ter. The *Chronicle* refused to print it, but offered to correct any misstatements in its article, an illusory offer in relation to such a tissue of inaccuracies, and one which we had no desire to accept.

We think it right that the scientific professions should know the attitude which the conductors of some newspapers consider themselves justified in adopting towards scientific workers, and we wish to record in your columns, once for all, that protest which they have not permitted us to make in theirs.

G. N. Stewart,
C. C. Guthrie.

Chicago, April 3, 1905.

Sir:—In yesterday's issue of your paper there occurs a garbled and misleading account of certain experiments communicated by us to a meeting of physiologists of the central states. We are entirely opposed to the discussion of such matters in the lay press. If any reporter was present at our meeting he certainly was there without invitation or permission. We do not know from what source this remarkable piece of copy reached your office. But we can not think the writer has fully considered how injurious such notices may be to the reputation of scientific investigators; and while we entertain the greatest respect for your paper in its proper sphere, we must beg of you in the future to do us the honor of leaving us and our work alone. We trust that you will give this letter the same publicity as the paragraph to which we object.

We remain, yours truly,
(Signed) G. N. Stewart,
C. C. Guthrie.

A MODEST STUDENT OF ANIMAL PSYCHOLOGY.

In the preface to 'The Watchers of the Trails' its author, C. G. D. Roberts, writes:

> The psychological processes of the animals are so simple, so obvious, in comparison with those of man, their actions flow so directly from their springs of impulse, that it is, as a rule, an easy matter to infer the motives which are at any one moment impelling them. In my desire to avoid alike the melodramatic, the visionary and the sentimental, I have studied to keep well within the limits of safe inference. Where I may have seemed to state too confidently the motives underlying the special action of this or that animal, it will usually be found that the action itself is very fully presented; and it will, I think, be further found that the motive which I have here assumed affords the most reasonable, if not the only reasonable, explanation of that action.

On page 221 of the same book the author writes:

> As the raccoons crept along behind the woodshed they smelt traces of a sickly pungent odour, and knew that other marauders had been on the ground not very long before. This made them bolder in their enterprise, for they knew that such depredations as they might commit would be laid to the account of the skunks, and, therefore not likely to draw down vengeance upon the [raccoon's] den in the sycamore.

Maynard M. Metcalf.

The Woman's College of Baltimore,
March 19, 1905.

A NEW FORM OF STEREOSCOPE.

To the Editor of Science: I read with interest Professor Whitman's account of his new form of stereoscope in your issue of April 7. I have described the same type of instrument in Science, Vol. VII., p. 619. I was led to the invention thereof by the instrument called the perspectoscope which mistakenly attempted to get a stereoscopic effect from a single photograph, but in doing so used the convenient device of placing the eyes at right angles to the picture. Using this principle, I made an apparatus with pivoting mirrors which enabled me to throw one of a pair of stereoscopic images into the one eye, and the other into the other, just as Professor Whitman has independently done. I have used this both in combination with weak lenses and without them. I have had such an apparatus in my laboratory for about seven years.

The main advantage of the instrument (its defects are well defined by Professor Whitman) for the psychological student is that it offers a simple means of reversing the perspective without changing the card, throwing the image of the right-hand picture into the right or left eye and correspondingly for the left eye, thus producing a stereoscopic or a pseudoscopic effect; indeed, an intermediate position in which the same view is thrown into each eye is also possible and thus gives the entire range of combinations. The Chicago

Laboratory Supply Company is now making some of these instruments to serve as reversible stereoscopes. In their manufacture the difficulties of projection of the two images to differently situated planes have been encountered, and have been met only by reducing this to a minimum and counting upon the fortunate property of the eyes to ignore or, indeed, to make terms of peace with this discrepancy. I find that this is easy, when an ordinary photograph with no sharp gradations of light and shade is used; but with diagrams the non-correspondence of top and bottom is moderately disturbing. I have not hesitated for purposes of convenience to combine lenses with this reflecting stereoscope; but I shall profit by Professor Whitman's suggestion to see how far the increased proximity of the eyes to the mirrors, which he recommends, will obtain certain of the advantages which I tried to secure by weak lenses. This last variation is a detail of construction in which Professor Whitman's device differs from mine.

JOSEPH JASTROW.

UNIVERSITY OF WISCONSIN,
April 8, 1905.

SPECIAL ARTICLES.

A REVISION OF THE COCCACEÆ.*

THE classification of the bacteria presents peculiar difficulties for several reasons. Morphological distinctions are so slight that physiological characters must necessarily be invoked in order to separate and classify the various organisms, and these physiological characters are often variable. Pathogenicity may be taken as a type of those powers of the organism which are easily and profoundly modified by external conditions. On the other hand, there are numerous characters which appear to be extremely constant. Such minute differences as occur in the resistance of different races to unfavorable conditions often remain unchanged through long periods of cultivation. In using these constant characters for classification we are met by another difficulty. Though constant, the differences are very minute, and in studying a number of organisms a perfect gradation is often found between the widest extremes. This is exactly what should be expected from organisms which reproduce only by asexual methods since it is the fusion of independent cells which swamps minor differences producing the uniformity of species among higher plants. With asexual reproduction every minute variation which is inheritable must persist unchanged until some other chance variation occurs. Each such variation means a new and different type of bacterium.

The immense number of generations which may succeed each other in a short space of time makes boundary lines as shifting as they would become among the higher plants if a dozen geological epochs were considered all at once.

Since with unicellular organisms acquired characters may probably be inherited in a higher degree than with other forms, existing races of bacteria will be markedly influenced by the selective effect of environmental conditions, and must bear the impress of their recent history.

There are, therefore, no species among the bacteria in quite the sense in which we ordinarily use the word,—as indicating a group of individuals bound together by a number of constant characters and easily identified by mutual fertility. From one point of view each distinct race might be considered a species; but to apply a name for every grade of difference in each varying character would be impracticable; and such names could have no true specific value. The best solution of the difficulty is the establishment of certain types around which the individual organisms may be more or less closely grouped; but it must be clearly recognized that the groups thus formed are defined by relation to the type at their center and are not sharply marked off at their extremities from the other groups adjacent.

It is impossible to make a natural classification of the bacteria, which shall be a true expression of phylogeny by considering a single character at a time,—for example, by dividing a group dichotomously, first according to mor-

* Preliminary communication. From the Biological laboratories of the Massachusetts Institute of Technology.