The foregoing, as has been stated, is only a brief summary of the contents of this report, which is given in an abridged form in *Nature*, and will doubtless hereafter be published in full by the association. The facts which it presents disclose in the people of this aboriginal Switzerland qualities much above the average, and should lead to further inquiry into their history and characteristics.

SOME REACTION-TIME STUDIES.

THE study of reaction times derives a great interest and importance from the fact that by this means another bond of relation between mind and matter becomes apparent. All material actions require time. Mental actions as well, from the perception of a sensation to the highest expression of the intellect that offers itself to experimental investigation, also occupy an appreciable amount of time. This mental time is not constant as the time of a falling body in space, but is affected by slight variations in bodily and mental conditions.

M. Beaunis [1] has studied the effect of one important mental requisite, namely, expectation. The reactions were made to a visual sensation, and 36 persons besides himself (most of whom were medical students) were experimented upon. A signal (*advertisement*) was given, whereupon the subject held himself in readiness for the flash of light, so as to react by pressing the key as quickly as possible. The time between the signal and the flash of light is the *expectation time;* that between the light and the seeing of it, the *reaction time.* The expectation time was varied from .3 sec. to 3 sec., and the following conclusions were reached: —

(1) As others had already shown, the reaction time is shorter if a signal is given than if it is not.

(2) The *longer* the expectation time, the *shorter* the reaction time. The experiment may be compared to the problem of finding an object in a dark room by bringing the light of a bull's-eye lantern upon it. When there is no signal, that is, when directed to find the object without time to get the lantern ready, it would evidently take longer to find the object than it would if time were given to get the lantern in position; and the longer this time, the quicker would the object be found. The attention acts as the bull's-eye lantern.

(3) The difference between the minimum and maximum times is greater than when a signal is not given, and increases as the expectation time increases.

(4) The influence of several individual differences, etc., was evident. In two of the medical students the reactions were always slow. In many it was very quick. M. Beaunis was the only person who was accustomed to this kind of experimentation, and in his case a much smaller percentage of experiments had to be thrown out as faulty than in the others. The effect of health was marked in one case. Feeling slightly indisposed in the morning, M. Beaunis's reaction time was .37 sec., *i.e.*, abnormally slow. In the afternoon it was .222 sec., showing that the normal condition was returning. Two hours later it was normal (.160 sec.).

[1] *Revue philosophique*, September, 1885.

An extremely interesting research is that of Guiccordi and Ranzi,[1] in which they compare the reaction time to a sound impression in normal persons with the same in patients suffering from auditory hallucinations. The reaction time is obtained somewhat in this way. The making of the sound which serves as the stimulus sets into motion a chronoscope, which the subject stops, as soon as the sound is heard, by pressing an electric key. In this way the following table, giving in seconds the time necessary for hearing the sound, was prepared: —

	Normal.	Hallucinated.
Average of 10 shortest reactions out of 50	.1012	.0947
Average variation	.0033	.0046
Average of remaining 40 reactions	.1259	.1403
Average variation	.0132	.0206
Average of all 50 reactions	.1135	.1175
Minimum time	.0885	.0802
Maximum time	.1731	.2287

Taking the mean of the 10 shortest reactions, or comparing the minimum reaction time, we see that those suffering from hallucination are quicker in their perception of sound; and this difference must be ascribed to morbid irritability of these centres of apperception. On the other hand, the other averages, and especially the average divergence from the mean reaction time, *i.e.*, the average variation, and the maximum time, show that normal persons can command a steadiness and regularity of the attention, which is impossible in those afflicted with sound hallucinations.

In many cases the reaction time is and must be studied under rather artificial conditions. This circumstance is apt to weaken inferences drawn from such studies to similar processes in normal mental activity. In a recent study [2] of the time necessary for recognizing letters, numbers, colors, etc., this difficulty has been successfully overcome. Small letters were fastened to a revolving drum, and looked at through a slit of variable width in a screen held before the letters. The letters are

[1] *Revue philosophique*, September, 1885.

[2] "Ueber die zeit der erkennung und benennung von schriftzeichen, bildern und farben," by J. M. Cottell. *Philosophiche studien* (Wundt), vol. ii., No. 4. Leipzig, 1885. The work was done in the psychophysical laboratory of Johns Hopkins university.

adjusted at such distances that, with a slit 1 cm. wide, one letter is always in sight; if 2 cm. wide, two letters; and so on. By varying the rate of rotation of the drum and the width of the slit, the time necessary for the reading of a single letter under various circumstances was obtained. Up to a certain limit, this time is *shortened* as the slit is *widened*. This fact is to be interpreted as follows: In reading these letters, two time elements are involved: 1°, that of recognizing the letter; and, 2°, that of naming it. The association between the sight of the letter and its name is so close, that the latter action is performed automatically: hence, if the letters follow one another with so great a rapidity that the first can be named while the second is being recognized, the average time for reading a single letter will evidently be shortened; and the experiments show that this power of carrying over one letter while pronouncing the preceding can be active when three, or in the case of several persons when four or five, letters were present to the eye at once.

Another series of experiments showed that it takes longer to count letters than to name them; and if the letters are counted in groups of two, or better still of three, instead of singly, the counting time is reduced.

The time necessary for reading words in different languages was also studied; and the general result is, that the maximum rapidity with which words forming sentences can be read varies directly with one's acquaintance with the language. A German read 100 German words in 18.4 sec., but 100 English words in 29.1 sec. This method offers a means of objectively testing a person's acquaintance with a foreign language. If the words are read backwards (thus eliminating the sense of the passage, and reducing the process to mere reading), the time is lengthened; but the smaller one's acquaintance with the language, the less difference in time between reading it forwards and backwards.

It seems that among those tested, women read faster than men; and Germans take longer to spell their words than English-speaking persons.

If small strips of colors are used, instead of letters, it takes almost twice as long to name the true color as it would to name a letter; and this difference in time is due to the greater difficulty in finding the proper name. In this case the association between the color and its name is a loose one. These studies will be continued in the next number of the *Studien*. J. J.

NEXT year's exhibition at South Kensington, of the products of India and the colonies, is to be the last of the sort in that locality. Liverpool is to have an exhibition of shipping and means of transport.

THE LAWS OF TEMPERATURE IN THE AUSTRIAN ALPS.

DR. JULIUS HANN of Vienna, editor of the Austrian meteorological journal and a leader among European meteorologists, has lately completed his detailed studies on 'Die temperaturverhältnisse der oesterreichischen alpenländer,' which are now published in three parts in the *Sitzungsberichte* of the Vienna academy of sciences. All available observations are included in the reductions, and the results are stated with great detail. As to method, attention should be emphatically called to the reduction to normal means; that is, to the mean of some definite series of years, in this case the thirty years from 1851 to 1880: thus, if a station had records from 1855 to 1884, the mean of these thirty years' observations was reduced to what it most probably would be for 1851–1880 by the use of a correction determined from neighboring stations where the records covered both periods; that is, from 1850 to 1884. Wild of Russia, and Buchan of Scotland, have employed this method for low-level stations; Hann is the first to show its applicability to mountain stations also. As to results, one of the most striking is the appearance of the *increase* of temperature upwards in the thirty years' winter mean of valley and mountain stations as a persistent climatic element. Observations of late years have shown that this inversion of temperature — extreme cold in valleys with moderate cold on mountains — was common enough in the winter during anticyclonic or high-pressure weather, but it is here first shown to be a persistent inversion characteristic of the winter mean. Hann was also the first to explain, several years ago, the peculiarities of the warm winter alpine wind known as the *föhn*, which depends directly on the unduly high temperature of the upper air in winter.

BEN NEVIS METEOROLOGICAL OBSERVATORY.

THE highest of the Scotch mountains, Ben Nevis, reaches an altitude of four thousand four hundred feet; less than five miles away, the sea stretches a long arm up the submerged portion of the great glen to Fort William. On this well-chosen summit, in the path of many a storm from the Atlantic, the Scottish meteorological society has built an observatory, here figured, for the direct study of the conditions of the upper air, which observations at their low-lying stations must leave to inference. Most of the few mountain observatories of Europe stand at a greater height than the summit of the Ben, but none of