dred students, and an average of one hundred medical students graduate yearly. In Tokio alone there are numerous active medical societies and over twenty hospitals.

RUSSIAN STUDY OF INFECTIOUS DISEASES. — An institute has been founded in St. Petersburg for the experimental study of infectious diseases and for prophylactic inoculations. The institute is to be under the charge of Professor B. Anrep.

FRENCH AND GERMAN TOBACCO. — The *Progrès Medical*, July 13, 1889, gives a brief account of the international congress to protest against the abuse of tobacco, which was recently held in Paris. M. Ortolan made the interesting statement that the proportion of nicotine in tobacco is less when the stalks grow close together, and when the leaves are numerous and placed very low upon the trunk. This is the reason, he said, why the German, who smokes more than the Frenchman, poisons himself less. In the former country tobacco-growing is free, whereas in France it is regulated by the government, and the number of leaves to the stalk is limited. French tobacco, he said, contains as much as six per cent of nicotine.

JELLY-FISH STING. — Bathers who have encountered the long tentacles of a medusa will be pleased to know, says *Medical News*, that the "sting," or erythema, may be speedily relieved by the application of water rendered alkaline by common washing-soda, in the proportion of an ounce of soda to about two quarts of water.

THE DANGERS OF CARBOLIC ACID. — The following letter of Dr. Th. Billroth of Vienna has been published in the *Lancet*: "I have lately seen four cases in which fingers which had suffered a most insignificant injury became gangrenous through the uncalled-for application of carbolic acid. Carbolic acid is now much less used in surgery than formerly. We have only gradually become acquainted with its dangers. The acid may not only cause inflammation and gangrene, but also blood-poisoning, and so may even prove fatal. It is useful only in the hands of a skilful surgeon, and ought never to be used without his advice."

VENTILATION IN ICELAND. — The extreme cold of the winter in Iceland reduces the system of domestic ventilation in that country to very primitive principles. A traveller there was so choked one night by the close atmosphere of the air-tight little chamber in which he slept, with all the male members of the family, as to be compelled to wake his host, who sprang out of bed at the call, pulled a cork from a knot-hole in the wall for a few minutes, and then, replacing the cork with a shiver, returned to bed.

LEPROSY IN HAWAII. — It is estimated that there is one leper to every forty of the inhabitants of the Sandwich Islands. Speaking of leprosy, *Medical News* states that a Chinese leper was recently discovered in the Sacramento jail. He had been sent there for refusing to pay a poll-tax.

FREEDOM OF AIR FROM GERMS. — Dr. Le Fort says that microbes are never conveyed in the air, but only by contact with the fingers, instruments, etc.

CHOLERA. — Two cases of cholera, one of which terminated fatally, are reported to have occurred in Hungary. Cholera has appeared also in Mesopotamia, as shown by the following despatch, published in the Marine Hospital Service *Bulletin* under date Sept. 13: "Cholera, since July 27, made its entry into Mesopotamia in as mysterious a manner as it made its appearance into Egypt in 1883. It is certain that it penetrated from Bombay *via* Bassora; it could not as yet be determined how, perhaps (as in Egypt) through Arabian stokers (firemen), who are employed on the English steamers of the Bassora-Bombay line, and who, upon their arrival at Bassora, go to their homes. At first cholera appeared at Schatra (3,000 inhabitants), two and a half days' journey from Bassora, at the Schatel-Hay Canal, which connects the Tigris with the Euphrates River. In a few days, from July 27 to Aug. 6, 308 persons died. On the 1st of August it appeared at Naszrie (8,000 inhabitants), southerly from Shatra, near the embouchure of the Schatel-Hay into the Euphrates, — a city which was founded in 1872 by Natir Pacha, the Montefik sheik. From the 1st to the 9th of August, 293 deaths occurred, on the 8th of August so many as 85. The houses are situated upon the flat marsh-land, and are only reed huts. The inhabitants carry on the culture of rice and some cattle-raising. It finally made its appearance at Bassora on Aug. 6, and at first an Arabian girl died who had come there ten days before from Filie in Persia. On Aug. 9, 15 deaths occurred there. The reports of Gazala, the sanitary physician, do not allow any doubt to arise as to the diagnosis."

MENTAL SCIENCE.

Experiments upon Association of Ideas.

IN *Mind*, No. 54 ("Mental Association investigated by Experiment," by J. McK. Cattell and Sophie Bryant, D.Sc.), is printed an account of experiments upon certain very usual mental products, which commands interest not so much for the intrinsic value of the results obtained as for the suggestiveness of the inquiry that it opens up. An association as ordinarily studied begins with the perception of a written or spoken word, includes the calling-up of another idea by the first, and ends with the expression of the associated word by mouth or pen. The characteristic element in the process is the central one, while the perception and the expression factors have a somewhat mechanical *rôle* to play, and must be eliminated in the study of the association process *per se*.

The two aspects of association studied in the present research are (1) the time taken up in mental association, and (2) the nature of the association. The difficulty in studying the former is that the time taken up by perception and expression is not absolutely separable from the association time, the two processes in part overlapping. In experiments specially designed to study the perception and expression times, it was found that it takes about half a second to see and name a word, so that approximately the difference between the entire time and half a second will be the association time. The same 20 nouns were used with about 500 observers, and 6 observers answered to groups of about 250 words. Former experiments in which it was possible to eliminate the mechanical elements had shown that it took Dr. Cattell, on the average, .380 of a second to make an association with a concrete noun, and .508 of a second with an abstract noun; the time for an association with a verb being intermediate, .465 of a second. The abstractness of the word renders the association process difficult, this being especially evident in extreme cases. Thus, to make the association *deliverance-hope* required 1.453 seconds; *civilization-wilderness*, 1.064 seconds; while the quickest associations were *good-bad* (.111 of a second), *father-mother* (.132 of a second), and the like. Individual variation regarding the time of association is of course large, and the stage of mental development is an equally important consideration. It was found that the boys in an upper class of a German gymnasium took considerably less time to respond with associations to a given series of words than the boys in a lower class.

A somewhat different method of investigation consisted in giving simply the first word, and asking the subject to write as many suggested words as possible within 20 seconds. From this the average association time (including the very long writing time) can be calculated. This was tried with four forms of a London girls' school, with a Dublin girls' school, with some students of Bryn Mawr College, and with some London and Irish graduates. A very distinct shortening of the time accompanies the advance in form. When the average age of the pupils was 12.7 years, the average time for concrete nouns was 6.9 seconds; at 14.8 years it was 4.76 seconds; at 16.3 years, 4.26 seconds; at 17.8 years, 3.7 seconds. The corresponding time for the Bryn Mawr collegians was 3.51 seconds. The associations with abstract words require constantly more time than with concrete words, but this difference diminishes as the mental development progresses. Furthermore, the last class-rank bears a relation to rapidity of association, the highest pupils showing a quicker time, though this relation is only a general one. Some words more readily call up a series of words than others. Fatigue and a variety of factors also enter to influence the association times, but their relative worth is not affected by these disturbances.

Turning to the nature of the association, we are at once struck by the frequency with which a word suggests the same word to the minds of different persons. Four hundred and sixty-five per-

sons were given each of the following ten concrete and ten abstract words, and were required to name a suggested idea as quickly as possible; viz., *house, tree, ship, chair, clock, bird, shoe, hat, child, hand,* and *time, courage, form, virtue, art, love, strength, part, beauty, number.* Of the 4,650 "concrete" words, the ten words most frequently suggested by the ten given words form no less than 1,210, or more than one in every four. Two hundred and nineteen (or nearly one-half) responded with *finger* to the word *hand,* and 212 responded with *leaf* to the word *tree:* of the 4,650 words associated with the ten abstract words, the ten most frequent associations amount to 760 occurrences, or one in six; the most frequent associations being *good* or *goodness* with *virtue* (127 times), and *painting* with *art* (115 times).

An analysis of the associating processes here involved shows that in part they harmonize with the ordinary laws of association, but in part necessitate an extension of their interpretation. Dr. Cattell, regarding *contrast* as a variety of *similarity,* makes the latter and *contiguity in space and time* the two fundamental types of association. The latter associations are given us ready-made by sensation, and so may be termed objective or outer associations, while *similarity* may be displaced by *logical* associations. The *objective* are subdivided into *co-existence* and *succession;* the *co-existence,* into *co-ordination, whole to part,* and *part to whole;* the *succession,* into *forwards* and *backwards.* Again, the *logical* are either cases of *specification* or *causation.* The former, again, are either cases of *correlation, specialization,* or *generalization;* the latter, *final* or *efficient.* These classes are not natural kinds, nor does every association fall unambiguously into one class; but they call attention to real classes, and serve as a starting-point for further investigation. Associations occur that only by straining fall into any of the classes, associations by sounds of words (alliteration, rhyming) being an important example of these. From the tables printed in their essay, the authors conclude that with concrete nouns the link is "not quite as often supplied by thought as by sensation." *Whole to part* and *specialization* are very much more frequently used than *part to whole* and *generalization.* A comparison of the associations made by the writers and two other professional persons with those made by the pupils of several schools shows that "logical and verbal associations are favored by the first four observers, who teach and write. With the students, *whole to part* is the favorite category: they seem to visualize the object and name some part of it. . . . The largest proportion of logical associations was made by E and C, who are engaged in abstract studies." The word itself often suggests the special kind of association. Thus, "*tree* and *hand* are natural objects which are easily pictured, and have parts (leaves and fingers respectively) readily named. With *child,* on the other hand, specialization was the favorite category. Final cause was the largest class in the case of *clock,* a thing made and used for the special purpose of measuring time. Conversely, *time* often suggested the means of its measurement. Of the other abstract nouns, *art* and *number* were commonly specialized, while *courage* and *love* most frequently suggested a similar or contrasted idea."

In all such experiments the subject himself, by going over his experience just after the association, can recover the lost links which the mere statement of a word and its association would neglect. A few very suggestive appendices, founded upon such introspections, are given, that show how very complicated the associative process may be, and how very cautiously one must proceed in the discussion of them. However, these uncertainties do not seriously vitiate the value of experimental studies, and it is only by such studies that a practical insight into our mental processes can be gained. The ease with which association studies can be made should lead one to expect many valuable contributions in the near future.

THE MENTAL POWERS OF THE CHIMPANZEE. — The female chimpanzee in the Zoölogical Gardens at London, says *Nature,* has recently been made the subject of experiments by Dr. G. J. Romanes, that shed interesting light upon animal psychology. The general intelligence of the creature is very high. She understands a great many words, is ingenious in her play, and gives expression to her feelings in a variety of ways. If, instead of being constantly exposed to the distracting influences of an inquisitive public, she were carefully reared, Dr. Romanes suggests that a higher degree of mental development might be expected. The experiments began by asking the chimpanzee to hand out one, two, or three straws from her cage. If the wrong number of straws was given, they were refused; but, when the action was correct, she was rewarded with a piece of fruit. The straws were taken one by one, and held in the mouth until the requisite number was gathered. She soon learned to associate these three names with the number of straws, and unfailingly gave the right number. Then *four,* and later *five,* was added to her vocabulary. Her keeper has attempted to teach the chimpanzee to count up to ten, but with only partial success. She rarely mistakes numbers up to five, and, when asked for seven, eight, nine, or ten, understands that this means "more than five;" but the accuracy of her count does not extend further than this. Dr. Romanes thinks it possible that the creature's patience may be exhausted in these high numbers, since she has to collect the straws one by one. As evidence of this, the creature has been observed to double a straw and offer it as two, thus showing a knowledge of multiplication. The mechanism of this process is hardly that of notation, but simply the appreciation of sense-impressions such as we see in a child and in savage people. Tribes to whom "more than five" is ascribed in an indefinite "many" have been observed. Dr. Romanes has also attempted to teach the chimpanzee the names of colors by holding out two straws of different colors, and requiring her to select the color named. She learned to distinguish the white straw from any other color, but never went further. Dr. Romanes sees no reason why this distinction should be easier than any other, and so regards the failure as probably due to color-blindness.

NOTES AND NEWS.

LOCOMOTIVE engineers are inclined, it is said, to obesity.

— Gum-chewers' paralysis is the latest form of professional neurosis recorded in medical literature.

— The chemists of the United States Agricultural Department are about to begin the work of investigating the different artificial foods and infant foods now on the market.

— The will of John W. McCoy, who died in Baltimore recently, contains a bequest of $100,000 to the Johns Hopkins University. He also gives his library to this institution.

— The following appointments are announced at Clark University: Professor Arthur Michael of Tufts College, professor of chemistry; Professor J. Playfair McMurrich of Haverford College, docent in biology; Dr. Franz Boas, docent of the University of Berlin, docent in anthropology; B. C. Burt of Michigan University, docent in historical psychology; Professor Alfred Cook of Bryn Mawr College, docent in psychology; Dr. Arthur McDonald, docent in psychology; Professor Herman C. Bumpus of Olivet College, Michigan, fellow in biology.

— The English Silk Association is arranging to hold in London, next spring, an exhibition of the silk manufactures in the United Kingdom and Ireland. In order to place before the public the capabilities of the home industry for supplying its requirements, it has been decided that the exhibition should contain specimens of various branches, consisting, among others, of broad and narrow silk fabrics, including poplins, etc.; also lace, embroidery, silk hosiery, costumes, fans, trimmings, sewing and embroidery silks, twists, cords, etc.; thrown silks, Indian and British colonial raw silks, etc.; exhibits illustrative of the growth of silk, of the processes of manufacture, and of the printing, dyeing, and finishing of silk; various silk handicrafts in operation; industrial and decorative design as applied to silk fabrics.

— The recently published statistics of criminality in Germany confirm once more a fact brought out in earlier reports. For many years the character of criminal acts in that country has been undergoing a radical change: while those against property have shown a constant decrease in number, the number of crimes against life has as constantly increased. Some think they can trace a connection between an increase in the crimes against life and the increase in the use of alcoholic drinks, the greatest increase