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-

missural fibres, and every stimulus that acts on one hemisphere is transmitted to the other, completing the image, the half-image of one eye arousing the half-image of the same eye on the opposite side so quickly that there is no consciousness of it.

For hallucinations to occur, the cortical centres of both sides must be in a particular state of irritability, and this may be occasioned by toxins, among other causes. If only one side is stimulated, the half-image corresponding to the normal side will not be projected, and hemianopic hallucinations will result. Pick had a case of this kind, but they are rare. It can be understood how bilateral homonymous hemianopic hallucinations arise if one of the visual centres is the seat of a severe lesion, as in Peterson's case, where the hallucinations were present only in the visual fields corresponding to the uninjured centre, and did not appear in the blind half of the field of vision.

Roncoroni is not prepared to say whether the centres where representation and sensation are formed are identical or not: he says that even more centres may exist for syntheses of different degrees, but holds that hallucinations are formed by a mechanism different to that put forward by Tanzi.

The author criticises Tanzi's arguments and facts brought forward to support the latter's theory, and holds that these can be explained easily in another way. Thus in the hallucination with the eyes shut, contrary to what generally happens in hallucinations, the pathological image is impeded in its manifestation by the real image when the eyes are opened.

In a case reported by Pieraccini the image disappeared on closing either eye, but this was probably due to auto-suggestions.

According to Tanzi the thought expressed aloud demonstrates the fact that there are separate centres for representation and hallucinatory sensations, for if the thought and its hallucinatory repetition had the same seat of origin one would have to admit a repetition of the stimuli. It is not, however, Roncoroni holds, necessary to suppose that the thought arises in every case in the representation centre corresponding to the sensory one where the hallucination apparently is seated. The idea might have its origin in other cortical centres, such as the visual or motor-verbal.

Bilateral antagonistic hallucinations, hallucinations of contrast, and associated antagonistic hallucinations may be explained by supposing that there are two antagonistic thoughts which determine in the sensory centres each an opposing hallucination. Here, also, it is not necessary to hold that the representations which arouse the hallucinations originate in the representation centre corresponding to the hallucinated sensory one.

Tanzi himself asks why, if the hallucinatory image is preceded by an analogous thought, many times it happens that the hallucination seems to have no relationship to the thought. His opinion is that this is due to the great rapidity of the "sensory repercussion" (*viz.* the recoil to the sensory centres) and also to the fact that the representation causing the hallucination is of a sub or unconscious nature. Unilateral hallucinations of hearing also seem to Tanzi to oppose his theory, and he has to call to his aid adventitious sounds in the affected ear to explain them.

According to Tanzi, sensations leave no trace on the sensory centres. These centres cannot give of themselves a complete image, but can only reflect it, acting in the case of sight like a mirror, in hearing like a resounding-board. In the representation centres, he says, mnemonic representations are fixed in the state of symbols. The hallucination is the result of the sensory centres, in pathological cases reflecting these mnemonic representations. Roncoroni asks, How can the sensory centres reflect a symbol? If the representation centres contain, as Tanzi holds, a picture of reality, they would be sensory in their function.

To sustain his theory Tanzi is constrained to deny to peripheral hallucinations the character of genuine hallucinations. Now, many authors hold that purely central hallucinations do not exist. Sully says that in the majority of hallucinations it is impossible to prove that there is no contributory external action.

Roncoroni holds that the mechanism at work in the formation of hallucinations is identical with that involved in epilepsy as propounded in an earlier paper. He puts forward the following conditions as necessary for the origin of an hallucination: (1) A hyper-excited condition of the hallucinated sensory centres. This state may be unilateral or bilateral, temporary or permanent. (2) Diminution of the inhibitory action of the association centres. He holds that as in epilepsy the subcortical centres assume more important and independent functions, and are less under control to the inhibitory action of the higher centres. These two factors are as a rule present together, but either may be wanting or in excess of the other. In cases where the hyper-excitability of the sensory centres is lacking he supposes, with Kraepelin, that the psychical centre is in such a state of over-excitability, and the representation power so vivid, that the sensory centre is stimulated in a manner similar to that obtaining in the case of a peripheral sensation.

The cause which determines the hallucination.—He believes that there is a stimulus of either a psychical (having its seat in the psychical centres, motor, sensory, or senso-motor) or a non-psychical nature.

Seat of the stimulus.—There is nothing to preclude the situation of the stimulus being in any part of the senso-psychical tracts, the hallucination being, as Tamburini held, in the sensory centres. The stimulus may arise from a peripheral organ; from the nerve connecting this with the subcortical centres; from the subcortical centres; from the cortical sensory centres (simple or complex); from the tracts uniting the sensory centres with one another or with motor or psychical centres; from peripheral parts of the body connected indirectly with the hyper-excited sensory centre; or from neoplasms or neuroglia in the sensory centre.

Roncoroni says that if we consider as such the situation of the hallucination, the conditions through which it arises, the causes which evoke it, and the seat of the stimulus which determines its manifestation, the clinical facts receive a natural explanation. Some of these have already been explained, as the hallucination with the eyes shut, and the thought expressed aloud. That the hallucination often has no relationship with the idea occupying the attention can be understood when the

stimulus provoking the hallucination has nothing in common with what the patient actually has in his thoughts.

As to unilateral hallucinations, Paoli's explanation is not an improbable one—that if the recall of an image can by retrogression acquire an hallucinatory character when the sensory centres are in an over-excited state, it can also be assumed that the phenomenon could be localised in one ear, if one only of the cortical auditory centres was in a similar excitable condition. This explanation will not suit for unilateral hallucinations of sight, because of the hemianopia resulting. For them always remains the hypothesis before mentioned of a higher visual centre, if this can be admitted to be alone in a state of hyper-excitability. On the other hand, it is admitted that the two cortical visual centres are united by commisural fibres, by the co-operation of which there is formed a complete image. It is possible, Roncoroni alleges, that the half-image of one eye has a greater intensity and proneness to reaction than the half-image of the other eye; so that if one hemisphere alone is stimulated the half-image of one eye only may be projected, and this, co-operating, by means of the association fibres, with the half-image of the same eye in the other hemisphere, would give a complete unilateral hallucination of sight.

Bilateral antagonistic hallucinations can be explained if it be supposed that the sensory centres are open to stimuli of different types—for instance, representations of opposite significance; but these need not come from the representation centre corresponding to the hallucinated sensory one.

The author holds that a very serious problem remains. If the conditions under which hallucinations are formed are permanent, why is it that they manifest themselves at intervals? Perhaps, he says, it is because the stimuli capable of evoking them are present only at intervals; perchance because the arrest or disturbance of the inhibitory power is not permanent, at least in its entirety; or because the morbidly excited state of the sensory centres can undergo phases of increase or diminution.

A. J. EADES.

Mental Symptoms associated with Pernicious Anæmia. (*Amer. Journ. Med. Sci., June*, 1904.) *Pickett, W.*

Five cases of pernicious anæmia exhibiting mental symptoms are here briefly described.

A composite picture of the mental disturbance in these cases, says the author, presents a shallow confusion with impairment of the ideas of time and place (disorientation), more marked on awakening from sleep. The patient fabricates, relating imaginary experiences of "yesterday" in a circumstantial way.

Illusions, particularly of identity, are common. Hallucinations appear at times, pertaining to any of the senses.

Based upon these illusions and hallucinations, persecutory delusions arise. These are usually transient, causing episodes of fear or agitation, but they may persist for considerable periods and be thus somewhat fixed; they may be even systematised, as in one of the cases described.

The pernicious anæmia psychosis is mainly an abeyance of mind; it