application. The author has now in hand a similar determination of proper motions of all stars fainter than the eighth magnitude for which suitable data can be obtained from the earlier double star observations of the Struves.

Photographs of Comet 1903 c (Borelly): Sebastian Albrecht.

This paper gave a preliminary account of results obtained from thirty-seven photographs of the comet taken at the Lick Observatory. The photographs show that the comet had two distinct types of tails—one very much curved and short, never much exceeding a degree and a half in length, the other long, and in its general direction straight. Measures of the long tail show that its average lag behind the radius vector was less than two degrees.

The period from the 22d to the 26th of July was one of unusual activity in the comet. The plates of July 23, 24 and 26 show detached portions of the main tail, indicating changes in the emission of cometary matter from the head. From a comparison of the Lick plate of July 24 with two plates of the same date taken at the Yerkes Observatory and one taken at Nanterre, an average recession from the head of thirty-five miles per second was obtained for a detached section of the main tail. This is equivalent to thirteen miles per second relative to the sun.

The paper was accompanied by slides showing the principal features of the comet.

A more complete account of results will be published in a Bulletin of the Lick Observatory.

The Eros Parallax Photographs at the Goodsell Observatory: H. C. Wilson.

Some of the results of the measurements of photographs taken with the eight-inch photographic telescope at the Goodsell Observatory were exhibited. A rough solution of the equations derived from the best situated plates gives for the solar parallax 8″.799. Similar equations from the published results from photographs taken at the Bordeaux and Paris Observatories give for the parallax 8″.798 and 8″.794 respectively.

W. S. Eichelberger,
For the Council.

SCIENTIFIC BOOKS.

L'Année psychologique. 9me Année, 1902. Publiée par Alfred Binet. Paris, Schleicher Frères et Cie. 1903. Pp. 666.

This ninth number of the yearly publication issued from the psychological laboratory of the Sorbonne is rendered especially notable by the clear and acute analysis which M. Binet gives of the oldest of the problems of experimental psychology. His conclusions are at variance with all the prevailing ideas concerning the measurement of the threshold for the discrimination of sensations of contact. Since Weber first introduced the problem, it has been believed, and the researches of numberless experimenters have seemed to confirm the belief, that this threshold of tactile sensibility could be definitely determined, and that it was uniformly lowered by practise. M. Binet asserts that what has been measured is not the acuteness of tactile discrimination, but a manner of judging, of interpreting; that the threshold itself practically can not be determined; and that in all probability practise does not alter its real position.

The original articles in this number, of which there are three besides that just mentioned, cover 252 pages. They are followed by 255 pages of bibliographical analyses of nearly 80 books and articles; and by the international Bibliographical Index for the year 1902. Analysis of the original articles follows.

(1) P. Malapert: 'Inquiry Concerning the Feeling of Anger in Children' (pp. 1–40). This is a presentation of the results of a questionnaire sent out in 1900 by the newly founded Société libre pour l'étude psychologique de l'enfant. The author remarks upon the ambiguity of some of the questions, the

uncertainty concerning the figures given and their interpretation, and the general difficulties attaching to this method of investigation; and then discusses his facts under three headings. I., 'General Statistics': 183 observations are given, of which 141 were on boys and 42 on girls. Children of normal intelligence, of normal height and of good health are subject to anger, in even greater proportion than those less well endowed. Paleness is a frequent characteristic of anger, as well as hyperæmia, a fact neglected by many previous observers. Secretions are augmented sometimes. Innervation of the voluntary muscles is increased, but is uncoordinated and spasmodic. Tears appear at the close of an attack in a very large proportion of cases. The malign influence of heredity is very apparent. In all but 20 per cent. of the cases the attacks of anger have diminished in violence and frequency with increase in age. II., 'Different Forms of Anger; Irascible Children': Two fundamental types of anger are distinguishable, the one defensive and the other offensive, both connected with the instinct of self-preservation. Considerable space is given to the demonstration and description of the former type, which had not been recognized by M. Ribot. Children of a pronounced irascible type show the influence of ill-health and of hereditary taint more strongly than do the others. Anger is rarely due primarily to example. III., 'Pedagogical Considerations': Hygienic measures are as important as moral ones. The method of cure must be adapted to the individual nature. It is essential that some image, idea or feeling, profoundly incorporated within the mind and awakened by the very fact of the arousal of anger, should oppose the latter and dominate it. Corporal punishment is often beneficial. The application of cold water is preferable. In general, motives of an intellectual and moral nature are best of all.

2. B. Bourdon: 'On the Possibility of Distinguishing the Sensations from the Two Eyes' (pp. 41–56). It is possible to distinguish which eye receives an impression, when the impressions received by the two eyes differ in intensity, in distinctness or in the number of details. The distinction is due to a subjective phenomenon consisting in a sensation of heaviness or constraint in the eye which receives the impression less strong, less clear or less rich in details, and in a feeling of lightness or of facility in the other eye. The author believes, contrary to the opinion of Brückner and Brücke, that these feelings have a peripheral origin, being due probably to sensations from the muscles or tendons of the eye. Feebleness of retinal excitations leads to a low degree of innervation of eye muscles, involving a greater degree of effort in fixating, hence a feeling of heaviness or constraint. An objective phenomenon, consisting in a shadow accompanying the luminous point, sometimes appears. It can be shown that this it not due to excess of convergence when both eyes view the point, as has been surmised, but that it is closely related to the subjective phenomenon.

3. A. Binet: 'Writing during States of Artificial Excitation produced by Work of a Graphic Nature' (pp. 57–78). The author had previously observed in experiments on hysterical patients that in states of excitation writing became larger and its lines thicker; and in tests on school children that marks made in crossing out certain letters from a printed page became longer, thicker and more inclined when the task was rendered more difficult by habituating them to one set of letters and then giving them another group to cross out. He now tries a series of experiments on normal persons, in which a phrase is first written correctly and then rewritten with the vowels omitted or with other vowels substituted for the correct ones. The change from the relatively mechanical act of normal writing to a task involving a greater degree of attention and effort causes the letters to be written larger, better and often detached from their neighbors. The fact is accounted for probably by a more vivid representation of the letters, by a desire to make the incorrectly written letters legible, and especially by an attendant diffuse excitation of the movements of writing.

4–9. M. Binet divides his discussion on the 'Measurement of Tactile Sensitivity' into six separate articles (pp. 79–252). They all to-

gether, however, form a unitary paper, and it will be more convenient to analyze them together. The primary object of the research is an investigation into the possibility of any true measurement of tactile sensitivity.

(*a*) *Introductory Discussion; Methods.*—The different meanings of the term sensitivity are discussed. Much space is given to an account of Weber's researches, a little to that of his successors. Tawney's recent analysis of the Vexirfehler (mistaking of one point for two) is very significant, and really throws doubt on the very possibility of determining a threshold. There have been grave errors of method in all previous researches. The æsthesiometer should be one capable of exercising a known and equal pressure on both points stimulated; of stimulating them simultaneously, or, in case simultaneity is not attained, of registering the fact; and of regulating and recording the rapidity of application of the stimuli. The author describes such an instrument. The method of minimal changes is faulty in that it introduces suggestion strongly and gives the subject too slow an adaptation to the difference between the feelings attending small and large distances between the points. The threshold given by the method of right and wrong cases is a mere convention. A mixed method, that of irregular variations, is preferable. It consists in arranging a series of minimal differences, but applying them in irregular yet uniformly determined order. There is a serious disadvantage in employing as subjects laboratory students exclusively. Most important of all is the giving of full psychological indications. It is necessary to take account of the subject's degree of acquaintance with æsthesiometry, and of everything that is said and done which has any relation to the study of tactile sensitivity. It is a mistake to confine the responses of the subject to the simple words *one* and *two,* and when he is doubtful, to make him guess or to count the doubtful cases half to the correct and half to the incorrect replies. A long and minute analysis of everything that is felt should be exacted, since the states of consciousness are very complex and variable. It is essential to guard against distraction and to recognize it when it occurs; this can, perhaps, be accomplished best by requiring the subject to estimate the distances between the points. This procedure has the further advantage of furnishing a control as to the correctness of the replies concerning the number of the contacts. The author quotes frequently from his records of every word that was spoken during his sittings and of all facts that might have any possible bearing upon them, and the insights gained thereby into the intricacies of the conscious processes and into the influence of suggestions of all sorts, revealing facts to which a bare enumeration of numerical results would have given no clue, amply justify his insistence on the essential importance of such records.

(*b*) *The Simplists.*—There are certain persons who make no errors for the single point (no Vexirfehler); few errors for points separated by small distances (*i. e.*, they call them almost uniformly *one*); whose threshold is obtuse and well-defined; and who after practise lose their exact perception of the single point and begin to make mistakes. These the author calls '*les simplistes.*' Now Clavière has shown that between the definite sensation of a single point (A) and that of two distinct points (C) there exists a series of intermediate sensations (B) of a single contact of varying thickness. The simplists are those who interpret sensations B as meaning a single contact, whether or not they know that all the stimulating points are of the same thickness. The author found such among school children, who were informed in advance that only one or two stimulating points were to be used and that the number of stimulating points felt was the information desired of the subject; and among adults to whom absolutely no preliminary instructions were given, who knew nothing of æsthesiometry, nothing of the nature of the points used nor of the object of the experiment, and who, after a long series in which they had at first occupied themselves with considering the character of the stimulating object or with the thought of possible painful sensations that might be inflicted, arrived spontaneously at the idea of indicating the number of contacts that were felt. The ab-

sence of preliminary explanation or its exact nature when given has a decisive influence on the character of the replies. The threshold for the back of the hand lies between 1 and 2 cm., and this is the same as the threshold for the difference between sensations *B* and *C*, for persons who deliberately seek to make this distinction. Continued practise tends to introduce Vexirfehler—to make interpreters out of the simplists; and the difference between the more and the less intelligent subjects, at first very marked—the intelligent having a lower threshold and being more subject to the Vexirfehler—tends to diminish. It is interpretation of the sensations, especially those of class *B*, and not improvement in attention or a real lowering of the threshold, that explains these effects of practise.

(*c*) *The Results of Distraction of Attention.*—Distraction may occur when attention is strongly directed elsewhere, or when there is difficulty in fixing the attention at all. The usual method of producing it consists in having the subject execute two tasks at once. When this is tried, the resulting mental states may vary enormously in different persons: there may be an easy and rapid alternation of attention between the two tasks, and thus no distraction; or an irregular alternation, with many errors and confusions; or a fixation in one direction, in which case the second task is suspended or becomes automatic. The author had his subjects carry out long additions aloud, and made contacts when the effort of attention to the figures, as clearly indicated by the voice, was greatest. Cases where attention alternated, going actually to the contacts when they were made, without distraction, could be easily distinguished from those where true distraction occurred, and presented no differences from the normal results. Investigations were made also of cases where distraction occurred as a result of mental revery, and on account of congenital defect in backward children. The effect of distraction is to produce a systematization of the replies, showing itself in an automatic repetition of the same reply, either 'one' or 'two'; or to produce replies that are due wholly to chance. The former effect, systematization, probably characterizes distraction with fixed attention; the latter is produced during distraction with mobile attention, due either to exterior causes or to congenital weakness.

(*d*) *The Interpreters.*—The author had his own tactile sensitivity tested, adopting two mental attitudes: in the one he answered 'two' only when he was certain that he felt two distinct contacts, 'one' in all doubtful cases; in the other he sought to make an interpretation for the doubtful cases, to determine whether the sensations of class *B* were occasioned by one point or two. In the latter case he obtained a lower threshold and more numerous errors for the single contact. One of his subjects exhibited in early trials a threshold of 1.5 cm.; a year later, one of 0.5 cm., but had meanwhile become fully acquainted with the processes and results of æsthesiometry, and this fact alone accounted for the difference. In general, the interpreters, who form the majority of intelligent adults, and thus of the subjects who have been employed in researches in æsthesiometry, are characterized (1) by a lower threshold for the 'double sensation,' which signifies not a greater degree of tactile acuteness, but merely a difference of judgment, of mental attitude; and (2) by a larger number of errors for the single contact. There are very many types of interpreters—sceptical, deliberate, unconscious, etc.—of which the author describes several. True hyperæsthesia may exist, and a probable case is described. It reveals itself not merely by the ambiguous apparent lowering of the threshold, which is usually only apparent, but also by an increase in the delicacy with which the distance separating the two points can be estimated for distances lying ordinarily below the threshold.

(*e*) *Influence of Practise and Suggestion on the Position of the Threshold.*—Transform a simplist into an interpreter, and you have an apparent lowering of the threshold. The transformation may take place spontaneously, or it may be due to a suggestion, to seeing or touching the apparatus, to a knowledge that all the points are of equal thickness, to observing that two points very near together give a sensation of thickness, to an expecta-

tion that the threshold will be lowered, to a fear of making errors, to a reprimand, etc. When such influences are lacking, practise has not been found, in the experience of the author, to lower the threshold, and his results agree in this respect with those of Tawney.

(*f*) *The Threshold of Double Contact can not be Determined Scientifically.*—For a simplist there is a determinable threshold. But every simplist is a latent interpreter. The determination of the threshold is practically impossible. It varies from moment to moment, and the more one seeks it the less he finds it; and it depends so strictly on the manner of interpreting the sensations, even in the cases where it appears to have a definite position, that one can not be sure that it expresses the degree of acuteness of the organ. Even if all persons had exactly the same degree of sensitivity, apparent differences would appear.

This research is certainly of the greatest value, and no future investigation in æsthesiometry can neglect the facts that it establishes. It seems legitimate, however, to question whether the author's final conclusion is fully justifiable. May it not be possible to make simplists of all one's subjects? To determine the threshold between sensations *B* and *C*, and thus to secure valuable information concerning the relative sensitivity of different regions of the body, of different persons and of the same person at different times and under various conditions?

E. B. Delabarre.

Brown University.

Traité des Variations des Os du Crane de l'Homme, et de leur Signification au point de vue de l'Anthropologie Zoologique. Par M. le Dr. Le Double. 118 Dessins dans le texte. Paris, Vigot Frères. 1903.

A volume of four hundred pages and all on the variations of the cranial bones! Be it noted, moreover, that the word 'cranial' is used in the strict sense, and that, therefore, the facial bones are not included. Ponderous as the work may seem, it is one that will be warmly welcomed by anatomists. It will be of great value not only to those devoted to human anatomy, but to all interested in vertebrate morphology. We are glad to understand that the author intends to continue the study of the variations of the human skeleton and that we may expect next a treatise on the facial bones. His method is that pursued in his treatise on muscular variations, which is already a classic. Side lights from embryology and comparative anatomy are thrown on the questions, while the various and often contradictory views of authors are discussed. It is natural enough that the size of this work should astonish outsiders; yet even anatomists will be surprised at the number of points of variation which present themselves.

There is no possibility of reviewing such a work in detail; but let us mention a few of the points of interest in a single bone in order to show how extensive is its scope. Let us take the first bone, the occipital. We must take up the story of the development of the squamous portion, the difference between the supra-occipital and the epactal bones, the former of which is that part which develops in membrane, while the latter is merely a wormian bone, or several together. On the outside there is the torus and the very rare median crest. On the inside are the endless varieties of arrangement of the venous sinuses (which the author attempts to classify), the torcular fossa, and the middle cerebellar fossa. Here as elsewhere the author is very severe on Lombroso and his school, who, as is well known, make much of the latter fossa as a criminal feature. He exclaims: "Must we consider Scarpa a madman or a criminal because his occipital, like that of Charlotte Corday, had a vermian fossa? If a defect in the formation of the skull or of the brain is an index of mental inferiority or of a tendency to crime, how happens it that Dante and Pericles had asymmetrical skulls (with great development of the parietal), that Kant had an interparietal bone, Volta a metopic suture, Byron, Humboldt and Meckel premature closure of sutures, and Bichat one hemisphere much smaller than the other?" For our part, while we have no wish to minimize the absurdities that the followers of the school of criminal anthropology have been guilty of,