THE MEETING OF THE NATIONAL ACADEMY OF SCIENCE.

The National Academy of Science, which held a meeting last October in this city, is again in session at the Smithsonian Institution in Washington. This body, as we before have had occasion to explain, is the highest scientific association in the country, and includes among its members all or nearly all eminent American scientists. The papers read are therefore of considerable importance, and in the abstract which we present below will be found a careful *resumé* of their contents.

Professor Joseph Henry presided over the deliberations, and recently rendered a graceful compliment to the President of the American Association for the Advancement of Science, Professor Le Conte, in calling upon him to open the proceedings with the reading of his paper on the classification of the *rhiphophorus coleoptera*. The American Association, by the way, is a body which is perhaps more popularly known than the National Academy; but we can hardly agree with a contemporary which alludes to it as a rival organization. The cause of Science is one that calls for cöoperation and not competition; and while societies may have distinctive names, they all strive for the same object in unison.

Professor Le Conte makes a division of the insects above named into three series: (1) Haplogastra, having abdomen alike in both sexes; ventral segments not prolonged upward into a sharp edge. (2) Allogastra, abdomen dissimilar in the two sexes; ventral segments prolonged upward, forming a sharp edge. (3) Heterogastra, abdomen alike in both sexes; ventral segments prolonged upward to fit into the elytral groove. Many other distinctive characteristics were given, with a detailed description of the very numerous genera belonging to each of the series.

Professor Fairman Rogers followed with a paper on apparently an odd subject for scientific discussion, namely,

AN AUTOMATON TO PLAY TIT-TAT-TOO.

Babbage, he said, in speaking of his analytical engine, has suggested that a machine might be made which would play a game of combination, such as drafts, provided the maker of the machine himself would work out perfectly the sequences of the game. Professor Rogers finds that the sequences of tit-tat-too are easily tabulated, and hence an automaton may be made which will play the game as follows: The opponent to the automaton makes the first move in the game, and in so doing causes a certain cylinder or equivalent device to change its position. This, from the construction of the apparatus, causes the automaton to make that play which the proper sequence of the game requires, and at the same time moves the corresponding cylinder into position. The next play of the opponent moves the third cylinder, and the combination of the three cylinders determines the action of the automaton for the fourth; and so on throughout the sequence. If the player plays perfectly, the game will be drawn, as the automaton's play will be mathematically correct. If the opponent makes a mistake, the automaton, by a simple device, takes advantage of it, and makes such a play as to win the game. The object of the speaker was to show that such mechanism, applied to apparatus for registering physical phenomena or for performing geometrical or mathematical operations, may enable such mechanical devices to have a use much more extended than heretofore.

THE FUNCTIONS AND MECHANISM OF AUDITION

was the subject of a paper by Professor A. M. Mayer, in which he shows that the significance of the anatomical relations of the parts of the ear is to bring the sound vibrations to act with the greatest advantage on the co-vibrating parts of the ear, and to cause these parts to make one half as many vibrations in a given time as the tympanic or basiolar membranes. This is demonstrated by an extended review of the functions and possibilities of different portions of the auditory apparatus. In the course of this train of argument, Professor Mayer advances the view that what are known as the hair cell cords, having swellings in the middle of their length which cause them to act like loaded strings, are probably so constituted that each hair cell cord is adapted to co-vibrate with only one special sound, and that a cord in the ductus of the ear will vibrate only half as often in a second as the basiolar membrane to which it is fastened. In a second paper on

THE DURATION OF THE SENSATION OF SOUND,

Professor Mayer said that experiment proved that the residual sensation only occupied one five-hundredth of a second in the case of 40,000 vibrations per second; but in the case of 40 vibrations to a second, the residual vibration was one eleventh of a second. He concludes that the whole ear vibrates as one mass, and the durations of these oscillations of the whole ear are far too short to remain one thirtieth of a second. He thinks that this explains our inability to distinguish the actual pitch of sound when that pitch exceeds certain well known limits.

THE REFLECTION OF SOUND FROM FLAMES AND HEATED GLASSES

was the subject of another paper by the same author. Two similar resonators are placed with the planes of their mouths at right angles to each. Then in this angle Professor Mayer firmly fixes the tuning fork corresponding to the resonators, so that the broad face of one of its prongs faces the mouth of one resonator, while the space between the prongs faces the mouth of the other. Complete interference of the sounds issuing from their mouths is obtained, and the only sound that reaches the ear is the faint sound given by the fork's action on the air outside the angle included by the mouths of the resonators. If in these circumstances we close the mouth of either one of the resonators with a piece of cardboard, the open resonator will strongly re-enforce the sound of the forks. If we now cover the mouth of this resonator with cardboard, we shall again have silence.

Now substitute for cardboard, when both resonators are open, the flame of a bat's wing gas burner, with one resonator, and use something more permeable to sound than the cardboard with the other. By trying a series of more and more permeable diaphragms, it was found that tracing paper just equaled the effect of the gas flame in guarding the mouth of the resonator from the entrance of sound. A sheet of heated air above the gas burner was found to be exactly equivalent to the gas flame. The passage of a sheet of cold coal gas over the mouth of the resonator produced a similar effect; and so also did carbonic acid gas, though in less degree; but cold, dry hydrogen closed the mouth of the resonator more effectively than either of the above gases, though not equal in this respect to the heated air above the bat's wing flame. Among other curious results, Professor Mayer has ascertained that there is an absorption of sound in the bat's wing flame; that the flame is heated by the sonorous vibrations which enter it as such, and issue as heat vibrations. He has endeavored to obtain a quantitative mathematical analysis of this absorption and hopes for exact results.

Professor Norton, of Yale College, referring to

TESTS OF THE STRENGTH OF PINE,

said that after repeated strains a molecular change took place in the wood, and the effect of strain, after an interval of rest, to a great extent not only passed away but even left the stick with less set than it had a short time before. As one of the results obtained, it appears that a load equal to one fourth of the breaking weight produces a permanent set, and that repeated applications of this load from day to day are attended with a continually increasing set. It results that such wood should never be subjected in any structure to one fourth of its breaking strain.

THE FUNCTIONS OF THE BRAIN AND NERVES

was the title of a very interesting discourse by Dr. Brown-Séquard. The theory ordinarily assumed is that sensation is conveyed through the body by the nerves, as the bells rung in any part of a hotel have the sound conveyed along wires to a central office where the fact is recognized from where the call may come. This assumption is as false as it is simple. There is no necessity for more than a very few fibers to establish communication between the brain and the spinal cord. It is more like a telegraphic communication than a movement along a wire, by which sensation is conveyed from the periphery to the brain, or the brain transmits its orders to the periphery. If, said the speaker, a piece of ice is laid upon my foot, I have at once the sensation of a contact, sensation of a temperature, the sensation of the extent of the surface of the ice that touches me, the sensation of the weight of the ice, and, if it is left upon my foot, the sensation of pain, and the sensation of the skin to which the ice is applied. All those forms of knowledge are communicated at once. I believe that all these impressions are communicated to the spinal cord, which as a single wire transmits it to the brain.

Now as to the two sides of the brain: The old view was that the left side of the brain governs the movements of the right side of the body, and the right side governs the movements of the left side of the body; and that there is a similar view respecting perception and sensation. Facts oppose this view. One third of one half the brain may be utterly destroyed without any symptom of the injury; then one third of the other half, and still no symptom. Still another third of either half may be destroyed without any indication of ill health. There are hundreds of the first named cases. With reference to the location of intelligence in the brain, the lecturer said that most physiologists are agreed that it exists in the gray matter of the upper parts of the organ. There is no case on record where the gray matter on both sides of the brain has been destroyed without the loss of intelligence, and we must regard that gray matter as the seat of the intelligence. But vast portions may be removed before the loss of intelligence becomes apparent. This the speaker had tested and proved by vivisection of the lower animals.

By the application of galvanism to certain parts of the brain, Dr. Ferrier has produced certain movements. This would seem to prove that there are in the brain certain centers of movement governing certain parts. But this is only a semblance. It is perfectly well known that the cutting away of a large portion of the brain does not produce the least alteration of voluntary movement anywhere. We now know that only a few fibers are necessary to make the connection between the spinal column and the brain. The brain, like the rest of the body, receives nerve fibers coming from other nervous centers, some along the blood vessels, for there are a great number of fibers starting along the blood vessels and going into the cellular tissue of the brain; some fibers coming from the sympathetic nerve; others coming from various sources. We find, for instance, that the prick of an exceedingly fine needle at the *crux cerebelli* will produce rotary movements, the animal whirling around with a rapidity impossible in a normal condition. The activity of the heart may be stopped by the prick of a needle point; convulsions may be similarly stopped by the action of carbonic acid on the mucous membrane of the throat. With these facts under consideration, we may see the vast field of research that yet lies before us, the mere questions arising from the activity of nerve cells affording an almost boundless subject for inquiry. But it is evident that we cannot locate the centers of either sensation or motion in specific parts of the nervous system

Professor Simon Newcomb gave a description of the proceedings to be taken by the United States in observing

THE TRANSIT OF VENUS

next December. After referring to the various methods of observation and the difficulties pertaining to them, he said that, about two years ago, circulars were sent to American consuls in almost every part of the world where the transit is visible, to ascertain the condition of the weather at those points in November and December, and every other source of similar information was utilized.

The only satisfactory station in the southern hemisphere, in respect to weather, was found to be Hobart Town, in Tasmania. But from all the other proposed southern stations the accounts were very bad, notably at the proposed station at Hurd's Islands; the chances of observation there did not exceed two tenths. The most favorable station left at the south was Kerguelen Island, and that was selected. A party will also be landed, if practicable, at Croisette. Instead of sending four parties to each hemisphere, we shall send three to the north and five to the south, to equalize the chances as to weather. It is hoped to get complete results from two parties in each hemisphere.

To each party there are detailed two officers from the Observatory, two from the Coast Survey, one from the navy, and two civilians. Professors Hall and Harkness go to Hobart Town. Among them are the celebrated astronomers Professors Watson of Ann Arbor, Mich., and Peters of Clinton, N. Y. The constitution of each party is such that in case of disability on the part of its chief, the second officer can take his place. Each party will have three photographers—a chief photographer, who must have been of long experience in the business, an assistant who has had practice, and a second assistant trained only for the occasion. Nearly all the second assistants' positions have been filled by students or graduates of various schools and technological colleges throughout the country. The parties for the southern station will sail, we expect, about June 1. These are all ready; the photographers are to be in full practice here next week. The northern parties will go later and not all together. The Navy Department has furnished a ship, the Swatara, to go to the southern stations. The longitudes of the stations will be determined by occultations wherever telegraph communication is impracticable; but already there is such communication between Vladivostok and Hobart Town. Arrangements are made with the governments for exchanging longitude signals, and the prospect of the extension of cables to New Zealand and other points gives fair hope that there will be only a few points where occultations will be the sole resort

Major J. W. Powell read a paper on the

COLORADO CAÑONS,

giving an account of the progress made in the survey of the Colorado river and its tributaries, under direction of the Smithsonian Institution. Among other wonderful natural phenomena is the Grand Cañon, the most profound chasm known on the globe. Were a hundred mountains, each as large as Mount Washington, plucked up by the roots to the level of the sea and tumbled into the gorge, they would not fill it.

Perhaps the most wonderful of the topographic features of this country are the lines of cliffs, escarpments of rock separating upper from lower regions by bold, often vertical and impassable barriers, hundreds or thousands of feet high and scores or hundreds of miles in length.

Floats for Ships' Boats.

The marine department of the London Board of Trade have been making experiments with the boats of coasters, and find that any old boat can be converted into an efficient lifeboat by using air casings outside. The marine department have for this purpose used air cylinders, which they have specially designed, fastened outside the boat by a netting; so that the boat can be used for an ordinary boat as long as wanted, and converted into a lifeboat when occasion requires it. The material used for these cylinders, and approved by the marine department, is a combination known as "Clarkson's." It consists of a layer of cork about a quarter of an inch thick between two layers of strong canvas. One cubic foot of air space in these cylinders will support about 60 lbs. The cylinders of this material are the cheapest, most efficient, and most durable means yet invented for converting an old boat into a lifeboat. Mr. Clarkson has made the experimental cylinders on models furnished to him by the marine department, and is, we believe, prepared to supply any number demanded. Air cases to place inside lifeboats, also made of this material, have been supplied to some of the mail steamers, and are much preferred by the marine department to cases of copper, iron, zinc, or wood, as they are practically indestructible, are not affected by heat, and are very light.—*Nautical Magazine.*

Lemons Wholesome.

When people feel the need of an acid, if they would let vinegar alone, and use lemons or apples, they would feel as well satisfied, and receive no injury. A suggestion may not come amiss as to a good plan, when lemons are cheap in the market, to make good lemon sirup. Press your hand on the lemon, and roll it back and forth briskly on the table to make it squeeze more easily; then press the juice into a bowl or tumbler—never into a tin; strain out all the seeds, as they give a bad taste. Remove all the pulp from the peels, and boil in water—a pint for a dozen pulps—to extract the acid. A few minutes boiling is enough; then strain the water with the juice of the lemons; put a pound of white sugar to a pint of the juice; boil ten minutes, bottle it, and your lemonade is ready. Put a tablespoonful or two of this lemon sirup in a glass of water, and have a cooling, healthful drink.