observations, as well as on account of the complexity of the curve, such an analysis must always be based on certain biological assumptions. Karl Pearson has shown how difficult an analysis of such curves is. If we assume that the composite curve results from measurements of two coexisting species we make one of many possible assumptions. Natural selection and mixture are two causes which may have effects of a similar character. When, for instance, two distinct types interbreed, and the offspring show a tendency to revert to either parental type, curves will result with two maxima, each representing one of the parental types; but this curve does not originate by addition of the two composing curves; it is much rather an unknown function of these curves. A case of this character was described by me when treating of the anthropometric characteristics of the descendants of Indian mothers and white fathers. On the other hand, when natural selection acts in such a way that a certain group of individuals is least favored, and if these individuals are not far removed from the average type, curves with two maxima may develop. It will, therefore, be seen that the mere existence of curves with two maxima does not by any means signify the existence of two distinct species.

The question of correlation, which has been well set forth by Professor Blankinship, seems a most interesting one, and has received very able treatment at the hands of Karl Pearson, who clearly set forth the theory of this subject. It does not seem likely that this method can be utilized for distinguishing between specific and individual characters. In the same species certain organs prove to be strongly correlated, while others are only slightly correlated; and according to this degree of correlation the proportions will change among various types, and it is probable that the degree of correlation will remain the same among all closely related types.

Since the application of statistical methods to zoology is still in its infancy, it is to be hoped that the study may be taken up according to strict methods, in order to avoid erroneous conclusions.

FRANZ BOAS.

SCIENTIFIC LITERATURE.

J. BOLYAI, *Scientia Spatii Absolute Vera.* With a Magyar translation by SUTÁK J., and a biography by FR. SCHMIDT. Budapest, Schmidt Ferencz. 1897. 8vo. Pp. xxviii + 143.

W. BOLYAI DE BOLYA, *Tentamen juventutem studiosam in elementa matheseos puræ elementaris ac sublimioris methods intuitiva evidentiaque huic propria introducendi, cum appendice triplici.* Budapestini, Sumptibus Academiæ Scientiarum Hungaricæ. 1897. Editio Secunda. Tomus I. 4to. Pp. xii + 679. Price, 50 francs.

Sixty-five years after its issue from the little provincial press of the 'Collegii Reformatorum' in Maros Vásárhely, why does the proud Hungarian Academy of Science reissue, in sumptuous quarto form, a magnificent *édition de luxe,* this strange Tentamen?

Bolyai Farkas (Wolfgang Bolyai) has two unimpeachable certificates of immortality. He was the father of Bolyai János, and he first publicly appreciated Lobachévski. The second of these two titles, though destined to bulk large in the final history of human thought, has never before been explicitly mentioned by any one, so far as I know. I here call attention to it for the first time. If any praise or appreciation of Lobachévski was ever published or printed before 1851, I have never heard of it. In Russia he found only such rude and offensive ironies as fill a criticism in one of the St. Petersburg journals, 'Son of the Fatherland,' 1834, or else complete indifference. The academician V. Bunyakovski in his work, 'Parallel Lines,' printed in 1853, does not even mention the investigations of Lobachévski. Among his own pupils not one worked at his ideas or appeared as their convinced defender.

Vasiliev, Engel and Staeckel give 1866 as the date of the beginning of the movement to recognize the non-Euclidean geometry. Vasiliev attributes the start to the Frenchman Hoüel, 'whom we must remember to-day with gratitude.' Engel in a note to this sentence of Vasiliev's Address traces back the initiative to Baltzer: "Hier haette Baltzer erwaehnt werden sollen, durch den Hoüel erst auf Lobatschefskij und Bolyai aufmerksam gemacht worden war." This was stated by Hoüel himself

in 1867: "C'est aux indications du Dr. Baltzer que je dois la connaissance de ces importants travaux."

Thus interested, Hoüel besought aid of an architect of Temesvár who had written to enquire of him about French mathematical books. The coincidence was most fortunate, for this architect was Fr. Schmidt, whose father, Anton Schmidt, had often told him of a young officer of engineers with whom he always feared to come in contact, who, to prove the might of his arm and the temper of his Damascus blade, was accustomed to show his visitors how with one stroke he could cut off a heavy nail driven into his door-post. This was Bolyai János. The facts collected by Fr. Schmidt in 1867, published in Grunert's Archiv and by Hoüel in 1868, were all the world knew of the two Bolyai for nearly thirty years.

Moreover, the first biographer became a sort of local representative for the world of science in all matters pertaining to Bolyai János. He procured for Hoüel two copies of the exceedingly rare 'Science Absolute,' from one of which Hoüel made his French translation, sending the other to Battaglini, who translated it into Italian, both translations appearing in 1868. In 1872 Schmidt furnished Frischauf the original for his German version. Now in 1897 he publishes at his own expense the Latin, with the first rendering in the native tongue of the author, the Magyar, and a new biography of János, but far too short, nine pages.

The Hungarian Academy of Science, in their costly edition of the father's Tentamen, have so rearranged the material that the immortal Appendix of the son is displaced from the first volume, the only one yet issued. Both the above books are, therefore, needed by one who would contrast the concise elegance of the son, who solved the problem of the ages, with the florid freedom of the father, who had failed.

The 'Science Absolute' has appeared in six languages and a Japanese reprint of the English.

The Tentamen will probably never be translated. Suták points out how it anticipates Riemann and Helmholtz.

(1) Space is continuous (V. I., p. 442).

(2) Rigid bodies exist independent of place, freely movable (principle of congruence, p. 444).

(3) Rigid bodies can move with one or two points fixed, not in general three (p. 446).

(4) Monodromie (p. 447) (motion which continued brings a point again into its first place).

From Lie's reinvestigation results that this fourth principle is a consequence of the others, though here Suták has the hardihood to attack Lie.

This anticipation is carried out consequently, and would have been complete, except that W. Bolyai postulates the infinity of space.

Now follows the first appreciation ever printed of the non-Euclidean geometry. W. Bolyai has the double honor, first to have praised in print each of the two founders of this marvellous doctrine. He was the first convert who dared profess his regeneration openly. The world waited thirty-five years for a second.

One sentence from the Tentamen must serve as specimen of his praise and penetration: "The Author of the Appendix, attacking the matter with singular acumen, comprehending in general (if except the remaining axioms none be assumed) all systems subjectively possible for us (that is, of which one only exists, though which is really true we cannot decide) makes a geometry absolutely true for every case; though in the Appendix of this volume he has given from a great mass only the strictly necessary, much (as the general solution of the tetrahedron, and many other elegant disquisitions) for the sake of brevity being omitted." His praise and discriminating exposition of Lobachévski was printed twenty years later.

In his 'Kurzer Grundriss eines Versuchs' (1851), § 32, speaking of 'the admirable work' of Lobachévski (1840), he says: "This alone is a proof of an extraordinary genius. Probably in the 'gelehrten Schriften' of Kazan University still more is communicated of that wherewith he has made debtor the centuries.

"Here also in the year 1832 appeared at the end of the first (Latin) volume an appendix so very like to that, that to both (since neither had seen the other) must have appeared the same Original of truth after thousands of years."

Then follows a comparison of Lobachévski with Bolyai János, and an elegant characterization of the non-Euclidean geometry.

Fresh after half a century, should not this

strange monument in the history of science find also somewhere speedy reissue?

GEORGE BRUCE HALSTED.
AUSTIN, TEXAS.

The Psychology of Suggestion. By BORIS SIDIS, M.A., Ph.D., Associate in Psychology at the Pathological Institute of the New York State Hospitals. With an Introduction by PROFESSOR WILLIAM JAMES, of Harvard University. New York, D. Appleton & Co. 1898.

Dr. Sidis divides his book into three parts, entitled, respectively, ' Suggestibility,' ' The Self,' and ' Society.' The interest of the first centers in two series of laboratory experiments and is intended to establish the ' Laws of Normal and Abnormal Suggestibility.' The second aims at establishing in every human being the existence of a ' Subwaking Self,' determining its intrinsic character, its relation to the primary self, its physiological conditions, and its relation to the phenomena of amnesia and insanity. The third ascribes to the activity of the subwaking self, stampedes, social epidemics, and in general the peculiar traits of crowd and mob psychology.

Suggestion is defined as ' the intrusion into the mind of an idea; met with more or less opposition by the person; accepted uncritically at last; and realized unreflectively, almost automatically.'

This definition has obviously been framed with the thought of normal suggestibility in mind, for in states of heightened, or, as Dr. Sidis would term it, abnormal suggestibility, the idea frequently meets with no opposition whatever. Nothing is more common than to see such patients anxiously consider and deliberately realize the suggestions given them. To make it apply throughout, the suggestion should be described as an idea which *would be* met with more or less opposition in the normal state, but which in the normal state is accepted, *usually* uncritically, and realized, *often* unreflectively, while in the abnormal state it meets with little or no opposition.

Yet even as thus amended, the definition would require us to show, before any intruded and realized idea can be termed a suggestion, that it would have met with opposition, of which

we have usually no better criterion than such as our knowledge of the tastes and habits of the individual in question can supply.

In Dr. Sidis' series of experiments he endeavored, by very ingenious means, to determine the subject's flow of ideas or to affect his choice of a limited number of alternatives without attracting his attention to the method by which he was influenced. The results are interesting, although one would like to have more precise information as to the conditions under which they were obtained. The main conclusion which Dr. Sidis deduces from these experiments he generalizes into the ' Law of Normal Suggestibility '—' Normal Suggestibility varies as indirect suggestion and inversely as direct suggestion.' Then after a review of the phenomena of hypnosis, he sets over against this ' The Law of Abnormal Suggestibility,' which 'varies as direct suggestion and inversely as indirect suggestion.'

Unfortunately, the distinction between direct and indirect suggestion has nowhere been defined. From the illustrations given, however, we may infer that a suggestion is indirect when it is so administered that it never passes beyond the marginal region. It then remains a mere seed upon the surface of consciousness, never strikes its roots down into the depths below, is merely *apprehended* and not *comprehended*. A normally repugnant intruded idea will then be less likely to arouse opposition and more likely to gain its ends if indirect than if direct, and the first law may be accepted as so far true even without experimental verification. But it should be noted that the numerous cases in which the opposition of the self-consciousness to a direct suggestion is overborne by sheer superior strength of will must be relegated to the class of abnormal suggestions—a more than questionable proceeding.

The second law, however, is by no means true. Increased susceptibility to direct suggestion does not carry with it diminished susceptibility to indirect suggestion. In states of heightened suggestibility, susceptibility to suggestion has no significant relation to the mode in which the suggestion is administered, but rather to the *source whence it comes*. A subject who is acutely sensitive to every suggestion, direct or indirect, that emanates from the person