It will be seen from these tables that the effect of ammonia gas in solution upon the water absorbing it is to increase greatly the co-efficient of expansion and to lower very rapidly both the points of maximum density and of freezing.

In these respects the gas acts just as a salt in solution would do. Gas solution and salt solution would seem to be closely related phenomena, each resulting in the formation of a mixed liquid, viz: of a liquid composed of two sets of independently moving molecules.

The effect of ammonia gas upon the volume of the water absorbing it is expressed by the following law:

When it is absorbed by water, the increase in volume for a constant temperature is directly proportional to the amount of gas absorbed.

This may be shown to be for NH_3 gas in water by plotting a set of curves with the volumes given in the above tables as ordinates and percentages of gas as abcissae. These curves, whatever temperatures be chosen, resolve themselves into straight lines. Since for the case of CO_2 gas in water the same law had been already found true by direct measurement of the change of volume due to the absorption of the gas at constant temperatures, we are warranted in suspecting the law to be a general one.

THE ENDOCRANIUM AND MAXILLARY SUSPENSORIUM OF THE BEE.

PROF. GEORGE MACLOSKIE, OF PRINCETON, N. J.

The endocranium of insects is produced by infoldings of the cranial wall, and although several groups (as Diptera, Hemiptera, Coleoptera, Lepidoptera,) have been represented as devoid of such structures, Prof. Macloskie finds an endocranium present in all these orders. The posterior or epicranial part of the skull has no internal processes. The clypeus, or "face," has a thick posterior ridge (just in advance of the antennæ). From this ridge descend, in bees and allied insects, two meso-cephalic pillars, reaching to the floor of the cranium, in front of the great foramen. These two pillars support the roof of the skull. They occur, with variations, in squash-bug, gadfly, mosquito, butterfly, and dragonfly. In the cockroach they take the form of a perforated plate, being united anteriorly by a cross-bar (which binds the mandibles together), and being webbed excepting at the centre. (Huxley's description of this in his Anatomy of the Invertebrates is inaccurate.)

The maxillæ and labium of the bee are supported by a long framework with elbows and hinges. This suspensorium is incorrectly represented in published figures. It is, in part correctly figured by Wolff, who misinterprets it (as if it were on the type of the mammalian skull). Its basal or posterior rods are attached close to the great foramen and to the base of the meso-cephalic pillars, and they are united by a thick web to the base of the skull. The mid-segment, consisting of a pair of bars, supports the maxillæ, and upon it is an anterior pair of bars supporting the labium. In its working, this frame-work embodies the principle of a recent patent for producing steady motion.

The methods by which the maxillæ and labium are protruded and withdrawn were described, also the relations and mode of working of the pharynx-parts in the mouth. The discovery of a double set of salivary glands was reported; a cephalic set supplying the inner tongue on the floor of the mouth, and the thoracic glands, sending their long duct forward to the labium. The inner structure of the bee's head was shown to be of the same pattern as in other insects, though varied in details. The paper was illustrated by diagrams and microscopic preparations.

NEW PLANETARY NEBULÆ.

BY PROFESSOR PICKERING.

He described the observations of the planetary nebulæ, are now in progress at the Harvard College Observatory. Besides measuring the light of these bodies, the spectrum of each has been examined by inserting a prism between the objective and eyepiece of the large telescope. A star is converted into a colored line of light, but the nebulæ, being nearly monochromatic, appears as a bright point. The difference is so marked that the idea suggested itself that by this means planetary nebulæ might be discovered, whose disks are so small that they can not otherwise be distinguished from stars. A search was accordingly undertaken on the evening of July 13th, by sweeping or moving the telescope so that a great number of stars could be examined in a short time. In a few minutes such a nebula was found, which with an ordinary eye-piece might readily be mistaken for a twelfth magnitude star. A similar object was also detected on the next evening. After this, sweeps on several evenings failed to reveal any new nebulæ, although it is estimated that the spectra of over a hundred thousand stars were examined.

On night before last, while continuing this work, an object with a remarkable spectrum entered the field. The light appeared to consist mainly of a band in the green, a line in the red and probably a fainter band in the yellow, the whole being superposed on a faint continuous spectrum. The new stars which blazed out in Corona in 1863 and in Cygnus in 1876, presented for a short time a similar spectrum, but with this exception the star noted above appears to be unique. It is too soon to form a theory regarding the nature of this body, as clouds interrupted the observations and barely allowed time for its identification. It proved to be the star known as Oeltzen 17681, and must therefore have had nearly its present brightness forty years ago.

The field for discovery by the method here given is far from being exhausted since, less than one hundreth part of the heavens has as yet been examined.

ON LAND SNAILS OF THE PALÆOZOIC PERIOD.

By DR. DAWSON, F. R. S., Principal of McGill University, Montreal.

The land snails occurring in the carboniferous and Devonian systems, of which six species are known, were noticed in detail. Two of these, *Pupa Bigsbii* from the coal formation of Nova Scotia, and *Strophites grandæva* from the Erian (Devonian) of St. Johns, New Brunswick, were described for the first time. Four of the known species belong to the different subdivisions of the old genus *Pupa*, and two are helicord or snail-like in form. They constitute a very isolated group of fossils, as none are known in older formations, and there are none newer till we reach the early Tertiary. Though all of somewhat distinct types, they all belong to one great family or sub-order of the *Pulmonifera*, and are all closely allied to types still living. All the species hitherto found are American, four being found in Nova Scotia and New Brunswick, and two in Illinois. The latter were discovered and described by the late Mr. Bradley. *Pupa vetusta*, the earliest known, was found in the material filling a hollow *Sigillaria*, by Sir Charles Lyell and Dr. Dawson in 1851. In the paper, which will probably appear in full in the AMERICAN JOURNAL OF SCIENCE, figures and descriptions of all the species are given, and their affinities and mode of occurrence are discussed.

FURTHER NOTES ON THE POLLINATION OF YUCCA AND ON PRONUBA AND PRODOXUS.

BY C. V. RILEY.

The author refers to the original paper on the Fructification of Yucca read at the Dubuque (1872) meeting of the Association and notices various criticisms since made upon its conclusions. The paper shows that none of these criticisms were warranted, and verifies the original observations and conclusions by subsequent experience. It points out the causes of error in that other writers have confounded related moths having similar *general* appearance but great structural differences and different habits. The characters of the Bogus Yucca Moth (*Prodoxus decipiens*), are given, and five new

species, *Pronuba maculata*, *Prodoxus marginatus*, *P. cinerius*, *P. æneseens* and *P. intermedius*), are described, and the paper concludes with remarks which point to these diffent Yucca Moths as admirable illustrations of the derivative origin of species.

THE WYANDOTTES.

By Major J. W. Powell.

The Indians now known as the Wyandottes, were first found on the lower St. Lawrence. Subsequently they inhabited a narrow district of country on the shores of Lake Huron, and were known as the Hurons; later they lived in Michigan about Detroit; then in Ohio in what is known as Wyandotte county; from Ohio they were moved to Kansas and placed on a reservation; and from Kansas to the Indian Territory. In their wanderings from point to point, as they were driven from advancing civilization, a few of their number were left behind, so that the Wyandottes are scattered from the lower St. Lawrence to the Indian Territory along the route of their migration. These Indians call themselves Wundat; the etymology of the word is not known. In their social organization four units are recognized—the family, the gens, the phratry and the tribe. The family, as the term is here used, is nearly synonymous with household. It is composed of the persons who occupy one lodge, or, in their permanent wigwams, one section of a communal dwelling. The head of the family is a woman. The gens is an organized body of consanguineal kindred in the female line. "The woman carries the gens," is the formulated statement by which a Wyandotte expresses the idea that descent is in the female line. Each gens has the name of some animal—the form of such animal being its tutelar god. Up to the time when the tribe left Ohio, eleven gentes were recognized as follows: Deer, Bear, Highland Turtle (striped), Highland Turtle (black), Mud Turtle, Smooth large Turtle, Hawk, Beaver, Wolf, Sea Snake, Porcupine. In speaking of an individual he is said to be a Wolf, a Bear, or Deer, as the case may be, meaning thereby that he belongs to that gens; but in speaking of the body of people comprising a gens they are said to be relatives of the Wolf, the Bear, or the Deer, as the case may be.

There are four phratries in the tribe—the three gentes, Bear, Deer and Striped Turtle constituting the first; the Highland Turtle, Black Turtle and Smooth Large Turtle the second; the Hawk, Beaver and Wolf the third; and the Sea-snake and Porcupine the fourth. The eleven gentes as four phratries constitute the tribe.

The civil government inheres in a system of councils and chiefs. In each gens there is a council composed of four women. These four women councilors select a chief of the gens from its male members; that is, from their brothers and sons. This gentile chief is the head of the gentile council. The council of the tribe is composed of the aggregated gentile councils. The tribal council, therefore, is composed one-fifth of men and four-fifths of women.

The government of the Wyandottes, with the social organization upon which it is based, affords a typical example of tribal government throughout North America. Within that area there are several hundred distinct governments. In so great a number there is great variety, and in this variety we find different degrees of organization, the degree of organization being determined by the differentiation of the functions of government and the correlative specialization of organic elements.

A SIMPLE DEVICE FOR PROJECTING THE VIBRATIONS OF LIQUID FILMS WITHOUT A LENS.

By H. S. Carhart, A. M., Professor of Physics and Chemistry, Northwestern University, Evanston, Ill.

This instrument is designed to project upon the screen the vibrations of a film of soapy water produced by the voice or by an organ pipe. It might be called the self-projecting phoneidoscope. It differs from Sedley Taylor's phoneidoscope in three particulars: first, the vibrations are communicated to the film through the agency of a mouthpiece and a ferrotype diaphragm; second, the vibrations are projected on a screen; third, the film is employed to project itself without a lens.

It consists of a wooden tube, having a telephone mouthpiece at one end and expanding into a large funnel at the other, the funnel being of metal. In the side of the tube a stop-cock is inserted. A film is obtained in the open end of the funnel and a little air is then blown through the stop-cock. This distends the film slightly, causing it to act as a convex mirror. It is then placed in a beam of *sunlight* and reflects it at the proper angle. Upon singing a note at the mouthpiece a sharply defined system of waves is projected. Photographs of these have been taken. Caps fitting into the funnel and provided with a square or triangular opening, are also employed to give films of different shape.

THE LANGUAGES OF THE IROQUOIS.

By Mrs. E. A. Smith.

The language of each nation represents its thought. If these thoughts have remained unrecorded, it is from the language itself that they must be obtained by tracing out the origin, history and meaning of its words. Each word has its history, which it can be made to reveal by tracing out the origin, history and their most hidden secrets, and the thoughts, customs and beliefs of the originator be read as truthfully as if recorded by the historian's pen. For "words unaided cannot lie;" twenty words in Tuscarora represent supernatural beings. Does this leave a doubt as to the tendency of their minds? The Tuscarora word for burial ground signifies "placed in the ground in a sitting posture," proving that some time in the past such was their method of burial. The very structure of the Indian languages, where the words are so self-explaining, affords unlimited scope to the etymologist in his search into word history. There are two distinct periods in the modern history of the Iroquois. The inundation of new ideas on the advent of the white man introduced almost a new vocabulary, differing according to the ideas of the observers. For instance, the horse when first seen by the Senecas was drawing logs, hence was called a log drawer. Another tribe saw it carrying packs, and termed it pack-carrier. The Tuscaroras adopted the English word and term it *hahath*. It is quite remarkable that so few words have been borrowed from the English. And these have become so Indianized by prefixes and appendages or changes in their vowel sounds as to be scarcely recognizable. Among them are: U-ts—oats; Sa-i tar—cider; Ha-hass—horse; Vi-ni-gair—vinegar; Qui-tair—Peter; Ta-wait—David; Tju-rus—Julius; Nay-yak-it-ando—jacket. Lastly was-tun for Boston, adding to this the plural suffix ha-kah, a term which in English might be interpreted *ites*. We have then Was-tun-ha-kah, or Bostonites, which in the Iroquois is the general term for Americans or the whole American nation. This almost supernatural intuition of the Indian mind crystallizes, I do not doubt, the opinion also and belief of at least 250,000 pale faces residing in the metropolis of Massachusetts. Of the length of some of incorporative words, which sometimes contain verb, subject, object, adjective or preposition, I would remark that the examples generally given in encyclopedias and works on language are almost entirely English Indian. That is, a missionary, perhaps, translating a portion of the Bible, finds some abstract word entirely beyond the comprehension of the Indian mind; he therefore takes Webster's definition of the word and translates that into the Indian in the form of one word until it has the appearance of the heading to a German railway time-table, the words consisting sometimes of forty letters and eleven or twelve syllables. The longest word thus Anglo-Indianized with which I have met is the Mohawk word for stove polish, the word itself being as indicative of the ingenuity of the inventor as the polish itself. It consisted of a glowing description of all the excellencies of said stove polish, which it required fifty-eight letters to express. The abstract nouns, represented as being absent from many of the Indian languages, are found in the Tuscarora, such as life, death, love, hate. An interesting feature of the language also might be traced in the prefer-