at prominent points along both the Atlantic and Pacific coasts, and on the principal rivers and the Great Lakes. The results of these observations are now being plotted graphically upon charts by the Fish Commission, and will be published in an early report. It is expected that they will prove of great importance in explaining the distribution and movements of the fishes.

Altogether the result of the Fish Commission's work has been very satisfactory. Much of the scientific study and digestion of material collected during the summer, of course, still remains to be done, and this will be pushed forward in Washington during the months when, as a rule, field-work is impracticable.

MENTAL SCIENCE.

Notes on Hypnotism.

The Paris and Nancy Schools of Hypnotism. — Dr. Bernheim, the leader of the Nancy school, whose classic work we are soon to have in English, contributes to the *Revue de l'Hypnotisme*, May, 1888, a platform of beliefs. These can be summarized as follows: 1. They do not obtain Charcot's three phases— lethargy, catalepsy, and somnambulism — by any physical manipulation; nor do they find, as Charcot claims, that opening the eyes or rubbing the vertex will cause the patient to pass from one of these stages to another. They do not get the phenomena of *transfert* (of an affection of one side of the body passing to the other) nor the localization of function by pressing different portions of the cranium, nor any purely physiological result. On the other hand, they easily get all these results by a slight suggestion. If the subject has heard of or witnessed the expected results, it is sufficient. Again: the unconsciousness of lethargy is apparent only, the subject being open to suggestions at any stage. 2. *In hysteria magna* the hypnotic phenomena are the same as in normal subjects, the three stages, etc., being equally illusory. 3. Hysterical subjects are not good for the study of hypnotism. They introduce neurotic and other foreign symptoms, and vitiate the purity of the results. 4. The hypnotic state is not a neurotic one. The phenomena are natural, are of a psychological origin, and can be developed from natural sleep. 5. Neurotic patients are not more ready subjects than others, the wards of hospitals representing all types of diseases, furnishing an equal number of good subjects. 6. Not all subjects are purely automata played upon by the operator: more or less resistance is frequent, and the individuality partially remains. 7. All methods of hypnotization depend upon suggestion. Physical methods, especially hypnogenetic zones, do not exist except as the results of suggestion. 8. Suggestion is the key to *all* the phenomena, and careful study with new subjects will prove it so. Moreover, the large percentage (eighty) of subjects among normal persons found at Nancy is not due to a mental contagion, but to a skill in applying the suggestion. This position is rapidly gaining adherence above that of Charcot and the Paris school, which it opposes on all the above points.

A New Hypnotic Phenomenon. — M. Liegois contributes to the August number of the same periodical an article describing a new hypnotic phenomenon, in the field of a 'negative hallucination.' This term describes a state in which the suggestion that a certain person, a certain object in the field of vision, remains unseen, has been obeyed. The state is explained as an annihilation of the perception as it reaches consciousness. The impression is received, but ignored. Having a third party to suggest to one of his subjects that he will be invisible to her, it is found that she does not hear him, see him, or even feel the prick of a pin when he holds the pin, re-acting normally to all other persons. If, however, M. Liegois calls out impersonally, "Camille feels thirsty, Camille will drink a glass of water," she hears and obeys the command; if similarly told to stand at his side, she does so; and so on for every sense. While she does not hear him, she none the less really can hear him. There is a sort of dual personality, one half of which obeys the negative suggestion, while the other is automatically regulated, and obeys any suggestion not directly in conflict with a previous one. The further development of this study promises interesting results.

Hygienic Aspects of Hypnotism. — Upon the hygienic side we find the discussion of the prohibition of public hypnotic performances. The Academy of Medicine of Belgium held a long discussion upon the question, and finally voted to recommend a law abolishing it. The chief advocate in favor of the exhibitions was M. Delboeuf. Belgium thus follows the action of Austria, Italy, Denmark, Germany, and most of the Swiss cantons. The people have been strongly impressed with the dangers of an unskilled use of hypnotism, and a healthy sentiment to have it restricted to experts prevails. At the last session of the French Association for the Advancement of Science, M. Berillon introduced a similar measure, and it was voted as the sentiment of the section of hygiene and public medicine that all public exhibitions of hypnotism should be legally prohibited in France.

Miscellaneous. — Considerable space is taken up in the same periodical with the discussion of phenomena whose genuineness is not recognized, particularly with Dr. Luy's experiments upon the action of drugs at a distance. A committee of the Academy of Medicine was appointed to examine the correctness of Dr. Luy's conclusions, and they find unconscious suggestion to be at the basis of it all. When the contents of the vials containing the drugs were unknown to those present, the subject also failed to be appropriately affected by them. So, again, these pretended mysteries fall to the ground, and exemplify the pitfalls of the subject as well as the uncritical nature of methods often adopted by eminent scientists. Mention should also be made of the fact that the Church has recently entered into relations with hypnotism by a letter from the Bishop of Madrid, warning his brethren against the evils of the new movement, and placing it in line with the forbidden treatment of miracles.

Abnormal Sense-Perceptions.

Sound-Blindness. — Recent observations have emphasized the fact that many persons are defective in the distinctness of their perceptions, while others form peculiar links between perceptions of different senses. An illustration of the former is what has been rather falsely termed 'sound-blindness.' This condition refers to the defective hearing of sounds; so that, in the same way as the color-blind fail to distinguish between to us utterly distinct impressions, the sound-blind fail to make distinctions perfectly evident to ordinary ears. A Boston lady, Sara E. Wiltse, has recently tested the powers of Boston school-children in this direction (*American Journal of Psychology*, No. 4). Standing on the teacher's platform, she repeated the following words as distinctly as possible to 259 boys of the Latin School, aged from twelve to twenty years: 'ultramarine,' 'altruistic,' 'frustrate,' 'ultimatum,' 'ululate,' 'Alcibiades,' 'unaugmented.' The words were repeated as often as required, some as often as five times, and ample time was given for the writing of the words. 84 of the boys made mistakes in the vowel-sounds, such as 'ultruistic,' 'frostrate,' 'altimatum,' 'elulate,' 'olulate,' 'alulate,' 'unolmented.' That these 84 were really defective, was shown by the further test, in which the following words were read to them but once; viz., 'fan,' 'log,' 'long,' 'pen,' 'dog,' 'pod,' 'land,' 'few,' 'cat:' for only 4 of the 84 spelled these monosyllables correctly. For 'fan,' there appeared 'than,' 'thank,' 'fanned,' 'clam,' 'thang,' and 'fam;' for 'log,' 'glove,' 'clog,' 'lug,' 'love,' 'land,' 'long,' 'knob;' for 'long,' 'lung,' 'lown,' 'lone,' 'lawn,' 'land,' 'log,' 'loud,' 'lamp;' for 'pen,' 'penned,' 'pan,' 'paint,' 'hen,' 'ten;' for 'dog,' 'dove,' 'dug,' 'dot;' for 'pod,' 'hour,' 'heart,' 'hog,' 'hod,' 'hard,' 'fod,' 'thod,' 'fog,' 'bog,' 'pug,' 'part,' 'plot,' 'pard,' 'long,' 'bog;' for 'land,' 'lamb,' 'lend,' 'lamp,' 'lambed,' 'blend,' 'hen,' 'can;' for 'few,' 'frew,' 'fuse,' 'pew,' 'pen.' 'Cat' was correctly understood in every case. Of the 80, only 2 were found to be hard of hearing, suggesting that the others were more or less 'sound-blind.' So, again, of 223 boys of the English High School at Boston, 105 misspelled one or more of the polysyllables. In the Comins Grammar School, where the pupils were between the ages of eight and fourteen, only 34 of the 530 spelled all the monosyllables correctly. These pupils were tested under good conditions, and five were found to be deaf to the sound of a tuning-fork, though the teacher was unaware of the defect. For 'fan,' 7 different words and 2 blanks were given (a blank indicating an entire failure to understand the word), the total number of mishearings being 17; for 'log,' 17 different words and 10 blanks, involving 86 mishearings, the word being understood as 'love' 65 times; for 'long,' 14 words and 11 blanks, with 22 errors; for 'pen,' 18 words and 12 blanks, with 135 errors, of which 48 made the word 'hen,'

and 47 'pan;' for 'dog,' 6 words and 1 blank, with 10 errors; for 'pod,' 51 words and 64 blanks, with 270 errors, of which 'hog' is responsible for 85, 'hod' for 36, 'pog' for 26, 'hard' for 25; for 'land,' 14 words and 12 blanks, with 63 errors, the word being written 'lamb' 42 times; for 'few,' 11 words and 10 blanks, with 15 errors; for 'cat,' 5 words, no blanks, and 5 errors. Of course, these errors may be due to defects elsewhere than in the power of sound-discrimination, e.g., in the power of translating auditory into visual symbols; but the variety and nature of the errors are certainly interesting. If we classify the nature of the confusions, we find that in the vowel-sounds, *a*, as in 'fan' and 'cat,' is most apt to be heard as *a* long 8 of 16 times; that the *e* of 'pen' is heard as a short *a* 69 of 84 times; the *o* of 'dog,' 'log,' 'long,' 'pod,' as a short *u* 83 of 132 times; while the *ew* of 'few' is about equally often regarded as various other sounds. With regard to consonants, *d*, as in 'dog,' 'pod,' becomes hard *g* 132 of 199 times; the *g* of 'dog' becomes *v* 67 of 82 times; the *p* of 'pen,' etc., becomes *h* 240 of 278 times; the *n* of 'pen,' etc., becomes *m* 56 of 78 times; the *ng* of 'long' becomes *n* 7 of 15 times; while *h*, *t*, and hard *c* have no sounds with which they are specially confused. These facts should be of some importance to philologists, and will perhaps agree with the laws of language and dialect transformations.

Color and Taste. — The peculiar association of a color with a sound by which a certain sound will at once vividly arouse a definite color, is quite normal, and has of recent years been frequently described. The association of color with smells is a much rarer phenomenon, and of color with tastes perhaps rarer still. Dr. Férè gives an account of a woman, who, after taking vinegar, saw every thing red for a few minutes, and then every thing as bright green for more than an hour. Dr. Férè explains this as due to a similarity in the subsidiary emotional effects accompanying the sensation.

HEALTH MATTERS.

Use of Tobacco.

C. W. LYMAN, in a communication to the *New York Medical Journal*, discusses in a very entertaining way, tobacco, its use and abuse. Tobacco, he says, contains an acrid, dark-brown oil, an alkaloid, nicotine, and another substance called nicotianine, in which exist its odorous and volatile principles. This description of the active principles of tobacco is of importance to smokers; for, when tobacco is burned, a new set of substances is produced, some of which are less harmful than the nicotine, and are more agreeable in effect, and much of the acrid oil — a substance quite as irritating and poisonous as nicotine — is carried off. These fire-produced substances are called, from their origin, the 'pyridine series.' By great heat the more aromatic and less harmful members of the series are produced, but the more poisonous compounds are generated by the slow combustion of damp tobacco. This oil which is liberated by combustion is bad both in flavor and in effect, and it is better, even for the immediate pleasure of the smoker, that it should be excluded altogether from his mouth and air-passages.

Smoking in a stub of a pipe is particularly injurious, for the reason that in it the oil is stored in a condensed form, and the smoke is therefore highly charged with the oil. Sucking or chewing the stub of a cigar that one is smoking is a serious mistake, because the nicotine in the unburned tobacco dissolves freely in the saliva, and is absorbed. 'Chewing' is on this account the most injurious form of the tobacco habit, and the use of a cigar-holder is an improvement on the custom of holding the cigar between the teeth. Cigarettes are responsible for a great amount of mischief, not because the smoke from the paper has any particularly evil effect, but because smokers — and they are often boys or very young men — are apt to use them continuously or at frequent intervals, believing that their power for evil is insignificant. Thus the nerves are under the constant influence of the drug, and much injury to the system results. Moreover, the cigarette-smoker uses a very considerable amount of tobacco during the course of a day. 'Dipping' and 'snuffing' are semi-barbarities which need not be discussed. Not much effect is obtained from the use of the drug in these varieties of the habit.

Nicotine is one of the most powerful of the 'nerve-poisons' known. Its virulence is compared to that of prussic acid. If birds be made to inhale its vapor in amounts too small to be measured, they are almost instantly killed. It seems to destroy life, not by attacking a few, but all of the functions essential to it, beginning at the centre, the heart. A significant indication of this is that there is no substance known which can counteract its effects: the system either succumbs or survives. Its depressing action on the heart is by far the most noticeable and noteworthy symptom of nicotine-poisoning. The frequent existence of what is known as 'smoker's heart' in men whose health is in no other respect disturbed is due to this fact.

Those who can use tobacco without immediate injury will have all the pleasant effects reversed, and will suffer from the symptoms of poisoning if they exceed the limits of tolerance. These symptoms are: 1. The heart's action becomes more rapid when tobacco is used; 2. Palpitation, pain, or unusual sensations in the heart; 3. There is no appetite in the morning, the tongue is coated, delicate flavors are not appreciated, and acid dyspepsia occurs after eating; 4. Soreness of the mouth and throat, or nasal catarrh, appears, and becomes very troublesome; 5. The eyesight becomes poor, but improves when the habit is abandoned; 6. A desire, often a craving, for liquor or some other stimulant, is experienced.

In an experimental observation of thirty-eight boys of all classes of society, and of average health, who had been using tobacco for periods ranging from two months to two years, twenty-seven showed severe injury to the constitution and insufficient growth; thirty-two showed the existence of irregularity of the heart's action, disordered stomachs, cough, and a craving for alcohol; thirteen had intermittency of the pulse; and one had consumption. After they had abandoned the use of tobacco, within six months' time one-half were free from all their former symptoms, and the remainder had recovered by the end of the year.

A great majority of men go far beyond what may be called the temperate use of tobacco, and evidences of injury are easily found. It is only necessary to have some record of what the general health was previous to the taking-up of the habit, and to have observation cover a long enough time. The history of tobacco in the island of New Zealand furnishes a quite suggestive illustration for our purpose, and one on a large scale. When Europeans first visited New Zealand, they found in the native Maoris the most finely developed and powerful men of any of the tribes inhabiting the islands of the Pacific. Since the introduction of tobacco, for which the Maoris developed a passionate liking, they have from this cause alone, it is said, become decimated in numbers, and at the same time reduced in stature and in physical well-being so as to be an altogether inferior type of men.

ELECTRICAL SCIENCE.

Some New Tests of Secondary Batteries.

IN the last two years the improvements in storage-batteries have been such as to indicate the near approach of the time when they can be economically used for street-car work. Indeed, it is now a question whether, under favorable conditions, they cannot advantageously replace horses; and the result of the experiments on the Fourth Avenue Road in New York, where ten storage-cars will soon be regularly operated, will be awaited with interest.

Dr. A. von Waltenhofen, in the *Centralblatt für Electrotechnik*, gives the results of some interesting experiments on the Farbaky-Schenck accumulators that have a direct bearing on the subject of electric traction. But before giving the results, it is well to call to mind the points in which the present storage-cells are lacking. The principal point is in the small discharge-rate, necessitating a large number of cells being carried by each car (from 3,200 to 4,500 pounds), a corresponding increase in the weight of the car itself to give the strength necessary to sustain this increased weight, a larger outlay for battery and a corresponding depreciation, a greater power to move the greater weight, and the necessity of re-laying much of the track now in use with heavier rails and a better roadbed. For instance: the weight of an ordinary 16-foot car is from 6,000 to 7,000 pounds. Equipped with motors and storage-battery, the weight is about 13,000 pounds. A car equipped with this weight of battery can be run for from 45 to 60 miles, depending on the conditions of the track and the type of equipment.