describing the difficulty of fixing the percentage of this lower group of the criminal class in prison, I go on to say :*—"Similarly, it is found outside, that there are dull-minded creatures who go on harmlessly from day to day labouring at their farm or navvy work without any mental preoccupation of a criminal nature. But although it cannot be said of them that they seek an occasion of doing wrong, or committing themselves criminally, yet in the face of temptation, and when such an occasion comes, or is thrown in their way, they are unable to resist it, and thereby become criminal. There is something wanting in them which should enable them to restrain themselves under such circumstances. This 'something'—which comprises a mixture of ready judgment, forethought, and healthy volition—is the common factor in this case of weak-mindedness and criminality. It is this which here links together crime and mental weakness; which makes crime an expression of mental weakness; and which, if you will, makes crime, but assuredly *not all crime*, a form of insanity. The same mental defectiveness which prevents the harmless labourer resisting a temptation to crime, oftentimes necessitates his being treated as weak-minded when a prisoner. But the bearing of this case, where we start with mental deficiency, is altogether different from that of the great proportion of criminals who have been convicted, and whose criminality shows itself as a positive propensity to evil-doing. These last, not unintelligent, and quite capable of balancing motives, deliberately, and in spite of their consciousness of its risk, prefer crime to an honest livelihood such as would fall to their share. Such men have said to me, 'I am a thief, and I don't see that I'll ever be anything else. I never did like work much. Of course there's risk, but I'll chance my luck again.' Now, apart from the moral and social degradation (which the already thief does not feel), and the risk of a 'lagging' or sentence to imprisonment (which he is willing to run), there is surely no madness in an idle-minded fellow preferring to live like a gentleman by helping himself directly from moneyed pockets instead of sweating his life out with a pick and shovel at 14s. a week. I fail to see insanity in this, any more than I do in the forged bill of the man of business, or in the sanded sugar and spurious tea of grocers who knowingly adulterate their goods."

Experimental Psychology in Relation to Insanity.† By W. H. R. Rivers, M.D.Lond., M.R.C.P.

Up to the present time the experimental movement in psychology has been directed chiefly to the study of methods by which mental phenomena may be subjected to exact investigation, and by which they may receive for purposes of comparison some kind of quantitative expression. So far as these methods have been perfected they have been directed mainly to the investigation of general psychological laws, and of the relation of psychological to physiological processes. Comparatively little has been done in the way of application of these methods to elucidate practical questions; little attention has been paid to individual psychology and to the exact nature of the differences which distinguish the

* "Journal of Mental Science," Jan., 1875.

† Read at the Annual Meeting of the Medico-Psychological Association, July, 1895.

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various types of normal and abnormal mind. The more theoretical work of experimental psychologists has naturally a great interest for students of insanity, and must affect their conceptions of abnormal mind, but the special question which I intend to consider is of a more direct and practical kind, viz., the possibility of using the methods of experimental psychology to help directly in the study of the problems of insanity.

One of the first, if not the first, to study the practical application of psychometric methods was Francis Galton, and among other observations of his are some on weak-minded children made at Earlswood.* At the present time the chief worker in this field is Professor Kraepelin, director of the asylum at Heidelberg, who has for many years been occupied in devising and elaborating methods capable of use with the insane. He has already done much, not only in the direct investigation of insanity, but also in the study ot questions closely related to those of mental pathology. At the beginning of the present year he began to issue a new publication, "Psychologische Arbeiten," in which his researches and those of his assistants and pupils will appear, and the first number contained a valuable introduction by himself, in which he described the principles and methods by which those researches will be conducted. Through the kindness of Professor Kraepelin I have had the opportunity of studying these methods at Heidelberg, and I cannot carry out the purpose of this paper better than by giving an account of his work.

A large number of preliminary researches have been carried out with the object of finding methods most suited to the investigation of abnormal mind, and these necessarily have to be of the simplest character possible. Any method which is to be so used must first be thoroughly tested in one individual; the influence of fatigue and practice, of diurnal periodicity and of various other factors must be determined, and, secondly, the method must be tested on a number of individuals to ascertain the influence of differences of mental constitution or temperament, and to discover the different ways in which fatigue, practice, etc., act on different people.

A large part of Professor Kraepelin's researches has been devoted to these preliminary inquiries, and this work not only serves as the foundation for a systematic plan of measurement of mental capacity, but has also in itself brought out

* "Mind," Vol. xii., p. 79, 1887.

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many points of direct importance to mental pathology. We are accustomed to speak of different types of individual, to which we give names, of which "neurotic," "melancholic," "unstable," may be taken as examples. These empirical types, however, are more or less vague, and the names are used by different people in different ways. An individual psychology, based on exact investigation, should give us the means of defining and classifying these types. As, following Galton and Charcot, individuals may be classified as visuals, audiles, or motiles, according to the nature of their mental imagery, so may we hope to classify them in other departments of mental life. As an instance of a step in this direction, I may mention that Oehrn* has found that different individuals show great differences in the influence of fatigue on mental work. If the amount of mental work of two hours be represented by a curve it is found that in most individuals the curve ascends at first owing to the influence of practice being greater than fatigue, and that it after a time descends owing to the influence of fatigue becoming predominant. Oehrn found that the summit of the curve occurred at very different times in different individuals, and that the effect of fatigue might be so marked that the curve showed a descending course from the beginning. In fatiguability and the power of recovery from fatigue we have properties of the individual of great importance from the psychiatrical point of view, and it is probable that investigations of this kind will be of much use in the definition, and, later, in the diagnosis of temperaments and of morbid diatheses.

Another most important branch of Kraepelin's work has been the investigation of abnormal influences on the mind, viz., of drugs and of excessive fatigue. His work† on the effects of alcohol and other drugs on mental processes is well known. In alcohol and over-fatigue we have two recognized causes of insanity; it is common knowledge that alcohol produces a condition which may be regarded as temporary insanity, and Kraepelin regards the mental effects of alcohol and other drugs as artificial insanities which can be investigated under conditions favourable for experimental inquiry. Moreover these conditions may be regarded as affording opportunity to study insanity in

* "Psychologische Arbeiten," Bd. i., Heft i., S. 92, 1895.

† "Ueber die Beinflussung einfacher psychischer Vorgänge durch einige Arznesmittel," Jena, 1892.

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its incipient stages; stages which in actual practice do not come under the eye of the physician, or, if they do, would be unsuited for exact investigation. Professor Kraepelin goes farther and suggests that experimental investigation of artificial insanities of this kind should be combined with the investigation of the effects of alcohol, etc., on the brains of animals, and that by combination of the two lines of research, anatomical in animals and psychological in man, we may obtain some insight into the intimate nature of abnormal mental processes, and of their physiological concomitants.

These two branches of Kraepelin's work, the study of individual differences and of abnormal influences on mind, not only furnish important contributions to our knowledge of insanity, but they provide the best possible training for the direct application of psychological methods to the study of the insane. Anyone who wishes to apply these methods must to a certain extent learn the difficulties and dangers of psychological experimentation by work of this kind. Kraepelin and his school have already had much experience of the practical utility of their methods in the direct observation of insane patients, though at present comparatively little has been published. Enough, however, has been done to enable Kraepelin to speak very positively of the practicability of exact investigation of the insane.

I will now pass on to the methods which are used at Heidelberg for these ends. Most have as their basis the measurement of time, either the measurement of the time taken by a given mental operation, or the measurement of the amount of mental work performed in a given time, but the special point of the methods is the combination of this quantitative basis with the analysis of certain qualitative features which vary according to the nature of the mental operation measured.

The ordinary forms of reaction time are employed, and, according to Kraepelin, employed with success on the insane. The more complex forms are used more than the simple reaction-time experiments, the one most extensively in use being that of choice time. I may here call attention to an important difference which distinguishes the use of reaction-time experiments as practical methods of investigating mental capacity from their use as means of physiological or psychophysical inquiry. When the experimenter with the latter aim in view measures reaction times, he is met by

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several disturbing occurrences, by premature and by false reactions; the individual observations may vary widely from one another, and the mean variation may be so large that it impairs or destroys the value of his results. His object is to get rid of premature and false reactions, and to reduce his mean variation to a minimum. In the practical application, however, to the study of an individual these abnormal factors, which only annoy the theoretical experimenter, become in themselves of great interest and possibly of greater importance than the actual times measured. Thus in employing the measurement of choice time to test the susceptibility of an individual to the influence of alcohol, it is the increase in the number of premature and false reactions which is of importance rather than the change in the time taken. In such a test a certain number of choice times are measured on successive days. On alternate days no alcohol is allowed; on the other days a dose of alcohol is given before the experiment, and by this method, which eliminates the influence of practice, the number of premature and false reactions on the days on which alcohol is taken, compared with that on normal days, gives a measure of the influence of alcohol on motor excitability and on the ease with which ideas give rise to impulses, a point which is of medico-legal importance.

Another form of reaction-time experiment employed is that of association time, and this is especially valuable owing to the possibility of combining the factors already considered with analysis of the associations which are formed. This method, combined also with the analysis of the associations which occur in simply writing down a series of words without time measurement, has been largely employed by Dr. Aschaffenburg, and has brought out many interesting results, some of which have been published.*

The second class of method employed by Kraepelin is the measurement of some simple kind of mental work. The kinds employed include counting, adding, writing, reading, learning figures by heart, and learning syllables, according to the method of Ebbinghaus.† Of these, adding and learning by heart have been most widely employed. Under Professor Kraepelin's direction I made use of the former method in a small investigation on fatigue and recovery, carried out during a visit to Heidelberg this summer, and I hope later

* "Archiv. f. Psychiatrie," xxvi., S. 597.
† "Ueber das Gedächtniss," Leipzig, 1885.

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in bringing this work before the Association to have an opportunity of describing more fully this method and some of the results obtained by its use. I will only say now that rows of figures, specially printed for the purpose, are added or learnt by heart continuously during certain times, varying according to the nature of the investigation. A signal sounds every five minutes, when the worker notes by a mark the amount added or learnt, and the amount of work done in each five minutes can afterwards be ascertained. Although the mental operations involved in these methods are simple, I think there can be no doubt as to their practicability in investigating mental capacity, and it was by their use that the effects of fatigue in different individuals were ascertained by Oehrn.

Among other researches by these methods which have been already published, is one by Bettmann* on the influence of previous physical and mental work respectively on the capacity for mental work. Work of this kind may be regarded as supplementing the work of Mosso† on the influence of mental fatigue on muscle work, and Kraepelin is continuing the investigation of the relations of mental and physical work by the comparison of the results obtained by the methods already mentioned with those obtained by means of the ergograph.

Other methods employed include the testing of sensibility, and especially the capacity for perceiving small stimuli—the estimation of time intervals, the testing of the depth of sleep, and most recently investigation of the characters of handwriting by a new and ingenious instrument, devised by Kraepelin, and called by him the "Schriftwage."

In order to test the chief features of any individual mind as regards capacity for mental work, susceptibility to fatigue, power of recovering from fatigue, etc., Professor Kraepelin has devised a method of taking a "psychical present state," in which the methods of adding and learning by heart are employed for different times and with pauses of different lengths on five successive days, the work of each day occupying about an hour and a half. The method is fully described in his introduction to the "Psychologische Arbeiten," and the author believes that by its means it is possible to obtain considerable insight into many of the chief mental characteristics of an individual.

* "Psych. Arbeiten," Bd. i., S. 152, 1895.
† "Du Bois Raymond's Archiv.," 1890, S. 89.

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I have here pointed out several ways in which experimental psychology may be useful to the study of insanity. The measurement of mental capacity, however, is capable of very wide application, and the methods which are found useful in the investigation of pathological problems may be found to be useful in other departments of practical life. They are capable of employment for the study of vexed questions in regard to education. Kraepelin has also devoted attention to this aspect of the subject,* especially in relation to the question of over-working school children, which is perhaps even a more serious problem in Germany than with us. Some of the investigations carried out in his laboratory have bearings in this direction. The work by Bettmann already mentioned is held to furnish evidence against the practice customary in German schools of sandwiching a lesson in gymnastics between two periods of mental work, a practice also condemned by Mosso on the ground of his experimental inquiries. Other observers, as Burgerstein† and Höpfner,‡ have carried out investigations directly on school children by more or less exact methods. Their work has been chiefly on the influence of fatigue, and its practical bearing has reference to such questions as the most suitable length of a school lesson. Work similar to that of Oehrn on the individual differences of children should prove useful in the examination of children who appear to be unable to stand the ordinary work of a school class, and this branch of practical psychometry should be especially interesting to us, partly because the simple methods which are found to be suited to children will probably also be suited to the insane, and *vice versâ*; partly because these educational problems are mainly matters of hygiene, and should be investigated by members of our profession.

[The paper was illustrated by a demonstration of the measurement of choice reaction-time, as carried out in Professor Kraepelin's laboratory. Hipp's chronoscope was used; the signal was one of two vowels, and was given with Kraepelin's lip key, which closed the circuit on depression; the reagent broke the circuit by means of one of two Morse keys, using the right hand for one vowel and the left hand for the other.]

* "Ueber geistige Arbeit," Jena, 1894.
† "Trans. 7th Internat. Congress of Hygiene," London, 1891, Vol. iv., p. 87.
‡ "Zeitsch. f. Psych. u. Phys. d. Sinnesorgane," Bd. vi., S. 191, 1893.

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Discussion on Dr. Rivers' Paper.

Dr. RAYNER, in moving a vote of thanks to Dr. Rivers, said that he was only expressing the views of the meeting by stating that they were extremely indebted to him for his deeply interesting communication and demonstration.

Dr. PERCY SMITH said he would have liked to have heard a little more from Dr. Rivers as to the nature of the cases in which Prof. Kraepelin had employed this method. One could understand that a certain number of patients would give more or less accurate answers, but he supposed that an asylum afforded a rather limited field of application. For instance, one would prefer not to have a clock or battery near a maniacal case; on the other hand, the melancholiac was so utterly wrapped up in his own troubles that he would be unable to give his mind to anything of the kind, except, perhaps, from the fact that it might be a novelty, and so attract his attention for a few minutes. No useful result was likely to follow its employment in such cases. With regard to dements, of course one would obtain evidence of delayed reaction, confusion or inattention; while with regard to general paralytics he should think that the results would be extremely untrustworthy. Again, as Dr. Rivers had stated, it involved a most tremendous expenditure of time, and he fancied that most superintendents had their time so fully taken up that but little was left to devote to such investigations. No doubt in some public asylums the expense required for such a purpose would be voted at once; but there were a great many who would think more than twice about the cost of such an apparatus.

The PRESIDENT did not think that the difficulties raised by Dr. Percy Smith with regard to the expenditure of time and money were so much in question, as, given the time, the apparatus, and the person, could definite results be obtained? In his opinion it would require a sane man to be able to obey the word of command in the proper manner; and the necessary process of education would not suit the disposition of many of their patients. Again, he had to consider the complaints of patients at Broadmoor that he worked batteries on them from his office. If he established an instrument of that kind there, he would not be able to give such a perfect denial as he could now. Apart from these points, however, if they could bring their minds to accept the records of the apparatus and the terms of explanation, important conclusions might be arrived at. At present he was sceptical, but perfectly willing to maintain an open mind to fresh developments and more definite results.

Dr. YELLOWLEES wished to know how mental fatigue was tested. He could understand the difficulty of teaching an insane patient to follow even such simple instructions as were necessary in the process, but in what way were they to get a lunatic to apply his mind so as to induce fatigue?

Dr. URQUHART asked whether the apparatus shown was a better one for their purpose than that which had been used by Dr. Bevan Lewis? It would also be interesting to know whether Dr. Bevan Lewis's work was in any way invalidated by that put before them to-day, or whether his results were corroborated by the more intricate apparatus.

Dr. RIVERS said that, so far as he knew, Dr. Bevan Lewis had only described experiments in simple reaction time, while Kraepelin thought simple reaction time of comparatively little value compared with more complex times. Besides, reaction time was only one of Kraepelin's methods. With regard to testing mental fatigue, that was done by giving the lunatic, or other subject, an hour's work (such as addition) to perform, but this method could only be carried out on a limited number. The amount of work done was noted at each quarter of an hour. Points were thus obtained, from which could be constructed a curve of work. His own opinion was that these methods would be chiefly of use in the study of those cases which did not go to asylums. The German psychiatrist had an enormous advantage, as nearly all the asylum physicians of Germany had under their charge cases of nervous diseases (which in England would be under the care of the neurologist) as well as such as would here go to the alienist.

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The objections offered to the application of Kraepelin's method to the insane did not, to his mind, at all alter the very great value of the results already obtained, the light thrown on problems such as the influence of work on normal and abnormal minds in normal and abnormal conditions. The objection to an electrical battery in an asylum was surely not insuperable, nor was the expense very great. The initial cost, especially in the absence of a supply of electricity, would be considerable, but a very great deal could be done by simple methods. He believed that the necessary expenditure of time would be the chief obstacle to the introduction of this method into England. Over a hundred observations could be made on an ordinary patient in about twenty minutes with the apparatus he had shown, and facility comes with practice.

Rest and Exercise in the Treatment of Nervous and Mental Diseases. A discussion opened by T. S. Clouston, M.D., and J. Batty Tuke, M.D., at the Annual Meeting of the Medico-Psychological Association, July, 1895.

Dr. Clouston.

I believe it is an absolute matter of fact that at the present time different physicians, both in private practice and in asylum practice, use different methods in regard to their newly-admitted patients, as far as in their treatment rest and exercise are concerned. I do not recollect that we have discussed this important question, nor do I recollect any definite paper on the subject by any competent authority. It therefore seems clear that the subject is one which demands our consideration.

Of late there has been a tendency to carry out what might be called rest in a much larger degree than formerly. I understand that it is the routine practice in many institutions to put a newly-admitted patient to bed for two or three days, or for a week or a fortnight, and in some cases even for as long as a month. Now this is so contrary to the practice of other men, and has arisen in so comparatively late years that it seems clear we ought to give some reason for the faith that is in us, whatever our practice be. There has also, I think, been a tendency of late to regard rest and exercise as if they were antagonistic modes of treatment; and the question as to how far they are antagonistic and how far merely complementary to each other is one for our discussion.

We have firstly to define the terms; secondly, to get at the symptoms, mental and bodily, present in the cases where those two respective modes of treatment can be ap-

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