Princeton, and 'An Outline of Psychology,' by Prof. E. B. Titchener, of Cornell University.

DR. DONALDSON SMITH gave before the Royal Institution, London, on January 20th, an account of his expedition to Lake Rudolf, in northeastern Africa. It was found that the Nianann is the only river emptying into the lake, and that there is no river Bass, as supposed by Count Teleki. Seven hundred birds were collected, and of these 24 have been described by Dr. Bowdler Sharpe as being new to science. The different species of insects numbered 3,000, and besides these there were many plants, butterflies and mammals collected.

A HEARING was given on January 30th by the Commissioners of the District of Columbia upon a Senate bill which would prevent vivisection in the District. Dr. Busey and Surgeon General Sternberg spoke against the bill.

MEMBERS of the Gypsy Moth Commission of the Massachusetts State Board of Agriculture appeared before the Committee of Agriculture and argued in favor of the passage of an appropriation of $200,000 for the work of exterminating the gypsy moth. It was stated by director E. H. Forbush that 425 men would be needed during the spring and summer; it is proposed to burn over infested waste lands which is done by means of a machine which throws out a spray of oil which burns so rapidly that the eggs and caterpillars are destroyed without injury to the trees, then the trees are burlapped and examined, and eggs laid during the season are so far as possible destroyed. Roads would be examined with special care to prevent caterpillars from dropping on passing teams and being thus carried to uninfested localities.

UNIVERSITY AND EDUCATIONAL NEWS.

AT a meeting of the convocation of the University of London on January 21st a resolution was passed, 460 votes being in its favor and 240 against it, favoring what is known as the Cowper Commission Scheme for the consolidation and reconstruction, of the examining and teaching institutions of London. It should be remembered that the University of London does not give instruction, but only grants degrees on examination, whereas there are also in London two or more colleges which give instruction but do not grant degrees. It is universally admitted that some reform is needed, either that the teaching institutions should be consolidated and permitted to confer degrees on their students, while the University of London remains purely an examining body, or that all the institutions should be united. As appears from the above vote, the members of the convocation of the University of London attending the meeting favored the latter plan, but it is claimed that it would not have the approval of a majority of all the graduates.

A PUBLIC meeting has been held in Albany urging the removal of Union University from Schenectady to that city, and it is understood that the matter will be seriously considered by the trustees.

MR. JOSEPH BANNIGAN has given $4,000 to the Catholic University of America, and has made known his intention to donate for twelve years $4,000 a year for library purposes.

BY the will of the late Mrs. Doyon, the University of Wisconsin has received $5,000, the income of which is to be devoted to scholarships for young women.

Two scholarships of $2,000 each have been presented to Tufts College, one by Mrs. A. B. Perkins and the other by J. S. and H. N. White.

DR. L. TRENCHARD MORE, of St. Louis, Mo., has become an assistant in physics at the Worcester Polytechnic Institute.

DISCUSSION AND CORRESPONDENCE.

THE INVERTED IMAGE ON THE RETINA.

EDITOR OF SCIENCE: Prof. Brooks can hardly hope that there should be any consensus among scientific men in regard to the difficult question whether we know or do not know whether the lower animals have or have not consciousness, if there are still distinguished scientists who think that there is anything which needs explanation in the fact that the image on the retina is inverted, or that the question will continue to be a subject for discussion for centuries yet to come. As long as we do not *feel* that the image on the retina is inverted, as long as we are not aware in consciousness that

there is an image or a retina, however much we may have formed the one and dissected the other, it makes no difference whether the image is inverted or not. With a proper distribution of nerve ends we could get on perfectly well with a three-dimensional image formed in the vitreous humor in the interior of the globe of the eye—what was once supposed to be the scheme of vision, a scheme which would have had the immense advantage of saving us a lot of thinking in the effort to understand how we see out- and in-ness. We could also get on perfectly well if the flat image which is actually produced were broken up into a thousand parts, and the parts distributed upon the retina in any confused order whatever, provided the order were a perfectly fixed one, and provided also (possibly) that the eyes were immovable in the socket.

While we are not conscious of the image nor the retina, we are conscious of the movement of the eye in the socket. With the present arrangement, when we reach the hand upward to touch an object, we also move the eye upward to fixate it, that is, the front half of the ball of the eye, which is the part we are familiar with on account of seeing its motion in other individuals and in our own mirror. If the image were not inverted and we had to move the eye to the left at the same moment that we move the hand to the right, there would then be something to be explained, though this incongruity would doubtless be perfectly overcome by experience.*

I touched my little girl of eleven with a pencil point on one corner of her eye and asked her what she saw. "I see a round whitish spot over there," she said. "Is it not strange," said I, "that when I touch you on the right, you see something on the left?" "No," she said, "I do not think it is strange at all." What, said I to myself, Prof. Le Conte is then right, and all the psychologists are wrong—this child is aware that rays of light cross within her crystalline lens, and that when she sees an object on the left it is because her retina has suffered an affection on the right, in spite of the fact that she has never heard of retina or of crystalline lens? But on questioning her farther I found that this was not the case. She had formed a rapid hypothesis to account for the otherwise unintelligible fact, namely, that the pressure of the pencil was communicated straight across the eyeball and affected it on the opposite side. It had not entered into her mind to conceive that a sensation on the right was not due to something going on in the right hand half of her eye, and she had no intuitive idea of projection through a point.

The psychologist's view is thus summed up by Professor James (*Principles of Psychology*, II., 42): "I conclude then that there is no truth in the 'eccentric projection' theory. It is due to the confused assumption that the bodily processes which cause a sensation must also be its seat. It is from this confused assumption that the time-honored riddle comes of how, with an upside-down picture on the retina, we can see things right side up. Our consciousness is *naïvely* supposed to inhabit the picture and to feel the picture's position as related to other objects of space. But the truth is that the picture is non-existent, either as a habitat or as anything else, for immediate consciousness. Our notion of it is an enormously late conception. * * * Berkeley long ago made this matter perfectly clear (see his Essay towards a New Theory of Vision, §§ 93–98, 113–118)."

Külpe, in his *Outlines of Psychology*, has attached himself to the position of James and Stumpf (and James mentions Professor Le Conte as one of the two or three writers who have given him most aid and comfort in supporting his position) to the effect that retinal impressions are from the first endowed with a spatial quality, in opposition to Helmholtz and others, who regard visual space sensation as purely a system of signs for effecting a one-to-one correspondence with tactual space sensation. To Professor James' argument, which is already inexpugnable, Külpe adds the testimony of a

* If the eyeball be moved up and down by the finger, objects looked at seem to move also. Prof. James has suggested that some one try the experiment of moving the eye in this way for many hours at a time, and he predicts that here also experience would have her perfect work, and that in time this apparent motion of objects would no longer take place.

fact of pathology, which by itself would be enough to settle the question—the rare cases, namely, of metamorphopsia. It sometimes happens that a piece of the retina is detached by means of a wound, and that it afterwards grows on again in a wrong position, and vision is regained, but things are out of place. A case has just been reported before the Italian Ophthalmological Society, in which distorted vision occurred over the portion of the retina affected, the inversion being from right to left, but not also up and down (showing, therefore, in addition, that the retina can still perform its function when it is wrong side out). Such cases as this are also plainly incompatible with a projection theory. C. L. F.

BALTIMORE, MD.

MARSH GAS UNDER ICE.

PROF. REMSEN'S note under the above title in SCIENCE for January 24th, p. 133, is of more than local interest. So far as I am aware, the phenomenon of gas spurts through ice has not before been described. As early as the winter of 1878–'79 the writer observed, at West Summit, N. J., the ice on a bog covered with miniature craters and mounds of new ice. These ice accumulations took place about vents up through which came water and gas bubbles, the former charged with the brick-red ferruginous deposit at the bottom of the bog. Frequently the vent was along the side of a blade of bog grass. During the winter, the surface of the ice on the bog become very rough by the additions made in this way. The flocculated bog ore thus brought to the surface was, during times of rain and thaw, washed into the neighboring stream, so that the process tends to retard the growth of bog ore deposit. Similar outbursts may be observed during the winter where a coating of ice forms over a lawn which has been treated with ordinary manure in the autumn. Gas spurts break out after a period of continued cold, and the surface of the ice becomes discolored with the products urged up by the escaping gas. An instance of this action was to be seen on the grounds of the Museum of Comparative Zoölogy at Cambridge last winter. It would be of some importance in glaciology to ascertain what part this escape of gas plays in the breaking-up of the ice on shallow ponds and lakes. J. B. WOODWORTH.

CAMBRIDGE, MASS., January 27, 1896.

ETHNO-BOTANIC GARDENS.

THE purposes of a museum are twofold: First, it is to be a place of instruction where the general public can resort for information as to objects from distant or foreign lands; second, it is to be a place for scientific research. A museum fulfills its purpose best when both of these objects are kept in view. The collections should be so arranged as to teach the public by object lessons, and at the same time be adapted for scientific work. Most of our colleges have kept these objects prominent in the fore front, and many of them have arranged synoptical collections for the instruction and edification of visitors. Several of the larger institutions of learning, notably Harvard and the University of Pennsylvania, have buildings set aside for museum purposes, and it is, therefore, to them that we must turn when we desire to study the operation of museums with educational views and aims.

The University of Pennsylvania proposes to erect, in the near future, a series of museum buildings, which will bring the institution into closer touch with the general public, and at the same time give the students in the several departments a chance for original research work. It is intended by the University authorities to place the buildings in a public park to afford better light for exhibition purposes, and so as to display to better advantage the architecture of the structures. A separate building it is planned will be devoted to archæology and ethnology. Such a building is badly needed at present, for the anthropological collections in general have accumulated to such an extent as to crowd the space in the library now allotted to them.

The opportunity is presented when these buildings are erected to construct an ethno-botanic garden in connection with the public park. It is to the outlining of the purposes of such ethno-botanic gardens, in general, that this article is directed.

1. Only aboriginal American plants should find a place in such a garden. No plant can be found more graceful than maize, a grass asso-