reaching that its history, however complete and exhaustive, a year later requires to be re-written; and there is no reason for supposing that the end, or even the beginning of the end, has been reached. With new materials and new methods, and new workers who will profit by the experience and results gained by those who have in our time accomplished so much, we may expect for the new century far greater results than those briefly recorded here.

It would be difficult just here to predict the future of astronomical photography, though one can foresee something of the great results it must accomplish. It will displace some of the visual work, but it is more likely to move along new lines, opening up new fields of research. The older astronomy, so nobly represented by Simon Newcomb and a few others, will be strengthened at every point, and will stand all the more sublime for the help it shall receive from photography.

E. E. BARNARD.
YERKES OBSERVATORY.

THE ZOOLOGICAL SECTION (F) OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

THIS section had a successful meeting. Papers of both a general and special nature were presented. The address of Vice-President Alpheus S. Packard, entitled 'A Half-Century of Evolution, with Special Reference to the Effects of Geological Changes on Animal Life,' has appeared in this JOURNAL. A brief outline of the papers read is presented in the following:

Evolution and Migration of Hawaiian Land Shells. By PROFESSOR ALPHEUS HYATT.

THE author studied about 22,000 shells, of which 18,000 at least were from Oahu. In that island there are about 280 species, as compared with about 140 in all the other islands of the group. There are three leading genera, Bulimella, Achatinella and Apex. The distribution of the species of these genera was represented on a large relief map of Oahu, by means of colored pins, connected by similarly colored threads. Each pin or series of pins represented a species, as indicated by attached labels.

All the shells probably sprang from a common ancestor, *Achatinella phœozona* G., which has become extinct in late years. Starting in the valley Kiliouou, as the shells migrated northward, there was an evolution of species and genera as plotted on the map. The principal occurrence of these mollusks is on the western flanks of the eastern range. The Bulimellæ inhabit the highest sides of the mountains, crossing to the eastern side, and there evolving a considerable number of species. This genus does not succeed in forming colonies in the range on the western crest of the island. The Achatinellæ occupy a lower zone below both the Bulimellæ and Apex. They cross to the eastern side of the mountains in several places; but are unable to contend successfully with the climate on that side. They were also unable to cross the valley lowlands in the center of the island, except in sporadic cases. The species of Apex occupy a middle zone, between the Bulimellæ and Achatinellæ, on the western flanks of the eastern range. They seem more delicate, and less able to contend with the surroundings on the ocean side of the hills. Not a species has been recorded from that side; but, on the other hand, it crossed the broad plain of the interior, and was successful on the short western range, where only a few sporadic species of the Achatinellæ are found. The evidence is that the species are distributed over the island in definite lines, which correspond to definite geographical areas. In the oldest part of the island are the oldest forms as evidenced by development.

Variation in the Shell of Helix nemoralis, in the Lexington, Va., Colony. By Professor James Lewis Howe.

Three series of this introduced snail were collected from gardens. There were over 1,000 shells in each lot. The colony originated in 1883. The conclusions reached from a study of these series are: (1) the variations tend in general along the same lines as in Europe; (2) the tendency of variations differs in different portions of the Lexington colony. The author gave a tabulated list of the varieties known in the Lexington colony, of which the total number was 385. Of these 277 were enumerated for the first time.

Variation versus Heredity. By Professor H. S. Williams.

Variation, and not heredity, is considered the fundamental characteristic of the phenomena of organisms. The arguments for variation versus heredity are as follows:

1. In any concrete case of natural selection, or other similar processes, the actual result of selection is the retarding and checking of variation, and the offspring necessarily evolves more slowly than its parent, in direct proportion to the efficacy of natural selection.

2. That the organic processes by which variation takes place in an organism differ from the ordinary process of development in individual growth only by passing beyond the limit reached by the ancestor, and hence variation is but a phase of the fundamental genetic process peculiar to living organisms.

3. That every act of variation is anterior to experience, and thus is necessarily original and genetic; whereas every hereditary act is necessarily secondary to and the result of experience, and the law of heredity must therefore be acquired in the process of evolution and is not fundamental.

4. That as to struggle for existence the most strenuous effort made (both by parent and offspring) in the course of organic processes is that which produces antagonism of interests. On the part of the parent it parts with that which has cost it the greatest expenditure of energy, and on the part of the offspring the result is the loss, in part or wholly, of the only source of its living up to the moment of the struggle.

5. That the orthodox view is inconsistent in so far as it recognizes mutability as applicable only to organic species and clings to the idea of the immutability of the more fundamental units of biology, viz., the individual and the cell and the protoplasmic states of matter.

These considerations bring us to a point of view in which heredity and variation hold a different relation to evolution than in the ordinary working hypothesis of biology. If this point of view presents the facts in their true relations we must seek for the immediate determining causes in variation, not in natural selection, nor in any of the environmental conditions, either direct or indirect, by which hereditary repetition is established, but in the phenomena of individual growth and development, and the more fundamental processes of cell growth and metabolism. (To be published in the *American Naturalist.*)

Localized Stages in Growth. By Dr. Robert Tracy Jackson.

As shown by Hyatt and others, stages in growth occur in the young and old organism, the adult representing full specific characters. The ontogeny of the individual therefore repeats, in an epitomized form, the phylogeny of the group.

From studies of animals and plants it has been found that stages may occur in localized parts throughout the life of the individual. In organisms that during growth present a serial repetition of similar parts there is often an ontogenesis of such parts, which is

more or less closely parallel to the ontogenesis of the organism as a whole, repeating characters seen in similar parts in the young individual and in adults of ancestral types. The repetition is usually of poembryonic or nepionic characters.

In asexual reproduction of Hydrozoa and Actinozoa, buds are given off, which during growth repeat characters seen in later stages of embryos from the egg. Young plates of the stem of certain crinoids throughout life repeat the features of the whole stem of ancestral forms. In ammonites that portion of the complex septum which lies close to the umbilicus is relatively simple, in this localized area repeating youthful and ancestral characters.

In plants, suckers from the roots, or base of stem, or stump, often repeat characters of the seedling, Pitch Pine, Areca, Oaks, Ash, Aralia, Sassafras, Ailanthus. In *Ampelopsis tricuspidata*, at the base, throughout life, the leaves are compound, as in seedlings. On all the remaining old wood, leaves are simple, trilobed (the species character); on wood of the current season's growth, leaves are simple, cordate, like a late stage in growths of seedlings. Degradational localized growth may be reversionary, as tuftlike growths of the Red Cedar, resembling the young and fossil allies. The terminal portion of leaves often repeats the character of leaves of seedlings in a close degree, seen in Tulip tree, Ashes, Ailanthus, Phœnix. Reversionary individual leaves often occur. These have failed to develop full specific characters and bear more or less resemblance to the young and fossil allies, seen in Tulip tree, Ashes, Negundo, Phœnix.

On the Carboniferous Fauna of Rhode Island. By PROFESSOR A. S. PACKARD.

THE fauna comprises worms, *Anthracomya arenacea*, crustacean trails, an Arachnid, and 14 species of insects, mostly cockroaches. Comparing with South Joggins, the animal remains support Lesquereux's reference of the beds (based on the flora) to the upper Carboniferous.

On the Present State of our Knowledge of the North American Tertiary Mollusk Fauna. By DR. WM. H. DALL.

REVIEWED fields covered by early workers from Say and Leseuer, in 1822, down to 1860, forming the first period, which was mostly on the coastal plain. A second group, Sowerby, Guppy, Gabb, were occupied with the Oligocene and Pliocene of the Antillean region.

A second period began about 1880. The new workers revised faunal lists, discriminated horizons, correlated continental and Antillean horizons,and discovered new horizons. The most important of these were the Pliocene of Florida, Miocene of Galveston, Texas, and Upper Oligocene of western Florida, as made known by Willcox, Heilprin, Dall, G. D. Harris, Aldrich and others. From recent discoveries, rich faunas have added a multitude of new forms.

Leidy's Genus Ouramœba. By WM. L. POTEAT.

HE showed that Leidy's view of the filaments as extensions of protoplasm was incorrect. They are mycelial filaments of a fungus, partially parasitic on an Amœba. The filaments arise from the germination of a spore, and issue at once into the water. The structure of the filaments is that of unseptate hyphæ, not of pseudopodia. The genus Ouramœba is not valid.

Moniloporidæ, a New Family of Palæozoic Corals. By A. W. GRABAU.

Notes on Æolosoma tenerarum. By MISS EDITH M. BRACE.

IT is shown that the nervous system of this worm, previously considered aberrant, conforms to the annelid type. The nervous system is connected throughout with the epidermis. The distribution of nerves and ganglia were described in detail. The sym-

pathetic system and sense organs were described; the latter consist of cells containing a pear-shaped refractive body, also compound bodies similar to the eyes found in other worms.

A New Classification of Fossil Cephalopods. By Professor Alpheus Hyatt.

Cephalopods with camerate shells, excluding Belemnoidea, are included in two orders, Nautiloidea and Ammonoidea. The classification of the Nautiloidea is in confusion, owing to the overthrow of the old systems. After revising all the genera and a considerable proportion of the species of this group it was found that the siphuncle offered the best basis for a classification. The siphuncle was of greater importance in ancient than in more recent times, in primitive than in specialized forms, and in the young than in later stages of ontogeny. This assumption is based on the relatively larger size, and more or less complicated structure of this organ, in ancient times, primitive types, and the young of all shells. Proposed sub-orders of Nautiloidea are as follows:

1. Holohoanites, funnels of siphuncle extending across air-chamber, deposits when present, more or less prolonged cones, filling endosiphuncle. Endoceras, Piloceras, Nanno.

2. Mixochoanites, siphuncles small, funnels composite, short in young, collars added in adult. Ascoceras, Aphragmites.

3. Schistochoanites, siphuncles large, funnels imperfect or split on outer side; these are at bases of flat rings or collars. Conoceras, Bronn (Bathmoceras, Barr).

4. Orthochoanites, siphuncles small, except in primitive forms, without deposits, or, if present, irregular and gathered around funnels, no endosiphuncle. Is difficult to separate some forms of this suborder from the Annulosiphonata. Orthoceras, Geisonoceras.

5. Cystochoanites, siphuncles of different sizes, funnels invariably short, bent outwardly. There are two subgroups. (A) Annulosiphonata, siphuncles large in primitive forms, beaded, internal deposits gathered about the funnels. There also are concentric layers advancing toward the interior, large endosiphuncle often present in primitive forms. Actinoceras, Loxoceras. (B) Actinosiphonata, internal deposits arranged as vertical radiating plates, directed toward interior, but not meeting; deposits increase in number of plates and thickness, so they often meet those of next segments. Jovellania, Rizoceras.

On the Systematic Position of the Trilobites. By Professor A. S. Packard.

Beecher has shown that all segments behind the antennal bear biramose limbs essentially alike for the head and trunk. In Crustacea, on the other hand, there is a differentiation of cephalic appendages. For this reason, with the different larval form, and obvious affinities of trilobites to Limulus which is not a Crustacean, we are inclined to refer trilobites to a separate class, older, more primitive, derived from the annelids on a different line from Crustacea. Probably the merostomes, including Limulus, descended from trilobites or similar forms.

Measurements of two large Lobsters, recently added to the Collections of the American Museum of Natural History. By Dr. E. O. Hovey.

Two large lobsters were caught off Atlantic Highlands, N. J., in 1897. Reported weight 31 and 34 pounds respectively. The length as mounted is respectively 92 cm. and 100.5 cm., or over 3 feet in each case.

A New Method of Studying Underground Insects. By Professor John B. Smith.

Shown that plaster of Paris, thinned, made excellent casts of burrows extending

nearly six feet underground, and branched. Satisfactory for burrows of bees, wasps, spiders, many coleopterous larvæ. The better the plaster the better the result. The best dental plaster mixed with an equal bulk of water is satisfactory.

Notes on the Habits of some Burrowing Bees. By PROFESSOR JOHN B. SMITH.

STUDIED by plaster method as referred to above. Several species were studied in Ocean Co., N. J.

Colletes compacta appears early in spring, digs almost vertically some 18 inches; then a horizontal burrow is sent off 2–5 inches. At the end a thin parchment-like cell is constructed, in which pollen and honey is stored, and the egg is attached about the middle of the cell. One or two additional lateral tunnels and cells may be built. The entire burrow is filled up, so that the young bees have to bore to the surface.

Andrena bicolor and *vicina* make burrows of greater diameter and sinuous, extending 40 inches or more below the surface. General habits of breeding as in Colletes. Some smaller species of Andrena line their cells with a sticky fluid; the pollen is formed in a loaf, on which the egg is laid.

Augochlora humeralis makes a vertical burrow nearly 6 feet deep. It sends off a short lateral burrow, then excavates a chamber 1–2½ inches across; 6–20 cells are constructed from this chamber and lined with clay. Pollen is placed in the form of a loaf, on which egg is laid. Two or three such clusters of cells may be made by one bee, and 30–40 cells may be found in a single cast. When starting the burrow the bee first makes an oblique burrow; after it begins to bore vertically it extends the upward burrow to the surface. The opening is concealed, and no earth is piled there. When the bee is in the burrow the entrance is closed by a ball of sand or clay. The bee does not fill the burrow, so that the young make an exit through the parent's burrow. They are also used as hybernating quarters. In early spring the females may be found piled on one another at the bottom of burrows.

On the Markings of Nodontian Larvæ. By PROFESSOR A. S. PACKARD.

As shown by Eimer and Cope, in the markings of lizards, changes from stripes to spots originate near the tail and extend forward in waves. Weismann has shown the same feature in caterpillars. The author observed the same in several Nodontian larvæ, *Lymmeristia albifrons*, *Dasylophia anguinea*, *Schizura concinna*. In these the longitudinal bands became broken up into spots on the last 4 or 3 segments, where banded arrangement disappears. The explanation is not obvious in lizards; in caterpillars it may be connected with the fact that new segments originate between the last body segment and the penultimate segment.

The proposed Attempt to introduce Blastophaga psenes into California. By DR. L. O. HOWARD.

CALIFORNIANS, in their attempt to produce a fig equal to the so-called Smyrna fig, have used cuttings imported from the eastern end of the Mediterranean. It was found that trees dropped the greater part of their fruit. It has long been known by Mediterranean growers that figs are fertilized by the insect *Blastophaga psenes*, which inhabits the wild Caprifig. Branches of Caprifig are collected annually and tied on to the branches of cultivated figs. The insects, loaded with pollen, enter the flowers of the cultivated figs and fertilize them.

In California artificial fertilization has been attempted and has been quite successful, the figs having the flavor of the Smyrna product. This has made it seem probable that if Blastophaga could be established in California a fig could be grown quite as

good as those imported. Caprifigs with their insects have been repeatedly imported, but attempts to establish the species have not been very successful. The author recently visited California and found Caprifigs abundant in numerous places. He thinks the time has come to carry on the experiment in a larger way and believes it will be successful.

Notes on the Life History of Protoparce Carolina. By Professor Wm. B. Alwood.

Breeding carried on with this species for two years shows that it is slightly double-brooded, at Blacksburg, Va. The earliest moths appear June 7th–12th. Oviposition begins June 20th; larvæ moult 4 times, at intervals of usually 4 days, become full fed in 20–21 days and enter the soil for pupation. A small part of early brood issues as adults the first year; but the greater part are single-brooded and appear as adults in July, after passing the winter as pupæ.

The Life History of Schizoneura lanigera Hansen. By Professor Wm. B. Alwood.

Breeding records show that the 'root and stem forms' can be colonized from root to stem, or the reverse, and their natural migrations were observed. Many of the agamic wingless females at Blacksburg, Va., survive the winter exposed on aërial situations. Records show twelve generations of agamic, viviparous females from May 12th to September 20th. At this date winged, agamic, viviparous females were produced in all the colonies observed. These proved a migrant generation and could not be induced to remain at rest on the apple plant under control conditions, but flew away. Under confinement they produced 4–6 young, which were sexed individuals. These are small, beakless, with rudimentary lobes where mouth parts should be; about $\frac{1}{3}$ are males and $\frac{2}{3}$ females. After copulation females lay one egg, which remains dormant over winter. From long observations it is concluded that in southern latitudes agamic individuals continue an unbroken chain, and that oviparous reproduction plays no important rôle in the life cycle. Only a small per cent. become winged, but on the contrary continue as normal, agamic, wingless lice.

The Phylogeny of North American Eucleidæ. By Dr. Harrison G. Dyar.

The Eucleidæ is a family of moths represented by 28–31 species in this country. The author is acquainted with life history of 20 species, and a partial life history of one other has been published. Larvæ offer structural characters of value in classification, and he presented a phylogenetic chart of the 21 species where the young is known. In the first division the lateral tubercle of the first abdominal segment is lost. One branch shows the origin of stinging spines. In another branch the first division corresponds to the loss of the primitive first stage, on the one hand, and to the complete suppression of the many paired warts, on the other. (To be published in *Journal N. Y. Entomological Society.*)

On the Genitalia in Ants, and their Value in Classification. By W. H. Ashmead.

The Records for 1898 of Broods VII. and XVII. of Cicada septendecim. By C. L. Marlatt.

Remarks on Aphorphora. By Professor Edward S. Morse.

Fossil Butterfly from the Base of the Severn Formation (Cretaceous) *of The Potomac River Exposure.* By P. R. Uhler.

On the Types of Vertebrate Embryos. By Professor Charles Sedgwick Minot.

On the Embryology of the Rabbit. By Professor Charles Sedgwick Minot.

Some New Points in Dinichthyid Osteology. By Dr. C. R. Eastman.

Dinichthys pustulosus, as shown by many characters of the cranial and dorsal shields,

is the most primitive known species of the genus.

In the cranial osteology of *Dininchthys intermedius* the 'parietal' and 'frontal' elements of Newberry and other authors, declared not to exist, the area assigned to them being covered by the centrals, as in *D. pustulosus*, and uniformly throughout the family. Identification of the side plates of the body, heretofore considered missing. The upper or transverse arm of the 'clavicular' is homologous with the anterior lateral of Coccosteus, and the inner branch of the bifurcated arm with the interlateral of the same genus. Outer branch of the bifurcated arm has articulated to its distal end a warped plate, supposed to represent a modified branchiostegal apparatus. The term 'clavicular' is thus a misnomer, since the element has nothing to do with a shoulder-girdle, and there is no evidence that such a structure was present in the Dinichthyids.

The orientation of the clavicular was described and illustrated by diagrams. The osteology of *Titanichthys agassiszii* was also described and illustrated by diagrams.

Transformation of the Brook Lamprey (Lampetra wilderi), and Parasitism among Lampreys. By PROFESSOR SIMON HENRY GAGE.

THE transformation of all lampreys is similar, as far as known. The egg develops into a larva comparable to á tadpole, and this transforms into an adult. Up to the present the larvæ of the sea, lake and brook lampreys have not been distinguished. At transformation the sea and lake lampreys are about 150 mm. long, while adults average 700 and 350 mm. respectively. The transformation of the lake lamprey requires 20–30 days until adult form is assumed, but metamorphosis is only begun in this time, and the animal stays under the sand, like a larva, for about 4 months before emerging for a free predatory life.

The brook lamprey attains full size during larval life, and remains under sand some 7 months; it then emerges, builds nest, lays eggs and dies. In the lake lamprey (*Petromyzon marinus unicolor*), from Cayuga Lake, no food, except blood, has been found in the enteron. As the brook lamprey has the same armature of teeth and rasping tongue as lake and sea lampreys it has been considered as also parasitic, but this is a mistake, as shown by experiments in aquaria. The suctorial mouth is used in all lampreys for nest building and mating; the question arises: was the buccal armature developed for this purpose or for a parasitic life?

Hybernation, Transformation and Growth of the Common Toad (Bufo lentiginosus americanus). By PROFESSOR SIMON HENRY GAGE.

IN literature it is stated that the toad hybernates under leaves, logs, etc. From observation it is believed hybernation occurs only in the ground, rather dry and not liable to be frozen. After emerging in spring, if a cold snap occurs, they seek shelter of leaves, etc. In burying itself the toad backs in, the hind legs and caudal end of body being used for digging, and forelegs for pushing backward. No sign of the hole is left.

In a freezing atmosphere the temperature of the toad was $\frac{3}{4}$ to $1\frac{1}{4}$ degrees Centigrade higher than surrounding medium. Toads found under frozen leaves were able to crawl. In one case the legs and skin were frozen solid, but not the internal organs; the toad recovered. When frozen solid the toad never recovered.

At Ithaca ovulating extends from the middle of April to the middle of June. Eggs are normally laid in a double string, one from each oviduct; 500–5,000 or more are laid at one time. Eggs hatch in about 4 days. Growth of tadpole is attained in about 40–60 days. After hind legs are well developed

no food is taken and a tadpole changes into a toad within 3 days. We get a clue to activity of life processes in transformation by weighing. A tadpole at maximum size weighed 230 milligrams; after hind legs developed and food was no longer taken, weighed 110 milligrams; two days later, when tail is only 3 mm. long and the little toad has crawled out into air, weight was 70 milligrams; less than $\frac{1}{3}$ the weight of tadpole from which it developed.

In man and other animals the proportion of water is greater the younger the animal. In a tadpole 91.6% of live weight is due to water; in the just transformed toad 88% is water. The dry weight of a tadpole was 19 milligrams; of a transformed toad, 8 milligrams, less than half the dry weight of the tadpole. There is, therefore, a great loss of substance other than water in transformation of tadpoles into toads. In the growth of the toad there is a steady increase from egg to maximum of tadpole. During transformation there is shrinkage. When the little toad is ready to take food its progress in size is rapid, and in a few years it may be 50,000 times as heavy as the egg from which it came.

On the Piscine Ancestors of the Amphibians. By Professor Theo. Gill.

A Historical Notice on Ross' Rosy Gull, Rhodostethia rosea. By John Murdoch.

This species was discovered by Sir James Ross, in 1823, at Alagnak, Melville Peninsula. It was described by Richardson in 1825. Up to 1881 only 14 specimens were known, but from several localities. The Point Barrow expedition (1881–93) found them in large numbers, flying northeast along the shore each autumn, and collected a good series. The delicate pink of the breast after death soon fades on exposure to light. Fifteen additional specimens have since been taken, all from the Arctic region except one (Bering Id.). Nansen found them abundant in July, near Hvitdenland (81° 38′ N.). They undoubtedly breed there, but the main breeding ground is probably the land believed to be not far north of Point Barrow. They probably always keep close to the loose edge of the ice-pack. (To be published in full in the *Auk.*)

The Winter Food of the Chickadee. By Clarence M. Weed.

The paper records a study of the food of the Black-capped Titmouse (*Parus atricapillus*) during winter months. Forty-one specimens were studied from November, 1897, to March, 1898. Results show that this bird feeds on a large variety of insects. The most striking item of food was eggs of aphids, 21 per cent. of the whole. Insects as a class constituted 51 per cent., spiders and their eggs 5 per cent., vegetable matter 28 per cent.; of this 20 per cent. consisted of buds and bud scales, introduced accidentally with aphid eggs; indeterminable 10 per cent.; grit and other extraneous matter 4 per cent. This study yields additional evidence of the usefulness of this familiar bird.

A Rare Species of Whale. By Professor Alpheus Hyatt.

The specimen came ashore on the beach at Annisquam, Mass., August, 1898. The specimen proves to be a species of Mesoplodon, is 12 feet long, measuring along the body. Two teeth, characteristic of the genus, exist in the mid-length of the lower jaw, but are small and not visible above the gum. The only species known in the North Atlantic is *Mesoplodon bidens*; this specimen is probably of that species. This species has been recorded from European coasts, but has been a very rare visitant of our shores.

Variations in Human Bones. By Dr. Thomas Dwight.

A lecture delivered before the Zoolog-

ical (F) and Anthropological (H) Sections. The speaker dwelt especially on anomalous spines of the vertebral column.

The Fauna of Cold Spring Harbor. By DR. C. B. DAVENPORT.

GAVE a general account of this station, a description of which will be published later in this JOURNAL.

Naples Station: General Description and Notes on Methods of Work Employed There. By DR. E. O. HOVEY.

THIS laboratory was established in 1872, by Dr. Anton Dohrn. Although some thirty stations have since been established on similar lines, this has maintained its lead in importance. The most popular feature is the aquarium, which consists of 26 tanks (described in some detail). The chief function is investigation, which is carried on by a corps of nine regular officials, and 30–40 students from all parts of the world. More than 1,000 men have studied at the Laboratory. An important feature is the beautiful preparations of the Naples marine fauna, which are sent to museums and investigators all over the world. The paper presented many interesting and practical details of methods employed.

General Statement of Types and Figured Specimens of Fossil Invertebrates in the American Museum of Natural History. By DR. E. O. HOVEY.

THE Museum has at least 8,000 types and figured specimens of fossils. A large part of these are in the James Hall collection, including a large proportion of species of the New York Palæozoic horizons; also important series from Waldron and Spergen Hill, Indiana; Racine, Beloit and other localities in Wisconsin and Minnesota. The Museum has the F. S. Holmes collection, including many Tertiary and Post-Tertiary types from South Carolina; the types of Hall and Meeky from the Cretaceous of Nebraska and many types of species described in the Bulletin of the Museum. In the paper a number of other lots of types and figured specimens are mentioned which cannot be referred to in this brief abstract.

Ink and Paper for Museum Labels. By DR. ROBERT T. JACKSON.

DWELT on the importance of carbon writing and rubber stamp inks, as being the only inks suitable for permanent records. Bond or linen record paper advised as being lasting. Ordinary paper not suitable for permanent records. This paper will be published in this JOURNAL.

ROBERT TRACY JACKSON,
Secretary of Section F.

NOTES ON PHYSICS.

SECTION B AT THE BOSTON MEETING.

THE program of Section B contained fifty titles of papers, forty of which were read in full. Many of these papers were of high order and almost every one was creditable and interesting. The increasing activity of Section B and its growing membership are matters for congratulation, and it is probable that an affiliated American Physical Society may soon become desirable and feasible. The proceedings of Section B will be reported in SCIENCE at an early date.

THE FLOW OF WATER IN PIPES.

THE flow of water in pipes and channels is again the subject of elaborate investigation,* but it is doubtful whether anything more than roughly approximate formulation of the laws of flow of water can ever be reached. It seems that the slightest roughness on the inside of a pipe leads to *unstable states* of fluid motion resulting in the formation of eddies. If incipient eddy motion is indeed an unstable state of fluid motion—and our knowledge of vortex sheets, such, for example, as the air jet of an organ pipe, seems to show that it is—then the flow of

* Paper by G. H. Knibbs, Journal and Proceedings of the Royal Society of New South Wales (XXXI.).