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Attention is called to the "Wants" column. All are invited to use it in soliciting information or seeking new positions. The "Exchange" column is likewise open.

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MR. SETH LOW, ex-mayor of Brooklyn, has been elected president of Columbia College, to fill the vacancy caused by the death of Dr. F. A. P. Barnard. President Low is an alumnus of the college of which he has just been made the head. He is a native of Brooklyn, and as mayor of that city attained a national fame. The general verdict is that the trustees have done well in selecting a man who has always shown himself equal to the positions of trust in which he has been placed, who is in the very prime of life, being about forty years old, and who has the due scholarly training for his new work.

THE WORLD'S-FAIR FINANCE COMMITTEE met Oct. 8, and received the report of their executive committee. The report of the executive committee was discussed, but not acted upon. After careful examination of the whole subject, the committee report that in their opinion no complete financial scheme can be determined upon until it is approximately known what is the aggregate amount of money to be raised; and this will be largely an open question until the site, plan, and scope of the exhibition are finally agreed upon. It is of first importance that Congress should give to the exhibition a national and an international character by appropriate legal enactment, which should, at the same time, determine its location in this the principal port of entry and metropolis of the country. It is also essential that the exhibition should receive encouragement and assistance from the State and city of New York; and the suitableness and liberality of this assistance must be an important factor in any financial plan which may be adopted, for if direct money contributions are voted, or lands are set apart for the use of the exhibition which belong to or may be acquired by the city, and upon which it may lawfully erect buildings, a very much less sum will be needed than if the committee must raise all the money, or if private property must be leased or purchased. Meanwhile, to show the sincerity and willingness of the citizens of New York, they recommend that steps be taken to raise a preliminary fund of $5,000,000, for which stock should be issued, when authorized by congressional or legislative enactment.

The meeting of the world's-fair committee on site on the same day was largely attended. The chief business was the consideration of a report from the sub-committee on buildings, consisting of Messrs. Towne, Chandler, and Hunt, who were appointed specifically to ascertain in regard to the value of property within the boundaries of the proposed site. In substance the report said that the site should be ample for the construction of five buildings, to cover in the aggregate 65 acres, and 200 smaller buildings, to be scattered over an area not to exceed 250 acres. In regard to the area of the main site, the committee reported that the exposition could be held at Riverside and Morningside Parks and on adjacent private lands, of which there might be needed only 120 acres, but that it could be better accommodated in 200 acres, making the total area of the site from 200 to 270 acres. From all the inquiries that the committee had been able to make, the price of property in that section of the city was about $100,000 per acre, involving an outlay of $12,000,000 or $20,000,000, according to the choice of 120 or 200 acres. When the various amendments had been voted on, the resolution, which was passed unanimously, read as follows: "That the proposed site, which includes Riverside and Morningside Parks, shall be held to comprise such portions of Central Park north of Ninety-seventh Street as are physically available and may be found absolutely necessary for the purposes of the exposition, and also to include adjacent lands fronting on the north and east of Central Park, is in all respects the best; that therefore all efforts should be concentrated upon the acquisition of the needed area in this locality."

MENTAL SCIENCE.

New Experiments upon the Time-Relations of Mental Processes.

WITH the law once admitted that all mental states are definitely related to and conditioned upon physical ones, it would readily follow that mental processes, or at least the physical changes that accompany them, take a definite amount of time for their normal performance. Furthermore, these times can be regarded as an index of the complexity of the act in question; and a comparison of the times taken up by various mental processes will furnish a basis for their classification, and may afford desirable glimpses of the nature of the processes themselves. This is the cardinal thought that has urged investigators to carefully measure those simple acts that lie at the basis of psychic life with all the accuracy that the use of refined and complicated apparatus could furnish. A great many interesting results were obtained, and many theories refuted. Recently the fact has come into prominence that the attitude of the subject, the direction of his attention, exercises a profound influence upon the results, and many observations have been repeated with this fact in mind. Among these the work of Dr. Münsterberg ("Beiträge zur Experimentellen Psychologie," Heft 1, 1889), of the University of Freiburg, merits detailed notice.

As re-actions were to be made by each of the five fingers of the right hand, many preliminary experiments were made with each to eliminate the difference in alertness of the fingers. The fingers pressed down upon the keys of a keyboard, and as soon as a sound (usually a word) was heard the re-action was made by raising the appropriate finger. In this simplest process of executing a move-

ment as soon as an expected sensation has been received, Lange had found a great and constant difference according as the attention was fixed upon the sensation, the expected sound, or upon the movement of re-action. In the first case the subject distinctly waits for the sensation, appreciates it, and then proceeds to move the finger: it is a "sensory" re-action. In the second case the impression is taken in almost automatically, and the desire is to have the finger move the moment any impression is felt: it is a "motor" re-action. The sensory is always longer than the motor re-action. Lange found in three observers sensory times of .230, .223, and .224 of a second; and motor times of .123, .125, and .137 of a second, — an average difference of one-tenth of a second.

I. Münsterberg's sensory time is .162, his motor .120, of a second, — a much smaller difference of only .042 of a second. It is to be noted that the motor times of all the observers agree remarkably well, while their sensory times show individual variations. The explanation of these facts will be attempted after the results of certain other experiments have been given.

II. The next complication consisted in calling out in an arbitrary order "one," "two," "three," "four," or "five," to which the thumb, forefinger, middle finger, ring-finger, and little finger were to respond respectively. This is more complicated, and involves the association of "one" with a movement of the thumb; and so on. As before, one may fix the attention upon the expected sound or upon the movement. The sensory time for the entire process was .383 of a second; the motor, .289 of a second, — a difference of .094 of a second. When making a sensory re-action, the sound is always appreciated; and errors, i.e., raising the wrong finger, never occur. In motor re-actions they occasionally occur, the error invariably consisting in raising a neighboring finger.

III. Here the re-action was the same; but, instead of the words "one," "two," "three," "four," "five," the Latin declension — *lupus, lupi, lupo, lupum, lupe* — was associated with the five fingers, the process being the same as before, but the association more artificial. The result was, for sensory re-actions, .465 of a second; for motor, .355 of a second, — a difference of .110 of a second. Only a single false re-action was made.

IV. The movements of the five fingers were associated respectively with the five members of the three following declensions of German pronouns: *ich, meiner, mir, mich, wir; du, deiner, dir, dich, ihr; der, des, dem, den, die.* This is more complex not only by the change between three series, but by the relatively minute and irregular distinctions between the words. The sensory time was .688 of a second; the motor, .430 of a second, — a difference of .258 of a second. Here errors occurred in the motor re-actions ten per cent of the time, showing the increased facility of confusion. It was noticed, too, that the second finger was often erroneously raised in answer to *du*, apparently on account of its position in the familiar series *ich, du, er*.

V. Here the elements of the process are changed. If a noun is called, the thumb is to be raised; if an adjective, the forefinger; if a pronoun, the middle finger; if a number, the ring-finger; if a verb, the little finger. This very artificial relation was first thoroughly learned by going over the list, raising each finger as the class to which it corresponded was mentioned. All the words were monosyllables, and new words were being constantly used, no word occurring twice. The sensory time was .712 of a second; the motor, .432 of a second, — a difference of .280 of a second. Here errors are very frequent (thirty per cent), but are confined to the motor re-actions.

VI. This series was just like the former except that the categories were "a city," "a river," "an animal," "a plant," "an element;" such as "London," "Rhine," "dog," "rose," "gold." The sensory time was .893 of a second; the motor, .432, — a difference of .461 of a second. Errors occurred in twelve per cent of the motor re-actions.

VII. Here the categories were still more difficult; viz., "an author," "a musician," "a naturalist," "a philosopher," "a statesman or general." Only in a few very prominent cases is this decision easy. The average time was, for sensory re-actions, 1.122 seconds; for motor, .437 of a second, — a difference of .685 of a second. Errors occurred in twenty-five per cent of the (motor) re-actions.

It is to be noted that the cases I., II., and III. involve associations of a finger-movement with but one word: it is an "anticipated" association. In the other cases a more or less wide range of words is to be re-acted upon by the same movement: it is a "free" association. It will have been noticed, too, at what a rapid rate the difference between sensory and motor times increases as the processes become more complex, this difference being sixteen times as great in VII. as in I.

The explanation of the shortening of the re-action time by the motor form of re-action is comparatively simple in Case I. We need only assume, quite naturally, that the fixation of the attention upon the movement really gets ready the innervation (as it were, lights the match beforehand), and is thus immediately ready to make the movement (to set afire the train of powder). But in the following cases not only does this explanation become doubtful (for, inasmuch as it is not known which finger is to be moved, only a general, unspecialized innervation to move *a* finger can be anticipated), but it can only account for .042 of a second of difference, while the real difference progressively rises to sixteen times that amount. We can be quite sure, then, that the shortening takes place in the purely mental process of recognizing a given word as an instance of a more or less general class, and of appreciating that this class is to be represented by a certain movement. While in the four last cases the sensory times rose from .688 to .712, to .893, to 1.112 seconds, the motor time practically remained unchanged,— .430, .432, .432, and .437 of a second. The increase in the sensory time indicates that the processes are becoming mentally more complex. It is more difficult to recognize that a given word (heard only once during the experiments) is a certain part of speech than to recognize a word as one of the same three, *ich, du, der*, or *meiner, deiner, des*, and so on; still more difficult to recognize a concept as belonging to one of five well-known general categories; and most difficult to place a man in one of five special, somewhat closely related professions. But why should these differences disappear by simply fixing the attention upon the movement to be executed? Indeed, according to a current theory, of which Wundt is the acknowledged champion, and which Dr. Münsterberg fiercely combats, turning the attention towards an act shortens the time of its accomplishment; fixing the attention upon the mental, sensory part of the process should shorten the time. This apperception theory, that conçeives the mind as a point in which only a single act has room at a given moment, and through which accordingly the several elements of a complicated process must pass *seriatim*, gives no satisfactory explanation. Dr. Münsterberg regards the true explanation to lie in the fact that in the motor re-actions the several parts of the mental process overlap in time. In the motor re-action we have before us, as it were, five possible movements, each (aided, perhaps, by unconscious tentative movements) ready to be made, and five lines of association along one of which the impulse is coming. The moment the word is sounded, it is referred to the "third-finger-moving category," or whichever it may be, — the intermediate acts of recognizing, let us say, that the word was "frog," that a frog is an animal (and not one of the other four classes), and that when an animal's name is called we must raise the third finger; which acts are gone through consciously and successively, in the sensory re-action being performed almost simultaneously and automatically, or at least subconsciously. This, in Cases IV., V., VI., and VII., would be about the same process, the tracts of association (cortical fibre-connections to concretize the conception) being about equally much used in each case, since their entire use was that brought about by the experiments themselves. We see, too, why it is natural that in the sensory cases errors did not arise, but that in the motor re-action an impulse could readily be switched into a neighboring association-tract. Dr. Münsterberg regards the motor form of re-action as the one more closely corresponding to natual, every-day processes; the sensory re action being a mere artificial, experimental result. When we act and speak, the movement results before we have consciously appreciated the excitation, analyzed it, and referred it to certain categories. It seems to be referred to certain definitely established trains of thought, the reasons for doing so never consciously appearing.

While this explanation is not entirely adequate, it has the advan-

tage of giving a very real interest to the facts, of being in harmony with current psychophysical and neurological conceptions, and of suggesting further experimental inquiry by the results of which it can be substantiated or refuted.

A point unnoticed in the original essay may be here appended. If we compare the gradual increase in the motor times from I. to VII., we find the greatest difference (.169 of a second) in passing from I. to II.; that is, when, instead of re-acting by one certain motion, we re-act according to circumstances by any one of five, — an evident increase of motor complexity. Next, in passing from II. to III., we find a smaller increase of .066 of a second easily explicable by reflecting that we have already had practice in considering the fingers as "one," "two," "three," "four," "five;" and so the connections are easier, while the associations with *lupus*, etc., are new. In passing from III. to IV. we have an additional motor complexity in the fact that each of the association tracts is subdivided into three sub-tracts, and the expectation of the intended movement is accordingly less definite. The time increases by .075 of a second. When these tracts become divisible into an indefinite number of strands, it does not seem to complicate matters, and from here on the motor times are the same. A similar comparison of the increase of sensory times and of the percentage of error will be equally instructive.

An account of further experiments by Dr. Münsterberg will be given in a future number of *Science*.

HEALTH MATTERS.

THE EFFECTS OF ALCOHOL UPON LONGEVITY. — The British Medical Association appointed a commission to inquire and ascertain the average age of three classes of drinkers; to wit, total abstainers from alcoholic beverages, moderate drinkers, and sots. The commission reported its observations upon 4,234 deaths, divided into five categories: 1. Total abstainers; 2. Habitual, temperate drinkers, — those who consume a moderate amount of alcoholic liquors; 3. Careless drinkers, — those who do not mean to get drunk, but are simply imprudent drinkers; 4. Free and habitual drinkers; 5. Decidedly intemperate drinkers, — sots. According to this classification, the average age reached by each of these categories is as follows: first class, 51 years 22 days; second, 63 years 13 days; third, 59 years 67 days; fourth, 57 years 59 days; fifth, 53 years 3 days. From this the curious fact is brought out that the teetotalers are the shortest lived, the sots having but a slight advantage over them in the average duration of life. The moderate drinkers reach the most advanced age.

THE FOOD TREATMENT FOR INSOMNIA. — Dr. Eggleston says, in the *Journal of the American Medical Association*, that most students and women who are troubled with insomnia are dyspeptic, and he has found it easy to successfully treat such cases without medicine. They are instructed to eat before going to bed, having put aside work entirely at least an hour before. If they are not hungry, they should simply be instructed to eat; and if they are hungry, they should eat whatever they want. A glass of milk and a biscuit is sometimes all that can be taken at first, or a mashed potato buttered. In a short time the night appetite will grow, and the appetite will then need no particular directions. If possible, the night meal should be taken in another room than the sleeping-apartment, and for men in the city it will be found advantageous to go out to a restaurant. The idea of going out for something to eat, and having to wait a short time for it, will excite the appetite. Before eating, however, a bath should be taken, preferably cold or cool, which should be given with a sponge or stiff brush, and the body thoroughly rubbed off with a coarse towel afterward. The bath need not be more than five minutes in duration. After the bathing and rubbing, or after eating, a moderate amount of exercise should be taken. For this a few minutes with Indian clubs or dumb-bells is sufficient. Further than this, the patient should go to bed at the same hour every night, and arise at the same hour every morning. There is a popular superstition that grown people should not eat immediately before going to sleep; that it will give them indigestion or nightmare, or both. Dr. Eggleston cannot see why adults should be so very different in this respect from babies. It may be true that digestion is carried on slowly during sleep, and that the digestive function is less active, but here one need not be in a hurry for the completion of the operation. The average person should be in bed seven or eight hours, which is time enough for the digestion of almost any thing edible. In our American life he thinks, the digestion carried on through sleep probably has the better chance for thoroughness.

PARASITES OF THE BLOOD. — A Russian scientific observer some years since discovered in the blood of birds animate bodies of the nature of parasites, to which he has given the name of *Polimitus*, presenting a striking resemblance to the organisms described by M. Laveran as existing in the blood of persons attacked by malarial fever. Subsequent researches have shown that the presence of microbial parasites of animal origin in the blood is much more common than had been suspected, more especially in cold-blooded animals. Of warm-blooded animals, carnivora are more liable to be invaded by these intruders than others; but it is comforting to learn, that, for the most part, their presence does not appear to entail any particular inconvenience. According to *The Medical Press*, only four or five out of three hundred birds examined died in consequence of lesions caused by the parasites, and the pathological appearances were then identical with those observed in the subjects of malarial fever.

EXECUTION BY ELECTRICITY. — At a recent meeting of the Paris Academy of Sciences a communication from Mr. Edison was read respecting the use of electricity as a means of inflicting capital punishment. He is of opinion that an alternative current will cause death without pain, but he adduces no experimental evidence in support of that contention. The matter was referred to the medical section of the Academy, which is to have the assistance of M. Marcel Desprez, the electrician, in drawing up a report on the subject.

BOOK-REVIEWS.

Strength: How to get Strong and keep Strong, with Chapters on Rowing and Swimming, Fat, Age, and the Waist. By RICHARD A. PROCTOR. London and New York, Longmans, Green, & Co. 12°. 75 cents.

HERE is a somewhat lengthy title, and one recalling those of a hundred years ago, when in the titlepage were generally revealed the author's tenets, be they in religion or the sciences. Mr. Proctor defines the strength to which he refers as that which it is well that all actively employed members of the human family should have. The average man or woman is so engrossed in his struggle for existence, that he has no time and energy to give to keeping his body in good working order in all its parts. It may be that it works well enough under ordinary circumstances, but after a few years of inattention any effort at unusual exertion reveals a softened muscle here, or a stiff joint there, that had not been suspected. How by a due but not excessive amount of exercise to find these weakening parts, and to bring them back to healthful vigor, is one of the author's objects.

But in the chapters on reducing fat, on nature's waist and fashion, on learning to swim, and on other cognate subjects, are to be found some good advice, and some suggestions likely to prove fruitful of discussion.

The Reconstruction of Europe. By HAROLD MURDOCK. New York, Houghton, Mifflin, & Co. 12°. $2.

THIS work is an account of leading political events in Europe from the establishment of Louis Napoleon's empire in 1850 to the close of the Franco-German war in 1871. The introduction by John Fiske gives a general survey of the great political movements of the century, and Mr. Murdock then takes up his theme at the downfall of the French republic of 1848, and the defeat of the other revolutionary attempts of that time. Attention is given almost exclusively to international affairs, and both diplomatic and military manœuvres are described at length. The work is well written, though sometimes with little too keen an eye to dramatic effect, and with less philosophical insight than might have been wished. Too much space is given to unimportant military details to the exclusion of political events of much greater consequence, a fault that is specially noticeable in the earlier chapters. Moreover, we do