“RE-EDUCATION OF THE ADULT BRAIN.”

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THE very interesting and important case narrated by Professor Sharpey in the April number of ‘BRAIN’ recalls one that fell under my own observation rather more than twenty years ago. I will state its principal features, without going into details, and then venture to make the two cases an occasion for a few brief speculations which I am desirous of laying before medical-psychologists, with a view to obvious practical inferences in respect to the treatment of what I conceive to be a not uncommon cerebral condition.

In 1858 I was requested to see a daily governess and teacher of music, who had been suddenly attacked with what was thought to be acute mania. I found a spare, somewhat angular, eccentric-looking young woman, *ætat.* 26, in a state of great excitement, hysterical and choreic. Within a few hours—after a paroxysm of considerable violence, during which she talked and sang wildly and was with difficulty restrained by those around her—she fell into a state verging on suspended animation, which lasted a week. The skin was cold, and presented a dark mottled appearance; the pulse was scarcely perceptible at the wrist; the breathing slow and seldom deep; there seemed to be complete loss of consciousness, and scarcely any trace of sensibility. The muscles were cataleptic, and the extremities dropped slowly when raised. It was barely possible to feed the patient by the mouth, by holding forward the larynx and placing the fluid far back in the pharynx with a spoon, when it seemed to flow down the œsophagus as through a flaccid tube. This condition, which was treated with the interrupted current from the occiput and nape to the

hypogastrium, and mustard-poultices down the spine, subsided very gradually. Then came the state I am chiefly interested to note. There had clearly been an exciting cause for the attack in religious excitement, acting on a nervous system exhausted by protracted toil as a teacher.

When consciousness began to return, the latest sane ideas formed previous to the illness, mingled curiously with the new impressions received, as in the case of a person awakening slowly from a dream. When propped up with pillows in bed near the window, so that passers in the street could be seen, the patient described the moving objects as "trees walking;" and when asked where she saw these things, she invariably replied "in the other gospel." In short, her mental state was one in which the real and the ideal were not separable. Her recollections on recovery, and for some time afterwards, were indistinct, and, in regard to a large class of common topics which must have formed the staple material of thought up to the period of the attack, memory was blank. Special subjects of thought immediately anterior to the malady seemed to have saturated the mind so completely that the early impressions received after recovery commenced were imbued with them, while the cerebral record of penultimate brain work in the life before the morbid state was, as it were, obliterated. For example: although this young woman had supported herself by daily duty as a governess, she had no recollection of so simple a matter as the use of a writing implement. When a pen or pencil was placed in her hand, as it might be thrust between the fingers of a child, the act of grasping it was not excited, even reflexly: the touch or sight of the instrument awoke no association of ideas. The most perfect destruction of brain-tissue could not have more completely effaced the constructive effect of education and habit on the cerebral elements. This state lasted some weeks, and the "recollection" of what had been "forgotten," to use conventional terms, was slow and painful, needing, or, as I would now say, seeming to require, a process of re-education as distinct as (though, I judge, less prolonged than) that which proved necessary in the case detailed by Professor Sharpey. In the end recovery was mentally and physically satisfactory.

I cannot assume that anything in these two narratives will strike the practical psychologist as novel, or of even unfrequent occurrence. The clinical aspect of such cases has been sketched times without number. Nevertheless they present features of interest, as viewed from an etiological stand-point, which may be worthy more than a passing notice.

Either of three conditions may, I believe, be set up by brain disturbance, or disease, causing "loss of memory":—1, complete destruction of cerebral cells; 2, withering or blighting, which amounts to obliteration of the cells without destruction of their nuclei;¹ 3, a suspension of function without arrest of nutrition, as though a particular area of the cerebral organism were thrown out of the circuit of energy.

In the first event there will be final effacement of the records of ideation. So far as the cells destroyed are concerned, they and their properties are lost for ever. If the functions previously performed by these strata or tracts reappear, it must be because some other part of the brain has taken up the business vicariously—as I believe is possible with nearly every function or manifestation of mental energy. In the second event, when the cells are withered but the nuclei remain, a new crop of cells may spring from the parent organism, and after a lapse of time sufficient for development, the educationary record will reappear, the seed reproducing its kind, plus the effect of training and ideation. It may be that there will need to be so much re-education as to cultivate the new growth, and perhaps a re-impression of purely objective ideas, but it may, and probably in the majority of instances does, happen that the new cells will be developed with all the characteristics of the old. In the third event recovery may occur instantly, almost at any moment, if the obstacle to communication is overcome or breaks down in convalescence, so that the isolated, but scarcely injured, congeries of brain cells may again be energised. I speak of brain cells instead of "nerve-molecules," because, even accepting the vibration theory, it must be assumed that the vibrating particles are cellular vital organisms.

¹ I use the term *nucleus*, here and throughout in a non-physiological sense, simply to designate the seat of life in a cell, whatever that may be.

Supposing the states I have described to exist, I venture to suggest that the development of a new crop of cells from denuded germs or nuclei will account for the facility with which re-education, in cases like that described by Professor Sharpey, reproduces *knowledge*, even at a period of life when it is not easy to learn. What the new training and teaching does is not so much to impart information as to foster the growth of a new crop from the old seed, just as an after-crop may be procured by breaking up an over-stocked soil and applying the stimulus of manure. It is always possible that in the first process of instruction more seed may have been sown than germinated. Some good mental seed doubtless falls on barren ground, and it is perhaps due to the vitality and subsequent germination of this seed, ideas we do not seem to have cultivated deepen as the years go on.

Meanwhile I fancy it is as the progeny of old nuclei the physical bases of a revived memory are restored during general recovery in cases of the class before us. It seldom happens that the re-educating process needs to be very explicit or prolonged. Far less teaching than would have sufficed to implant the knowledge originally will cause it to reappear. In cases where the cells only are destroyed and their centres of vitality remain, it may even happen that the mere establishment of health will suffice to bring about complete restoration. When the new cells grow, the old memories will be revived. This is what takes place in ordinary cases, when, although no especial pains are taken to re-educate, the "lost" knowledge returns. The completeness of the recovery will probably depend on the vigour of the first growth, and is doubtless governed by the same law which determines permanence or tendency to revert to an old type in the propagation of recently impressed or acquired qualities of species or family. Ideas, or an organic tendency to form particular conceptions, are certainly transmitted from parent to child. The cells first developed in a foetal cerebrum are probably imbued with the qualities and properties of the brains of the mother and father, in different proportions. The transmission of germs of mental character which slumber through one generation and awaken with all their ancestral energy in the next

is a recognised fact. It will therefore probably happen that the new crop does not at first present all the features of that which was blighted by disease, but develop part of its characteristics later on. Thus vigorous health at an advanced period of life will sometimes produce a perfecting of the recovery commenced, but not consummated, years before.

Cases of the first and third class are very likely to be confounded in practice. Final destruction may be assumed when perhaps, a tract has been isolated without being destroyed. In this way I venture to think hopeless dementia is occasionally diagnosed, when what has happened is the disconnection, or throwing out of the circuit of cerebral energy, of a particular tract or stratum of elements; and, unless watched, partial recovery, susceptible of treatment, may happen without being observed and helped at the critical moment.

Treatment for the first class of cases is valueless; for the second, the cure must consist in the reproduction of brain-cells, or rather, as I have suggested, the development of a new crop from the denuded nuclei of blighted cells. The so-called "re-education" is only in a limited and scarcely physiological sense educational. It is a repetition of the training, not so much to teach as to stimulate the growth of new organic elements from pre-existent germs imbued with formative forces and characteristics which must themselves determine the physico-mental result. If new cells *are* produced they will be found already educated, that is, endowed with inherited characteristics which constitute the physical bases of memory. The educated germ naturally produces an educated cell. Upon this hypothesis rests the whole theory of heredity, species, and transmission.

In the third class of cases, recovery occurs as an accident of treatment, except when in the presence of a constitutional cachexia like syphilis, specific medication may remove the grip of disease which, so to say, holds the mental organism in fetters that its energy cannot act. It will, I think, be often found that the seemingly permanent losses of memory which occur after acute disease are due to the isolation of special strata of cerebral tissue by the stasis of syphilitic or gouty disease. Mercury, iodide of potassium, or colchicum,

may in this way serve as a "memory-powder," and work a cure.

The two points I am chiefly anxious to place on record, without any claim to novelty of suggestion are, first, that what is called re-education is often simply the fostering of a natural growth—never harmful unless overdone, but of less value than may at first sight be supposed—second, that, in the absence of special indications that what seems to be helpless dementia is actually what it seems, i.e. a physical destruction of brain-cells; it is always *possible* the patient may recover, and therefore never justifiable to write a case off as incurable, and leave it to drift unnoticed and unhelped.