sis of ocular paralysis cannot be made with certainty, and Dr. Savage's differentiation (on pp. 514 and 515) is hence inadequate, and, if strictly adhered to, would often mislead. In particular, it may be said that the tilting of the false image, upon which he relies for his diagnosis, is a very unsafe guide, being often absent and sometimes transferred to the image formed by the non-paralyzed eye. This part of the book, in fact, must be characterized as quite unsatisfactory.

It is not necessarily true, as stated on page 517, that in comitant squint there is no diplopia. In many, indeed in their beginning probably in most, cases of comitant squint there is a diplopia, which, in distinction from that of a paralytic squint, remains the same in all parts of the field.

Objection must also be raised to his statement that in oblique directions of the gaze, the obliques act to keep the vertical meridians of the two eyes not only parallel but also always vertical. This certainly runs counter to a vast mass of anatomical and physiological data accumulated by various observers, and seems to be supported by no direct proof, being based solely on *a priori* reasoning.

The author's well-known views on cyclophoria, its production by oblique astigmatism, and its correction by means of cylinders, are given full place in the book. The reviewer has not seen reason to concur in these views nor to consider cyclophoria as an important element in muscular anomalies.

There are various other points regarding which the reviewer would take issue with the author, such as his notion that in esophoria the presence of a certain amount of hyperopia necessarily argues that a certain proportion of the esophoria is false or accommodative (p. 198); his failure to recognize divergence anomalies; and in general his tendency to attribute muscular anomalies too exclusively to disturbances in the tension and action of the muscles *per se*, rather than to disturbances of the conjugate centers, particularly those for convergence and divergence. We have good reason for thinking that it is in these centers that most motor anomalies arise, so that in their origin at least such anomalies are usually bilateral, affecting the movements of both eyes equally, while the muscles *per se* are normal at the outset, and do not become affected until later on.

Enough has been said, however, in the way of criticism, and it seems fitting to close with a word of hearty praise for the many original ideas that the book contains; for the author's skill in their presentation; for his fairness in dealing with the work of others; and finally for the many happy suggestions that he puts forth, particularly as regards treatment, whether by exercise or by operation.

ALEXANDER DUANE.

NEW YORK CITY.

SOCIETIES AND ACADEMIES.

THE TEXAS ACADEMY OF SCIENCE.

AT the meeting of the Texas Academy of Science, held in the Chemical Lecture Room of the University of Texas, February 21, 1902, Dr. William Morton Wheeler, Professor of Zoology, presented "A Consideration of S. B. Buckley's 'North American Formicidæ'" (by title), and delivered an illustrated lecture on 'The Principles of Acceleration and Retardation in the Development of Animals.'

At the meeting of April 25, Mr. E. T. Dumble, of Houston, read a paper on the 'Cretaceous and Later Rocks of Presidio and Brewster Counties,' which is of interest on account of the prominence now given the last-named county, owing to the discovery and development of quicksilver deposits in the Terlingua District.

The second paper on the program was presented by Dr. William L. Bray, Professor of Botany in the University, who discussed 'The Present Status of Forestry in Texas.' Many excellent views, illustrative of the subject, were thrown upon the screen.

The formal meeting of the Academy was held in the Chemical Room of the University on Wednesday, June 11, at 3:30 P.M.

President J. C. Nagle announced the result of the election of officers for 1902–1903, which is as follows: *President,* Robert A. Thompson, M.A., C.E., Expert Engineer to the State Railroad Commission; *Vice-Presidents,* Professor O. C. Charlton, M.A., late of

Baylor University, and Professor J. C. Nagle, of the Agricultural and Mechanical College of Texas; *Treasurer,* Dr. H. Y. Benedict, Adjunct Professor of Mathematics and Astronomy in the University of Texas; *Secretary,* Dr. Frederic W. Simonds, Professor of Geology in the University of Texas; *Librarian,* Dr. William L. Bray, Professor of Botany in the University of Texas; *Members of the Council,* Hon. Arthur Lefevre, State Superintendent of Public Instruction, Henry Winston Harper, M.D., F.C.S., Professor of Chemistry, University of Texas, and Dr. William Morton Wheeler, Professor of Zoology in the same institution.

The first paper on the program was on 'Consciousness and Purposive Movements,' by Dr. Edmund Montgomery, of Hempstead, Texas.

Professor S. E. Mezes, of the University, discussed 'Some Fundamental Characteristics of the Extensity of Sensations.' He pointed out that every sensation has a local sign embedded in it, different, roughly speaking, from every other local sign, and that sensations, therefore, constitute, from this point of view, a manifold of differing elements. This manifold is, however, continuous, and not discrete; for any two local signs, *A* and *L,* whose difference is barely discernible, are less similar to each other than either is to other local signs, *e. g., B, C, J, K,* and this is precisely the distinguishing characteristic of a continum. Another very fundamental characteristic of our extensity experience the speaker found in the arrangement of local signs and their sensations in tridimensional extent. The basis of this he found in our organic and muscular sensations coming from within the skin, which are always present as a totality in waking moments, and which in their totality constitute, as immediately felt, a tridimensional bulk. And it is because of their relations to our tridimensional cenesthesia that special sensations are located in tridimensional space. First, largely by virtue of the changing relative positions of different parts of the body, there arises ontogenetically a sense of empty space surrounding the body, and largely because of the contrast of double and single touch there arises a sense of filled space outside the body. Here it was insisted that touch intrinsically locates its objects outside the surfaces of the body, and *in the third* dimension relative to that surface. Moreover, all the special senses, probably in virtue of being daughter senses descended from the mother sense of touch, were found to locate their objects in tridimensional space. Cheseldens and other cases were quoted to show that vision never presents a colored surface only, but at the worst a colored surface located *in the third* dimension, a point that has been strangely overlooked. And with local signs of depth thus present in vision, even under the least favorable conditions, it was considered at least possible that these same local signs were competent, when developed by practice, to substitute objects in proper perspective for the surface seen antecedent to practice.

Professor H. Ness, of the Chair of Botany in the Agricultural and Mechanical College of Texas, spoke on 'De Vries' Mutation Theory,' which has recently attracted widespread attention.

Mr. W. H. von Streeruwitz, of Houston, a former geologist on the State Geological Survey, who had recently returned from a protracted visit abroad, spoke upon 'Mining—With some Account of Russian Practice.'

The last paper was of a very practical character, being an exposition of 'New Departures in Cotton Mill Machinery and Appliances,' by Messrs. Stonewall Tompkins and W. E. Anderson, Mechanical Engineers of Houston.

Part II., completing Volume IV. of the *Transactions* of the Academy, has been received from the printer and is now being distributed. The following is the table of contents: 'The Influence of Applied Science,' the Annual Address by the President, Professor J. C. Nagle; "A Consideration of S. B. Buckley's 'North American Formicidæ,'" Dr. William Morton Wheeler; 'The Silt Problem in Connection with Irrigation Storage Reservoirs,' Professor J. C. Nagle; 'The Water Power of Texas,' Professor Thomas U. Taylor; 'Reptiles and Batrachians of McLennan County, Texas,' John K. Strecker,

Jr.; 'The Red Sandstone of Diabolo Mountains, Texas,' E. T. Dumble; 'Cretaceous and Later Rocks of Presidio and Brewster Counties,' E. T. Dumble; 'A Preliminary Report on the Austin Chalk Underlying Waco and the Adjoining Territory,' illustrated with half-tone engraving, John K. Prather; *Proceedings* of the Academy for 1901; List of Patrons and Fellows; List of Members; Constitution, in all covering 138 pages.

Frederic W. Simonds.
University of Texas.

Discussion and Correspondence.

Iridescent Clouds.

To the Editor of Science: The letter of Mr. Ward in Science of July 4, concerning iridescent clouds, leads me to record my observations of similar phenomena. From my own observations, covering five years in Princeton, Williamstown, Mass., and Baltimore, and seven years in Boulder and Denver, Colo., I am led to think that iridescent clouds are of very much more frequent occurrence in Colorado than in the Eastern States. And they occur much more frequently near the mountains than at a short distance out on the plains.

Boulder is situated immediately at the base of the eastern foothills of the Rocky Mountains, these foothills being from 1,200 to 3,000 feet higher than the plains, upon the edge of which the town is built. Just above these foothills a stratus cloud sometimes forms, especially in winter, whose lower edge is often bordered with a band of color, frequently very bright and clear. These colored bands occur from ten to twenty minutes after sunset. The cloud usually lies at a distance of 5° or 10° above the horizon and is often almost absolutely horizontal. The colors extend along the lower edge for a distance of 15° to 30°, being about 1° or 2° wide.

At other times I have seen great patches of cirrus clouds which were most beautifully iridescent. One of these I saw at about eleven o'clock which covered a space perhaps 5° or more each way and which was about 15° or 20° east of the sun. It lasted for ten or fifteen minutes, there being very little motion of the clouds on that day. At other times I have seen many small patches of color, mostly bluish-green and pink, appearing simultaneously in light cirrocumulus clouds. These usually occur about the middle of the afternoon. I have on a single occasion observed a similar effect produced by the full moon.

Denver is situated about twenty miles from the foothills. Although I have not kept a record, my observations during the last two years convince me that these cloud colors are seen much less frequently here than in Boulder.

I wish also to speak of a related phenomenon of very much less frequent occurrence. On July 5, I was looking toward a nimbus cloud from which the rain was apparently falling beyond a mesa which lies about five miles east of Boulder. It was between four and five o'clock in the afternoon. There appeared in the cloud a patch of rainbow colors about 10° long by half as wide. The colors were in the order of the rainbow, but the bands were very much broader and quite irregular. The colors lasted for ten or fifteen minutes. The position of the sun precluded the possibility of the colors being produced in the same way as in an ordinary rainbow.

I have but once before observed the same phenomenon. In the spring of 1895, I was teaching in Grand Junction, which is situated in the valley of the Grand River in the western part of the state. To the east of the town at a distance of about thirty miles the Grand Mesa rises to a height of 5,000 or 6,000 feet above the valley. On May 1, I observed a nimbus cloud, from which rain could be seen falling, lying in the eastern end of the valley and so low that the top of Grand Mesa could be seen above it. About half past three I saw in this cloud a strip of color extending north and south about 10° and about 5° wide. The red was above and about 10° or 12° from the earth. (These data are copied from my diary of that date.) The colors were quite as bright as in a brilliant rainbow and included all the colors of the rainbow. As in the former case, the position of the sun made it impossible to explain the production of the colors on the basis of the theory of the rainbow.

High School, Denver. E. Waite Elder.