844, and of the Essex Institute, Aug. 10, 1853, and died in Salem, Dec. 31, 1892.

E. Frank Balch, son of Benjamin and Caroline (Moore) Balch, was born in Salem, Nov. 27, 1842; elected a member of the Essex Institute, Nov. 18, 1878, and died in Wenham, Aug. 29, 1892.

Gardner Barton, son of John and Mary (Webb) Barton, was born in Salem, July 23, 1815; elected a member of the Essex Institute, Mar. 8, 1854, and died in Salem, July 15, 1892.

James Emerton, son of James and Hannah (Mansfield) Emerton, was born in Salem, Oct. 14, 1817; elected a

member of the Essex Institute, Mar. 8, 1854, and died in Boston, May 31, 1892.

Mary Eliza Gould, daughter of Robert W. and Sarah (Osgood) Gould, was born in Salem, Oct. 3, 1819 ; elected a member of the Essex Institute, Nov. 18, 1875, and died in Salem, Aug. 22, 1892.

John T. Moulton, son of Joseph and Relief (Todd) Moulton, was born in Lynn, Aug. 7, 1838 ; elected a member of the Essex Institute, Nov. 18, 1872, and died in Lynn, Oct. 17, 1892.

Nathaniel Ropes, son of Nathaniel and Sarah E. (Brown) Ropes, was born in Cincinnati, O., Jan. 7, 1833 ; elected a member of the Essex Institute, Feb. 9, 1870, and died in Salem, Feb. 6, 1893.

Mrs. Nancy M. Safford, widow of James O. Safford, and daughter of James and Lydia (Eustis) Potter, was born in Salem, Jan. 23, 1831 ; elected a member of the Essex Institute, Jan. 3, 1876, and died in Salem, Mar. 5, 1893.

Dr. Henry Wheatland, son of Richard and Martha (Goodhue) Wheatland, was born in Salem, Jan. 11, 1812 ; elected a member of the Essex Historical Society, Sept. 6, 1841, and of the Essex County Natural History Society in 1834, and died in Salem, Feb. 27, 1893.

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GEOLOGICAL AND MINERALOGICAL NOTES. No. 6.[1]

ON THE OCCURRENCE OF AUGITE[2] AND NEPHELINE[3] SYENITES IN ESSEX COUNTY, MASS.

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IN a short paper by Dr. M. E. Wadsworth on the presence of syenite and gabbro in Essex County, Massachusetts, published in the Geological Magazine (Decade 3, Vol. 2, No. 5, 1885), Dr. Wadsworth says: — "Much of the eastern coast of Essex County, Massachusetts, extending from Salem to a point beyond West Manchester, has been found by the writer to be occupied by a typical

[1] This paper forms a more complete report of geological and mineralogical notes No. 5 (Bulletin of the Essex Institute, Vol. XXV, 1892).

[2] Augite-syenite, Vom Rath. This term was introduced by Vom Rath for a class of rocks occurring near Predazzo in the Tyrol.

[3] Nepheline-syenite, Brögger. Nepheline and augite syenites of Norway. (Die Silurischen Etagen 2-3.)

syenite of a reddish and grayish color, which in its macroscopic characters appears to be identical with that from Plauen'schen Grund, Saxony. The syenite in places contains much biotite, and also near West Manchester, quartz grains (segregations?). This syenite is often cut by dykes of a fine grained grayish syenite, which hold the same relation to the syenite proper as the micro-granite dykes do to the granite of the region, and hence, for convenience of description, the rock of the syenite dykes may be styled micro-syenite.

A careful study of the rocks of Cape Ann made during the past three years has led to certain conclusions, which are presented in the following pages, together with their macroscopical, microscopical and micro-chemical analyses and the extent of the principal outcrops and the general trend of the whole rock-mass."

I. DESCRIPTION OF THE ROCK-MASS AT THE VARIOUS OUTCROPS.

This rock is distinctly plutonic in the coarse massive granitic areas, while in the finer granitic forms it has all the characters of eruptive flows when viewed on the surface of the outcrops, but an examination of sections in some of the deserted quarries shows that these flows were due to local variations of the plutonic magma. Probably this is the micro-syenite of Dr. Wadsworth. There are dyke forms, which are intrusive in the hornblende-granitite of the region. The syenite rock varies in color from reddish and bluish to all shades of gray and light green, as seen in fresh specimens taken beneath the surface, while on the surface it is weathered to a dull reddish gray. In all cases the rock mass in fresh unaltered specimens consists of a compact tough aggregate of well crystallized minerals in which long porphyritic feldspar crystals are

more or less thickly scattered. In some of the outcrops these crystals are tabular, so that there is a conspicuous development of the clinopinacoid plane, giving the surface a decided porphyritic appearance, while in other places crystals showing the basal plane are more abundant, giving the surface of the rock-mass a distinctly tessellated appearance.

II. MACROSCOPICAL CHARACTERS.

The rock in the hand specimen is extremely variable. Specimens from the southern end of West beach, from West Manchester and from Winter island are of a decidedly coarse well crystallized felspathic rock with a little hornblende and biotite. Numerous specimens from various outcrops in Salem, Beverly, Essex, Manchester and Gloucester of the more typical rock are all of a decidedly similar type, being composed of coarse well crystallized minerals, the recognizable ones being orthoclase, pyroxene, hornblende, biotite, magnetite and a little quartz. The color of these specimens is a grayish green. At other outcrops, as on the hill in the city of Gloucester, which is used for the purpose of road building, at Powder House hill in Essex, at a cutting on the road side in Lanesville, opposite Young avenue, and at Poor House hill in Beverly, this rock is of a dark green color, almost black, which, if examined with the pocket lens and with the usual field apparatus could only be considered a porphyritic pyroxene-hornblende rock. At Thompsonville in Essex, and extending to the Loaf on Coffin's beach and nearly the whole length of the Squam river, there are varieties of the augite-syenite rock. Other outcrops are found at Wheeler's Point, Pierce's island, Rust's island, and by the roadside towards Coffin's beach in West Gloucester, and also in the cellar of the Russia cement works in West Gloucester. At

these outcrops the rock is granitic in character and contains considerable quartz with hornblende and biotite. The porphyritic feldspar is often quite fresh and glassy and therefore this rock, or the series of outcrops last mentioned, if studied by themselves in the field, would have every appearance of fine-grained hornblende-granitites. Several outcrops in Beverly and Essex, which are of the same type, are seen to be varieties of the augite-syenite group. Another phase of these rocks, as observed in the field, is in the form of massive flows of the micro-syenite previously mentioned. Certain outcrops of this form are seen at Conomo, Essex, Blind brook, Braywood, West Gloucester, at the hill south of the Cape Ann forge works, and extending to the outcrop used for road building by the city of Gloucester. Another extensive outcrop is seen from Rocky Neck, East Gloucester, extending across Pleasant avenue and East Main street to Bass Rocks, near the corner of Fair View avenue and again on Salt island, Briar Neck and Emerson's point, Rockport, and extending to Gap Head in the village of Rockport are seen tongues and veins of this same flow structure. Smaller masses from ten or twelve feet long and half as wide to as many rods in length and width, are seen on all parts of the area covered by these syenites. There are also several intrusive dyke rocks which must be classed as rocks of more recent age than the mass of this augite-syenite, one of which proves to be a phonolite dyke rock of the type called by Rosenbusch,[1] tinguaite. This dyke cuts the hornblende granitite 200 yards southwest of Singing beach, Manchester. On the surface this rock has weathered to a dull whitish gray with numerous porphyritic feldspar crystals standing out upon it. In the fresh rock the color is a greasy olive green, in texture it is very compact and ex-

[1] Min. Phys., Vol. II, p. 627.

ceedingly tough. Two forms of porphyritic crystals are seen, one glassy, long, lath-shaped and the other dull, white and hexagonal.

III. THE MICROSCOPICAL STRUCTURE.

Thin sections of the phonolite dyke rock, when studied under the microscope in polarized light, show that it is composed of some crystals of sodalite, hexagonal in outline, and numerous long irregular feldspar phenocrysts which are sometimes in Carlsbad twins with a quite fine multiple twinning and in one section the double twinning of the microline structure. Several of the feldspar crystals have a perfect, square, cross-section which is very noticeable and suggests a resemblance to the anorthoclase phenocrysts which were described in my paper on keratophyre[1] from Marblehead Neck. Micro-chemical tests of this feldspar in hydro-fluosilicic acid give, upon evaporation of the acid, equal numbers of crystals of sodium (Na_2O) and potassium (K_2O), but with no calcium (Ca O); sp. gr. 2.572 to 2.58. The analysis of the anorthoclase feldspars in the keratophyre rock which was made at the laboratory of the U. S. Geol. Surv. at Washington by Dr. Thomas Chatard gives K_2O, 6.98; Na_2O, 6.56. This micro-chemical test, therefore, shows that the feldspar in this phonolite rock is very near if not chemically equal to anorthoclase. The hexagonal outlines of the sodalite phenocrysts are isotropic and the mineral gelatinizes readily with acid which upon evaporation gives an abundance of common salt crystals. There are also some crystals of green augite and brown hornblende, one of the outline hornblende crystals being filled with minute crystals of ægirine. The holo-crystalline ground mass is

[1] Bulletin of Museum of Comparative Zoölogy at Harvard College, Geological Series, Vol. II, June, 1890.

composed of feldspars and feebly polarizing nepheline in a nearly complete felting of ægirine crystals and grains, some of which sink to the finest dust. These ægirine grains are so abundant in the feldspars of the ground-mass that the specific gravity of the feldspar in the rock powder, even after passing through the 100 sieve, could not be clearly made out, but with the inclusions of ægirine it was as low as 2.59. This rock powder gelatinized readily with acid and, upon evaporation, an abundance of gypsum crystals appeared, thus characterizing some of the minerals in the ground-mass as belonging to the hauyne group. In a communication received at a late date (June 17), from Prof. H. Rosenbusch, in relation to this rock he says: "Specimen No. 4 is a very good representation of the dyke rocks which I have called tinguaite. Phenocrysts of orthoclase in scarce quantity are disseminated in a holocrystalline mass of feldspar, nepheline and augite. I feel very sure there may be some lucite in it, but I did not succeed in proving it until to-day." The letter is dated June 6, 1893. With this determination the phonolite dyke rock would, therefore, be a lucite-tinguaite.

The microscopical structure of the typical augite-syenite from various outcrops is as follows:—Thin sections prepared from specimens collected in an old quarry on the W. D. Pickman estate at Beverly Cove; numerous large porphyritic crystals of microcline-microperthite,[1] some multiple twinned plagioclase, probably labradorite, much orthoclase, augite in two forms, one in large ragged crystals, and the other in long needle-shaped crystals enclosed in the feldspars as microliths, numerous small ragged crystals of ægirine, some brown hornblende, red biotite in large

[1] This form of feldspar is characteristic of Professor Brögger's microline-microperthite in the augite-syenite rocks of Norway.— Brögger, Min. der Syenite Py., p. 627.

patches, numerous perfect zircon crystals, fine sections of nepheline, some apatite and magnetite with a ground-mass of thin films of quartz.

Sections prepared from the outcrop on the east side of Briscoe Hill in Beverly are of similar composition, but contain in addition olivine and titanite. At the ledge used for road building purposes on Poor House hill, Beverly, there are two well marked forms. One is rich in hornblende, contains little augite and has much quartz, not only as a ground-mass but also as distinct patches with fine large crystals of microcline-microperthite (the soda-microcline of Professor Brögger), some ægirine crystals, apatite and magnetite. The other is rich in augite, still having considerable quartz, some hornblende, biotite, ægirine and nepheline. The first, except for the ægirine and microcline-microperthite, would be classed as hornblende-granitite. The other is nearly if not quite like the typical augite-syenite. In this last a vein of pyrrhotite of a rich yellow bronze color is seen which carries a small percentage of nickel. Molybdenite also occurs in this outcrop.

Several thin sections of the rock in the massive outcrop near Magnolia Station, and in the railroad cutting one hundred yards east of the station, when studied with the polarizing microscope, were found to be composed of microcline-microperthite, well twinned plagioclase, orthoclase, augite, green hornblende, red biotite, zircons, apatite, fine sections of titanite, much magnetite, some limonite, nepheline and isotropic sections of sodalite which gelatinized readily with hydrochloric acid. Some sections also contained regular crystals of hypersthene and some well formed crystals of olivine, and in one of the sections there were large patches of elæolite. The color of the whole rock mass in fresh hand specimens is dark grayish and green. This rock is

thus shown to be quite distinct from any member of elæolite-zircon-syenite group heretofore described, inasmuch as it contains hypersthene and olivine without a glassy ground-mass, and it is equally distinct from the typical augite-syenite of Vom Rath. We, therefore, have a distinct variety in this Magnolia outcrop. Sections from the Lanesville outcrop opposite Young avenue contain olivine. In some of the sections serpentine has developed in the cleavage cracks and some of the feldspars have the microscopical characters common to anorthoclase, extinguishing by sections and in patches. This is the soda-microcline of Professor Brögger (Zeitschrift für Krystallographie, Vol. XVI, page 261). One section shows multiple twinned albite intergrows directly across the twinned microcline, giving it a very beautiful appearance when seen in polarized light. This form is characteristic of Professor Brögger's microcline-microperthite in the augite-syenite rocks of Norway. There are also numerous irregular fragments of ægirine and a few small triangular patches of nepheline with a ground-mass of quartz as a cement.

At the augite-syenite outcrop in Brace's Cove, East Gloucester, and by the roadside on the sand beach near the Niles farm buildings, on the southwest side of Eastern point, the large, almost perfect tabular feldspar crystals give this rock a very striking appearance. The microscopic structure of thin sections, when studied with the polarizing microscope, gives the following minerals in its composition: much augite, green hornblende, glaucophane and chlorite as secondary products in the decomposition of the hornblende, microliths of ægirine, one characteristic crystal of hypersthene, magnetite, limonite, numerous zircon and apatite crystals, orthoclase, microcline-microperthite, some plagioclase, and a little quartz as the ground-mass. The large tabular porphyritic crystals of feldspar are micro-

cline-microperthite. The outcrop of this augite-syenite, in the marsh near the poor farm, used by the city of Gloucester for road making, is of a very dark color and a macroscopical examination would indicate it to be diorite, but the microscopical structure, as seen in thin sections, shows it to be composed of augite, ægirine, hornblende, limonite, some biotite, orthoclase, microcline-microperthite, zircons, apatite, magnetite and a little quartz as a cement in the ground-mass, thus making the rock a typical augite-syenite. Numerous thin sections have been prepared from all parts of the outcrops of this augite-syenite described above. In specimens from the corner of Warner and Prospect streets in the city of Gloucester, the microscopical structure is quite characteristic of this rock mass. They all contain augite, ægirine, titanite, microcline-microperthite with some quartz. Some of the sections contain nepheline and one section contains an excess of the fine multiple twinned albite (sp. gr. 2.63). There is more or less orthoclase, hornblende, biotite and magnetite with crystals of zircon and apatite as inclusions in the feldspars, showing this rock mass to be a nearly typical augite-syenite.

From the area mapped as diorite (9th Annual Report of the United States Geological Survey: Geology of Cape Ann by Prof. N. S. Shaler) in Gloucester and the islands in Squam river, I have collected specimens from every outcrop. These have been carefully studied and compared with known types of the augite-syenite group from other parts of the region and, after making thorough microscopic analyses of numerous thin sections, I am convinced that these outcrops are phases of the augite-syenite rock. The microscopical structure, when studied from thin sections in polarized light, shows these outcrops to be composed of augite-syenite minerals, microcline-microperthite

and the soda-microcline which are characteristic minerals described by Professor Brögger as occurring in the augite-syenite rocks of Norway. Thin sections prepared from specimens collected on Pierce's island in Squam river have the following mineral composition: Nos. 1, 2, 3, contain numerous patches of red biotite, hornblende and augite, in perfect crystal form, microcline, orthoclase, microcline-microperthite, microliths of ægirine, and numerous inclusions of zircons, apatite and magnetite, the whole cemented in a coarse ground mass of quartz. Thin sections prepared from specimens collected in an old and deserted quarry on the northeast side of this island are much more porphyritic. The larger crystals are always microcline-microperthite (sp. gr. 2.60 to 2.64). One of the sections has fine crystals of titanite and the quartz is in thinner films as a ground-mass or cement, otherwise the minerals are of a similar character to Nos. 1, 2, 3, except that no ægirine was detected. Specimens were collected from various outcrops along Essex avenue and Concord street to a point near Coffin's beach, West Gloucester. Sections, from an outcrop on the side of the road to Coffin's beach, near a deserted quarry in West Gloucester, are of a fine grained rock, slightly porphyritic, with an abundance of biotite, perfect well twinned crystals of albite, much microcline in large irregular patches, microcline-microperthite, hornblende, augite and titanite, some of the orthoclase feldspars having areas of micropegmetite. From the great abundance of biotite in this rock mass it may be locally called biotite-augite-syenite (sp. gr. of feldspars in this rock 2.57 to 2.62). Thin sections from the augite-syenite outcrop at Wheeler's point, Gloucester and extending to Goose Cove, Annisquam and Bay View, give the microscopic structure as follows:—Nos. 1, 2, Wheeler's point, numerous large porphyritic crystals of microcline-

microperthite, albite and orthoclase, good crystals of augite, hornblende, ægirine; numerous crystals of titanite, some biotite, magnetite, a little quartz, some crystals of apatite and zircons. No. 3, section from Goose Cove, is the same as the last except that it does not contain ægirine. Nos. 4, 5, 6, sections from Bay View quarries, contain more augite and ægirine. In one section, No. 5, there is a complete felting of these ægirine crystals which sink to the finest dust as inclusions in the microcline-microperthite, giving the rock a deep green color. Several thin sections, prepared from specimens collected in East Wenham, Essex, Conomo Point and on Cross' island, have the same microscopical structure but are more nearly of the typical augite-syenite. Thin sections from outcrop at Conomo point are nearly the same as from the outcrop at Lanesville except that they contain diallage instead of olivine, and sections from the massive outcrop at Powder House hill in the village of Essex contain long acicular crystals of brown acmite instead of the usual ægirine found in the various outcrops of the augite syenite.

Another phase of the augite-syenite rocks is found in the flow structures previously mentioned. When studied from thin sections under the microscope in polarized light they are seen to be different in structure from any variety previously described. The minerals are largely microcline-microperthite, orthoclase and albite. These are by the addition of quartz grains again broken up into a micropegmetite forming a beautiful mosaic. Other minerals are augite, titanite, hornblende, biotite, hexagonal sections of sodalite, numerous zircons, some colorless garnets and magnetite. In some of the sections there are fine masses of glaucophane a probable decomposition product of hornblende. One section has microliths of ægirine in the orthoclase and larger quartz grains. When preparing the preliminary

paper (Geological and Mineralogical Notes No. 5), I considered part of this formation to be a granophyre. In the microscopical investigation made of loose grains of all these augite-syenites, the specific gravity of the feldspars in the crushed rock, as passed through the 90 sieve and separated in the Thoulet solution, has been obtained of all the specimens from which these microscopic sections have been prepared, giving the same general result, as determined by the Westphal balance, 2.65 for the quartz and some albite, 2.57 for the microcline and orthoclase; lighter minerals ranging between 2.55 for nepheline and 2.28 for sodalite have been found.

IV. THE EXTENT AND TREND OF THE WHOLE SERIES OF THESE SYENITES.

The trend of these syenites in Essex County, Mass., is from southwest to northeast. The most distant southwestern outcrop observed is in Lynnfield Centre, near Pilling's pond, in an old railroad quarry. From this point, across Peabody to Salem and Marblehead, and, extending across Salem harbor, it is seen on the shore line, in connection with the elæolite-zircon-syenite, from Beverly to the Singing beach and Eagle head in Manchester. From here to the railroad cutting at Magnolia it is continuous and crossing the great Magnolia swamp it is seen again at West Gloucester, in the city of Gloucester, at Eastern point and the islands and rocks known as Bemo ledge, Salt island, Milk and Thatcher's islands and the Salvages outside of Pigeon Cove, Rockport. It also occupies part of the main land, one outcrop being the so-called black granite of the Rockport Granite Company's quarries, and numerous tongues are seen extending into the hornblende-granitite at Gap head and on Emerson's point. The west and northwest line of contact across Beverly is extremely irregular,

commencing on Briscoe hill in the centre of the village the line of contact with the hornblende-granitite of Powder house hill is seen on Essex street, by the roadside near the cemetery, the contact at this point being quite plain in a northeasterly direction. From here numerous outcrops can be traced to Coy's pond, East Wenham and the Chebacco lakes, whence a long tongue extends in a northwesterly direction across Hamilton nearly to Vineyard hill. It occupies the entire area from Cutler's pond in Hamilton to Powder house hill in Essex, Conomo point, Cross' island, Thompsonville, Essex, to West Gloucester, the southwest side of Annisquam and Bay View to the outcrop opposite Young avenue, Lanesville, thus forming a circle nearly around Cape Ann. The largest area occupied by these augite-syenite rocks is in Salem, Beverly, Essex and Manchester; an area eight miles in length by six miles in width besides an area nearly equal in extent, in Gloucester, including Eastern point and West Gloucester. The outcrops at Bay View and Lanesville are probably connected with the larger mass in the city of Gloucester, under a drift covered valley, which is quite extensive and well marked to the east of Riverdale and which extends nearly to some of the outcrops at Bay View and Lanesville. It is clear that the drift covered valley occupied by the Boston and Maine railroad between Gloucester and Rockport may cover a narrow vein of the syenite connecting those at the Rockport Granite Company's quarry (the so-called black granite) and the dry salvages with the main mass at Gloucester. It will be seen, therefore, that the augite-syenites form the principal rock mass of Cape Ann and that the hornblende-granitites occupy a secondary place in this large area of granitic rocks. I include as Cape Ann all of the area given in the state atlas covering parts of Beverly, Essex and Manchester together with Gloucester and Rockport.

IN CONCLUSION.

The geological age of the granitic rocks of which this paper treats is undoubtedly post Cambrian as large and small fragments of the metamorphosed Cambrian sediments are often seen to be included in them. On Poor house hill, in Beverly, and Conomo Point, in Essex, examples of these included Cambrian rocks are met with on all sides. In regard to the relative age of these rocks as compared with the hornblende-granitite, the granitite is the younger rock; for the massive forms of the augite-syenite are not seen cutting the granitite but usually surround it, thus forcing the conclusion that the granitites have burst up through the augite-syenites. The micro-syenite and tinguaite dyke rocks are more recent for they often cut both the granitite and the massive augite-syenite. Dr. M. E. Wadsworth in his paper on the presence of syenite in Essex County, Mass. (Geological Magazine, Decade 3, Vol. 2, No. 5, p. 207), says, "The preponderance of evidence is that the granite is the younger rock unless it is contemporaneous with the syenite." In the 9th Annual Report of the U. S. Geological Survey (Geology of Cape Ann, Mass., by Prof. N. S. Shaler), the rocks of this area were mapped and classified as hornblende granitite, with the exception of a small area in Squam river and vicinity which was mapped as diorite. This so-called diorite, as is shown in the microscopical analyses of thin sections from all parts of the area described, is composed of augite-syenite minerals and the few sections that were wanting in some of these minerals would be nearer a fine grained hornblende-granitite than a diorite. The city of Gloucester is built almost entirely upon this augite-syenite. It was stated in the text of the Geological Report that the ledge at Magnolia and the islands on the coast were syenitic in character, but on the map of the

Cape Ann region, printed in connection with the report, these areas were recorded as hornblende-granitite. In the whole area of the augite-syenite rock there are several dome shaped and irregular masses of the hornblende-granitite and, as the two forms of rock are distinctly granitic in type, it is not surprising that they have long been considered as one formation. Indeed, on the surface of some of the eroded augite-syenite outcrops, secondary quartz has been developed to such an extent that it would be impossible from a macroscopical examination to distinguish them from the hornblende-granite rocks, while a few inches deeper, in the fresh unaltered mass, the absence of quartz would at once show that the formation belonged to the syenite rock group.

Paper read before the Essex Institute, Mar. 20, 1893.

THE ANTERIOR CRANIAL NERVES OF PIPA AMERICANA.

BY G. A. ARNOLD.

This study was undertaken to extend the method of serial sections so successfully employed by Von Plessin and Rabinowicz ('91) on *Salamandra maculata*, to one of the Anura. The embryos of Pipa, which form the basis of the study, had a body length of 9 mm. and were cut transversely into sections 22½ micra thick, stained with alum cochineal and Bleu de Lyon (the latter after Röse's method ('91), and the reconstructions were made by plotting the projections of the sections on cross-section paper. It is only by such methods that detailed and conclusive knowledge can be obtained of the distribution of the nerves in the smaller forms. Since this method has been used in so few instances, comparison with other Batrachia is impossible and so the text is solely descriptive. It is, in fact, but an extended explanation of the plate to which reference must be made for all details. In my account of the several nerves, I have omitted detail with regard to such features as are common to all Batrachia and have dwelt more especially from points previously unknown or apparently peculiar to this form. So far as I am aware the nervous system of Pipa has been studied previously only by J. G. Fischer whose paper, unfortunately, is not to be found in the libraries I have consulted.

VIII(Auditory)VII(Facial) and V(Trigeminal) nerves. These three nerves have a common origin from the side of the medulla oblongata, arising by fibres among which the roots of separate nerves cannot be distinguished.

The auditory nerve separates directly and goes to the large auditory ganglion, situated in a foramen in the wall of the otic capsule immediately opposite the common origin of the three nerves from the medulla.

From this ganglion three groups of nerves arise, which may be taken up in order, beginning with the most posterior. The posterior ramus or group consists of the ramulus posterior (*r.p.*), the ramulus neglectus (*r.a.neg.*), the ramulus basilaris (*r.bas.*), and the ramulus lagenæ (*r.a.lag.*). The ramulus posterior leaves the posterior side of the ganglion, and runs outward and backward to the ampulla of the posterior semicircular canal, over the sensory epithelium of which it is distributed. The ramulus neglectus leaves the ganglion in company with the preceding nerve and soon distributes itself to the pars neglecta of the sacculus. The ramulus basilaris has a similar course to the pars basilaris of the cochlea. The fourth and last of this group, the ramulus lagenæ, has a more ventral origin and runs somewhat ventrally to the lagena. The second branch of the Auditory nerve, the ramulus sacculi, consists of a large branch running outward and spreading slightly, forming a large brush distributed over the macula acustica on the lower side of the sacculus. The third group consists of the nerves to the two anterior ampullæ. They arise as a single nerve from the anterior side of the ganglion and run forward and outward. Then they divide to go to their respective ampullæ. The ramulus anterior (*r.a.a.*) makes a turn around the external semicircular canal to reach its own ampullæ.

After the separation of the auditory nerve, the V and

VII continue forward along the side of the brain, until they enlarge into a ganglion,— the Gasserian— oval as viewed from above, situated proximally within and distally without the cranial walls. The facial nerve arises as two branches, one lateral, the other ventral, near the middle of this ganglion. The former of these (*coms.g.*) forms the commissure between the facial nerve and the glossopharyngeal. Its course is at first outward, then it curves backward in an horizontal plane until it joins the glossopharyngeal nerve directly opposite the origin of the V, VII and VIII from the brain. Its further course is that of the glossopharyngeal. The large loop which it forms is necessitated by the fact that it has to pass around the otic capsule, close to the walls of which it runs.

The other branch, the facial proper (*fac.*) takes an outward and downward course from its origin from the ventral side of the ganglion. It soon divides into a large ramus to the lower jaw (*hy.man.*) and a palatine ramus (*p.*), to the roof of the mouth. Immediately on separation the palatine runs forward and inward and then directly forward above the roof of the mouth, until near the anterior wall of the orbit it gives rise to an anastomosing commissure connecting it with the ramus nasalis of the trigeminal. Beyond this commissure the palatine bends inward and distributes itself to the epithelium of the mouth and the internal choana. I do not find a branch of the palatine continuing forward through the vomer to the region of the snout as in other Batrachia. The fact that the nerve does not extend forward to the nose precludes the possibility of there being any connection between it and the frontalis or nasalis other than the commissure above mentioned. A terminal connection between the palatine and the trigeminal is described by Ecker in *Rana esculenta*. He also mentions a double origin for the palatine from the separate

ganglions of V and VII. My study of Pipa gives no indication of such a dual condition, since the nerve arises not from the common ganglion of the V and VII, but as a branch of the facial nerve.

After the separation of the palatine, the main branch of the facial (*hy.man.*)[1], turns outward and backward for some distance, passing along a groove in the ventral side of the otic capsule, between it and the roof of the mouth. Thence it passes downward around the buccal cleft to the lower jaw. After making this turn, the hyomandibularis runs forward on the inner side of Meckel's cartilage along the floor of the mouth. It soon gives off a branch (*buc.*), which in turn divides to innervate the mucous lining of the mouth. This branch, although scarcely larger than several that are given off later as terminal branches with similar distribution, corresponds most nearly to the buccalis of other forms. The main nerve continues its course forward following the general contour of the jaw and is distributed to the inner lining of the mouth. The chief points of interest in connection with the facial in Pipa are the relations of the palatine and the apparent lack of connection between the facial-glossopharyngeal commissure and the facial proper. This of course is to be explained by the peculiar relations of the VII to the V, the facial first appearing as a distinct nerve coming from the trigeminal ganglion, the connection existing in the ganglion itself.

The trigeminal nerve consists of three divisions arising by as many separate roots from the anterior end of the Gasserian ganglion. These three divisions will be described in order corresponding to their origin from the ganglion, namely, the mandibularis, the frontalis, and the supramaxillaris superior.

[1]Hyo-mandibularis, Von Plessin = Jugularis, Fischer = Facial, Wyman.

The mandibularis (*man.*)[1] arises from the dorsal side of the anterior end of the Gasserian ganglion and runs outward, upward and forward. Then it turns in a gradual curve backward and in a sharp curve downward through the masseter and temporal muscles until it reaches the angle of the lower jaw, along the outer side of which it runs forward. Just outside of the Gasserian ganglion the mandibularis gives rise to a branch (*mas.*) which innervates the masseter and temporal muscles. Soon after entering the lower jaw it divides into the mandibularis proper and the mentalis which have their usual distribution. The mentalis has at first a more outward course, but later passes inward under the mandibularis to be distributed to the outer skin of the lower jaw. The mandibularis follows along the outer side of the mandible until it almost reaches the symphysis menti, to the integument of which region it is distributed. The only feature especially worthy of notice is that this nerve arises directly from the ganglion, not as a branch of the maxillaris superior.

The frontalis[2] (*f.*) arises beside the mandibularis, in juxtaposition with which it runs at first and preserves a slightly dorsal and lateral direction forward, passing over the masseter and temporal muscles to reach the orbit. Here it is deflected downward and inward around the eyeball. Then it ascends again upon the anterior side of the orbit and branches outward to innervate the skin of the cheek and the side of the upper jaw. This distribution differs from that in the common frog, where the frontalis sends branches to the lining of the nasal capsule, thus making terminal connection with fibres of the olfactory,

[1]Mandibularis, Von Plessin and Rabinowicz=Maxillaris inferior, Fischer=Lower jaw branch, Wyman.

[2]Frontalis, Von Plessin and Rabinowicz=Nasalis, Fischer=Ophthalmic, Wyman.

and also where the frontalis pierces the premaxillary bone and exchanges fibres with the palatine nerve. This region of the snout is entirely supplied by the maxillaris and nasalis in this form. I failed to discover any branch to the muscles of the eye.

The supramaxillaris superior[1] is the largest ramus of the trigeminal. Almost immediately after leaving the Gasserian ganglion, from the anterior end of which it takes its origin, it becomes divided into two branches: 1. The maxillaris proper. 2. The nasalis of Von Plessin and Rabinowicz.

These two branches have a similar course forward, turning slightly inward and downward. The maxillaris takes a more ventral course than the nasalis, although they do not become widely separated until after the anastomosis between the maxillaris and the palatine has occurred. The maxillaris and the palatine run very nearly parallel throughout their courses and at no very great distance from one another; hence the commissure between them is short compared with its length in most Batrachia. It also presents another and more marked difference from the conditions obtaining in most Batrachia, in that its course is vertical rather than horizontal. After this anastomosis has occurred, the maxillaris continues forward in two branches which distribute themselves in the region of the nose and the side of the jaw. No terminal filaments connecting this nerve with the frontalis or the palatine can be traced.

The nasalis[2] (*n.*) lies slightly above the maxillaris after their separation, and so preserves an almost horizontal course forward to the tip of the nose, in which region

[1] Supramaxillaris superior, Von Plessin and Rabinowicz = Supramaxillaris, Ecker=Upper maxillary branch, Wyman=Maxillaris superior, Fischer.

[2] Nasalis, Von Plessin and Rabinowicz.

one of its branches (*a*) is distributed. Branch (*b*) of the nasalis branches outwardly and distributes itself to the integument of the side of the upper jaw. Shortly after the nasalis has divided from the maxillaris, a large branch (*c*) splits off with the following course and distribution: The nerve turns sharply inward and passes over the olfactory nerve to which it gives off a small branch. Thence its course is downward and forward near the roof of the mouth to the snout, passing downward through the premaxillary bone for distribution to the region of the upper lip.

There arises from the supramaxillaris, superior soon after leaving the Gasserian ganglion, a nerve which follows along near its parent until it reaches the orbit in which it bends upward and outward. Then it leaves the orbit and turns upward, backward and inward, distributing itself to the cutaneous layer on the top of the head midway between the eyes. This nerve is apparently the same as that which Fischer has described in the case of Necturus, as innervating the skin of the dorsal surface of the head. According to Huxley (Encyl. Brit., Art. Amphibia), it occurs only in the tadpole of Anura and disappears from the adult.

From the maxillaris superior, there also arises a nerve which innervates the superior oblique eye muscle and hence is to be regarded as trochlearis which has remained fused with the fifth, a condition possessing much morphological interest.

The oculomotor nerve (*o.c.m.*) arises the ventral side of the medulla oblongata. Its course is outward and forward within the chondrocranium, then it leaves the chondrocranium through the same foramen as the trigeminal and runs forward to be distributed in the usual manner to the rectus muscles of the eye. The only feature worthy of

comment is the absence of a separate foramen for its exit from the cranium.

The optic nerve (*op.*) presents no special features, either in regard to its origin or its course. Its roots form a a very intricate chiasma.

The olfactory nerve (*ol.*) arises from the anterior extremity of the olfactory lobe, passes out through the walls of the skull, and distributes itself to the epithelium of the nasal capsule and to the organ of Jacobson in two branches. There is no indication of two roots like those described by Wiedersheim in the Gymnophiona and which have later been commented upon by Burckhardt.

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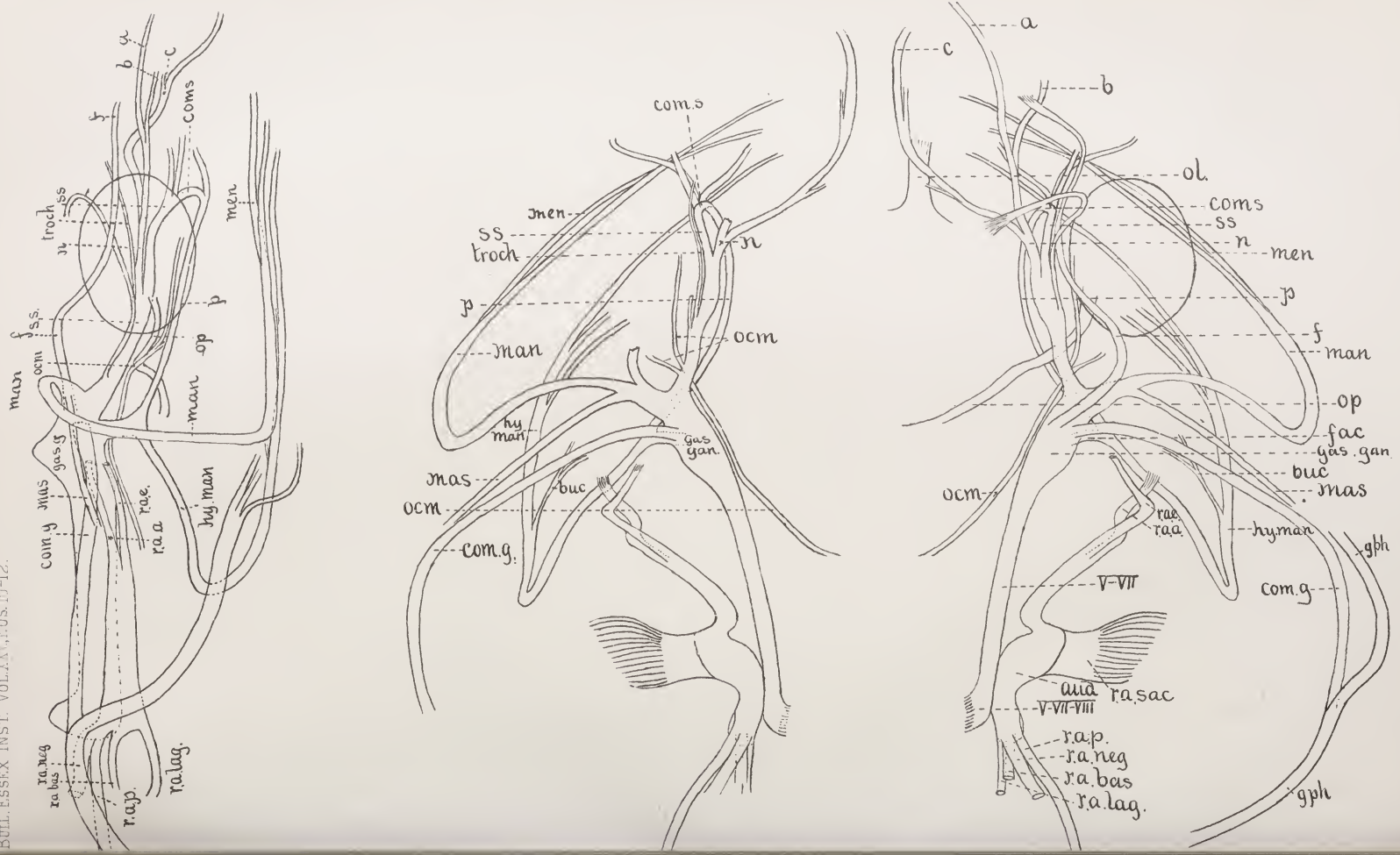
EXPLANATION OF PLATE REFERENCE LETTERS.

a.b.c. = terminal branches of nasalis.
buc. = buccalis.
com.g. = commissure of VII and IX.
com. = commissure between palatinus and maxillaris.
f. = frontalis.
fac. = facialis.
gph. glossopharyngeal.
gas.gang. = ganglion of V and VII.
hy.man. = hyomandibularis.
man. = mandibularis.
men. = mentalis.

mas. = masseter.
n. = nasalis.
o.c.m. = oculo-motor.
ol. = olfactory.
op. = optic.
r.a.a. = ramulus acusticus anterior.
r.a.l. = " " exterior.
r.a.p. = " " posterior.
r.a.bas. = " " basilaris.
r.a.neg. = " " neglectus.
r.a.sac. = " " sacculi.
s. s. = supramaxillaris superior.
troct. = trochlearis.
V, VII, VIII = origin of V, VII, and VIII from brain.

FIG. 1. Nervous system of Pipa from the right side.
FIG. 2. Same from above. On the left side some of the more dorsal nerves are removed.



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A PRELIMINARY LIST OF THE VERTEBRATE ANIMALS OF KENTUCKY.

By H. GARMAN, Lexington, Ky.

THIS list is based upon collections and observations made since July, 1889, in various parts of Kentucky from points near the eastern limit of the State to Hickman on the Mississippi river. The original list, as thus prepared, has been extended by including species observed by Audubon, by Beckham in Spencer County, and very considerably by the use of the publications of the United States Fish Commission. Since the days of Audubon the bird fauna of the State has changed greatly, and his statements concerning the abundance of species are not in all cases to be accepted as applying at the present time. A few species which he observed here will probably not again be seen in Kentucky. Others which he recorded as occurring in great numbers are scarce. Some species, known to be

abundant at present, were not observed by him in the State and have probably increased in numbers since he collected. Facts of this sort will become more apparent when the list has been completed. It is published in its incomplete condition largely for the purpose of establishing a nucleus about which to build up a more thoroughgoing account of the vertebrate fauna of the State. The writer has given the mammals only incidental attention while engaged in other work. The list is very imperfect, especially in the small rodents, shrews and the like, a number of which have been observed but not studied. The lists of reptiles and amphibians probably do not contain more than half of our species. A good many which have been collected by me in southern Illinois, doubtless also occur on the Kentucky side of the Ohio river, but I have thought it best to include no species not actually taken in the State. A single month's active collecting in the more thinly settled parts of western Kentucky would doubtless add a number of these to the list. In collecting fishes my opportunities have been better than for the other groups, and I have been fortunate in having the aid of work done in the State by Commissioner McDonald's assistants. The list will probably be found to contain fully three-fourths of the Kentucky species.

My thanks are due to the managers of the Cincinnati Society of Natural History for the privilege of using a copy of Audubon's "Birds of North America," and especially to Mr. Seth Hayes for courtesy shown me during a recent visit to the library of this excellent institution.

MAMMALS.

Cats (Family Felidæ).

1. Panther, Cougar (*Felis concolor*, Linn.).

From accounts given me by intelligent men who

have long been familiar with the mountainous districts of Kentucky and West Virginia I am satisfied that this species has existed in the State within the past fifty years.

2. Wild Cat (*Lynx rufus*, Guld.).
   This species still occurs in the mountains of eastern Kentucky. Captain Bent of Aden Springs informs me that a pair lived for some time in 1891 on a bluff near his residence, and that finally his dog treed one of them and it was shot.

Dogs (Family Canidæ).

3. Wolf (*Canis lupus*, Linn.).
   Not common.
4. Gray Fox (*Urocyon cinereo-argentatus*, Schreber).
   Formerly common. Still occurs in the mountain regions and occasionally in settlements.
5. Red Fox (*Vulpes vulpes*, Linn.).
   Not rare. Occurs throughout Kentucky.

Weasels (Family Mustelidæ).

6. Mink (*Putorius vison*, Schreber).
   Occasionally taken in traps.
7. Skunk (*Mephitis mephitica*, Shaw).
   Rather common everywhere. Sometimes enters caves, penetrating to a depth of two hundred feet or more.

Bears (Family Ursidæ).

8. Black Bear (*Ursus americanus*, Pallas).
   Formerly common, now rare, possibly not occurring at all.

RACCOONS (Family Procyonidæ).

9. Coon (*Procyon lotor*, Linn.).

Common everywhere. Young from the nest squeal when alarmed somewhat like a pig. The young also at times utter a low and rather musical trill resembling that commonly heard from the screech owl. This latter seems to be a call note probably employed to inform the parent that the young want food. When just able to run about they play like kittens, scampering after children, and worrying the end of a rope in evident enjoyment. One, kept by me for some time, ate freely of nearly everything given it: bread, meat, cabbage leaves, corn, insects; but had a special fondness for birds, becoming very irascible and suspicious of attentions while engaged in eating this kind of food. From the clamor of English sparrows in an elm tree up which this individual frequently climbed I suspect he was not above robbing nests of eggs or young.

BISON (Family Bovidæ).

10. Buffalo (*Bison bison*, Linn.).

Common in the early days of the settlement of Kentucky.

DEER (Family Cervidæ).

11. Elk (*Cervus canadensis*, Erxleben).

Long since exterminated in the State. With the buffalo it is said to have furnished a considerable part of the food supply of the pioneer settlers.

12. Deer (*Cariacus virginianus*, Boddært).

Not common anywhere in Kentucky at present,

but still occurs in both eastern and western ends of the State.

BATS (Family Vespertilionidæ).

13. Red Bat (*Atalapha noveboracensis*, Erxleben).
Taken at Lexington occasionally.

14. Long-eared bat (*Vesperugo serotinus*, Schreber).
An example of this was taken at the Experiment Farm, near Lexington, in August, 1893. The specimen is very dark in color, with large ears, and but little hair on the membranes. The outer of the two upper incisors is so small as to be made out with difficulty. The lower incisors are imbricated, the cutting edge of each with three rounded denticles.

15. Little Brown Bat (*Vespertilio subulatus*, Say).
Occurs in caves near Lexington, Ky.

Moles (Family Talpidæ).

16. Mole (*Scalops aquaticus*, Linn.).
Exceedingly common everywhere, and often troublesome in lawns and fields. It is accused by farmers of eating grain after it is planted. It undoubtedly devours large quantities of injurious insects.

SHREWS (Family Soricidæ).

At least one species of this family is common in pastures and cultivated ground at Lexington. I take it to be *Blarina parva*, but have not yet examined my material carefully enough to decide positively.

SQUIRRELS (Family Sciuridæ).

17. Flying Squirrel (*Sciuropterus volans*, Linn.).

I include this on the authority of Messrs. A. M. Peter and H. E. Curtis of the Kentucky Experiment Station. These gentlemen have observed it near Lexington.

18. Fox Squirrel (*Sciurus niger*, Linn.).
Kentucky (Audubon and Bachman).

19. Gray Squirrel (*Sciurus carolinensis*, Gmelin).
Very common in all parts of the State.

20. Ground Squirrel, Chipmunk (*Tamias striatus*, Linn.).
Very common about old rail fences.

21. Woodchuck, Ground-hog (*Arctomys monax*, Linn.).
Not rare.

MICE and RATS (Family Muridæ).

22. Wood Rat (*Neotoma floridana*, Say and Ord).
Some rodent which I presume to be this is rather common in caves throughout Kentucky, but its shyness is so great that one may visit its haunts scores of times without getting a glimpse of it. Captain Bent of Aden Springs tells me of a "cliff rat" which is probably the same species.

23. Muskrat (*Fiber zibethicus*, Linn.).
Common in all parts of Kentucky.

RABBITS (Family Leporidæ).

24. Rabbit (*Lepus sylvaticus*, Bachman).
A very common mammal in Kentucky and brought to market in winter by wagon loads.
Probably the marsh and water rabbits also occur in the State, but I have not yet recognized them among the many rabbits seen in the markets in a half dozen Kentucky cities.

Opossums (Family Didelphidæ).

25. Possum (*Didelphis virginiana*, Shaw).
Very common everywhere.

BIRDS.

Thrushes (Family Turdidæ).

26. Bluebird (*Sialia sialis*, Linn.).
A common resident throughout Kentucky.
27. Robin (*Merula migratoria*, Linn.).
Resident and rather common.
28. Hermit Thrush (*Turdus aonalaschkæ*, Gmelin).
A common migrant. "Observed during spring and summer" (Aud.).
29. Olive-backed Thrush (*Turdus ustulatus*, Nuttall).
Common during the spring migrations.
30. Grey-cheeked Thrush (*Turdus aliciæ*, Baird).
Nelson County, transient (Beckham).
31. Veery (*Turdus fuscescens*, Stephens).
Nelson County, transient, not common (Beckham).
32. Wood Thrush (*Turdus mustelinus*, Gmelin).
A summer resident. Common locally.

Kinglets (Family Sylviidæ).

33. Blue-gray Gnat-catcher (*Polioptila cærulea*, Linn.).
A summer resident. Common everywhere during the spring migrations.
34. Ruby-crowned Kinglet (*Regulus calendula*, Linn.).
Common during both spring and fall. "In winter, but generally in southern exposures" (Aud.).
35. Golden-crowned Kinglet (*Regulus satrapa*, Licht.).
Very common in fall and spring.

NUTHATCHES (Family Paridæ).

36. Black-capped Chickadee (*Parus atricapillus*, Linn.).
"Extends as far as Kentucky in winter" (Aud.).

37. Chickadee (*Parus carolinensis*, Aud.).
A common resident throughout Kentucky.

38. Tufted Titmouse (*Parus bicolor*, Linn.).
One of the most abundant and characteristic Kentucky birds. Resident.

39. Red-bellied Nuthatch (*Sitta canadensis*, Linn.).
I have seen one example of this bird at Lexington, in fall. Beckham reports it as an irregular fall and winter visitant in Nelson County.

40. White-bellied Nuthatch (*Sitta carolinensis*, Latham).
A common and familiar species throughout the State. Resident.

CREEPERS (Family Certhiidæ).

41. Brown Creeper (*Certhia familiaris*, Linn.).
Common everywhere during fall and spring. Winters in sheltered localities.

MOCKING BIRDS and WRENS (Family Troglodytidæ).

42. Short-billed Marsh Wren (*Cistothorus stellaris*, Lichtenstein).
Beckham reports having taken a male in Nelson County.

43. Winter Wren (*Troglodytes hiemalis*, Vieillot).
Occasional during winter and early spring. Beckham says it is rather common in Nelson County.

44. House Wren (*Troglodytes ædon*, Vieillot).
A rare bird in Kentucky, according to my experience. Its place about dwellings is occupied to some extent by the next. I have seen but one

specimen, captured in the State College hot house at Lexington in the spring of 1890.

45. Bewick's Wren (*Thryothorus bewickii*, Audubon). Resident throughout the State. Common locally.

46. Carolina Wren (*Thryothorus ludovicianus*, Gmelin). Very common everywhere. Resident.

47. Brown Thrush (*Harporhynchus rufus*, Linn.). A moderately common, summer resident. Less common here than in the states along our northern border.

48. Catbird (*Galeoscoptes carolinensis*, Linn.). A common summer resident.

49. Mocking Bird (*Mimus polyglottos*, Linn.). Resident in all parts of the State. Becoming shy and rather scarce in the thickly settled regions, owing to persecution by boys and negroes who capture the young for "pets."

WAGTAILS (Family Motacillidæ).

50. Titlark (*Anthus pensilvanicus*, Latham). Nelson County, transient (Beckham).

WARBLERS (Family Mniotiltidæ).

51. Redstart (*Setophaga ruticilla*, Linn.). An abundant migrant in both fall and spring. Summer resident.

52. Canada Warbler (*Sylvania canadensis*, Linn.). Kentucky (Aud.). Transient in Nelson County (Beckham).

53. Green, Black-capped Warbler (*Sylvania pusilla*, Wilson). Transient in fall and spring. East Cairo in September. Nelson County, May (Beckham).

54. Hooded Warbler (*Sylvania mitrata*, Gmelin).
Along the Ohio river (Audubon). Transient, Nelson County (Beckham).

55. Small-headed Warbler (*Sylvania* (*?*) *microcephala*, Ridgway).
"I have never seen it out of Kentucky, and even there it is a very uncommon bird" (Aud.). "Known only from the works of Wilson and Audubon" (Check-list Am. Orn. Union, 1886).

56. Yellow-breasted Chat (*Icteria virens*, Linn.).
A common summer resident throughout the State.

57. Maryland yellow-throat (*Geothlypis trichas*, Linn.).
A common summer resident.

58. Mourning Warbler (*Geothlypis philadelphia*, Wilson).
Transient in Nelson County (Beckham).

59. Connecticut Warbler (*Geothlypis agilis*, Wilson).
Transient, Nelson County (Beckham).

60. Kentucky Warbler (*Geothlypis formosa*, Wilson).
A summer resident. Common locally.

61. Large-billed Water Thrush (*Seiurus motacilla*, Vieillot).
A summer resident.

62. Water Wagtail (*Seiurus noveboracensis*, Gmelin).
Canebrakes at Henderson and below (Aud.). Nelson County (Beckham).

63. Oven Bird (*Seiurus aurocapillus*, Linn.).
Frequent in wooded regions in spring. A summer resident (?).

64. Red-poll Warbler (*Dendrœca palmarum*, Gmelin).
Common near Lexington and elsewhere during the fall migrations.

65. Prairie Warbler (*Dendrœca discolor*, Vieillot).
Common in spring, probably a summer resident in Nelson County (Beckham).

66. Pine-creeping Warbler (*Dendrœca vigorsi*, Audubon).

Transient. Common in wooded regions.

67. Black-throated Green Warbler (*Dendrœca virens*, Gmelin).

Transient. Common in fall and spring.

68. Orange-throated Warbler (*Dendrœca blackburniæ*, Gmelin).

Transient. Beckham records it as common in Nelson County, in fall.

69. Yellow-throated Warbler (*Dendrœca dominica*, Linn.).

Observed at Midland, Ky., in April, common. Common summer resident in Nelson County (Beckham).

70. Black-poll Warbler (*Dendrœca striata*, Forster).

Transient. East Cairo, September, common. Nelson County (Beckham).

71. Bay-breasted Warbler (*Dendrœca castanea*, Wilson).

Transient. East Cairo in September. Nelson County (Beckham).

72. Chestnut-sided Warbler (*Dendrœca pensylvanica*, Linn.).

Transient; common in Nelson County (Beckham).

73. Cærulean Warbler (*Dendrœca cærulea*, Wilson).

A summer resident.

74. Black and yellow Warbler (*Dendrœca maculosa*, Gmelin).

Very common during the fall migrations in wooded regions.

75. Yellow-rumped Warbler (*Dendrœca coronata*, Linn.).

A winter resident; common everywhere.

76. Black-throated blue Warbler (*Dendrœca cœrulescens*, Linn.).

Transient; common, Nelson County (Beckham).

77. Summer Yellow Bird (*Dendrœca æstiva*, Gmelin.

Summer resident. Frequent.

78. Cape May Warbler (*Dendrœca tigrina*, Gmelin).

Transient. Rare in Nelson County (Beckham).

79. *Dendrœca carbonata*, Audubon.

Two specimens of this were killed by Audubon at Henderson, Ky., May, 1811. The species has not been collected since and ornithologists are in doubt as to its status. Audubon's account of the bird reads as follows: "I shot the two little birds, here represented, near the village of Henderson in the State of Kentucky, in May, 1811. They were both busily engaged in searching for insects along the branches and amongst the leaves of a dogwood tree. Their motions were those common to all the species of the genus. On examination they were found to be both males. I am of the opinion that they were each young birds of the preceding year, and not in full plumage, as they had no part of their dress seemingly complete, excepting the head. Not having met with any other individuals of the species, I am at this moment unable to say anything more about them. They were drawn like almost all other birds which I have represented, immediately after being killed."

80. Parula Warbler (*Compsothlypis americana*, Linn.).

Rather common during the fall migrations. A common summer resident in Nelson County (Beckham).

81. Nashville Warbler (*Helminthophila ruficapilla*, Wilson).

Kentucky (Aud.). Transient, not uncommon in Nelson County (Beckham).

82. Orange-crowned Warbler (*Helminthophila celata*, Say).

Transient, Nelson County (Beckham).

83. Tennessee Warbler (*Helminthophila peregrina*, Wilson).

Transient. East Cairo in September. Nelson County (Beckham).

84. Blue-winged Yellow Warbler (*Helminthophila pinus*, Linn.).

Frequent in the barrens (Audubon). Common in spring in Nelson County (Beckham).

85. Golden-winged Warbler (*Helminthophila chrysoptera*, Linn.).

Kentucky, several specimens (Aud.). Rare, Nelson County (Beckham).

86. Worm-eating Warbler (*Helmitherus vermivorus*, Gmelin).

In Kentucky and Ohio I have seen only a few of them; nor have I ever found their nests in either of these states (Aud.). The species is not rare during the nesting season in southern Illinois not far from the Kentucky border and hence is probably to be found breeding also on the Kentucky side of the Ohio river.

87. Prothonotary Warbler (*Protonotaria citrea*, Boddært).

Observed by Audubon along the Ohio below Louisville. Probably not rare in the forests of western Kentucky. A specimen was observed by me at Midland in the eastern end of the State last April.

88. Black and White Creeper (*Mniotilta varia*, Linn.).

A summer resident in western Kentucky.

VIREOS (Family Vireonidæ).

89. White-eyed Vireo (*Vireo noveboracensis*, Gmelin).
A summer resident, Nelson County (Beckham).

90. Blue-headed Vireo (*Vireo solitarius*, Wilson).
Observed at Henderson and elsewhere in the State by Audubon. Not common. Nelson County (Beckham).

91. Yellow-throated Vireo (*Vireo flavifrons*, Vieillot).
Summer resident in Nelson County (Beckham).

92. Warbling Vireo (*Vireo gilvus*, Vieillot).
A common summer resident.

93. *Vireo philadelphicus*, Cassin.
Rare in Nelson County (Beckham).

94. Red-eyed Vireo (*Vireo olivaceus*, Linn.).
A common summer resident everywhere.

SHRIKES (Family Laniidæ).

95. Logger-head Shrike (*Lanius ludoviciunus*, Linn.).
Apparently not common in Kentucky. I have never seen it in the State. Beckham appears to have observed it in Nelson County. Miss Sadie F. Price of Bowling Green has a water color sketch of a specimen obtained at that place.

96. Northern Shrike (*Lanius borealis*, Vieillot).
Audubon states that this shrike is not rare in Kentucky in winter. I have not seen it here, and am inclined to think it does not penetrate much beyond the Ohio River.

WAXWINGS (Family Ampelidæ).

97. Cedar Bird (*Ampelis cedrorum*, Vieillot).
Summer resident throughout the State. Frequent.

SWALLOWS (Family Hirundinidæ).

98. Rough-winged Swallow (*Stelgidopteryx serripennis*, Aud.).

A summer resident.

99. Bank Swallow (*Clivicola riparia*, Linn.).

According to Audubon this swallow produces two annual broods in Kentucky.

100. Barn Swallow (*Chelidon erythrogaster*, Boddært).

Abundant everywhere in summer.

101. Cliff Swallow (*Petrochelidon lunifrons*, Say).

Summer resident. Observed by Audubon, nesting at Newport in 1819.

102. Martin (*Progne subis*, Linn.).

A very abundant summer resident. At Lexington these birds assemble in the latter part of the summer in an immense flock. For several years they have made some maple trees on a retired corner of the State College grounds their place of assemblage. As early as July 4 they begin to gather on these trees to roost at night, coming at about 5 o'clock P. M. from the surrounding country for miles. In August thousands of the birds are every night gathered on these trees. When settling for the night they make a deafening clatter, quite unlike that produced when about their nests, and are so numerous that the branches sway and bend under them. On one occasion I secured a half-dozen specimens by throwing stones among them. They disappear suddenly about the 25th of August, though a few stragglers may be seen as late as Sept. 1, gathering upon the tower of the State College building of evenings.

One of the birds obtained on the College grounds

had fed very largely on a small brown beetle (*Colaspis brunnea*) which in its grub state sometimes does considerable mischief by eating the roots of strawberry plants.

Audubon observed martins at Louisville as early as March 15.

TANAGERS (Family Tanagridæ).

103. Scarlet Tanager (*Piranga erythromelas*, Vieillot).

A rather rare migrant in eastern Kentucky. Audubon records it as plentiful in the State.

104. Summer Red Bird (*Piranga rubra*, Linn.).

A common summer resident throughout Kentucky. The nest with fresh eggs may often be seen from the middle of May to June 1. It is one of our most characteristic birds.

FINCHES (Family Fringillidæ).

105. Black-throated Bunting (*Spiza americana*, Gmelin).

A summer resident. Not very common. This is one of the birds mentioned by Mr. John Burroughs (see an article entitled "A Taste of Kentucky Blue-grass" in *The Century* for July, 1890) as characteristic of this region. The bird is not rare in some localities, but taking the State as a whole, cannot be ranked with such species as the red-headed woodpecker, the flicker, the summer red bird, the cardinal grosbeak, the Carolina wren, the crow, and the mocking bird. These are permanent residents and are common throughout the State. The black-throat occurs here only during the summer, and not a tithe of the individuals are to be seen in the State that occur on the prairies of states north of the Ohio River. The nests with

the pale, blue eggs may be found in tufts of grass during the first half of June.

Since the above was written, I have looked through Audubon's work, and find that he did not find the species common in Kentucky: "They are also abundant on the open lands of Missouri and Illinois; but rarer in Ohio, and scarce in Kentucky."

106. Indigo Bird (*Passerina cyanea*, Linn.).
Very common everywhere in summer.

107. Blue Grosbeak (*Guiraca cærulea*, Linn.).
Not a common bird. I have seen but one specimen.

108. Rose-breasted Grosbeak (*Habia ludoviciana*, Linn.).
Henderson (Aud.). Not common. Seen occasionally during spring.

109. Cardinal Grosbeak (*Cardinalis virginianus*, Linn.).
A common permanent resident.

110. Chewink (*Pipilo erythrophthalmus*, Linn.).
Frequent during the summer.

111. Fox Sparrow (*Passerella iliaca*, Merrem).
A winter visitant. Not rare.

112. *Melospiza lincolni*, Audubon.
Transient. Not uncommon in May in Nelson County (Beckham).

113. Swamp Sparrow (*Melospiza georgiana*, Latham).
Not very common. Occurs during the fall and spring.

114. Song Sparrow (*Melospiza fasciata*, Gmelin).
A very common, permanent resident.

115. *Peucæa æstivalis*, Lichtenstein.
This species has been observed by Miss Sadie F. Price at Bowling Green. It is probably not uncommon locally in western Kentucky. I have found it rather common in Illinois near our border.

116. Snow Bird (*Junco hyemalis*, Linn.).
A common winter visitant.

117. Field Sparrow (*Spizella pusilla*, Wilson).
A common summer resident.

118. Chippy (*Spizella socialis*, Wilson).
A common summer resident.

119. Tree Sparrow (*Spizella monticola*, Gmelin).
A common winter bird.

120. White-throated Sparrow (*Zonotrichia albicollis*, Gmelin).
A common winter visitant.

121. White-crowned Sparrow (*Zonotrichia leucophrys*, Forster).
Rather common in fall and spring. Probably winters in the forests of sheltered localities.

122. Lark Finch (*Chondestes grammacus*, Say).
Not common in blue grass Kentucky. Mr. Beckham reports it as a common summer resident in Nelson County.

123. *Ammodramus henslowi*, Audubon.
Audubon obtained a specimen in Kentucky, opposite Cincinnati, in 1820. Not common. Nelson County (Beckham).

124. Grasshopper Bird (*Ammodramus savannarum*, Gmelin).
Common everywhere in summer.

125. Savanna Sparrow (*Ammodramus sandwichensis*, Gmelin).
A common migrant in Nelson County (Beckham).

126. Vesper Sparrow (*Poocætes gramineus*, Gmelin).
A common summer resident in the blue grass region. Becomes active and musical at sunset, and during sultry threatening weather. Audubon did not observe it in the State, from which it seems

probable it is extending its range to the westward. It is extremely common in the Shenandoah Valley of Virginia. Audubon writes: "I have never seen the Bay-winged Bunting in any portion of Louisiana, Missouri, Kentucky, or Ohio, and am therefore inclined to look upon it as a resident of the country lying to the eastward of the range of the Alleghanies."

127. Lapland Longspur (*Calcarius lapponicus*, Linn.).
On the 15th of February, 1819, Audubon says he saw immense flocks of this bird "scattered over the open grounds on the elevated grassy banks of the Ohio," at Henderson.

128. Snow Bunting (*Plectrophenax nivalis*, Linn.).
In the winter from Nova Scotia to Kentucky (Audubon).

129. Pine Siskin (*Spinus pinus*, Wilson).
Henderson (Aud.). Nelson County (Beckham).

130. Black-headed Goldfinch (*Spinus notatus*, Du Bus).
A Mexican species taken years ago in Kentucky by Audubon.

131. Goldfinch, Thistle Bird (*Spinus tristis*, Linn.).
A common summer resident. Remains with us during mild winters.

132. Red Crossbill (*Loxia curvirostra*, Linn.).
Nelson County (Beckham).

133. Purple Finch (*Carpodacus purpureus*, Gmelin).
I have not seen this bird in eastern Kentucky. It is recorded from Kentucky by Audubon. Beckham reports it a common migrant in Nelson County.

134. English Sparrow (*Passer domesticus*, Linn.).
Common everywhere. Often injurious to ripening wheat, sometimes making it necessary to keep a man in the fields with a shotgun.

BLACKBIRDS (Family Icteridæ).

135. Crow Blackbird (*Quiscalus quiscula*, Linn.).
A common summer resident. Raises its young very early in spring, and from the middle of June until the latter part of August or early September spends its time foraging in fields and collects at night to roost in clumps of evergreens in towns. Immense numbers of them often assemble at these roosts, and men and boys shoot them for food.

136. Rusty Blackbird (*Scolecophagus carolinus*, Müller).
I have not seen this species in the blue grass region. A common migrant in Nelson County (Beckham).

137. Baltimore Oriole (*Icterus galbula*, Linn.).
Moderately common during the summer.

138. Orchard Oriole (*Icterus spurius*, Linn.).
Less common than the preceding. A summer resident.

139. Meadow Lark (*Sturnella magna*, Linn.).
A permanent resident, but probably goes beyond our borders during severe winters. Moderately common in summer.

140. Red-winged Blackbird (*Agelaius phœniceus*, Linn.).
A moderately common, summer resident. Not as abundant as in the states north of us.

141. Cow Bird (*Molothrus ater*, Boddaert).
A common summer resident.

142. Bobolink (*Dolichonyx oryzivorus*, Linn.).
Not common. Miss Sadie F. Price has observed it at Bowling Green.

CROWS AND JAYS (Family Corvidæ).

143. Crow (*Corvus americanus*, Audubon).
Very common, permanent resident; often as-

sembles in flocks containing hundreds, and appears to migrate from one locality to another, though I am unable to say just what controls these movements.

144. Raven (*Corvus corax*, Linn.).

I am informed by an intelligent hunter that he has seen this bird occasionally in the mountains of eastern Kentucky.

145. Florida Jay (*Aphelocoma floridana*, Bartr.).

A Florida species said to have been taken in Kentucky. I include it only to call the attention of local observers to it. It is described by Dr. Coues as follows: "Not crested; wings and tail blue, not barred. Blue; back with a large well defined gray patch, belly and sides pale grayish, under tail coverts and tibiæ blue in marked contrast; much hoary whitish on forehead and sides of crown; chin, throat and middle of breast vague streaky whitish; ear coverts dusky; the blue that seems to encircle the head and neck well defined against the gray of the back and breast; bill comparatively short, very stout at the base. About 12; wing 5 or less; tail about 6, much rounded; bill about 1."

146. Blue Jay (*Cyanocitta cristata*, Linn.).

A common permanent resident.

Larks (Family Alaudidæ).

147. Shore Lark, Horned Lark (*Otocoris alpestris*, Forster).

Occasionally seen in small flocks during the winter. Not as common as in the states north of the Ohio River.

FLYCATCHERS (Family Tyrannidæ).

148. Least Flycatcher (*Empidonax minimus*, Baird).
Transient in April and May, common, Nelson County (Beckham).

149. Green-crested Flycatcher (*Empidonax acadicus*, Gmelin).
Summer resident. Not rare.

150. Yellow-bellied Flycatcher (*Empidonax flaviventris*, Baird).
Nelson County; transient (Beckham).

151. Wood Pewee (*Contopus virens*, Linn.).
Summer resident, common.

152. Pewee (*Sayornis phœbe*, Latham).
A common summer resident. Nests about old quarries, and at the mouths of caves.

153. Great Crested Flycatcher (*Myiarchus crinitus*, Linn.).
A common summer resident.

154. King Bird, Bee Bird (*Tyrannus tyrannus*, Linn.).
Common in summer.

155. Fork-tailed Flycatcher (*Milvulus tyrannus*, Linn.).
A tropical species occurring at intervals in widely separated localities in the U. S. Audubon secured it in Kentucky and wrote of it as follows: "Many years ago while residing at Henderson in Kentucky, I had one of these birds brought to me which had been caught by hand, and was nearly putrid when I got it. The person who presented it to me had caught it in the barrens, ten or twelve miles from Henderson, late in October, after a succession of white frosts, and had kept it more than a week."

HUMMING BIRDS (Family Trochilidæ).

156. Ruby-throated Humming Bird (*Trochilus colubris*, Linn.).

A moderately common summer resident.

SWIFTS (Family Micropodidæ).

157. Chimney Swallow (*Chætura pelagica*, Linn).

A very common, summer resident, probably nesting exclusively in unused chimneys. The chimney swift forms the subject of Audubon's animated account of a visit to a large hollow sycamore tree in which this bird collected at night to roost. By cutting a hole at the base he was able to enter the tree where he found the whole inside covered with birds and estimated that the tree contained 9,000.

GOATSUCKERS (Family Caprimulgidæ).

158. Night Hawk (*Chordeiles virginianus*, Gmelin).

A common summer resident.

159. Whippoorwill (*Antrostomus vociferus*, Wilson).

Not common in blue grass Kentucky, though it occurs in the vicinity of Lexington in spring. "The more barren and mountainous parts of the Union seem to suit it best. Accordingly the open Barrens of Kentucky, and the country through which the Alleghany ridges pass are more abundantly supplied with it than any other region" (Aud.).

WOODPECKERS (Family Picidæ).

160. Flicker, Yellow Hammer (*Colaptes auratus*, Linn.).

One of our most common birds. A permanent resident.

161. Red-bellied Woodpecker (*Melanerpes carolinus*, Linn.).

Frequent at all seasons throughout the State.

162. Red-headed Woodpecker (*Melanerpes erythrocephalus*, Linn.).

A very common, permanent resident. One of the characteristic Kentucky birds.

163. Logcock (*Ceophlœus pileatus*, Linn.).

Frequently seen in the less settled parts of the State. Becoming rather shy.

164. Yellow-bellied Woodpecker, Sap-sucker (*Sphyrapicus varius*, Linn.).

Occasional. Have seen but one example at Lexington.

165. Downy Woodpecker, Sap-sucker (*Dryobates pubescens*, Linn.).

A common permanent resident throughout the State.

166. Hairy Woodpecker, Sap-sucker (*Dryobates villosus*, Linn.).

Common. Permanent resident.

167. Ivory-billed Woodpecker (*Campephilus principalis*, Linn.).

Kentucky (Aud.).

Kingfishers (Family Alcedinidæ).

168. Kingfisher (*Ceryle alcyon*, Linn.).

Common along streams and about ponds in summer.

Cuckoos (Family Cuculidæ).

169. Black-billed Cuckoo (*Coccyzus erythrophthalmus*, Wilson).

A summer resident. Not common.

170. Yellow-billed Cuckoo (*Coccyzus americanus*, Linn.).
A common summer resident.

PARROTS (Family Psittacidæ).

171. Carolina Paroquet (*Conurus carolinensis*, Linn.).
From being so common that its flesh was used as food, and it was shot as a pest in grain fields, this bird has become nearly exterminated except in Florida, and probably does not now occur in Kentucky. Even in Audubon's time the numbers had been greatly reduced, and he states that very few were to be found in Kentucky higher than Cincinnati, and that they were abundant only at the mouth of the Ohio.

OWLS (Family Bubonidæ).

172. Snowy Owl (*Nyctea nyctea*, Linn.).
Occasional in Kentucky during severe winters. I have occasionally seen it in the lower part of Kentucky (Aud.).

173. Great Horned Owl (*Bubo virginianus*, Gmelin).
Not uncommon in forest-covered regions.

174. Screech Owl (*Megascops asio*, Linn.).
Our most abundant owl. Nests even in the edges of cities.

175. Barred Owl (*Syrnium nebulosum*, Forster).
Rather common in the bottomlands of western Kentucky.

176. Short-eared Owl (*Asio accipitrinus*, Pallas).
Occasionally observed near Lexington. Nelson County, rare (Beckham). By no means scarce (Aud.).

177. Long-eared Owl (*Asio wilsonianus*, Lesson).
Lexington, Ky., not very common. Observed

in the Barrens by Audubon and said by him to be "not very rare."

Barn Owls (Family Strigidæ).

178. Barn Owl (*Strix pratincola*, Bonaparte).
Occasional examples of this bird are secured at Lexington. Several have been brought to me by persons who regarded them as great rarities.

Hawks and Eagles (Family Falconidæ).

179. Fish Hawk (*Pandion haliætus*, Linn.).
Occasional. Audubon observed several pairs each year nesting on the Ohio River opposite the falls.

180. Sparrow Hawk (*Falco sparverius*, Linn.).
A permanent resident. Very common; often seen about buildings, apparently after English sparrows.

181. Pigeon Hawk (*Falco columbarius*, Linn.).
Bowling Green (Miss Sadie F. Price).

182. Bald Eagle (*Haliætus leucocephalus*, Linn.).
Audubon found the nest of this eagle, with young, at the mouth of the Green River. A large example was brought to the State College, some years ago, that was killed near Lexington.

183. Chicken Hawk (*Buteo lineatus*, Gmelin).
A permanent resident in Nelson County. Abundant throughout the State.

184. Hen Hawk (*Buteo borealis*, Gmelin).
Lexington. Bowling Green (Miss Price).

185. Goshawk (*Accipiter atricapillus*, Wilson).
I have found them rather abundant in the lower parts of Kentucky (Aud.).

186. Chicken Hawk (*Accipiter cooperi*, Bonaparte).
Lexington. Nelson County (Beckham). Bowling Green (Miss Price).

187. Sharp-shinned Hawk (*Accipiter velox*, Wilson).
Lexington. Observed breeding along the Ohio (Aud.). Nelson County; a common permanent resident (Beckham).

188. Marsh Harrier (*Circus hudsonius*, Linn.).
Observed nesting in the barrens by Audubon. Lexington, occasional.

189. Swallow-tailed Kite (*Elanoides forficatus*, Linn.).
"Near the falls of the Ohio a pair had a nest and reared four young ones in 1820. In the lower part of Kentucky it begins to become more numerous" (Aud.).

VULTURES (Family Cathartidæ).

190. Carrion Crow (*Catharista atrata*, Bartram).
Tyrone. Nelson County (Beckham). According to Audubon it continues during the whole year in Kentucky.

191. Turkey Buzzard (*Cathartes aura*, Linn.).
A very common permanent resident throughout Kentucky.

PIGEONS (Family Columbidæ).

192. Turtle Dove (*Zenaidura macroura*, Linn.).
A moderately common summer resident.

193. Wild Pigeons (*Ectopistes migratorius*, Linn.).
Not common. Have never seen it in the blue grass region. When one listens to the accounts of the great numbers of this harmless bird which occurred in Kentucky only fifty years ago, he cannot but speculate on the final outcome of Man's destructiveness.

PHEASANTS (Family Phasianidæ).

194. Wild Turkey (*Meleagris gallopavo*, Linn.).
This fine bird still occurs in small numbers in unsettled districts of both eastern and western Kentucky.

GROUSE (Family Tetraonidæ).

195. Prairie Chicken (*Tympanuchus americanus*, Reich.).
The prairie chicken probably does not now occur anywhere in Kentucky. Like the buffalo and paroquet it has been completely exterminated for many years. I have conversed with men now over eighty years old who have spent all their lives in eastern Kentucky and do not remember having seen or heard this grouse. It probably persisted longer in the western end of the State, for Audubon, who settled at Louisville about 1819, writes: "When I first removed to Kentucky, the Pinnated Grouse were so abundant that they were held in no higher estimation as food than the most common flesh, and no 'hunter of Kentucky' deigned to shoot them."

196. Pheasant, Partridge (*Bonasa umbellus*, Linn.).
A permanent resident in all parts of the State. Frequently seen in the market.

197. Quail (*Colinus virginianus*, Linn.).
A very common permanent resident. Large numbers may be seen in the markets of our towns during the winter months.

PLOVERS (Family Charadriidæ).

198. Killdeer (*Ægialitis vocifera*, Linn.).
A common summer resident.

199. Golden Plover (*Charadrius dominicus*, Müller).
Occasional in spring in the vicinity of Lexington.

SNIPE (Family Scolopacidæ).

200. Tip-up (*Actitis macularia*, Linn.).
Transient in spring, rather common, Nelson County (Beckham).

201. Willet (*Symphemia semipalmata*, Gmelin).
Shores of the Ohio (Aud.).

202. Upland Plover (*Bartramia longicauda*, Beckstein).
Kentucky (Aud.). Observed at Lexington on one occasion only, in September.

203. Solitary Tattler (*Totanus solitarius*, Wilson).
Lexington. Nelson County (Beckham).

204. Semipalmated Sandpiper (*Ereunetes pusillus*, Linn.).
Audubon observed large flocks at Henderson.

205. Least Sandpiper (*Tringa minutilla*, Vieillot).
East Cairo in September.

206. Wilson's Snipe (*Gallinago delicata*, Ord).
Rather common in spring.

207. Woodcock (*Philohela minor*, Gmelin).
Observed in fall and early spring. A few are brought in by hunters. Beckham thinks it breeds in Nelson County.

PHALAROPES (Family Phalaropodidæ).

208. Red Phalarope (*Crymophilus fulicarius*, Linn.).
A flock was observed by Audubon in 1808 at Louisville.

209. Wilson's Phalarope (*Phalaropus tricolor*, Vieillot).
Kentucky (Aud.).

RAILS (Family Rallidæ).

210. Coot (*Fulica americana*, Gmelin).
Common in the fall of the year.

211. Florida Gallinule (*Gallinula galeata*, Licht.).
A young bird, nearly grown, was brought to me Oct. 4, 1893, by a colored man who stated that he had caught it in a trap set in the country near Lexington.

212. Purple Gallinule (*Ionornis martinica*, Linn.).
Beckham reports having seen an example of this species in Nelson County many years ago.

213. Yellow Crake (*Porzana noveboracensis*, Gmelin).
Transient, rare; Nelson County (Beckham).

214. Carolina Rail (*Porzana carolina*, Linn.).
Transient, rather common in fall; Nelson County (Beckham).

215. Virginia Rail (*Rallus virginianus*, Linn.).
Audubon observed a female with eggs in April at Henderson. Transient, rare; Nelson County (Beckham).

216. King Rail (*Rallus elegans*, Audubon).
Henderson (Aud). Bowling Green (Miss Price).

CRANES (Family Gruidæ).

217. Sand-hill Crane (*Grus mexicana*, Müller).
Nelson County (Beckham).

218. Whooping Crane (*Grus americana*, Linn.).
Kentucky (Aud.) Nelson County (Beckham).

HERONS (Family Ardeidæ).

219. Night Heron (*Nycticorax nycticorax*, Linn.).
Transient, not common, Nelson County (Beckham).

220. Green Heron (*Ardea virescens*, Linn.).
Very common in summer. The nest, consisting of loosely placed sticks, may be found with fresh eggs about the middle of May. It is sometimes placed in an orchard some distance from water.

221. Snowy Egret (*Ardea candidissima*, Gmelin).
Nelson County (Beckham).

222. Great White Egret (*Ardea egretta*, Gmelin).
East Cairo, September. Nelson County (Beckham).

223. Blue Heron (*Ardea herodias*, Linn.).
Rather common in summer.

224. Bittern, Indian Hen (*Botaurus lentiginosus*, Montagu).
Probably not common anywhere in Kentucky, as Audubon states that he never saw or heard the species in the State. A fine example, taken at Lexington, Sept. 25, 1893, had eaten nothing but grasshoppers. Transient, not common, Nelson County (Beckham).

STORKS (Family Ciconiidæ).

225. Wood Ibis (*Tantalus loculator*, Linn.).
Observed by me at East Cairo in September.

DUCKS and GEESE (Family Anatidæ).

226. Trumpeter Swan (*Olor buccinator*, Richardson).
In ponds about Henderson, during mild winters, until the beginning of March (Aud.).

227. Wild Goose (*Branta canadensis*, Linn.).
Common during the migrating season in spring.

228. White-fronted Goose (*Anser albifrons*, Gmelin).
Kentucky (Aud.).

229. Snow Goose)*Chen hyperborea*, Pallas).

The young arrive at Henderson in the beginning of October, the adults a fortnight later (Aud.).

230. Dipper, Buffle-head (*Charitonetta albeola*, Linn.).
Ohio River (Aud.).

231. Golden Eye (*Glaucionetta clangula*, Linn.).
Henderson (Aud.).

232. Ring-necked Duck (*Athya collaris*, Donovan).
Kentucky (Aud.); Nelson County (Beckham).

233. Flocking Fowl, Scaup Duck (*Athya marila*, Linn.).
Kentucky (Aud.).

234. Wood Duck (*Aix sponsa*, Linn.).
A common summer resident in western Kentucky.

235. Pin-tail (*Dafila acuta*, Linn.).
Extremely abundant in Kentucky (Aud.).

236. American Widgeon (*Anas americana*, Gmelin).
Kentucky; remaining all winter when the weather is mild (Aud.).

237. Green-winged Teal (*Anas carolinensis*, Gmelin).
Transient. Rather common.

238. Blue-winged Teal (*Anas discors*, Linn.).
Ohio river in September and October; abundant (Aud.).

239. Black Duck (*Anas obscura*, Gmelin).
According to Audubon this duck breeds along the Mississippi River as far up as its confluence with the Ohio.

240. Mallard (*Anas boschas*, Linn.).
A common migrant in western Kentucky. Breeds in ponds in Kentucky lowlands (Aud.).

241. Hooded Merganser (*Lophodytes cucullatus*, Linn.).
Audubon records this as not uncommon near Louisville when he first moved there.

242. Red-breasted Merganser (*Merganser serrator*, Linn.).
Breeds in Kentucky (Aud.).

243. Merganser (*Merganser americanus*, Cassin).
Said by Audubon to have bred in the State when he first resided there.

PELICANS (Family Pelecanidæ).

244. White Pelican (*Pelecanus erythrorhynchus*, Gmelin).
Ohio River (Aud.).

GULLS (Family Laridæ).

245. Black Tern (*Hydrochelidon nigra*, Linn.).
Abundant at Louisville (Aud.).

246. Least Tern (*Sterna antillarum*, Lesson).
Ohio River, abundant (Aud.).

247. Common Tern (*Sterna hirundo*, Linn.).
Henderson (Aud.).

248. Bonaparte's Gull (*Larus philadelphia*, Ord).
Ohio River at Cincinnati in 1819 (Aud.).

249. Herring Gull (*Larus argentatus*, Brünnich).
Ohio River (Aud.).

250. Great Black-backed Gull (*Larus marinus*, Linn.).
Ohio River (Aud.).

LOONS (Family Urinatoridæ).

251. Black-throated Loon (*Urinator arcticus*, Linn.)
Ohio River (Aud.).

252. Common Loon (*Urinator imber*, Gunner).
I have seen several examples which were taken in eastern Kentucky.

DIVING BIRDS (Family Podicipidæ).

253. Dab Chick (*Podilymbus podiceps*, Linn.).
Rather common in ponds in the vicinity of Lexington. Resident.

REPTILES.

Family Emydidæ.

254. Box Turtle, Terrapin (*Cistudo carolina*, Linn.).
Common everywhere in the less settled regions.

Family Chelydridæ.

255. Snapping Turtle (*Chelydra serpentina*, Linn.).
Occurs everywhere in Kentucky. Very abundant in the ponds in the blue grass region.

Family Trionychidæ.

256. Soft-shelled Turtle (*Aspidonectes spinifer*, Le S.).
Ohio River.

257. Soft-shelled Turtle (*Aspidonectes nuchalis*, Agassiz).
Occurs in the headwaters of the Cumberland and Tennessee Rivers.

258. Soft-shelled Turtle (*Amyda mutica*, Le S.).
Ohio River.

Family Iguanidæ.

259. Brown Swift (*Sceloporus undulatus*, Daudin).
Common in all parts of the State. Apparently equally at home in the mountains of eastern Kentucky and in the forests of the extreme western end of the State.

Family Anguidæ.

260. Joint Snake (*Ophisaurus ventralis*, Linn.).
Observed only in the western end of the State, but probably occurring everywhere.

Family Scincidæ.

261. Blue-tailed Lizard (*Eumeces fasciatus*, Linn.).
Common throughout the State.

262. Ground Lizard (*Oligosoma laterale*, Say).
Apparently not common. Observed only in the western end of the State.

SNAKES (Family Colubridæ).

263. Garter Snake (*Thamnophis sirtalis*, Linn.).
Very common everywhere. The variety *ordinata* is occasionally seen at Lexington.

264. Water Snake (*Nerodia sipedon*, Linn.).
Common about streams. The varieties *fasciatus* and *erythrogaster* have been taken on several occasions at Lexington.

265. Water Snake (*Regina leberis*, Linn.).
Rather common about ponds and streams near Lexington.

266. *Storeria occipitomaculata*, Storer.
A specimen collected near Mammoth Cave by Dr. B. F. Shumard is in the National Museum at Washington.

267. Green Snake (*Philophyllophis æstivus*, Linn.).
Moderately common throughout the State.

268. Black Snake, Blue Racer, (*Coluber constrictor*, Linn.).
Common everywhere.

269. Pilot Snake (*Elaphis obsoletus*, Say.).
Common everywhere, but especially abundant in the mountains.

270. House Snake, Chicken Snake, Milk Snake (*Ophibolus triangulus*, Boie).
Moderately common in all parts of the State.

271. Chain Snake, King Snake, Thunder Snake (*Ophibolus getulus*, Linn.).
Taken only at Midland, Ky., but probably occurs throughout the State, as I have collected specimens across the Ohio River in Illinois.

272. Spreading Adder (*Heterodon platyrhinus*, Latreille).
Common everywhere.

273. Worm Snake (*Carphophis amœnus*, Say.).
Found throughout Kentucky, but not as common as the next.

274. Worm Snake (*Carphophis helenæ*, Kennicott).
Very abundant throughout the State. Especially common under stones and logs along the Kentucky River. Probably a variety of the preceding, from which it differs only in lacking the anterior pair of prefrontals. It occurs with the other form, but twenty of this occur to one of *C. amœnus*. A specimen taken at Tyrone, Ky., is intermediate in the character of its prefrontals, having only one of the anterior pair present.

RATTLE SNAKES (Family Crotalidæ).

275. Timber Rattle Snake *Crotalus horridus*, Linn.).
Rather common in the mountainous regions.

276. Diamond Rattle Snake (*Crotalus adamanteus*, Beauv.).
This species is said to occur in mountains of eastern Kentucky. I have not yet seen an example.

277. Copperhead (*Agkistrodon contortrix*, Linn.).
Occurs in mountainous regions of the eastern end of the State.

278. Water Moccasin (*Agkistrodon piscivorus*, Holbr.).
Occurs about bayous in the western end of the State. Said to be common in Reelfoot Lake.

AMPHIBIANS.

FROGS (Family Ranidæ).

279. Leopard Frog (*Rana pipiens*, Schreber).

Very abundant thoughout Kentucky. An inflation of the skin at the angles of the mouth, common here during the breeding season, has never been observed by me in the numerous specimens examined in Illinois. There is also a tendency to a loss of the anterior of the three dark spots on the head in Kentucky examples.

280. Green Frog, Spring Frog (*Rana clamitans*, Latr.).
Rather common in the eastern half of the State.

281. Bull Frog (*Rana catesbiana*, Shaw).
Common in western Kentucky.

Toads (Family Bufonidæ).

282. Toad (*Bufo lentiginosus*, Shaw).
Very common everywhere. Especially noticeable in spring about ponds.

Tree Toads (Family Hylidæ).

283. Cricket Frog (*Acris gryllus*, LeConte).
Common in the western end of the State about bayous.

284. Prairie Tree Frog (*Chorophilus triseriatus*, Wied.).
Observed thus far only at Nortonville towards the western end of the State.

285. Tree Toad (*Hyla versicolor*, LeConte).
Common everywhere.

Newts (Family Pleurodelidæ).

286. Newt, Eft (*Diemyctylus miniatus*, Raf.).
Occasional.

Family Desmognathidæ.

287. Dusky Salamander (*Desmognathus fusca*, Raf.).
Very abundant in and about springs and mountain rills in the eastern end of the State. Difficult

of capture because of its slimy skin and active wriggling. A female with a mass of eggs just hatching was recently (in September) found by Prof. C. W. Mathews among liverworts in a springy place along the Cumberland River at Burnside. The young soon acquire a series of red spots along each side. The gills of the young are well developed.

Family Plethodontidæ.

288. Cave Salamander (*Spelerpes longicauda*, Green).

Occurs throughout the State. Rather common; sometimes found within the mouths of caves, but quite as often under stones in woods.

289. Gray-spotted Salamander (*Plethodon glutinosus*, Green).

Distributed throughout the State. Rather common under logs and stones in woods.

290. Red-backed Salamander (*Plethodon erythronotus*, Green).

Abundant in the vicinity of Hopkinsville under stones and logs. Louisville is given as the locality for a specimen in the National Museum at Washington.

Family Ambystomidæ.

291. Tiger Salamander (*Ambystoma tigrinum*, Green).

A specimen is recorded by Dr. Yarrow as in the U. S. National Museum collection from Russellville.

292. Spotted Salamander (*Ambystoma punctatum*, Linn.).

Mr. Kirsch reports having taken a large number of this species in Rock Creek at Whitley Station, Kentucky.

Family Amphiumidæ.

293. Congo Snake (*Amphiuma means*, Linn.).
A specimen of this singular amphibian is in the National Museum collection from Jeffersonville, Indiana, hence it may be considered a Kentucky species.

FISHES.

Cod-fishes (Family Gadidæ).

294. Burbot, Ling (*Lota lota*, Linn.).
Ohio River, occasional.

Sculpins (Family Cottidæ).

295. Miller's Thumb (*Cottus bairdi*, Girard).
Common throughout the State in springs and streams flowing from them. Often penetrates into caves, occurring as much as half a mile from the entrance. Not observed in the warmer surface waters.

Sheepshead (Family Sciænidæ).

296. Sheepshead, White Perch (*Aplodinotus grunniens*, Raf.)
Common in all the larger streams: Ohio River, Green River, Cumberland River, Tennessee River. Rolling Fork, Obion Creek, Bayou de Chien (Woolman).

Bass (Family Serranidæ).

297. Yellow Bass (*Morone interrupta*, Gill).
Ohio River at East Cairo.

298. White Bass (*Roccus chrysops*, Raf.).
Cumberland River, Tennessee River.

PERCH (Family Percidæ).

299. Sand Pike (*Stizostedion canadense*, C. H. Smith).
Common in the larger streams: Ohio River, Rockcastle River, Big Sandy River, Little Sandy River. Indian Creek, Clinton County (Kirsch).

300. Salmon, Wall-eye, Pike Perch (*Stizostedion vitreum*, Mitchill).
Common in the larger streams: Ohio River, Big Sandy River, Little Sandy River, Green River, Cumberland River and Tennessee River.
With the preceding this is sold in all our markets as "salmon."

301. Least Darter (*Etheostoma microperca*, Jordan and Gilbert).
Green River (Woolman).

302. *Etheostoma fusiforme*, Girard.
Tradewater River, Mayfield Creek, Bayou de Chien (Woolman).

303. *Etheostoma cœruleum*, Storer.
Very abundant in most small creeks in the eastern half of the State. Big Sandy River, Kentucky River and tributaries, Green River, Cumberland River. Rolling Fork, Licking River (Woolman). Indian Creek, Willis Creek, etc., in Clinton County (Kirsch), Otter Creek, Wayne County (Kirsch).

304. *Etheostoma virgatum*, Jordan.
Rockcastle River (Jordan), Green River (Woolman).

305. *Etheostoma sagitta*, Jordan and Swain.
Cumberland River (Jordan). Original description in Proc. U. S. Nat. Mus., 1883, p. 250. A single specimen was obtained from Wolf Creek in Whitley County. "Its long, naked, tapering head is its most striking peculiarity."

306. *Etheostoma obeyense*, Kirsch.

Small tributaries of the Cumberland River, in Clinton County (Kirsch). Original description in Bull. U. S. Fish Commission for 1890, p. 292. Beaver and Otter Creeks in Wayne County; very abundant (Kirsch).

307. *Etheostoma cinereum*, Storer.

Little South Fork and Rock Creek, tributaries of the Cumberland; scarce (Kirsch). For a description, see Bull. U. S. Fish Commission for 1891, p. 264 (printed in 1893).

308. *Etheostoma squamiceps*, Jordan.

Kentucky (Jordan).

309*a*. *Etheostoma flabellare*, Raf.

Very common in small streams in eastern Kentucky. Big Sandy River, Kentucky River, Rockcastle River, Green River. Licking River (Woolman). Indian Creek, Smith's Creek, in Clinton County (Kirsch).

309*b*. *Etheostoma flabellare* var. *cumberlandicum*, Jordan.

Original description in Proc. U. S. National Museum, 1883, p. 251. The types were taken by Dr. Jordan in Wolf Creek, Briar Creek and other small streams in Whitley County in May, 1883. "In all these streams this was the most abundant of the darters." It is said to have a thicker head than the type form, and to be plain olivaceous except for the black humeral spot.

310. *Etheostoma rufolineatum*, Cope.

Green River, Licking River (Woolman), Indian Creek in Clinton County (Kirsch).

311. *Etheostoma maculatum*, Kirtland.

Cumberland River, Licking River (Woolman).

312. *Etheostoma camurum*, Cope.
Green River, Cumberland River (Woolman).

313. *Etheostoma zonale*, Cope.
Big Sandy River, Kentucky River, Cumberland River, Green River.

314. *Etheostoma variatum*, Kirtland.
Kentucky River, Licking River (Woolman).

315. *Etheostoma histrio*, Jordan and Gilbert.
Green River (Woolman). Described in Proc. U. S. Nat. Mus., 1887, p. 47.

316. *Etheostoma spilotum*, Gilbert.
Kentucky River (Jordan).

317. *Etheostoma cymatotœnia*, Gilbert and Meek.
Green River (Woolman).

318. *Etheostoma evides*, Jordan and Copeland.
Ohio River, at Racoon Island (Henshall); Green River (Woolman).

319. *Etheostoma ouachitæ*, Jordan and Gilbert.
Green River, Obion Creek (Woolman).

320. *Etheostoma scierum*, Swain.
Ohio River, near Little Sandy River (Henshall); Green River, Little Sandy River (Woolman).

321. *Etheostoma phoxocephalum*, Nelson.
Big Sandy River, Cumberland River, Green River, Rolling Fork, Tradewater River (Woolman).

322. *Etheostoma aspro*, Cope and Jordan.
Big Sandy River, Kentucky River, Rockcastle River, Green River, Cumberland River, Tennessee River. Obion Creek, Bayou de Chien (Woolman).

323. *Etheostoma macrocephalum*, Cope.
Green River, Big Sandy River (Woolman).

324. *Etheostoma caprodes*, Raf.
Common throughout the State. Tributaries of Kentucky River, Rockcastle, River, Green River,

Cumberland River, Tennessee River. Obion Creek, Bayou de Chien (Woolman).

325. *Etheostoma shumardi*, Girard.

Green River, Cumberland River, Obion Creek (Woolman).

326. *Etheostoma copelandi*, Jordan.

Ohio River, at Racoon Island (Henshall). Green River (Woolman).

327. *Etheostoma blennioides*, Raf.

Common locally in eastern part of the State. Big Sandy River, Kentucky River and tributaries, Green River, Cumberland River.

328*a*. *Etheostoma simoterum*, Cope.

Rockcastle River, Green River, Cumberland River.

328*b*. *Etheostoma simoterum*, var. *atripinnis*, Jordan.

Canada Creek, Wayne County (Kirsch).

329. *Etheostoma susanæ*, Jordan and Swain.

The types were taken in small tributaries of the Cumberland River in Whitley County in 1883. The original description appeared in the Proc. U. S. Nat. Mus., 1883, p. 249.

330. *Etheostoma stigmæum*, Jordan.

Green River, Cumberland River (Woolman). Willis Creek, Clinton County (Woolman).

331. *Etheostoma nigrum*, Raf.

Occurs everywhere in Kentucky. Big Sandy River, Little Sandy River. Kentucky River, Green River, Tennessee River, Bayou de Chien (Woolman).

332. *Etheostoma asprellus*, Jordan.

Green River (Woolman).

333. *Etheostoma pellucidum*, Baird.

Common locally in the larger streams. Big

Sandy River, Little Sandy River, Kentucky River, Green River, Cumberland River, Tennessee River.

SUN FISHES (Family Centrarchidæ).

334. Large-mouthed Black Bass (*Micropterus salmoides*, Lacépède).

Common throughout Kentucky. Big Sandy River, Little Sandy River, Kentucky River, Rockcastle River, Green River. Obion Creek, Bayou de Chien (Woolman).

335. Small-mouthed Black Bass (*Micropterus dolomieu*, Lacépède).

Not uncommon locally in the larger streams of eastern Kentucky. The young are frequently obtained from the small creeks. Big Sandy River, Little Sandy River, Kentucky River, Rockcastle River, Green River, Cumberland River, Tennessee River. Obion Creek, Bayou de Chien (Woolman).

336. *Lepomis heros*, Baird and Girard.

Common in bayous of bottoms along the Ohio River at East Cairo. Bayou de Chien (Woolman).

337. *Lepomis garmani*, Forbes.

Mr. Woolman seems to have taken this species in the Upper Cumberland at Barboursville and in the Bayou de Chien in the western end of the State. The types were collected by the writer in tributaries of the Wabash River in southern Illinois.

338. Long-eared Sun Fish (*Lepomis megalotis*, Raf.).

Abundant throughout the State. Big Sandy River, Little Sandy River, tributaries of Kentucky River, Green River, Cumberland River, Tennessee River. Obion Creek, Bayou de Chien (Woolman).

339. Common Sun Fish (*Lepomis pallidus*, Mitchill).

In the larger streams throughout Kentucky, Big Sandy River, City reservoir at Lexington, Cumberland River, Green River. Bayou de Chien (Woolman).

340. *Lepomis humilis*, Girard.

Tributaries of the Kentucky River; occasional.

341. *Lepomis macrochirus*, Raf.

Creeks in Whitley County (Jordan). Tradewater River, Obion Creek (Woolman).

342. Green Sun Fish (*Lepomis cyanellus*, Raf.).

Throughout the State, common. Sometimes called "pearch." It constitutes the greater part of the catches made by small boys and negroes who fish with hook and line in the numerous small ponds of blue grass Kentucky. Big Sandy River, tributaries of Kentucky, Green River, Cumberland River, Barnett's Creek in Trigg County.

343. War Mouth, Goggle Eye (*Chænobryttus gulosus*, Cuv. and Val.).

Western Kentucky, common. Green River, Barnett's Creek in Trigg County, Bayous at East Cairo. Obion Creek, Bayou de Chien (Woolman).

344. Rock Bass, Red Eye (*Ambloplites rupestris*, Raf.).

Not rare in the eastern part of Kentucky. Ohio River, Big Sandy River, Little Sandy River, Kentucky River, Rockcastle River, Green River, Cumberland River, Tennessee River.

345. New Light, Pale Crappie (*Pomoxis annularis*, Raf.).

Very abundant in ponds in eastern Kentucky, and common also in bayous in the extreme western end of the State. Ohio River, Little Sandy River, Kentucky River, Green River, Bayous at East Cairo.

346. Dark Crappie, Calico Bass (*Pomoxis sparoides*, Raf.).
Obion Creek, Bayou de Chien (Woolman). I have not yet seen this species in eastern Kentucky.

347. (*Centrarchus macropterus*, Lacépède)
Barnett's Creek in Trigg County. Mayfield Creek (Woolman).

TINY PERCHES (Family Elassomatidæ).

348. *Elassoma zonatum*, Jordan.
This species has been collected by me on the Illinois side of the Ohio near Cairo and also across the Mississippi River at Bird's Point, Missouri. There can be no doubt that it occurs also in the bayous on the Kentucky side.

PIRATE PERCHES (Family Aphredoderidæ).

349. Pirate Perches (*Aphredoderus sayanus*, Gilliams).
Western Kentucky, Barnett's Creek in Trigg County. Green River, Mayfield Creek, Obion Creek, Bayou de Chien (Woolman).

SILVERSIDES (Family Atherinidæ).

350. Brook Silversides (*Labidesthes sicculus*, Cope).
Common throughout Kentucky, Big Sandy River, Little Sandy River, tributaries of Kentucky River, Green River, Cumberland River, Tennessee River. Obion Creek, Bayou de Chien (Woolman).

EELS (Family Anguillidæ).

351. Eel (*Anguilla anguilla*, Linn.).
Ohio River, Rockcastle River, Cumberland River, Bayou de Chien (Woolman).

PICKEREL (Family Esocidæ).

352. Little Pickerel (*Esox vermiculatus*, Le S.).
Barnett's Creek in Trig County. Mayfield Creek, Obion Creek, Bayou de Chien (Woolman).

353. Mascalonge (*Esox nobilior*, Thompson).
"I have seen heads of large pike from several streams in eastern Ohio and northwestern Kentucky, said to have weighed from thirty to forty pounds, and there were no specific differences between them and those of the mascalonge of the Great Lakes" (Dr. J. A. Henshall).

TOP MINNOWS (Family Cyprinodontidæ).

354. *Gambusia patruelis*, Baird and Girard.
Western Kentucky. Cumberland River, Obion Creek (Woolman).

355. *Zygonectes notatus*, Raf.
Common throughout most of the State. Tributaries of Kentucky River, Green River, Cumberland River. Mayfield Creek, Obion Creek, Bayou de Chien (Woolman).

356. *Fundulus catenatus*, Storer.
Green River, Tennessee River, Indian Creek, Willis Creek, in Clinton County (Kirsch). Beaver and Otter Creeks in Wayne County (Kirsch).

CAVE FISHES (Family Amblyopsidæ).

"Professor Ray Lankester, in a recent lecture at the Royal institution, thus attempted to account for the absence of eyes in the fishes in the famous underground Kentucky caves in the following way: A great flood carries to the bottom of the Ken-

tucky caves, some thirty miles below the surface, a number of fishes among whose very numerous offspring will be some defective in sight, as some babies are born blind, or without any eyes at all. The fish who can see some faint glimmerings of light will swim away toward that light, while those will remain that cannot perceive the gleams. This with every succeeding generation would occur, the stronger in sight swimming away and the weaker remaining, and as the breeding would therefore occur between those of the worst sight, fish would be born with weaker eyes and weaker until born blind."

The above is quoted from a newspaper, and probably does not in all respects report Professor Lankester correctly, since it is hardly to be supposed that he believes Mammoth Cave to penetrate the earth for a distance of thirty miles. But in the main it gives his theory as to the origin of cave animals correctly. It will probably strike the majority of those who are familiar with the caves simply as a curiosity in speculation. The views expressed by Herbert Spencer (Popular Science Monthly, XLIII, 487, 488) seem to me much more sound and consistent with the facts:

"The existence of these blind cave-animals can be accounted for only by supposing that their remote ancestors began making excursions into the cave, and, finding it profitable, extended them, generation after generation, further in, undergoing the required adaptations little by little."

357. *Chologaster agassizii*, Putnam.

Underground streams.

358. Blind Fish (*Typhlichthys subterraneus*, Girard).

Inhabits wells, caves and springs in the vicinity of Mammoth Cave.

359. Blind Fish (*Amblyopsis spelæus*, DeKay).
Subterranean waters in and about Mammoth Cave.

Trout Perches (Family Percopsidæ).

360. Trout Perch (*Percopsis guttatus*, Agassiz).
Ohio River, occasional.

Herrings (Family Clupeidæ).

361. Hickory Shad (*Dorosoma cepedianum*, LeS.).
Throughout the State in the larger streams; common. Ohio River, Big Sandy River, Little Sandy River, Green River, Cumberland River, Tennessee River. Obion Creek, Bayou de Chien (Woolman).

362. Ohio Shad (*Clupea chrysochloris*, Raf.).
Ohio River at East Cairo and elsewhere; common. Little Sandy River (Woolman), Lower Cumberland River (Jordan), Willis Creek, Clinton County (Kirsch).

Moon-eyes (Family Hiodontidæ).

363. *Hiodon selenops*, Jordan and Bean.
Cumberland River (Jordan), Rolling Fork, Green River (Woolman).

364. Moon-eye (*Hiodon tergisus*, LeS.).
Ohio River, common; Cumberland River, abundant (Jordan).

365. *Hiodon alosoides*, Raf.
Ohio River. Cumberland River, Rolling Fork (Woolman).

MINNOWS (Family Cyprinidæ).

366. German Carp (*Cyprinus carpio*, Linn.).
Very common in ponds in eastern Kentucky. Sometimes escapes into streams.

367. Shiner (*Notemigonus chrysoleucus*, Mitch.).
Western Kentucky. Barnett's Creek in Trigg County. Mayfield Creek, Bayou de Chien (Woolman).

368. *Opsopœodus bollmani*, Gilbert.
Three specimens of this were taken by Mr. Woolman in Obion Creek. According to him it has been taken only in one other locality, viz., Satilla River, Georgia.

369. *Opsopœodus emiliæ*, Hay.
Cumberland River, Mayfield Creek, Bayou de Chien (Woolman).

370. Horned Dace (*Semotilus atromaculatus*, Mitch.).
Common everywhere in Kentucky. Big Sandy River, Kentucky River and tributaries, Green River, Rockcastle River, Cumberland River. Bayou de Chien (Woolman).

371. Flat-headed Chub (*Platygobio gracilis*, Raf.).
A single specimen of this species was taken by Prof. S. A. Forbes and myself near East Cairo in the Ohio River.

372. *Hybopsis watauga*, Jordan and Everman.
Kentucky River, Green River, Tennessee River. The original description is in the Proc. U. S. Nat. Museum, XI, p. 355, pl. xliv, Fig. 9.

373. Horny Head (*Hybopsis kentuckiensis*, Raf.).
Common in eastern Kentucky in most streams. Big Sandy River, Kentucky River, Rockcastle

River, Green River, Tennessee River. Spring Creek, Smith's Creek, etc., in Clinton County (Kirsch), Beaver and Otter Creeks in Wayne County (Kirsch).

374. *Hybopsis storerianus*, Kirtland.
Throughout Kentucky. Little Sandy River, Kentucky River, Green River, Cumberland River, Tennessee River. Bayou de Chien (Woolman).

375. *Hybopsis amblops*, Raf.
Common throughout Kentucky. Ohio River at East Cairo, Big Sandy River, Little Sandy River, Kentucky River, Green River, Cumberland River, Tennessee River.

376. *Hybopsis dissimilis*, Kirtland.
Rolling Fork of Salt River (Woolman).

377. *Hybopsis hyostomus*, Gilbert.
Ohio River at Racoon Island (Henshall). Big Sandy River, Green River (Woolman).

378. Black-nosed Dace (*Rhinichthys atronasus*, Mitchill).
Common locally in small tributaries of the Kentucky River. Common in clear cold streams in Whitley County (Jordan), Indian Creek, Willis, Smith's Creek, etc., in Clinton County (Kirsch).

379. *Phenacobius uranops*, Cope.
Rockcastle River, Green River, Cumberland River.

380. *Ericymba buccata*, Cope.
Common locally in Kentucky River; Little Sandy River, Big Sandy River, Cumberland River.

381. *Notropis micropteryx*, Cope.
Rockcastle River, abundant (Jordan).

382. *Notropis arge*, Cope.
Green River, Kentucky River (Woolman).

383. *Notropis atherinoides*, Raf.
Throughout Kentucky; common. Little Sandy

River, Big Sandy River, Kentucky River, Green River, Cumberland River, Tennessee River. Bayou de Chien (Woolman).

384. *Notropis dilectus*, Girard.
Big Sandy River, Kentucky River, Green River, Cumberland River, Tennessee River.

385. *Notropis telescopus*, Cope.
Green River (Woolman). Willis Creek, Indian Creek, in Clinton County (Kirsch).

386. Red-fin (*Notropis ardens*, Cope).
Tributaries of Kentucky River, Cumberland River, Rockcastle River, Green River.

387. *Notropis ariommus*, Cope.
Kentucky River, Green River, Big Sandy River.

388. *Notropis jejunus*, Forbes.
Ohio River at East Cairo, Little Sandy River, Big Sandy River, Cumberland River.

389. *Notropis leuciodus*, Cope.
Five specimens were collected in Smith's Creek, Clinton Co., by Mr. Philip H. Kirsch.

390. *Notropis coccogenis*, Cope.
Big Sandy River (Woolman).

391. Shiner (*Notropis megalops*, Raf.).
Occurs throughout Kentucky. Big Sandy River, Kentucky River, Rockcastle River, Green River, Cumberland River, Tennessee River. Obion Creek (Woolman).

392. *Notropis galacturus*, Cope.
Rockcastle River, Cumberland River, Willis Creek, Spring Creek, etc., in Clinton County (Kirsch), Beaver and Otter Creeks in Wayne County (Kirsch).

393. *Notropis whipplei*, Girard.
Everywhere, common. Little Sandy River, Big Sandy River, Kentucky River, Green River, Cum-

berland River, Tennessee River, Bayou de Chien (Woolman).

394. *Notropis deliciosus*, Girard.

Occurs throughout the State. Big Sandy River, Kentucky River, Green River, Cumberland River, Tennessee River.

395. *Notropis spectrunculus*, Cope.

Cumberland River, Kentucky River.

396. *Notropis heterodon*, Cope.

Canada Creek, Wayne County, two small specimens (Kirsch). Jordan took in 1883 in Wolf County and Clear Fork, Whitley County, several specimens of a fish which he named *Hemitremia vittata*, Cope, but subsequently decided that the latter name was a synonym of the above.

397. Bull-headed Minnow (*Cliola vigilax*, Baird and Girard).

Kentucky River, common; Big Sandy River, Cumberland River.

398. *Pimephales notatus*, Raf.

Occurs everywhere in the State. Big Sandy River, Green River, Rockcastle River, Cumberland River, Tennessee River, Bayou de Chien.

399. *Pimephales promelas*, Raf.

Tributaries of the Kentucky River, common locally. This small minnow was described by the eccentric Rafinesque, once connected with the old Transylvania University, from a single specimen said to have been obtained from Mr. W. M. Clifford of Lexington, Kentucky, in 1820. The species is especially common in the North Elkhorn at Bryant Station, about six miles north of Lexington. A few specimens have been taken in the Kentucky River at Clay's Ferry.

400. *Hybognathus nuchalis*, Agassiz.

Occurs throughout Kentucky. Ohio River at East Cairo, Big Sandy River, Little Sandy River, Green River, Cumberland River, Tennessee River.

401. Red-bellied Minnow (*Chrosomus erythrogaster*, Raf.).

Rockcastle River, Cumberland River.

402. Stone Roller (*Compostoma anomalum*, Raf.).

One of our most common minnows, occurring throughout the State. Big Sandy River, Kentucky River, Green River, Cumberland River, Tennessee River, Barnett's Creek in Trigg County.

SUCKERS (Family Catostomidæ).

403. Hare-lip Sucker (*Lagochila lacera*, Jordan and Brayt.).

Little Sandy River, Cumberland River (Kirsch).

404. *Placopharynx carinatus*, Cope.

Ohio River.

405. *Moxostoma crassilabre*, Cope.

Little Sandy River (Woolman). Dr. Henshall states that specimens from the Ohio River which he at one time thought to belong to this species proved to be *Placopharynx carinatus*, and he does not think this species (*M. crassilabre*) occurs west of the Alleghany Mountains.

406. Red Horse (*Moxostoma macrolepidotum*, LeS.).

Occurs in most Kentucky streams, large or small. Ohio River, Big Sandy River, Kentucky River, Green River, Cumberland River.

407. White-nose Sucker (*Moxostoma anisurum*, Raf.).

Ohio River, not uncommon (Henshall). Little Sandy River (Woolman). Clear Fork of Cumberland River in Whitley County, one fine large specimen (Jordan).

408. Spotted Sucker (*Minytrema melanops*, Raf.).
Green River (Woolman).

409. Chub Sucker (*Erimyzon sucetta*, Lac.).
Common in many streams. Ohio River, Rockcastle River, Cumberland River, Barnett's Creek in Trigg County.

410. Stone Toter (*Catostomus nigricans*, LeS.).
Common everywhere in the eastern half of the State. Big Sandy River, Kentucky River, Green River, Rockcastle River, Cumberland River, Tennessee River.

411. Common Sucker (*Catostomus teres*, Mitchill).
Very common in eastern Kentucky. Kentucky River and tributaries, Rockcastle River, Cumberland River.

412. Black Sucker (*Cycleptus elongatus*, LeS.).
Ohio River, Cumberland River.

413. Carp, Quill-back (*Ictiobus velifer*, Raf.)
Ohio River, Kentucky River, Big Sandy River, Tennessee River. Obion Creek (Woolman).

414. *Ictiobus difformis*, Cope.
Ohio River, Big Sandy River, Cumberland River, Obion Creek (Woolman).

415. *Ictiobus carpio*, Raf.
Ohio River, common. Rolling Fork, Tradewater River (Woolman).

416. Small-mouthed Buffalo (*Ictiobus bubalus*, Raf.).
Ohio River, common; Green River, Cumberland River, Tennessee River.

417. Mongrel Buffalo (*Ictiobus urus*, Agassiz).
Ohio River at Paducah.

418. Red-mouthed Buffalo (*Ictiobus cyprinella*, C. and V.).
Ohio River at East Cairo and Paducah, common. Indian Creek, Clinton County (Kirsch).

CATFISHES (Family Siluridæ).

419. *Noturus gyrinus*, Mitchill.
Green River, Mayfield Creek, Bayou de Chien (Woolman).

420. *Noturus eleuthurus*, Jordan.
Green River (Woolman).

421. *Noturus miurus*, Jordan.
Common in many streams. Ohio River, Big Sandy River, Kentucky River, Green River.

422. Stone Cat (*Noturus flavus*, Raf.).
Licking River (Woolman).

423. Mud Cat, Yellow Cat (*Leptops olivaris*, Raf.).
Common in the larger streams. Ohio River, Kentucky River, Green River.

424. Bullhead (*Ameiurus melas*, Raf.).
Ohio River, common (Henshall).

425. Bullhead (*Ameiurus nebulosus*, LeS.).
Common throughout the State. Kentucky River, Green River, Cumberland River. Bayou de Chien (Woolman).

426. Yellow Cat (*Ameiurus natalis*, LeS.).
Green River, Mayfield Creek (Woolman). Small tributaries of the Cumberland in Whitley County (Jordan).

427. Mississippi Cat (*Ameiurus nigricans*, LeS.).
Common in the Ohio River. A specimen observed at East Cairo some years ago weighed one hundred and twenty pounds. Dr. Jordan states that he has seen the adult of the Channel Cat (*Ictalurus punctatus*) used on hooks as live bait to catch this species at Cumberland Falls. Beaver and Otter Creeks, Wayne County, common (Kirsch).

428. Channel Cat, Blue Cat (*Ictalurus punctatus*, Raf.).

Ohio River, common; Kentucky River, Green River, Cumberland River, Tennessee River.

429. Channel Cat, Blue Cat (*Ictalurus furcatus*, C. and V.).

Common at East Cairo, Paducah, and elsewhere in the Ohio River.

Dog Fish (Family Amiidæ).

430. Dog Fish (*Amia calva*, Linn.).

Probably common in the bayous of western Kentucky. Reported thus far only from Bayou de Chien.

Gars (Family Lepisosteidæ).

431. Alligator Gar (*Lepisosteus tristœchus*, Bloch and Schneid.)

Ohio River at East Cairo; not rare.

432. Short-nosed Gar (*Lepisosteus platystomus*, Raf.).

Ohio River at East Cairo. Tradewater River, Tennessee River, Bayou de Chien (Woolman).

433. Long-nosed Gar (*Lepisosteus osseus*, Linn.).

Ohio River, Little Sandy River, Kentucky River, Green River, Cumberland River, Tennessee River.

Sturgeons (Family Acipenseridæ).

434. Common Sturgeon (*Acipenser rubicundus*, Le S.).

Common at East Cairo and elsewhere in the Ohio River. Cumberland River at Kuttawa (Woolman).

435. Shovel-nosed Sturgeon (*Scaphirynchus platyrhynchus*, Raf.).

Common in the Ohio River at East Cairo and elsewhere.

SHOVEL FISHES (Family Polyodontidæ).

436. Shovel Fish (*Polyodon spathula*, Walbaum).
Ohio River at East Cairo and Paducah, common. Wolf Creek, in Clinton County (Kirsch).

LAMPREYS (Family Petromyzontidæ).

437. Mud Lamprey (*Ammocœtes branchialis*, Linn.).
Kentucky (Jordan).

ADDITIONAL SPECIES WHICH MAY OCCUR IN KENTUCKY.

The following list is made up of species which have been found in States adjacent to Kentucky and of such as are known to be generally distributed in the Eastern United States, and hence are likely to occur here. The white-bellied swallow, the geographic turtles, and others, undoubtedly live within our boundaries, but I have no authoritative records to this effect at hand, and prefer to place them for the present under the above heading.

MAMMALS.

1. Weasel (*Putorius nivalis*, Linn.).
2. Little Striped Skunk (*Mephitis putorius*, Linn.).
3. Otter (*Lutra hudsonica*, Lacépède).
4. Big-eared Bat[1] (*Plecotus macrotis*, Le C.).
5. Twilight Bat (*Nycticejus crepuscularis*, Le C.).
6. *Vesperugo georgianus*, F. Cuv.
7. *V. noctivagans*, Le C.
8. Prairie Mole (*Scalops argentatus*, Aud. and Bach.).
9. *Blarina exilipes*, Baird.
10. *B. carolinensis*, Bachman.
11. *B. brevicauda*, Say.

[1] Since this list was prepared I have received a specimen of this species from Bowling Green, collected by Miss Sadie F. Price.

12. White-footed Mouse (*Calomys americanus*, Kerr.).
13. Red Mouse (*C. aureolus*, Aud. and Bach.).
14. Rice-field Mouse (*C. palustris*, Harlan).
15. Harvest Mouse (*Ochetodon humilis*, Aud. and Bach.).
16. Meadow Mouse (*Arvicola pennsylvanicus*, Ord.).
17. *A. austerus*, Le C.
18. Pine Mouse (*A. pinetorum*, Le C.).
19. Porcupine (*Erethizon dorsatus*, Linn.).
20. Jumping Mouse (*Zapus hudsonius*, Zimmerman).
21. White-Rabbit (*Lepus americanus*, Erxleben).
22. Water Hare (*L. aquaticus*, Bachman).
23. Marsh Hare (*L. palustris*, Bachman).

BIRDS.

24. Brown-headed Nuthatch (*Sitta pusilla*, Latham).
25. Long-billed Marsh Wren (*Cistothorus palustris*, Wilson).
26. *Helinaia swainsoni*, Aud.
27. White-bellied Swallow (*Tachicineta bicolor*, Vieillot).
28. Painted Bunting (*Passerina ciris*, Linn.).
29. Pine Grosbeak (*Pinicola enucleator*, Linn.).
30. Chuckwill's Widow (*Antrostomus carolinensis*, Gmelin).
31. Prairie Falcon (*Falco mexicanus*, Schlegel).
32. Golden Eagle (*Aquila chrysaetos*, Linn.).
33. American Rough-legged Hawk (*Archibuteo lagopus* var. *sancti-johannis*, Gmelin).
34. Gray Hawk (*Asturina plagiata*, Schlegel).
35. Broad-winged Hawk (*Buteo latissimus*, Wils.).
36. Harlan's Hawk (*B. harlani*, Aud.).
37. Mississippi Kite (*Ictinia mississippiensis*, Wils.).
38. White-tailed Kite (*Elanus leucurus*, Vieillot).

39. Ground Dove (*Columbigallina passerina*, Linn.).
40. Turnstone (*Arenaria interpres*, Linn.).
41. Ring-necked Plover (*Ægialitis semipalmata*, Bonaparte).
42. Black-bellied Plover (*Charadrius squatarola*, Linn.).
43. Eskimo Curlew (*Numenius borealis*, Forst).
44. Hudsonian Curlew (*N. hudsonicus*, Lath.).
45. Long-billed Curlew (*N. longirostris*, Wils.).
46. Buff-breasted Sandpiper (*Tryngites subruficollis*, Vieillot).
47. Yellow-legs (*Totanus flavipes*, Gmel.).
48. Yellow-shanks (*T. melanoleucus*, Gmel.).
49. Hudsonian Godwit (*Limosa hæmastica*, Linn.).
50. Marbled Godwit (*L. fedoa*, Linn.).
51. Sanderling (*Calidris arenaria*, Linn.).
52. Dunlin (*Tringa alpina* var. *pacifica*, Coues).
53. Baird's Sandpiper (*T. bairdii*, Coues).
54. Pectoral Sandpiper (*T. maculata*, Vieillot).
55. Purple Sandpiper (*T. maritima*, Brünn).
56. Robin Snipe (*T. canutus*, Linn.).
57. Long-billed Dowitcher (*Macrorhamphus scolopaceus*, Say.).
58. Black-necked Stilt (*Himantopus mexicanus*, Müll.).
59. American Avocet (*Recurvirostra americana*, Gmel.).
60. Northern Phalarope (*Phalaropus lobatus*, Linn.).
61. Black Rail (*Porzana jamaicensis*, Gmel.).
62. Yellow-crowned Night Heron (*Nycticorax violaceus*, Linn.).
63. Louisiana Heron (*Ardea tricolor*, Müll.).
64. Reddish Egret (*A. rufescens*, Gmel.).
65. Little Blue Heron (*A. cœrulea*, Linn.).
66. Least Bittern (*Botaurus exilis*, Gmel).
67. White Ibis (*Gaura alba*, Linn.).
68. Roseate Spoonbill (*Ajaja ajaja*, Linn.).

69. Whistling Swan (*Olor columbianus*, Ord).
70. Ruddy Duck (*Erismatura rubida*, Wils.).
71. Surf Scoter (*Oidemia perspicillata*, Linn.).
72. White-winged Scoter (*O. deglandi*, Bonaparte).
73. Old Squaw (*Clangula hyemalis*, Linn.).
74. Lesser Scaup Duck (*Athya affinis*, Eyton).
75. Canvas Back (*A. vallisneria*, Wils.)
76. Red-head (*A. americana*, Eyton).
77. Shoveller (*Spatula clypeata*, Linn.).
78. Gadwall (*Anas strepera*, Linn.).
79. Mexican Cormorant (*Phalacrocorax mexicanus*, Brandt.).
80. Double-crested Cormorant (*P. dilophus*, Swainson).
81. Snake Bird (*Anhinga anhinga*, Linn.).
82. Forster's Tern (*Sterna forsteri*, Nutt.).
83. Caspian Tern (*S. tschegrava*, Lepech.).
84. Franklin's Gull (*Larus franklini*, Sw. and Rich.).
85. Ring-billed Gull (*L. delawarensis*, Ord).
86. Horned Grebe (*Colymbus auritus*, Linn.).
87. Red-necked Grebe (*C. holbölli*, Reinhardt).

REPTILES.

88. Painted Turtle (*Chrysemys marginata*, Agassiz).
89. *Pseudemys elegans*, Wied.
90. *P. troosti*, Holbr.
91. *P. hieroglyphica*, Holbr.
92. Geographic Turtle (*Malacoclemmys lesueuri*, Gray).
93. Geographic Turtle (*M. geographicus*, Le S.).
94. *Aromochelys carinatus*, Gray.
95. *A. odoratus*, Latr.
96. Mud Turtle (*Cinosternum pennsylvanicum*, Gmel).
97. Alligator Snapper (*Macroclemys lacertina*, Schweigger).
98. *Aspidonectes ferox*, Penn.

99. *Amyda mutica*, Le S.
100. *Cnemidophorus sexlineatus*, Linn.
101. *Eumeces anthracinus*, Baird.
102. *Eutainia saurita*, Linn.
103. *Nerodia rhombifer*, Hallowell.
104. *N. cyclopium*, Dum. and Bibr.
105. *Regina rigida*, Say.
106. *R. grahami*, Bd. and Gir.
107. *Storeria dekayi*, Holbr.
108. Red-lined Horn Snake (*Hydrops erythrogrammus*, Daudin).
109. Red-bellied Horn Snake (*H. abacurus*, Holbr.).
110. Green Snake (*Cyclophis vernalis*, Harlan).
111. Fox Snake (*Elaphis guttatus*, Linn.).
112. *Ophibolus doliatus*, Linn.
113. *O. elapsoideus*, Holbr.
114. *Cemophora coccinea*, Blumenbach.
115. Ring Snake (*Diadophis punctatus*, Linn.).
116. *Heterodon simus*, Linn.
117. *Haldea striatula*, Linn.
118. *Virginia elegans*, Kenn.
119. *V. valeriæ*, Bd. and Gir.
120. Coral Snake (*Elaps fulvius*, Linn.).
121. Massasauga, Prairie Rattle Snake (*Sistrurus catenatus*, Linn.).

AMPHIBIANS.

122. Pickerel Frog (*Rana palustris*, Le C.).
123. Wood Frog (*R. silvatica*, Le C.).
124. Nebulous Toad (*Engystoma carolinense*, Holbr.).
125. Bell Frog (*Hyla cinerea*, Pennant).
126. Castanet Tree Frog (*H. pickeringi*, Holbr.).
127. *H. squirella*, Daudin.
128. *Desmognathus ochrophæa*, Cope.

129. *D. nigra*, Green.
130. Red Salamander (*Spelerpes ruber*, Latr.).
131. *S. guttolineatus*, Holbr.
132. *S. bilineatus*, Green.
133. *Hemidactylium scutatum*, Schlegel.
134. *Gyrinophilus porphyriticus*, Green.
135. *Ambystoma jeffersonianum*, Green.
136. *A. opacum*, Gravenhorst.
137. *A. talpoideum*, Holbr.
138. Hellbender (*Cryptobranchus alleghaniensis*, Leuckart).
139. Mud Puppy (*Necturus maculatus*, Raf.).
140. Siren (*Siren lacertina*, Linn.).

FISHES.

141. *Etheostoma aurantiacum*, Linn.
142. *E. chlorosoma*, Hay.
143. *Lepomis symmetricus*, Forbes.
144. *Chologaster papilliferus*, Forbes.
145. *Phoxinus flammeus*, Jor. and Gilb.
146. *P. neogæus*, Cope.
147. *P. estor*, Jor. and Brayt.
148. *Hybopsis monachus*, Cope.
149. *Rhinichthys cataractæ*, C. and V.
150. *Phenacobius mirabilis*, Gir.
151. *P. teretulus*, Cope.
152. *Notropis photogenis*, Cope.
153. *N. lirus*, Jordan.
154. *N. scabriceps*, Cope.
155. *N. lutrensis*, Bd. and Gir.
156. *Hybognathus nubila*, Forbes.
157. *Petromyzon concolor*, Kirtland.
158. *P. castaneus*, Gir.

MINERALOGICAL AND GEOLOGICAL NOTES.
No. 7.

Evidences of Subsidence and Elevation in Essex County in recent Geological Time, as shown by Field Work at the Sea Shore.

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While engaged in other work connected with the geology of the county, I have noted such evidences of the subsidence and elevation of the coast line as came under observation and call attention to them now, hoping to awaken some general interest in this subject.

First. The evidences of subsidence are clearly shown along the entire coast line in many sheltered coves. At Nahant, in the cove between Bass Point and the steamboat landing, covered by six to thirteen feet of water at high tide, may be seen numerous stumps of several species of forest trees. Among those which are well enough preserved to be determined are white pine, swamp or white cedar, hemlock, spruce, ash, oak and maple. The roots of these trees are found in original leaf mould and peat beds, from one to three feet in thickness, which rest upon a very tenacious, slippery, blue clay of unknown depth, the leaf mould and peat beds being covered by

washed sand, and stones of all sizes, in a stratum of varying thickness. There are several other places at Nahant where peat beds are seen at or near low water mark. One in the southwest cove of Crescent beach is quite extensive and contains many logs and stumps of old forest trees; another on the northwest side of Little Nahant is of similar character. Lynn harbor and the marshes of Saugus furnish numerous examples of old peat beds in which large logs of pine and oak lie imbedded below the recent accumulation of marine peat and salt grass roots. At Chelsea beach, a few years ago, some excitement was occasioned by the supposed discovery of a supply of natural gas. No doubt the decay going on in one of these old peat beds and the throwing off of marsh gas caused the disturbance.

On the Beverly shore, between West Beach and Moulton's Misery Island, are many stumps of forest trees which may be seen, when the water is clear and still, at a depth of twelve or fourteen feet at low tide. A piece secured from one of these stumps proved it to be white pine.

In a cove near Chubb's Island, Manchester, at the depth of eleven feet below high water mark, are the remains of an oak stump, which, now divested of the sap wood, is twelve feet in diameter inside the buttresses, representing the tree at its full growth in this region.

In Manchester harbor, inside of the Ram Islands, stumps of white pine and oak are found in the original leaf mould and peat beds covered by washed sand and rocks as at Nahant.

In Kettle cove, Manchester, there is one large oak stump four feet below low water mark.

On Kettle cove beach a good section of the submerged area is visible at low water during the spring tides. Near the old road bed, inside of Crow's Island, the marine peat and salt grass roots are from ten to fourteen inches thick.

Directly under the marine peat is a bed of leaf mould and fresh-water peat, from three to four and one-half feet in thickness, in which are found numerous logs of pine, spruce and white cedar and the branches of the ground yew (*Taxus canadensis*), the last named remaining in its normal prostrate position. Below the peat are large oak stumps standing where the trees grew on glacial drift. While securing a specimen of one of the larger oak roots, scratched pebbles and grooved stones were found with oak roots growing around them in their natural position. From these observations it would appear:—(1) That the ancient oaks grew on the glacial till which became depressed; (2) that a lake formed on this area in which accumulated the peat and leaf mould upon which grew the pine, cedar, spruce and ground yew; that (3) this in turn became submerged and the marine peat and salt grass formed above it; and, lastly, (4) that the seaward slope has become so great that the waves are cutting into and carrying away these earlier formations and thus exposing them to view.

At Lobster cove, Magnolia, are the remains of numerous red cedar stumps. Red cedar stumps are also found at Mingo's beach, some of which are six inches in diameter, only the heart wood remaining. With these are many logs of spruce and hemlock ramified by the borings and containing shells of *Petricola pholidiformis*, a mollusk abundant in the peat and clay at this beach.

A section through the peat shows it to be five and one-half feet thick which, taken together with the fact that the surface of the peat is nine feet below high water mark, gives a total depth of fourteen and one-half feet below high water for the bottom of the peat as seen on the beach. In this peat I have collected hundreds of wings of water beetles and a great many fragments of other insects, which

have been identified by Prof. Samuel Henshaw of the Museum of Comparative Zoölogy.[1] These occur from eighteen inches below the surface of the peat to near the bottom. At two feet below the surface of the peat a large bed of coarse stones and roots of the cow lily (*Nupha advena*) were found, while white pine cones, oak acorns, spruce cones, and roots, logs and stumps of spruce, hemlock, pine and oak were found mixed in great confusion, making the work of removing them very laborious. Immediately below this last deposit occurred numerous stems of a species of grass, probably Phragmites. Occasionally these stems and joints, and also the roots, have become silicified, but still retaining the outer cuticle and showing the characteristic stomata of the grasses. Near the bottom the peat thins out into beds of leaves, including those of nearly all of our common trees and shrubs. Small twigs and branches were found well preserved, many of which are as tough and strong as if broken from the living tree to-day. This last named and very interesting deposit yields the greatest abundance of spruce and hemlock cones, beech nuts and the empty burrs, chestnuts, hickory nuts, seeds of the hop hornbeam, nutlets of the burr reed (*Sparganium* sp.) and a few oak acorns, besides the seeds of various sedges, grasses, etc.

Salem harbor furnishes additional evidence of subsidence. Oak stumps are often found in the coves, and on the land of Mr. Charles Metcalf in South Salem, near Forest river, are several oak stumps standing in beds of peat.

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[1] Professor Henshaw writes:—"With the exception of four vials labelled 'Nahant,' I have looked over your peat insects. The greater part of the material belongs to the Carabidæ (ground beetles) and Dytiscidæ (water tigers). Of the former there are specimens of the genera Cychrus, Platyrus and Pterostichus. *Ilybius biguttalus*, one of the Dytiscidæ, is the most abundant and characteristic species of the lot as a whole. I have also been able to identify specimens referable to Gyrinus and there are at least two species of Donacia. I cannot see that the insect remains are any different from what we should find to-day."

I have also observed sunken stumps of forest trees at Long beach, Nahant; Little Nahant; Phillips' and King's beaches in Swampscott; Marblehead beach and on the northern end of West beach, Beverly; while the beaches and marshes of Ipswich, Rowley and beyond, furnish similar deposits.

In 1866 I found an area of submerged forest in the cove southwest of Cape Hedge, Rockport, near the point recently called Briar neck. The stumps, so far as could be determined, were red cedar, pitch pine, maple and birch. Of this station, in his report on the geology of Cape Ann (U. S. Geol. Surv., Vol. IX, p. 568), Professor Shaler says: "These interesting remains lie in a position that appears to me to exclude any other hypothesis than that which assumes that the surface on which they stand has been lowered by a downward movement of the subjacent earth."

Specimens have been collected from the stumps in many of the places referred to above and may be seen in the Essex county geological cabinet of the museum of the Peabody Academy of Science. In this connection the following extract from an article in the "Forum" (June, 1890, p. 448) by Prof. W. J. McGee, entitled "Encroachments of the Sea," is of much interest. "The cautious estimate of the rate at which the New Jersey coast is sinking, made by the official geologist of that state, is two feet per century. Now the mean seaward slope of the coastal plain, including its sub-aërial and submerged portions, is perhaps six feet per mile; so that each century's sinking would give a third of a mile and each year a rod of lowland to the ocean. This is probably the maximum rate for this country." The evidence of geographic outline furnished by "drowned rivers" and half flooded and outlying islands indicates that the land has either been recently submerged or is now sinking.

During the past summer I have made soundings in Salem and Marblehead harbors for the purpose of comparing the depths of the water over certain rocks with those given in the report and on the chart prepared by Dr. Nathaniel Bowditch in 1804 and 1805. In his report Dr. Bowditch states that the summit of Bodin's rock was seven feet below low water on the full and change of the moon, taken from easily recognized compass points on the main land and islands in the harbor. Soundings taken with an iron rod on this spot, the first July 17, 1894, low water 6 A. M., full moon, gave 9 feet of water; again taken August 1, 1894, new moon, low water 5.28 P. M., gave 8½ feet of water at the same spot. These soundings were made with care and are reasonably correct and, in this case, offer evidence of a subsidence in the past ninety years at least of one and one-half feet at this point.

Dr. Bowditch's report gives 5 feet of water, at mean low water, on the summit of Privy ledge, 300 yards outside Orne's Island. August 2, 1894, new moon, low water 5.28 A. M., there was 7 feet of water at this point, indicating a subsidence of 2 feet. There is, however, in all probability a greater amount of erosion at this place than on Bodin's rock in the harbor. Dr. Bowditch reported 6 feet of water on the shoalest portion of Abbot's rock, Salem harbor, while on August 30, 1894, new moon, low water, I found 8 feet. Taken at low water, August 31, 1894, Archer's rock had 8 feet of water; September 1, 1894, Bowditch's ledge had 7½ feet, and September 2, 1894, Cut-throat ledge had 6 feet of water. In Dr. Bowditch's report 6–7 feet of water is given for Archer's rock which is 1 foot less than I find it. He gives for Bowditch's ledge 5–6 feet of water where my soundings gave 7½ feet. On Cut-throat ledge Bowditch gives 4 feet of water, while I found 6 feet at extremely low water.

Assuming these soundings taken the past summer to be even fairly correct there certainly appears to be a considerably greater depth of water on all of these ledges than there was ninety years ago. This also agrees with the estimates of Professor McGee of two feet of subsidence for the century for the entire coast.

The season at which these measurements were taken (Aug. 30, 31, Sept. 1, 2, 1894,) was one of extremely high tides and consequently correspondingly low water, so that the figures used give as fair a comparison as it is possible to make with those of Dr. Bowditch.

Second. The evidences of elevation in recent geologic time along the coast line of the country are exceedingly obscure.

According to previously accepted theories the Quaternary period was one of great and widely extended oscillations of the earth's crust. It was divided into three epochs: I. The Glacial. II. The Champlain. III. The Terrace. During the Glacial epoch, in high latitudes, the land became elevated until the continents were from one to two thousand feet above their present height. The Champlain epoch, on the contrary, was characterized by a downward motion of land surfaces in these same regions, until the sea stood, relatively, from five hundred to one thousand feet above its present level. The Terrace epoch was characterized by the gradual rising of the land until the present conditions of the continents and their climate were attained.

But the study of the submerged forests and the comparison of soundings in our harbors indicate a different story for the later portion of the Terrace epoch, and necessitates a probable modification of the theory, so far as it applies to this region.

In Essex County there are numerous examples of shore

lines, determined by the absence of drift and by water worn ledges, at elevations from fifty to one hundred and fifty feet above the sea. At elevations from twenty-five to one hundred feet above the present sea level, noticeably at Turkey hill and Town hill in Ipswich, Grasshopper plain and at Pipe-stave hill in West Newbury, and also in many places on the Merrimac River at Haverhill and Lawrence, there are numerous areas of sand similar to the beaches of our seacoast at the present time. But as no remains of a marine fauna have as yet been obtained from these so-called inland beaches or from the talus of the cliffs, it is highly improbable that they all belong to the Champlain epoch. It is much more probable, however, that they should chiefly be referred to the Terrace epoch. Prof. J. D. Dana says (Manual of Geology, p. 557): "The height of the upper terraces of river valleys and lakes was largely an effect of the height of the flood and not necessarily of a subsequent change of level of the continent."

In relation to the height of the sea level since the Glacial period, Professor Shaler says in the report previously mentioned (p. 571): "The imperfect evidence which I have succeeded in obtaining on the Cape Ann district serving to show the action of the sea above its present level is limited to 150 feet above the present tide mark." These evidences certainly appear to be capable of two interpretations:—first, action of the waves when the sea was at a greater height; and, second, decay *in situ* of weaker rock surfaces resulting from atmospheric causes. Dykes beyond the reach of the action of the sea at its present level, which have been disintegrated, are taken as evidence that the sea must at some time have been at that level. But there are numerous dykes on Salem Neck at about the same level as those referred to by Professor Shaler, which have decayed

in situ to a depth of fifteen feet or more and from which the disintegrated material can be shovelled out in the form of ordinary sand. It does not seem necessary to account for the areas in higher levels where there is an absence of glacial detritus by comparing them to stations on the coast line where the sea has removed boulders and glacial till, and assume that the sea must therefore have produced similar results at these higher levels.

When the flood waters of the Champlain epoch, which undoubtedly covered nearly all parts of New England, subsided and the land surfaces were elevated in the Terrace epoch, doubtless many of the so-called inland sand beaches and alluvial terraces were produced which are now faintly recognizable in some parts of Essex County.

According to the Powellian theory (Prof. W. J. McGee) the sea bottom, being continually weighted down with the detritus furnished during the Glacial, Champlain and Terrace epochs, must have been depressed. The denuded inland hills and mountains which furnished this detritus that built up the drumlins and kames and the deltas at the mouths of the streams,—the outer lobes of which have been cut away by the inroads of the sea, and which are now seen in the forms of marine marshes and clay beds,—being lightened of their loads, would naturally become elevated. As the whole of Essex County is simply a portion of the general coast line, we must look farther inland for the mountains which have become elevated. The elevation of our county coastline in recent geologic times is thus rendered improbable.

From all observations made, the evidence points to the conclusion that there has been a subsidence of the land surface of this coast region in recent, or, more accurately speaking, in post-terrace times; and that this subsidence is still in progress. The submerged forest growth and

peat beds and the compared soundings in the harbors clearly indicate this.

During the past summer, Lieutenant Ripley, U. S. N., and a corps of assistants, have been surveying Salem harbor in connection with the work of the U. S. Hydrographic Survey. Lieut. Ripley has authorized me to say that the results of his work show a greater depth of water over all the ledges in the harbor than was recorded by Dr. Bowditch in 1804–5, and that the seaward slope in the outer harbor has apparently deepened from one to one and one-half fathoms since that time. This corroboration of my observations is especially gratifying for the reason that I had no knowledge of the work of the survey until these results were obtained.

From the accepted rate of subsidence,—two feet for each century,—and as indicated by my observations here, it is fair to assume that the peat beds stood in their normal position and that the trees, whose remains we find today beneath the ocean, were flourishing in their full growth from one thousand to twelve hundred years ago.

GEOLOGICAL AND MINERALOGICAL NOTES.

No. 8.

On a Pre-Glacial Sand Plain, probably of the Tertiary Age, in the Central Part of Essex County, Mass.

BY JOHN H. SEARS.

(*Curator of Geology and Mineralogy, Peabody Academy of Science, Salem.*)

Surrounding the drumlins or glacial hills in Ipswich, Rowley and Newbury, can be seen deep beds of stratified, nearly pure quartz sand that dip away at a slight angle from the bases of the hills; they have been considered to indicate ancient elevated sea-beaches. Tracing these sand beds in a westerly direction they develop into a considerable sand plain covering a large part of the Linebrook Parish in the western part of the town of Ipswich and extending to Great Swamp Brook in Rowley, forming the plain known as Rooty Plain. Other large beds are seen in West Newbury, north of J. C. Peabody's hill and across the town line into Georgetown. In this town it forms the plain between Rock and Pentucket ponds and the southwestern part of Groveland, extending across West Boxford and a part of North Andover, largely in the valley occupied by the head waters or source of the Parker river.

In North Andover there are a series of drumlins extending from the northeastern part of the town, in a nearly southerly direction to Marble Ridge Station, that nearly obliterate the sand plain except to the north of Great pond and a portion of the Merrimac River bank; here the

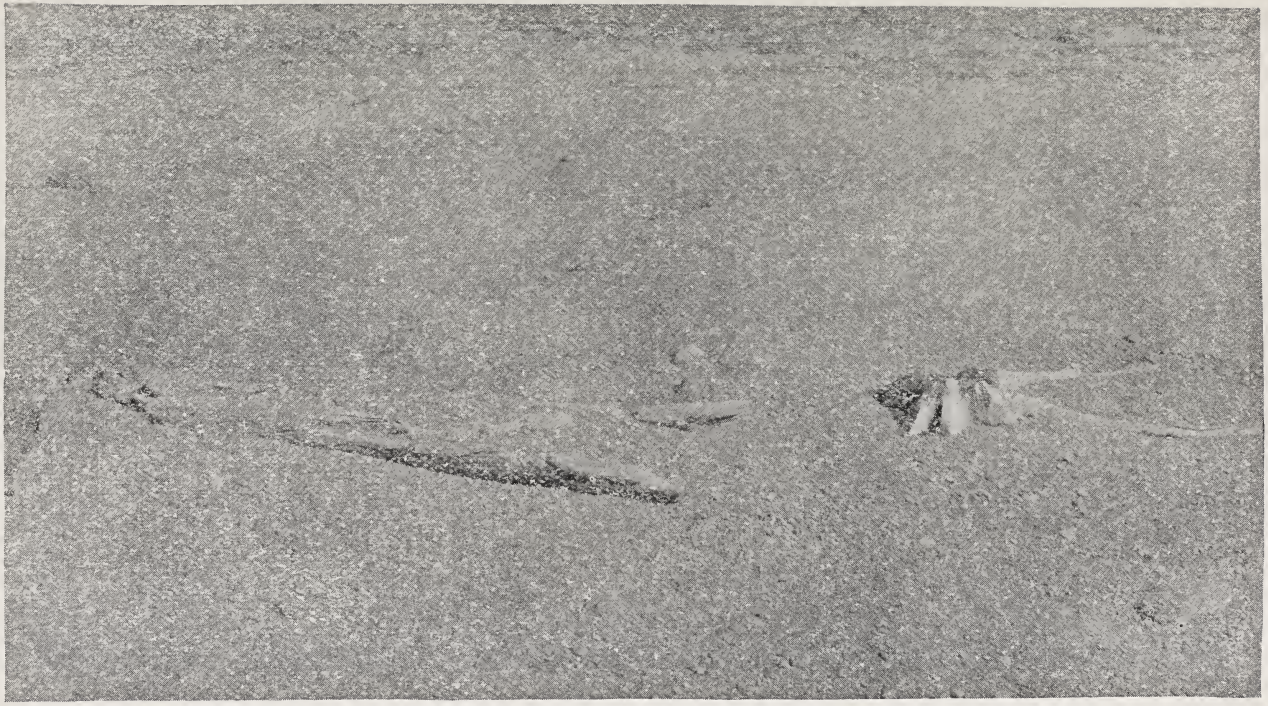
river bends abruptly north-northeast, but following the upward course of the river the sand plain spreads out across the city of Lawrence and the eastern part of South Lawrence and in a southerly direction, following up the valley of the Shawsheen river to Haggett's Pond and extending into Middlesex county. By consulting the geological map of Essex County it will be seen by following this course that this sand plain, in pre-glacial times, must have been continuous and have occupied the larger part of the central portion of Essex County.

The drumlins of Prospect Hill in Rowley, Jewett's, Turkey and Town hills in Ipswich, were apparently deposited on this ancient sand plain, as remnants of it are seen in deep beds to form a nearly complete circle around their bases and the slight dip away from the drumlins is a decided argument in favor of this theory. There are also numerous kames and eskars of stratified sand and gravel that are similarly resting upon the remnants of the sand plain in South Groveland and North Andover. Ipswich Town Hill is an especially characteristic example of a glacial hill or drumlin deposited upon the sand plain. On the northwestern part of the hill near High street, there is a deep section from which the sand is being removed showing the dip of the beds of sand and giving a section well up under the hill nearly to the one hundred foot contour line, and in a northeasterly direction about fifty feet above, there is a good section of the drumlin (opened for gravel) showing the unstratified boulder till. Similar exposures of the sand are seen the whole length of High street, north and south and down East street the length of the hill. Other large exposures of the sand cropping out here under the hill are seen on the northeast and north side of this hill, thus making a nearly complete circle around its base. Turkey Hill is also encircled by this sand but the exposures have not been worked into to the same extent.

In texture this sand is very clean and quite even in size of the grains, all but two tablespoonfuls of nearly two quarts passing through a sixty-mesh-to-the-inch sieve. The quartz grains are from sub-angular to well rounded, in fact almost pearlitic in form, the feldspar grains are about one in twenty, also well rounded; there are a few plates of muscovite, some of which are one-quarter of an inch in diameter; no hornblende or iron-bearing minerals have been detected. Near the surface the sand is in many places quite deeply discolored by limonite which has undoubtedly come from the drift on the surface. Sand from the sand dunes of Plum Island, Castle Neck or Ipswich Beach, are invariably composed of sharp angular grains of feldspar, magnetite and a little quartz; thus it will be seen that the sand of this sand plain, upon comparison with the wind-blown sand of the sea-beach, is found to be quite unlike in its essential characters.

Upon comparing the sand of the sand plain with the well known tertiary sand on Gay Head and with the Nashaquita Cliffs in Chilmark, Martha's Vineyard, they are found to be identical in general character. From the general trend or direction across the county from Ipswich to the Merrimac River in Lawrence, of the remnants of the sand plain, it is fair to presume that the Merrimac River flowed down this valley in pre-glacial times to the sea, covering a much larger territory than it does at the present time. If the drumlins, kames, eskars and other glacial drift were removed and the surface of our county was restored to the condition that it was previous to the glacial period, quite a large part of the central and northern part of the county would present a nearly level plain surface with the water-courses and streams meandering through it with an occasional Monadnock or high, rocky hill rising out of the plain.

Nov. 1894.



VIEW AT POND BEACH, NAHANT, SHOWING SUBMERGED WHITE PINE TREE STUMPS. PHOTOGRAPHED OCTOBER, 1894.

VIEW AT MINGO'S BEACH, BEVERLY. PHOTOGRAPHED OCTOBER, 1894.

a. Submerged peat beds, 5½ ft. thick, 9 ft. below high water mark. *b*. Logs and stumps of forest trees.
c. Sand and stones covering logs, stumps, etc.

BULLETIN

OF THE

ESSEX INSTITUTE.

VOL. 26. SALEM: APR., MAY, JUNE, 1894. NOS. 4, 5, 6.

ANNUAL MEETING, MAY 21, 1894.

THE annual meeting was held in Plummer Hall, this evening, at 7.45 o'clock, President Edmund B. Willson in the chair.

The reports of the Secretary, Treasurer, Auditor, Librarian and Committee on Library and Publication, were read, accepted and ordered to be placed on file.

The report of the Committee on Nominations was presented by Mr. Gardner M. Jones, and it was

Voted, to proceed to the election of officers for the ensuing year. Messrs. Robinson, Perley and J. G. Morse were appointed by the chair to distribute, collect, assort and count votes.

This committee reported the following list of names as receiving all the ballots (77), and these officers were declared unanimously elected:

PRESIDENT:
EDMUND B. WILLSON.

VICE-PRESIDENTS:

Abner C. Goodell, Jr.,	Edward S. Morse.
Daniel B. Hagar,	Robert S. Rantoul.

SECRETARY:	TREASURER:
Henry M. Brooks.	William O. Chapman.
AUDITOR:	LIBRARIAN:
Henry M. Batchelder.	Chas. S. Osgood.

COUNCIL:

William H. Gove,	Geo. D. Phippen,
Thomas F. Hunt,	David Pingree,
Francis H. Lee,	Frederic W. Putnam,
Richard C. Manning,	George M. Whipple,
S. Endicott Peabody,	Alden P. White.

Report of the Secretary.

I suppose it will generally be conceded that the report of a society or corporation is not expected to be very interesting to the hearers.

What inspiration can any one find in the process of preparing a report — the gathering together of a number of dry statistics, which the writer well knows will go into one ear of the listener and out the other.

A railroad report, upon the supposition that you could understand it, is not very entertaining reading, even to a shareholder. Who, for instance, can enjoy the reading of the Atchinson, or the Union Pacific Railroad report? We have a great many reports of societies and corporations presented to the Institute, but they are almost always uncut showing that they have not been read. No wonder

—they belong to the class of literature which Charles Lamb styled "books which are no books." I hope I shall not be charged with being a cynic or a pessimist if I say that, pretty generally, reports are "as dry as a Monday bun!"

It seems to be expected, however, at the annual meeting of a society like ours, there should be some statement made of the doings, in its various departments. In accordance therefore with this time-honored custom, I will read to you the Secretary's report for the year ending May 1, 1894.

There have been thirteen meetings of the society held at its rooms the past year, for business and discussion. At these meetings, papers mostly of an informal character, have been offered by the following members: The President, Professor Morse, Mr. Nevins, Dr. Cherrington, Mr. Sears, and Rev. Mr. Latimer; and a paper written by Mrs. Grace A. Oliver, upon "Literature for Children," was read by Mr. Willson.

Remarks upon these papers were made by the President, Mr. Hunt, Mr. Robinson, Professor Morse, Mr. Bridgman, Dr. Cherrington, Mr. Welch, Mr. Cousins, Mr. Manning and other members.

All who participated in these semi-monthly meetings have spoken quite favorably of them, regarding them as interesting and instructive. The attendance so far has been good, but will, we hope, be larger as the meetings become better understood. They are held in one of our library rooms, and it is designed to have them as social as possible, so that no one need feel afraid to speak, as some might hesitate to do, if we met in a larger place.

The course of free lectures in Plummer Hall was well attended. This course attracts a great many people who probably never attend other lectures. The audience is

always an attentive one, and this has often been noticed and the different speakers have from time to time alluded to it. The society is really doing a good work in this direction. The lectures this year have been by Rev. Geo. D. Latimer, Rev. Dr. Flanders, Col. Henry Stone, Rev. E. P. Farnham, Miss Catherine H. Spence of South Australia, Dr. L. J. Cherrington, Rev. Dr. A. P. Putnam and Ezra D. Hines, Esq.

Two special lectures were delivered in Academy Hall, under the auspices of the Institute, members having been admitted by tickets furnished upon application, by the Secretary. The first was on Oct. 16, by Rev. Wm. Henry Johnson, of Cambridgeport, who spoke upon "University Extension," to an interested audience. Mr. Johnson desired to have a course in Salem upon the subject presented, but there were not enough subscribers to induce him to undertake it. It is hoped that another season those persons who are anxious for such a course will make some efforts to have it succeed.

The second lecture was by Rev. Matthew H. Buckham, D.D., of the Vermont University at Burlington, on Oxford University, with lantern illustrations. This lecture gave pleasure to a good-sized audience.

The Institute and Peabody Academy have entertained the following schools and associations, with special attentions:

On June 6, 1893. The Senior Class of Bradford Academy.

On April 23, 1894. A Class of the Lasell Seminary, Auburndale.

On April 24, 1894. New York State Library School.

May 5. Authors' Guild of New York.

May 10. Senior Class of Bradford Academy.

May 12. Society of Colonial Wars.

The donations to the cabinets, the past year, number 670, from 138 different donors.

The number of visitors to the rooms of the Institute has equalled that of previous years, although an inspection of our register indicates that we had but a very few persons from the West last summer. This is easily accounted for, as all the western people went to Chicago, instead of coming east, as usual. Visitors came generally from New York and New England. We had also many from abroad.

The old meeting house of the First Church seems to be more attractive than many modern churches, judging from the applications for the big key. The record says about 8000 attended there the past year.

The last year has been an especially busy one in all departments. The large collection of books and newspapers, in Plummer Hall, the accumulation of years, have been examined and re-arranged, the papers repaired, where they needed it, and collated; and we have helped kindred societies with some of our duplicates.

The entire collection of relics and curiosities in our cabinets has been cleaned, re-arranged and re-labelled. The re-arrangement was made under the direction of Mr. Arthur R. Stone, whose assistance has been invaluable. Upon the completion of this work, on Monday evening, April 9, the whole building was lighted for the first time, and thrown open to members and their friends, some 300 or more of whom, availed themselves of the opportunity to examine the collections, which was done with evident satisfaction. Light refreshments were served and excellent music furnished by the Adéle Mandolin, Banjo and Guitar Club. Mr. Ross Turner exhibited some fine water colors on this occasion.

The work of preparing and arranging the joint exhibit of the Institute and the Peabody Academy of Science at

the World's Fair was, of itself, a great tax on the time and energy of a number of our members and friends, many of whom contributed besides, very handsomely, to the necessary expenses incurred. The society is greatly indebted to this committee who were instrumental in making our exhibit a success. That it was a decided success, is the testimony of all who saw it.

Since the last report the Secretary has made some progress in the arrangement of the manuscripts and other old papers in the fire-proof room on the first floor. When it is remembered that these pieces of paper are estimated by the hundreds of thousands, it will be readily believed, that it is a vast work to arrange all this mass of letters, deeds, etc., which the society has in its possession. The papers left to the society by Doctor Wheatland are in process of arrangement, by Wm. P. Upham, Esq. They are for the most part of a genealogical character, and probably of great value to the historian or genealogist. What we need in this department is more money. A person qualified for the purpose, could be constantly employed in assorting, arranging and indexing these papers, if we had the means to do it. I fear the importance of this matter is not understood. More and more people, as years go by, are becoming interested in looking up family history and genealogy. We are constantly having applications from individuals all over the country for information relative to their ancestors. So many families came originally from England to Salem, in the early settlement of the country that here is the starting point of their investigations. And now the great interest taken in the "Sons and Daughters of the Revolution" and the "Colonial Dames," etc., is such that we are beset with queries, which require considerable study to answer. In this connection, it gives me pleasure to say that during the coming

year, several ladies connected with the Institute contemplate the formation of a class for the study of our local history. It is well known that many of our people have a good knowledge of English, Grecian, Roman or French history, but have little or no knowledge of the history of our own country and city, never having given much attention to this subject.

The following members have died during the year: Stephen M. Allen, of Boston; George F. Brown, James B. Curwen, James Dugan, Willard Goldthwaite, Wm. H. Simonds, William A. Lander, Oliver Thayer, of Salem; Charles P. Thompson, of Gloucester; also Francis Parkman (an honorary member).

There has recently been quite a revival in membership. Since the last annual meeting we have added 91 names to our list of active members, making the whole number 394.

We ought to have 1000 members, and it is hoped every friend of the society will consider it not only a duty but a privilege to help us in the work of increasing our numbers. Professor Morse has spoken of the great number of members, of some of the scientific and literary societies in European cities, some of them numbering from 5,000 to 10,000 members, with a very much larger assessment than we have. Those societies are consequently enabled to do a very important work. It is true they are located in places of a larger population than ours but the population of the County of Essex, of which we are the centre, is large enough to furnish us with a greatly increased membership, to say the least.

I repeat what I have said before, that no society like ours can long be in a flourishing condition, without the encouragement of the young. We want more young men and young women to join us and become interested in the work of the society, and we believe a large number will

do so, as soon as they realize the advantages of belonging to such an institution.

I have said so much in former reports of the great need of increased accommodation for the Library and Cabinets, and that matter is, I believe, so well understood by most of our members, it is hardly necessary for me at this time, to say more. We are constantly hoping that something will turn up, sooner or later, to meet the demands in these departments.

When we consider the comprehensive and inclusive character of the Institute, we feel that we may well pride ourselves in the recollection that we number among our members persons of every religious name—members of all political parties—of the various charitable and fraternal societies—Free Masons, Odd Fellows, Improved Red Men and various other kinds of men and—women. Here are no factitious distinctions. The four pillars which uphold us are History, Science, Literature and Art.

Which is respectfully submitted,

HENRY M. BROOKS,

Secretary.

REPORT OF THE LIBRARIAN.

The additions to the library for the year (May, 1893 to May, 1894) have been as follows:

By Donation.

Folios,	79
Quartos,	199
Octavos,	2,078
Twelvemos,	936
Sixteenmos,	377
Twentyfourmos,	223
Total of bound volumes,	3,892
Pamphlets and serials,	14,313
Total of donations,	18,205

By Exchange.

Folios,	1
Quartos,	22
Octavos,	126
Twelvemos,	1
Total of bound volumes,	150
Pamphlets and serials,	1,461
Total of exchanges,	1,611

By Purchase.

Folios,	2
Octavos,	12
Twelvemos,	7
Total of bound volumes,	21
Pamphlets and serials,	602
Total of purchases,	623
Total of donations,	18,205
Total of exchanges,	1,611
Total of purchases,	623
Total of additions,	20,439

Of the total number of pamphlets and serials 7,572 were pamphlets and 8,202 were serials.

The donations to the library for the year have been received from two hundred and thirty individuals and one hundred and twelve societies and governmental departments. The exchanges from eleven individuals and two hundred and twenty-one societies and incorporated institutions, of which one hundred and twenty-seven are foreign; also from editors and publishers.

The largest donations have been 628 volumes and 3427 pamphlets, the larger part of the latter being magazines of early dates, from Hon. Caleb Foote; 155 botanical books from Mr. John Robinson, and 109 miscellaneous works together with 600 pamphlets from the estate of Samuel P. Andrews.

The librarian has little to add to these statistics. A quiet and uneventful year leaves little to be said in a report. Some considerable time has been spent in an examination of the library with a view to making it more accessible to users. The files of newspapers have been arranged and a list made of missing numbers. In order to make room for our ever-increasing number of books it has been found necessary to remove some of those which are rarely consulted to quarters outside the library building. The necessity for this is to be regretted and we are looking hopefully forward to the time when an addition to our funds will enable us to build a stack room in the rear of our present building. We also trust that we may be able at no distant day to make a catalogue of the library and thus greatly increase its usefulness.

With all our drawbacks the library is consulted very frequently and we have reason to believe is of great use to students who are pursuing special lines of study and research.

Our library does not aim to be a popular one in the sense of furnishing the current literature of the day. This is left to, and is abundantly supplied by the Public Library. But we do aim to make it as complete as possible in certain directions and believe it to be a most valuable library for reference and consultation. Students and investigators are always welcome to the rooms and all the advice and assistance possible is given them in the prosecution of their researches.

The public appreciate more and more as the years go by the good work that the Institute is doing in their midst. Let us hope that this appreciation may before long take some substantial form which will enable the Institute to increase its sphere of usefulness.

CHAS. S. OSGOOD,
Librarian.

Treasurer's Report.

Condensed from Treasurer's Report presented May 21, 1894.

RECEIPTS.

Balance from last year's account,		$378 87
Assessment of members,	$929 00	
Sales of publications,	315 48	
Income from invested funds,	3,423 87	
" " other sources,	1,326 54	
		$5,994 89
Interest and contribution to be funded,		44 58
		$6,417 84

EXPENDITURES.

Salaries of secretary, assistant librarians and janitor,	$2,141 00	
Cost of books, periodicals and binding,	339 02	
" " publications and printing,	669 51	
" " fuel,	150 00	
" " gas and water,	82 47	
" " interest on note,	150 00	
" " labor in the building,	403 15	
" " Athenæum (our proportion of expenses,)	237 36	
" " express, postage and miscellaneous,	350 35	
" " annuities,	610 00	
" " Columbian exhibition committee,	650 00	
" " repairs,	39 39	
" " lecture expenses,	42 04	
		$5,864 29
Interest and contribution funded,		44 58
Balance of cash on hand,		508 97
		$6,417 84

COLUMBIAN EXHIBITION FUND.

Cash received from all sources,		$3,773 09
Cash expended,	$3,762 31	
Balance of cash on hand,	10 78	
		$3,773 90

INVESTMENT OF FUNDS.

Invested for income,	71,762 33	
Essex Institute Building and Ship Rock,	23,470 69	
		$100,233 02

Respectfully submitted,
W. O. Chapman, *Treasurer.*

Salem, May 19, 1894.

Examined and found correct,
Geo. D. Phippen, *Auditor.*

Auditor's Report.

The Auditor would respectfully report that he has examined the report of the Treasurer, with all the stocks and securities in hand and finds the account correct.

Showing that the sum of $28,470.69 is invested in real estate, including the deeds of this building and a small piece of land with Ship Rock; also $71,762.33 invested in stocks and bonds, from which income is derived, making a total investment of $100,233.02.

The running account for the past year has also been examined, including the receipts and expenditures with the vouchers in hand, and find the Treasurer opened his account with a

Balance of Cash on hand,	$ 378.37
Collected from assessments, and the income of the fund,	6,039.47
Total,	$6,417.84

$5,908.87 of which has been paid out for the running expenses as detailed by the Treasurer's report, leaving a balance of $508.97 cash on hand with which to commence the new year, making a total of $6,417.84 balancing the other side.

Certificates of verification were appended to the two accounts of the Treasurer.

Respectfully submitted,

Geo. D. Phippen, *Auditor.*

Salem, May 21, 1894.

Report of the Publication Committee.

Since the last annual meeting there have been printed five parts of the Historical Collections, completing Vol.

29, and the first part of Vol. 30; six parts of the Bulletin, completing Vols. 24 and 25. It is hoped that part two of the Historical Collections, Vol. 30, and part two of the Bulletin, Vol. 26, will be ready for distribution immediately after the present meeting. Besides the regular exchanges with home and foreign societies there have been additions to the library by exchange of publications of the Institute to the amount in value of $150. The amount received by subscription is very little if any in excess of one hundred dollars. The reprints published this year are:

Salem at the World's Columbian Exposition.
Annual Report for 1893.
Dwellings of Boxford, by Sidney Perley.
Vertebrates of Kentucky, by H. Garman.
Tusayan Foot Race, by J. Walter Fewkes.
Geological Notes, No. 6, by J. H. Sears.
Pipa Americana, by G. A. Arnold.
List of Essex County Soldiers in the French War, etc., by Eben Putnam.
New Edition of First Church pamphlet.
The Building of Essex Bridge.
Biographical Sketch of James R. Newhall, by N. M. Hawkes.

Probably one of the most important works of a local nature, published by the Essex Institute, is now in the hands of the Heliotype Printing Company, and will come from the press by June 1st. It is the first of a series of Geological Charts of Essex County from the field work of John H. Sears, Curator of Geology in the Peabody Academy of Science.

The lines on which the publications of the Essex Institute should continue are now pretty clearly marked out. It is only a question of financial ability to carry out the work properly. Societies of like character to the Institute

have large publication funds, the income of which is sufficient to defray the annual expense of publishing. A conservative estimate of the amount required for carrying on the ordinary publications of the Institute would be in the neighborhood of $800 annually. For special publications there should be added from five to six hundred dollars more. The more one is acquainted with the work of the Institute in its publications, the broader is one's view in regard to their value as a factor in the success of the Institute. Having given up to the Peabody Academy of Science the line of special natural history research, it is the duty of the Institute, on its scientific side, to disseminate the information obtained by local students in geology, zoölogy, archæology and ethnology. This with the hearty coöperation of its sister society it is striving to do. On the historical side, it should as far as possible furnish a medium for Essex County historical memoranda. Much could be done in this way if there were funds which could be employed in copying the parish and town records for preservation and publication. The copying of early records of the Town of Beverly would be a very valuable work, and their publication would bring to the treasury some money from neighboring towns. The Committee have on hand material enough to complete volumes of both the Bulletin and Historical Collections, while the Wheatland Memorial Volume is ready for the press as soon as there is money enough to publish it in the style and with the photogravure illustration which is desired.

LECTURES AND MEETINGS.

Monday, Oct. 16, 1893.—A special lecture under the auspices of the society, by Rev. William Henry Johnson of Cambridgeport, was delivered in Academy Hall

this evening at 8 o'clock; subject, "University Extension." The president introduced the speaker with appropriate remarks. This lecture was of great interest to teachers and there was a large audience present. It was introductory to a course which Mr. Johnson hoped to have in Salem.

Monday, Nov. 20, 1893.—A special lecture was given this evening at 8 o'clock in Academy Hall, by Rev. Matthew H. Buckham, D.D., of Vermont University, Burlington, Vt. The subject was "Oxford University," and was illustrated by excellent views of buildings and scenes in the University city, with the aid of the stereopticon. It was interesting, and the hall well filled. Mr. Willson, the president of the society, made some introductory remarks.

Monday, Jan. 8, 1894.—Rev. George D. Latimer of this city, lectured this evening in Plummer Hall—the first lecture of this season in the free course; subject, "Social Settlements." The paper was a scholarly and exhaustive description of the institutions of the sort in London and Chicago. The Toynbee hall in the very lowest precinct of the Whitechapel district in London was fully described; and the Hull house in Chicago, in one of the lowest parts of that city was spoken of, and an extended account given of it. As it had been visited by the speaker, his statements with regard to it were from personal observation. The speaker said that the "Social Settlement" was not a panacea but a leaven. It is not so much for those who have sunk to the very lowest depths of crime and misery, as for the ambitious poor; not at all for the idle, but for the man who wishes to elevate his condition. It must be on social grounds to be effective.

Monday, Jan. 15, 1894.—Regular meeting in library room. *Voted*, that the secretary be authorized to fill in and sign the blank from the Lexington Historical Society in reference to Fast Day, viz. :—to abolish the same and petition the Legislature to make the 19th of April, a legal holiday; also voted to authorize the Secretary to send thanks to every one who loaned articles for the Institute's exhibit at the World's Fair in Chicago.

Rev. Mr. Willson read a paper written by Mrs. Grace A. Oliver, on "Literature for Children," which was of an important and interesting character, and was subsequently printed in full in the columns of the *Salem Observer*. This paper was discussed by several of the members who were present.

Monday, Jan. 22, 1894. Col. Henry Stone, of South Boston, lectured in Plummer Hall; subject, "General Grant." The lecturer said :—There are no more stirring or thrilling examples before the American public to-day than the four great generals of the late war: Grant, Sherman, Sheridan and Thomas. I knew them all, personally and well. Of the last three I have already spoken to you; and I now would speak concerning the first and greatest of them all—General Ulysses S. Grant. I knew him well, and can speak of him from my heart." Colonel Stone then proceeded to trace the history of the great General from boyhood, up through early manhood; his wonderful war successes and his political and social career.

Monday, Jan. 29, 1894.—Miss Catharine H. Spence, of South Australia, lectured this evening in Plummer Hall on "Reformed Representation." The lecturer began by saying that although Australia was a small country, and was first settled as a penal station for British convicts, it

had taught the whole world many valuable lessons in reform. It was in that country that the "Australian ballot" system originated.

She spoke of the plan of distributing poor children among families of industrious people to be brought up, instead of placing them in institutions. She claimed that this system did away with crime and pauperism to a large extent. All the railroads and telegraphs in her country were under control of the government, by which the people were benefited with low rates, the same as the postal service here.

The speaker explained a system of voting by which the majority and minority were both represented, and said this system would do away with the present political machines and rings.

Monday, Feb. 12,1894.—Rev.A. P. Putnam, D.D., of Concord, lectured in Plummer Hall; subject, "Recollections of noted persons, at home and abroad." The long array of distinguished men he had known, eminent in civic, military, scientific and social life, for the past fifty years, attested the extensive acquaintance of the speaker. He gave many characteristic anecdotes of Webster, Choate, Garrison, Phillips, Sumner and others of similar eloquence and power. When he spoke of Lincoln, Grant, Adams, Garfield and a few others, and particularly of the acts, which made them great, the enthusiasm of the speaker was imparted to the listeners. In describing his visit to Rome, he spoke of William W. Story, Harriet Hosmer, Joseph Ropes and others he saw there, and alluded to a cherished art specimen given to him by Mr. Ropes at the time. (Mr. Ropes was in the audience, and at the close of the lecture, advanced to the rostrum, where cordial greetings were exchanged between Doctor Putnam and him-

self.) A high tribute was paid to the late Abiel Abbot Low of New York and to several others who have been intimately connected with Salem by birth or residence.

Monday, Feb. 19, 1894.—Regular meeting this evening in the library room. Rev. E. B. Willson read an interesting paper upon the "Covenant of the First Church in Salem in 1629." The paper showed careful preparation and exhaustive research, and at its conclusion a discussion was participated in by A. C. Goodell, jr., John Robinson, W. L. Welch and others. Mr. Willson went over the matter which was discussed at great length many years ago by the late Dr. S. M. Worcester and Judge Daniel A. White, as to whether the covenant of 1629 and 1636 were identical. The point, it was (well) said, was not of vital importance, but interesting (to theologians).

Monday, Feb. 26, 1894.—Rev. George T. Flanders, D.D., of Rockport, lectured in Plummer Hall; subject, "The Seven Stars; a Study of Early Mythology." The lecturer pictured in glowing language the beliefs of the ancients about man upon the earth, more particularly his first habitations and surroundings; drawing illustrations from the views held by the Chinese and other of the older nations upon the subject.

Monday, March 5, 1894.—Regular meeting of the society in the library room. Dr. Leroy J. Cherrington read a paper on "The Electric Theory of Pain." It was a carefully prepared address written for a popular medical article. Pain was regarded as a morbid condition of some bodily part. The working of pain in the system was explained. The general and excessive use of "pain killers" was deprecated, and the lecturer gave an account of his theory for relieving pain, etc. Followed by discussion.

Monday, March 12, 1894.—Rev. E. P. Farnham lectured in Plummer Hall, on "The Kindergarten." The President, in introducing the lecturer, spoke of the fact that two Salem ladies, the daughters of the late Dr. Nathaniel Peabody, were among the very first in this country to be interested in the kindergarten movement, which had been introduced by Horace Mann, Secretary of the Massachusetts Board of Education, upon his return from Europe (Mrs. Mann and Miss E. P. Peabody.)

Mr. Farnham, in giving the history of the movement, pointed out the difference between the kindergarten training received by young children nowadays, and the former methods of instruction. In the first, pleasure is mingled with the studies, while by the old way it was nothing but grinding, hard work.

Monday, March 19, 1894.—Regular meeting in the library room at 8 o'clock this evening. Rev. George D. Latimer read an instructive paper on "Municipal Government." After referring to the government of some of the leading American cities, upon which he made some criticisms, the lecturer spoke of Birmingham and Berlin as remarkable for good city governments. He referred to our own city affairs and thought there could be some improvement. The paper was discussed by Mr. Hunt, Mr. Gove, Dr. Cherrington, Mr. Welch and Mr. Robinson.

Monday, March 26, 1894.—Dr. L. J. Cherrington lectured in Plummer Hall; subject, "The Human Workshop." The lecturer told in an entertaining and explanatory way of the wonderful workshop placed in every human being. He said that man had been likened to a machine, but he went further and declared that in every man was a complete machine shop. He explained the

evolution of the human workshop, which he declared, had its superintendent, its head, and its various departments. For the purpose of his lecture he divided the human system into three parts, the vital, physical and mental, and explained his assertions by several drawings or charts placed upon a screen. The lecture showed much study in its preparation and much ingenuity in its presentation by diagrams placed upon the screen.

Monday, April 2, 1894.—Regular meeting this evening in library room.

Mr. Gardner M. Jones spoke of a large and brilliant meteor he had seen on his way to the meeting at 7.27. His point of observation was opposite 24 Federal street. Its course was northwest through an arc of about 90 degrees, from nearly due south to nearly due west. Elevation—from about 45 degrees at first appearance to about 30 degrees at disappearance. Brightness—like a large rocket, apparently less than 150 feet distant. No explosion or sound was heard. Speed—that of a rocket soon after it begins its descent.

Prof. E. S. Morse gave a most interesting talk on "Left-handedness." He said that to a certain extent it was not peculiar to man but was observed in animals of high or low degree. Certain peculiarities of left-handed people were shown and the speaker said that the right side of the brain was heavier in a left-handed person, and the left side in a right-handed person. Professor Morse gave some interesting examples upon the blackboard of the power of writing with both hands. He said that about two per cent. of mankind are left-handed. Persons who are left-handed can by practice learn to use their right hand, and so can right-handed people learn to use their left hand, but they can never acquire the same dexterity with both

hands. Speaking of the so-called science of palmistry, he said the Japanese had a similar science, only everything there meant about the opposite from what it does among English-speaking people, showing that there cannot be anything in it.

A Geological Map prepared by John H. Sears, as the result of five or six years' labor, was exhibited. It is to be published by the Institute. It is said to be as perfect a geological map as was ever prepared, of any section of the country. Mr. Sears was present and explained some of its features.

Monday, April 16, 1894.—Winfield S. Nevins of Salem, gave an informal talk on Worlds' Fairs that have been held previously to that of last year. The first one was in Paris in 1844. The next in London in 1851; it was for this fair that the Crystal Palace was built, a building which was subsequently sold to private parties and enlarged, the final cost having been more than $7,500,000, or a million dollars more than all the buildings put together in Jackson Park, Chicago. The third fair was in New York in 1853, and was a failure financially. The fourth in Paris in 1855. The fifth in London in 1862. Paris had another fair in 1867. Vienna, the seventh fair in 1873, a financial failure, but which proved of great benefit otherwise. The Centennial Exhibition in Philadelphia in 1876 came next. The ninth fair at Paris in 1878. In 1889 was held the great Exhibition in Paris, visited by 28,150,000 people or 600,000 more than visited the Chicago exhibition. The Art exhibition at this fair far surpassed anything the world has ever seen, both in quantity and quality. The "Hall of Industry" covered 27 acres and Machinery Hall 15 acres.

Monday, April 23, 1884.—Ezra D. Hines, Esq., of

Danvers, gave the closing lecture in the "free course" this evening in Plummer Hall; subject, "An Historic Highway." Mr. Hines gave an interesting account of the old road leading from Ipswich to Boston. It was probably an old Indian trail that was laid out as a road prior to 1634. Henry F. Waters of Salem, a few years ago, discovered a map in the British Museum, that describes this road. The map was from the celebrated Hans Sloan collection and was labelled, "Map of Massachusetts in New England." On this map the road or path was traced as clearly as though it was a new print. It ran through Medford, Malden, Revere, Saugus, across Saugus river, Lynn, Peabody, Danvers, North Beverly, along the shore of Wenham Lake to "Agawam" (now Ipswich). There can be no doubt as to the age of the map, as the word Agawam shows that it must have been made before 1634, for in that year the name Agawam was changed to Ipswich. Mr. Hines also spoke of the traditions concerning the old highway; its noted inns, and of the distinguished persons who had travelled over it—Gov. Winthrop, Nathaniel Saltonstall, and many others.

Monday, April 30, 1894.—Meeting this evening in the library rooms. Prof. Edward S. Morse spoke interestingly, as usual, upon some new methods of printing in colors. First, describing with chalk illustrations, the common mode of steel and copper engraving and printing, lithographs and wood cuts, and then showing by drawings and specimens the old and new way of color printing.

Monday, May 7, 1894.—Regular meeting of the Society this evening in the library rooms.

John H. Sears, of the Peabody Academy of Science, read some extracts and made some observations upon an

article of his now in process of printing entitled, "Evidences of subsidence and elevation in Essex County in recent geologic time as shown by field work at the seashore." He spoke particularly of this appearance at Nahant in the cove between Bass Point and the steamboat landing.

Prof. E. S. Morse exhibited additional photographs, etc., showing the work of the new process of color printing.

Necrology of Members.

Stephen M. Allen, son of Isaac and Betsey (Gilman) Allen, was born in Burton, now Albany, N. H., April 15, 1819; elected a member of the Essex Institute, Feb. 27, 1874, and died in Charlottesville, Va., Jan. 19, 1894.

George F. Brown, son of Samuel and Mary (Smith) Brown, was born in Salem, June 18, 1811; elected a member of the Essex Institute, Aug. 2, 1848, and died in Salem, June 11, 1893.

James P. Cook, son of John and Mary (Patfield) Cook, was born in Salem, Nov. 12, 1820, elected a member of the Essex Institute, July 27, 1865, and died in Salem, Oct. 23, 1892.

James B. Curwen, son of Samuel and Priscilla (Barr) Curwen, was born in Salem, Nov. 20, 1818; elected a member of the Essex County Natural History Society, June 18, 1845, and died in Salem, Mar. 23, 1894.

James Dugan, son of Bernard and Mary (Moran) Dugan, was born in Ireland in 1835; elected a member of the Essex Institute, Feb. 6, 1888, and died in Salem, June 8, 1893.

Willard Goldthwaite, son of Willard and Dolly (Johnson) Goldthwaite, was born in Weston, May 1,

1820; elected a member of the Essex Institute, July 6, 1864, and died in Salem, Sept. 1, 1893.

William A. Lander, son of William and Mary (Jenks) Lander, was born in Salem, May 8, 1816; elected a member of the Essex County Natural History Society, Mar. 12, 1846, and died in Salem, June 26, 1893.

William H. Simonds, son of William H. and Julia (Goldsmith) Simonds, was born in Salem, Dec. 3, 1843; elected a member of the Essex Institute, Feb. 7, 1876, and died in Salem, Oct. 29, 1893.

Oliver Thayer, son of Stephen and Rebecca (Oliver) Thayer, was born in Salem, Mar. 12, 1798; elected a member of the Essex County Natural History Society, Sept. 2, 1846, and died in Salem, June 1, 1893.

Charles P. Thompson, son of Frederick M. and Susanna (Cheesman) Thompson, was born in Braintree, July 30, 1827; elected a member of the Essex Institute, Feb. 21, 1876, and died in Gloucester, Jan. 19, 1894.

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Boston City Hospital,	1	1
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Boston, Massachusetts Society for Promoting Agriculture,		1
Boston, Massachusetts State Board of Agriculture,	2	12
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Cope, Gilbert, West Chester, Pa.,	1	
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Crane, Albert, Stamford, Ct.,	1	
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Leeds, Philosophical and Literary Society,		1
Leiden, Nederlandsch Entomologische Verein,		2
Leiden, Rijks-Universiteit,		3
Leipzig, K. S. Gesellschaft der Wissenschaften,		9
LeMans, Société d'Agriculture, Science et Arts de la Sarthe,		2
Lincoln, Nebraska State Historical Society,	1	
Lisboa, Academia Real das Sciencias,		34
Little, William, Newbury,		2
Lodge, Henry C., Nahant,		1
Logan, Walter S., New York, N. Y.,		1
London, Geological Society of,		2
London, Royal Geographical Society,		10
London, Royal Society,		13
London, Zoölogical Society of,		5
London, Entomological Society of Ontario,		14
London, Ont., Hellmuth College,		1
Los Angeles (Cal.) Public Library,		2
Lovett, William H., Beverly, Newspapers.		
Lund, Kongliga Universitetet,		3
Lyon, Académie des Sciences, Belles-Lettres et Arts,		8
Lyon, Société d'Agriculture, d'Histoire Naturelle et des Arts Utiles,		4
Mack, William,	1	56
Madison, Wisconsin State Historical Society,	63	13
Madrid, Observatorio de,	1	

Madrid, Sociedad Española de Historia Natural,		3
Maine, Secretary of the State of,	1	
Manchester Literary and Philosophical Society,		3
Manchester Museum, Owens College,		3
Manning, James,	8	
Manning, Rebecca, Newspapers and Circulars,		12
Manning, Richard C.,		106
Manning, Robert, Newspapers,	17	1556
Marburg, Gesellschaft zur Beförderung der Gesammten Naturwissenschaften,		2
Massachusetts Board of Managers, World's Columbian Exposition,	1	
Massachusetts, Commissioner of Public Records,	1	
Massachusetts, Secretary of the Commonwealth of,	13	1
Meek, Henry M., Newspapers.		
Meriden (Ct.) Scientific Association,		1
Michigan Agricultural College,		6
Milwaukee (Wis.) Public Museum,		1
Minneapolis (Minn.) Public Library,		1
Montreal Natural History Society,		2
Morgan, John T., Washington, D. C.,		1
Morse, Edward S., Newspapers,	28	1013
Morse, John G., Newspapers and Circulars,		46
Moscou, Société Imperiale des Naturalistes,		4
Moses, Zebina, Washington, D. C.,	1	
Moulton, Augustus F., Portland, Me.,	1	
München, K. B. Akademie der Wissenschaften,		9
München, Bayerische Botanische Gesellschaft,		1
München, Deutsche Gesellschaft für Anthropologie, Ethnologie und Urgeschichte,		7
Munster, Westfalischen Provinzial Verein,		1
Murphy Varnish Company, Boston,		1
Nahant Town Clerk,		1
Napoli, Accademia delle Scienze Fisiche e Matematiche,		6
Narbonne, Mary A.,	5	
Nashville, Tennessee Historical Society,		1
Nashville, Tennessee State Board of Health,		11
Nelson, William, Paterson, N. J.,		3
Nevins, W. S.,	1	52
Newark, New Jersey Historical Society,	5	47
New Haven, Ct., Yale University,		5
Newport, R. I., Redwood Library and Athenæum,		1
Newport, Vt., Rutland County Historical Society,		1
New York (N. Y.) Academy of Sciences,		3

New York, N. Y., American Geographical Society,		7
New York, N. Y., American Museum of Natural History,		8
New York, N. Y., Astor Library,		1
New York (N. Y.) Central and Hudson River Railroad,		1
New York (N. Y) Chamber of Commerce,	1	
New York (N. Y.) Genealogical and Biographical Society,		4
New York (N. Y.) Historical Society,	1	
New York, N. Y., Linnæan Society of,		1
New York (N. Y.) Mercantile Library Association,		2
New York (N. Y.) Microscopical Society,		4
New York (N. Y.) Scientific Alliance of,		2
New York, N. Y., Society of the Sons of the Revolution,	1	
New York, N. Y., The Holland Society of,	1	
Nichols, Andrew, jr., Bridgewater, N. H.,		1
Nichols, James B.,		2
Nichols, John H., Newspapers and Plans,	12	38
Nicholson, J. P., Philadelphia, Pa.,		1
Northampton, Smith College,		2
North Andover Town Clerk,		2
Nourse, Dorcas C., Newspapers.		
Noyes, Horatio N., Cleveland, O.,	1	
Nürnburg, Naturhistorische Gesellschaft,		1
Oliver, Mrs. Grace A., Newspapers,		18
Osborne, Arthur D., New Haven, Ct.,		2
Osgood, Frank S., Newburyport,	1	
Ottawa, Geological and Natural History Survey of Canada,		5
Ottawa, Royal Society of Canada,	1	
Ottawa, The Central Experimental Farm,		29
Page, Alfred B., Boston,		1
Paine, Robert T., Boston,		24
Palfray, Charles W., Newspapers and Music,	12	321
Palo Alto, Cal., Leland Stanford Junior University,		1
Paris, Journal de Conchyliologie,		4
Paris, Société d'Anthropologie,		13
Paris, Société des Etudes Historiques,		1
Paris, Société Entomologique de France,		13
Paris, Société Geologique de France,		3
Paris, Société Nationale d'Acclimatation,		25
Parker, Rev. Edwin P., Hartford, Ct.,		1
Parker, Theodore, Worcester,	1	
Payson, Edward H., Newspapers and Maps,	2	42
Peabody Education Fund,		1
Peabody, Peabody Institute,		1

Pearl, Joseph H., Bradford,		15
Peet, Rev. S. D , Good Hope, Ill.,		7
Pennypacker, Samuel W., Philadelphia, Pa.,	1	
Perkins, George A.,	1	6
Perley, M. V. B., Ipswich,		4
Perley, Sidney, Newspapers,		
Philadelphia, Pa., Academy of Natural Sciences,		2
Philadelphia, Pa., American Catholic Historical Society,		3
Philadelphia, Pa., American Philosophical Society,		3
Philadelphia, Pa., City Institute,		1
Philadelphia, Pa., Drexel Institute of Art, Science and Industry, Circulars.		
Philadelphia, Historical Society of Pennsylvania,		4
Philadelphia, Pa., Indian Rights Association, Circulars.		8
Philadelphia, Pa., Library Company of,		2
Philadelphia, Pennsylvania, Academy of Fine Arts,		1
Philadelphia, Pa., Zoölogical Society of,		2
Philbrick, Misses Eliza and Helen, Newspapers,	4	27
Phillips, Stephen H , Newspapers,	1	30
Phillips, Mrs. Stephen H.,		2
Phippen, Nathaniel,	2	
Pillsbury, Parker, Concord, N. H.,		1
Pingree, David, Newspapers,	86	169
Pitman, Adelaide, Music.		
Poole, William F., Chicago, Ill.,	1	
Pope, Albert A., Boston,		1
Porter, Rev. Edward G., Lexington,		1
Portland, Maine Genealogical Society,		2
Portland, Maine Historical Society,	6	11
Portland (Me.) Society of Natural History,		2
Poughkeepsie, N. Y., Vassar College,		16
Prague, K. K., Sternwarte,	1	1
Pratt, Francis G., jr., Boston,	1	
Providence, R. I., Brown University,		1
Providence, Rhode Island Historical Society,		4
Providence (R. I) Record Commissioners,	3	
Putnam, Eben, Newspapers and Circulars,	4	226
Putnam, Frederic W., Cambridge, Newspapers and Circulars.	17	762
Quebec, L'Université Laval,		2
Queensland Branch of Royal Geographical Society of South Australia,		11
Quill, D. W., Beverly,		
Rantoul, Robert S., Newspapers and Circulars,	2	177

Reinwald, C., et Cie, Paris,		11
Renwick, Arthur, N. S. W. Commissioner at World's Fair,	1	16
Rice, Miss M. C., Newspapers,		1
Richardson, Frederick P.,		1
Richmond, Virginia Historical Society,		2
Riga, Naturforschende Verein,		1
Rio de Janeiro, Museu Nacional,		1
Roberts, Misses A. and E. K.,	11	219
Robinson, John, Maps and Portraits,	177	356
Robinson, Mrs. John,	62	
Roblin, Rev. S. H., Boston,	1	
Rochester (N. Y.) Academy of Science,		1
Roma, Biblioteca Nazionale Centrale Vittorio Emanuele,		1
Ropes, Emmerton and Company,	142	12
Ropes, Mary P.,	27	104
Ruggles, H. S., Wakefield,		2
Sacramento, California State Library,	2	
Sacramento, California State Mining Bureau,		1
Sadler, Mrs. Charles J.,	17	17
St. John, Natural History Society of New Brunswick,		1
St. Louis (Mo.) Academy of Science,		5
St. Louis, Missouri Botanical Garden,	1	
St. Louis (Mo.) Public Library,		1
St. Paul, Minnesota Historical Society,	2	22
St. Pétersbourg, Académie Imperiale des Sciences,		1
St. Pétersbourg, Jardin Imperiale de Botanique,		1
St. Pétersbourg, Société Entomologique de Russie,		10
Salem Associated Charities,		1
Salem Athenæum,	8	7
Salem Electric Lighting Company,	1	
Salem, First National Bank,	131	485
Salem, Peabody Academy of Science, Newspapers,	9	79
Salem Public Library,	4	17
Salem Register,	23	59
Salem Savings Bank, Newspapers and Circulars,	64	295
Salem Water Works,	1	
San Diego, West American Scientist,		40
San Francisco (Cal.) Board of Supervisors,	1	
San Francisco, California Academy of Sciences,		3
San Francisco (Cal.) Mercantile Library Association,		2
San Francisco (Cal.) Technical Society of Pacific Coast,		4
Santiago, Société Scientifique du Chili,		2
Savannah, Georgia Historical Society,		1

Scudder, Samuel H., Cambridge,		1
Sears, John H., Circulars.		
Shanghai, China Branch of Royal Asiatic Society,		1
Shirley, George H., Brooklyn, N. Y., Newspapers.		
Silsbee, Mrs. William,		2
Silver, Mrs. Peter,		36
Simonds, William H.,	1	
Slade, Daniel D., Chestnut Hill, Newspapers,		3
Smith, Edward A., Newspapers,	22	73
Smith, Mary B., Wellesley Hills, Newspapers.		
Smith, Sarah E., Map,		12
Somerville Overseers of the Poor,	2	
South Boston, Perkins Institution and Massachusetts School for the Blind,		2
Spencer, Mrs. Sarah E., Ithaca, N. Y.,		1
Sprague, Henry H., Boston,	1	
Springfield City Library Association,		1
Springfield, Illinois State Board of Agriculture,	8	
Springfield, Illinois State Board of Health,		1
Springfield, Illinois State Laboratory of Natural History,		2
Springfield, Mo., Drury College,		1
Stavanger Museum,		1
Stickney, G. A. D.,	13	8
Stimpson, T. M., Newspapers.		
Stockholm, Entomologiska Föreningen,		2
Stockholm, Institut Royal Geologique,		26
Stockholm, K. Svenska Vetenskaps Akademie,	10	36
Stone, Robert, Newspapers.		
Sydney, Department of Agriculture of New South Wales,		2
Sydney, Linnean Society of New South Wales,		3
Sydney, Royal Society of New South Wales,		2
Tacoma (Wash.) Academy of Science,		3
Taunton, Old Colony Historical Society,		3
Taunton, Somersetshire Archæological and Natural History Society,		1
Thorpe, Francis N., Philadelphia, Pa.,		1
Tilton, John P., Newspapers,	1	
Todd, W. C., Atkinson, N. H.,	1	1
Tokio, Imperial University of Japan,		2
Tompkins, Edward, Oakland, Cal.,		1
Topeka, Kansas Academy of Science,	1	
Toronto, Canadian Institute,		3

Traill, Horace S.,	1	
Treat, J. Harvey, Lawrence,	1	
Trenton, New Jersey State Library,	2	
Turner, J. Horsfall, Bradford, Eng.,		5
Turner, Ross, ... Newspapers.		
Underwood, Mr., Boston, . . . Newspapers,	1	173
U. S. Bureau of Education,	3	4
U. S. Bureau of Ethnology,	2	2
U. S. Census Office,		3
U. S. Chief of Engineers,	7	
U. S. Chief of Ordnance,	1	
U. S. Civil Service Commission,	1	
U. S. Coast and Geodetic Survey,	1	5
U. S. Commissioner of Patents,		1
U. S. Department of Agriculture,	3	26
U. S. Department of Interior,	105	21
U. S. Department of State,	4	21
U. S. Director of the Mint,		1
U. S. Fish Commission,	2	
U. S. Geological Survey,	6	13
U. S. Judge-Advocate-General,		1
U. S. Life-Saving Service,	2	
U. S. National Museum,	1	4
U. S. Naval Observatory,	1	
U. S. Patent Office,		54
U. S. Quartermaster-General,	1	
U. S. Surgeon-General,	1	
U. S. War Department,	11	10
U. S. Weather Bureau,		14
Upsal, K. Vetenskaps Societeten,		1
Ward, C. J., Honorary Commissioner for Jamaica,	2	1
Ware, William R., Boston,	1	183
Waring, George E., Jr., Newport, R. I.,		1
Waring, Chapman and Farquhar, Newport, R. I.,		1
Warren, Fiske, Boston,	1	
Washington, D. C., Anthropological Society of,		5
Washington, D. C., Microscopical Publishing Company,		11
Washington, D. C., National Academy of Science,		1
Washington, D. C., Smithsonian Institution,	4	6
Washington, George, Committee of Centennial Celebration of the Inauguration of,	1	
Waterhouse, S., St. Louis, Mo.,		8
Watertown, Historical Society of,		1
Waterville, Me., Colby University,		2

Watson, Caroline A., North Andover,		2
Watson, S. M., Portland, Me.,		2
Webb, Arthur N.,		1
Webb, Mrs. John K.,		1
Weeden, William B.,		1
Welch, William L., Newspapers,	9	125
Welsh, Herbert, Philadelphia, Pa.,		1
Wendell, Barrett, Cambridge,	1	
Wheatland, Elizabeth,		3
Wheatland, Henry,	1553	399
Whipple, George M., Newspapers,		30
Whipple, Prescott, Newspapers and Circulars,	1	66
White, Andrew C., Ithaca, N. Y.,		1
White Plains, N. Y., Westchester County Historical Society,		1
Whitney, Mrs. H. M., North Andover, Newspapers,		26
Wien, K. Akademie der Wissenschaften,	1	13
Wien, K. K. Geologische Reichsanstalt,		14
Wien, K. K. Naturhistorische Hofmuseums,		24
Wien, K. K. Zoologisch-botanisch Gesellschaft,		4
Wien, Verein zur Verbreitung Naturwissenschaftlicher Kenntnisse,		3
Wiesbaden, Nassauischer Verein für Naturkunde,		1
Wilkes-Barré, Pa., Wyoming Historical and Geological Society,		1
Willcomb, Oliver C., Lynn,		1
Willson, Rev. E. B., Newspapers and Circulars,	3	108
Winnipeg, Historical and Scientific Society of Manitoba,		2
Winsor, Justin, Cambridge,		38
Worcester, American Antiquarian Society,		3
Worcester, Clarke University,		2
Worcester, Society of Antiquity,		2
Wright, Frank V., Hamilton, Newspapers and Circulars,		97
Wright, W. H. K., Plymouth, Eng.,		3
Wurzburg, Physikalisch-Medicinische Gesellschaft,		16
Youmans, William J., New York, N. Y.,	2	413
Zurich, Naturforschende Gesellschaft,		4

The following have been received from editors and publishers :

American Journal of Science.
American Naturalist.
Beverly Citizen.
Cape Ann Advertiser.
Chicago Journal of Commerce.
Danvers Mirror.
Georgetown Advocate.
Groton Landmark.
Home Market Bulletin.
Iowa Churchman.
Lawrence American.
Le Naturaliste Canadien.
Lynn Item.
Lynn Transcript.
Marblehead Messenger.
Musical Record.
Nation.
Nature.
Open Court.
Peabody Advertiser.
Peabody Press.
Salem Gazette.
Salem News.
Salem Observer.
Salem Register.
Traveler's Record.
Voice.
Zoologischer Anzeiger.

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Cuvier Natural History Society.
Davis, Warren P.
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Jewett, Daniel H.
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Mansfield, Emeline.
Melcher, George B.
Mercantile Library Association,
Mercantile National Bank, San Francisco.
Messervy, Mrs. Lucy J.
Mitchell, Mrs. John A.
Morse, Edward S.
Morse, Mrs. Edward S.
Nelson, William H.
Nichols, John H.
Nolcini, C. A.
Oliver, Sarah E. C.
Osborne, Alice H.
Palfray, Charles W.
Payson, Edward H.
Peabody Academy of Science.
Peabody, George W.
Pearson, Elbridge G.
Philbrick, Helen and Eliza.
Phillips, S. H.
Phippen, Nathaniel.
Pickering, Mrs. John.
Pierce, Charles H.
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Ropes, Joseph.
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Salem Light Infantry Veteran Association.
Salem Observer.
Salem Police Relief Association.
Salem Public Library.
Savory, T. T.
Silsbee, Mrs. William.
Simon, E. A.
Smith, Edward A.
Stickney, G. A. D.
Stickney, Walter J.
Stone, Arthur R.
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Thompson, Joseph P., Portland, Me.
Tilton, John P.
Towle, Rev. E. D.
Trask, John L. R., Springfield.
Treadwell, J. Russell.
Treat, John Harvey, Lawrence.
Valentine, H. E., Boston.
Walton, E. N.
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Weil, George L.

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Wright, Frank V., Hamilton.

REPORT ON THE GEOLOGY OF ESSEX COUNTY, MASSACHUSETTS, TO ACCOMPANY MAP.

BY JOHN H. SEARS.

(Curator of Mineralogy and Geology, Peabody Academy of Science. 1894.)

A COMPLETE account of the geology of even so small an area as that of Essex County could only be given after devoting the time of a long life to the work in the field and laboratory. I do not, therefore, pretend to offer this report as a completed account, but rather as the results of several years' continuous devotion to the study of our rocks; rocks of such a complex character that in many cases their satisfactory determination seems almost hopeless.

In justice to those who have previously investigated the rocks of the county, and to assist future workers in this field, a list of books and papers which have come to my notice, treating more or less fully of the subject, is appended. In making this list I have been greatly aided by the notes of Dr. M. E. Wadsworth on the Mineralogy and Petrography of Boston and Vicinity, published in the Proceedings of the Boston Society of Natural History, vol. XIX, p. 217, 1877. Nearly all that has been published, however, is of a general character, very little being given in detail.

With the exception of the centennial map of the geology of Massachusetts published in the Proceedings of the

Boston Society of Natural History, in 1876, by Prof. W. O. Crosby, and the maps accompanying the ninth annual report the U. S. Geological Survey of a part of Cape Ann, by Prof. N. S. Shaler, 1890, no other attempt, so far as I am aware, has been made to map the bed rock of any portion of the county.

The atlas sheets of the State Topographical Survey, based on the U. S. Topographical Survey, have been used in the construction of the accompanying map and all plotting of the various formations has been done upon the separate sheets in the field, thus giving more accuracy to the work than could otherwise have been possible.

In connection with the map work, at the outset, it was planned to obtain as nearly a complete collection as possible of the minerals and rocks of the county for exhibition in the cabinet of the Peabody Academy of Science. With this in view persistent collecting has been done each year since 1887. Several thousand specimens of the minerals and rocks have thus been obtained from all parts of the county and covering nearly every outcrop. As the work proceeded it soon became evident that a more accurate map of the bed rock was needed than had been made by previous workers, necessitating a very careful study of the contacts, strike, dip and trend of the rock-masses. Owing to the difficulty of obtaining fresh, unaltered specimens of the outcropping rocks constant drilling and blasting have been required to procure good specimens unaffected by the weather. This, together with the care needed to verify and correct the accounts of previous investigators, has made the work exceedingly slow and laborious.

Many days, and even months, have been devoted to the study of rock specimens from one single station, while, later, renewed field work was required to correlate evi-

dence obtained by microscopic and microchemical analyses; and this, often, in cases where the rock at first appeared to be of some familiar sort and its determination once completed satisfactorily.

While mapping the bed rock it was found that notes upon the drainage and watershed of the county could be made at the same time and thus prepare material for a second map. This work is now nearly completed. Work on the glacial phenomena in the county, represented by the drumlins, moraines, stratified and unstratified drift, kames, eskers, smoothed, striated and grooved surfaces on the various outcropping rocks, has been in progress and the material for a third map is thus well under way.

At the end of each year a report of progress has been made to the Trustees of the Peabody Academy of Science, while during the same time several papers have been prepared which have been accepted and published by the Essex Institute. They are as follows:

Geological and Mineralogical Notes: No. 1. On Sodalite from Salem Neck and Vicinity (Bulletin Essex Institute, Vol. XXI, 1889).

Geological and Mineralogical Notes: No. 2. The Stratified Rocks of Essex County (Bulletin Essex Institute, Vol. XXII, 1890).

Geological and Mineralogical Notes: No. 3. The Elæolite-Zircon-Syenites and Associated Rocks of Essex County (Bulletin Essex Institute, Vol. XXIII, 1891).

Geological and Mineralogical Notes: No. 4. The Extent and Probable Thickness of the Crystalline Cambrian Deposits in Essex County (Bulletin Essex Institute, Vol. XXIII, 1891).

Geological and Mineralogical Notes: No. 5. Augite-Syenite, Vom Rath (Bulletin Essex Institute, Vol. XXIV, 1892).

Geological and Mineralogical Notes: No. 6. On the Occurrence of Augite and Nepheline-Syenites in Essex County. (Bulletin Essex Institute, Vol. xxv, 1893).

A paper (Bulletin Museum Comp. Zoology, Harvard University, Vol. xvi, No. 9): Keratophyre from Marblehead Neck.

Other papers are in course of preparation on the quartz-augite-diorite; the granitic arkoses of the northern part of Essex County and on the conglomerates and interstratified red slate, limestone and quartzite beds of Middleton, Topsfield and Boxford.

In studying the rocks for the preparation of these papers over one thousand thin sections and slides have been made for microscopical and microchemical tests in determining the minerals composing them. The determinations have all been made at the petrographical laboratory of Harvard University with the kind assistance of Dr. J. E. Wolff.

The classification here employed largely follows that of Professor Rosenbusch of Heidelberg University, as given in "Notes to Accompany a Tabulation of the Igneous Rocks based upon the system of Prof. H. Rosenbusch," by Frank D. Adams, Lecturer McGill University; published in Canadian Record of Science, Dec., 1891.

PLUTONIC ROCKS: HYPIDIOMORPHIC GRANULAR STRUCTURE.

No. 1. Hornblendic-Granitite.

This name was given to the granitic rocks of Cape Ann by Dr. M. E. Wadsworth and is equivalent to the biotite-granitite of Professor Rosenbusch. Under the general type there are several varieties, either coarse or fine grained, and containing little or much biotite. The Peabody and Lynnfield granitites contain little biotite, while in the Gloucester and Rockport granitites there

is much biotite. There are also local variations in color due to inclusion of other minerals in the feldspars. The Pigeon Hill and Lanesville granitites are of a greenish color, while the granitite from Wenham and Ipswich is grayish white. In a few areas the quartz is in excess while in others there is little quartz which is of a smoky color. Examples of this are seen in the upper opening of the Rockport Granite Company's quarry at Rockport. Thin sections of this hornblendic-granitite when studied with the microscope show it to be composed of the following minerals: orthoclase, microcline, microperthite which is composed of simple twinned albite crystals intergrown across the twinning plane of the microcline, hornblende of the green variety, sometimes altered to glaucophane, much quartz and biotite; with biotite, fluorite, garnet, zircons, actinolite and magnetite as accessory minerals in the feldspars. Nearly all of the rocks of this formation show evidence of subjection to a great strain or crushing force, as most of the original minerals have numerous cracks which have been filled with a secondary formation, either biotite or glaucophane.

Minerals in the thin sections from the Cape Ann Granite Company's quarries are as follows: quartz in large patches which is greatly cracked and crushed, orthoclase, microcline, some plagioclase, microperthite, hornblende, a little biotite, some muscovite, large patches of magnetite, some quite large microscopic zircons, epidote and limonite. The feldspars are much decomposed. This section is nearly identical with sections of the same rock from Wenham, Hamilton and Ipswich.

No. 2. Granophyric-Granitite; Contact Zone.

This rock formation is quite variable in texture according to its position in the rock-mass. Near the exact con-

tact it is a coarse, friable, reddish-colored rock; at the centre of some of the larger masses it is fine grained and compact, resembling quartz porphyry, while it is often seen, in portions of larger masses, with a distinctly stratified form. This last form is clearly due to flows or streams of the minerals in the magma of which the rock was composed previous to its consolidation. Near Bass Rock, East Gloucester, every variety of this rock-mass can be seen near the contacts of the augite-syenite and the hornblende-granitite. Microscopic investigation of thin sections of this rock shows that it is composed of the following minerals: quartz, orthoclase, augite, hornblende, biotite, colorless garnet, magnetite, iron-pyrite, glaucophane. The orthoclase has intergrowths of albite forming microperthite and these microperthite areas are honeycombed with quartz forming a micropegmatitic mass which, under cross nicols in polarized light, resembles a beautiful mosaic.

No. 3. Augite-Nepheline-Syenite.

This number covers a great variety of forms of this rock-mass which on a map of a greater scale could be subdivided as elæolite-zircon-syenite, mica-syenite, hornblende-syenite, quartz-hornblende-syenite, quartz-augite-syenite and ægerine-syenite; besides pegmatitic masses containing sodalite, ægerine, acmite, ainigmitite, hydronephelinite, zircons and lepidomelane. There are numerous areas in which foliation is developed as in No. 2. For a fuller description of these rocks see Geological and Mineralogical Notes, No. 6, Bulletin of the Essex Institute, Vol. xxv.

No. 4. Hornblende-Diorite.

In part of this area the rock-mass is distinctly an augite-hornblende-diorite. This is particularly well seen at

Marblehead near the old fort, and on Gerry's Island. In Danvers and Beverly there are numerous small porphyritic and pegmatitic masses of this formation. At Putnamville, Danvers, foliation in these rocks has produced a form which has received the distinctive name of amphibolite-gneiss. A technical description of this formation will be found in Geological and Mineralogical Notes, Nos. 3-4, Bulletin of the Essex Institute, Vol. XXIII.

No. 5. Quartz-Augite-Diorite.

This formation has three distinct forms: quartz-augite-diorite, quartz-hornblende-diorite and quartz-augite-mica-diorite. It has its greatest development in Newburyport, Salisbury and Seabrook, and extends in a southwesterly direction through the towns of Georgetown, Boxford, Middleton and Andover. The form quartz-augite-diorite which I have taken as the type is seen in all parts of the area. Thin sections of the rock from Newburyport, at the old quarry opposite Carr's island, and from Salisbury, give the following minerals: uratilized augite with occasional masses of typical augite, hornblende, biotite, plagioclase having the extinction angle of labradorite, some orthoclase and quartz, an abundance of chlorite, considerable calcite of secondary origin, numerous crystals of apatite, fine acicular crystals of rutile, large micro-zircons, iron-pyrites and magnetite.

No. 6. Muscovite-Biotite-Granite.

This is the typical granite of Rosenbusch and only occurs in Essex County in the towns of Andover and North Andover. Thin sections show that it contains the following minerals: orthoclase, microcline, some plagioclase, quartz, muscovite, biotite, hornblende, numerous garnets, rutile in long needleshaped crystals, magnetite and limonite.

No. 7. Granitic-Hypersthene-Diabase (Norite).

Rocks of this type occur at Nahant, but not elsewhere in Essex County. The granitic-hypersthene-diabase, a distinctive type, is the principal rock-mass of Little Nahant and at Nahant, east of the Maolis Garden, while on Bass point this rock is in part an augite-hypersthene-norite. On Pea island and the ledge adjoining it at Nahant it has the panidiomorphic structure of the dyke rocks, interrupted by areas of porphyritic structures of the older effusive rocks.

EFFUSIVE VOLCANIC ROCKS; PORPHYRITIC STRUCTURES, INCLUDING VOLCANIC FRAGMENTAL ROCKS, TUFFS, BRECCIA AND AGGLOMERATE.

No. 8. Rhyolites; Quartz-Porphyry.

Under this head are united all of the so-called felsites, banded felsites, porphyry-felsites, breccia-felsites, agglomerate and altered or metamorphosed forms of this rock mass. On Cat island and on Marblehead Neck, south east of the lighthouse, are good exposures of the form called agglomerate or rhyolitic-tufa containing sharp edged fragments of volcanic glass embedded in ashy materials. Much of this glass has been altered to quartz and the ashy material to an earthy chloritic mass, but it has the same general character as specimens from Breakheart hill in Saugus, described by Prof. J. S. Diller in the Bulletin of the Museum of Comparative Zoölogy, Vol. VII, No. 11, p. 168. The entire area covered by these rocks is too small to attempt to indicate the various forms assumed on a map of this scale, but it is intended to prepare a map, in the near future, on a scale large enough to bring out the principal features of all of the varieties of this most interesting formation. Prof. George

H. Williams, in a recent paper on a similar outcrop in the Cumberland Valley proposed the distinctive name of "the ancient volcanic rocks" for this formation.

OLIVINE ROCKS CONTAINING NO FELDSPATHIC CONSTITUENT.

No. 9. Serpentine-Peridotites.

This formation has its greatest development in the region of Newbury, two of the principal outcrops being in localities popularly known as the Devil's den and the Devil's basin. They are represented on the map by numbers on the outcrops. Since the area was mapped, microscopic studies of thin sections of these rocks have proved the presence of much augite and hornblende with the serpentine surrounding them, and also developed in the cleavage cracks of these minerals, thus proving that the rock-mass was originally an augite-hornblende-picrite-peridotite. The outcrops in Lynnfield, Peabody and Boxford while probably of the same character have not at present been absolutely proved as such. Sections studied thus far are composed of serpentine and magnetite with colorite and other minerals.

No. 10. Biotite-Mica-Peridotite.

This rock-mass appears on the banks of the Skug river in Andover. When studied from thin sections it is seen to be composed of biotite-mica which is bleached to a nearly white color, calcite, talc, serpentine and magnetite surrounding irregular patches of olivine which is rare, some tremolite and a few small masses of augite which is also surrounded by serpentine.

ARCHEAN ROCKS.

No. 11. Hornblende-Granitic-Gneiss.

This rock-mass which has its greatest development in Middleton, Boxford and Georgetown, has the appearance of an ancient rock by being greatly folded and crumpled, by being cut by veins and tongues of diorite and granite rocks and, also, from its position, being in part below the lower cambrian gneisses. Conclusions made from these field evidences indicate that it is one of the oldest rock-masses of the region, and it should be placed in archean time, the equivalent of the Canadian Laurentian period.

No. 12. Porphyritic-Granitic-Gneiss.

This formation occurs in Georgetown, West Newbury and Amesbury. It is much like the last one described, but contains numerous large porphyritic crystals of microcline which are invariably developed across the plane of the stratification of the rock-mass. The whole area has been subjected to great strain by a down throw fault in the river Parker valley between Georgetown and West Newbury. This strain is seen in the large porphyritic crystals, nearly all of them being cracked, bent or broken. For fuller account of these last two gneisses (Nos. 11 and 12) see Bulletin of the Essex Institute, Vol. XXII, Geological and Mineralogical Notes No. 2.

ARKOSE : CONGLOMERATE-GRANITE.

No. 13. Muscovite-Granitic-Gneiss.

During the past season many additional thin sections of the rocks from all over the area where this formation occurs have been studied in the laboratory with the microscope, throwing much light upon this otherwise little

known class of rocks. The conclusion reached is that these rocks are arkoses and belong to a series of more or less crushed granite conglomerates which have been washed and reconsolidated from the decay of the muscovite-biotite-granite of the region, or from some similar rock farther to the north.

SCHISTOSE FOLIATED ROCKS.

No. 14. Amphibolite-Gneiss.

Where this rock-mass occurs in the diorite area it is clearly proved to be a flow structure caused by currents of minerals in the diorite magma. This seems to be especially clear in the Peabody and Danvers regions. The outcrop near Crooked pond in Boxford is entirely surrounded by the archean gneiss and is probably a remnant of some metamorphosed Cambrian slate. This is also probably the case at Rooty plain in Rowley. The outcrop in Newbury of this rock-mass from its position, interstratified with limestones, slates and gneisses, is of undoubted Lower Cambrian age, a metamorphosed Cambrian slate.

CRYSTALLINE ROCKS STRATIFIED. METAMORPHIC ROCKS OF CLASTIC ORIGIN.

No. 15. Mica-Schist and Sandstone.

These two rock-masses are invariably interstratified and in some places are seen as members of the Lower Cambrian sediments. The schist is undoubtedly a metamorphosed slate.

No. 16. Corderite-Gneiss.

This rock formation is another member of the Cambrian series and is well developed in North Andover and north of Bald Pate hill in Georgetown.

No. 17. Zoicite-Gneiss.

This is still another member of the Cambrian sediments and should in places be called zoicite-epidote-gneiss. It belongs to the series of metamorphosed slates and sandstones.

No. 18. Limestone, Slate, Quartzite and Sandstone.

This formation comprises the interstratified members of the Olenellus Lower Cambrian fossiliferous beds.

No. 19. Conglomerate-Granite. (Arkose.)

This is composed of large pebbles of granite, limestone and mica-schist.

No. 20. Bostonite or Keratophyre.

Bostonite is the name given by Professor Rosenbusch to a series of dyke rocks of the same composition as the keratophyre, which is distinctly a surface flowing lava and not a dyke. Careful investigation has proved that it covers a coarse breccia and other members of the rhyolite and quartz-porphyries on a nearly level floor gently sloping into Marblehead harbor.

No. 21. Tinguaite Dyke.

This dyke is seen in Manchester cutting the hornblende granitite and augite-nepheline-syenite at Pickard's point. It is the only recorded occurrence of this rock formation in Massachusetts.

HYPIDIOMORPHIC STRUCTURE.

No. 22. Essexite.

This formation is found in numerous outcrops on Salem neck, Winter island, and at Beverly and Marblehead. It is the type of a basic-augite-nepheline rock, quite porphyritic, and of a nearly black color. It is very different

from any of the syenites previously described and was named from the county of Essex, being peculiarly local in its occurrence.

EFFUSIVE VOLCANIC DYKE ROCKS.

No. 23. Quartz-Porphyry Dykes.

This number is placed on outcrops of this rock to distinguish a series of narrow quartz-porphyry dykes which are of a later age than the quartz-porphyry and rhyolite of the ancient volcanic series, inasmuch as these narrow dykes are seen cutting the latter.

No. 24. Arkose: Conglomerate-Granite.

A typical granitic-breccia found at Magnolia on the southwest side of Crescent beach and in Saugus Centre.

No. 25. Diallage-Gabbro: Pyroxene Rocks.

These are massive dykes first noticed by Dr. M. E. Wadsworth.

EFFUSIVE VOLCANIC ROCKS, YOUNGER SERIES.

No. 26. Liparite Dyke.

This is a dyke about seven feet wide cutting the diorite and granite in Throckmorton's cove on the Marblehead side of Forest river. Thin sections show that the ground mass of this rock is composed of a felting of sanidine crystals, enclosing numerous long porphyritic crystals of sanidine; quite large crystals of quartz, surrounded by a fringe of spherulites, and having inclusions of augite and hornblende crystals; blebs of chalcedony, surrounded by a ferrugineous feathery mineral, and the whole thickly covered with spherulites.

CRYSTALLINE ROCKS OF CLASTIC ORIGIN.

No. 27. Red-Slate: Jaspelite.

This rock occurs in Saugus Centre, Lynn and Nahant.

It has been classed by authors as one of the felsite series, but in thin sections, studied with the microscope, it is seen to be composed of clastic grains of quartz and feldspar in a ferrugineous pasty cement. At Saugus Centre it is interstratified with a conglomerate and is clearly one of the lower members of the Olenellus Cambrian rocks.

No. 28. Andalusite-Schist.

This rock which is seen in Crescent cove, Nahant, at Glenmere, Lynn, and also in Beverly, at the base of Goat hill, is a metamorphosed slate with veins of andalusite developed in the bedding planes.

VEIN ROCKS.

No. 29. Lead, Silver and Copper Ores.

This number only occurs on the map to mark outcrops where I have actually collected specimens of these ores.

As the town boundary lines have been placed upon the map, thus making the location of the various rock-masses comparatively simple, and as the numbers are invariably placed upon the outcrops of the rocks designated, further explanations seem superfluous.

In printing the map a few unimportant errors have crept in and some smaller outcrops are omitted which will be treated in other papers hereafter. The figure 18, indicating limestone, slate and sandstone, placed at the southeast of Glenmere, Lynn, should have been placed between Glenmere and lake Wenuchus and covering the territory to near Brown's pond in Peabody. Near lake Wenuchus may be seen a fine contact of the slate and hornblende-diorite, and west of Mr. Shorey's house, at the foot of Detroit street, there are good contacts showing the hornblende-granitite cutting the old Cambrian slates.

In closing this report I desire to acknowledge my in-

debtedness to Mr. John Robinson, of the Peabody Academy of Science, for his kind assistance and encouragement throughout the work, to the Essex Institute for the generous manner in which my papers and map have been published, and especially to Mr. T. F. Hunt of the Institute's publication committee, and also to Mr. David Pingree for his gift of the petrographical microscope. I feel under great obligations to Dr. J. E. Wolff, instructor in the Petrographical Laboratory at Harvard and to Prof. N. S. Shaler, for their very kind assistance and advice; and I desire to dedicate this map to the Lawrence Scientific School in acknowledgment of this kindness and the friendships formed there while one of its students.

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JOHN H. SEARS.

Peabody Academy of Science.
Salem, Sept., 1894.

BULLETIN

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ON THE SO-CALLED BOW-PULLER OF ANTIQUITY.

BY EDWARD S. MORSE.

IN many of the European Museums one finds in the Department of Classical Archæology a curious bronze object included with the Etruscan, Roman, and Greek collections. This object usually bears the name of *Bogenspanner*, *Buespander*, *Tira Archi*, *Tira del Arc*, etc., according to the nationality of the Museum.

An examination of this object convinced me that it was not a bow-stretcher, or arrow-pull. A further study persuaded me that it had nothing whatever to do with the archer's bow. Realizing that a step would be taken if it could be demonstrated that it was not an archer's implement I began the accumulation of material in the form of sketches and other memoranda of these objects from the private collections of C. J. Longman, Esq., of London, Prof. Henry W. Haynes, and of the lamented William

Hammer, Esq., of Copenhagen, and from the unrivalled collection of armor and weapons of Louis Richard Zschille, of Grossenhain, which was exhibited at the Columbian Exposition, and from the Louvre, the British Museum and the Museums of Zurich, Brussels, Antwerp and the University of Pennsylvania.

It seemed with the material at my command that some light might be thrown on the uses of this object, but after a greatly interrupted study of it for over seven years I reluctantly yield the solving of the enigma to others, having got no nearer an explanation of it than when I first began, contented, however, with the conviction that the usual attribution assigned to it has been disproved.

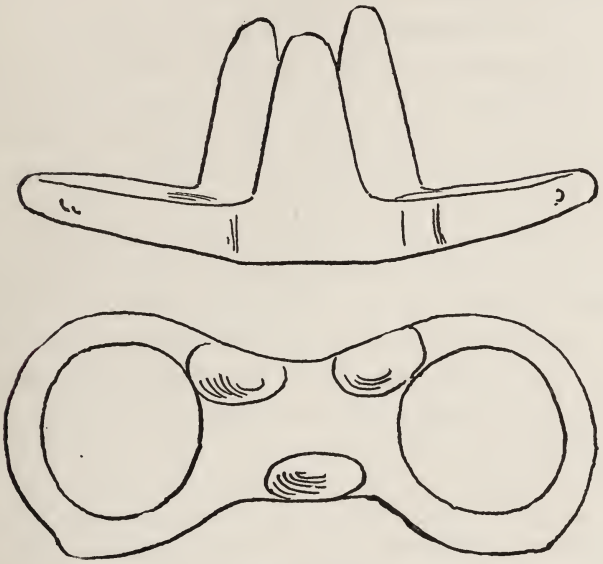
I must here express my indebtedness to Mr. Edward Robinson, Curator of Classical Antiquities of the Boston Museum of Fine Arts, for numerous references to works containing allusions to this object. To Prof. Henry W. Haynes, I am also under obligations for important citations; and to Mr. Ross Turner, for two examples which he purchased in Florence; also to Mr. Dwight Blaney, for a number of sketches of bow-pullers in the Museum of Archæology, at Florence, and in the British Museum.

To the courtesy of Mr. Stuart Culin, Director of the Museum of Archæology, University of Pennsylvania, and to Mrs. Cornelius Stevenson, Curator of the Mediterranean Collections, I am indebted for the privilege of figuring the superb example on Plate I.

As the object under discussion has been almost universally labelled bow-stretcher in museum collections I shall use a similar term bow-puller in referring to it.

The bow-puller is usually of bronze, rarely of iron, roughly cast. (The accompanying figures 1, 2 and 3, in outline, represent the front, top and side views respectively of a plain form of bow-puller; on Plate I are shown in half-tone the front and top views of the plain and the

ornamented form of bow-puller.) It is in the form of two rings springing from a solid centre. The two rings might



FIGS. 1 and 2.

be compared to the frame of a pair of eye-glasses, only in place of the delicate spring connecting the rings, the intervening space is solid metal though less in width than the transverse diameter of the ring (see plan, Fig. 2). This space may be called the body, and from this body spring three spines at right angles to the plane of the rings. It will be observed that the rings are not on a plane but turn slightly upward so that the object rests on the body. This feature is very marked in some specimens though in rare instances the rings are in a plane, and in very rare cases bend slightly

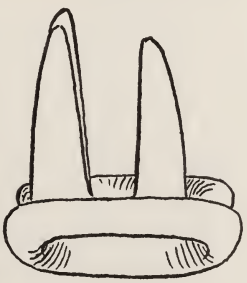


FIG. 3. End View.

downward. The spines are arranged in a triangle, the perpendicular of which is at right angles to the longitudinal axis of the body. It will be seen by the plan that the base of one spine is on one side of the longitudinal axis, while the other two spines are on the opposite side of this axis and parallel to it. It will be observed that when any ornamentation is present (see Plate III), it is always on that side from which the single spine springs; furthermore when an animal's head is part of the ornamentation the head invariably points downward when the object is resting with the spines pointing upward. From these facts it is safe to assume that the object has a front and back, and an above and below. The longitudinal axis should really be the fore and aft axis, but for convenience of description I have indicated the greatest length of the object as the longitudinal one. All embossments, ribs, cross-hatchings, circles, depressions, etc., are on the front side of the object, or on that side from which the single spine springs. On the front sides of the rings, also, inequalities are often found, usually duplicated on both sides. These may be small swellings, strongly marked knobs and in some cases phalli conspicuously modelled. The knobs suggest rudimentary phalli.

There are two leading types of these objects, one in which the rings are slender (see Plate II), the outline when looking down upon it showing only a narrowing between the rings; a section of the outer part of the ring is round, or an oblique oval as in Fig. 1, Plate IV. In this type there is no ornamentation whatever, though the front side of the rings may show slight inequalities as if rudiments had survived of previous embossments. The upward turning of the rings is more marked and the spines are usually shorter than in the other type in which the rings are thick and ponderous (see Plate III), and a section of the outer part of the ring resembles the section of a

cylinder as shown in Fig. 3*a*, Plate III. The front side is conspicuously ornamented with circles, cross lines, vertical ribs, knobs, and in a few cases with the phallic emblem on each side and pointing away from the centre. At the base of the front spine a steer's head is sometimes seen in high relief, or a lion's head with a lion on both sides, stretching toward it. The outline of the object shows strong indentations and the spines are usually heavier and longer. In both types the spines vary greatly in form; the paired spines may be widely separated at their bases, or united nearly to their apices; the bases of the three spines may be close together, or a space of a centimeter or more may separate the front spine from the back spines; the spines may be long and pointed or they may be very short and blunt; they may be round, square or angular in section or elongate oval (Plate IV, Fig. 8), but in the latter case the flattening is parallel to the longitudinal axis of the object. The three spines may be of equal length, or may vary; in some the front spine is the longest, in others the two back spines are longer. The paired spines may also vary, sometimes the left one, sometimes the right one being the longer. While there is no uniformity in the length, thickness or form of the spines, the larger number of bow-pullers have three spines, though they are found rarely with four spines (Plate IV, Fig. 1), sometimes long and tapering and again in the shape of four short knobs (Plate IV, Figs. 2, 3, 4).

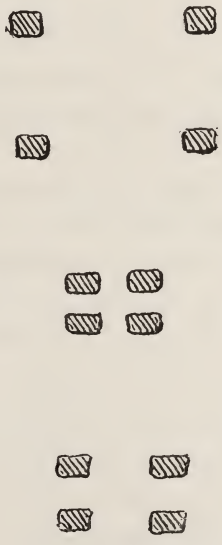


FIG. 4.

In this form the knobs may be widely apart or close together (Fig. 4). Furtwängler figures one from Olympia with five spines (Fig. 5), and in the Zschille collection is one with two spines only (Plate II, Fig. 9), these being the paired ones with no trace of a front spine having existed.

While the decoration is generally duplicated on either side, that is, the bilateral symmetry of the object is carried out in the decoration, I have never seen two bow-pullers alike or in pairs.

FIG. 5.

The objects in their extreme length, measured from the outer edges of the rings and the inner edges of the openings across the solid body are remarkably constant. The dimensions are as follows:

Mean of heavy form—length, 71.0; between rings, 19.3
" " light " " 67.8; " " 20.7

The average deviation from the mean is greater in the light forms and the space between the two rings, or across the body, has a slightly larger average in the light forms.

In the few bow-pullers I have had an opportunity of studying minutely, the signs of wear are such as would be produced by a cord, rope, or leathern strap passing through the rings and under the body as in the accompanying figure (Fig. 6, A B strap). The signs of wear are very marked in some specimens. The outer surface of the back spines also shows marked evidences of wear in some cases.

FIG. 6.

The objects are sometimes found broken and the manner of breaking is of importance. The outer portion of one or both rings is broken away (Fig. 7, also Plate IV, Figs. 5, 6, 7), indicating the direction of the strain to have been outward, and probably downward, as if the strap or cord was used in binding the object to some body, and the method of wear would sustain this proposition. The spines also in rare cases are found broken and it is usually the outer spine which is mutilated in this way. The tip of the front spine is in some cases bent inward. In no case have I seen a specimen with the spines bent outward. The object, whether heavy or light, has been designed for strength.

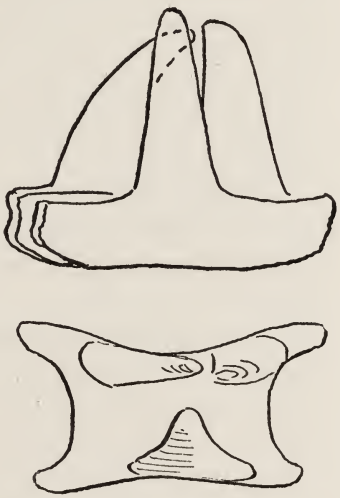


Fig. 7.

The bow-puller shown in Fig. 5, Plate II, has an opening in one of the rings; this is probably the result of an imperfection in casting and not intentional. The same may also be true of a round protuberance on the front of one of the rings of a bow-puller (Fig. 6, Plate II). The curious groove seen in the inner edge of the outer part of the ring in Fig. 3, Plate II, is unique so far as I know.

In an object varying so much in weight, number and length of the spines, ornamentation, or absence of it, the features which seem to have an importance in considering their probable use are first and foremost the two rings springing from the solid body and their usual upward

inclination and the uniform length of the object (the average deviation from the mean being very slight), the evidence that the object has a front and back, and an above and below, the spines springing at right angles to the plane of the rings. With these constants, so to speak, might be added the importance of those surfaces showing signs of wear, as well as the bending of the spines and manner of breakage.

The bow-pullers are found associated with Etruscan, Early Roman and Early Greek remains; they belong to pre-classic and early classic times. They have been found in the tombs of warriors. In two examples figured by Strobel, chains with large 8-shaped links are drawn through them (Fig. 10). It was the association of the chain in this way that led Strobel to conceive the object to have been designed for some form of snaffle or curb for horses. Reference to Strobel's memoir will be made further on.

While in nearly every instance this object is labelled in museums bow-stretcher or bow-puller, authorities have not fully accepted this interpretation without question. Gozzadini in his memoir on the ancient Etruscan Cemetery of Marzabotto near Bologna says: "Archæologists have agreed, but I do not know on what foundation, in supposing that certain double rings provided with three points were used by archers by inserting the middle and fore finger in order to stretch the cord. Now this attribution is strengthened by Tommsen, Director of the Museum at Copenhagen, who told Cavedoni that some 'of these implements were found placed together with bronze bows in caves in the northern countries.' They are found in all Egyptian, Etruscan and Roman Museums and they are taken out of Lacustrian stations, and *Torbiere* (Pit graves ?) and they find them again in opening the Necropolis of Marzabotto without, however, that phallic sign

which occurs on others. For the same purpose were possibly three other double rings the peculiarity of which is that they have three small points." Gozzadini figures two of these objects which are reproduced on Plate V, Figs. 20, 21.

Friederichs, in his catalogue of bronzes in the Berlin Museum, protests against the usual interpretation of the use of this object without, however, offering any suggestion as to its possible character. He says, " As a foundation for the common acceptation that the implements here catalogued should have served the purpose of pulling the bow I have been able to find only one observation, namely of Tommsen who has rendered good service in the sphere of northern Archæology. According to his statement these objects have been found together with bows in the caves of northern nations. However, this circumstance is not sufficient to confirm the supposed purpose, all the more as it is absolutely impossible to understand how this implement is to be used; particularly those having five points (for they have been found with three, four and five points) are entirely inexplicable from this point of view. In Naples the implements are exhibited among articles pertaining to harness, but I cannot specify how and where they should have been applied. They have also been explained as weapons for hurling against cavalry, for which purpose, however, the points are partly too broad, partly too thick and stout. Finally I will give the opinion of a technical friend whose explanation is that they are a kind of screw-driver." Friederichs further adds that these implements are of classic as well as of barbaric origin.

As a practical archer my attention was immediately arrested by this object—the first one I ever saw—in the Antiquarian Museum at Zurich. The curator kindly allowed me to examine it, and I was soon convinced that it had

nothing to do with a bow so far as drawing the arrow was concerned. It was important, however, to settle definitely this question. Derived from early classic times it seemed reasonable to believe that, if it were associated with archery in any way, a representation of it would certainly be found on figures of soldiers or hunters in antique bronzes and marbles. A categorical statement of the objects represented in the hands of these ancient figures would show among other implements, utensils, weapons, etc., such as the cestus, discus, strigil, shield, spear, sword, cymbal, pipes and even the bow; and such ornaments as arm-bracelets, clasps, etc., all details of the sandal, and manner of fastening; and yet an examination of hundreds of these figures fails to show any object remotely resembling the bow-puller. An extended examination of the decoration on ancient vases did not reveal any object of this nature. The figures are depicted as holding in their hands various weapons, flowers, tablets, branch of a tree, flask, staff, club, jumping weight, double flute, oil-jug, fillet, helmet and an infinite variety of other objects, yet no evidence of this implement is found either in the hand or upon the person. Wall paintings in Etruscan tombs while showing a variety of weapons do not depict the bow-puller. Surely if this object was associated with man as an implement or was utilized in any way by a soldier, a hunter, or an archer, we ought in some single case to find a trace of it. What more natural than to show the insignia of an archer on the hand, or secured to his person? Yet figures of archers, and fragments of hands in the attitude of drawing the bow have been repeatedly found and no such appliance as the bow-puller is depicted. Its entire absence in these ancient representations is certainly overwhelming proof, if no other evidence were needed, to show that this object has been wrongly named.

I have already shown in my paper on Ancient and Modern Methods of Arrow Release[1] that, as far back as classic times, the European drew the bow with the tips of his two or three fingers. From the fact that the Mediterranean nations have used this release I have termed it the Mediterranean release. A remarkable example of this release has come to light since the publication of that paper in the discovery of the so-called Alexander Sarcophagus, at Sidon, in Phœnicia. Mr. Edward Robinson informs me that this most beautiful specimen of Greek sepulchral art yet brought to light is now in the Museum at Constantinople, to which place it was carried by Hamdy Bey, the Director of Antiquities of the Ottoman Empire. This scholar, in conjunction with M. Theodore Reinach, has published it, and other sarcophagi found at the same time and place, in a sumptuous work entitled *Une Necropolé royale à Sidon*. The date of this sarcophagus is probably the latter part of the fourth century B. C. On one side is represented a hunt, in which Greeks and Persians take part, and on the other a battle between the Greeks and Persians. At the time of its discovery the magnificence of its decorations gave rise to the supposition that it was the sarcophagus of Alexander the Great, whence it derived its name; but while this theory is no longer maintained it is still possible that the principal figure in each scene may be a portrait of him, somewhat idealized, as many of his portraits were.

In the battle scene is shown the most perfect Mediterranean release of classic times. A photograph of this sarcophagus was sent to Mr. Robinson shortly after its discovery and from this he has recently had made a sun print enlarged to natural size which may be seen in the gallery of sculpture, Boston Museum of Fine Arts.

The bow-puller certainly had nothing to do with this

[1] Bulletin of the Essex Institute, Vol. XVII, Oct.—Dec., 1885.

method of release. The savage releases which I have termed primary and secondary are out of the question. The only other release which could have occurred in the regions where the bow-pullers are found is the release which I have termed the Mongolian, and this method would have been used by some Mongoloid race such as the Turks, or the modern Persians, who, though not Mongolian, early acquired the Mongolian release, and here the thumb-ring would have appeared. Had the so-called bow-puller been used in the way conjectured we should expect a certain uniformity in that part presumably engaged in pulling the cord of the bow, but we have seen that the spines vary in number from two to five, and in length from two millimeters to sixty. The variation in the space between the spines is equally great, in one case wide enough to admit a rope as big as one's finger, and in another example so constricted that a thread would hardly be admitted. If now we examine the thumb-ring used in the Mongolian release we find the greatest uniformity in its shape, even among widely separated peoples, and even in ancient times, as shown by a bronze thumb-ring dug up near Palmyra, by the distinguished classical archæologist Dr. Felix von Luschan.

I have not been able to find any early references in regard to the bow-puller and do not know on what grounds, or at what time, the name *bogenspanner* was first applied, but one may easily conjecture the origin of its name. In a vague sort of way it was known that the Asiatic archer used a thumb-ring in drawing the bow; little attention, however, seems to have been given to the exact method in which it was used. As an illustration of this vagueness in regard to archery one may find in the art galleries of Europe many pictures, particularly by Italian artists, of the martyrdon of Saint Sebastian. In nearly every case

the archers are armed with the Turkish bow! Cross-bows are often depicted in illustrating the same subject, a weapon that was not known for hundreds of years after the event. As another illustration I may cite the famous Germanic Museum of National Antiquities at Nuremburg. In its collections is a Turkish thumb-ring, a Turkish bow, and other accessories of a Turkish archer's outfit. A detailed drawing, natural size, is exhibited to illustrate the manner in which the thumb-ring is used, and the drawing shows the ring on the wrong hand and upside down! Even the curious grooved device which is held in the bow hand to permit the archer to draw the arrow some inches within the bow is directed outward as if to guide the arrow. In a similar way the idea having obtained that the ancient Greeks pulled the arrow in the Asiatic fashion (see Hansard—*The Book of Archery*), Thorwaldsen in restoring the hands of the figures on the pediments of the temple of Ægina endeavored to represent what he supposed to be the Asiatic method of drawing the bow. As a result he has wrought the fingers in a way utterly impossible for an archer to assume in releasing the arrow, and of course leaving out the thumb-ring or any other appliance of that nature. From this confusion of ideas in regard to the matter it is quite probable that, when the curious bronze implement under discussion was first studied, the two fingers so naturally adjusted themselves in the rings that it was supposed to be an archer's device for drawing the bow, and this error has been transmitted by subsequent writers on the subject.

Caylus in 1757 figures this object in his *Recueil d'Antiquités*. He expresses no opinion in regard to its use, and further adds that no use has been assigned to it. He figures the object upside down as if standing on three legs, the three spines in this instance, being of the same length.

Friederichs has stated that some have conceived it to be a caltrop, and rightly says it could not be of service in this way on account of the bluntness of the spines.

A comparison with the ancient Tribulus (Fig. 8) shows an entirely different device. The Tribulus was a ball of metal from which sprang four sharp spikes so that in whatever manner it was flung upon the ground one spike always pointed upward. In this connection it may be remarked that Furtwängler in his *Olympia*, figures a single flat ring from which spring three sharp spines (Fig 9), and he queries whether this was allied to the bow-puller. It is barely possible, though hardly probable, that this might have been a form of caltrop. We can hardly imagine what Friederichs' technical friend had in mind when he suggested that the bow-puller was a kind of screw-driver, for it seems impossible that any implement for drawing or pulling out any fixed object could remotely resemble the bow-puller.

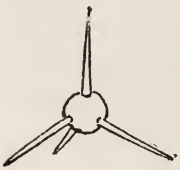


FIG. 8.

Pellegrino Strobel under the title *Anelli gemini Problematica* (Bulletin di Paletnologia Italiana XVI, 1888), presents the results of his study of a number of specimens preserved in the Museum at Parma.

FIG. 9.

His material consisted of fourteen bronze ones and two of iron. The larger number of these were three pointed but as the double spines were in some cases united nearly to their tips he regarded them as bicuspid. These, as I have already shown, should be regarded as tricuspid, and in a later paper Strobel so regards them. Of the fifteen specimens described, twelve had three spines, and three had four spines. In two of the implements the front spine was bent inward and was also slightly longer than the paired ones.

In this memoir Strobel advances the idea that the object was designed for a snaffle or nose-band to be used as a curb for horses. He says that in the Iron Age some progress must have been made in the training of horses and in this training a curb or snaffle must have been evolved, and he therefore expresses the belief that this enigmatic object was used for that purpose. He believes that it was held against, or upon the nose of a horse in such a way that the spines could be forcibly pressed against the flesh, the two spines being below, while the longer single spine was above, and hence this side of the object was ornamented. (I have already shown that there is no constancy in the relative length of the spines in the tricuspid ones. In forty-two specimens, for example, the single spine is longer in fourteen, shorter in thirteen, and of the same length as the others in fifteen. In some of them the single spine is only half the length of the other two.) He explains the phallic emblem which is found on some of them to indicate the soundness and virility of the horse in training. In a second paper in the same bulletin (xv, 1889), he had examined sixty specimens of which five were of iron, the rest of bronze. Of these sixty specimens the origin of thirty were known, and in some of these the method of burial and associated objects were also known. In this paper Strobel states that there are three theories in regard to the probable use of this puzzle: First, to assist in drawing the bow; second, for stretching the cord of the cross-bow (which was not used for a thousand years after!); third, to aid in restraining horses not only as a snaffle, but as a curb.

Dr. Charvet, in the Bulletin of the Anthropological Society of Lyons (1889, p. 70), has a communication on this subject which he calls *Gourmet de Répression*. In this paper he adopts the views of Strobel in regarding it as a

snaffle, though he thinks the instrument was worn under the nose instead of above, and he says this opinion is based on a daily experience in training horses by ordinary *caveçon* (curb), which ought not to operate except at the will of the trainer. In Strobel's conception of its use it would always be pressed against the horse's nose whereas it should be under the chin or throat; the trainer then pulls it with greater or less force at will. Strobel figures two of these instruments with a large eight link chain passing through the rings (see Fig. 10), and Charvet says this chain was simply to hold the implement in place. Charvet further expresses the belief that from this object the curb originated when bits were rigid and not jointed in the middle. Strobel in reply cites the quadridentate type as being curved to adapt itself to the curve of the horse's nose when pressed down. The rings were big enough to allow the chain to pass through and yet leave room for a rope to be tied to each ring. In his second paper Strobel figures a snaffle of two centuries ago and one used at the

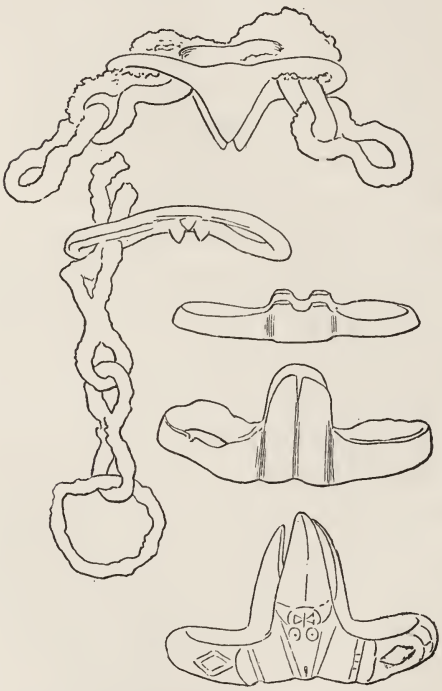


FIG. 10. Reproduced fro . Strobel's Memoir.

present time. I fail to see any relation between these two forms and the enigma under discussion. Charvet urges that the implement worn in the way suggested by Strobel would wound and ruin the horse. Strobel says that in any case the chain did not press down the implement; the rein or cord which he believes was attached to it was pulled at the will of the trainer. He believes that his first idea of the use of this object is correct, though it might have been used under the nose as suggested by Charvet. Strobel says that no object preceding the bit has been found in pre-historic times. He contends that there must have been an evolution of the bit, and if this object is not a stage in that development then nothing has been discovered to fill the gap. He finally expresses the opinion that all the twin rings were similar in function and that was the controlling of horses. I have quoted the views of these authors at some length as the object certainly suggests an association with harness and possibly with that of a curb or snaffle.

(In Fig. 10 some of Strobel's figures are reproduced half-size.) Opposed to this idea may be properly urged the great variation in the length of the spines. In some we find long, sharp points, in others short, square knobs. Nothing would be effected by forcing such short blunt knobs against a horse's nose either above or below, and as to the long-spined ones it would be impossible to hold the object in place; the object would be tipped or pulled over on its side however it were worn. As to its forming a stage in the evolution of the bit we find the linked bit in Etruscan tombs associated with this object. If this were a curb or snaffle of any kind it would certainly appear on some one of the many ancient bronzes, marbles or vase paintings of horses. Now an extended examination of these various representations has failed to reveal any

object remotely resembling this implement. If it had been used as a curb in the way suggested it would have been, of all objects, the most conspicuous in those examples in which men are represented as leading or holding a rearing horse, and there are many representations of this character. Had it been worn inside the mouth as a bit the elaborate ornamentation seen on some of them would have been useless. The ponderous weight of some compared to the light weight of others would also be against this supposition. For these reasons we cannot accept this interpretation of its use.

Knowing the ingenuity of Mr. Frank Hamilton Cushing, the distinguished ethnologist, in puzzling out enigmas of this nature, I placed in his hands one of these objects for study; he also had access to a very beautiful long-spined specimen in the collections of the Museum of Archæology of the University of Pennsylvania, a figure of which I am permitted to publish through the courtesy of the officers of the museum. In an exceedingly instructive paper on the origin of the bow published in the proceedings of the Anthropological Society of Washington (the same being Mr. Cushing's address as presiding officer of the Anthropological Section of the American Association for the Advancement of Science), Mr. Cushing has advanced a most ingenious idea of the use of the bow-puller by conceiving that it was originally developed from a spear-thrower. Indeed he goes so far as to assert his belief that it was really used functionally for that purpose, and, to support this contention, he gives a graphic figure of an ancient Roman soldier in the attitude of throwing a spear with the aid of this implement. Were all the bow-pullers similar to the two he had in his possession one might be inclined to regard his surmise as having the same degree of probability as the various guesses that have already

been offered. The ancient spear-thrower of the Romans has long been known from numerous figures of it in classical drawings. It was simply a leathern strap—amentum—secured to the middle of the spear or javelin to assist in giving force to the act of throwing. The amentum is so often figured on ancient vases that the method of spear-throwing is beyond question. The bow-puller shows by its signs of wear no such use as would be indicated by Mr. Cushing's supposition. The single spine, against which the end of the spear is supposed to rest, is, when bent at all, always bent inward and not outward; furthermore the two spines, between which the end of the spear is supposed to pass, are usually too close together to permit the passage of even a narrow spear-butt. In many cases, as we have seen, the two spines are united nearly to their tips (Plate V, Fig. 12); in one instance only the double spines are present (Plate II, Fig. 9); in a considerable number there are four spines in pairs. This attribution of its use, therefore, may be dismissed with the other conjectures.

Other suggestions occur to me as to its probable use, though I confess they have no greater degree of probability than that of the screw-driver conception. The Japanese, and probably the Chinese, are accustomed to use a device of metal for holding down the long pith wicks in the saucer-shaped lamp. This object is in the form of a ring with a single spine rising from one side, or the ring may have a transverse bar from which springs the metal spine. Figures of these two forms are here given (Fig. 11). After this idea occurred to me I became acquainted with Friederichs' catalogue of bronzes in the Berlin Museum already referred to. In cataloguing the specimens of Bogenspanner he describes one upon which is a steer's head, flanked by two phalli, and adds parenthetically "a connection that has already been found in the lamps." The

phallus, as we know, was to guard the object against evil influences, and one may find representations of this symbol not only on lamps, and other objects, but even painted on

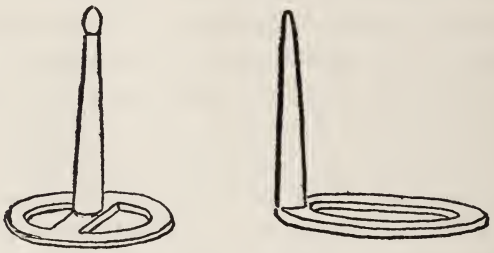


FIG. 11.

the kitchen range as at Pompeii. This remote surmise, however, is not at all weakened by a curious object in the British Museum, for a sketch of which I am indebted to Mr. Dwight Blaney, and which is here produced (Fig. 12). In this a steer's head rises from the body between the two rings, while the two horns curve back and unite with the outer rim of one of the rings. It does not seem possible that this object has any relation to the bow-puller unless it be a lamp wick-holder. If it is related, then all other attributions of its use are vitiated by this unique

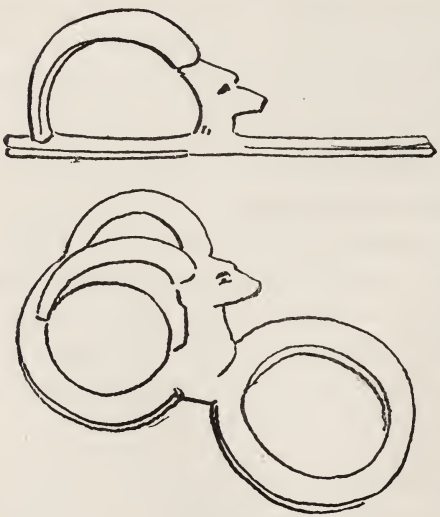


FIG. 12.

form. If any grounds exist for believing it to be a lamp utensil then the spines might be supposed to assist in holding the wicking material whatever it might be. The upward bending of the rings might be supposed to fit the curving surface of the oil saucer. Roman saucer-lamps are common and would seem to necessitate some device for keeping the wick submerged. The great variety in the objects which are supposed to be bow-pullers, or related to them, suggests the idea that they were not all used for the same purpose. Whatever the first one was designed for it is possible that objects for entirely different purposes were made in imitation of the first form. Thus in our times a paper-weight may be seen in the form of four cannon balls, an inkstand in the form of a mortar, a bronze pen-rest in the shape of a cavalry saddle, or a horseshoe turned up on end (a remarkable Greek vase in the British Museum is beautifully modelled in the form of a horse's hoof) and so on. Thus it may be that some of these objects may have been used as a weight to hold down the lamp wick.[1]

It is possible that the long-spined ones were strapped or bound to a horse or man to keep a load from shifting or swinging. This use is suggested on account of their manner of wear and breakage.

A friend of mine has suggested that the object might have been bound to the hand to enable a chariot driver to hold the reins more firmly in driving; a curb, in fact, but held in the hand and not attached to the horse's head. This idea is strengthened by the uniform length of the object, and the upward inclination of the rings corresponding respectively with the width of the palm and its hollowing shape. Nearly all the bow-pullers fit naturally into the palm of the hand; the occasional bending of the spines and

[1] I have already called attention to the evidence of, at least, two distinct types of bow-pullers, not including such forms as those shown in Figs. 10 and 12. With sufficient material these types may be found to run into each other; but with the objects thus far examined the differences seem to hold good.

the points being sometimes broken, the signs of wear on the sides of the spines, and the manner of breaking of the rings just where a strain would come when great force was used, all support the idea. So impressed was Lieut. W —— of the United States Navy of the correctness of this supposition that he bound a bow-puller to his hand by means of a handkerchief, and then held a leathern strap so firmly that three men dragged him about the room but could not loosen his hold upon the strap. If this suggestion has any value then one can easily understand why the object has not been revealed in ancient sculpture or painting. The object being grasped in the closed hand would be concealed from view.

It has been suggested that possibly the spines were made to be driven into some object. This could hardly be so, as the openings in the rings were evidently to be left free for the passage of a cord or strap. In this connection, however, it may be remarked that the bronze figurines illustrated in Gozzadini's memoir have spines springing from the feet below, for the purpose of attaching the object to some base of support, and these spines strongly resemble the spines of many of the bow-pullers, in being broad at the base, pointed at the end and strong and clumsy in appearance.

The possibility of the spines being inserted in any object is further negatived by the ornamentation extending along the front spine as in Fig. 3, Plate I, which would not have been added if the spine were intended to penetrate anything. The head shown in high relief on the spines of Fig. 2, Plate III, and Fig. 14, Plate V, would prevent their insertion for the purpose of fixing the object.

In Japan a curious device is used to hold a pot at varying heights above the kitchen fire. These devices are shown in my work on Japanese Homes and their Surroundings (Figs. 173, 175). The device shown in Fig. 173 is

often depicted in old Dutch paintings and is doubtless in use in Holland to-day. In Gozzadini's final memoir on the ancient Etruscan cemetery at Marzabotto, 1870, are figured two bronze pots to which are attached chains (links 8-shaped) terminating in a large circular ring and identical with one of the chains figured by Strobel as passing through a bow-puller, a reproduction of which is given in this paper in Fig. 10.

If the various forms regarded as bow-pullers are for different purposes, and there can be no question that some of them are entirely unrelated, then we may conceive that some of them might have been used for holding the reins. The bow-pullers if representing a single purpose (as Strobel is inclined to believe they do), invalidate by the varying length, character and number of spines, every attribution assigned to them.

As an evidence of the uncertainty in regard to the uses of the bow-puller one may turn to the comprehensive Dictionary of Greek and Roman Antiquities, by Daremberg and Saglio, in course of publication, and he will there find on page 473, under matters pertaining to the bow, a very poor figure of a bow-puller with a brief note of its supposed use, signed by Saglio. Later on under horses' bits, curbs, etc., under the sub-title *Siguette*, page 1336, the figures of Strobel are reproduced and his interpretation of the bow-puller as being a snaffle is indorsed. The article is signed G. Lafaye.

SUMMARY.

1. As a Bow-Puller. It is simply impossible to draw a bow with it, and if a bow-puller it would appear in ancient sculpture and painting.

2. As a Cross-Bow Implement. The cross-bow was unknown to the ancients.

3. As a Caltrop or Tribulus. The spines are too short and blunt in many of them and the long-spined ones would not remain in position; they would show no signs of wear; furthermore the Tribulus is known and has no resemblance to this object.

4. As a Screw-Driver. The idea is unthinkable.

5. As a Spear-Thrower. The varying character of the spines and signs of wear are against the idea; furthermore the amentum used by the ancients for spear-throwing is well known as a leathern strap attached to the middle of the spear.

6. As a Snaffle or Curb. Again the variation in the length of the spines, and the fact that in no case has any device of this nature been represented on a horse's head in ancient sculpture, are sufficient to disprove the idea.

7. As a Bit inside the mouth. The jointed bit was co-existent with it, and the ponderous character of some of the bow-pullers, and the lightness of others, would militate against this conception of its use.

8. As a Lamp Wick Holder. The signs of great wear and its manner of breakage renders this supposition valueless.

9. As an object to prevent a load from slipping. The small tubercles which take the place of long spines in some of them would render it useless for that purpose.

10. As a Curb to hold in the hand for grasping reins or anything else. The great length of the spines in some specimens would preclude its use in that way.

EXPLANATION OF PLATES.

PLATE I.

Natural size.

Figs. 1, 2. Bow-puller. Plain type, front and top view. Collection, author.

Figs. 3, 4. Bow-puller. Ornamented type, front and top views. Collection, Museum of Archæology, University of Pennsylvania.

PLATE II.

Plain type. Natural size.

Fig. 1. Collection, Prof. Henry W. Haynes, Boston.
" 2. " C. W. Longman, Esq., London. From Perugia.
" 3. " " " " "
" 4. " E. S. M.
" 5. " Antiquarian Museum, Zurich.
" 6. " Louis Richard Zschille.
" 7. " " " " (cast iron).
" 8. " The late William Hammer, Copenhagen.
" 9. " Louis Richard Zschille (no trace of front spine).

PLATE III.

Ornamented type. Natural size.

Fig. 1. Collection, C. W. Longman, Esq., London.
" 2. " Louis Richard Zschille.
" 3. " Museum of Archæology, University of Pennsylvania. *a*, Section of ring. Rough sketch of the one shown on Plate I, Figs. 3, 4.
" 4. " British Museum.
" 5. " Louis Richard Zschille.
" 6. " " " "
" 7. " " " "

PLATE IV.

Figures natural size.

Fig. 1. Collection, Louis Richard Zschille.
" 2. " " " " This section shows the form adapted for rope or strap to pass through rings and under body in the manner already described.
" 3. " British Museum.
" 4. " Louis Richard Zschille.
" 5. " William Hammer.
" 6. " Prof. Henry W. Haynes.
" 7. " " " " "

The last three figures are given to show manner of breakage.

Fig. 8. Sections at base of spines of some of the bow-pullers already figured.

PLATE V.

The Figures are reproduced half size from rough sketches made through museum cases, etc. The exact dimensions are not known.

Figs. 1, 2, 3, 4, 5. Collection, Museum Porte de Hal. Brussels.
Fig. 6. " Museum of Archæology, Florence (Etruscan).
Sketch by Mr. Dwight Blaney.
" 7. Collection, British Museum.
Sketch by Mr. Dwight Blaney.
Figs. 8, 9, 10, 11, 12, 13. Collection, Museum of Archæology, Florence.
Sketch by Mr. Dwight Blaney.
Fig. 14. From Strobel's Memoir referred to in text.
Figs. 15, 16, 17. From Photographs Etruscan Collection, Museum of Archæology, Florence.
" 18, 19. The Louvre. Hasty sketches by E. S. M.
" 20, 21. From Gozzadini's Memoir referred to in text.

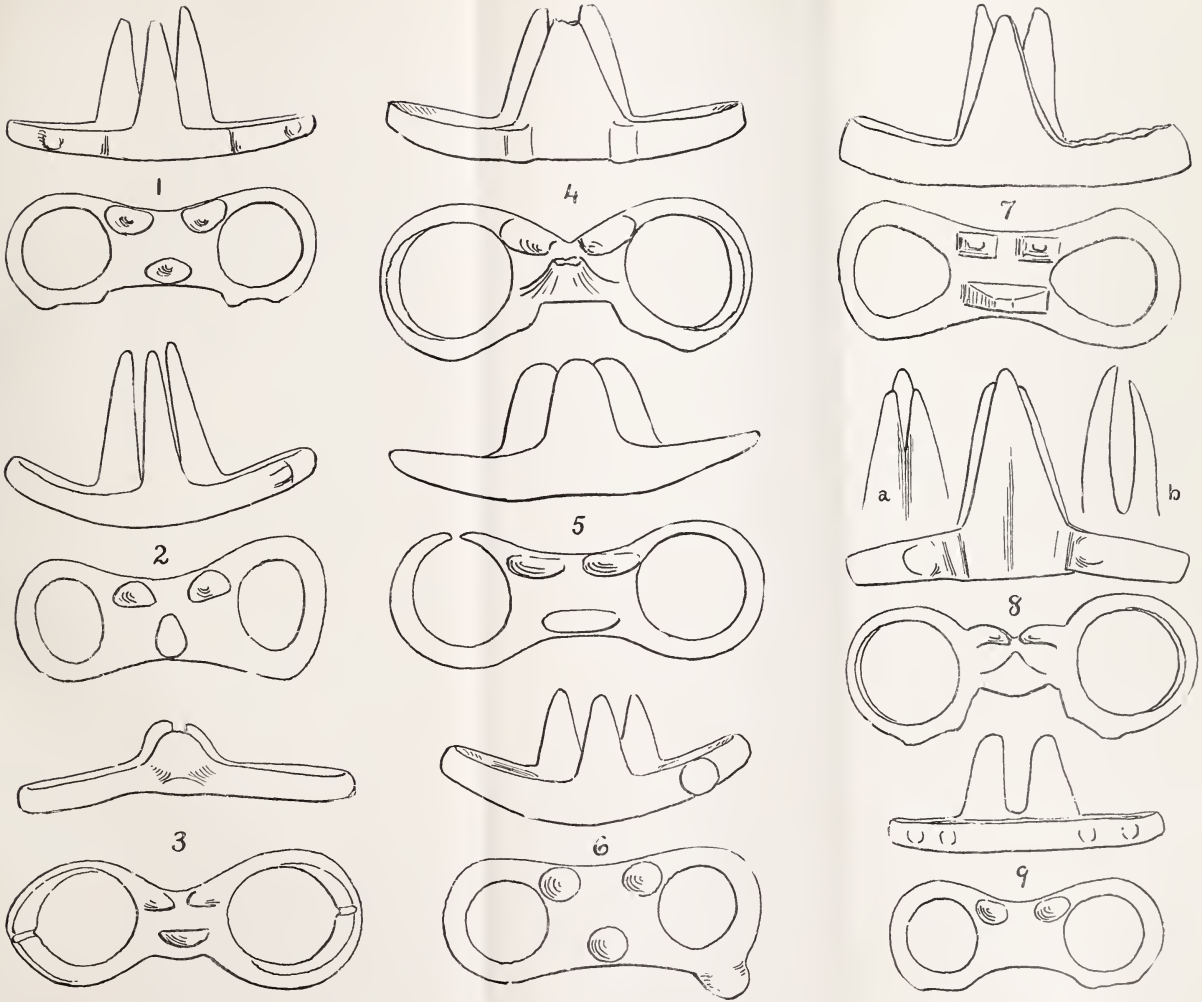
FIG. 1.

FIG. 2.

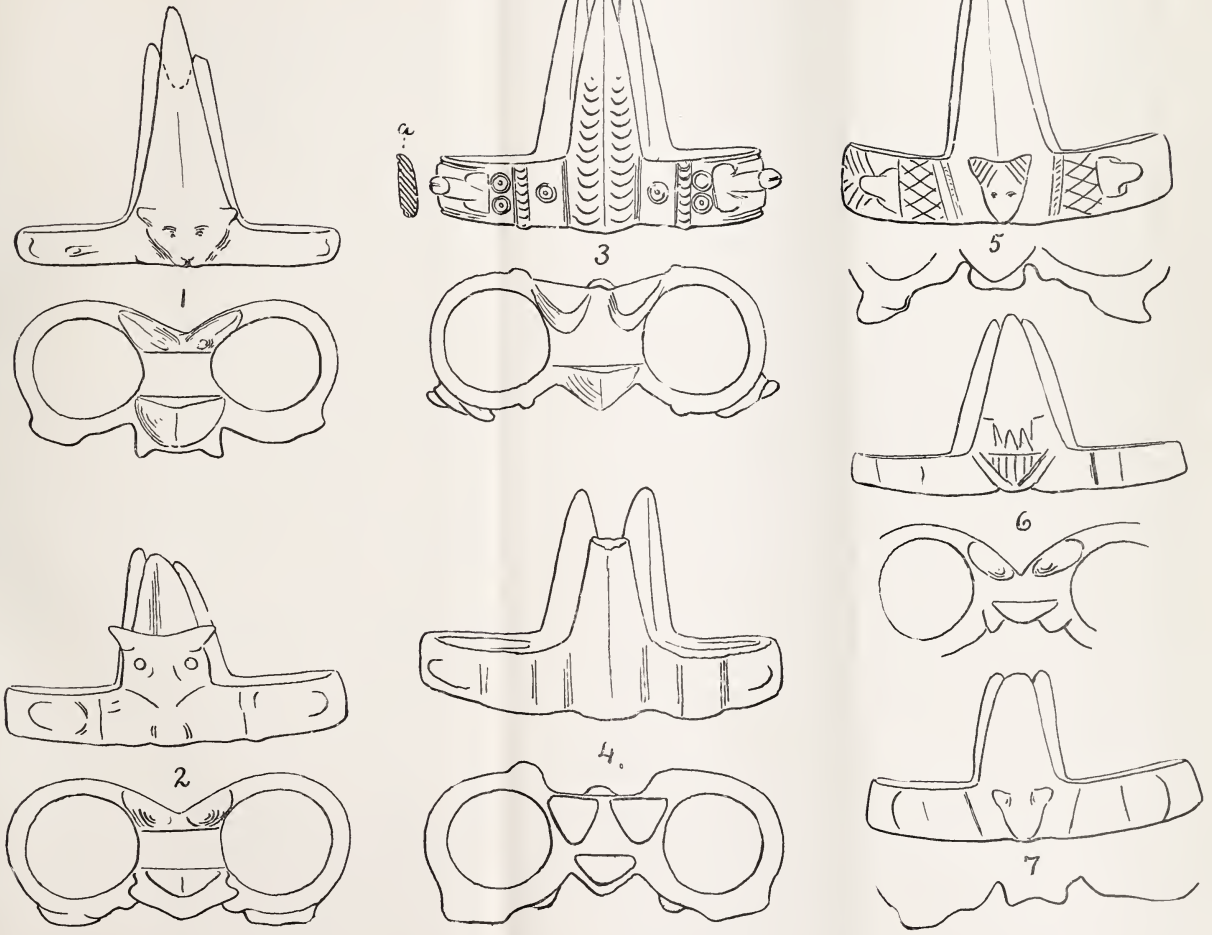
FIG. 3.

FIG. 4.

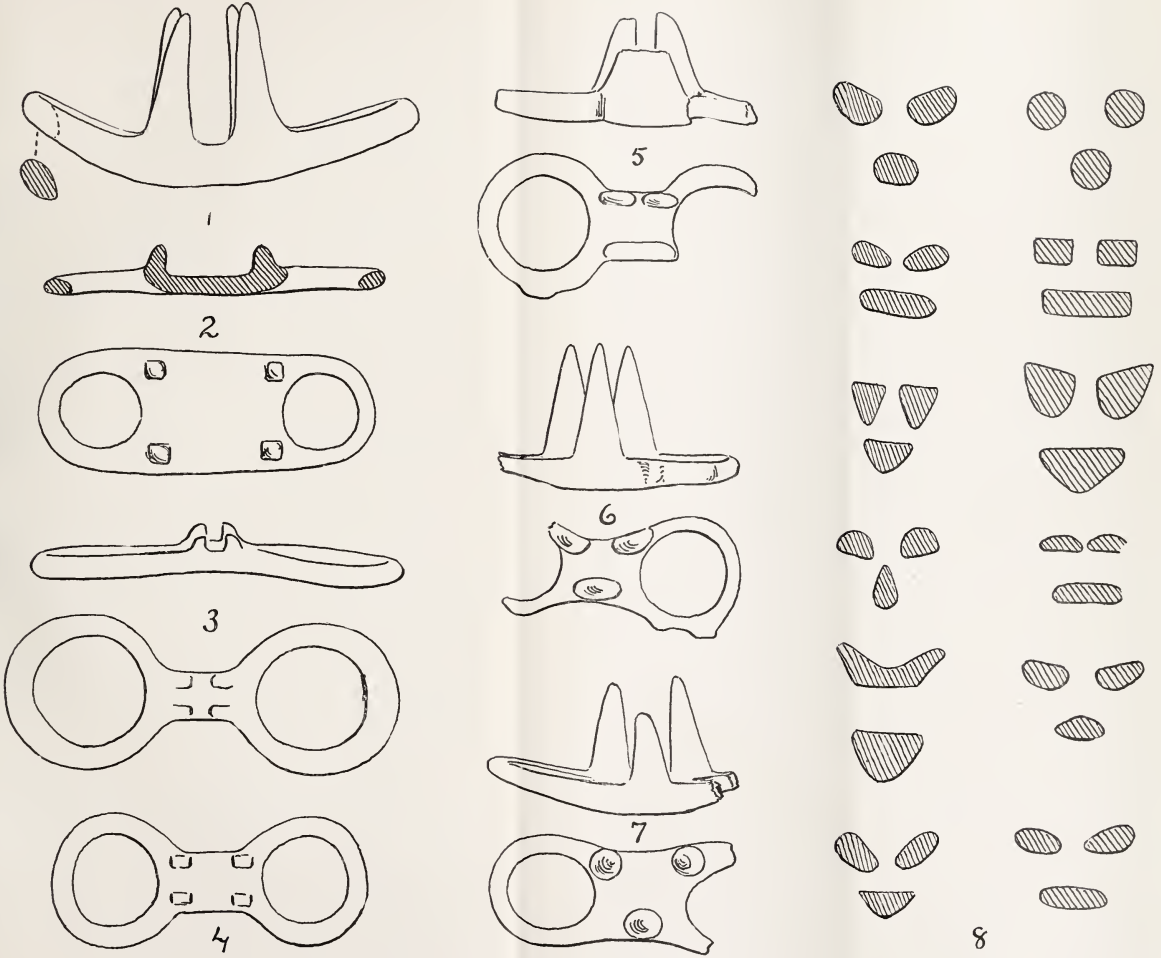
MORSE ON SO-CALLED BOW-PULLERS OF ANTIQUITY.



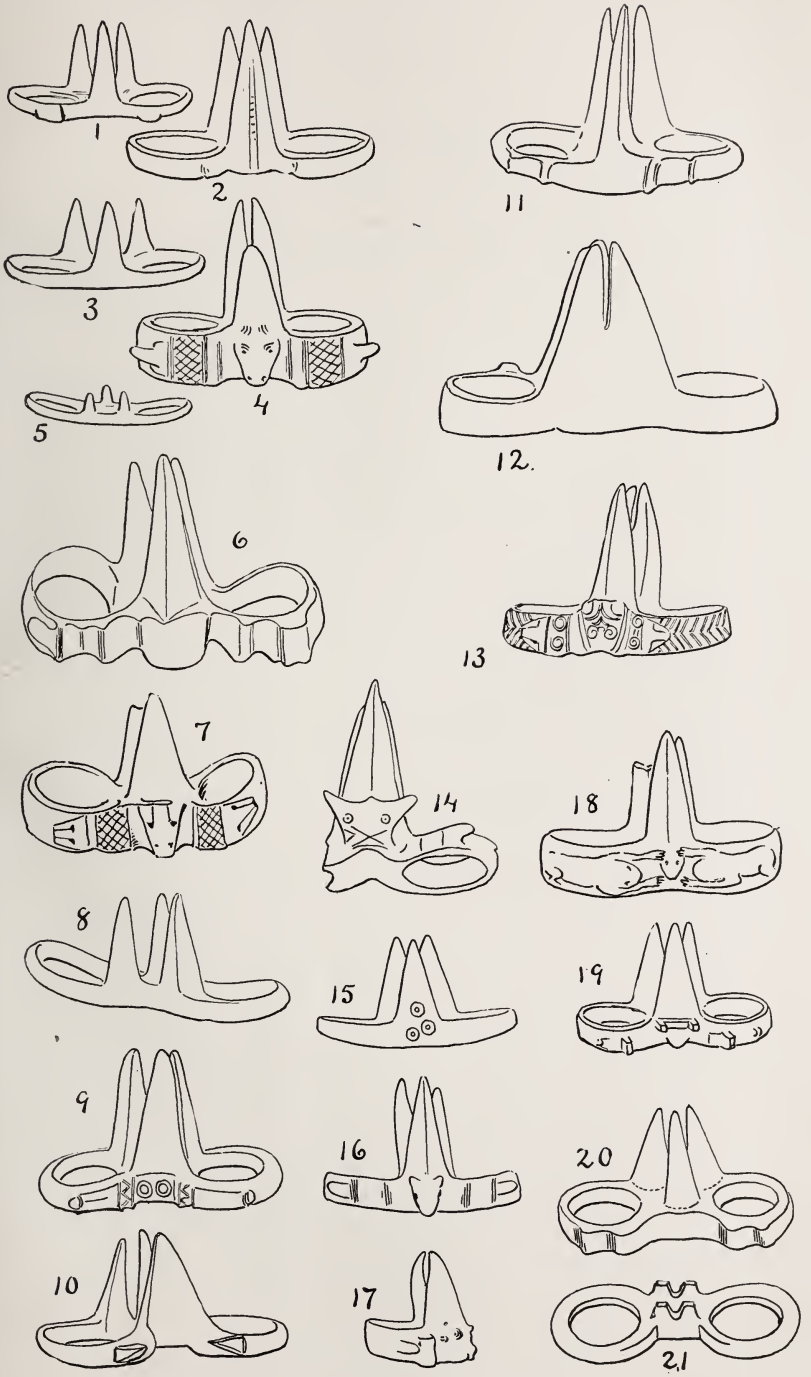
MORSE ON SO-CALLED BOW-PULLERS OF ANTIQUITY.



MORSE ON SO-CALLED BOW-PULLERS OF ANTIQUITY.



MORSE ON SO-CALLED BOW-PULLERS OF ANTIQUITY.



MORSE ON SO-CALLED BOW-PULLERS OF ANTIQUITY.

ESSEX COUNTY DIALECT.

BY HELEN MANSFIELD.

The object of this paper is to awaken interest in the dialect of Essex County, to comment a little on some material found there, and to speak of the method of collecting material for the use of the American Dialect Society.

So much has been done in Salem to preserve all that is old, the rest of the county should bow down in gratitude: and no doubt there is much dialect-matter scattered about in your collections awaiting a patient gleaner. That will keep however, since it is already recorded; while a more urgent matter is the dialect and pronunciation fast vanishing from current speech, and it is very important that attention to the matter should be roused in the county as soon as possible, and that people should be put on the alert to notice and record what comes in their way.

Words come out when no one is thinking of the matter, which could not be extracted from people by *asking* them if they know any queer words, and then we want one of our watchmen at hand to snap up the prize. The older members of the community can tell us of words which were already passing out of use when they were young, and some quite recent usages seem almost incredible.

Fifty years ago Sayward was *Soward* in Gloucester: (always written ay, always pronounced *ow*, as Judge Mitchell says Hayward was in Bridgewater). Goldthwaite was *Goothright;* Greenleaf was *Gründluf*, (a true umlaut,

suggesting a translated name); Tristram was *Trustram;* Tomlinson was *Tumpleson*, (earliest form, *Tomlins*): and people said to each other, "Are you going to the *vandue?*" The causeway at Essex is still the *cossey* to some of the "old stand-bys."

The matter of pronunciation is important. I find in Gloucester records, in the older Gloucester speech, and elsewhere, a tendency to sharpen d into *t*, b into *p*, v into *f*, ng into *nk*, and so on:—traces, as I think, of ancestors who spoke a more Teutonic tongue than English, namely Dutch or Flemish, (there is little difference); and in general the sounds we have been trying to banish, as uncultivated, seem likely to prove relics of an alien speech.

Instances: *Hutson* for Hudson (Concord 1677), *secont* for second; *Bapson* for Babson, *popple-stones* for pebbles; (we have a beach, High *Popples*, once a steep terrace of pebbles); *Finson* for Vinson, *Medifer* for Madiver; *Sprinkfield* for Springfield on Boston records, 1684; and I have heard natives of that town teased for saying *Sprinkfield*, as I have heard New Yorkers teased for *Hutson*, manifestly a Dutch relic there.

L and *n* were interchangeable. (*m* with them, to some extent; Tomlinson, *Tumpleson*, *Tumblesome*). Ingersoll was long *Inkerson* on Gloucester records, and seventy years ago the two forms were co-existent. "Aunt Becky Ingersoll," a barber with a famous parrot, used to say, "Between Capt. Jack Ingersoll' and the *Inkersons* about, there's a difference." (They were all of the same stock.) Any man now would sit on the *capson* of the wharf, instead of the capsill.

Final e often served for y; *Luce* and *Stace*, for Lucy and Stacy,—(another Teutonic trait, to understand final e as a separate syllable.) *Becca*, *Doratha*, etc., for Becky and Dorothy, was common here, and still prevails in parts

of New Hampshire, settled by Concord and Watertown people. To spell Frothingham and Hildreth *ffrodingham* and *Hildred* shows a Danish strain. (Charlestown and Middlesex.)

This county affords two interesting variations in guttural forms:

1. *Mighill* for Michael among the Cressys and Hopkinsons of Rowley. (Gaelic, an Irish friend says.)

2. A Scotchman, early in Lynn, was written *Arzbell* Anderson, and the historian of Lynn says, "*Arzbell* is right;" but there is no such name. For the ch in Archibald they substituted the Teutonic *z*, (sounded tz); they left the i to be understood; they flattened the a with an umlaut into our short *e;* and dropped the d after a liquid, like the Danes.

The long Teutonic sound of *oo* was freely used in this county. Different methods of producing our long *o* sound:—Rhodes, Rodes, Roads, *Roods;* rode-line, road-line, *rood*-line; Coates, *Cootes*:—all equivalent.

In 1836 and later a *booby-hut* was running between *Sprinkfield* and Ludlow. Worcester assigns this word to the "East of England," as he does several Essex County words. This is not strange, since two-thirds of all the early settlers are estimated to have come from those parts, but I fancy some of our words had been domesticated there from beyond the channel.

Authorities unite in three statements:—

1. London and the southeast counties were full of refugees from the Netherlands and descendants of refugees.[1]

2. London and the southeast counties were always hot-beds of non-conformity.

3. London and the southeast counties furnished two-thirds of the settlers of New England.

[1] May not this very large contingent, with a French habit of pronunciation, be responsible for the "cockney" propping of the h?

But they do not seem to have connected these facts very closely, or to see that the sudden prosperity of London after the downfall of Antwerp was largely due to the actual presence in its midst of the men who had made Antwerp, with their greater enterprise and broader views.[1]

Weavers, in particular, are always mentioned in connection with Lollardism in earlier times; and weaving was introduced into England by Walloons from Brabant in 1330, although England long continued to play into the hands of Flanders in this important respect. The so-called Huguenots, to whom Queen Elizabeth allowed chapel and workshops in the crypt of Canterbury, were not Huguenots at all, but French-speaking Walloons, silk-weavers from the country round Brussels.

Any connection with cloth I begin to regard with suspicion. I even suspect the Winthrops, "clothiers of Norwich," of being Van Throops or Van Tromps in disguise. Such a descent is quite as honorable as the English, for these were the men who led the world in their time. England rose only on their ruin, and the Dutch Republic still remained far greater than England until William the Third dragged it at the tail of England's kite.

Old Flemish point is very like Honiton; it was Flemish lace-makers who set up the manufacture in Devon. People seem never to have remembered that any one spoke French outside of France, or the Channel Islands. In fact, the Dukes of Burgundy must have introduced much Flemish blood into France in their trains and armies. Barante mentions a representative of the well-known Boston name, *Sohier*, in the the service of the Duke of Burgundy at Paris in 1391, "the son of a weaver of Malines."[1] The

[1] N. E. Hist. Gen. Reg., vol. XLIX, pp. 24-28. "The Grasshopper in Boston."—p. 28. "Before Elizabeth, almost impossible for the city to raise a loan of £10,000. Before she died it was advancing her loans of £60,000."

Ibid. p. 27. The Gresham crest, a grasshopper, puzzled the experts. The Thachers also bear it. I believe it Flemish, one of the quaint conceits of that fun-loving people.

argument for French answers very well for Flemish, for many of them had the two languages, and the Walloon language would seem to be a compound of the two: "French, with Teutonic elements."

I wanted to approach the subject of dialect with you to-day as I approached it myself. About three years ago I became tired of *purring my eyes out* over German text, and took to Dutch, because it was printed in Roman text. Eighteen months later I took to genealogy; and looking over old records and lists of freemen, I found names changing under my eyes according to certain laws which presupposed a Dutch element in the population. Changes, very perceptible to the eye, were no changes at all to the ear of a person who knew ever so little of the sound of Dutch diphthongs, the odd habit of not pronouncing a final syllable in *n*, and of introducing a vowel-sound between consonants where no vowel is written.

Here, I consider, is the cause of the "absurd perversion of proper names which has taken place in this country."[2] An Englishman, taking down names given him by a Dutchman, would certainly write a vowel where the Dutchman speaks but does not write it,[3] and would not write the syllables which the Dutchman writes but does not speak. The Dutch scribe naturally would, and actually did make equal havoc with English names, and he had his opportunity too—("Clark *Vargoose*,"[4] Boston 1679, and doubtless others earlier.) The English rapidly assimilate foreign names to their own, and I infer that many Flemish names were anglicized before reaching this country, and the Flemings then went on distorting these names according

[1] Barante. "Histoire des Ducs de Bourgogne." Vol. II, p. 130.

[2] N. E. Hist. Geneal. Register.

[3] A Dutchman says *Delluft* and *mel-luck*, for Delft and milk.

[4] Sewall's Diary, vol. I, pp. 53, 108. "Vergoose, Vertigoose, Goose," (properly Vergoes. Dutch œ=English oo.) "Nurse Goose had another son, Peter, in Norwich, England, and the family was probably not of English origin."

to their command of English. The effect on names of the struggle between two languages is always the same, and to be observed every day in a town like Gloucester, where an ordinary notice in the Post Office must be posted in five or six languages.

The Portuguese Pereira and Rodriguez become *Perry* and *Rogers*. The Swede, Konstanz Mattson, became *Constantia Madison* by accident of deafness in her first mistress. (Later she was *Lena*). Carlsen became *Charlton* by a mistake in shipping papers in England. Clevinhausen became *Hawson* for convenience. If the Virginia name Tagliaferro were spelt *Tolliver*, as pronounced, it would be disguised to the eye; and I suspect a good deal is hidden under many an innocent-looking English name, while Savage and the early freemen's lists show an imposing contingent of foreign blood.[1]

But I did not go into genealogy with a bias, although I had read Douglas Campbell's book; for he did not go so far as to say that any of that blood came over here. The first hint came from a *Bethiah* Leach of Manchester, who married in Gloucester in 1685. Bethiah seemed a Bible-name, but it was singular in Gloucester. Looking across the line for relatives, I noticed a Bethia *Rea* of Salem Village, and Rea recalled the Spanish-Dutch names in Motley. "*Is* Bethya a Bible-name?" Two concordances failed to give it, and I began to suspect a corruption of *Betje* (Bate′-ya. Dutch for Betty), later mispronounced in three syllables, Be-thy′-a.

This single inference may prove a delusion, but it led to observations which are confirmed by Mr. Waters, the experienced searcher, on page 118 of Vol. L, of the New England Historical and Genealogical Register.

[1] John Heard of Dover is John *Hoord* on freemen's list. *Hoorn* may have become Horne and Orne. Curtis of Boxford was Curthout; Grover of Beverly was Grovwand, 1734.

And now we can stick more closely to our point;—my first specimen of dialect, (as I suppose it to be), serving to bind the two parts together.

In the year 1714 the inhabitants of Salem petition for help in manning a fort, because, they say, they "have considerable *Lott and Scott* in carrying on the government."[1]

In 1687 Gloucester, petitioning against abuses under Andros, complains she has to "pay the *Shott* for the Justices at the Tavern."

In Van Lennep's "Tales of our Ancestors" (Dutch), a crusader says, "it is hard on free citizens who have always paid *schot* and *lot*, to be bandied from one master to another," etc.[2]

NOTE. *Sch.* hard in Dutch, soft in German; so that the German rendering would be *Shot*, and the Dutch *Scot*.

I do not know if *scot and lot* has been in use in England, but *scot-free* seems to belong to it. The same volume contains "donderkoppen," the *thunder-heads* of New England; and "schmerzengeld," corresponding to the *smart money* sometimes allowed by General Court to wounded Indian-fighters. Other phrases I neglected to mark:—one is always sorry later for an omission of that kind.

About eighteen months ago the Secretary of the Dialect Society wrote a letter to the New York Nation, and spoke of wanting reports from "hill-towns where the population had remained stable, preserving their habits of speech intact." They ran about like ants on their way to the hill-towns, however, as the genealogist soon discovers. It is a task to follow the course of a family from Concord or Watertown, through Sudbury, Grafton, Framingham, Chelmsford, (picking up wives all the way), to a New Hampshire hill-town where it may join another Concord

[1] Essex Institute Collections, vol. v, p. 259.
[2] "De Reisgenooten," pp. 244, 345.

stock, which has almost certainly taken in a Scotch-Irish strain on its way through Worcester, Rutland or Londonderry; and it is hardly perched in New Hampshire before it is off for the West.

All these things affect the family speech, and I really think that we of Essex County are stability itself compared with them, especially on the sea-board. The dialect of Marblehead or the Shoals remained the same, I suppose, until it died out; and having just found a few words of it in the Marblehead History, I sent them to the Secretary with some Gloucester words, and referred to the account of the word *schooner* in Worcester's Dictionary. You know the rig and the name are said to have been invented in Gloucester; but even I find it hard to believe that the verb *scoon* was used in Gloucester in 1740, unless it were a Marbleheader who stood by and said, "How she *scoons!*" which is quite possible. I have heard *scoot* used to express haste without grace, but never *scoon*.

I could see no Dutch element in the few Marblehead words I found, unless *pixilated*, (bewildered in the dark), could be connected with *pikzwart*, (pitchdark), which it may not be at all. There was a French element, and I suppose the Cornish strain, manifest there in names beginning with *Tre*, might account for anything. The Marblehead pronunciation quoted by Mr. Chadwick,[1] *barn in a born* for born in a barn, reads like the dialect of Gwenny, the little Cornish maid in "Lorna Doone." John Fisk says Cornish is allied to Gælic and Welsh, and the last person who spoke it in England died in 1770. Think of carrying a language out of the world in your own person!

The Haskells, who left a numerous progeny in Gloucester, Salem and Marblehead, are said to have *hailed* from

[1] "Harper's Monthly," Vol. XLIX, p. 189.

the Isle of Man. Can it be they who have flooded an innocent country-side with the Americanisms of that Gælic population! Hall Caine's "Manxman" says, "If a man has done wrong, the next best thing he can do is to say *darned* little about it," and the Manx song about *hunting Jenny Wren!* I wonder if that song has been as familiar everywhere as in this county?

On receiving *rave*, (the rail of a cart), from Sewall's Diary, the Secretary said he had heard it in Eastern Connecticut, but had forgotten to record it. You see we all have valuable words hidden away in our memories; it is a great point gained if we can be on the watch and seize them as they come to the surface. And the older members of the community are invaluable store-houses of pure New England usage; (safer guides than the younger generations, whose heads are full of phrases from all quarters of the earth), and then they may remember words used long ago by only a few old persons, and they had a comprehensive view of a place, too. It would not be possible now to say confidently, "He is the only person in the community who says that," as some one said the other day, speaking of a man who used to come from West Gloucester to sell vegetables in 1825, perhaps. He always said, "Do you want to buy any *whortleberry*-plums?" and everybody else in town said "huckleberry;" but I am told *whortleberry* was not uncommon in Deerfield about that time, and the persons who used it were not trying to be fine.

But in 1810 Gloucester plus Rockport numbered not quite 6,000 souls; now Gloucester minus Rockport numbers nearly 30,000, and all these arrivals tend to "swamp" the native speech. My chief quarrel with them is that they have totally obliterated the auxiliary *shall*. In my young days nobody said *will* for shall in Gloucester. It

[1] See "Vinton Memorial."

was New England's boast that she always had it right without thinking of the matter. It is so no longer. Speaking broadly, none of the young people say *shall* at all now. They use *will* in all cases, and their speech is the speech of the future. I hold the schools responsible for a thing like that. They should not permit a pure usage to be driven from one ofits strongholds.

I had a strong impression that this county, and particularly the sea-board, had never been very thoroughly looked up by collectors of "Americanisms," and that we should soon have a fine feather in our caps in the shape of a long list of uncollected words. I still hope so, if we can awaken an interest; although a hasty glance into the "Century Dictionary" showed numbers of my words, but not always treated in a satisfactory manner. The much-prized *dun fish*, for instance, is there a compound word: "dun'-fish" and the "process of dunning" is mentioned. No such verb is known in Gloucester, and we object to the hyphen and the accent for the noun. Guy of Warwick did not kill the Dun'cow—he killed the Dun Cow, and Gloucester makes a *dun fish*.

An objection to Worcester's and Webster's definition of *killick* is in the Collections.[1] I sent an abstract of it to the Society, (with proper reference to the Collections.) If I remember rightly, the Century definition was not much better than the other, and to "come to killick" was mentioned as a current phrase. It sounds like Governor Bradford, or Christopher Wood. We of Essex County say, "*I threw my killick over.*"

A subject I should like to see investigated, and which seems to me connected with dialect, is the name *Dogtown*, applied to a high, rolling common in the middle of Cape Ann, which, (the Cape), was never settled except around

[1] Vol. VII, page 36.

the edges. Mrs. Emery[1] mentions a *Dogtown* in the outskirts of Newbury, "a hamlet beyond a belt of trees;" and it seems evident that the name has a common origin, not local. I do not think it has any connection with dogs. I have thought it more likely to be a corruption of syllables no longer understood, and assimilated to something familiar.

"Dialect-Notes" refer to the verb *fudge* used in playing marbles. One writer says it means to cheat; but it seems a particular form of cheating, for another says *fudge* means to push the marbles out of place. In Squam River is a shoal over which boats have to be *fudged* along with a pole, and the place where deep water begins was called *Done Fudging*.[2] The name extended to the region around, and as a child I supposed it was Dunfudgeon. Thus do things get mixed.

It is not easy to decide whether a word is dialect or not, and luckily it is not necessary for us to do so. It is much safer to report peculiarities, and let the experts decide. They throw out *keeler*, because the word is used wherever the thing is used, but the thing is not used everywhere. No doubt they will throw out *quarrel*, but it will do no harm to report that Judge Sewall used it in Boston 1685–95: "480 *quarrels* of the Front broken by the Hail."[3] He says a "house was broken *up*," instead of broken into: (Dutch, op gebroken). His *booby-hut* was a coach on runners, while that mentioned above was a clumsy coach on wheels. It might be of importance to the Society to know one was used as late as 1840, and *where* the word survived. And in all cases of doubt, I should say, report rather than risk losing anything.

[1] "Reminiscences of a Nonagenarian."
[2] History of Gloucester, page 150.
[3] Diary, I, 402.

At the annual meeting of the Society, "local pride" was mentioned as an incentive to the work. Essex County is well-entitled to an honest local pride, and Salem before all, for the lead she has taken in all other branches of archæology. She is sure to have a hand in this; and then her fine libraries fit her to be the headquarters of this work;—the last circular having expressed a wish for "local branch-circles at places where the reference-books are accessible." The Society very much wants "more members, more co-operation, and more money for printing," and the Essex Institute's appeal to the county would carry much weight.

Practical: A thin ledger-index, about thirteen inches by four, two pages to a letter, procured of any stationer, is very convenient for recording words.

If a word is taken from a book, note volume and page on entering it. If from a person, enter the name, and the sentence in which you heard it. These precautions save much trouble. Give date of use, if possible—*i. e.*—the time when a word went out of use, came into use, or simply how far back you can trace it. Classes of various kinds, especially of Local History, can without trouble collect much material, by simply saving what comes up naturally in the course of their researches.

A new *meaning*, be it remembered, is as good as a new word.

THE MINERALS OF ESSEX COUNTY, MASSACHUSETTS.

FOUR SECTIONS OF CABINET, PEABODY ACADEMY OF SCIENCE, SALEM.

GEOLOGICAL AND MINERALOGICAL NOTES, NO. 9.

BY JOHN H. SEARS,

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LIST OF THE MINERALS OF ESSEX COUNTY, MASSACHUSETTS.

The following list of the minerals of Essex County has been prepared after a careful examination of the work of the earlier mineralogists and dilligent search in almost every portion of the county for species not previously noticed. With so few persons devoting themselves to the study of mineralogy or collecting specimens in this region, it is not possible to present an absolutely complete list. Of the minerals here enumerated nearly all are represented by excellent specimens in the County collection in the museum of the Peabody Academy of Science in Salem.

As early as 1821, Prof. J. W. Webster discovered the minerals epidote and fibrous prenhite at Nahant and made analyses of them (American Journal of Science, Vol. III, page 364), and in 1823 he discovered the green feldspar and zircon crystals at the hill on the south side of the common in Beverly. In the analysis of the green feldspar he mentions the metallic particles in the compound, which, he writes, are probably oxide of titanium (Boston Journal of Philosophy, Vol. I, pp. 390–599). In the American Journal of Science (Vol. XXXIV, p. 402, 1838), is

recorded the discovery by Prof. C. U. Shepard, of twelve-sided crystals of columbite and hemitropic crystals of tin ore in the green feldspar rock at Beverly. From examinations of the minerals in the green feldspar rock of Beverly, I am inclined to think that the crystals of tin ore may have been titanite or titaniferous magnetite, as this mineral is quite abundant in the rock,—in fact, it is abundant in all of the varieties of the nepheline and elæolite-zircon-syenite rocks of the region,—and especially as titanite was not found by Professor Shepard in the analysis of the rock.

In the Essex County Journal of Natural History of 1839, Rev. William Prescott communicated a paper on the mineralogy and geology of the southern part of Essex County. In this paper Mr. Prescott enumerates twenty-nine different minerals and gives the localities in which they were found and their mode of occurrence. On January 14, 1856 (Proceedings E. I., Vol. I, pp. 151–153), Rev. A. P. Chute read a paper and mentioned cancrinite (this so called cancrinite proved later to be sodalite), pyrite and zircon, collected by Gilbert A. Streeter in Salem. In the proceedings of the Institute (Vol. II, p. 47), Mr. Chute gives a list of the minerals of Lynnfield, enumerating fourteen species. This would be a good list from that town at the present time, for a large portion of the bed rock is a Cambrian quartzite, in which there are very few minerals sufficiently conspicuous to be detected without a compound microscope.

In the Proceedings of the American Academy (Vol. VI, 1863, p. 167), Dr. Charles T. Jackson gives the analyses of the green feldspar, fergusonite and rhodonite, and mentions the discovery of minute crystals of topaz in the green feldspar by Mr. Francis Alger of Boston: the minerals were collected at Rockport by the Rev. Stillman Barden of that town.

The rocks from which the minerals recorded in the following list were taken represent twenty-nine distinct rock formations, with several thousand outcropping ledges, in all portions of Essex County. The greater number of these ledges have never been broken into except to collect the few specimens required to determine the character of the rock. They will, therefore, without doubt furnish many mineral species new to the county, as they are worked into and studied, and an extremely interesting field is thus offered to the mineralogist in the future as it has proved in the past.

I desire to acknowledge the kind assistance which I have received in determining many of the minerals here enumerated, from Prof. H. Rosenbusch of the University of Heidelburg, Germany; Prof. S. L. Penfield of the Sheffield Scientific School, New Haven, Conn.; Prof. J. E. Wolff and Messrs. Charles L. Whittle and T. A. Jaggar of Harvard College; Prof. W. O. Crosby of the Boston Society of Natural History; to Mr. John Robinson of the Peabody Academy of Science for other aid, and to the many friends in all parts of Essex County who have so kindly assisted me in procuring specimens, I especially desire to express my thanks.

Peabody Academy of Science.
Salem, July, 1896.

CATALOGUE.

No. 1. Gold.

The gray copper, galena and quartz, from the Chipman silver mine at Newbury, contains gold, and gold has been reported from various other mines in the neighborhood, and also from Boxford, Topsfield, Lynnfield Centre and Saugus. The analysis of the gray copper from the Chipman mine made by Prof. R. H. Richards of the Mass.

Institute of Technology (Proc. Boston Soc. Nat. History, Vol. XVII, pp. 200–204), gives: silver, $1,422. per ton; gold, $145.12 per ton and 27 per cent of copper. The galena (30 pounds) from the Chipman mine analyzed by Prof. Richards, yielded 25 lbs. of refined lead, 436.32 grains of silver and 4.19 grains of gold. An analysis of this galena made by myself at the Lawrence Scientific School gave silver at the rate of 27 ounces per ton.

Thus it is seen that gold, silver, lead and copper occur in Essex County. The gray copper of the quality above indicated is very rare even in Newbury and I do not believe that it is to be found in the county in sufficient quantities to be mined at a profit.

No. 2. Graphite.

This occurs in minute foliated scales in the granitic rocks of Peabody and Danvers, and in the slaty, carboniferous shales of Topsfield, Middleton and Lynnfield Centre.

No. 3. Stibnite: Gray Antimony.

Found associated with galena at the Newbury and Newburyport silver mines.

No. 4. Molybdenite.

Found in foliated masses of considerable size at the Pomeroy granite quarry at Gloucester, in the augite-syenite at Salem Neck and some good specimens have been found in the diorite at Marblehead.

No. 5. Silver Ore.

Newbury, Newburport, Amesbury, Rowley, Boxford and Lynnfield Centre.

No. 6. Galena: Lead Ore.

Found in the same places as the last named.

No. 7. Bornite: Variegated Copper Ore.

Luther Noyes copper mine and the southern part of Kent's Island, Newbury.

No. 8. Chalcopyrites: Copper Pyrites.

Found at the Luther Noyes copper mine, the Chipman silver mine and at Kent's Island, Newbury, the Stephen Osgood mine in South Georgetown and the old Governor Endicott copper mine in Topsfield.

No. 9. Sphalerite: Zinc Blende.

This occurs in considerable masses at all of the mines in Newbury, Newburyport and Rowley, and also in much larger quantities in the John Pettingale mine at Amesbury.

No. 10. Pyrrhotite: nickel Ore.

From the Luther Noyes nickel mine in Newbury and in a small vein exposed in the augite-syenite at Poor House hill in Beverly.

No. 11. Pyrite: Iron Pyrites.

This occurs in large masses near the Harriman mine at Boxford, and in Newbury in connection with the galena and silver ores. This is also common in small quantities in nearly all of the bed rocks of the county.

No. 12. Marcasite: White Iron Pyrites.

Found in large masses at the Luther Noyes nickel mine, Newbury.

No. 13. Arsenopyrite: Mispickle.

This occurs in thin sheets or veins at the John Pettingale mine, Amesbury, and good specimens were found at an old mine near the River Parker, Rowley.

No. 14. Tetrahedrite: Gray Copper.

Good specimens of this mineral were found in the dump heaps of the Chipman silver mine, Newbury, and at the Stephen Osgood mine, South Georgetown.

No. 15. Halite: Salt.

Found as incrustations and in acicular crystals on rocks and the borders of tide pools at the sea shore.

No. 16. Fluorite: Fluor Spar.

In irregular, crystalline masses in the granitite at the

quarry of the Rockport Granite Co., Rockport, and associated with galena at Lynnfield Centre.

No. 17. Hematite: Specular Iron.

Found on the surfaces of the slickensides of diorite, Salem, in amphibolite at Putnamville, and in hornblende granites, Peabody.

No. 18. Hematite, var. Micaceous Hematite.

Found in the bed rock of the Tophet hill lost gold mine, Lynnfield, Centre.

No. 19. Hematite, var. Red Ochre.

Beverly Cove, Danvers, Topsfield, etc. This is the common anhydrous form.

No. 20. Menaccanite: Ilmenite: Titanic Iron.

Seen in microscopic patches in nearly all of the eruptive rocks, especially in the augite-syenites, diorites and mica schists.

No. 21. Leucoxen.

This mineral, a decomposition product of the titanite, is usually seen surrounding the titanite or entirely replacing it.

No. 22. Magnetite: Iron.

This occurs in masses in the elæolite-zircon-syenite at Great Haste ledge, Salem harbor, and is common in crystals and small grains in all of the eruptive rocks of the county.

No. 23. Chromite: Chromic Iron.

In octahedral crystals in the limestone and serpentine at the Devil's Basin, Newbury.

No. 24. Rutile.

Common in microscopic crystals in the metamorphic Cambrian rocks in all parts of the county. Larger crystals occur in the granites at Swampscott, West Wenham, etc.

No. 25. Turgite: Red Ochre.

An earthy form of this mineral occurs in a hillside, northwest of the old meeting house, at Beverly Farms.

No. 26. Limonite: Brown Hematite: Bog Iron Ore.

Found in the beds of brooks and small ponds in nearly all of the towns in Essex County. This was the ore used at the Saugus Iron Works, the first iron casting works in America, in 1643.

No. 27. Limonite: Brown Ochre.

Mineral paint mine, Georgetown.

No. 28. Limonite: Yellow Ochre.

Danvers, Topsfield, Newbury, etc.

No. 29. Limonite: Clay Iron Stone.

Good specimens of this mineral are found in pockets in the granite at the Pomeroy quarry, Gloucester.

No. 30. Xanthosiderite.

Found in segregated masses, stalactitic and botryoidal in form, in crevices of the granitite at the quarry of the Rockport Granite Co., Rockport.

No. 31. Brucite.

A mineral belonging to the magnesia group, found associated with serpentine at the serpentine ledge, Lynnfield Centre.

No. 32. Wad: Bog Manganese.

Found in large masses in a meadow and brook at Putnamville, and in the form of rounded concretions in small ponds and spring holes at Peabody and Topsfield.

No. 33. Quartz.

Massive vein quartz occurs at North Beverly, Danvers, and various other places in the county.

No. 34. Quartz: Rock Crystal.

Found in large masses and crystals in pegmatite veins at Andover, Nahant, Rockport, etc.

No. 35. Quartz: Drusy Quartz.

In minute crystals, Danvers, Nahant, West Newbury.

No. 36. Quartz: False Topaz.

Light yellow color, Rockport.

No. 37. Quartz: Smoky Quartz.

The massive vein form is found in the rhyolites of Marblehead and in the granitite of Gloucester and Rockport.

No. 38. Quartz: Cairngorm Stone.

Found in nearly black crystals at the Pomeroy quarry, Gloucester, and at Rockport.

No. 39. Quartz: Milky Quartz.

Massive veins occur at South Georgetown and Groveland.

No. 40. Quartz: Ferruginous Quartz.

In the carboniferous slates of Topsfield.

No. 41. Quartz: Rose Quartz.

Occasionally found in the glacial drift.

No. 42. Prase: Actinolitic Quartz.

A vein occurs at Bass Point, Nahant.

No. 43. Chalcedony.

Good specimens occur at Prospect Hill, Beverly, and it is also found filling the amygdules of the amygdaloidal melaphyre at Saugus.

No. 44. Basanite: Chert.

Found in the Cambrian rocks at Peabody, Middleton, Rowley and Nahant Head, Nahant.

No. 45. Jaspelite.

Saugus Centre and Nahant. This is the so called red jasper as popularly known.

No. 46. Quartzite.

Saugus, Lynnfield Centre, etc., forming large beds in the lower Cambrian rockmass.

No. 47. Opal, var. Silicious Sinter.

Found as segragated, granular, stalactitic masses at the contact of the augite-syenite and granite in Beverly.

No. 48. Opal, var. Tripolite: Infusorial Earth.

Found in beds of brooks and meadows in Danvers. At West Boxford beds occur two feet or more in thickness.

No. 49. Hypersthene.

In irregular, cleavable, crystalline grains and masses in the hypersthene-gabbro at Misery Island and Salem Neck.

No. 50. Wollastonite: Tabular Spar.

A bladed variety of this mineral is found at the Devil's Den, Newbury.

No. 51. Diallage.

Found in large crystalline masses at the Luther Noyes nickel mine, Newbury.

No. 52. Pyroxene, var. Augite.

In irregular crystals in the augite-nepheline-syenite at Salem Neck, Beverly and Manchester.

No. 53. Diopside, var. Brown Augite.

This occurs as irregular, microscopic crystals in the augite-nepheline-syenite on the Pickman estate, Beverly Cove.

No. 54. Acmite.

This occurs as small acicular crystals in the augite-syenite at Powder House hill in Essex, and at Lanesville in Gloucester.

No. 55. Ægirine.

Typical bent crystals, sometimes three inches long, are found in the ægirine-syenite at Gale's Point, Manchester. (Sears Bull. Essex Institute, Vol. XXIII, Min. and Geol. Notes, No. 3, p. 5.). It is also seen in thin sections of the elæolite-zircon-syenite of Salem Neck and Beverly when studied with the microscope.

No. 56. Enstatite.

In micro-crystals in the olivine-gabbro of Salem Neck.

No. 57. Bronzite.

Found as the last and also in a coarse pegmatitic mass on Misery Island, Salem harbor.

No. 58. Hornblende.

Irregular crystals are abundant in the hornblende-granite of Peabody and, microscopically, it is common in the diorite, syenites and the dyke rocks.

No. 59. Tremolite.

The Devil's Basin, Newbury.

No. 60. Actinolite.

Long crystals are found at Bass Point, Nahant, and it is also found in a large pegmatite boss in the quarry of the Rockport Granite Co., Rockport.

No. 61. Asbestus, pseudomorph of Actinolite.

A vein, six inches wide, in the diabasic norite, at Bass Point, Nahant.

No. 62. Arfvedsonite: Alkali Hornblende.

Irregular crystals are found at Salem Neck and larger masses on Coney Island, Salem harbor, in the elæolite-zircon-syenite.

No. 63. Ainigmatite.

Rare, in microscopic masses in the elaeolite-zircon-syenite, Great Haste ledge, Salem harbor.

No. 64. Cossyrite.

Microscopic crystals in the augite-syenite at Magnolia.

No. 65. Glaucophane. A deep blue hornblende.

Massive forms in the augite-hornblende-granite at Pickering's Point, Salem, and in the granite-porphyrite at Marblehead Neck, etc.

No. 66. Chrysolite: Olivine.

Found in porphyritic crystals in olivine basalt dyke rocks, Salem Neck, etc.

No. 67. Fayalite.

A large mass, at a depth of sixty feet, in the quarry of the Rockport Granite Co., Rockport. (See Penfield and

QUARRY OF THE ROCKPORT GRANITE CO., ROCKPORT, ESSEX CO., MASS.

Forbes, American Journal of Science, Vol. 1, 1896, page 129.) The specimens which I collected in 1890 were the first observed in New England.

No. 68. Danalite.

In irregular masses and microscopic blebs scattered through the hornblende-biotite-granitite at the quarry of the Rockport Granite Co., Rockport, and at the Pomeroy quarry, Gloucester.

No. 69. Garnet.

Garnet occurs plentifully in a garnet schist outcrop between Powder House hill and White's hill in Essex, and elsewhere in the county.

No. 70. Almandite Garnet.

Abundant in the biotite-muscovite–granite, Andover.

No. 71. Grossularite Garnet: Cinnamon Stone.

In a drift boulder, Nahant.

No. 72. Massive Garnet.

Devil's Den, Newbury.

No. 73. Zircon.

Crystals with double terminations are abundant in the elæolite-zircon-syenite, Salem Neck, Beverly, etc.

No. 74. Vesuvianite.

Specimens from a vein in the serpentine at the Devil's Basin, Newbury, analysed by Prof. W. O. Crosby, were determined as vesuvianite, but the mineral, however, is isotropic and identical with No. 72 above, massive garnet.

No. 75. Epidote.

Veins with fine drusy crystals are found at Egg Rock near Nahant, in the diabase at East Point, Nahant, and also in the rhyolites at Marblehead, Clifton, etc.

No. 76. Allanite.

Radiated crystals are found in the diorite at Beverly, and long slender crystals are found in the augite-syenite at Beverly and West Gloucester and in the granite at Swampscott. The specimen determined as orthite by D.

M. Balch and described in the American Journal of Science and Arts, Vol. XXXIII, p. 198, should undoubtedly be referred to Allanite.

No. 77. Orthite.

Found in radiated crystals in the hornblende-biotite-granitite at the quarry of the Rockport Granite Co., Rockport.

No. 78. Zoisite.

This occurs in fine blue crystalline masses in the zoisite-gneiss and the hornblende-epidote-gneiss at Andover, Georgetown and Newbury.

No. 79. Iolite.

Found in corderite-gneiss at Marble Ridge, North Andover.

No. 80. Phlogopite Mica.

In granitite, Rockport.

No. 81. Biotite Mica.

In augite-syenite, Salem Neck and Beverly, and also in granitite at Rockport.

No. 82. Lepedomelane.

Found in hexagonal plates of a bronze color in the Pomeroy quarry, Gloucester.

No. 83. Astrophyllite.

In the quarry of the Rockport Granite Co., Rockport.

No. 84. Muscovite Mica.

Common in the biotite-muscovite-granite at Andover, Methuen and Rowley.

No. 85. Lepidolite: Lithia Mica.

In mica schist at Ballardvale, Andover, Bradford and Methuen; in the mica schist at Ward's Hill, Bradford.

No. 86. Cryophyllite.

In the hornblende-biotite-granitite at Rockport.

No. 87. Annite.

Found, as the last.

No. 88. Sericite.

OUTCROP OF ELÆOLITE-ZIRCON-SYENITE, SALEM NECK, ESSEX CO., MASS.

This occurs in irregularly banded plates in the jaspelite at Saugus Centre, etc.

No. 89. Scapolite: Wernerite.

In 1890 I found microscopic grains of scapolite in thin sections of the hornblende-granite collected at a quarry on Humphrey street, Swampscott, which is, I believe, the only record of this mineral being detected in granite.

No. 90. Elæolite.

This occurs in large irregular crystalline masses in the elæolite-zircon-syenite at Beverly, Salem Neck, etc.

No. 91. Nephelite: Nepheline.

Found in small micro-crystals in the augite-nepheline-syenite at Salem Neck, Beverly and Gloucester (See Bull. E. I., Vol. xxv, No. 6, p. 5, 1893.)

No. 92. Cancrinite.

This occurs in minute irregular masses in the elæolite-zircon-syenite at Salem Neck where it is lemon yellow in color. It is more abundant at Great Haste ledge and the Ram Islands, Salem harbor, where the color is grayish to brown.

No. 93. Sodalite.

In coarse pegmatetic masses in the elæolite-zircon-syenite at Salem Neck, Great Haste ledge and Beverly shore.

No. 94. Hydronephelite.

In radiated crystals in the elæolite-zircon-syenite at Salem Neck.

No. 95. Anorthite.

A large mass of this feldspar occurs at East Point, Nahant, near the residence of Hon. H. C. Lodge.

No. 96.. Labradorite.

This occurs in large crystals, some of which are three inches long by one and one-half inches wide, in the gabbro at Bay View, Davis Neck and Lanesville in Gloucester, also in porphyretic dyke rocks in various localities.

No. 97. Albite.

Fine, glassy, multiple twinned crystals are found at the Pomeroy quarry, Gloucester.

No. 98 Orthoclase.

Simple and twinned crystals are found in pegmatetic masses in the granitite at Rockport. Common in the granite.

No. 99. Microcline: Amazon Stone.

Specimens of a bright verdigris green color are found at Briscoe hill, Beverly, and at Gloucester and Rockport.

No. 100. Microcline-microperthite (Soda Microcline of Brogger.)

Found in coarse crystalline masses in the elæolite-zircon-syenite at Salem Neck.

No. 101. Orthoclase-microperthite (Albite and Orthoclase intergrowths.)

In the elæolite-zircon-syenite Coney Island, Salem harbor.

No. 102. Sanadin.

Crystals from the Bostonite porphyry (Rosenbusch), a dyke rock on Coney Island, Salem harbor.

No. 103. Anorthoclase.

Crystals in the keratophyre at Marblehead harbor (See Bull. M. C. Z., Geol. Ser., Vol. II, No. 9, p. 167.)

No. 104. Prehnite.

Rare, in reniform or globular masses in the diabasic norite at Nahant.

No. 105. Natrolite.

This occurs as a secondary pseudomorph of elæolite on Salem Neck and in amygdules in the amygdaloidal melephyre at Rowley.

No. 106. Steatite: Soapstone.

In a massive bed associated with the serpentine at Newburyport.

THE "DEVIL'S DEN," NEWBURY, ESSEX CO., MASS.

No. 107. Talc.

The fine granular variety known as French chalk is found at Newburyport near the silver mines.

No. 108. Serpentine: Noble Serpentine.

Rich oil green color, Devil's Den, Newbury.

No. 109. Serpentine: Common Massive Serpentine.

Devil's Den, Newbury.

No. 110. Serpentine: Foliated Serpentine: Marmolite.

The same station.

No. 111. Serpentine: Picrolite.

Devil's Basin, Newbury.

No. 112. Serpentine: Picrosmine.

Devil's Basin, Newbury.

No. 113. Serpentine: Baltimorite.

Devil's Basin, Newbury.

No. 114. Serpentine: Chrysotile: silky fibrous.

Devil's Basin, Newbury.

No. 115. Serpentine: Massive Serpentine, dark colored variety.

Lynnfield Centre.

No. 116. Kaolinite.

Kent's Island, Newbury, and at "Little Niagara river," Bradford.

No. 117. Tourmaline.

Long accicular crystals, some of which are in finely radiated groups and black in color, are found at South Groveland.

No. 118. Andalusite.

In veins of andalusite slate at Nahant, and near Flax pond, Lynn.

No. 119. Andalusite: Chiastolite.

Crystals are found in glacial drift at the Castle, Castle river, Ipswich.

No. 120. Fibrolite.

In the corderite gneiss at Marble Ridge, North Andover.

No. 121. Titanite: Sphene.

Micro-crystals are found in augite-syenite at Salem Neck, Beverly, Magnolia, etc.

No. 122. Bastite: Schiller Spar.

Resulting from the alteration of pyroxine-diallage in the diabasic norite, Nahant.

No. 123. Pinite.

Pseudomorph of orthoclase; Eagle Island, Little river and Kent's Island, in Newbury, etc.

No 124. Jeffersite.

In broad crystalline plates resembling biotite mica, northwest side of Powder House hill, Beverly, and in the old lime pits near Stevens' pond, Boxford.

No. 125. Pennenite.

Pomeroy quarry, Gloucester.

No. 126. Delessite.

This occurs as thin folia in seams of diorite at Salem, and in diabase dyke rock in Bradford, etc.

No. 127. Uralite.

A paramorph of hornblende after pyroxene. This mineral is abundant, microscopically, in the quartz-augite-diorite of Newburyport, Carr's Island, etc.

No. 128. Fergusonite.

Found in the granitite at the quarry of the Rockport Granite Co., Rockport.

No. 129. Apatite: Phosphate of Lime.

Microscopic crystals occur abundantly in diorite, augite-syenite, and many dyke rocks.

No. 130. Apatite: var. Guano.

Found incrusting the rocks, Great Haste ledge and Half way rock, Salem harbor.

No. 131. Calcite: Calc Spar.

Often found in good rhombic crystals in the amphibolite-gneiss at Putnamville.

No. 132. Calcite: Dogtooth Spar.

Near the Tri-Mountain house, Bass Point, Nahant.

No. 133. Calcite: Massive Granular Limestone.

Found in large masses at the Devil's Den and Devil's Basin, Newbury, and at the old lime pits in Boxford.

No. 134. Calcite: Massive Blue Limestone.

Interstratified with quartzite-sandstone and slate in the carboniferous rocks at Topsfield.

No. 135. Calcite: Statuary Marble.

Specimens, pure white and fine grained, occur at the Devil's Den, Newbury.

No. 136. Calcite; Silicious Limestone.

This belongs to the Olenellus, Lower Cambrian period and occurs at Archelaus hill, West Newbury, and at Rowley and Nahant.

No. 137. Dolomite: Magnesian Limestone.

Found in veins in the serpentine at the Devil's Den, Newbury.

No. 138. Ankerite.

Good rhombohedral crystals are found in the granitite in the Pomeroy quarry, Gloucester.

No. 139. Magnesite: Brown Spar.

Found in the old serpentine ledge, Lynnfield Centre, and at Boxford and Newbury.

No. 140. Siderite: Spathic Iron.

Massive crystalline forms are found associated with the iron pyrites and galena at the Chipman mine, Newbury, and (rare) in small compound scalenohedrons and rhombic crystals incrusting the albite feldspars at the Pomeroy quarry, Gloucester.

No. 141. Siderite, bronze var.

In the Newbury mining region. The usual form is granular in structure.

No. 142. Malachite: Green Carbonate of Copper.

Found associated with gray copper at the Osgood mine, South Georgetown.

No. 143. Azurite: Blue Carbonate of Copper.

Osgood mine, South Georgetown.

No. 144. Quartz.

A quartz crystal an inch broad, a pseudomorph of fluorite, deep scarlet in color, was found in the granitite at the quarry of the Rockport Granite Co., Rockport.

No. 145. Coal: Earthy Brown Coal.

East side of Nahant, near the old iron mine.

No. 146. Bog-butter: Oxygenated Hydrocarbon (?)

Three feet below the surface, Clifton, Marblehead.

No. 147. Rhodonite: Red Bi-silicate of Manganese.

"Rockport, Rev. S. Barden, collector." (Dr. C. T. Jackson, Proc. Am. Acad. Vol. VI, p. 167.)

No. 148. Topaz.

"Determined by Mr. Alger." Same citation as above. Not represented in the collection of the Peabody Academy.

No. 149. Columbite.

"Small twelve-sided prisms of columbite in the green feldspar rock at Beverly" (Prof. C. U. Shepard, American Journal of Science, Vol. XXXIV, p. 402.) Not represented in the collection of the Peabody Academy of Science.

No. 150. Tin Ore.

"Hemitropic (twinned) crystals of tin ore." Same citation. Not represented in the collection of the Academy.

In closing this list I would again call attention to the collection of the minerals of Essex County in the museum of the Peabody Academy of Science, which occupies several sections in the cases devoted to the natural history of the county, and which covers, with the few exceptions noted, all of the species enumerated in the list. A few of

OUTCROP OF ELÆOLITE-ZIRCON-SYENITE AND ESSEXITE. SALEM NECK, ESSEX CO., MASS.

the minerals are only to be seen with the aid of the compound microscope, although abundant in the rocks. The arrangement of the minerals follows the text book of Prof. E. S. Dana, tenth revised edition. In studying the rock formations more than six hundred thin sections were made for microscopic study and these may be seen by persons engaged in the study of the minerals by applying to me at the office on the lower floor of the museum building. In connection with the minerals will be found collections illustrating the rocks of the county and the geological formations, including photographs of the more interesting features. All of the specimens are clearly labelled and can readily be found by anyone who may care to examine them in connection with this list.

INDEX.

The references are to the numbers of the minerals in the list.

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ANNUAL MEETING, MAY 21, 1895.

THE annual meeting was held in Plummer Hall, this evening, at 7.45 o'clock.

President Edmund B. Willson, in the chair.

The reports of the Secretary, Treasurer and Auditor, Secretary of the Women's Local History class, Librarian, Committee on Publications and Library, were read, accepted and ordered to be placed on file.

The report of the Committee on Nominations was presented by Mr. Geo. H. Allen, and it was

Voted, to proceed to the election of officers by ballot, and the Society voted that the Secretary be authorized to cast one ballot for the whole list of names that had been nominated. This was done and the following persons were declared to be unanimously elected:

PRESIDENT:
EDMUND B. WILLSON.

VICE-PRESIDENTS:

Abner C. Goodell, Jr.	Edward S. Morse.
Daniel B. Hagar.	Robert S. Rantoul.

SECRETARY:	TREASURER:
Henry M. Brooks.	William O. Chapman.
AUDITOR:	LIBRARIAN:
Henry M. Batchelder.	Charles S. Osgood.

COUNCIL:

William H. Gove.	George D. Phippen.
Thomas F. Hunt.	David Pingree.
Francis H. Lee.	Frederic W. Putnam.
Richard C. Manning.	George M. Whipple.
S. Endicott Peabody.	Alden P. White.

Report of the Secretary, May 20, 1895.

It will perhaps be remembered that last year I spoke to you on the great lack of interest, by people in general, in society or corporation reports. This year I have a few words to say on another subject.

Annual meetings, to a large majority of people, are a *bore!* Some may think this is rather a strong expression. I suppose it is, but it is the way such meetings are generally regarded and spoken of. Bank officers have to "scratch round" and get a sufficient number of proxies to elect themselves, and so do the officers of many other corporations. I am telling you nothing new, for this is well known.

But, some will say, how is it with those societies, where they *sometimes* have *full* meetings? My answer to this is, that steps have to be taken to enliven the meeting with something besides the regular business. There must be

speeches, literary exercises or music, or there would be but a slim attendance even at those meetings.

When the time comes round to prepare for *our* annual meeting, I always feel as Artemas Ward said he felt when he was surrounded by the Indians. He wished he had happened to be somewhere else, just at that time; or, like General Butler, when he was out of favor with the Commander-in-chief, ordered to report at Lowell.

Of course, when I come to the meeting, I like to see a good attendance of handsome, well dressed people, of both sexes—like those here to-night—but I have no words of censure for those members who do not care to come, for I might myself, under certain circumstances, stay away.

One very rainy Sunday afternoon, many years ago, the worthy old sexton of the North church was pacing the broad aisle, when the minister, Dr. Brazer, arrived. They were the only persons in the house. The Doctor said—"It doesn't look, Mr. Sexton, as if there would be many here this afternoon." "No, sir," answered the sexton, with his usual rapid and pointed speech, "and you and I, sir, wouldn't be here if we weren't paid for it."

But in spite of what I have had to say on this subject, it is, I suppose, incumbent on the Secretary to sacrifice his own feelings and present for your consideration some statistics, thought to be applicable to the occasion.

The year just closed has been one of comparative prosperity to the society. We have not, it is true, any of those large legacies to mention, which we are always anxiously looking for. But we must continue to work with patience, and have faith that there is a good time coming, some day or other, when we shall have the means to enlarge our building, in order to properly display all our constantly increasing donations.

At the last annual meeting the fact was referred to, that efforts were making to increase our membership, which was then reported as numbering 391. I have now the pleasure of stating that we have more than doubled the number. To be exact, we have at this time 806 members, and eight have become life members.

The life members are Caleb Davis Bradlee, Augustus Hemenway, Robert C. Winthrop, Jr., Edward Wigglesworth, of Boston, James J. Higginson, of New York, Horace Fletcher, of New Orleans, Geo. Peabody Wetmore, of Newport, R. I., C. W. Galloupe, of Swampscott.

This is certainly a good showing and proves that the method adopted by the Secretary is a good one, whatever any chronic fault-finders may have to say to the contrary,— I mean if we have any such characters about. I hope we haven't.

We must continue this work until we have obtained at least 1,000 members, then we can take a short vacation.

The question has been asked how many members we have outside of Salem. About 300, in 65 different cities and towns throughout the country, and one member in Birmingham, England.

The following members have died during the year: Lincoln F. Brigham, Caleb Foote, John W. Masury, of New York, Daniel Needham, of Groton, Fitz W. Perkins, George W. Pousland, of Boston, Thomas E. Proctor, of Boston, Henry Saltonstall, of Boston, A. A. Scott, of Saugus, Leverett Saltonstall, of Newton, Joseph W. Lefavour, of Beverly, Matthew A. Stickney, Dr. George A. Perkins; and of Honorary Members, Robert C. Winthrop, of Boston, Prof. James D. Dana, of New Haven, Oliver Wendell Holmes, of Boston, E. Rockwood Hoar, of Concord.

The free course of lectures the past season in Plummer

Hall was apparently quite satisfactory to the audiences, which were generally much larger than in previous years. The lectures have been by Prof. T. C. Mendenhall, of Worcester, Richard Hodgdon of Boston, Dr. George A. Dorsey, of Cambridge, Howard Walker, of Boston, Gamaliel Bradford, of Boston, George S. Hale, of Boston, Charles Carleton Coffin, of Boston, Rev. Dr. Pullman, of Lynn, Miss Lucia T. Ames, of Boston.

There have been twenty-three regular meetings of the Society held this year; a larger number, I think, than has ever been held in any year previous. The evening meetings in the Library room have been well attended. Papers have been read by the following persons: Herbert E. Valentine, of Somerville, John Robinson, Prof. E. S. Morse, John H. Sears, Hon. R. S. Rantoul, Frank Cousins, Mrs. H. W. Edwards, Mrs. E. A. Kilham, of Beverly, Miss Helen D. Lander for Miss Lucy Perry, Mrs. R. C. Manning, Miss Mary S. Cleveland, Miss Abby L. Read, Miss Irene Weir, of Boston, and three papers by the Secretary.

These papers were discussed by various members of the Society. There is a great interest taken in these meetings, which is very encouraging to those who planned them. The only drawback seems to be that some of our members, who would gladly take part, have engagements elsewhere on Monday evenings. But it might be the same if we had the meetings upon any other evening.

Our regular meetings, in accordance with the by-laws, occur on the first and third Monday in every month. They have been held this season in the evening, from the first Monday in December until the first Monday in May. During the summer months they are usually held on Monday mornings, for business only, and notice is given in the newspapers of the city on Friday and Saturday previous. I mention this here because members sometimes say they

do not know when we have our meetings, or they would be present.

At the last annual meeting it was stated that some of the women connected with the Society proposed to form a class for the study of local history. Such a class was begun early in June last, and has continued during the year. Miss Helen D. Lander, the Secretary, will read to the meeting a most excellent report of the doings of that very successful class. With regard to this matter, I have only to say that, in my judgment, this is the most important movement made in the Institute for years. I will not except even the Chicago boom,—for one of the principal objects of the society is the investigation and study of local history.

As is perhaps well known almost everywhere now, we hold the key to the broadest church in the land. Roman Catholics, Protestants, Trinitarians and Unitarians, all go to this church. Between 9,000 and 10,000 have been into the church this year, the largest number ever reported. It is amusing to hear remarks often made about this house of worship. As we have a card posted up explaining the matter, visitors have ceased to ask how they got up in the gallery. One party who applied for admission asked if they "could be permitted to walk through the church," meaning, I suppose, up the broad aisle and down another. One man from New York, upon returning the key, said, "That'll do well enough to show to countrymen, but I can hardly swallow it." One person asked how long the church continued to be Baptist after Roger Williams left. Another asked if all the seats were like the old "settle" we have there.

The following societies have visited Salem the last year and received attentions from the Institute and the Peabody Academy of Science: The Auburndale Review Club, on June 5, the Asbury Grove Methodist Trustees on June

15, and on August 2, sixty members of the American Society of University Extension under the direction of Prof. Lyman T. Powell, of Philadelphia. This society, under the escort of a committee of the Institute, was taken about the city to historical points in barges, lunched in Plummer Hall at 12 o'clock and attended a meeting at Academy Hall in the afternoon, where Hon. R. S. Rantoul gave a fine address on the history of Salem during the Revolution. The visitors expressed themselves as greatly pleased with the attention they received, and with what they saw and heard on this occasion. Professor Morse and the Secretary by invitation, represented the Institute at a reception given to the "Historical Pilgrims" in Boston, on the succeeding Friday evening.

As usual, several schools and classes have visited our rooms the past year. These excursions are becoming so general with the increase of the "travel habit," which has taken possession of most people, that any record of them, ceases to be of special interest to any of us, I imagine. I will mention, however, that on the 31st of last May, the architectural class of the Massachusetts Institute of Technology made a visit to Salem for the purpose of studying examples of colonial architecture. This class was taken to points of historical note about town by a committee of the Institute, and two or three evenings our rooms were opened to them that they might study any objects of interest to be found there. The first evening the class was introduced by Mr. Ross Turner to the officers and committees of the society, who gave an informal reception from 8 to 10 o'clock, with a light lunch, music, etc.

The large and valuable collection of manuscript letters and papers left to the society by Dr. Wheatland have been carefully examined and arranged by Wm. P. Upham, Esq., curator of manuscripts, and these are now in the

hands of our library assistants who are placing them in scrap books for their better preservation.

The donations to the Cabinets the past year have been 470, from 132 donors. Among these donations were an ancient sword, silver case and hilt (marked 1319) from Miss Mary Ellen Briggs; a wooden bust of Hippocrates which, in Oct., 1771, was a sign for Nathaniel Dabney of Salem, apothecary; a cradle used by Judge Story and afterwards by his son Wm. W. Story; and several very finely carved tortoise shell combs from the Misses Cleveland.

From the late Judge E. Rockwood Hoar, a gold watch, key, seal and chain, which belonged to Major John Clarke, who was at the capture of Quebec in 1759; and an early Chickering piano from Mrs. W. A. Lander; from the Salem Marine Society, miniatures on ivory, of Capt. Jona. Lambert and Capt. Samuel Lambert, of Salem, and from Prof. Alpheus Hyatt of Cambridge, a slave whip.

We have also been presented with a Bull.* He is, however, somewhat aged and infirm and will have to be doctored before he is ready for a bull fight, or can be exhibited. Besides this we have some of the bones of George Jacobs, who was executed for witchcraft.

An album of leaves and flowers gathered in Italy by Una Hawthorne in 1858–9, sent to us by Richard Garnett, Esq., of the British Museum, London.

These are a few of the most noted donations, for we could not enumerate all in this report.

The Society still wants room, money and members—the young and old of both sexes.

Which is respectfully submitted,

HENRY M. BROOKS,

Secretary.

* Made of wood, used as a sign by Jona. Andrew in 1769, near Williams Street.

Report of the Librarian.

The additions to the library for the year (May, 1894, to May, 1895), have been as follows:

By Donation.

Folios,	23
Quartos,	75
Octavos,	517
Twelvemos,	177
Sixteenmos,	119
Twenty-fourmos,	39
Total of bound volumes,	950
Pamphlets and serials,	3,563
Total of donations,	4,513

By Exchange.

Folios,	5
Quartos,	21
Octavos,	184
Twelvemos,	1
Total of bound volumes,	211
Pamphlets and serials,	1,819
Total of exchanges,	2,030

By Purchase.

Folios,	4
Quartos,	3
Octavos,	12
Twelvemos,	25
Total of bound volumes,	44
Pamphlets and serials,	441
Total of purchases,	485
Total of donations,	4,513
Total of exchanges,	2,030
Total of purchases,	485
Total of additions,	7,028

Of the total number of pamphlets and serials, 2,244 were pamphlets and 3,579 were serials.

The donations to the library for the year have been received from two hundred and one individuals and ninety-three societies and governmental departments. The exchanges, from ten individuals and two hundred and nineteen societies and incorporated institutions, of which one hundred and twenty-two are foreign; also from editors and publishers.

To these facts and figures the librarian has but little to add. The ordinary routine work of the library has been performed quietly and effectively and, we have reason to believe, has been appreciated by many students and investigators. There have been no large donations as in many former years which accounts for the much smaller increase of the library, although the number of donors and exchanges have not materially changed.

The use of the library shows a steady increase from year to year, one reason for it this year being found in the impetus given to local historical research by the formation, by the ladies connected with the Institute, of the history class to which reference is made in the other reports.

During the year the magazines in the library, both bound and unbound, have been arranged, and an alphabetical list of them made, so that it is now possible to tell at once what numbers of the different magazines we have and what are our deficiencies. This will be found a great convenience to all who wish to consult them.

The long-looked-for, and confidently expected addition to the funds of the Institute, has not as yet been forthcoming, but we do not lose heart on this account. During the past year we have made an almost phenomenal addition to our list of members. This brings to the mind of

many more persons the wants and needs of the Institute and the good work it is doing for the county and city. From this largely increased membership, or by means of it, we hope and believe that some will be interested to the extent of furnishing, in some form, a substantial addition to our available funds. When we realize how much has been done by the Institute, at a comparatively small expense, we can form some estimate of how much the public would be benefited were a larger fund placed at its disposal.

The needs of the library are a stack room for books and a catalogue. Our ever increasing number of books, now about 65,000 bound volumes and 200,000 pamphlets, make the first a pressing necessity which we have partly relieved by the undesirable method of storing those least used outside the library building, and the second is needed that the users of the library may be able to know just what it contains on the subjects upon which they desire to inform themselves. Both these needs appeal to the liberality of the public and must await the time when that liberality shall manifest itself.

In conclusion, the librarian would congratulate the members on the possession of a library somewhat unique in character, and one which, notwithstanding all the drawbacks, is frequently and profitably consulted.

Charles S. Osgood,

Librarian.

Treasurer's Report.

RECEIPTS.

Balance from last report,		$508 97
Received from invested funds,	$2,777 05	
" " assessments of members,	1,986 00	
" " life membership fees,	400 00	
" " publications,	528 14	
" " other sources,	90 47	
		5,781 66
Money borrowed,		1,500 00
Interest received and funded,		12 58
		$7,803 21

Also received from Almy, Bigelow & Washburn, $25, the nucleus of a Reception Fund.

EXPENDITURES.

Salaries of secretary, assistant librarians and janitor,	$2,458 00	
Fuel,	309 75	
Lighting and water,	102 72	
Labor, etc., on grounds,	51 15	
Postage and express,	173 44	
Supplies,	72 90	
Insurance,	45 00	
Interest on loan,	208 50	
Furniture and fixtures,	158 87	
Storage,	51 80	
Lecture expenses,	62 42	
Reception "	197 35	
Our proportion of Athenæum expenses,	246 54	
Repairs,	158 68	
Books,	422 72	
Publications and printing,	1,626 62	
Miscellaneous,	29 42	
Annuities,	610 00	
		$6,985 88
Interest added to manuscript fund,	7 30	
North Bridge monument fund,	5 28	
		12 58
Balance of cash on hand,		804 75
		$7,803 21

Respectfully submitted,

W. O. Chapman, *Treasurer.*

Auditor's Report.

Salem, May 20, 1895.

The treasurer's accounts and books have been examined from the last annual meeting to date.

The receipts appear to be correctly entered and the expenditures properly entered and vouched.

The securities herein reported by the treasurer were examined on May 18, 1895, and agree with the list submitted within.

Respectfully submitted,

H. M. Batchelder,

Auditor.

Library and Publication Committee Report.

The Library and Publication Committee respectfully presents its report for the year ending May 20, 1895.

The condition of the library has undergone no considerable change and is clearly indicated in the exhaustive report of the Librarian. The library increases with a steady and healthy growth, and so in an unmistakable degree does the use of it, and the need of much additional shelf-room is once more pressing upon us.

The publications of the Institute have now been sustained in a manner which is recognized as creditable, for a series of years dating from 1856–7, when the Institute moved into Plummer Hall, and when six volumes of Proceedings, covering the work of the society from its inception in 1848, were begun and published at intervals through a dozen years. In 1869 the Proceedings made way for the Bulletin, now in its twenty-sixth volume, which has, for a reason about to be disclosed, become

scientific in the main, although still embracing the current record of the doings, the meetings and the necrology of the society.

In April, 1859, a new publication, devoted to historical matter, was begun, which has now reached a total of thirty completed volumes. It has been sustained without a break. The spirit in which it was conceived and carried on appears from the introductory notes which preface each of the first eight volumes.

At first such material as came to hand and seemed worthy of perpetuation in type—historical sketches, copies of records, and essays in antiquarian research—was printed, by a mutually convenient plan, in the columns of the Salem Gazette, and before distribution of the type, a limited number of extra copies were run off, paged up in a form to be bound into a periodical volume, and hence the double columns and peculiar shape of the page in the first eight volumes of our Historical Collections. But in 1869, not without a good many pangs amongst the more conservative of us, it was decided that these swaddling clothes had been outgrown, and our publications took on the decorous and customary form of the regulation octavo page.

During this series of forty years the Institute has printed and put on record very little matter which has not sufficient interest and value to warrant its preservation. Some of the articles in this long series have possessed an exceptional importance and a literary quality which has been recognized by the public. Some have been the work of persons of established literary, scientific and genealogical repute. On the whole it is not presumptuous, perhaps, to claim that our publications, as compared with others of their class, contain a fair share of matter which would be accepted as of value in the current issues of the press.

Yet, notwithstanding the unstinted efforts which have been made to keep up the standard of our publications and to bring their merits to the notice of appreciative readers —notwithstanding the frequent expressions of pride and satisfaction in the work which prevail about us,—the fact remains that no appeal to the people of Essex County, be they members or non-members of the Essex Institute, to sustain these publications has any effect; that no considerable portion of the cost of production can be met by sales, and that their remunerative value to the Institute lies in their availability in exchange.

As books of reference in the libraries of the country, they are used by persons pursuing genealogy, local history and natural science. We have had occasion within a year to refer an English investigator to a copy of our Historical Collections which is on the shelves of the British Museum. As a purchasing medium, they bring us large accessions of books from outside sources in the way of exchange. As a ready source of information which could not be reached without them, except through protracted research, they are drawn on by newsmen and genealogists and antiquarians and historical students, as unconsciously as the air they breathe, and, for the most part, with as little sense of dependency or obligation as the bird feels towards the atmosphere in which it floats. Perhaps this is as it should be; clearly it is beyond our power to change the fact, and we have either to support the publications on these terms or suspend them altogether.

Besides parts four, five and six of volume twenty-six —the current volume—of the Bulletin, comprising valuable contributions from Mr. Sears and the annual reports, and besides the second half of volume thirty of the Historical Collections, wholly given up to the memorial tribute to Doctor Wheatland, and the first half of volume

thirty-one containing church records, family history, etc., there have been printed and issued the following extras:

1. A Partial Catalogue of Publications on sale.
2. The Annual Report for 1894.
3. Baptismal Records of the Church in Topsfield, copied by Geo. Frs. Dow.
4. A Geological Report by Mr. Sears to accompany his map.
5. Geological and Mineralogical Notes, parts 7 and 8, by Mr. Sears.
6. The Wheatland Memorial in pamphlet form.
7. Salem and the Conkling Family, by Frank J. Conkling, Brooklyn, N. Y.
8. The Pepperrell Portraits, by Cecil Hampden Cutts Howard, Beebe, Ark.

In commemorating the founder of the Institute, as the occasion was unique, so a course was followed not altogether usual and, it was apprehended, open possibly to adverse remark. Instead of presenting a carefully drawn sketch, the work of a single hand, which must exhibit at once the capabilities and the limitations of the limner, it was thought the better plan to collate, in one volume, estimates and characterizations of the distinguished subject from a multitude of appreciative sources, thus perpetuating, so to say, a rounded statue observable from many points of view, rather than a canvas offering only one. So far as your committee have been informed, the departture has not been considered an unwise one.

The elaborate map exhibiting the surface geology of the county, prepared by the curator of that branch in the Peabody Academy of Science and promised us for publication last year, has been issued by the Institute and has been received with favor.

A trustworthy Guide to Salem and the adjoining region

has been for years a desideratum with visitors at the Essex Institute, and several books of no mean pretensions have been furnished of late by private enterprise. One of these has already reached its thirty-second thousand and has enjoyed the commendation of critical journals in remote sections of the country. It has seemed advisable, this year, for the Institute to assume the publication of such a guide. For this purpose the valuable accumulation of material in the "Visitor's Guide" has been placed at the service of the Institute and, largely extended and revised with care under the supervision of the committee, it will be issued at once and will bear the imprint of the Essex Institute. It is thought to be as free from inaccuracies as is fairly to be expected. Such errors as may linger in it, will, as they are discovered and pointed out, disappear in subsequent editions.

The committee are unable to close this retrospect of the year without alluding to a new element of Institute work which has come to their notice, and which seems to them to be of rich promise for the future. The class of ladies who have taken up, as a recreation, the pursuit of local history and antiquities, embodying the results of their research in a series of short, carefully written and well-constructed papers, have been pleased to place these at the service of the Essex Institute for reference or publication. While some of the best of them, from the necessity of the case, are made up largely of material already to be found in our pages and are therefore of no value to us, as contributions to our collections, commensurate with their literary quality, there are others, and these not a few, containing original features of marked merit,—some new mode of treatment of a familiar topic,—some new light thrown on a conspicuous character,—some new view of an event heretofore regarded from an ill-selected standpoint,

—which make the papers distinct contributions to the store of knowledge this committee is endeavoring to accumulate. It can hardly be that this new movement will fail of rendering welcome aid in our historical labors.

Robert S. Rantoul.
Geo. M. Whipple.
Chas. S. Osgood.
Edw. S. Morse.
William H. Gove.
Alden P. White.
Sidney Perley.

Local History Class Report.

It has been suggested that it might be of interest to the members of the Institute to hear a short report of the work of the Local History Class, a branch of the parent tree, to a report of whose proceedings for the past year, we have just had the pleasure of listening.

At the last annual meeting of the Institute a suggestion was made that a class should be formed for the study of our local history. It was thought this study might prove interesting and instructive.

In pursuance of this suggestion, Mrs. Henry M. Brooks, with a view to finding out if such a class would be desirable, talked over the matter with a few persons, and, as a result, a meeting to consider the question was called for Thursday afternoon, May 24th, at the Institute rooms. The day proved very stormy and but three persons were present: Mrs. Brooks, Miss Arvedson and Miss H. D. Lander. Of course no formal action towards the formation of a class could be taken, and the meeting adjourned to June 6th.

At that meeting nineteen persons were present. It

was voted to form a class for the study of our local history, to hold weekly meetings on Tuesday afternoons; the hour of meeting to be four o'clock; the time of the session to be limited to one hour; the place of meeting, the Henry Wheatland library room, the use of which was offered to the class.

Mrs. Henry M. Brooks was chosen chairman, Miss H. D. Lander, Secretary, and Miss M. E. Arvedson, Reference Librarian.

At first the members read extracts from books containing accounts of life in the early times. In a few weeks they began to write papers, gathering the facts from the books, but telling the stories in their own words. The interest has increased greatly as the study has progressed. Forty-nine papers have been prepared upon a variety of subjects, including the lives of the early planters, of the early governors, of the first ministers, and of the notable women of those early days, who so bravely endured the hardships and privations, and often the persecutions to which they were exposed. Papers have been written also descriptive of the places prominent in our early history: North and South Fields, Salem Neck, and Salem Common.

Accounts have been given of Salem's early commerce, ship building, the early New England fisheries, schools and school-masters, the establishment of Harvard College, custom houses, taverns, slavery, travelling, the early Quakers, and the cruelties and persecutions they suffered at the hands of the Puritans. A paper dealing with Roger Williams' life in Salem, and the persecutions inflicted upon him by the magistrates, drew forth a paper from another member of the class, taking the other side, and, as the title sets forth, "Trying to prove that the magistrates had some reason in their sentence of banishment of Roger Williams from the Massachusetts Colony, from their point of view."

A paper describing the persecutions the Episcopalians underwent from the Puritans was followed by another paper called "A Defence of the Puritans." A discussion usually follows the reading of the papers and often new light is thrown upon a subject in that way.

Chronologically speaking, the class has not made much progress, as the field of interesting material concerning the very early days has not yet been exhausted. The last paper was upon John Woodbury.

Several gentlemen, members of the Institute, have very kindly consented to address the class from time to time, at Plummer Hall, and there have been given many not only delightful, but also very instructive afternoon talks on subjects bearing upon the work the class has been doing. Mr. Rantoul gave the first informal talk on "Life Among the Early Planters," which was most interesting. He was followed by Rev. E. B. Willson, with a charming sketch of "Life Among the Early Ministers." Next Mr. Sidney Perley gave a very instructive and interesting talk upon the "Interpretation of old Colonial Manuscripts," illustrated by blackboard drawings. Mr. Ezra D. Hines took the class one afternoon, in imagination, upon his picturesque and attractive ramble over "An Historic Highway." Jan. 1, Mr. Henry M. Brooks read a most delightful paper, entitled "Old Schools." At the close of this paper, in celebration of the day, a bowl of "Literary Salad," containing quotations from the papers which the members of the class had written, was passed around. Each person took a lettuce leaf with quotation attached and was requested to bring to the next meeting the name of the author.

Soon after this meeting, Hon. Alden P. White gave, with blackboard illustrations, his most charming and fascinating "Evolution of Essex County."

One afternoon Mr. Frank Cousins took the class upon

an imaginary walk through the streets of Salem, describing very graphically, the various points of interest.

Mr. Brooks very kindly repeated, lately, his recent paper upon "Early Localities," followed by some extracts from the paper called "Some Eccentric People." Both of these papers were very enjoyable.

Last September, the Danvers Historical Society, through Mr. Hines, sent a most cordial invitation to the class, to attend a field-meeting at Danvers Centre. Twenty-five persons availed themselves of this opportunity to visit the places of historic interest in that town, under such admirable guidance. After studying the Ingersoll Boulder, lately placed upon the Common and visiting other interesting spots, the party adjourned to the Chapel of the First Church, where Mr. William P. Upham gave a most carefully prepared paper upon the ancient land grants in that vicinity.

The class numbers at present sixty-four members, and new ones are constantly being added. The largest number of persons at any meeting has been forty-eight, the smallest twelve, with an average attendance of twenty-eight.

Through the winter the hour for beginning the meeting was changed to half-past three as the Institute Rooms closed at five o'clock. Since May 1, the original hour of four o'clock has been resumed.

The question has often been asked to whom is this Local History Class open, and how is membership obtained? The class is open to any member of the Institute or to any person a member of whose family belongs to the Institute.

No formality is required to become a member. Any person fulfilling the above condition, who feels interested

in the subjects the class is studying, will be most cordially welcomed any and every Tuesday afternoon.

Respectfully submitted,

H. D. Lander,

Secretary L. H. C.

Lectures and Meetings.

Regular Meeting, Monday, June 18, 1894.—The Secretary stated that he had just heard of the death of Hon. Caleb Foote, who had been a member of the society from its organization in 1848, and one of its best friends. Upon motion of Capt. George M. Whipple, it was voted, That the Secretary be instructed to write a letter of condolence to the family of our revered friend, expressing the feelings of the members of the society upon the loss sustained by them in this event.

In accordance with the above vote the Secretary wrote to Mrs. J. B. Tileston at Mattapan (daughter of Mr. Foote) : "It is the sense of the members of our society that in the removal, by death, of our late associate, the Hon. Caleb Foote, we have lost a most valued member and kind friend, who was always ready to aid us in our work in every way in his power, by liberal contributions of books for our library, as well as by his ready pen whenever occasion required. His memory will long be cherished by us, as having been one of the most genial and worthy persons connected with the society. In communicating this vote I would most tenderly offer to the family my heartfelt sympathy with them in their bereavement."

Tuesday, July 10, 1894.—A field meeting was held this day in Lynn Woods. About fifty members took a special electric car at 9.15 o'clock and reached the woods

in about an hour; some members went in a later car. During the forenoon a portion of the party visited the "wolf pits" and other places of interest, under the guidance of Nathan M. Hawkes, Esq. Lunch was eaten at 1 o'clock near the summit of Mount Gilead. At 2 o'clock the meeting was opened by President Willson with some interesting remarks explaining the objects of field-meetings, that for many years had been pursued by this society:— the study of history, botany, geology, etc., by visits to fields and woods, more especially in the county of Essex. The speaker wished it understood that this was a county society and not merely a Salem institution. Mr. Willson referred to the beautiful park in which we were holding our meeting and wished Salem could boast of something of the sort. Mr. Hawkes gave a full account of the establishing of the park and told how the property was acquired. Professor Morse spoke in his usual entertaining manner of the value and importance of out-door education. Alderman Gove hoped Salem would do something to get possession of the territory between Lynn and Salem for a park—that part between the railroad and the turnpike. In the same line were the remarks of W. S. Nevins, Dr. H. C. Merriam, Dr. Jesse Robbins, Captain Whipple and C. H. Preston of Danvers. A vote of thanks was given to Mr. Hawkes and others for courtesies extended. Meeting adjourned at 4 P. M.

Thursday, August 2, 1894.—About sixty members of the American Society of University Teaching, under the direction of Prof. Lyman T. Powell, visited Salem this day and were entertained by the Institute and Peabody Academy of Science. They arrived in town at 9.30, and were met at the railway station by a committe of the Institute, with barges, and taken to our rooms, where they examined our collections; they then took the barges again and were

driven about the city to points of historical interest. Returning at 12.30 o'clock, a lunch was served in Plummer Hall where about one hundred persons, including the Committee, sat down to a lunch by Caterer Wentworth. At two o'clock a meeting was held in Academy Hall at which President Willson, in a few well chosen remarks, introduced Prof. E. S. Morse who gave a brief history of the Institute and Peabody Academy. The Hon. R. S. Rantoul then delivered a scholarly address, abounding with information, on the history of Salem in the Revolution. He was followed by Professor Powell who made a pleasant speech expressive of the appreciation and thanks of the visitors for the reception and courtesies extended to them. The guests then visited the Museum of the Peabody Academy and afterwards took the cars for Boston or Marblehead.

Regular Meeting, Monday, Aug. 20, 1894.—The Secretary called the attention of the members to the death of Mr. M. A. Stickney which occurred on the 11th inst. The following resolutions offered by Mr. Rantoul, seconded by Mr. Cousins, were adopted. *Resolved:* That it is with a deep sense of loss and regret that the Essex Institute is called to record the death of Matthew Adams Stickney, at the ripe old age of eighty-nine. His early, constant, and unfaltering devotion to the interests of this society, dating from a time when its existence from year to year was only secured by the untiring zeal of a few promoters like himself, deserves to be remembered now when the records of the society's stability and usefulness cover half a century. Born of an ancient Essex County stock, leading a life pure and lofty in its aims and exemplary in all its relations, his estimable qualities widely recognized as they could not fail to be, and honored with membership in many leading archæological and literary societies of the

country, a naturalist at the age of ten, devoted to the study and to the collection of specimens which came to possess a rare interest and value, a careful student of genealogy and family history, leaving much of his research in print, besides a fund of manuscript material most helpful to those who follow him,—he made his acquaintance an invaluable privilege to the student by a wealth of personal reminiscence; by an acquaintance with the dark history of Gallows Hill, under whose shadow he passed his life, and of the Witchcraft period of which he made a specialty; while his gathered store of antique furnishings, publications and coinage made his comfortable homestead a Mecca for the bibliophile and the archæologist. His accumulation of coins and medals of British and American issue, of colonial and provincial currency, of continental paper money, of New England almanacs, covering more than two centuries in their publication, of autograph letters, French, English and American, illustrating our Revolutionary period, represented the devotion of a lifetime and challenged comparison with the most exhaustive collections in the country. With the exception of six consecutive years during which Mr. Stickney was the librarian of the Essex Institute, he was curator of numismatics from the foundation of the society in 1848 until his death."

The Secretary was instructed to send a copy of the above to the family of Mr. Stickney.

Regular Meeting, Monday, Nov. 19, 1894.—Mr. Rantoul made a statement in reference to a cradle presented to the Institute by Richards W. Bradley of Boston. "The Essex Institute accepts with satisfaction the custody of an object so intimately associated with two of the most distinguished sons of Essex County, as is the cradle of

Joseph Story and William Wetmore Story. The list of their contributions to the fair fame of Salem, in politics, in literature, in good citizenship, in law and in art, is quite too extended to bear rehearsal here. Judge Story was born Sept. 18, 1779, in a mansion house in Marblehead now standing and nearly opposite the old Town House, and was there cradled in this quaint and interesting relic. In 1801, he came to Salem, building ten years later the house, now numbered 26 on Winter street, where he continued to reside until his removal to Cambridge in 1829; and in that house, on Feb. 12, 1819, the son was born whose genius as sculptor and author has kept the name of Story fresh in the regard of a second generation of Americans. No reminder of these two eminent men could be more suggestive to the people of this region by whom their fame is cherished than this cradle, and no place of deposit could be selected where it will be more sacredly cared for than in the Essex Institute." It was voted to adopt this statement as the sense of the members of the Institute and the Secretary was requested to record the same and forward a copy through Mr. Bradley to the Hon. Wm. W. Story at Rome, Italy.

Regular Meeting, Monday, Dec. 3, 1894, in Library room.—The Secretary gave some reminiscences of several old Salem schools, notably Master Lang's and Master Watson's; Mrs. Rogers', latter part of the last century; Mrs. Brown's; Misses Pierce's, Miss Haskell's, James S. Gerrish's, and the English High school down to about 1836. Specimens of penmanship of some of the old scholars 1791 to 1815, were exhibited, also receipts from old schoolmasters at various dates. This paper called forth quite a discussion, and among those who spoke on the subject in hand were President Willson, Mr. G. M. Jones, Mr. W. L. Welch and others.

Regular Meeting, Monday, Dec. 17, 1894, in Library room.—Papers were read by members of the Local History Class connected with the society: Mrs. H. W. Edwards on "Lady Deborah Moody;" Mrs. E. A. Kilham of Beverly on "Anne Hutchinson;" and Miss Helen D. Lander read a paper on "Hugh Peters," written by Miss Lucy W. Perry. These papers were well written and highly appreciated by the audience.

Remarks were made by the President and Hon. R. S. Rantoul in praise of what had been said.

Regular Meeting, Monday Evening, Jan. 7, 1895, in Library room.—Mr. John Robinson gave an account of the stone implements and other relics of the early native Indians of Essex County, with suggestions as to their age, origin and mode of manufacture. Specimens of stone implements, pottery, etc., from the Peabody Academy of Science were exhibited. Mr. Robinson was of the opinion, which he substantiated in some interesting remarks, that the stone relics must have been made not later than 1550, for the Indians would not have been likely to have made such articles after contact with Europeans, who visited these parts in the sixteenth century and could furnish them with iron or copper utensils and tools. Some of the implements may of course be much older.

Monday Evening, Jan. 14, 1895.—The first lecture in the "free course" was delivered this evening, in Plummer Hall, by Prof. T. C. Mendenhall, President of the Worcester Polytechnic Institute; subject, "The Seal Islands and the Bering Sea Controversy," illustrated with lantern views. The lecturer gave a brief account of the origin and present condition of the Bering Sea Controversy, mentioning incidentally that Bering, the discoverer of the straits, invariably spelt his name without the *h*. The gazetteers and geographies all spell the word

"Behring." He then spoke of the seal islands, discovered by a Russian named Publlof in 1786. Two of the group he named St. Peter and St. Paul. The Russians occupied the islands until they were sold with Alaska to the United States, in 1867, for $7,200,000. Professor Mendenhall said, that from these islands have already been reaped more money than was paid for the entire area of Alaska. The year after the U. S. bought it, over 250,000 seals were killed by poachers from all over the world. In 1871, a law was passed protecting seals, but the poachers took to killing them in the open sea, and before long their numbers became greatly diminished and an effort was made by the government to stop this, which eventually resulted in the "Bering Sea Controversy." The lecturer described his trip to the islands on a commission to obtain an estimate of the actual loss of seal life. Pictures were shown of seal life and of the natives of the islands. The lecturer stated that the seal would be extinct in a few years, unless in the near future some new and better plan than the arbitration provided, should be made for its protection.

Regular Meeting, Monday Evening, Jan. 21, 1895, at the Library room.—Mr. Herbert E. Valentine, a Salem boy, but now of Somerville, read an historical sketch of Company F, 23d Massachusetts Volunteers, organized in the fall of 1861, from the "Union Drill Club" of Salem. In introducing the speaker, Mr. Willson said it was appropriate that this paper should be read at a meeting of the Institute, as all the officers of the company and several of the members were more or less prominently connected with the Institute: Henry F. Waters, Dr. James A. Emmerton, F. H. Lee; and the commander of the corps, G. M. Whipple, was for years secretary of the Institute.

The company's life was traced by Mr. Valentine from its first camp on Winter Island (Camp Bertram) to the camp at Lynnfield, thence on its march through Boston, New York, Philadelphia and Perryville, where steamers were taken for Fortress Monroe. In January, 1862, the fleet sailed, the land forces under Gen. Burnside, the naval squadron under Commodore Goldsborough; after a stormy and perilous time at Cape Hatteras, the troops landed at Roanoke Island. The speaker described, in vivid language, the engagements at this place, at Newberne, N. C., at later fights at Kingstown, Whitehall and Goldsboro. Ninety per cent of Co. F were Essex County men and seventy per cent from Salem alone.

Monday Evening, Jan. 28, 1895.—Dr. Richard Hodgdon, of Boston, lectured in Plummer Hall on "Unusual Hypnotic States." The lecturer began by saying that Hypnotism was the same as mesmerism, and mentioned recent French experiments in hospitals, in attempting to cure insanity and relieve mild delusions, which had been successful to a certain degree. He described the different states of consciousness which could be induced in the same persons at different times by the treatment—the individuals maintaining a concurrence of recollections and sentiments in each of the several states, quite independent of the other states.

Monday Evening, Feb. 4, 1895.—Regular meeting in the Library room. Mr. Frank Cousins gave an interesting and instructive talk on "The Old Houses of Salem," and events connected with them.

Monday Evening, Feb. 11, 1895.—Dr. George A. Dorsey, of Cambridge, lectured in Plummer Hall on "Peruvian Antiquities," illustrated with lantern views.

Pictures were shown of excavations made in a 40 acre lot, where 10,000 persons had been buried. The unearthing was made twenty-five years ago, in connection with the building of a railroad. Photographs of mummies were shown as they appeared partially exhumed, and with the natives working over the graves.

Monday Evening, Feb. 18, 1895.—Regular meeting at the rooms. Three interesting papers were read by members of the Local History Class of the Institute. One by Miss Abby Read on "Cats and Dogs" (of the olden time) was quite amusing; many of the old laws were given, together with anecdotes. The second paper was by Miss Mary S. Cleveland, on "South Fields" (South Salem), giving an interesting historic sketch of that part of the town in the early days, and the laying out of Lafayette street, by Mr. Derby and others. The third paper was by Mrs. R. C. Manning, on "Early Travel;" she spoke of the old roads and conveyances, giving particularly a sketch of a journey by Madam Knight, from Boston to New York and return, in 1740, which took about two months. The paper was full of curious and entertaining incidents. These papers were discussed by the President, Mr. Goodell, Mr. Rantoul, Mr. G. M. Jones, Mr. Welch and Rev. Dr. J. L. Hill.

Monday, Feb. 25, 1895.—C. Howard Walker, Esq., of Boston, lectured this evening in Plummer Hall, on the "Application of Architectural Ornamentation." He spoke of the beginning of Egyptian and Grecian architecture, and of the fine buildings abroad, where they had proper locations. He praised American enterprise, but thought our countrymen lacked good taste in architecture. School-houses are put up in lanes, and public buildings on side streets, when they should have more prominent

sites. He alluded to Boston's City Hall, on a street thirty six feet wide and the Court House up a lane; but improvement will come in time.

Monday, March 4, 1895.—Regular meeting this evening at the Library room. Professors E. S. Morse and John H. Sears spoke of Indian implements, pottery, shell heaps, etc. The former mentioned the measuring of a great number of clams from different shell heaps of Japan and America and of different periods, as showing age, etc. Mr. Sears thought the stones used by the Indians here for implements were of Essex County origin.

Monday, March 11, 1895.—Gamaliel Bradford, Esq., lectured this evening in Plummer Hall, on "Responsibility in Municipal Government." The lecturer had made a life-long study of the problems of government, and was therefore well qualified to speak on the subject. He favored the giving of more power to the executive and holding him strictly accountable for the proper conduct of city affairs, and he also favored single-headed commissions for the same purpose. All power to appropriate money should be vested in the aldermen, and should depend upon the advice of the city treasurer as to the disposal of the funds of a city.

Monday, March 18, 1895.—Regular meeting of the society this evening in the Library room. Miss Irene Weir, of Boston, read an exceedingly interesting paper on artistic "Posters." The fine collection, of Mr. Charles K. Bolton of the Brookline Public Library, was used for illustration. Miss Weir pointed out the many details which make a poster at once attractive and pleasing, and spoke of the various styles of French and American designers. A copy was shown of an early American printed

poster of 1797, with an engraving of an elephant, which was imported into this country in 1796, by a Salem vessel —the first elephant ever landed in America. Mr. J. D. H. Gauss exhibited a large Spanish poster, announcing a recent bull-fight.

Monday, March 25, 1895.—Hon. Geo. S. Hale, of Boston, lectured this evening in Plummer Hall, on "Why all citizens should vote." The speaker said that "unless a man is going to vote as he ought to, it is not his duty to vote at all." There is, he said, a growing tendency to hold the individual voters responsible, personally, for the faults and sins of mismanaged governments, but the voters throw the responsibility upon the party with which they are identified. Mr. Hale said that the evil of the day is the absurdity of submitting to the party in matters where the individual judgment should be exercised. A coterie of politicians, of either party, get together in some little room and pick out the "rascal" whom they think most likely to be elected, hold a "cut and dried" caucus to get him nominated, and the appeal is, to stand by the party. Until every voter is made to realize that he is to be held morally responsible, personally, for the well-being of his town, city, state or nation, in so far as he is able to express his choice of men and measures, politics will be as they are now, in a deplorable state. Men should vote independently, the lecturer said, without regard to party.

Monday, April 1, 1895.—Regular meeting this evening in the Library room. Hon. R. S. Rantoul read a very valuable and entertaining paper on the old Assembly House in Cambridge street, giving from deeds, documents, etc., a description of the building, of its size and general

appearance. In this building General Gage and Governor Hutchinson were entertained in 1774.

In the Assembly House in Federal St., built in 1782, Generals Washington and Knox attended a brilliant assemblage of ladies and gentlemen in Oct., 1789, when the President visited Salem.

Monday, April 8, 1895.—Hon. Charles Carleton Coffin, of Boston, lectured on "The Study of American History." He traced briefly the history of our own country, from its discovery by Columbus down to the present time, and showed how great events and important changes had often resulted from small things. He gave personal reminiscences of his experiences at Bull Run and Gettysburg, graphically describing those famous battles, and showing where comparatively small matters had very materially affected the results.

Monday, April 15, 1895.—A regular meeting of the society this evening in the Library room. The Secretary read a paper on the old localities about Salem. His remarks were of an historical nature, interspersed with anecdote. Among the localities mentioned were Buttonhole, Knockers-hole, Norman St., Norman's rocks, old Eveleth house and vicinity, Creek Court, Broadfield, "Neighbor Thompson's" field or "Nauvoo," Circus Lane or Hathorne St., Wapping, Juniper, Hollingsworth Hill, Winter Island, Hospital Point, Bentley's rock, Gifford's Cave, Plank Alley or Elm St., Hawkes' Wharf or New Dublin, Seccomb's Wharf where anthracite coal was first sold in Salem (1826), Stage Point now site of Naumkeag Mills, Ship-yards in South Salem, Early ships, etc., Burying Point now Charter St. Cemetery (first burying place in Salem), Old Paved Street, Cheapside, "Nigger Huts" on Turnpike, Oliver's Cellar (site of Lynde Block),

Roast Meat Hill, Mill Hill, North and South fields, Wyman's Mills, Batchelder's Point, Leggs Hill, Dungeons, Throgmorton's Cove, Castle Hill, Baptist Hill, Hacker's, Chapman's and Dutch's corners, Cape Driver, Carltonville, Harmony Grove, Gallows or Witch Hill, Paradise, Peirce & Waite's Wharf, Blubber Hollow, Orne's Point, Kernwood, Liberty Hill and Cold Spring. Fish, Water, Neptune and County streets, Bath Street and Gutter Lane, Old Jail, Witchcraft Jail, Court and Marlborough Streets, Short Street, Sun Tavern, Essex Place, Dark Lane, Cowboy's Beach, etc. This paper was followed by a discussion participated in by the chairman, Hon. R. S. Rantoul, A. C. Goodell, Jr., W. L. Welch, John Robinson, Frank Cousins and others, and many interesting facts were brought out.

Monday, April 22, 1895.—Rev. J. M. Pullman, D.D. of Lynn, lectured in Plummer Hall on the "Administration of Public Charity." He spoke of the various ways in which charity is distributed and of the experience of many persons in alms-giving. He quoted several high authorities in the deprecation of public out-door relief, the evil being that it tends to degeneracy, and the relief only goes to the unworthy.

Monday, April 29, 1895.—Miss Lucia T. Ames, of Boston, lectured this evening in Plummer Hall, on "A more beautiful City Life," with lantern illustrations. Miss Ames spoke of the disfigurement of some of our American cities by the erection of high buildings—such, for instance, as one which is to be built on the site of the Tremont House in Boston, 135 feet high in a comparatively narrow street. These buildings shut out the light and sun, and make business for the oculist and physician, although they are considered works of enterprise. She

made a good argument against telegraph poles and spoke earnestly in favor of light, air and space, the establishment of playgrounds for children, and the laying out of parks for the people's use. She spoke of the decoration of the school-house and thought children should be taught the lines of beauty, so that when they grew up to be men and women, they would not permit ugliness in our streets, nor so much waste paper blowing about as we now see. She spoke of the laws on the subject of street cleanliness in our own and some foreign cities, especially Paris, which she praised. She exhibited on the screen fine views of prominent American and foreign buildings.

Monday, May 6, 1895.—Regular meeting this evening in the Library room. Prof. E. S. Morse announced by title an account of a new mineral called Fayalite, discovered for the first time in this county, at Rockport, by Mr. John H. Sears, of the Peabody Academy of Science.

Necrology of Members.

Lincoln F. Brigham, son of Lincoln and Lucy (Forbes) Brigham, was born in Cambridge ,Oct. 4, 1819; elected a member of the Essex Institute, Apr. 4, 1870 and died in Salem, Feb. 27, 1895.

Caleb Foote, son of Caleb and Martha (West) Foote, was born in Salem, Feb. 28, 1803; elected a member of the Essex Historical Society, Dec., 1842 and died in Milton, June 17, 1894.

Joseph W. Lefavour, son of David and Nancy (Foster) Lefavour, was born in Beverly, Mar. 11, 1836; elected a member of the Essex Institute, May 9, 1866 and died in Beverly, May 20, 1895.

John W. Masury, son of John and Priscilla (Carroll) Masury, was born in Salem, Jan. 1, 1820; elected a member of the Essex Institute, Mar. 4, 1895 and died in Centre Moriches, N. Y., May 14, 1895.

Daniel Needham, son of James and Lydia (Breed) Needham, was born in Salem, May 24, 1822; elected a member of the Essex Institute, Sept. 17, 1894 and died in Groton, Feb. 20, 1895.

Fitz W. Perkins, son of Jacob and Margaret (Collins) Perkins, was born in Gloucester, Aug. 20, 1844; elected a member of the Essex Institute, Aug. 10, 1894 and died in Washington, D. C., Sept. 30, 1894.

George A. Perkins, son of David and Hannah (Fabens) Perkins, was born in Salem, Oct. 15, 1813; elected a member of the Essex County Natural History Society, Jan., 1835 and of the Essex Institute, Nov. 21, 1849 and died in Salem, May 18, 1895.

George W. Pousland, son of Capt. John and Abigail (Derby) Pousland, was born in Beverly, May 13, 1814; elected a member of the Essex Institute, June 29, 1865 and died in Boston, Sept. 27, 1894.

Thomas E. Proctor, son of Abel and Lydia (Emerson) Proctor, was born in Danvers, Aug. 29, 1834; elected a member of the Essex Institute, Aug. 15, 1860 and died in Boston, Dec. 7, 1894.

Henry Saltonstall, son of Nathaniel and Caroline (Sanders) Saltonstall, was born in Salem, Mar. 2, 1828; elected a member of the Essex Institute, Mar. 11, 1857 and died in Boston, Dec. 3, 1894.

Leverett Saltonstall, son of Leverett and Mary E. (Sanders) Saltonstall, was born in Salem, Mar. 16, 1825;

elected a member of the Essex Historical Society, Apr. 21, 1821, of the Essex County Natural History Society in 1834, and of the Essex Institute, Jan. 4, 1854. He died in Newton, Apr. 15, 1895.

Andrew A. Scott, son of Francis and Elizabeth (Miller) Scott, was born in Salem Nov. 9, 1832; elected a member of the Essex Institute, June 15, 1868 and died in Saugus, Dec. 17, 1894.

Matthew A. Stickney, son of Dudley and Elizabeth (Davis) Stickney, was born in Rowley, Sept. 23, 1805; elected a member of the Essex Historical Society, Dec. 1843, and of the Essex County Natural History Society, Jan. 17, 1846. He died in Salem, Aug. 11, 1894.

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Adams, A. N., Fair Haven, Vt.,	1	
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Amherst, Massachusetts Agricultural College,		28
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Andover Theological Seminary,		1
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Augsburg, Naturhistorischer Verein,		1
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Boston Art Club,		2
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Boston, City of,	6	
Boston, Directors of Old South Work,		53
Boston Home Market Club,		2
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Boston, Massachusetts Bureau of Statistics of Labor,	2	
Boston, Massachusetts Charitable Mechanics Association,	1	1
Boston, Massachusetts Commissioner of Public Records,	1	
Boston, Massachusetts General Hospital,		1
Boston, Massachusetts Historical Society,	1	
Boston, Massachusetts Horticultural Society,		179
Boston, Massachusetts Humane Society,		2
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Boston, Massachusetts Medical Society,		2
Boston, Massachusetts Society for Promoting Agriculture,	1	
Boston, Massachusetts State Board of Agriculture,	1	14

Boston, Massachusetts State Board of Health,	2	45
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Buffum, Mrs. Ruth H.,	1	
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Burlington, University of Vermont,	1	1
Byfield, Dummer Academy,		1
Calcutta, Geological Survey of India,	1	5
Calcutta, Indian Museum,		1
Calcutta, Surveyor General of India,	1	
Cambridge (Eng.) Philosophical Society,		2
Cambridge, Harvard University,	1	2
Cambridge, Museum of Comparative Zoology,		10

Carpenter, Rev. C. C., Andover,		1
Chamberlain, James A., Boston,	2	10
Chapel Hill, N. C., Elisha Mitchell Scientific Society,		2
Chapman, William O.,		1
Charleston, West Virginia Historical and Antiquarian Society,		1
Chase, Charlotte F., ... Newspapers.		
Chemnitz, Naturwissenschaftliche Gesellschaft,		1
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Chicago, Ill., Field Columbian Museum,		3
Chicago (Ill.) Historical Society,		1
Chicago, Ill., Newberry Library,	1	
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Christiania, Norwegischen Meteorologischen Instituo,		1
Christiania, Videnskabs-Selskabet,		23
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Cincinnati, Historical and Philosophical Society of Ohio,		1
Cincinnati, Ohio Mechanics' Institute,		1
Cincinnati (O.) Public Library,		2
Cincinnati (O.) Society of Natural History,		4
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Cutter, Abram E., Boston,		1
Danvers, Peabody Institute,		1
Danzig, Naturforschende Gesellschaft,		1
Darmstadt, Verein für Erdkunde,		2
Daves, Graham, New Bern, N. C.,		1
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Dedham Historical Society,	4	4
Dedham Town Clerk,		1
Derby, Perley,		1
Des Moines, Iowa Academy of Science,	1	
Des Moines, Iowa Geological Survey,	1	
Detroit (Mich.) Public Library,		1
Dickson, W. S.,	1	
Dijon, Académie Imperiale des Sciences, Arts et Belles-Lettres,		1
Dodge, Charles C., Newspapers and Circulars,		265
Dow, Geo. Frs., Topsfield,		18
Dreer, Ferdinand J., Philadelphia, Pa.,	2	
Dresden, Naturwissenschaftliche Gesellschaft "Isis,"		2
Dublin, Royal Irish Academy,		7
Dublin, Royal Society,		8
Edes, Henry H., Charlestown, Newspapers,		6
Edinburgh Royal Society,		1
Egbert, Rev. John L., Marblehead,	1	
Ellis, Frank R., Cincinnati, O.,		1
Ely, Theodore N., Philadelphia, Pa.,	1	
Emden, Naturforschende Gesellschaft,	1	
Endicott, Charles,	1	
Erlangen, Physikalisch-medicinische Societat,		1
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Exeter, N. H , Phillips Exeter Academy,		1
Fabens, Caroline,		40
Falmouth, Royal Cornwall Polytechnic Society,		1
Fearing, A. C., Jr., Boston,	1	
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Firenze, Biblioteca Nazionale Centrale,		24
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Folsom, A. A., Brookline,		1
Foster, John M.,	1	
Frankfurt-a-M., Senckenbergische Naturforschende Gesellschaft,		3
Frear, William, State College, Pa.,		4
Fribourg, Société Fribourgeoise des Sciences Naturelles,		5
Gardner, Mrs. Henry,	40	
Garrison, F. J., Boston, Newspapers.		
Gauss, John D. H., Newspaper.		
Genève, L'Institut National Genevois,		1
Gerould, Rev. S. L., Hollis, N. H.,		3

Gilman, Emily S., Norwich, Ct.,		1
Glasgow Archæological Society,		1
Glasgow, Baillie's Institution,		1
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Goodell, A. C., Jr.,	21	9
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Gustrow, Verein der Freunde der Naturgeschichte,		4
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Hartford, Connecticut Quarterly Company,		2
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Hartford, Ct., Trinity College,		1
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Hooper, N. M.,		1
Hotchkiss, Miss S. V., New Haven, Ct.,	Newspapers.	
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Howson, Hubert, New York, N. Y.,		1
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Huntington, Ind., Free Library of Public Schools,		1
Iowa City, Iowa State Historical Society,		7
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Portland, Maine Genealogical Society,		20
Portland, Maine Historical Society,		4
Portland, Ore., Library Association of,		23
Port-of-Spain, Victoria Institute,		2
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Prime, Temple, Huntington, N. Y.,	1	7
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Providence, R. I., Brown University,		1
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Providence (R. I.) Record Commissioners,	2	1
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Putnam, F. W., Cambridge, Newspapers,		11
Quebec, L'Université Laval,		1
Ramsay, Rev. William H.,	7	
Rantoul, Robert S., Newspapers,	5	12
Regensburg, Naturwissenschaftlicher Verein,		1
Reynoldsville (Pa.) Volunteer,		1
Rhode Island Commissioner of World's Fair,	1	
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Richmond, Virginia Historical Society,		2
Riga, Naturforschende Verein,		1
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Robinson, John,		28
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Rochester (N. Y.) Academy of Science,		1
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San Francisco (Cal.) Mercantile Library Association,		1
San Francisco, California State Mining Bureau,		1
Santiago, Société Scientifique du Chili,		1
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Scudder, Samuel H., Cambridge,		1
Sears, John H.,		1
Shanghai, China Branch of Royal Asiatic Society,		1
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Silsbee, Mrs. William,		1
Snowdon, W. H., Arcturus, Va.,		1
Somerville Public Library,		1
South Boston, Church Home for Orphan and Destitute Children,		1
South Boston, Perkins Institution and Massachusetts School for the Blind,		1
Springfield, Illinois State Board of Agriculture,		1
Springfield, Illinois State Museum of Natural History,		3

Springfield City Library Association,		3
Start, Rev. William A., Tufts College,		1
Stavanger Museum,		1
Stearns, John P., Santa Barbara, Cal.,		2
Stettin, Entomologischer Verein,		3
Stimpson, T. M., Peabody, . . . Newspapers.		
Stockholm, Académie Royale des Sciences,	4	8
Stockholm, Entomologique Föreningen,		2
Stone, Arthur R.,		1
Stone, Joseph W.,	3	
Streeter, Gilbert L.,	164	703
Sydney, Department of Agriculture of New South Wales,		1
Sydney, Linnean Society of New South Wales,		5
Sydney, Royal Society of New South Wales,		2
Tacoma, Washington State Historical Society,		1
Taunton, Old Colony Historical Society,		3
Taunton, Somersetshire Archæological and Natural History Society,		1
The Babcock and Wilcox Company, New York, N. Y.,	3	
The Hague, Nederlandsche Entomologische Verein,		6
The Werner Company, Chicago, Ill.,		1
Throndhjen, K. Norske Videnskabernes-Selskab,		2
Todd, William C., Atkinson, N. H.,	1	3
Tokio, Imperial University of Japan,		1
Topeka, Kansas State Historical Society, Newspapers,		1
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Turner, J. Horsfall,		1
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U. S. Commissioner of Labor,	1	
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U. S. Committee on Finance,		52
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U. S. Director of the Mint,		1
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U. S. Interstate Commerce Commission,	1	
U. S. Judge-Advocate General,		1
U. S. Life-Saving Service,	1	
U. S. Naval Observatory,		1
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U. S. Quartermaster-General,	1	
U. S. Secretary of the Treasury,	2	
U. S. Surgeon-General,	1	
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Washington, D. C., American Forestry Association,		3
Washington, D. C., Anthropological Society,		4
Washington, D. C., Microscopical Publishing Company,		13
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Waterville, Me., Colby University,		2
Watson, S. M., Portland, Me.,		1
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Welch, William L.,	12	96
Wellesley, Wellesley College,		1
West, Edward W., Brooklyn, N. Y.,		1
Wheatland, Elizabeth, Newspapers,		30
Wheatland, Henry, Estate of,	1	
Wheeler, W. O. and E. D. Halsey, Morristown, N. J.,		1
Whipple, George M.,		8
Whitney. Mrs. H. M., North Andover, Newspapers and Maps,	1	173
Wien, K. Akademie der Wissenschaften,	1	24
Wien, K. K. Geologische Reichsanstalt,		20
Wien, K. K. Naturhistorische Hofmuseums,		4
Wien, K. K. Zoologisch-botanisch Gesellschaft,		4
Wien, Verein zur Verbreitung Naturwissenschaftlicher Kenntnisse,		1
Wiesbaden, Nassauischer Verein für Naturkunde,		1
Wilkes-Barré, Pa., Wyoming Historical and Geological Society,		3
Williams, Mrs. Henry L., Newspapers.		
Williams, Tucker D., Newspapers and Circulars,	25	33
Williamsburg, Va., William and Mary College,		2

Willson, Rev. E. B., ... Newspapers,		151
Wilson, Fred A., Nahant, ...	1	
Winnipeg, Historical and Scientific Society of Manitoba, ...		4
Winsor, Justin, Cambridge, ...		35
Winthrop, Robert C., Jr., Boston, ...	1	
Worcester, American Antiquarian Society, . . .		3
Worcester Society of Antiquity, ...		3
Wright, Frank V., Hamilton, ...	1	120
Wurzburg, Physikalisch-Medicinische Gesellschaft, .		17
Yates, Lorenzo G., Santa Barbara, Cal., . . .	1	
Zeballos, E. S., Argentine Minister, Washington, D. C.,		3
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The following have been received from editors and publishers:

American Journal of Science.
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BULLETIN

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THE LUMBAR CURVE IN SOME AMERICAN RACES.

BY GEORGE A. DORSEY.

ASSISTANT CURATOR, IN CHARGE OF PHYSICAL ANTHROPOLOGY, FIELD COLUMBIAN MUSEUM.

INTRODUCTION.

THE human vertebral column in profile presents two sets of curves: the primary, or dorsal and sacral curves; and the secondary, or cervical and lumbar curves. The secondary curves are preëminently human characteristics and are not acquired by the individual until after birth. Furthermore, the secondary curves are essential to the upright gait, and of the two, the lumbar is the more important. Investigation has shown that the curvature of the lumbar region varies according to age, sex and race. It has also been shown that the lumbar curve is not an

exclusively human characteristic, but that it prevails to a greater or less extent in the anthropoid apes and is anticipated at least in some of the quadrupedal mammals.

Up to the present time investigations upon the character of the lumbar curve in man have been pretty exclusively confined to Europeans and the peoples of the Pacific and Indian Oceans; scarcely any observations have been made, so far as I know, on the spines of aboriginal Americans.

To attempt to supply this omission is the motive of this paper. But, before turning to a direct examination of the material in hand, it may not be out of place to sum up the results of former investigators in this field.

The literature at my immediate command is not such as to enable me to attempt anything like a complete history of the observations on the lumbar curve, and I can only mention the most important papers on the subject.

In 1886, two papers, each preceded by an abstract, appeared on the lumbar curve. The first was by Professor D. J. Cunningham of Dublin, in "Nature" (issue of February 18th). This was an abstract of his researches which were published in full in the same year under the title "The Lumbar Curve in Man and Apes" (Dublin, "Cunningham Memoirs," II, 1886). The other paper was by Professor W. Turner of Edinburg in the April number of the "Journal of Anatomy and Physiology." In the same year appeared Vol. XVI of the "Challenger Reports," in which Turner not only investigated the curve in the skeletons collected by the Challenger expedition, but incorporates also, to some extent, the results obtained by Cunningham.

The acquisition of the fresh spine of an aboriginal Australian was made the subject of another paper by

Cunningham before the Royal Society in 1888, which was printed in full in Vol. 45 of the "Proceedings."

Other writers on this subject have been Huxley, Symington, Ravenel and Aeby. The brothers Sarasins have reported the results of their investigations of the curve among the Veddahs in their invaluable work "Die Weddas von Ceylon." (Wiesbaden, 1893).[1]

In all of the above investigations the method of procedure is as follows. The anterior and posterior vertical depth of each vertebral body is measured separately. The anterior depth is taken as 100 and so the index of each vertebra can be obtained. By taking the sum of the anterior depths and the sum of the posterior depths the *Lumbo-vertebral* or *Lumbar Index* is obtained by this formula:

$$\frac{\text{Sum of posterior measurements} \times 100}{\text{Sum of anterior measurements}} = \text{Index}$$

The index, thus obtained, will be 100, when the sum of the posterior measurements equals the sum of the anterior measurements; less than 100, when the sum of the anterior measurements exceeds the sum of the posterior; and more than 100 when the opposite condition prevails.

To these three conditions Turner has applied the following terms: Orthorachic (straight spine) Index 98–102, Kurtorachic (curve convex forwards) Index 98—, Koilorachic (curve concave forwards) Index 102+.

To illustrate the method of procedure, I give the measurements of the lumbar vertebræ of the spine of a European which may be regarded as fairly typical.

[1] A complete bibliography of the lumbar spine is to be found in the Cunningham Memoir, pp. 113-116.

	ANTERIOR DEPTH. MM.	POSTERIOR DEPTH. MM.	INDEX.
I. Lumbar Vertebra . . .	27	28	103.6
II. Lumbar Vertebra . . .	27	27	100.0
III. Lumbar Vertebra . . .	27	25	92.5
IV. Lumbar Vertebra . . .	26	24	92.3
V. Lumbar Vertebra . . .	28	20	71.4
Total	135	124	90.3

On analyzing this table it appears that in the first vertebra, in this particular instance, the anterior measurement exceeds that of the posterior, which is contrary to the general rule in Europeans; the anterior and posterior depths are equal in the second vertebra; while in the remaining vertebræ the anterior depth increases more and more proportionately to the posterior depth until in the fifth vertebra the anterior depth exceeds the posterior in a very marked manner.

This it is which gives rise to the wedge-shape appearance in the last lumbar so typical in European spines; and which, as Cunningham has pointed out, is not found in so marked a degree in the lower races.

For the purpose of future comparisons and for the reason that the original papers of Turner and Cunningham are not always easily accessible in this country, I take the liberty of reproducing here the most valuable portions of their observations.

It will be seen at once that the results in the two tables correspond very closely except in case of the Andamanese and Negroes. In the case of the low index (99) assigned to the Andamanese in Turner's table, it is

TABLE I (CUNNINGHAM).

		76 EUROPEANS.	17 AUSTRALIANS.	3 TASMANIANS.	3 BUSHMEN.	23 ANDAMANESE.	10 NEGROES.
Five Lower True Vertebræ	*a* . . .	106.1	119.8	115.1	115.9	112.6	113.5
	b . . .	101.4	113.0	109.9	113.4	111.2	111.3
	c . . .	97.2	113.6	110.1	109.9	108.1	105.9
	d . . .	93.5	103.9	109.5	100.8	102.6	105.1
	e . . .	81.6	90.4	92.4	95.3	91.4	92.0
Lumbo-vertebral Index		95.8	107.8	107.2	106.6	104.8	105.4

TABLE II (TURNER).

		12 EUROPEANS.	5 AUSTRALIANS. 4♀, 1♂.	2 ANDAMANESE.	3 NEGROES. 2♀, 1♂	3 DAHUANS, SANDWICH ISLANDS.
Index of Lumbar Vertebræ	I	106.8	114.4	119.3	108.8	114.6
	II	101.5	112.3	105.6	104.2	108.0
	III	95.4	108.0	102.0	100.0	108.2
	IV	93.0	103.7	91.8	93.0	101.5
	V	83.6	91.4	84.2	89.0	87.7
Mean Average Index		96.0	105.96 =106.0	98.98 =99.0	99.0	104.0

probably to be explained by the fact that both subjects measured were females. This explanation is also manifestly good for explaining the difference between the two sets of figures for the Negroes, for in Turner's tables two of the three Negroes measured were females.

Cunningham investigated the influence of sex on the curve and found a difference of .03 approximately, in those races which he studied. Here are his results:

TABLE III (CUNNINGHAM).

	IRISH.		ANDAMANESE.		NEGROES.	
	21♂	23♀	14♂	9♀	7♂	3♀
Average Lumbar Index . .	96.2	93.5	106.3	102.4	106.	103.4

	AUSTRALIANS.		TASMANIANS.	
	10♂	4♀	2♂	1♀
Average Lumbar Index	110.1	103.1	108.5	104.7

We now come to the question of the relation of the umbar index to the lumbar flexure in the living subject. Cunningham reached the conclusion that practically there could be no inference as to the character of the curve from lumbo-vertebral index. The facts which led him to adopt this conclusion were:—

1. "In European spines a high index is not infrequently associated with a high degree of curvature.

2. In the chimpanzee, in which the lumbo-vertebral index is so high as 117.5, the prominence of the lumbar curve exceeds that found in the European spine."

Cunningham has further concluded that "the form adaptation of the vertebral bodies must be regarded as the consequence, and not as a cause, of the curve; at the same time it cannot be due to an immediate and mechanical influence operating upon the vertebral bodies during the life of the individual. If it were so, the same characters would be present in the lumbar vertebræ of the low races, and even of the anthropoid apes. It is an hereditary condition."

As to the causes of such great variations among different races Cunningham says—"The European, who leads a life which early necessitates his forsaking the erect attitude, except as an intermittent occurrence, and then for short periods, has sacrificed in the lumbar part of the vertebral column *flexibility* for *stability*. It is evident that the deeper the bodies of the vertebræ grow in front, the more permanent, stable and fixed the lumbar curve will become, and the more restricted will be the power of forward-bending in this region of the spine.

The savage, in whose life agility and suppleness of body are of so great an account, who pursues game in a prone condition, and climbs trees for fruit etc., preserves the anthropoid condition of vertebræ, and in consequence possesses a superior flexibility of the lumbar part of the spine."[1]

In 1888, in a paper by Cunningham, the title of which has already been given, he carried his investigations still farther by examining the fresh spine of an Australian girl, a full account of which is there given. In this he investigates the indices of the intervertebral disks. The results are self-explanatory and show at once the determining factor in the curve of the living individual.

[1] "Nature," Feb. 18, 1886, p. 379.

TABLE IV.

	INDEX OF VERTEBRAL BODIES.	INDEX OF INTERVERTEBRAL DISKS.
Australian Spine, ♀	101.4	49.5
European Spine, ♀	91.0	80.3

THE LUMBAR CURVE IN AMERICAN RACES.

The skeletons examined for the preparation of this paper come from the following localities:

I. North-west Coast Indians, 36:
   1. Songish, seven males, seven females.
   2. Kwakiutl, seven males, ten females.
   3. Chinook, one male, four females.

II. Iroquois, two males, one female.

III. Mounds of Ohio, 22:
   1. Oregonia, four males, two females.
   2. Fort Ancient, ten males, six females.

IV. Peru, 35:
   1. Ancon, fifteen males, fourteen females.
   2. Cuzco, four males, two females.

The skeletons from the North-west Coast, except the Chinook, were collected by Dr. Franz Boas. The Chinook skeletons are from old graves on the upper Columbian River, and were collected by Mr. D. Scott Moncrieff. The Iroquois skeletons were collected by F. M. Noe from ancient graves in New York State. All of the Ohio skeletons were collected by Mr. W. K. Moorehead. Those from Oregonia are from a mound on the Taylor Farm, and those from Fort Ancient, from the village site. The Peruvian skeletons from Ancon were

collected by the writer, and those from Cuzco were collected by Sr. Emelio Montez in the tombs at Huaracondo, near Cuzco.

I greatly regret that other localities are not represented by sufficient material in this Museum so that the paper might be made more complete. It will be evident, however, that at least three regions, widely separated from each other, are well represented.

It is believed that the material from the North-west Coast is sufficient to enable us to draw conclusions which shall be applicable to that entire region.

The Ohio material may be regarded as typical of the older populations of the Ohio Valley. Whether it will be found to be similar to that of the modern red-skins of the Ohio Valley and of the eastern United States in general remains to be seen—the number of Iroquois skeletons examined not being sufficiently large to enable us to draw any satisfactory conclusion.

The two peoples of ancient Peru, the Yuncas of the coast and the Quichuas of the interior plains and valleys, are fairly well represented; the former it is believed to an extent quite satisfactory.

Observations on the lumbar curve among the peoples of the east coast of South America are especially desirable, for it seems to me not unlikely that the results from that region may equal or even surpass those of Australia in the height of the lumbo-vertebral index. It may be further stated that only the spines of normal adults, unless otherwise indicated, have been used in the preparation of this paper.

I. North-west Coast tribes:

1. KWAKIUTL. TABLE V. SEVEN MALES, TEN FEMALES.

Kwakiutl	MEAN SPECIAL INDEX.					MEAN GENERAL INDEX.
	I	II	III	IV	V	
Males	117.8	110.1	109.8	99.9	88.7	105.0
Females	111.2	106.8	100.8	90.7	84.3	98.1
Both sexes	114.5	108.4	105.3	95.3	86.5	101.5

The average total of the sum of the anterior depths in the males is 125 mm., the highest single sum being 135 mm., the lowest, 118 mm.; of the sum of the posterior measurements, the highest is 143 mm., lowest 125 mm., mean average 132 mm. In the females the highest anterior sum is 136 mm., the lowest 119 mm., mean average 128 mm.; posterior sums, highest 138 mm., lowest 119 mm., mean average 126. Of the mean general index for the males the highest 110, the lowest 101.6; for the females the highest 105, the lowest 90.3. It is interesting to note that although the gap separating the index of males from the females is considerable, yet no general male index falls below 100, while forty per cent. of the females indices are above 100.

2. SONGISH. TABLE VI. SEVEN MALES, FIVE FEMALES.

Songish	MEAN SPECIAL INDEX.					MEAN GENERAL INDEX.
	I	II	III	IV	V	
Males	115.7	111.6	107.9	96.5	82.5	102.2
Females	111.3	108.	102.	92.	82.8	99.1
Both sexes	113.5	108.8	104.9	94.5	82.6	100.6

Of this mean general index of 100.6 it is worth while to note that in only one instance does any male index fall below this figure; while no female index equals it. In fact the range in both sexes among the Songish is very slight, the highest index in the males being 104.7, and in the females the lowest is 98.2. The sum of the anterior measurements in the males averages 126 mm.; the maximum being 150 mm., the minimum 115 mm.

3. CHINOOK. TABLE VII. ONE MALE, FOUR FEMALES.

Chinook	MEAN SPECIAL INDEX.					MEAN GENERAL INDEX.
	I	II	III	IV	V	
Males	116.	115.2	111.5	103.6	80.	104.4
Females	107.1	103.9	99.8	89.5	85.5	98.7
Both sexes	111.5	109.5	105.6	96.5	82.7	101.5

Of course it is barely possible that the mean general index, 101.5, would be slightly raised if there had not been such a disproportionately large number of females to the males; but a larger number of measurements of the spines of both sexes would not, in all probability, have raised the index above 102.

The variations in the four Chinook females are very slight, the highest general index being 100, the lowest 97.7. The average sum of the anterior measurements in the male is 134 mm., of the posterior 140 mm. The average sum of the anterior measurements of the females is 127 mm.; the highest being 137 mm., the lowest 126 mm. Of the sum of the posterior measurements, the average is 125 mm., the highest being 127 mm., and the lowest 120 mm.

II. Iroquois:

TABLE VIII. TWO MALES, ONE FEMALE.

Iroquois	MEAN SPECIAL INDEX.					MEAN GENERAL INDEX.
	I	II	III	IV	V	
Males	110.	108.	105.6	102.9	94.4	105.
Females	112.5	108.	100.	92.5	74.	96.8
Both sexes	111.1	108.	102.8	97.7	84.2	100.9

The sum of the anterior measurements of the lumbar vertebræ in the two males is 128 mm., and 129 mm., the sum of the posterior measurements 131 mm., and 139 mm.; similar measurements in the female are 129 and 125 mm. In both males the anterior depths of the first, second, third and fourth lumbars are less than the posterior depths; in the female this is true of the first three vertebræ only.

III. Mounds of Ohio:

1. OREGONIA. TABLE IX. SEVEN MALES.

Oregonia	MEAN SPECIAL INDEX.					MEAN GENERAL INDEX.
	I	II	III	IV	V	
Males	109.9	107.5	103.2	100.5	85.9	101.2

The variation in the general lumbar index for Oregonia skeletons is very small, the maximum index being 103.4, the minimum 98. As in the North-west Indians

the special index of the first, second, third and fourth vertebræ are in every single instance 100 or above, except in two cases where the index of the fourth vertebra is 96. In the sums of the measurements of the anterior and posterior depths there is remarkable uniformity, the average being 144 mm. for the sum of the anterior and 145 mm. for the sum of the posterior measurements; the range is from 137 mm. to 150 mm., and from 138 mm. to 152 mm. for the sums of the anterior and posterior measurements respectively.

2. FORT ANCIENT. TABLE X. TEN MALES, SIX FEMALES.

Fort Ancient	MEAN SPECIAL INDEX.					MEAN GENERA INDEX.
	I	II	III	IV	V	
Males	114.3	111.4	106.5	100.0	89.0	104.0
Females	110.1	106.1	102.5	92.5	83.0	98.7
Both sexes	112.2	108.6	104.5	96.2	86.0	101.3

The Fort Ancient skeletons resemble those of Oregonia in the remarkably small amount of variation in the lumbar measurements. In the males the variation of the lumbo-vertebral index varies from 100.7 to 108.9. The special index of the first, second and third lumbars are all over 100, of the fourth three fall below 100. The averages of the sums of the anterior and posterior measurements, 137 mm., and 143 mm., respectively, are very high and the range of variation is small, the maximum and minimum sums being 130 mm. and 145 mm. for the anterior measurements and 135 mm. and 148 mm.

for the posterior. No general lumbar index among the females exceeds 99.2, while the minimum index is 97.5, a remarkably narrow range of variation. Curiously enough the average of the sums of the anterior measurements in the females, 138 mm., exceeds by a single millimetre the average sum of the anterior measurements of the ten males. The posterior average in the female is 136 mm.; the range of variation being 131 mm. to 148 mm., and 127 mm. to 146 mm., for the anterior and posterior sums respectively.

IV. Peru:

1. ANCON. TABLE XI. ELEVEN MALES, EIGHT FEMALES.

Ancon	MEAN SPECIAL INDEX.					MEAN GENERAL INDEX.
	I	II	III	IV	V	
Males	115.2	110.9	107.2	99.2	85.2	102.9
Females	110.1	104.8	101.8	94.7	81.0	97.9
Both sexes	112.6	107.8	104.5	96.9	83.0	100.4

In this table for the first time the average of the special indices of the 4th vertebra in the males falls considerably below 100. Eight of the indices are exactly 100, one is 92.3, another 96 and the other one 104.1. The averages of the sums of the measurements of the lumbars in this group of skeletons falls below any so far recorded in this paper. This is what might be expected from the fact that the coast tribes of Peru were of very short stature. In fact some of those of the south of Peru may almost be called dwarfs. The average of

the sums of the anterior measurements of the five lumbars in the males is 124 mm., highest 138 mm , lowest 114 mm.; average for the females, 120 mm.; highest 126 mm., lowest 113 mm. The general average of the sums of the posterior depths in the males is 130 mm., highest 140 mm., lowest 119 mm.; females, average 117 mm.; highest 121 mm., lowest 110 mm.

In addition to the nineteen skeletons from Ancon which were examined for the preparation of the above table, there were twelve other skeletons which showed marks of senility to such a degree as to necessitate a separate treatment. In the preceding sections such skeletons have not been sufficiently numerous to deserve special notice, and they have consequently been excluded along with the skeletons of children and partially grown individuals. But it is believed that these nine Ancon skeletons may throw some light on the changes produced by old age on the lumbar curve.

ANCON. TABLE XII. FIVE MALES, SEVEN FEMALES. SENILE CONDITION.

Ancon	MEAN SPECIAL INDEX.					MEAN GENERAL INDEX.
	I	II	III	IV	V	
Males	122.1	115.5	112.5	105.2	90.3	109.4
Females	120.5	122.0	107.5	105.6	87.9	106.1
Both sexes	121.3	118.1	110.0	105.4	89.1	107.7

In the next table the results brought out in tables XI and XII are contrasted.

TABLE XIII.

Ancon		MEAN SPECIAL INDEX.					MEAN GENERAL INDEX.
		I	II	III	IV	V	
Males	Normal . . .	115.2	110.9	107.2	99.2	85,2	102.9
	Senile . . .	122.0	115.5	112.5	105.2	90.3	109.4
Females	Normal . . .	110.1	104.8	101.8	94.7	81.0	97.9
	Senile	120.5	112.8	107.5	105.6	87.9	106.1
Both sexes	Normal . . .	112.6	107.8	104.5	96.9	83.0	100.4
	Senile . . .	121.3	118.1	110.	105.4	89.1	107.7

There are several interesting points brought out in this comparative view. Perhaps the most striking one is the amount of difference for the two mean general averages. Whether there is any significance in the fact that this difference is greater in the figures for the females than in the males I am unable to determine.

Another interesting point is that the two sexes are more nearly alike for the fifth lumbar than they are for the first lumbar. That is, the amount of difference in the curve for the normal spine and the senile spine is greater at the upper part of the curve than it is at the lower portion. The increased age shows itself especially plain in the spine on the fifth lumbar, which no longer has a distinct wedge-shape, as is shown by the average index 89 for the senile group, as contrasted with the index 83, for the normal group.

It is interesting to note also the marked decrease of the total length of the lumbar region of the spine in the

senile skeletons. In the males the highest total of the anterior depths is but 124 mm., the average is 117 mm., and the lowest is 113 mm.

Similar measurements for the females are: maximum 118 mm., average 112 mm., minimum 106 mm. To make more clear the comparison between the normal adult and senile condition of the length of the spine, at any rate as far as the lumbar region is concerned, I give the figures in the following table:

TABLE XIV. HEIGHT OF LUMBAR VERTEBRÆ.

Ancon	MALES.		FEMALES.		BOTH SEXES.	
	NORMAL.	SENILE.	NORMAL.	SENILE.	NORMAL.	SENILE.
Average sum of anterior depths	mm. 124	mm. 117	mm. 120	mm. 112	mm. 122	mm. 114
Average sum of posterior depths	130	128	117	119	123	123

2. CUZCO. TABLE XV. THREE MALES, THREE FEMALES.

Cuzco	MEAN SPECIAL INDEX.					MEAN GENERAL INDEX.
	I	II	III	IV	V	
Males	115.7	107.5	107.1	95.0	81.8	103.3
Females	112.2	107.7	104.4	95.4	80.4	99.4
Both sexes	113.9	107.6	105.5	95.2	81.1	100.3

In this table, as in the one for Ancon, it may be noted that the break in the curve in the males is between the fourth and fifth lumbars and not between the third and fourth lumbars as is the case in the North American

skeletons. As the Quichuas of the Cuzco region are taller than the coast Peruvians, we may expect an increase in the anterior and posterior lengths of the lumbar spine. In the males, the average anterior length is 133 mm., posterior, 135 mm. in the females, the anterior length is 121 mm., posterior 119 mm. Averages for both sexes are, anterior and posterior, 127 mm.

Summary.

From the fact that the length of lumbar region of the spine is a fairly reliable factor in computing the height of the skeleton, I have summed up in one table the average of the sums of the anterior measurements of the five lumbar vertebræ for both sexes, and have arranged the table in a serial order beginning with the longest lumbar spine.

TABLE XVI. HEIGHT OF LUMBAR VERTEBRÆ.

ANTERIOR HEIGHT OF TRUE LUMBAR VERTEBRÆ.	MM.
Oregonia, Ohio	144
Fort Ancient, Ohio	138
Cuzco, Peru	131
Chinook, British Columbia	130
Iroquois, New York	129
Songish, British Columbia	129
Kwakiutl, British Columbia	128
Ancon, Peru	122

If this table shows nothing else, it at least explains what is already pretty generally known and that is that the ancient inhabitants of the Ohio Valley were very tall

people and that the coast people of Peru are among, if not the shortest people, on the American continent.

The table further emphasizes the great difference in stature between the coast people and those in the mountain valleys of Peru. This difference extends to every part of the skeleton and I am convinced of the utter worthlessness of any observations on the osteology of the "Peruvians" in which the two races are not sharply separated.

It is now time to gather into one table the results so far obtained:

TABLE XVII.

America	MEAN SPECIAL INDEX.					MEAN GENERAL INDEX.
	I	II	III	IV	V	
Kwakiutl { 7 ♂	117.8	110.1	109.8	99.9	88.7	105.0
Kwakiutl { 10 ♀	111.2	106.8	100.8	90.7	84.3	98.1
Songish { 7 ♂	115.7	111.6	107.9	96.5	82.5	102.2
Songish { 5 ♀	111.3	108.0	102.0	92.0	82.8	99.1
Chinook { 1 ♂	116.0	115.2	111.5	103.6	80.0	104.4
Chinook { 4 ♀	107.1	103.9	99.8	89.5	85.5	98.7
Iroquois { 2 ♂	112.5	108.0	105.6	102.9	94.4	105.0
Iroquois { 1 ♀	111.1	108.0	100.0	92.5	74.0	96.8
Oregonia, 7 ♂	109.9	107.5	103.2	100.5	85.9	101.2
Fort Ancient { 10 ♂	114.3	111.4	106.5	100.0	89.0	104.0
Fort Ancient { 6 ♀	110.1	106.1	102.5	92.5	83.0	98.7
Ancon { 11 ♂	115.2	110.9	107.2	99.2	85.2	102.9
Ancon { 8 ♀	110.1	104.8	101.8	94.7	81.0	97.9
Cuzco { 3 ♂	115.7	107.5	107.1	95.0	81.8	101.3
Cuzco { 8 ♀	112.2	107.7	104.4	95.4	80.4	99.4

Arranging this table in another manner so as to bring out more clearly the average or general lumbar vertebræ index of the various American races examined, we have:

TABLE XVIII.

		17 KWAKIUTL.	12 SONGISH.	5 CHINOOK.	3 IROQUOIS.	7 OREGONIA.	16 FORT ANCIENT.	19 ANCON.	6 CUZCO.
Mean Special Index of Lumbar Vertebræ	I	114.5	113.5	111.5	111.1	109.9	112.2	112.6	113.9
	II	108.4	108.8	109.5	108.0	107.5	108.6	107.8	107.6
	III	105.3	104.9	105.6	102.8	103.2	104.5	104.5	105.5
	IV	95.3	94.5	96.5	97.7	100.5	96.2	96.9	95.2
	V	86.5	82.6	82.7	84.2	85.9	86.0	83.0	81.1
Mean General Index.		101.5	100.6	101.5	100.9	101.2	101.3	100.4	100.3

Taking the average index of these eight general indices we have an index of 100.9 for American aborigines. I confess to some astonishment at the result. The lack of variation from 100 is striking and more or less puzzling. One thing should be borne in mind, viz., that although the tribes represented above are widely separated, yet they all are good examples of the better sort of Indians found on this continent at its discovery; all of them were semi-barbarians dwelling in more or less permanent homes and depending chiefly upon agriculture for their food supply, although the North-west Coast people were, to a great extent, hunters and fishers. Perhaps it is not wholly without significance that in those two races which

were most civilized and most fixed in their abode we find the lowest lumbo-vertebral index.

Notwithstanding the remarkable uniformity shown in the above results I am almost persuaded, from what I have seen of the osteological characters of the Brazilian and other east coast tribes of South America, that there we shall find a lumbar curve which will approximate that of the lowest races yet examined.

Accepting Turner's classification of the lumbar index we may make the following grouping of those tribes and races which so far have been examined.

KURTORACHIC, INDEX, 98—	ORTHORACHIC, INDEX, 98–102.	KOILORACHIC, INDEX, 102—
European, . . 96	American:	Hawaiians, . . 104
	Northwest Coast,	Andamanese, . 104.8
	Iroquois,	Negroes, . . 105.4
	Mounds of Ohio,	Bushmen, . . 106.6
	Peru . 100 9	Tasmanians, . 107.2
		Australians, . 107.8

The following conclusions can, it seems to me, be drawn in regard to the Lumbar Index: (1) In any individual race or tribe, it is an important means of determining sex; (2) It bids fair to become one of the most valuable ethnic tests known in determining the physical superiority or inferiority (so-called) of any tribe or race.

THE FLORA OF COLONIAL DAYS.

BY MISS MARY T. SAUNDERS.

In these days of historical research, it is interesting to look back and see what records the colonists left of the plants growing upon these New England shores, and also what efforts they made to promote the growth of many of the home plants which they brought with them. We think of them as a band of men caring little for the gentler side of life and it is pleasant to see that in many instances they had eyes for the beautiful in Nature and rejoiced in the noble trees, waving grass and lowly wayside flowers, as well as in the abundance of fish and game which would minister to their physical needs. The first record, of which we find mention, was made by Gabriel Archer, a gentleman who accompanied Capt. Gosnold in his voyage to the north part of Virginia, in 1602. He says: "May 15, we had again sight of land, which made ahead, being, as we thought, an island, by reason of a large sound that appeared westward, between it and the main, for coming to the west end thereof we did perceive a large opening; we called it Shoal Hope. Near this Cape we came to anchor in fifteen fathoms, where we took great store of cod fish, for which we altered the name and called it Cape Cod. The captain went ashore and found the ground to be full of pease, strawberries, whortleberries, etc., as then unripe.

May 21. The place (Martha's Vineyard) most pleasant, for the two-and-twentieth we went ashore and found it full of wood, vines, gooseberry bushes, whortleberries, raspberries, eglantines, etc. The fire-wood then by us taken in, was cypress, birch, witch-hazel and beech."

"In June, 1603, Martin Pring, with two small vessels, arrived on the American coast, between the forty-third and forty-fourth degrees of north latitude among a multitude of islands. Following the coast south in search of sassafras, he entered a large sound and, on the north side, built a hut and enclosed it with a barricade, where some of the party kept guard while others collected sassafras in the woods. The natives were treated with kindness and the last of the two vessels departed, well-freighted, on the ninth of August."

We next find a record that Edward Winslow, writing from Plimmouth, Dec. 11, 1621, says: "All the springtime the earth sendeth forth naturally very good salad herbs; here are grapes, white and red, and very sweet and strong also. Strawberries, gooseberries, raspberries, &c., with plums, black and red, being almost as good as a damson, abundance of roses, white, red and damask, single, but very sweet indeed." Another writer from Plymouth speaks of "the bay which is about four miles over from land to land, compassed about to the very sea with oaks, pines, juniper, sassafras and other sweet wood. The crust of the earth a spit's depth (the depth of a spade), excellent black earth, all wooded with oaks, pines, sassafras, juniper, birch, holly, vines, some ash, walnut."

Following in chronological order, we find that the next record is the account of "A Voyage into New England, begun in 1623 and ended in 1624, performed by Christopher Levet. . . . The first place I set my foot upon in New England was the Isle of Shoals, being

islands in the sea about two leagues from the main. Upon these islands, I neither could see one good timber tree, nor so much good ground as to make a garden."[1] From here he journeyed and settled at York, where he says: "I have obtained a place of habitation in New England where I have built a house and fortified it in a reasonable good fashion, strong enough against such enemies as are these savage people. And to say something of the country," and here is a bit of sarcasm, "I will not do therein as some have done to my knowledge, speak more than is true: I will not tell you that you may smell the cornfields before you see the land, neither must men think corn doth grow naturally (or on trees) nor will the deer come when they are called, or stand still and look upon a man until he shoot him, not knowing a man from a beast; nor the fish leap into the kettle nor on the dry land, neither are they so plentiful that you may dip them up in baskets, nor take cod in nets to make a voyage, which is no truer than that the fowls will present themselves to you with spits through them. But certainly there is fowl, deer and fish enough for taking if men be diligent; there be also vines, plum trees, strawberries, gooseberries and rasps, walnuts, chestnuts and small nuts, of each great plenty; there is also great store of parsley

[1] Celia Thaxter seems to have demonstrated that this was an error. She made a very famous garden there. Perhaps the soil of it was carried to the island from the main land.

The early records are filled with orders for the protection and disposal of the timber growing on these shore islands. They do not indicate the nature of the wood, but it seems to have been valued for ship-building. The "Miseries" were "Moulton's Miseries," and got the name from Robert Moulton, the chief shipwright here in 1629. Probably when Governor Endecott asked for and obtained a grant of Catta Island (now Lowell Island) in 1655, he was moved by a consideration of the value of its growing timber. When the larger islands became bare and denuded of shade, as we see them, has not been stated, but Catta Island was a wooded island in 1735, and was stripped of its trees by the British sloop-of-war Merlin, while enforcing the Boston Port Bill on the night of January 6-7, 1776, probably to secure a better view into Salem and Marblehead harbors. —EDITOR.

and divers other wholesome herbs, both for profit and pleasure, with great store of sassafras, sarsaparilla and anise seeds. Thus have I related unto you what I have seen and do know may be had in these parts of New England where I have been, yet was I never at Massachusetts, which is counted the paradise of New England, nor at Cape Ann, but I fear there hath been too fair a gloss set on Cape Ann."

In 1629, Rev. Francis Higginson came to Salem in the ship Talbot, and from the relation of his voyage a few passages can be quoted, showing how deeply he was impressed by the appearance of the country.

"June 24. This day we had all a clear and comfortable sight of America and of Cape Sable that was over against us seven or eight leagues northward. Here we saw yellow gilliflowers on the sea." These were probably the Alexanders seen by Gosnold on Elizabeth island, *Thaspium aureum*.

"Friday, 26th. A foggy morning, but after clear and wind calm. The sea was abundantly stored with rockweed and yellow flowers like gilliflowers. By noon we were within three leagues of Cape Ann, and as we sailed along the coasts we saw every hill and dale and every island full of gay woods and high trees. The nearer we came to the shore the more flowers in abundance, sometimes scattered abroad, sometimes joined in sheets nine or ten yards long, which we supposed to be brought from the low meadows by the tide. Now what with fine woods and green trees by land and yellow flowers painting the sea, made us all desirous to see our new paradise of New England, where we saw such forerunning signals of fertility afar off.

"Saturday, 27th. We had a westerly wind which brought us between five and six o'clock to a fine and

sweet harbor, seven miles from the head-point of Cape Ann. There was an island (Ten pound island) whither four of our men with a boat went and brought back again ripe strawberries and gooseberries and sweet, single roses."

"The sweet briar and gooseberries are still found on the island and before it was cleared up, strawberries were found there," says Dr. Charles Pickering.

"Monday, 29th. We passed the curious and difficult entrance into the large and spacious harbor of Naimkecke, and as we passed along, it was wonderful to behold so many islands replenished with thick wood and high trees and many fair, green pastures." After passing the winter of 1629-30 at Salem, Mr. Higginson writes: "The fertility of the soil is to be admired at, as appeareth in the abundance of grass that groweth everywhere, both very thick, very long and very high, in divers places. But it groweth very wildly with a great stalk and a broad and ranker blade, because it had never been eaten with cattle, nor mowed with a scythe, and seldom trampled on by foot.

"Our Governor hath store of green pease growing in his garden, as good as ever I eat in England. This country aboundeth naturally with store of roots of great variety and good to eat. Our turnips, parsnips and carrots are here both bigger and sweeter than is ordinarily to be found in England. Here are also store of pumpions, cowcumbers, and other things of that nature which I know not; also divers excellent pot-herbs, growing among the grasse, as strawberrie leaves in all places of the country and plenty of strawberries in their time, and penny royal, winter savory, sorrell, brooklime (*Veronica Americana*), liverwort, carvell and water cresses. Also leeks and onions are ordinary and divers physical herbs.

Here are also abundance of other sweet herbs delightful to the smell, whose names we know not, and plenty of single damask roses, very sweet, and two kinds of herbs that bear two kinds of flowers, very sweet, which they say are as good to make cordage or cloth as any hemp or flax we have. Excellent vines are here up and down in the woods. Our Governor hath already planted a vineyard, with great hope of increase. Also mulberries, plums, raspberries, currants, chestnuts, filberts, walnuts, small nuts, hurtleberries and haws of white thorn near as good as our cherries in England; they grow in plenty here. For wood, there is no better in the world, I think, here being four sorts of oak, differing both in the leaf, timber and color, all excellent good. There is also good ash, elm, willow, birch, beech, sassafras, juniper, cypress, cedar, spruce, pines and fir that will yield abundance of turpentine, pitch, tar, masts, and other materials for building both of ships and houses. Also here are sumach trees that are good for dyeing and tanning of leather; likewise such trees yield a precious gum called white benjamin that they say is excellent for perfumes. Also here be divers roots and berries wherewith the Indians dye excellent holding colors that no rain or washing can alter." The carvell of which Mr. Higginson speaks is chervil or sweet cicely (*Osmorrhiza longistylis*), and was found by Dr. Charles Pickering in a rocky, precipitous place at "Paradise," North Salem, possibly the spot where it was seen by Mr. Higginson. The mulberry, flowering raspberry (*Rubus odoratus*), still flourishes in "The Great Pastures."

In this same year, 1629, William Wood arrived in New England, but he lived principally in the Plymouth colony. He writes of the trees: "An ash different from the ash of England, being brittle and good for little, ever trem-

bling asps, the red oake, the white oake, and a third kind, the blacke. The diar's shumach, the cedar tree, not very high and its wood more desired for ornament than substance, being of color red and white, smelling as sweet as juniper—the white cedar, the mournefull cypres tree," as distinguished from the cedar with red wood, the American elm, which he calls the "broad spread elme whose concave harbours waspes." In planted gardens and in woods, "sweet marjoram, sorell, perennial yarrow, hempe and flaxe, some planted by the English, with rapes, besides turnips, parsnips, carrots, radishes, muskmillions, cucumbers, onyons, also good crops of rye, oates and barley." He mentions the rattlesnake root (*Nabalus alba*) as the "root called snake-weed" an antidote to the bite of the rattlesnake of which Mr. Higginson says, "to bite on within a quarter of an houre by the partie stinged," —the snake weed was always carried about by Governor Winthrop in summer time. Wood also speaks of the "treackle berries" and he says, "There is likewise strawberries in abundance, very large ones, some being two inches about. One may gather half a bushel in a forenoon. Vines afford great store of grapes, which are very big both for the grape and cluster: sweet and good. There is likewise a smaller kind of grape which groweth on the islands (that is of Massachusetts Bay) which is sooner ripe and more delectable, so there is no known reason why as good wine may not be made in these parts as well as Bordeaux in France, being under the same degree." The choke cherry, "red cherries which grow on clusters like grapes, are much smaller than our English cherry and so furre the mouth, that the tongue will cleave to the roof." Roger Williams wrote of the strawberry. "This berry is the wonder of all the fruits growing naturally in these parts. It is of itself excellent, so

that one of the chiefest doctors of England was wont to say, 'God could have made, but God never did make a better berry.' In some parts where natives have planted, I have many times seen as many as would fill a good ship within a few miles compass." In September, 1629, Master Graves sent a letter to England in which he wrote at length of the fertility of the soil. "The grass and weeds," he said, "grow up to a man's face in the lowlands and by fresh rivers abundance of grass and large meadows, without any tree or shrub to hinder the scythe." He speaks of the grapes,—"some I have seen four inches about."

William Bradford, Governor of Plymouth Colony, wrote "A Descriptive and Historical Account of New England" in verse, which has much of interest in this connection—

"Almost ten years we lived here alone—
In other places there were few or none;
For Salem was the next of any fame
That began to augment New England's name.
But after, multitudes began to flow
More than well knew themselves where to bestow.
Boston then began her roots to spread,
And quickly soon she grew to be the head
Not only of the Massachusetts Bay
But all trade and commerce fell in her way.
And truly it was admirable to know
How greatly all things here began to grow,

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[2] Governor Winthrop arrived at Salem in June of the next year, 1630, and this is the entry in his Journal:—"passed through the narrow strait between Baker's Isle and Little Isle, and came to an anchor a little within the islands. After Mr. Peirce came aboard us and returned to fetch Mr. Endecott, who came to us about two of the clock and with him Mr. Skelton and Capt. Levett. We that were of the assistants and some other gentlemen with some of the women and our Captain returned with them to Nahumkeck where we supped with a good venison pasty and good beer, and at night we returned to our ship. But some of the women stayed behind. In the meantime most of our people went on shore upon the land of Cape Ann which lay very near us and gathered store of fine strawberries." Wild strawberries still abound on the upland along West's Beach. —EDITOR.

New plantations were in each place begun
And with inhabitants were filled soon.
All sorts of grain which our own land doth yield
Was hither brought and sown in every field,
As wheat and rye, barley, oats, beans and pease
Here all thrive and they profit for their raise.
All sorts of roots and herbs in gardens grow,
Parsnips, carrots, turnips or what you'll sow.
Onions, melons, cucumbers, radishes,
Skirets, beets, coleworts and fair cabbages.
Here grow fine flowers, many, and 'mongst those
The fair, white lily and sweet fragrant rose.
Many good wholesome berries here you'll find
Fit for man's use almost of every kind.
Pears, apples, cherries, plumbs, quinces and peach
Are now no dainties, you may have of each,
Nuts and grapes of several sorts are here
If you will take the pains them to seek for."

It appears somewhat singular and only proves that the colonists knew nothing of the severity of the climate, that they should have thought seriously of planting vineyards in this region. Vine planters are mentioned in a list that the company were to provide to send to New England.[3] In 1634, the yearly rent of Governor's Island in Boston Harbor was a hogshead of wine. That island had been granted to Governor Winthrop on condition that he should plant a vineyard or orchard there. Thomas Leckford spent four years in the country and wrote an article, "Plaine dealing or Newes from New England." He speaks of the land, cattle and grain and mentions one fact which other writers omitted that "the Pease have no wormes at all." July, 1638, there arrived at Boston, John Josselyn, son of Sir Thomas Josselyn of Kent, and brother of Henry Josselyn, Esq., of Black Point, in

[3] Vine planters were to be sent over Feb. 1628. According to Cradock's letter to Endecott, April 1629, they were to have been Frenchmen but such could not be found.—Mass. Colony Records, vol. I, p. 24 and p. 390; Suffolk Deeds, *Liber* I, *Folio* VI.—EDITOR.

Scarborough, Maine. After staying a short time at Boston, he went to his brother's home in Maine, where he remained until October of the following year. In 1663, he again visited the country and stayed eight years. The results of his travels, observations, etc., are recorded in two volumes, one entitled "New England's Rarities discovered in birds, beasts, fishes, serpents, and plants of that Country," and published at London in 1672; the other, "An Account of two voyages to New England." The former book was issued, with full and valuable annotations, by Prof. Edward Tuckerman in 1865, and from this we quote largely. He says, "Josselyn was, it appears, a man of polite reading." His curiosity in picking up "excellent medicines," points to an acquaintance with physic, of his practising which there occur several instances. Nor is he by any means uninterested in prescriptions for the kitchen as, for instance, when he gives an elaborate recipe for cooking eels and also one for a compound liquor "that exceeds passada, the nectar of the country," which is made, he tells us, of "Syder, Maligo Raisons, Milk, and Syrup of Clove Gilliflowers." But his curiosity in Natural History and especially Botany is his chief merit and this now gives almost all the value that is left to his books. William Wood, the author of "New England's Prospects," was a better observer generally than Josselyn, but the latter makes up for his shortcomings by the particularity of his botanical information. But we will return to the "Rarities," and see what record Mr. Josselyn has left of the plants of the country. He has divided them into five groups, viz:

1. Such Plants as are common with us in England.
2. Such Plants as are Proper to the country.

3. Such Plants as are Proper to the country and have no name.

4. Such Plants as have sprung up since the English planted and kept cattle in New England.

5. Such Garden Herbs amongst us as do thrive there and such as do not.

In the first group some of the most familiar are the following: Cat's-tail, Wild Sorrel, Blew Flower de luce, Yellow bastard Daffadil, it flowereth in May, the green leaves are spotted with black spots. Water-cresses, Red Lillies, One Blade (*Smilacina bifolia*) Lilly Convallie with the yellow flowers, Small water archer (arrow head), Autumn Bell Flower (Closed Gentian). Glasswort grows abundantly in salt marshes. Upright Peniroyal, Catmint, Water Lily with yellow flowers, the Indians eat the roots, the Moose Deer feed upon them, at which time the Indians kill them, when their heads are under water. Dragons (*Arum*)—they come up in June. Violets of three kinds, Solomon's Seal, Doves Foot, and Herb Robert, Yarrow, with the white flower, Columbines of a flesh color, growing upon rocks, Ferns and Brakes, Dew Grass (*Drosera*), Lime Tree, both kinds, Maple, Elm, Fuss Balls, very large. Noble Liverwort, Blood Root, Black-Berry, Dew Berry, Rasp Berry, Hawthorn, Toadflax, there is Oak of three kinds, Juniper, very dwarfish and shrubby, growing for the most part by the seaside. Willow, Spurge Laurel, called the Poyson Berry, it kills the English cattle if they chance to feed upon it, especially calves. Gaul or noble mirtle (*Myrica gale*), Alder, Hazel, Walnut, Chestnuts, very sweet in taste, and may be, as they usually are, eaten raw; the Indians sell them to the English for twelve pence the bushel. Wild Purcelane, it is eaten as a pot-herb and esteemed by some

as little inferior to asparagus. Woodwax, wherewith they dye many pretty colors.

NOTE.— There is a tradition that it was introduced here by Gov. Endecott, which may have been some forty years before Josselyn finished his herborizing — enough to account for its naturalization then. It was long confined to Salem. Dr. Cutler says "pastures between New Mills and Salem." Woad seed is set down in a memorandum of the Governor and Company of Massachusetts Bay before February, 1628, to be sent to New England. Gov. Endecott is also responsible for importing another plant to his Danvers home, for we find in Hanson's History of Danvers this note, after referring to Gov. Endecott's land: "If tradition be correct, he introduced for medicinal purposes, as well as by way of ornament to his garden, the Whiteweed, or *Chrysanthemum leucanthemum* of the botanist, which has since become so detrimental to the hayfields of our farmers in some parts of the State."

"Of such Plants as are proper to the country. Indian Wheat, of which there are three sorts, yellow, red and blew. Mountain Lillies, bearing many yellow flowers. Hollow-leaved Lavendar is a plant that grows in salt marshes, overgrown with moss, with one straight stalk about the bigness of an Oatstraw, better than a cubit high; upon the top standeth one fantastical Flower, the Leaves grow close from the root in shape like a Tankard, hollow, tough and always full of Water, the Root is made up of many small strings, growing only in the Moss and not in the Earth, the whole Plant comes to its perfection in August, and then it has Leaves, Stalks and Flowers, as red as blood, excepting the Flower, which hath some yellow admixt. I wonder where the knowledge of this Plant hath slept all this while, *i. e.*, above Forty Years. Tree Primrose, Maiden Hair, ordinarily half a yard in height, Pirola of two kinds, Indian Beans, Squashes, but more truly Squonter-squashes, a kind of Mellon or rather Gourd, Pompiones and Water Mellons, too, they have in good store. New England Daysie or Primrose, flowers in

May and grows amongst moss upon hilly grounds or rocks that are shady. Wild Damask Roses, single, but very large and sweet. Sweet Fern, Sarsaparilla, Bill Berries, two kinds, Black and sky colored, which is more frequent. Sumach, our English cattle devour it most abominably. The cherry trees yield great store of cherries which grow in clusters like grapes. They be much smaller than our English cherry; nothing near so good, if they be not fully ripe; English ordering may bring them to an English cherry, but they are as wild as the Indians. Board Pine (*P. strobus*) is a very large tree. Pitch Pine, its wood cloven in two little slices something thin, the only candles used by the New England natives, and Higginson found them adopted by the first colonists." The Board Pine, the loftiest tree of New England, was seen in 1605 by Capt. George Weymouth on the Kennebec, and hence the name Weymouth Pine given in England to the imported deals. Wood refers to these Pines, the White Pines, when he speaks "of these stately, high-growne trees, ten miles together, close by the river side." "The Larch Tree, which is the only Tree of all the Pines that sheds his Leaves before Winter, the others remaining Green all the Year. Hemlock Tree, the bark of this serves to dye Tawny. Cran-Berry, or Bear-Berry, because Bears use much to feed upon them, is a small trayling Plant that grows in Salt marshes that are overgrown with moss. The Indians and English use them much, boyling them with Sugar for Sauce to eat with their meat. Pirola, or Wintergreen, that kind which grows with us in England, is common in New England, but there is another plant which I judge to be a kind of Pirola and proper to this country, a very beautiful Plant. The Ground of the Leaf is a Sap Green, embroydered (as it were) with many pale yellow Ribs, the whole Plant in shape is like

Sempervivum, but far less, being not above a handful high, with one slender stalk adorned with small, pale, yellow Flowers, like the other Pirola. It groweth not everywhere, but in some certain, small spots, overgrown with moss, close by swamps and shady, they are green both Summer and Winter." Another plant is illustrated and described in the following language: "This Plant the Humming Bird feedeth upon, it groweth likewise in wet grounds, and is not at its full growth till July, and then it is two cubits high and better, the leaves are thin and of a pale green colour, some of them as big as a Nettle leaf, it spreads into many Branches, knotty at the setting on and of a purple colour, and garnished on the top with many hollow, dangling Flowers of a bright, yellow colour, speckled with a deeper yellow as it were shadowed; the Stalkes are as hollow as a Kix, and so are the Roots, which are transparent, very tender and full of a yellowish juice." The list of plants in the fourth group is short and we will mention only a few; they are the plants which have sprung up since the English planted and kept cattle. "Couch Grass, Shepherd's Purse, Dandelion, Mallowes, Plantain, which the Indians call English Man's Foot, as though produced by their treading, Knot Grass, Chickweed. I have done now with such plants as grow wild in the country. I shall now in the Fifth place give you to understand what English herbs we have growing in our Gardens that prosper there as well as in their proper soil, and of such as will not grow there at all. Cabbage grows there exceeding well. Lettice, Parsley, Burnet, Tansie, Sage, Carrots, Parsnips of a prodigious size," other Vegetables and grains. "Spearmint. Rew will hardly grow. Southern Wood is no Plant for the country, nor Rosemary, nor Bayes, Lavendar Cotton, but Lavendar is not for the cli-

mate. Gilly Flower will continue two years. Fennel must be taken up and kept in a warm cellar all winter. Houseleek prospereth notably. Hollyhock, Sparagus, Satin,—'we call this herb in Norfolke Sattin'—says Gerard, and among our women it is called Honestie, Garden Sorrel and Sweet Bryer or Eglantine. English Roses very pleasantly, Celandine."

There are very many plants which we have omitted, but the principal familiar ones have been given. We can see that much progress had been made and that the gardens were well stocked. When Josselyn made his first visit in 1638-9, he was treated with "half a score very fair pippins" from the Governor's Island in Boston Harbor, though there was then he says, "not one apple tree, nor pear planted yet in no part of the country but upon that island."[4] But he has a much better account to give in 1671. "The quinces, cherries, damsons, set the dames a work. Marmalad and preserved damsons is to be met with in every house. Our fruit trees prosper abundantly. Apple trees, pear trees, quince trees, cherry trees, plum trees, barberry trees. The countrey is replenished with fair and large orchards." Here end our quotations from the "Rarities" and with one more item, this paper must be brought to a close. "Sebastian Raslis, a missionary from the Society of Jesuits to the Indians in North America, 1689, in speaking of the method of illuminating his chapel, observes that he had found an excellent substitute for wax, by boiling the berries of a kind of laurel in winter and skimming off the thick, oily substance which rose to the top. Twenty-four pounds of this beautiful green wax, and an equal amount of tallow will make one hundred wax candles of a foot long."

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[4] Probably Josselyn was mistaken. The Governor Endecott pear-tree is thought to have been planted where it now stands, in 1630.—Memoir of John Endecott, by Chas. M. Endicott, p. 23, note.—EDITOR.

OBJECTS FROM PRE-HISTORIC GRAVES, BEVERLY, MASS.

OBJECTS FROM PRE-HISTORIC GRAVES, BEVERLY, MASS.

PRE-HISTORIC RELICS FROM BEVERLY.

(WITH TWO PLATES.)

CONTRIBUTED BY JOHN ROBINSON.

On July 21, 1871, a very interesting collection of pre-historic objects was obtained by the Peabody Academy of Science from three graves, accidentally discovered on Lovett street, Beverly, by workmen engaged in digging a trench. Some account of these objects will be found on page 125 of the Bulletin of the Essex Institute for 1871, Vol. III, as announced by Mr. F. W. Putnam at an Institute field meeting held at Ship Rock, Peabody, Aug. 2, 1871. It was intended to give a fuller description of this collection, with illustrations, in the "American Naturalist" magazine, but this was never done. Professor Putnam also intended to contribute, to the memoirs of the Peabody Academy, an article on the pre-historic graves in Essex County; but, later, this plan was relinquished. For this last purpose, however, two excellent lithographic plates were prepared by Mr. G. M. White, and printed. It is now thought well to use these plates for the Institute Bulletin, and they are introduced here as supplementary to the article of 1871, Vol. III, pp. 123–5, above mentioned.

The plates cover the more interesting objects found in the three graves at Beverly and may be described as follows:—

Plate I.

Fig. 1. Pipe, peridotite; very probably made of the rock, commonly called soapstone, from the Andover outcrop.
Fig. 2. Knife blade of Marblehead felsite.
Fig. 3. Spear-head of Marblehead felsite.
Fig. 4. Celt or skin dresser of diorite.

Plate II.

Fig. 1. Slate stone marked as shown.
Fig. 2. Slate tablet, very probably made of the Bradford rock.
Fig. 3. Slate tablet, as last.
Fig. 4. Tablet of porphyritic dyke rock. It shows indication of the beginning of a hole at the smaller end as in figure 2.

All of the objects are drawn actual size. In addition to the objects figured, there are in this collection from the Beverly graves, another tablet, similar to fig. 2, Plate II, but of a lighter colored slate; a porphyritic dyke rock pebble, with indentations on the edge; two flat pieces of sandstone, evidently used for rubbing or sharpening implements; a flat slate stone and two pebbles showing traces of ochre upon them; and several thin pieces of muscovite mica of the Andover form of this mineral. The identification of the rock materials has been made by Mr. Sears. There is no reason to suppose that these implements originated outside of Essex County; for, in each case, a rock of precisely the same character as the object is found within the limits of the county.

There are, in the county collections of the Peabody Academy, a large number of interesting objects obtained from pre-historic graves, or graves of the people of the

pre-historic race which occupied this region, although from the finding of European beads and copper trinkets in connection with aboriginal stone implements, these latter burials must have been made after the year 1500, when Europeans had visited our shores. In the case of the Beverly graves from which the objects figured were obtained, unless the pipes are of European workmanship, or were made with tools obtained from the early voyagers, the age may be placed at more than 350 years. If, however, the pipes were made by Europeans or with tools obtained from them, then 270 to 350 years would be a safer estimate for the age of the objects found; they undoubtedly antedate the permanent settlement of the region in 1626.

Peabody Academy of Science,
Jan. 19, 1897.

NOTE TO ARTICLE OF REV. WM. P. ALCOTT

Since pages 92–94 were in print I have other items as to the history of this Ilex from Mrs. Horner. The bush originally stood by the roadside in the edge of No. Andover. It was transplanted by Mr. P. B. Folansbee to his nursery at Haggett's Pond, and a rooting from it is growing at the Arnold Arboretum. Professor Gray considered this plant simply a freak, like the white huckleberry, etc.

In his "November Chronicle," *Atlantic Monthly*, Nov. 1888, Mr. Bradford Torrey mentions finding—perhaps in a wider range of conditions—73 species blooming during Nov. 1887.

BOTANICAL NOTES.

BY REV. WM. P. ALCOTT, BOXFORD.

The writer's duties have called him to drive in different directions nearly every day of November, 1896. He has noted the roadside flowers seen on these rides, together with such as he could find about his own premises. Persons having opportunity for systematic search may have found many more during such a favorable month, and I shall be happy if my own list may serve to call forth longer catalogues. Certain plants which I have not found must surely have been observed, while some mentioned are evidently exceptional cases. Quite a list of Cryptogams might be added and possibly a few belated grasses.

The vigor and beauty of *Aster undulatus*, even so late as the 18th, was very interesting. It will be noted that fifteen of these brave twenty-eight were Compositæ.

Flowering plants of the following were abundant:

Capsella bursa-pastoris, L.
Lepidium Virginicum, L.
Brassica campestris, L.
Stellaria media, L.
Malva rotundifolia, L.
Trifolium pratense, L.
Hamamelis Virginica, L.
Aster undulatus, L.
Aster miser, L.
Erigeron Canadense, L.
Solidago cæsia, L.
Solidago altissima, L.

Solidago memoralis, Ait.
Achillea millefolium, L.
Gnaphalium polycephalum, Mchx.
Leontodon autumnale, L.
Taraxacum dens-leonis, Desf.
Lobelia inflata, L.

Two or three specimens were seen of these :—

Solidago bicolor, L.
Maruta cotula, D. C.
Erecthites hieracifolia, Raf.
Gentiana crinita, Frœl.

Of six only single flowering specimens were observed :

Ranunculus acris, L.
Sinapis nigra, L.
Viola sagittata, L.
Potentilla argentea, L.
Aster dumosus, L.
Aster longifolius, Lam.

Early this last summer Mrs. C. N. S. Horner called my attention to a strange plant found somewhere in Georgetown, which proved to be an emigrant from Western Europe, *Hieracium aurantiacum*, var. *bicolor*. Later in the season, during a carriage ride, this plant was seen to be very abundant at a place near East Templeton, Worcester County, and also in Florida, Berkshire County, along the main road over Hoosac Mountain. It thus grows "in high pastures" here, as across the Atlantic. Should it flourish at lower altitudes it might prove another of those beautiful but most troublesome weeds which the Old World has so often sent us. If memory is correct, I have seen this plant on the high ground of Mr. T. C. Thurlow's Nursery, at West Newbury.

Other interesting "finds," by that most observing bota-

nist, Mrs. Horner, have been *Salvia virgata* and *Trifolium tomentosum*, L., both of Southern Europe. The latter was found ten years ago and from the place of its discovery in Georgetown, is evidently to be added to the list of "Woolen Mill Plants." I am not aware that it has been collected there since. The *Salvia* appeared this summer, or last, among the seedling flowers of a garden.

A small-flowered pink, *Silene gallica*, var. *quinquevulnera*, has bloomed for me two years, coming with "wild garden" seed, probably imported from France. Botanists who know our native weeds from strange ones may often get rare things in this way.

What one might call persistent local attachment is remarkably manifested in some plants. Crocuses and Star-of-Bethlehem (*Ornithogalum*) blossom every year in the dense sward near my house, where they must have been planted twenty-five years ago, perhaps much more, having never in that time been cultivated. Probably some readers can far overmatch these instances. *Polygonum bistorta*, L., also grows, and often flowers, in the same grass, in spite of having been mown close, once or twice a summer for many years. No doubt it is a relic of some ancient garden.

In August a white-flowered form of *Linaria Canadensis*, Spreng., was somewhat abundant near Milwood P. O., Rowley. Years ago specimens of "white-fruited" black alder, *Ilex verticillata*, Gray, were given to the Boxford Natural History Society, from a bush on the land of a Mrs. Cole, of West Boxford. The berries were rather of a yellow color. One specimen of *Houstonia purpurea*, L., var. *longifolia*, with white flowers, was also brought to our Society from near the center of the town, sown perhaps with grass seed, which so often brings into our soil transient and extra-limital specimens.

For a note appended to the above, see p. 91.

ON A NEW GENUS AND TWO NEW SPECIES OF MACRUROUS CRUSTACEA.[1]

BY J. S. KINGSLEY.

I owe to Professor Hermon C. Bumpus, of Brown University, the privilege of examining a small shrimp which he obtained from the Island of Naushon, one of the Elizabeth Islands, on the southern coast of Massachusetts. Under ordinary circumstances the publication of isolated descriptions is to be deplored, but in this case the procedure seems to have some justification. In the first place the whole Vineyard Sound region has been so thoroughly explored by the various parties of the U. S. Fish Commission and by the members of the Marine Biological Laboratory at Woods Holl, that novelties among the Decapod Crustacea are extremely rare. Again, the form in question is unique in several of its features, combining as it does the characters of several other genera or even of so-called families.

The specimen, which is the basis of the following description, was found July 13, 1893, in the sand of the small channels — the so-called gutters — of the island.

Genus Naushonia. Body somewhat depressed; mandibles stout, incurved, the cutting edge excavate anteriorly, the edge itself serrate; a two-jointed palpus present.

[1] Contributions from the Biological Laboratories of Tufts College, under the direction of J. S. Kingsley, No. XVI.

First pair of feet larger than the second, the first pair being sub-chelate, the second non-chelate, and with simple carpus. Antennulæ biflagellate, the inner flagellum about half the length of the outer. Antennæ long; antennal scale small, not reaching to the external spine.

This genus resembles the Crangoninæ in the larger first pair of pereiopoda; in the sub-chelate character of the anterior hand, and the non-annulate carpus of the second pair of pereiopoda. It differs, however, from this sub-family, and from all the Crangonidæ as limited by Dana, in the excavate mandible and in the possession of a mandibular palpus. The cutting edge of the mandible recalls somewhat that of the Atyidæ, but the palpus is not present in that family. Mandibular characters also exclude it from all known Palæmonidæ. Subsequent investigations may show that it will be necessary to erect a new 'family' for its reception.

Naushonia crangonoides n. sp. Carapax somewhat cylindrical, depressed in front, the rostral region being down curved. The rostrum flattened, tip broadly triangular, extending forward slightly beyond the eyes. Supra-orbital and antennal spines present; branchiostegal, hepatic and pterygostomian spines lacking. Cervical groove well marked in the middle but not reaching the antero-lateral margin of the carapax. A well-marked impressed line extends from the antero-external angle on either side to the posterior margin of the carapax. With these exceptions the carapax is smooth and is without pubescence. The abdomen is about a third longer than the carapax; is smooth and without carinæ, spines, etc. The telson is a third longer than broad, its tip regularly and broadly rounded, with a spine at each external angle. The eyes are on short peduncles, not visible from above, and with a minute pigment spot. The antennulæ are

biflagellate, the flagella short, the inner ramus being about half the length of the outer. The antennæ are provided with a small basal scale, the external spine of which reaches to the middle of the last joint of the peduncle, while the laminate portion of the scale falls short of the external spine. The external maxillipeds are pediform, elongate and furnished with extremely long hairs. The mandibular palpus bears simple hairs on its inner, and stiff bristles on its outer margin. The pereiopoda are provided with small exopodites. The first pair (only the left present in the specimen) are much the larger, and recall strongly the corresponding appendage in the Crangonids, but the occludent margin is more oblique than in most of the genera of that group. The meros is about twice as long as the ischium, and both these joints have the external margin acute. The short carpus is approximately an equilateral triangle in outline. The hand is flattened, the propodus being twice as long as broad, and externally with an acute edge. A long acute 'thumb' directed obliquely forward, at about the middle of the inner margin of the propodus, limits the occludent margin of the palm. This margin is acute and is provided with one large and several smaller teeth, the distribution of which is shown in the figure. The dactylus is bent, proximally, at a right angle, the distal portion being regularly arcuate and the tip acute. Its margins are sharp and the outer one is provided with a fringe of long hairs. The second pair of feet are the shortest, the carpus is simple, without annulations, and the dactylus is flattened and covered with a pubescence of long hairs. The remaining pereiopoda are slender, pediform and terminated by acute, slightly curved dactyli. The total length from the tip of the rostrum to the end of the telson is 26 mm.

Caradina pasadenæ n. sp. Carapax smooth, ecarinate above, rostrum long, three-fourths the length of the carapax, and exceeding by a third of its length the antennular peduncle. It is smooth above, its apex minutely bifid, and occasionally a small tooth beneath at about the level of the extremity of the antennular peduncle. Pterygostomian spine present, rather obtuse; external angle of the orbit spiniform. Antennula with external spiniform scale on the outer margin of the basal joint, reaching slightly in advance of the extremity of the joint, a small spine on the inner margin of the joint. Antennal flagella subequal in length, the length about equal to that of the carapax without the rostrum. Antennal scale about four times as long as broad, extending slightly beyond the antennular peduncle; its external margin straight, its apex obliquely rounded; antennal flagellum about two-thirds the length of the body. External maxillipeds pediform, the ischium strongly arcuate; the terminal joints partly fused and armed with two rows of spines; exopodite slender, filiform, joints obsolete. First pair of pereiopoda short, rather stout, the meros about equal to the propodus in length; hand of regular Atyid character, the fingers excavate and furnished with pencils of hairs. Second pair of pereiopoda about twice the length of first, the carpus simple, slightly obconical, and longer than any other joint; fingers excavate and pencilled. Remaining pereiopoda elongate, pediform, with moderate, slightly curved dactyli, spinulose beneath. Telson with straight, converging sides, its apex truncate and spinulose. Total length from tip of rostrum to end of caudal pleopoda 32 to 39 mm.

This species, which was sent me by Professor A. J. McClatchie of Throop University, is stated by him to be common in the streams about Pasadena, California. This species differs from *C. multidentata*, *serrata*, *acuminata*,

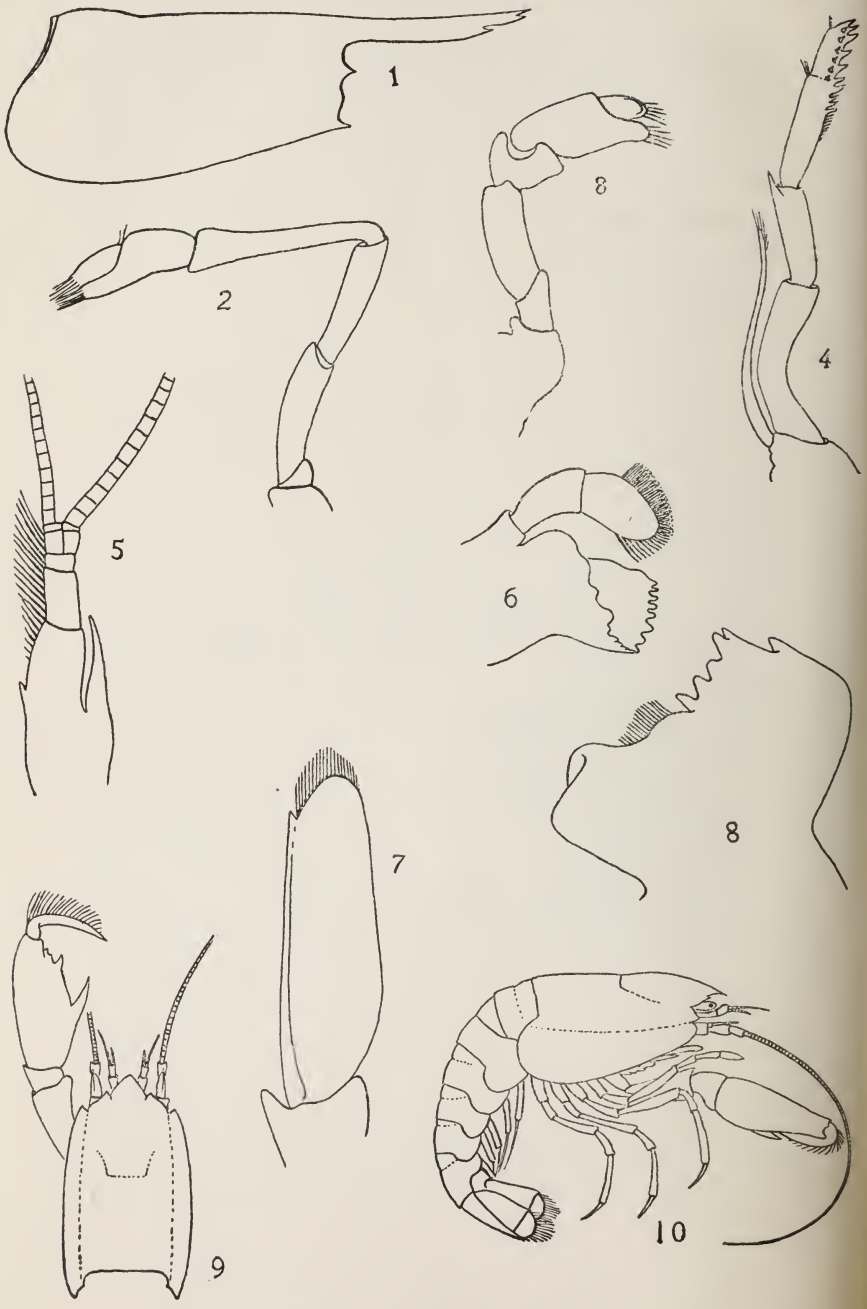
brevirostris, *exilirostris* and *typus* in its elongate rostrum. From *C. grandirostris* and *leucosticta* it differs in the lack of teeth upon the upper margin of the rostrum; from *C. americana* in the almost total lack of teeth on the lower surface of the rostrum, while *C. denticulata* is thrown out by similar characters. *C. tenuirostris* is a species of Virbius.

[Published, March, 1897.]

EXPLANATION OF PLATE III.

Figs. 1–7. *Caradina pasadenæ*. Figs. 8–10. *Naushonia crangonoides*.

Fig. 1. Carapax.
" 2. Second pereiopod.
" 3. First pereiopod.
" 4. External maxilliped.
" 5. Base of antennæ.
" 6. Mandible.
" 7. Antennal scale.
" 8. Mandible.
" 9. Carapax, etc., from above.
" 10. Side view.



KINGSLEY. NEW CRUSTACEA.

THE NASAL ORGANS OF PIPA AMERICANA.[1]

BY IRVING REED BANCROFT.

THE investigations recorded in the following paper were undertaken at the suggestion of Professor Kingsley, who pointed out to me that the nasal structures of the Surinam toad differed considerably from those described by Seydel as occurring in other Batrachia; and that aside from a short reference by Stewart Lee, no account of the olfactory organ of *Pipa americana* was accessible.

The whole work was done by means of sections and plastic models, the slides being the same as those which formed the basis of Arnold's paper on the cranial nerves. The animals were from 9 to 12 mm. in body length and in their general features were much like the adult. The systematic position of Pipa as a member of the Aglossate group of the Anura renders all facts regarding its structure especially interesting.

For convenience of comparison in my description, I have followed Seydel ('95) in beginning my account at the choana or posterior nasal aperture. The choana opens from the back and upper part of the oral cavity as in other amphibians. It almost immediately shows clearly two main divisions, fig. 9, plate IV. Of these the superior or cavum nasale, *c*, figs. 2–9, has an ovoid section with the narrow end directed outward. The second division, the

[1] Contributions from the Biological Laboratories of Tufts College, under the direction of J. S. Kingsley, No. XVII.

inferior or lateral nasal canal, *ln*, is a long, flattened outpushing and lies more externally. The walls of the cavum nasale become thickened immediately and the epithelium is specialized for sensory purposes. The walls of the lateral nasal canal are thinner and contain no specialized cells except at its external end.

As we go farther forward, the lateral nasal canal suddenly widens laterally, still retaining its flattened condition, fig. 8, plate IV, and the external part becomes cut off from the main canal, forming a small and short blindsac. The epithelium of this posterior blindsac is not thickened or specialized, but is of the simple columnar type. This blindsac occurs in each series of sections and is apparently a constant structure. It is shown in outline in plate V and fig. 7 cuts through its anterior end.

The thickening seen to bound it internally in fig. 7 is merely the oblique section of the wall of the lateral nasal canal, which is here extending itself outward to connect with Jacobson's organ, and has nothing to do with the posterior blindsac itself.

In front of the posterior blindsac, the walls of the lateral portion of the lateral nasal canal become greatly thickened and its epithelium in this region assumes the same specialized condition as was found in the cavum nasale. This lateral portion now assumes a more nearly cylindrical shape and almost immediately leads away from the lateral nasal canal and forms the duct for the organ of Jacobson. From this duct, the organ of Jacobson extends forward, figs. 6, 5, 4, its anterior end being a little posterior to the middle of the whole nasal apparatus, plate V. It is the most external of the cavities connected with the nasal organ and lies on a lower plane than the rest. It is a rounded cone, viewed from below, and its outer walls have a flattened cylindrical section while its ulmen is broad and low.

The sensory epithelium is very thick, consisting of cells of an extreme columnar condition. The nuclei are scattered at various depths in the basal two-thirds of the cells while the free ends of the cells present the appearance familiar in this region in all Amphibians.

A little in front of the point of union of the duct of Jacobson's organ with the lateral nasal canal is the opening of the duct of Jacobson's gland, fig. 6, *jd*, the opening being at the inner angle of the organ. The gland itself, figs. 4 to 8, *jg*, lies below the cavum nasale and lateral nasal canal and is on a level with Jacobson's organ. Jacobson's gland, as in other Anura, is situated on the median side of the olfactory organ, and in front it extends laterally beneath the nasal cavities. It consists of convoluted cylindrical tubules lined with cubical or low columnar protoplasm, both nuclei and protoplasm staining deeply. It extends from a point somewhat in front of the planes of fig. 4 to that of fig. 8. Its duct passes from the anterior fourth of the gland to empty into the organ of Jacobson, Plate V. In fig. 4 there is a gland, *g*, which appears differentiated from the rest. It continues forward as a tube, and finally enters into the lateral nasal canal just posterior to the plane of fig. 2.

Farther forward (figs. 4–7), the lateral nasal canal expands externally into a secondary cavity, *ln*, which is lined with the same sensory epithelium as the cavum nasale, with which it remains in connection by the narrower and much depressed portion of the lateral nasal canal. This latter is lined with undifferentiated low columnar cells. More anteriorly, the secondary cavity gradually bends downward and inward so that its anterior region comes to lie below and in the median line of the rest of the olfactory apparatus as shown in Plate V.

From the anterior end of the lateral nasal canal the nasal canal continues forward as a flattened tube to the

external nares. Its epithelium throughout is of an undifferentiated character.

The cavum nasale is nearly the same size and shape throughout its whole length (*cn*, figs. 2–9). It is composed of specialized cells, and, in its grosser features, its histology is similar to that of Jacobson's organ. It has fine branches of the olfactory nerve[2] distributed chiefly to its internal part. These are in many cases too small to be seen with the magnification used. At its anterior end, it becomes separated from the lateral nasal canal (fig. 2) and soon ends as a small blindsac.

In fig. 5, the naso-lachrymal duct is seen. It can be traced for several sections, but as yet it has not formed its connection with the cavum nasale, as it apparently does in a later stage.

It is yet too early too say how much weight is to be placed upon the varying conditions of the olfactory organ in settling the vexed questions of the interrelationships of the Amphibia. Too few forms have as yet been studied to allow of any broader generalizations. Naturally one would expect to find more points of resemblance between the conditions occurring in Pipa and in Rana than between Pipa and the Urodeles, but from the foregoing account it will be seen that Pipa is about as widely removed in its nasal structure from the one as from the other. Certainly, if much weight is to be given these structures, naturalists are justified in the separation of the Aglossa from the other Anura.[3]

In more detail, these differences are as follows :—

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[2] Fischer ('43) has figured and described the olfactory nerve as double in this species; his figures representing the two components as arising side by side, directly from the brain. His account has often been quoted. I find, however, that the olfactorius arises by a single root and the nerve passes undivided through the ethmoidal cartilage, and almost immediately after its emergence breaks up into two superimposed branches which at once subdivide for distribution to the olfactory epithelium.

[3] A study of the structures in Dactylethra would prove very interesting.

In *Rana esculenta*, as described by Seydel, the cavum nasale and the nasal canal are not differentiated from each other, and, while the cavum nasale terminates in both in a cul-de-sac, this termination in Rana is in front of the external nares, in Pipa behind it. Then, too, the lateral nasal canal of Pipa is a structure differing considerably from that of Rana both in position and in histological differentiation. In Rana, Jacobson's organ lies beneath the main nasal canal (cavum nasale) and extends inwards as far as does any other structure connected with the olfactory region. In Pipa, on the other hand, it is not covered by any of the other nasal structures, and it is placed entirely on the external side of the whole nasal apparatus. From the whole course of the duct, so far as developed, the naso-lachrymal canal in Pipa will apparently connect with the cavum nasale, while in Rana it opens into the lateral nasal canal. The most posterior blindsac, given off behind Jacobson's organ, is apparently unrepresented in other Amphibians so far as I have studied the literature. Its lack of specialized sensory epithelium would seem to imply that it was of no great importance.

It seems unnecessary to make any comparisons with the Urodeles farther than to point out that in some respects Pipa seems to be intermediate between these and the Anura, especially in the relationships of what I have called the nasal canal, which agrees well in some respects with what Seydel calls the respiratory duct. Again the position of Jacobson's organ is nearer that found in Urodeles than that occurring in Rana and Pelobates.

Comparisons with the account given by Born ('77) of the conditions found in Pelobates show differences as great as those occurring between Pipa and Rana. One thing that is necessary in these studies is a new nomenclature of the parts. The terminology employed by

Born and by Seydel is hardly applicable to Pipa. I have, however, refrained from proposing any new names since I believe that this can only be done in a satisfactory manner by one who is making a comparative study of many different forms, and not by one who has only the limited perspective of a single species. Still it is well to point out what terms are employed by Born for the nomenclature adopted here which is based upon the terminology of Seydel.

Born distinguished three blindsacs which lie directly under each other; the upper being the largest and the middle the smallest. Born's "unterer Blindsac" may be compared to the Jacobson's organ in Pipa, while the "oberer Blindsac" is the cavum nasale. Born also finds another blindsac between the other two, which may possibly be compared to a similarly lying unnamed blindsac which Seydel found, the "a" of his figures, and possibly to the enlargement of the lateral nasal canal in Pipa. It is true that in Pipa it forms no blindsac, but it is specialized and forms an enlargement which, from the outside, might readily be taken for an actual blindsac. This enlargement is situated between the Jacobson's organ and the cavum nasale in Pipa, but is more internal in Rana.

[Published, March, 1897.]

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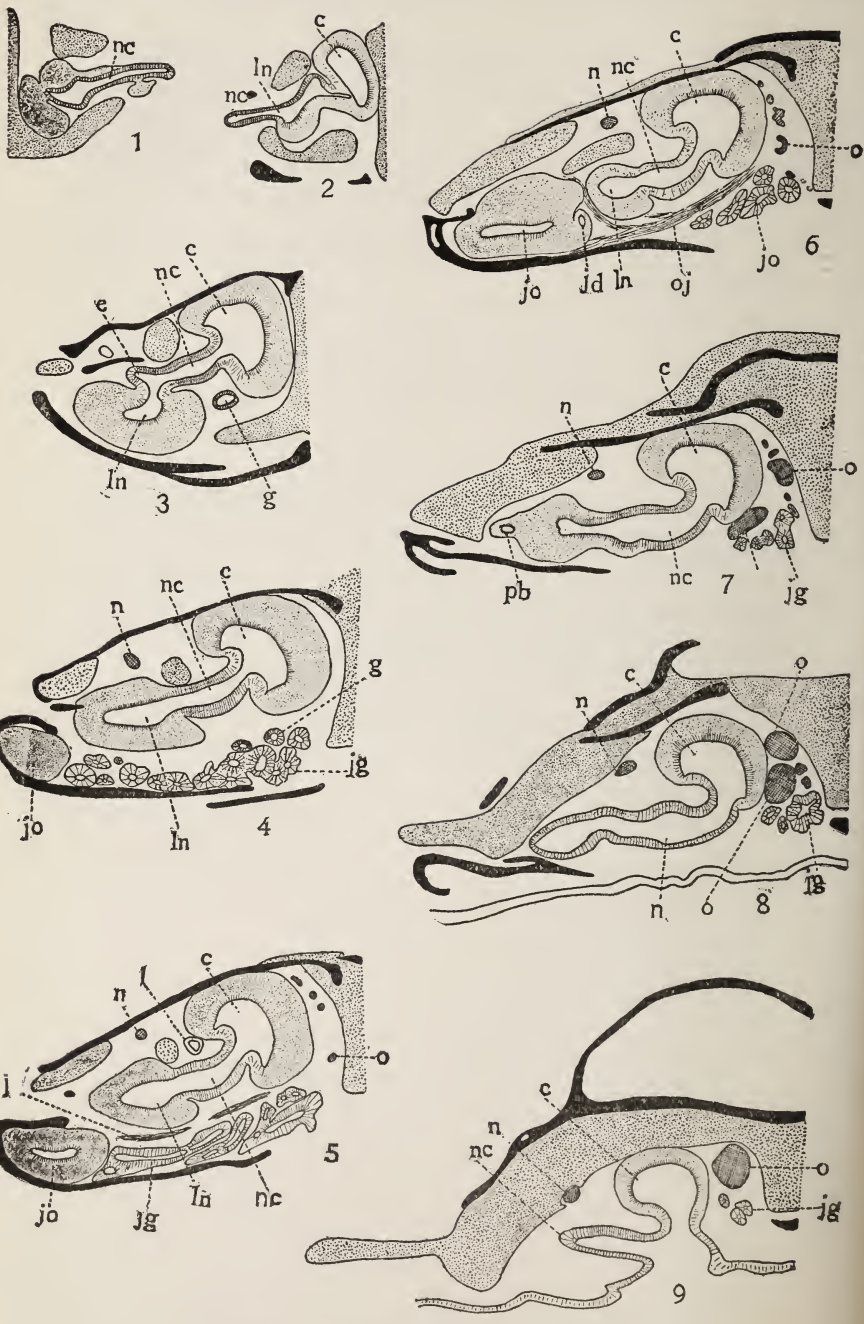
EXPLANATION OF PLATES.

Plate IV. Nine consecutive sections of the nasal region, fig. 1 being a short distance behind the external narial opening, fig. 9 passing through the internal nares.

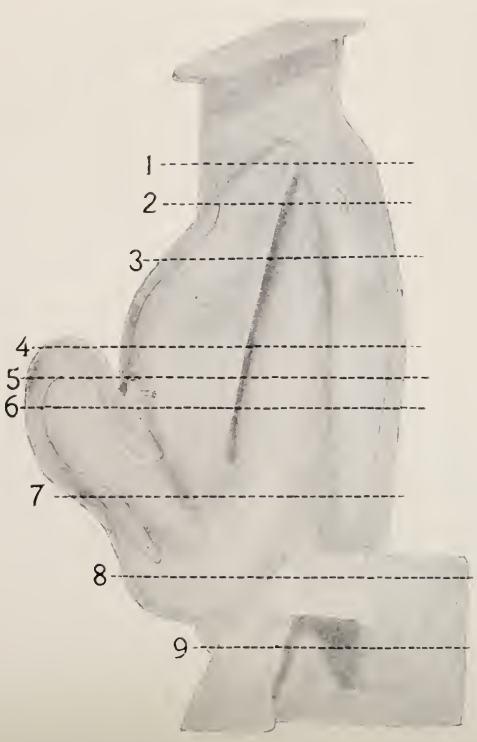
Plate V. *A*, Dorsal, and *B*, Ventral veins of a reconstruction of the nasal apparatus of *Pipa americana*. In *B* is shown in outline the limits of the internal cavity; while in both figures the planes of the sections shown in Plate IV are indicated.

ABBREVIATIONS.

j. o. = Jacobson's organ.
l. n. = lateral nasal canal.
n. c. = nasal canal.
n. = branch of nasalis.
o. = olfactory nerve.
c. = cavum nasale.
e. = external portion of the nasal canal.
j. g. = Jacobson's gland.
j. d. = Jacobson's duct.
p. b. = posterior blindsac.
g. = differentiated gland.
l. = naso-lachrymal duct.
o. j. = branch of olfactory nerve to Jacobson's organ.



BANCROFT. NASAL ORGANS OF PIPA.



B

A

BANCROFT. NASAL ORGANS OF PIPA.

SUPPLEMENTARY REPORT ON THE MINERALOGY AND GEOLOGY OF ESSEX COUNTY.

BY JOHN H. SEARS,

Curator of Mineralogy and Geology, Peabody Academy of Science.

During the seasons of 1894, '95 and '96, the principal work in the geology of the county has been the study of the quartzite and interstratified beds in Lynnfield Centre and North Saugus and carrying the work southwest into Middlesex County in the towns of Reading, Wakefield, etc. The quartzite beds of North Saugus are, without doubt, parts of the basal Lower Cambrian and the knowledge of this formation has been extended southeast on both sides of the head waters of Penny brook to Saugus river. The quartzite and interstratified slates and coarse conglomerates of Lynnfield Centre are the basal members of the Carboniferous rocks, a continuance of the blocked area, No. 19 on the map, of Topsfield and Middleton. This work makes several changes necessary in the preliminary map published in 1893. As an evident mistake was made in the mapping of the contact of the hornblende-granite and the diorite areas of Marblehead and Swampscott, these have been more carefully worked out and remapped. Another correction made necessary is the separation of the hornblende-granites from the hornblende-biotite-granitite. This was not done when the map was published

on advice at the time, although I personally felt then that it would have been better to do so. Another correction is an addition to the augite-nepheline-syenite area. The augite-nepheline-syenite area in Gloucester and Rockport has been extended over two miles and remapped on the west side of Cape Pond. This work was greatly assisted by the Gloucester and Rockport street railroad work and the trenches opened by the Rockport water works, when numerous sections of the fresh rock were exposed thus affording good specimens of the rock for investigation. Many specimens from these outcrops have been collected and the data thus at our disposal have been of great help in tracing this rock formation. The trend of the augite-nepheline-syenite rock from Gloucester to these outcrops in Rockport and to Sandy bay and the Dry Salvages is in the usual northeast direction and unites in this area the augite-nepheline-syenite, the so-called black granite of the Rockport Granite Company's Quarry. Having thus traced the augite-nepheline-syenite in comparatively narrow area through the hornblende-biotite-granitite rock-mass, it is an indication that the syenite is the younger rock and cuts through the granitite without these recently seen outcrops; and, with the knowledge at our command when the geological map of Essex County was published, the small detached areas of the augite-syenite in this region seemed to be cut by the granitite, thus making the granitite apparently the younger rock. I have therefore, taken all of the maps remaining on hand at the Essex Institute and have made the necessary corrections to date in color.

These corrections may not appear important to the untrained eye; still they are so to the student and it at least brings the maps on hand correct to our best knowledge to the present time.

Revised scheme of numbers.

(+) Hornblende granite.
(12) Eruptive porphyritic gneiss.
(18) Cambrian rocks.
(19) Carboniferous rocks.

GEOLOGICAL SUCCESSION OF THE ROCK FORMATIONS OF ESSEX COUNTY, MASS., FROM THE EARLIEST TO THE MOST RECENT.

Archean, Laurentian gneiss, schists and sandstones, all crystalline, more or less contorted and highly metamorphic.

Pre-Cambrian, Arkoses, Hornblende epidote gneiss, Limestones, folded and metamorphic.

Lower Cambrian (Paleozoic) conglomerates, quartzites, slate and limestone, Georgian Olenellus, etc.

Eruptive (igneous) rocks, muscovite biotite granite.
Hornblende granite.
Hornblende biotite granitite.
Eruptive porphyritic gneiss.
Quartz augite diorite.
Quartz hornblende diorite.
Essexite nepheline rock and aegirite ditroite schieffer.
Hornblende diorite.
Elaeolite zircon syenite and augite nepheline syenite.
Hypersthene augite basalt dyke rocks (eobasalt).
Augite olivine basalt dyke rocks.
Diallage gabbro dyke rocks.
Diallage augite olivine gabbro dyke rocks.
Aegirine Tinguaite dyke rocks.
Aegirine syenite dyke rocks.

Ancient volcanic rocks, rhyolite breccias, banded rhyolite, eorhyolite.

Hornblende diorite dyke rocks.

Hornblende augite porphyrite, feldspars from one to three inches long, dyke rock.

Aphanitic diorite dyke rocks.

Aplitic granite dyke rocks.

Felsite porphyry dyke rocks (eorhyolite).

Bostonite porphyry (sanadin dyke rock).

Quartz porphyry dyke rocks (eorhyolite).

Liperite dyke rock (eorhyolite).

Vitrophyre dyke rock (eorhyolite).

Keratophyre lava (anorthoclase rock), a sheet covering the rhyolite breccia and banded rhyolites on Marblehead Neck.

Paleozoic Era, Carboniferous Period, Permo-Carboniferous Epoch. Very coarse ferrugineous conglomerates and grits, blue shales, sandstones and black limestone, that is fossiliferous.

Surface deposits.

Cenozoic Era, Pleistocene Period, Pre-glacial Epoch. Pre-glacial clay beds, covered by glacial boulder till (older diluvium) occurring in long ridges or drums, which lie in the general direction of the rock striations.

Cenozoic Era, Pleistocene Period, Glacial Epoch. Scratched, grooved, polished and striated surfaces of ledges and stones, drift boulder clays. Terminal moraines as drums and drumlins. Eskers, valley sands and clays deposited in ice dammed seas. This determination may include inter-glacial epochs and a post-glacial epoch.

Psychozoic Era, Post-Terrace period, Present Epoch. Peat-beds, river alluvium. Evidence of subsidence, submerged forest trees, cones, nuts and fruits; also many hundreds of wings and fragments of beetles and other insects submerged to a depth of fourteen and one-half feet below high water mark. For full description, see Bulletin of the Essex Institute, Vol. XXVI, 1894.

PEABODY ACADEMY OF SCIENCE,
Salem, March 29, 1897.

SANDSTONE DIKES ACCOMPANYING THE GREAT FAULT OF UTE PASS, COLORADO.

BY W. O. CROSBY.

INTRODUCTION.

THREE years ago, Whitman Cross[1] first directed the attention of geologists to the fact that dike-like masses of sandstone occur in the granite of the Pike's Peak massif, forming a belt about one mile wide extending north-northwest from the vicinity of Green Mountain Falls, in Ute Pass, along the southwest side of the narrow Manitou Park basin of sedimentary rocks (Silurian and Carboniferous). Among the most important characteristics of the dikes noted by Cross are the following:—

1. The dikes have a general trend parallel to the belt in which they occur; are approximately vertical and often appear as a complex of nearly parallel fissures with many branches and connecting arms; and vary in width from mere films to two or three hundred yards, the largest being a mile or more in length, and forming rugged ridges with narrow crests which contrast markedly with the gently sloping hills of granite about them. In short, "in all formal relationships to the enclosing

[1] Bull. Geol. Soc. America, 5, 225-230;
U. S. Geol. Survey, Pike's Peak Folio.

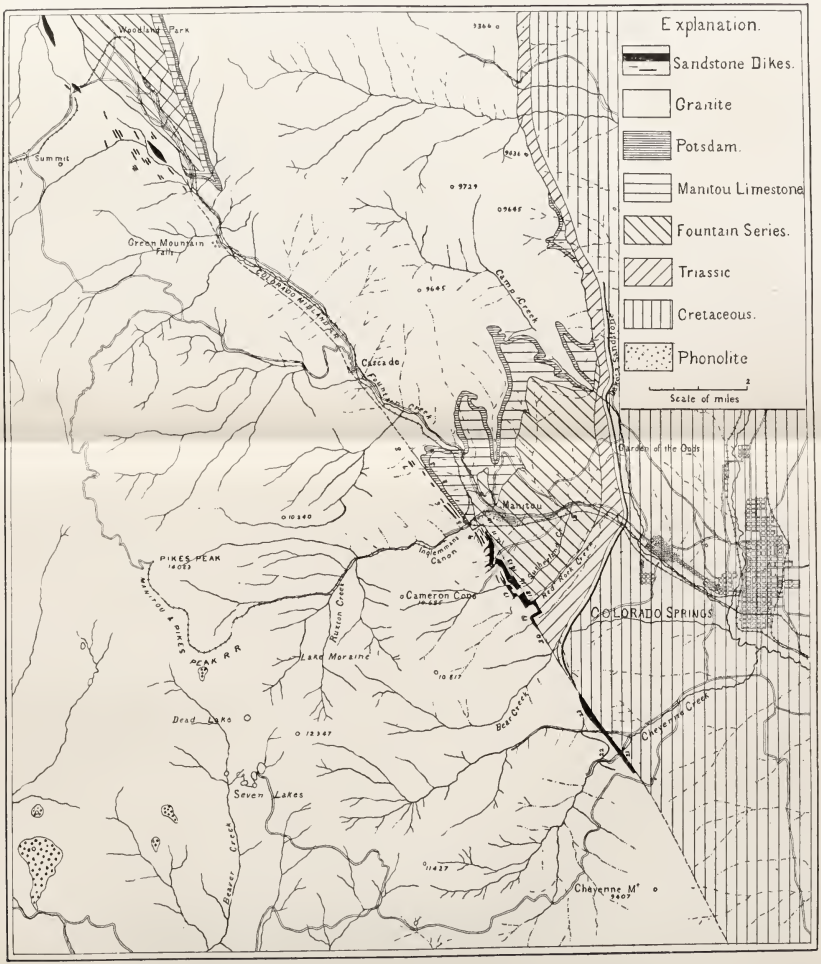
rocks these bodies are as typical dikes as any of igneous origin."

2. The rock of the dikes is a fine and even-grained aggregate of sand grains varying in degree of induration from a normal sandstone to a dense hard quartzite, but throughout of a remarkably massive and uniform character. The induration is mainly due to limonite; in the quartzitic portions, however, there appears to be some secondary silica, although a distinct enlargement of the quartz grains is rare.

During the past summer of 1896 I was able to devote several weeks to the investigation of the sandstone dikes and the great displacement to which I have found them to be genetically related. To the dikes described by Cross I gave only sufficient attention to become familiar with their characteristics; and then endeavored to trace the series southeastward through Ute Pass to Manitou and beyond.

The sedimentary formations of the Manitou area embrace, from below upward, as described by Hayden, Cross, and others:

1. A basal sandstone which is usually forty to fifty feet thick, white or gray for the lower ten to fifteen feet and dull red or brown above, only rarely of arkose character, but frequently more or less glauconitic. 2. This sandstone, which may be referred provisionally to the Potsdam, becomes calcareous upward, passing into red, cherty limestones, and these into a massive gray limestone having a thickness of several hundred feet. The limestones are throughout more or less magnesian and contain recognizable traces of a Lower Silurian (Ordovician) fauna. 3. This great Manitou limestone series is overlain without apparent unconformity by the Fountain (Carboniferous) beds, one thousand to possibly


Explanation.
Sandstone Dikes.
Granite
Potsdam.
Manitou Limestone
Fountain Series.
Triassic
Cretaceous.
Phonolite
Scale of miles
Woodland Park
Summit
Green Mountain Falls
Cascade
Camp Creek
Garden of the Gods
Manitou
Iron Springs
Soda Springs
Red Rock Cañon
Ingleside Cañon
PIKES PEAK
14083
Cameron Cone
Boston Creek
Lake Moraine
Dead Lakes
Seven Lakes
Bear Creek
Cheyenne Creek
COLORADO SPRINGS
Cheyenne M'
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fifteen hundred feet in thickness—a remarkable complex of red and white arkose sandstones, grits and conglomerates. 4. The red sandstone series (Triassic), a thousand feet or more in thickness. 5. The white, variegated and gypsiferous Jurassic strata. 6. The Cretaceous series, beginning with the massive and conspicuous Dakota sandstone.

Each of these formations is cut off on the south by the great fault which skirts the northeastern base of the Pike's Peak massif. This profound displacement, which must be regarded as a dominant factor in the geological structure of the region, and to which we undoubtedly owe, in the main, the Manitou embayment of sedimentary rocks and the exceptional elevation of the Pike's Peak massif as compared with the Front Range to the North of Ute Pass, gained early recognition and is clearly indicated on Hayden's map of the Manitou area[2], the principal features of which are reproduced in the map accompanying this paper. Although the traveler through Ute Pass now leaves the sedimentary rocks and passes on to the granite within two miles of Manitou, there is, apparently, no reason to doubt that the sedimentaries were once continuous with those of the Manitou Park area, which now begin a mile north of Green Mountain Falls or nine miles from Manitou, and coincidentally with the sandstone dikes described by Cross; and it is altogether probable that the fault by which Cross has bounded the Manitou Park sediments (Potsdam, Manitou limestone and Fountain series) on the southwest is a direct continuation of that which, cutting across the strike of the beds, is so much more conspicuous in the Manitou area. This great displacement, which divides

[2] Ann. Rep. U. S. Geol. and Geog. Survey, 1874, p. 40.

very obliquely the entire Front Range and the beds lying upon either flank of the range and sloping away from its crest, may therefore be appropriately designated the Ute Fault. Erosion has cut deeply enough over the top of the arch to remove the sedimentary rocks from the downthrow as well as the upthrow side of the fault. The Ute Fault cuts every formation of the region from the fundamental granite and the Potsdam to the Laramie, and in its maximum throw must exceed the aggregate thickness of the Paleozoic and Mesozoic terranes; and its completion, at least, must date from relatively late geological times.

SANDSTONE DIKES NORTHWEST OF MANITOU.

The contact of the granite and sedimentary rocks is obscurely exposed in the southeast bank of Ruxton Creek, beneath the bridge of the Colorado Midland Railroad. It is exposed again and more satisfactorily in the cut on the railroad at Iron Spring Station (Map, 5). The cut and the hillside just above it show the Potsdam beds in normal succession — white sandstone, red sandstone with glauconitic layers, and red calcareous strata passing into the normal Manitou limestone. Near the granite the beds are tilted by the drag of the great fault to a dip of 90° which rapidly subsides to a northeast dip of about 45° degrees at the northeast end of the section. The actual contact can be located within a foot or two; and along this line both the granite and sedimentary rock are much crushed, the bedding of the sandstone is almost obliterated, and all the indications suggest a fault.

Within two hundred feet southwest of the fault the granite incloses several sandstone dikes. One of these is exposed in the railroad cutting about forty feet from the fault and the base of the Potsdam. It is fifteen feet

thick and hades southwest. An uncertain thickness of granite separates this from a dike fifty and possibly one hundred feet wide of undetermined hade. Both dikes are entirely typical in lithological character, but in consequence of the deep disintegration of the granite they are not well exposed. The sandstone is the usual dull red, blotched and spotted with white where the iron oxide has been reduced and leached out; and it seems to be somewhat glauconitic.

From this point a gulch extends northwesterly along the line of the old South Park trail, between the long slope of disintegrated granite and the abrupt, sharp-crested hill of the Potsdam sandstone and Manitou limestone, which still maintain a high northeast dip. The indications are that the first dike mentioned follows the bottom of the gulch and the fault-line closely. On the col at the head of the gulch several irregular dikes of sandstone, with a maximum width of at least forty feet, outcrop obscurely in the granite; and immediately above on the northeast are the highly inclined Potsdam sandstone and red and gray cherty limestones, the lines of snow-white chert in the lower limestone contrasting strongly with the deep red matrix.

The northwest-southeast ridge of sedimentary rocks, which the fault-depression places *vis à vis* with the abrupt border of the granite, is, within a distance of about one and a half miles from Iron Spring Station, divided by transverse gulches into four hills (1, 2, 3, 4). On passing down either of these gulches we see that the high northeast dip due to the fault quickly gives way to the normal dip of the region (S. E. 10°–15°), and this rising of the formations to the northwest brings the basal beds above the present surface at the northwest end of the fourth hill.

Opposite the middle of the second hill, a few feet southwest of the trail (6), is a small prospect shaft about fifteen feet deep on a sandstone dike three to four feet wide. It trends northwest-southeast, approximately, and hades southwest about 5°. The rock is much crushed, with evidences of shearing along the walls. On the trail, opposite the northwest end of the second hill, a dike at least six or eight feet wide is exposed between disintegrated granite walls. The sandstone of the dike is white on the northeast side and red (highly ferruginous) on the southwest. These two outcrops make the sandstone dikes unquestionable for this locality; and the appearances suggest their origin in the sheeting of the formations along the great fault-line.

On the second spur of granite opposite the third hill, and several hundred feet southwest of the probable line of the fault, are two large sandstone dikes (7). The southwest dike is fifty to one hundred feet wide and separated by about twenty feet of granite from the narrower northeast dike. The larger dike gives off a branch one to two feet wide on the southwest side. Toward the northwest end of the third hill the granite appears beneath the Potsdam beds, the downthrow being no longer sufficient to conceal the base of the Potsdam; and it is clear that from this point northwest the fault now lies wholly in the granite. The Potsdam sandstone is non-glauconitic here and not unlike that of the dikes, except that it is, in the main, rather coarser. Some of it is blotched and spotted with white in the manner so characteristic of the dike rock.

From this point and the last sedimentary outcrops northwestward an occasional small fragment of sandstone in the disintegrated granite shows that the dikes are not wholly wanting. About half way to Cascade (8)

and about three hundred feet west of the trail, a dike of sandstone, which may be ten or fifteen feet wide, outcrops quite plainly for a few rods. Beyond this is the front of the great moraine which stretches quite across the valley — an immense accumulation of granite bowlders and débris, and beyond this, as far as Cascade, no farther traces of the sandstone dikes were observed. Between Cascade and Green Mountain Falls I have not searched for dikes, assuming that Cross had covered this ground. Although it appears probable that thorough search would reveal traces of the sandstone dikes along the entire distance from Manitou to Green Mountain Falls, it is a very significant fact that they are practically coterminous with the sedimentary rocks, alike of the Manitou and the Manitou Park basins.

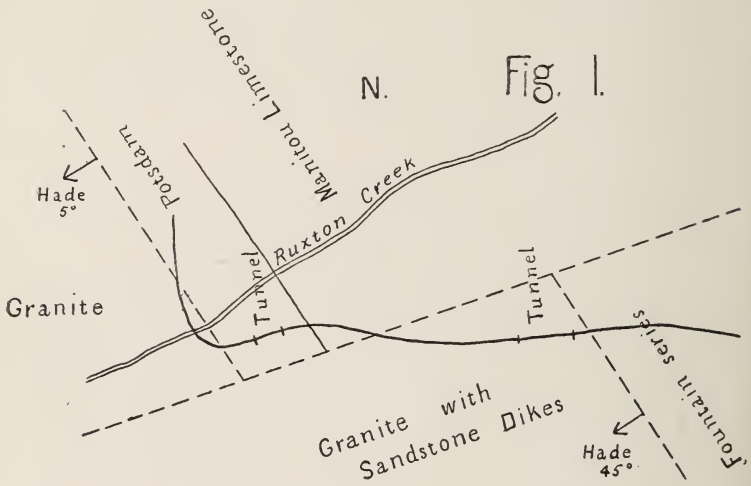
SANDSTONE DIKES SOUTHEAST OF MANITOU, BETWEEN RUXTON CREEK AND BEAR CREEK.

Having demonstrated that northwest of Manitou the great fault is bordered by sandstone dikes on the southwest as far as it is by the sedimentary rocks on the northeast, and somewhat farther, I naturally anticipated that the same relation would be found to hold southeast of Manitou; but I was not prepared for the great development of sandstone dikes in that direction which my observations disclose.

Immediately south of Ruxton Creek the structure is rather complicated; and it appears to me that the best explanation of this complexity is found in a transverse fault in the valley of Ruxton Creek, as shown on the map (9) and more in detail in Fig. 1. This transverse displacement, which may be called the Ruxton fault, evidently breaks the great Ute fault; and it affords the simplest and most natural explanation of the fact that the

Potsdam sandstone and Manitou limestone, which have such a prominent development north of Ruxton Creek, are wholly wanting south of this line, the throw of the Ute fault south of the Ruxton fault being great enough to conceal all the sedimentary formations below the Fountain series. The Ruxton fault not only breaks and displaces the Ute fault, but south of the former the latter has a greatly increased southwest hade (inclination to the vertical).

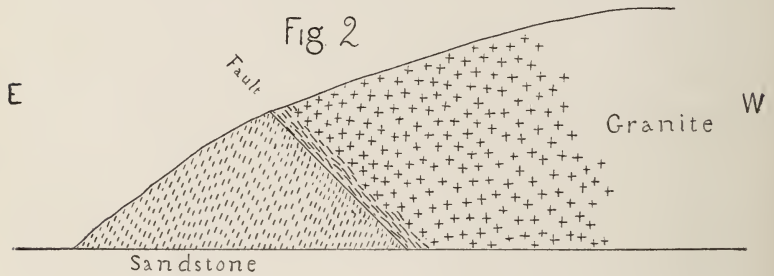
Immediately east of the bridge over Ruxton Creek and



Avenue the railroad passes through a tunnel about one hundred feet long, which with the open cuts at either end gives a continuous section of nearly four hundred feet. The western end of this section shows a red and gray mottled and banded sandstone, which, although non-glauconitic or nearly so and closely resembling the sandstones of the dikes, must be correlated with the Potsdam. The prevailing dip of this sandstone is southwest 60°–80°; but it is highly disturbed, crushed, and mineralized

in consequence of its proximity to the faults. Above the tunnel is a craggy and highly brecciated mass of quartzite, which extends down through the tunnel. On either side of this, and extending twenty to fifty feet beyond the ends of the tunnel are soft, decomposed, ochrey rocks, apparently ferruginous and manganiferous clays occurring as residuary impurities of a crushed limestone (base of the Manitou limestone). East of the tunnel, sandstone like that of the west end of the section dips northeast 60° at first and then changes abruptly to dips, away from the railroad on either side, of 10° to 30°. East of this tunnel (Fig. 1) is another about two hundred feet long with open cuts giving again a continuous section of about four hundred feet, the distance between the two sections being about four hundred and fifty feet, following the railroad. The second section shows in the cut west of the tunnel, or for about one hundred feet, the variegated and structureless dike sandstone. The tunnel and first fifty feet of the eastern cut are in coarse granite with numerous small (one to four feet) dikes of sandstone. A very regular dike cuts the tunnel at the east portal, widening downward from one to three feet, with a westerly hade of 10° to 20°. Most of the dikes are transverse to the tunnel, but they run in all directions and are extremely irregular. Midway of the eastern cut the granite overlies the soft, red and white sandstones of the Fountain series, the contact hading southwest about 45°, while the sandstone dips northeast 70°, approximately (Fig. 2). Both rocks, and especially the granite, show much crushing near the contact. This is very obviously the continuation of the Ute fault, crossing the railroad obliquely and trending in a southeasterly direction, with the Fountain series on one side and the coarse granite with sandstone dikes on the other.

Higher up on the spur intersected by the western tunnel sandstone dikes outcrop obscurely; and the south wall of what appears to be the most southerly dike is exposed in two prospect holes, showing, like the great fault, a strong hade to the southwest. All along this line of contact the granite has a finely brecciated or semi-crushed appearance, with much slickensiding along the joints. On the spur above the second tunnel this contact, not well exposed, is found again in the same direct line. Between this contact and the tunnel eight hundred feet to the north is granite with occasional inclosed masses of foliated diorite and numerous dikes of sandstone. About three of the dikes are large (10 to 50 feet) and



these are clearly parallel with the Ute fault. In several of the dikes the sandstone is much coarser than usual and practically indistinguishable from the ordinary brown sandstone of the Potsdam.

The next spur, which terminates below near the junction of Ruxton and Manitou Avenues (10), is all drift in the first bench south of the railroad, but at the head of this bench, about eight hundred feet from the railroad, the Fountain beds can be seen dipping gently to the east; and on the steep front of the next bench a large sandstone dike outcrops obscurely. The same conditions were noted

on the next spur (11), which rises directly above the Barker House. A small prospect hole at the head of the first bench shows the coarse, soft Fountain beds *in situ*. The sandstone dike, one hundred feet or more in width and coarser than the normal, outcrops more prominently here, giving the second bench an almost precipitous front. These breaks in the profiles of the spurs are directly in the course of the Ute fault as followed from the second tunnel; the topography and geologic structure are evidently in agreement; and the sandstone dikes closely accompany the fault.

The spur running southwest from the Midland Depot (12) is drift underlaid by Fountain beds to the head of the first main bench, about one thousand feet (estimated) from the railroad. Here, on the steep slope or front of the second bench the great sandstone dike has a width of fully one hundred and fifty feet. Both the north and south granite walls are obscurely exposed, fifty to one hundred feet of granite separating the dike from the great fault. Some of the dike rock is quite coarse and indistinguishable from the normal Potsdam; and the dike is divided by some very prominent slickensided shear planes. As usual, the prospect openings afford valuable exposures of the geologic structure.

The first important gulch east of Ruxton Creek is that running south-southwest from the Midland Depot. On the western slopes of this gulch, above the main detrital cones, the dike sandstone outcrops very strongly on several spurs, extending about one-fourth mile up the gorge from its mouth, or approximately one half mile from the railroad. Good exposures are afforded by road-cuttings; and the indications are favorable to the view that the great dike turns slightly on reaching the gulch and extends with a breadth of one hundred to two

hundred feet obliquely along the side of the gulch. On the uphill side, at least, the dike is very much branched, surrounding and enclosing many large masses of granite; and there appear also to be large dikes of sandstone extending southwest into the granite. The sandstone is mostly fine, but some of it is decidedly coarse; and in general it is much mottled. Traces of a true bedding are indicated at various points in alternating layers of coarse and fine material. The numerous shear planes show a strong southwest hade. On the east side of the gulch the sandstone outcrops strongly about one hundred yards below its southern limit on the west side; and extends thence eastward along the steep slope (13) above the more gently sloping bench of the Fountain series. The dike sandstone seems to extend to the bottom of the slope, and its lower edge is concealed by drift; but on the uphill side the boundary can be traced at intervals, although the fine grained dark brown granite occurring here is easily mistaken for the sandstone. If all the sandstone on this slope is to be referred to one dike, it must be from two hundred to three hundred feet wide. A quarry-like excavation affords a good exposure of the sandstone, which is of entirely normal character. The distribution of sandstone in the slide material indicates branching along the upper edge of the dike; and one dike four feet thick is clearly exposed, hading southwest about 45°. Near this is a dikelet two to four inches wide of a very dark brown sandstone which is not easily distinguished from the inclosing granite; and this is but one of many instances where the brown color of the sandstone is most marked next the granite; suggesting the biotite of the granite as a source of a part at least of the cementing and coloring iron oxide of the sandstone.

In its eastern extension this great dike appears to split

up. Thus, on the high, steep and smooth hill (14) directly south of the Denver and Rio Grande Depot I found that a broad sandstone dike crosses the lower northern slope of the hill; all the upper and main part of the hill, including the crest, is granite; the col leading from this hill to the higher summit on the southwest shows two sandstone dikes, probably fifteen to twenty feet wide and separated by twenty to thirty feet of granite, the more southern dike, especially, showing a strong southerly hade; and, finally, several hundred feet farther southwest up the ridge is a small dike (10 feet?).

Below the sandstone dikes and the fault-line the Fountain beds form as usual a gently sloping plain or terrace and exhibit near the mountains low east to southeast dips (5° to 10°). But farther down the slope toward the railroad, in the numerous excellent outcrops and monuments, the beds dip due south 20° to 25°, seeming thus to show in the diminished dips toward the fault-line the lifting effect or upward drag of this great displacement. In the long deep cut on the railroad, however, the dip is east-southeast as usual and not exceeding 10° or possibly 15°. The Ute fault is clearly, in all this part of its course, a thrust fault; and hence this pronounced roll of the Fountain beds, and the general disturbance of the stratification, may be regarded as normal features. Returning toward the mountains by the spur or mesa that slopes up in a southwest direction from the limekiln (15) east of Manitou, and leaving the gulch containing the little cemetery on the west, the following dips were observed. Near the railroad the Fountain beds dip E. by S. about 10°. Farther south this changes to S. or S. by E. about 20°. Quite clearly a low anticline runs about southeast and pitches in that direction one-third to one-half mile from the fault and the base of the moun-

tains. Nearer, the beds change gradually to a north dip 3° to possibly 5° ; and this very gentle dip continues to within about two hundred feet of the fault, when the beds are suddenly flexed up to a nearly vertical northeast dip.

At the fault, which is quite clearly exposed in the bottom of the gulch on the east side of the mesa, the vertical or overturned Fountain beds are in direct contact with a large dike of sandstone. The north edge of the dike shows a trend N. W. – S. E. and a southwest hade of at least 30° and possibly 45°. The dike is mainly fine white sandstone, but abundantly mottled with red. It is exposed almost continuously in the bottom of the gulch for a breadth of about seventy-five feet. On the west side of the gulch the upper or south contact may be easily traced, showing the same southwest hade as the lower contact. The dike is here, however, much branched, inclosing large masses of granite and penetrating the granite in numerous sharply defined dikelets one-fourth inch to one foot thick. In some parts of the sandstone numerous small angular fragments of granite are inclosed. About one hundred yards above this sandstone dike is another with the same southwest hade, and a surface breadth of twenty to thirty feet. These two sandstone dikes cross the ridge or spur on the east side of this little gulch to the next gulch beyond, in which the fault is not clearly exposed ; but the Fountain beds are seen within forty feet of the north dike dipping north about 10°. The north or fault dike is here nearly if not quite one hundred and fifty feet wide, and seems to be nearly vertical. The sandstone is light gray blotched with red, as usual, with many highly polished and striated slickensides or shear planes. There are also some indications of faulting along the south side of this dike. Two to three hundred feet south of this dike is the other,

which is probably not more than ten to fifteen feet thick and seems to retain its strong southwest hade.

The south dike does not seem to cross the next spur, but across its steep north end is some float that may be referred to the great north dike; and on passing around to the northeast corner of this spur, where it slopes down to the next little gulch, there is a great development of sandstone. It meets the granite along a northeast-southwest line and quite certainly extends under the granite at a low angle. In part the sandstone is quite distinctly stratified, in beds one to two feet thick, and these are sometimes minutely laminated. On the south side of the outcrop and near the granite, the dip is toward the granite, indicating that the sandstone underlies the granite; but toward the north side of the dike the beds dip slightly in that direction. In all cases the dip is low—5° to 15°. Apparently we have here the original stratification of the sandstone. The granite has been thrust obliquely over it, crushing and disturbing the (then) half consolidated sandstone, but not wholly obliterating its bedding. The sandstone is traversed in all directions, but especially parallel to the bedding planes, by highly perfect slickensides.

In the bottom of the gulch, below the dike sandstone, the Fountain beds are seen tilted 90° or more. Farther down, both in this gulch and the next one, the Fountain beds quickly subside to a northerly dip of 10° to 15°. The great fault evidently hades southwest at a very low angle, so far as the southwest wall of the dike is concerned, but in the bottom of the gulch the dike sandstone, where it comes nearest to the Fountain beds (the nearest outcrops being thirty to forty feet distant), is inclined at the same angle (S. W. 85°). The stratification is very distinct, and the sandstone beds are evidently

beat sharply down along the fault plane, which presumably hades southwest 5° (from vertical) at this point.

Crossing the next spur brings us to the valley of Sutherland Creek (16), a living stream which supplies the reservoir near the limekiln. On the west of the valley where it issues from the mountains, the Fountain beds, as before, are tilted to a S. W. 85° dip. This out-

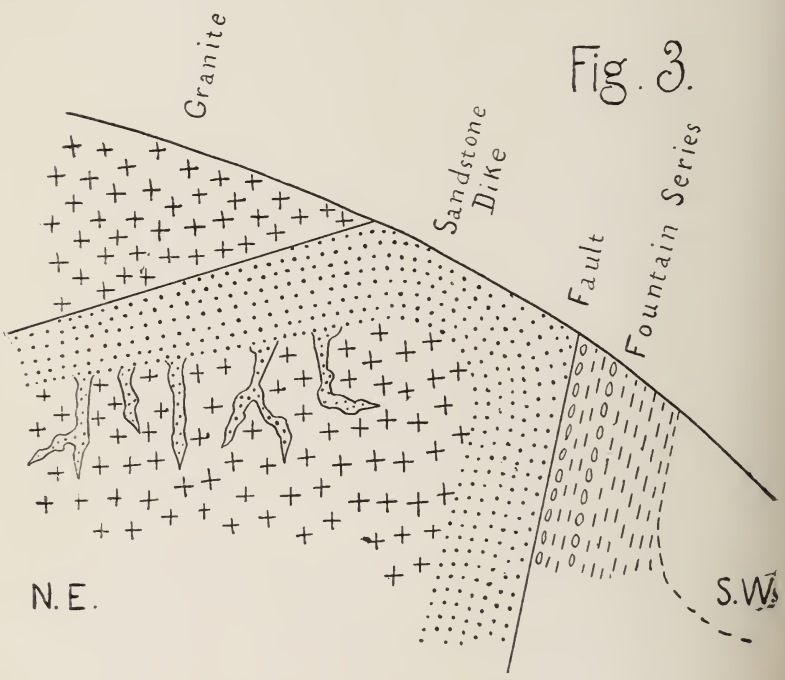


Fig. 3.

crop must be near the fault, for within a few yards south of it the dike sandstone is seen also dipping S. W. 85°, while higher up the dike sandstone dips S. W. only 5° to 10°. These outcrops are thus in perfect harmony with those of the preceding gulch, and the accompanying section (Fig. 3) may be regarded as expressing the

general relations of the formations for both localities. It will be observed that the flexing of the beds is entirely normal—upward on the downthrow side of the fault and downward on the upthrow side. From the top of the curve the dike sandstone dips gently (5° to 10°) into the hill. The outcrop, in part nearly horizontal, can be followed right around the hill to the extreme south side. The sandstone seems to become gradually thinner and to die out finally in the bottom of the lateral gulch. The upper contact is well exposed in a prospect hole and is seen to be much broken by minor transverse faults, and both sandstone and granite are much crushed and slickensided along the contact. Below the main body of sandstone the granite is a complete network of sandstone dikes from three inches to several feet wide running in all directions. Apparently, the granite has overridden the sandstone bed, and the unconsolidated portions were forced down into the cracks in the granite below. Some of the sandstone is quite coarse and gritty, with many feldspar grains; and there are slickensided surfaces all through it. In this hill and the preceding, the sandstone is mainly brown. Gray sandstone is most characteristic of vertical or highly inclined strata, probably because that position is most favorable to the circulation of the meteoric waters which have bleached the strata. The stratification is in part as perfect as in any of the sandstones of the region—a fine and even lamination. This dike is exposed again, with essentially the same characters, on the east side of the creek; but before gaining the crest of the first main ridge it ends abruptly, apparently cut off by a transverse fault.

Going up the west side of the valley, we find south of the lateral gulch, first granite and then at least two hundred feet of sandstone of the usual dike character. Its

southern contact with the granite is exposed and hades steeply to the southwest; and some small branches penetrate the granite. The dike trends about E. S. E. and re-appears in force on the east side of the valley, at the base of a dark cliff of granite (17). This dike has here a maximum width, though possibly enclosing some granite, of about four hundred feet. On the crest of the spur it is narrowed down to about two hundred feet; and six hundred feet of granite separate it from the fault, beyond the abrupt eastern termination of the fault dike. All the indications favor a strong southwest hade; and on the east slope of this spur it is seen very clearly that the fault hades southwest at a very flat angle (45° or more). The granite passes obliquely up over the edges of the Fountain beds, which for a breadth of several hundred feet are overturned about 10°.

On the first branch of the next main spur, we cross, from the fault southward, nearly eight hundred feet of granite, and then, high up on the united spur, come to about one hundred feet of sandstone. A few yards farther east, on the second branch of the spur, this sandstone seems to broaden out to four or five hundred feet. The next spur (18) is a short one which the fault cuts low down on its end slope; and, immediately south of the fault and the outcrops of the Fountain beds, are four hundred, and possibly five or six hundred, feet of sandstone. The south wall is cut by a prospecting tunnel; and it can be clearly seen, both in the tunnel and in the ledge above it, that four feet of granite separate the main body of sandstone from a parallel two-feet dike of sandstone. The hade is S. W. about 45°. This tunnel spur is directly at the head of the little or western Red Rock valley. All the way down the west side of the valley the Fountain beds dip E. S. E. about 30°; while on

the opposite (east) side the Red Beds (Triassic) dip in the same direction 40° to 60°, the dip increasing rapidly eastward.

On the next main spur east of the tunnel the southern boundary of the dike sandstone is found in the same direct line and evidently hades southwest. Northward from this contact the sandstone is exposed continuously for a breadth of nearly if not quite five hundred feet, or to the extreme end of the spur, with no distinct appearance of bedding. The Ute fault clearly forms the northern boundary of this great dike, every exposure on this line showing the dike sandstone in contact with either the Fountain series or the Red Beds. In following this boundary eastward it is found, on the west side of the last spur referred to, to be shifted to the northward about three hundred feet by an obliquely transverse fault, the course of which is readily traced by a superb zone of crush breccia. This zone, fifteen to twenty feet wide and vertical, is a complete breccia of the dike sandstone in angular fragments of all sizes, mingled with the quartz pebbles and cobbles of the Fountain conglomerate, and with the finer part of the Fountain series as a paste. Near the re-entrant angle where the fault should enter the dike, the crush breccia terminates abruptly against a transverse fissure hading S. E. about 20° and containing a thin seam of reddish brown clay and sandstone. It is probable, however, that the fault continues obliquely across the spur along some offset parallel line not now clearly exposed.

On the next spur to the eastward the dike sandstone seems to form a comparatively narrow band, possibly one hundred feet wide, across its steep north end. North of it are the Red Beds, and south of it all is granite. Beyond this spur is the main west branch of Red Rock Cañon. Along the west side of this gulch is another very

plain transverse fault, the Red Beds on the east side being jogged to the south or up the gulch fully one thousand feet and terminating just north of two mining tunnels. On meeting the transverse fault the sandstone dike appears to turn and border it on the west side, a very plain indication that these transverse faults are contemporaneous with the Ute fault.

The mesa east of this gulch is probably underlain by Red Beds right up to the steep granite slope, with only slight indications of dike sandstone along the fault line. In fact, the slide of disintegrated granite hides all contact phenomena for the next half mile, or to where the main or quarry ridge of red sandstone meets the granite slope (20) with a nearly vertical dip (E. 85°). The next and last red ridge, about six hundred feet farther east, is swerved to the east as it nears the granite, approaching the granite at the last very obliquely. Between Red Rock Cañon and Bear Creek no satisfactory evidence of sandstone dikes has been observed; but the Ute fault appears to cross Bear Creek without deflection or offset, and the Jurassic and Cretaceous beds meet it in the same manner as the last of the Red Beds, each formation in turn experiencing a sharp flexure parallel with the fault and consequent eastward deflection of its outcrop. East of the Cretaceous (Dakota) hogback, forming the gateway of Bear Creek, the Cretaceous beds form first a sharp and unsymmetrical syncline followed by a gentle anticline.

SANDSTONE DIKES IN THE VICINITY OF CHEYENNE CREEK.

From Bear Creek southeast for one and a half miles I was unable, for lack of time, to follow the fault line; but my observations were resumed at South Cheyenne Creek, working first northwest and then southeast.

Exactly at the mouth of South Cheyenne Cañon, where the carriage road crosses the creek and the burro trail from the terminus of the electric railroad joins it (21), a large and entirely typical sandstone dike outcrops on both sides of the creek. On the west side it is sixty, if not seventy-five feet wide and both walls can be located. The north wall is clearly exposed by the roadside and shows sandstone penetrating and enclosing the coarse red granite; while on the south side the sandstone is involved with a dark green, fine grained, crushed igneous rock. Crossing the end of the mountain toward North Cheyenne Creek, I found a good outcrop in a prospect hole seventy-five to one hundred feet above the creek. This excavation does not expose either wall; but it does show an inclosed mass of the compact greenish igneous rock. It is dike-like in form, eighteen to twenty-four inches thick, and hades southwest 45°; but it is also clearly traversed by dikelets of the sandstone one-fourth inch to two inches in diameter. Hence the altered trap must be older than the sandstone dike. The dike sandstone is quite friable in part, and some of it rather coarse, even containing pebbles of quartz and granite. Appearances indicate a wide dike here, and it is readily traced down the slope to North Cheyenne Creek and up the west slope of the valley. Immediately north of the dike is a large but obscure outcrop of a soft or friable white sandstone which weathers buff, yellow, red and purple (mainly yellow). It agrees very well with the Dakota sandstone of Bear Creek, while it is entirely different from the adjacent dike sandstone.

The great shear plane so conspicuously exposed on the west side of South Cheyenne Cañon (22) demands attention here. It rises from the creek level near the toll gate, passes around the end of the mountain at a height of about two hundred feet, and appears to be traceable east

and west across both branches of Cheyenne Creek, being indicated in the topography and also in the contrast presented by the granite — dark red and brown to gray and variable above, and a lighter, brighter red and coarser texture below. The really striking exposure is on the northwest side of South Cheyenne Cañon, where it appears as a perfectly straight, sloping and open crack or fissure, with a southwest hade of 60° to 70° (from vertical). The shear faces are plane, smooth or even polished, and slickensided in the line of hade (southwest). The fissure is six to fifteen inches wide and occupied by some broken granite, but mainly by what appears to be the dike sandstone, though some of it might be comminuted granite. Examination with a lens leaves no doubt that the filling is chiefly the dike sandstone. This prominent shear plane is clearly a feature or part of the Ute fault; and was probably once connected with the sandstone dike already described which crosses the ridge between the two creeks only a short distance below the fissure.

On the northwest bank of North Cheyenne Creek the sandstone dike crops with a breadth of certainly one hundred feet. On the slope above is a very large and prominent outcrop, showing a width of fully two hundred and fifty feet (23). Neither wall is clearly exposed, but the boundary on the southwest or granite side can be readily traced by the float and also by the prospect holes. The lower hole is in the sandstone only a foot or two from the granite and shows an irregular streak of granite six to twelve inches wide running vertically through the sandstone and parallel with the wall. In the same hole some of the sandstone appears to be glauconitic. Toward the middle of the dike are some masses and layers of conglomerate with water-worn quartz pebbles up to an inch in diameter, exactly like what may be observed in

different parts of the Manitou basin at the base of the Potsdam, and much of the sandstone is rather coarse.

Farther northwest the dike passes beneath a broad, steep slope of talus from the granite cliffs above. It can be traced, however, in an occasional prospect hole and in float. About half a mile or so from the creek is a quite conspicuous outcrop of white Cretaceous (Niobrara) limestone in beds nine to fifteen inches thick with thinner shaly partings. It has been quarried somewhat and shows a dip to the southwest 45°. Overlying it is a brown and highly fossiliferous limestone with a bituminous odor when freshly broken. Between this limestone and the granite cliff is about two hundred feet concealed by talus, but with indications that the limestone is bordered by the sandstone dike with a breadth of one hundred feet more or less, the Benton shales and Dakota sandstone being concealed by the fault at this point. In the next one-fourth mile, going west, the dike seems to die out completely, no float showing in the slide; but the white limestone is exposed in several prospect holes and ledges almost to the head of this valley, which extends nearly a mile northwest from the creek to the summit of the mesa. The dip is constantly southwest, 45° approximately. Probably these Cretaceous strata, like the Fountain beds farther west, have been overturned by the oblique upward thrust of the granite.

On tracing the great sandstone dike southeast from South Cheyenne Creek it is found well exposed on the first spur with a breadth of one hundred to possibly two hundred feet. Neither contact is exposed, but the granite contact can be located within a foot or two at several points. On the north are extensive but obscure exposures of the gray fossiliferous limestone and the compact white limestone. The bedding is not clearly exposed,

but the gray limestone is south of the white, as before. The sandstone dike can be traced by float across the lower slope of the next spur toward the mountain road. Beyond the Cheyenne Mountain road my observations have not extended, and I have no information as to whether or not the Ute fault, with or without the accompanying sandstone dikes, can be traced farther in that direction. The topographic indications are certainly very favorable to their occurrence, at least as far as Deadman's Cañon; but probably the extensive mesa and slide deposits make satisfactory outcrops few and far between.

The Ute fault series of sandstone dikes has been proved for a distance of over twenty miles, and an extreme length of thirty miles or more is certainly by no means impossible. Professor Stone's observation, cited by Cross, demonstrates the existence of another extended system of dikes in the Pike's Peak region. This occurs in the valley of Turkey Creek, south of Cheyenne Mountain, and is quite certainly not connected with the Ute fault. According to Stone, the Turkey Creek system has been located for about twelve miles, and through his courtesy I am able to cite a third system, since he writes me that a short sandstone dike occurs about half a mile east of Nipple Mountain, near Wilbur Station, southeast of Cripple Creek. These facts indicate the probable discovery of other systems, as the region is more thoroughly studied.

ORIGIN OF THE SANDSTONE DIKES.

Mr. Cross has briefly discussed this topic, without arriving at a definite conclusion. He recognizes that these sandstone dikes are radically distinct in character and origin from those described by Diller in California, and asserts that the known facts do not indicate the source

of the sand; that the facts do show that the fissures of this dike complex were filled by fine quicksand injected from a source containing a large amount of homogeneous material; that such a system of fissures, large or small, with their many intersections, could not remain open to be filled by any slow process; that the uniformity and purity of the material filling fissures, varying from mere films on cleavage planes of orthoclase grains in the granite to dikes several hundred yards in width, could not have resulted from infiltration; and, finally, that none of the sedimentary formations of the region can be regarded as probable sources of the material.

My study enables me to accept all of these generalizations, except the last one. The main purpose of the preceding detailed descriptions of the dikes which have come under my special notice is to set forth the facts which the true theory of the dikes must explain. The most important of these are: first, their very evident close relationship to an important zone of displacement; second, the homogeneity of the materials and the general absence of stratification in the dikes; third, the great maximum and average widths of the dikes.

The relations of the dikes to the great Ute fault are indisputable. Not only is the fault at most points closely accompanied by one or more dikes; but nowhere have I been able to find any trace of the dikes more than a few hundred feet (500 to 1000 feet) distant from the principal line of displacement. Of course it can not be positively asserted now, in the absence of sedimentary deposits in those districts, that the dikes of the Turkey Creek and Nipple Mountain areas accompany lines or zones of displacement; but it is certainly a fair presumption that they do, in view of the fact that they are, apparently, in every other respect, identical in character

with the Ute fault series. That these fissures, unlike the relatively narrow ones described by Diller in California, have not been filled from below becomes perfectly obvious when we reflect that the inclosing rock formation is a deep-seated plutonic. The homogeneity and purity of the sandstone, and especially the absence of feldspathic or argillaceous material, make it impossible to regard the dike rock as a fault breccia or as due in any way to the comminution of the wall rock. Ruling out this theory, and infiltration, we are forced to the conclusion that the fissures have been filled from above. But of this theory two principal forms naturally suggest themselves. First, the fissures antedate the deposition of the sand, existing as cracks in the sea-bottom which were filled by the slow process of sedimentation. Second, the cracks post-date the deposition of the sand, but antedate its lithifaction to form a firm sandstone; and the unconsolidated sand subsided and flowed down into and filled the fissures. As Cross has pointed out, the necessary slowness of the process is a valid if not a fatal objection to the first view; and it also fails to account for the very general absence of stratification in the dikes and of more or less water-worn fragments of the wall-rock. Furthermore, if these traps for sediments opened on the marginal portion of the sea-floor, coarse material washed into them would be protected from further attrition, and the observed fineness and homogeneity of the dikes could not exist.

By this process of elimination we are forced to the consideration of the view that the fissures were formed after the granite had been covered by the sedimentary deposits and before their complete consolidation, the unconsolidated portions naturally contributing to the filling of the fissures and the formation of the dikes. In the opinion of the writer this view is not, *a priori*, improb-

able. On the contrary, it postulates conditions which must be realized now and then—a normal type of geological accident. The next step, therefore, is to test its applicability to the actual conditions of the present problems. There are two questions especially which the acceptance of this explanation would require to be answered in the affirmative. First, are there, among the sediments of the Manitou and Manitou Park basins, any that, aside from structural features like stratification, which would of course be obliterated during the filling of the fissures, present a reasonably close agreement in character (composition and texture) with the sandstone of the dikes? Second, may we reasonably assume that these sediments were, in part at least, unconsolidated, or imperfectly consolidated, at the time when the fissures were formed? The only sandstone formations that need be considered in this connection are the Potsdam, Carboniferous, Triassic and Dakota. The Laramie and Monument Creek beds are so far removed in every sense — lithologically, stratigraphically and topographically — as to place them quite beyond the possible purview of the problem. Of the four sandstone horizons first named, the last three bear no special resemblance to the material of the sandstone dikes. Cross insists upon this lack of agreement for the Carboniferous or Fountain beds, which are ruled out especially by their prevailing coarseness and arkose character. It is almost as difficult to find in the bright red Triassic sandstones an equivalent of the reddish-brown and gray sandstones of the dikes; and similarly with the white or buff Dakota sandstone, weathering to bright yellow, orange and red tints. Furthermore, the derivation of the dike rock from any of these higher sandstone horizons would imply the existence of sandstone dikes in the lower sedimentary forma-

tions; but that the dikes are strictly limited to the granite no student of this area will question. The Potsdam beds, on the other hand, resting as they do directly upon the granite, are in an extremely favorable position, stratigraphic and otherwise, for filling fissures in the granite.

In the foregoing descriptions of the dikes I have several times stated that the rock resembles the Potsdam sandstone, and this resemblance is frequently indicated in my note-book. In fact, I became convinced before the field work was finished that the two formations are lithologically identical, except that the dike rock is usually unstratified and rarely glauconitic. The glauconite, however, characterizes only a small part of the Potsdam strata, and is often wanting altogether. This agreement holds for both the Manitou and Manitou Park basins. From the sandstone dikes north of Green Mountain Falls I crossed the Manitou Park Basin to the highly inclined Silurian and Potsdam outcrops along its eastern edge, and found that a part of the latter formation is practically indistinguishable from the dike rock. Cross describes the sandstone of the dikes as of fine and uniform texture; but this is also the prevailing character of the Potsdam beds, and my observations show that the dikes, as a whole, embrace much coarse sandstone and some conglomerate, and that their range in texture is fully equal to that of the Potsdam. Furthermore, the structural contrast does not hold universally, for at several points, as I have noted, and including also a part of the great dike north of Green Mountain Falls, the dike sandstone is plainly stratified. The facts that no sandstone dikes have been observed in the Potsdam beds, and that, so far as known, the dike rock is never calcareous and rarely glauconitic, suggests its derivation from the lower rather than the calcareous and glauconitic upper layers of

the Potsdam. The basal member of the Potsdam, it will be remembered, is a white to gray sandstone more or less interstratified or blended with the prevailing reddish brown variety. It is not only calcareous or argillaceous, but it contains insufficient iron oxide for its thorough cementation, and has very clearly never been exposed to volcanic influences. We can, therefore, readily conceive that it remained unconsolidated for a long time after the lithifaction of the overlying beds. The dike rock is absolutely indifferent to the changes in the character of the neighboring sedimentary formations, showing no appreciable variation as, in succession, from Manitou southeast to Cheyenne Cañon, the Potsdam, Silurian, Carboniferous, Triassic and Dakota beds abut against or border the great fault.

The close association of the dikes, throughout the entire belt, with the great displacement, and their unvarying lithological similarity to the Potsdam sandstone, have suggested to me that the dikes probably date from the formation of the Ute fault; that the fault probably dates from the time when the Potsdam beds, which are still at the base in part of a more or less friable character, were imperfectly consolidated and covered the entire region; that the fault, as is likely to be the case with a great displacement, was not simple, but that a moderate breadth of the granite and overlying formations was traversed by a series of parallel fissures; and that the dikes resulted from the sinking of the Potsdam sandstone and sand into the fault-fissures. Such local subsidences of the friable sandstone would naturally be attended by a more or less complete obliteration of the bedding. That the structure of the Potsdam beds has been locally effaced under shearing and compressive or plicating movements can be seen at a point on the east side of Ute Pass a few rods below

Rainbow Fall. On the south side of a small lateral gulch a sharp, inverted flexure of the basal Potsdam beds can be seen (Fig. 4). Throughout the flexure the sandstone is beautifully slickensided in various directions precisely as in the sandstone dikes. The extremity of the sharp lower curve is not clearly exposed, but on both this and the main curve above it the bedding is much obscured or completely effaced, and the sandstone closely resembles the dike rock.

Many of the sandstone dikes are one hundred feet or

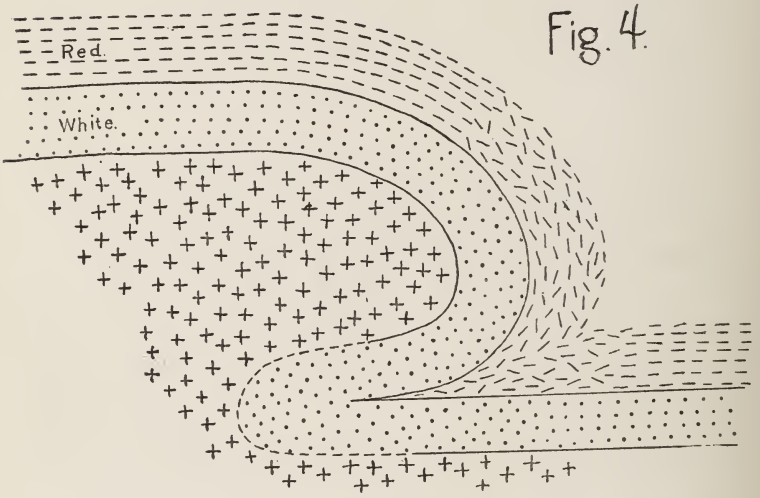


Fig. 4.

more in breadth, and the largest, as described by Cross, five hundred to one thousand feet; and certainly no single feature of the dikes is more significant than the great breadth of individual examples. Although presenting, apparently, an insuperable obstacle to all the other suggested explanations of the sandstone dikes, it offers no difficulty whatever to the theory proposed here, for we have only to make the extremely probable supposition that sheets of granite of varying width and bordered by

complementary faults have settled down relatively to the bordering masses, bearing with them their loads of Potsdam sediment. The very moderate thickness of the Potsdam beds (40 to 50 feet) would seem to set a correspondingly narrow limit to the depth of these wide dikes; and yet some of them actually outcrop in such strong relief as to prove a depth of several hundred feet at least. Escape from this dilemma is afforded, however, by the reasonable supposition that the sandstone was sufficiently unconsolidated to flow under the great pressure to which it was exposed; and also by the facts noted in the great dike on Sutherland Creek, where the sandstone, still distinctly bedded, has been strongly folded and tilted to a vertical or overturned position (Fig. 3). Compression between converging walls of granite might, obviously, increase the vertical thickness of the sandstone to almost any extent. An actual flowing of the sand into the chasms opened beneath it is plainly indicated in the case of all the narrower dikes and dikelets and their intricate branches.

Of course it is a logical though by no means a necessary deduction from this theory that some of the sandstone dikes should break the granite-Potsdam contact, disturbing or obliterating the bedding of the sandstone. No undoubted instances of this have been observed in a somewhat thorough examination of this contact throughout the Manitou area, but it is not impossible that they exist.

Concerning the geological age of the sandstone dikes no positive statements are warranted by the facts now at our command, although the explanation of the dikes here proposed affords us a clue, since they must be coeval with the Ute fault. This displacement was certainly not completed until Post-Cretaceous times, but it may well have begun at a much earlier period, since, as Cross has stated,

orographic movements have affected this region many times since the early Paleozoic epoch. It is certainly improbable that the Potsdam sandstone was, in any Post-Cretaceous epoch, so imperfectly consolidated as the formation of the minor sandstone dikes in the manner here proposed, at so late a date, would require. I suggest therefore that they probably date from some comparatively early movement along this line. In this connection it may be noted that the numerous slickensides in the dikes show movement after the lithifaction of the sand, and therefore long subsequent to the first formation of the dikes.

It is a necessary corollary of the view developed here that the sandstone dikes of Turkey Creek, Nipple Mountain, and possibly other localities in this region, indicate formerly overlying Potsdam strata, and thus throw light upon the former distribution of that formation. They are narrow linear *Gräben* formed along sheeted zones, or more literally trenches in which portions of the Potsdam sediments have been buried below the present plane of erosion, and thus preserved. As erosion cuts more deeply, all the sandstone dikes will disappear, as they practically have done already between Cascade and Green Mountain Falls, or where the Potsdam beds are wanting.

The sheeting of the granite which this theory demands is by no means a purely theoretical feature. On the contrary, this type of jointing may be regarded as more or less characteristic of the granite of Ute Pass, as may be so well seen at Rainbow Fall. And two striking illustrations of sheeted zones in a distant part of the Pike's Peak Massif accompany the recent monograph by Penrose on the Mining Geology of Cripple Creek.[3]

[3] 16th Ann. Rep. U. S. Geol. Survey, part 2, plates III and IV.

Two other modes of occurrence of sandstone are, in the opinion of the writer, sufficiently dike-like to demand recognition here. One of these is that described by Prof. J. D. Dana,[4] in the quartzite of Dutchess Co., N. Y., where the rock between vertical joint or shear planes has, perhaps before its complete induration, been reduced by compressive and shearing movements to a structureless mass of sandstone — a dike of sandstone in walls of sandstone, a species of crushed zone, dike-like structurally but not dynamically or in the sense of being intrusive. Professor Dana says, "The obliteration of the bedding by impulses of lateral pressure is well illustrated in the quartzite near Poughquag, where the bedding is beautifully distinct and nearly horizontal. In two or three places, in the course of a long section of the well stratified beds, there are narrow vertical portions of the whole height of the section exposed, which have lost entirely the bedding, and are divided only by vertical joints." Such a vertical strip "looks a little way off like a dike of igneous rock, yet it is only a narrow vertical section of the stratified quartzite, in which, under the lateral pressure, fractures were produced, and where, consequently, the successive movements shook down and re-arranged the sands adjoining, so as to obliterate the planes of bedding and substitute vertical planes."

The other mode of occurrence of sandstone in dike form is really one phase of unconformity, where sediments deposited over an eroded surface fill fissures and chasms of various forms. Later erosion may remove the sedimentary deposit and leave the ancient floor intact, with the dike-like roots of the sediments remaining in it. Irving[5] has described and figured sandstone dikes of this

[4] Am. J. Sci. (3) *3*, 181–182.
[5] Monographs U. S. Geol. Survey, v, 292–3.

type in amygdaloid on the shore of Lake Superior, near Duluth, and I have described and figured equally striking "root" dikes of sandstone and conglomerate in the granite of the Boston Basin[6], which have been exposed by the erosion of the Carboniferous conglomerate of the Nantasket area. No student of our coastal geology can doubt that other fine examples are now forming where the numerous deep and narrow chasms due to the erosion of trap dikes or of the rock between contiguous joint planes, as in the case of the chasm called Purgatory at Newport, R. I., are being filled with sand and gravel, during the gradual subsidence of the land; and unquestionably dikes of this type were developed on a grand scale when the rugged topography due to pre-glacial and early glacial erosion was wiped out by the drift deposits.

It appears, then, that although the term sandstone dike is a comparatively recent coinage, four distinct types now claim recognition, and may be classified as follows:—

1. Dikes formed in antecedent or original fissures (erosion crevices and gorges) by sedimentation. The "root" dikes of Duluth, Boston Basin, and doubtless, many other localities, belong here.

2. Dikes formed in subsequent or secondary fissures:

(*a*) By earthquake movements forcing quicksand upward from a bed below the horizon of the dikes. This type includes the dikes described by Diller[7] in California and Hay[8] in Nebraska; and the fact that the ejection of quicksand from fissures is a common accompaniment of earthquakes indicates that many other examples must await discovery.

(*b*) By the settling down of sand from overlying

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[6] Occas. Papers, Boston Soc. Nat. History, IV, pt. 1, 76-77.
[7] Bull. Geol. Soc. America, *1*, 411.
[8] Bull. Geol. Soc. America, *3*, 50-55.

deposits into earthquake and fault fissures and chasms. The only examples so far recognized are those of Ute Pass and the Pike's Peak massif; but according to the explanation which I have proposed this is probably not a rare type, especially in the Rocky Mountain region.

(*c*) *In situ*, by compressive and shearing movements. The examples described by Dana belong here, and practically all sharply defined crushed zones accompanying faults and joints. This type is the commonest of all; but, as noted, the material is not intrusive, and hence they are dike-like in their structural but not in their genetic relations.