always experienced it, and saw exactly the same colour as her son for each vowel. As regards the diphthongs, however, mother and son were not agreed, and the mother's synæsthesias were more extensive than the son's. HAVELOCK ELLIS.

Variability of Reaction-Time. (*Psychol. Bull., April*, 1904.) *R. Yerkes.*

The *Psychological Bulletin* is a "literary section" of the *Psychological Review*, of some fifty pages, now published every month, and made up of short articles, reviews, and notes.

This paper on reaction-time deals with scientific method rather than with results. The author believes that investigators do not give sufficient attention to the variability of their results, and wishes to call attention to (1) the importance of variability in reaction-time statistics; (2) the need of choosing statistical methods in accordance with the nature of the material in hand and the demands of the problems; (3) the desirability of the more general use of curves of distribution; (4) the pre-eminent importance of relative variability, or the co-efficient of variability, for comparative reaction-time studies; and (5) the use of equality of variability as a basis of comparison in case of reactions to different modes of stimulation. In every study of reaction-time, he points out, it is usually desirable, and often necessary, to determine (1) *the curve of distribution*; (2) the *mode* (*i.e.* the most frequent group); (3) the *average* reaction-time, with its probable error; (4) the *range* of the series; (5) the *standard deviation* and its probable error; and (6) the *co-efficient of variation.* Several diagrams are given in illustration, and the paper will be found very valuable by those who wish to work out reaction-times in accordance with the methods now widely advocated by scientific investigators. HAVELOCK ELLIS.

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4. Clinical Neurology and Psychiatry.

On Unilateral Hallucinations of Hearing [*Sulle allucinazioni unilaterali dell' udito*]. (*Riv. di Patologia Nerv. e Ment., vol. ix, p.* 228, *May*, 1904.) *Lugaro, E.*

Lugaro's patient, a married railway official, æt. 39 years, had a maternal aunt who suffered from about 40 years of age from delusions of persecution, and a sister who, from the age of about 39, suffered from auditory hallucinations and mental enfeeblement. He himself broke down after his father's death, in 1898, became intensely depressed, and shot himself with a revolver in the right ear. The external auditory canal and the drum were injured by the ball, which lodged in the temporal bone, and was probably only partially extracted, having been broken up in its progress. Notions of persecution and sitophobia followed the suicidal attempt, but these were soon relinquished, and patient professed to have forgotten them, though he remembered the other incidents of his early illness. In about two months he resumed his business, feeling perfectly recovered. Early in November, 1901, he

relapsed after domestic trouble. He was silent, sluggish, sitophobic, sleepless; in a few days became lucid, saying that during the silent period he had constantly heard a voice calling into his right ear, "Kill yourself! kill yourself!" It seemed his dead father's voice. During the two previous years he had heard a noise in this ear like the sound of a grasshopper, but non-rhythmical, low, uniform and continuous. He was discharged quite recovered at the end of November. The "voices" soon returned; they came from time to time when he was alone and thinking, particularly when he lay awake at night, but also during office hours. The "noise," on the other hand, was continuous, but most noticeable when there was stillness around. The voice which seemed his father's said, "What hast thou done? Scoundrel!" referring to his suicidal attempt, for which he experienced remorse. Later, the patient began to hear his thoughts repeated in his right ear. He then endeavoured to divert his mind from this phenomenon and to turn the current of his ideas, but in a moment the hallucination returned again, clear and impressive. Early in November, 1903, the hallucination became more frequent, diurnal, always on the right side, the repetition of thought more insistent than ever. After a trivial domestic annoyance, he became much disturbed, and finally stuporous. Readmitted to asylum. He soon again recovered, and was able to give a lucid and intelligent account of his symptoms. Objective examination showed a cicatrised right membrana tympani. The right ear was deaf. Tuning-fork to vertex heard only in left ear. Electrical examination showed that a moderate current produced hissing noises in the right ear, while the strongest that could be borne was absolutely without this effect in the left.

Lugaro believes that the only other examples in literature of an hallucinatory repetition of thought in the unilateral form are cases which have been recorded by von Bechterew and Régis. In discussing unilateral hallucinations he follows Tanzi, and expands the latter's theory to the effect that the fibres which normally subserve the function of attention may in diseased conditions serve to carry sensory impulses from the higher to the lower centres—that is, in a retrograde direction. While each ear has its centre in the opposite hemisphere, yet each ear is connected with both hemispheres through the fact that the auditory tracts are only partially crossed; in the same way the attention-fibres from each ear connect with both hemispheres, though mainly with the opposite: therefore, the acusma acts by constantly fixing the attention (whether with the patient's full consciousness or not) on the affected side, and thereby facilitating the transmission downwards of impressions originating in the higher centres. Thus the threshold of hallucination is rendered lower on the diseased side, and a central disturbance incapable of giving rise to hallucination on the sound side, and which would, perhaps, never have given rise thereto if the patient had not had a diseased ear, causes hallucinations solely on the side whence originated the acusma.

On the other hand, acquired deafness and acquired blindness undoubtedly favour hallucinations respectively of hearing and of vision. In some cases, as in the one above described, the phenomena of acusma and deafness are combined. In case of unilateral auditory

hallucination with deafness it may be said that the sensory centre, condemned to inactivity by deprivation of its natural centripetal stimulant, acquires a special sensibility, and reacts too readily to retrograde stimulation. Neither is this explanation inconsistent with that which has been given above, for the acusma that may be combined with deafness or partial deafness is not sufficient to exhaust the energies of the centre, which remains inert, in spite of the more or less continuous irritation of a comparatively simple nature. CONOLLY NORMAN.

The Pathogenesis of Hallucinations [*Nota sulla patogenesi delle allucinazioni*]. (*Rev. di Patol. Nerv e Ment., vol. ix, fasc. vii.*) *Roncoroni L.*

In this paper, the author gives his views as to the pathogenesis of hallucinations and endeavours to prove the fallacy of Tanzi's teaching. He quotes this author at length and gives specious reasons for doubting his theories.

He says that Tanzi has developed in a very full and original manner the theory of an hallucination being the result of a retrogression of a represented image on to the sensory centres, but he does not seem to have removed the doubt that his theory is neither necessary nor sufficient to explain the phenomenon. Tanzi, while admitting the identity of the situation of sensory phenomena and hallucinations, holds that the origin of all genuine hallucinations is transcortical. He writes: "The hallucination arises as an idea or a symbol, or a more or less conscious part of an idea, in the association region . . . . this returns to the sensory area whence it emerged as a sensation. It thus becomes anew what it was—a sensation, but a pathological one, owing to its unusual origin."

One of the chief arguments advanced by Tanzi against Tamburini's theory is that it does not explain how incongruous pathological stimuli —as, for instance, a chemical irritant—acting on the usual centres, produce complete images, since the visual centre of each hemisphere can only give rise to a half-image. They should rather, according to Tanzi, excite a confused mass of hemianopic images. The author holds that it has not been proved that chemical irritants, acting on the nerve centres, produce hallucination. The toxic agent only acts as a predisposing cause: the hallucination arises, except in cases of local stimulation, through a psychological process. This may seem to lean to Tanzi's theory, but it has not been proved that the psychological stimulus determining the origin of the hallucination belongs solely to the representation centre corresponding to the sensory centre where the hallucination is present.

Gowers believes in the existence of a higher visual centre in which is represented all the retina of the opposite side as well as that of the same side, but the former more than the latter, and that this centre was connected with the corresponding centre of the other side, as well as the cortical visual spheres of either side. It is not necessary, Roncoroni holds, to call into aid such a centre, since it is admitted that the visual centres of both sides are directly connected by com-