do it in the future, but no *prima facie* statement without such investigations is of any value. If you reject persons who are capable of work because they are not able to read certain letters at a particular distance you are going to throw a number of men out of employment who might otherwise be pursuing occupations remunerative to themselves and beneficial to the community, and add materially to the number of the unemployed, although not unemployable.

A PLEA FOR A NATIONAL LABORATORY FOR THE STUDY OF MENTAL ABNORMALITY.

BY

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By the publication in 1914 of Dr. Shaw Bolton's *The Brain in Health and Disease* and of Dr. G. A. Watson's equally important work on cortical stratification and cerebral function in horizontal layers, it appears to be established that developmental errors in the cellular elements of the several horizontal layers of the cerebral cortex underlie many of those antisocial reactions characteristic of criminality and some of the insanities.

Almost every branch of study shows that the principles underlying the structure of the nervous system are the same in all vertebrates. Once fertilization is accomplished the single-celled ovum undergoes a rapid process of cell division, and these cells resolve themselves into three great types—somatic, reproductive, and nervous. As regards the last highly specialized cells (neurons), it is now generally believed that, though they remain throughout life anatomically independent, they cannot function physiologically unless they become combined into chains and arcs. A neuron is usually comprised of three nerve elements—a receptor, afferent, or sensory neuron conducting from the periphery centrally; an interposed, connecting, or internuncial neuron; and an effector, efferent, or motor neuron. Medical attention has, perhaps, been too exclusively focused on the long conducting receptor and effector neurons, yet it is the internuncial neurons which, when present in sufficient numbers, result in the phenomena termed "mind."

The researches and investigations of Golgi, Cajal, Mott, Bolton, Watson, and many others suggest, if they do not actually prove, that all mental phenomena—speech, reason, memory, and the like—are the products of many thousands of millions of cerebral neurons linked together in arcs and functional units, and that these millions of cerebral cells appear to be internuncial in type.

In the spinal cord the dorsal spinal nerve roots are composed of receptor neurons. The connecting associational and commissural neurons are internuncial in character, and the ventral spinal nerve roots transmit the effector neurons of the arcs. In the cerebellum the receptor (proprioceptor) neurons chiefly traverse the inferior cerebellar peduncles. The internuncial neurons are of the supra-segmental type—that is, the associational and commissural neurons of the spinal cord are replaced by small granular cells strictly confined to the grey matter and forming the bulk of the cerebellar cortex, and greatly outnumbering all other neurons in the cerebellum. The relatively few Purkinje cells constitute the effector cells of the cerebellar neuron arcs. The cerebellum is thus distinguished by a totally different type of internuncial or connecting neuron, and the associational and commissural spinal cord types are completely absent, being replaced, as stated, by the granular cell type. The fact that anatomical nomenclature has differentiated these granular cells as basket, stellate, Golgi Type II, and the like, should not be allowed to divert attention from the fact that all are interposed between the receptor and effector neurons of the cerebellum and are thus internuncial in character. Cerebellar cortical construction thus compels the conclusion that the function of these numerous cerebellar internuncial cells must be that of storage of nerve impulse; hence the cere-

bellum is, clinically and functionally, a great storehouse of nerve energy, and this energy is liberated under the control of the cerebral cortex exercised through the cortico-ponto-cerebellar pathway, and comes into action in every voluntary muscular movement.

The cerebral cortex fulfils functions so different from those of either spinal cord or cerebellum as to suggest that a totally different construction must be employed by nature, and yet such is not the case. The cerebral cortex, in its structure, simply repeats both spinal cord and cerebellar types, the essential difference being that there are far more associational and commissural internuncial (spinal cord type) neurons, and granular (cerebellar type) ones in the cerebral cortex than in either spinal cord or cerebellum.

In the cerebral cortex the thalamo-cortical fibres form the receptor limbs of the neuron arcs. The projection systems represent the effector sides of the arcs. There are thus left the enormous numbers of granular cells, and the even more numerous pyramidal and polymorphic cells, the axons of many of which form the associational and commissural systems of the brain, as the representatives of the connecting or internuncial units of the neuron arcs. It is not, as yet, clear whether these numerous cerebral neurons are all to be regarded as the internuncial neurons of the primary cerebral neuron arcs, or whether they form secondary neuron arcs within the primaries. All the evidence, however, seems to warrant the conclusion that it is these presumably internuncial cortical neurons which, by storing up all those numerous nerve impulses which continually bombard the brain from birth to death, act as the physical basis of memory, and therefore of speech, reason, judgement, and of all mental phenomena.

Recent research, particularly that of Bolton and Watson, has shown that the cell bodies of these cerebral neurons which are almost certainly internuncial in character and function tend to arrange themselves in the cerebral cortex in definitely stratified layers, and that this horizontal stratification has a subtle, but profoundly important, functional significance. Excluding the fibre laminae of the cerebral cortex, which are not germane to the present argument, the human cerebral cortex is composed of three layers of cell bodies—pyramidal cells on the exterior, granular cells in the middle, and polymorphic on the interior next the white matter. The polymorphic cells on the interior, termed by Watson the infragranular cortex, are present in all mammals, and are believed to be the nerve elements controlling or concerned with the purely animal functions of the body, such as the acquisition of food and the activities of sex—that is, the infragranular cortex appears to be the brain of the preservation of the individual and the perpetuation of the species.

The pyramidal cells on the exterior are best and most largely developed in man, and man is the only animal who possesses a sufficiency of such pyramidal cells to give him the power of voluntarily inhibiting the animal functions of the infragranular cortex. The layer is termed by Watson the supragranular cortex, and the cell bodies are of the kind commonly and always associated with the effector functions of inhibition. When normally developed man can, therefore, exercise a voluntary control over the animal instincts of sex, acquisition, and self-gratification; and society, in the interests of all, expects him to do so. It is illogical and erroneous to attribute mental evils to a purely physiological process like repression, for repression is a human attribute, and the welfare of the nation calls for its exercise. If, however, the individual possesses a relatively undeveloped supragranular controlling cortex it necessarily follows that his powers of control are diminished, and he is more likely to react to his environment on the more purely animal basis of acquisition, sexual gratification, and lack of appreciation of the consequences of these reactions. It is a striking fact that at least 75 per cent. of those antisocial reactions against which society seeks to protect itself, and known as "crimes," are directed against the person or the property—that is, sex and acquisition. It is equally striking that Bolton and others have been able to demonstrate that these antisocial personalities are found, after death, to possess a thinner supragranular cortex—that is, one with fewer pyramidal

cells than normally should be the case. It is equally confirmatory that Berry and Porteus in Victoria, and Morris Miller in Tasmania, have been able to substantiate the fact, from an examination of many thousands of cases, that about two-thirds of the known antisocial group possess appreciably smaller heads than the normal, which is, of course, a macroscopic and clinical confirmation of Bolton's microscopic studies.

This definitely measurable thinning of the cerebral cortex occurs chiefly, according to Bolton, in the frontal region, and chiefly affects the pyramidal-celled supragranular cortex, and these observations of Bolton are generally confirmatory of the earlier and more primitive work of Batty Tuke and other alienists. Such a cortical thinning denotes, as stated, a diminished number of cortical neurons, and a diminished number of cortical neurons equally connotes an altered reaction to the environment. Many human individuals pass into the complexities of adult life with an undeveloped, partially developed, or irregularly developed pyramidal-celled supragranular cortex. They possess the sexual and physical appetites of the adult with the brain of control of the child, and it is futile to expect from such abnormally constructed individuals that normality of conduct as regards sex and respect for the property and welfare of others which constitutes the essential basis upon which all civilized society rests. The bulk of them are aments and will remain aments, and their social reactions will be the final product of their environment. With such an undeveloped and unstable mental or cerebral structure they may succumb earlier, and in larger numbers, to the stresses and strains of a complex civilized life, and thus swell the populations of our poorhouses, police courts, mental hospitals, gaols, benevolent homes, and the like. They thus add to the financial burdens of the fit, and aided, as they so frequently are, by a misguided charity, may not improbably eventually poison and destroy civilization itself.

A minority of this group, those with an apparently irregularly developed cerebral cortex, form an even more dangerous section of society, the more so because they are frequently mistaken for people of ability, and defy most of the known or recognized tests for amentia.

Many forms of abnormal mental reaction are probably not so much due to disease as to aberrant cerebral development, with a consequent disordered reaction to the environment. Debates on the relative importance of heredity and environment are many. The human brain is the product of both. Mentally deficient parents will breed similar children, and will do so in larger numbers than is good for society, and for obvious reasons. Lacking an adequate brain of control, they obey, like the animal, the dictates of nature, and give free rein to the passions of the body. Developmentally, and in the normal individual, the neuron or brain cell undergoes a series of embryological changes, without which it cannot function. At birth the cerebral cortex, and particularly the pyramidal cells of the supragranular cortex, are largely in a neuroblastic, non-functional condition, and hence the mental reactions of the newborn child tend to resemble those of the idiot. With the incoming of the exteroceptive stimuli, particularly those from light and sound, a necessary factor for the conversion of the non-functional neuroblast into the functional neuron is introduced. The environment, therefore, materially affects, not only the nature of these stimuli, but also brain growth itself. If, for example, the acoustic exteroceptive stimuli be completely cut off, the child becomes a deaf-mute, with a thinner acoustic cortex and a correspondingly diminished general intelligence. If both visual and acoustic stimuli are arrested the child may become an idiot from deprivation of its senses, because stimuli important to the conversion of neuroblasts into neurons are lacking—always assuming, of course, that no other form of "education" takes the place of these important "senses." If, again, the child be in such an environment as to encounter only obscene words, criminal acts, and the expression of perverted thoughts during this most important formative stage of cerebral development, there can be only one result—antisocial reaction at a later stage. Education is the establishment

of neuronic habit, and that, in its turn, is the result of the environment. Education—that is, the environment—thus plays an important part in brain growth and mental development, but if the machine be so imperfectly constructed from the beginning as to make it incapable of receiving the necessary number of stimuli, then some severe degree of amentia must persist throughout life. If this be very pronounced the law will probably demand the segregation of the child as an imbecile, but if it be not so pronounced, or be obvious only to the adequately trained neurological expert, the child will be passed into the complexities of a civilization for which it is quite unfit, there to perform those bodily acts regarded as criminal by the more normally constructed members of society. All scientific evidence thus seems to show that mental phenomena are the result of an adequate number of exteroceptive stimuli being received by an adequately constructed cerebral cortex—environment and heredity. The first place to seek for mental abnormality of all kinds, and certainly those which are commonly classified as antisocial, are the cells of the human cerebral cortex, and this study demands co-operative national effort.

That there has not hitherto been any co-operative effort to study the mental abnormalities appears to be due to a lack of appreciation of the simplicity of the great principles underlying the construction of the vertebrate neuraxis, and the present-day somewhat illogical position of the study of the nervous system may not unfairly be represented thus:

<i>Structure.</i>	<i>Specialty.</i>
1. Receptor neurons	Diseases of the nervous system.
2. Internuncial { Normal	Psychology.
{ Abnormal	Psychiatry.
3. Effector neurons	Diseases of the nervous system.

To divide a functional entity, like the neuraxis of man, into a series of watertight, non-correlated specialities appears to be unscientific and calculated to breed error. It is rather unity of study which is so essential; and the future integrity of the nation appears to demand the establishment of a national laboratory for the study of cerebral and mental abnormality. Even though the critic may be indisposed to accept the statements herein briefly mentioned, he must in fairness admit that there is sufficient suggestive evidence to warrant further inquiry, and the magnitude of the problem justifies a national effort.

TREATMENT OF LUPUS VULGARIS.

BY

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DURING the last four years almost exactly 4 per cent. of the patients treated at the dermatological clinic of the Royal Infirmary, Cardiff, were cases of lupus vulgaris, the proportion of males to females being a little more than two to three. The methods of treatment used have been pyrogallol ointment, acid nitrate of mercury (as recommended by Adamson), salicylic acid and creosote plaster, x rays, ultra-violet rays, and alkaline phenol followed by a hypertonic dressing as described below. Of these x-ray treatment has been little employed as the results were slow and uncertain. Ultra-violet rays applied by the Kromayer lamp locally, combined with general irradiation, have been disappointing, as cases which did not readily yield to other methods failed to respond, and where they would doubtless have been efficacious the other methods gave quicker results. Salicylic acid and creosote plaster acted well in some cases, but was slow.

Pyrogallol ointment 5 to 10 per cent. proved valuable if thoroughly applied for a long period. One case—a girl aged 13—had when first seen a wide band of lupus on the left thigh, a smaller area about the right gluteal fold, a large area on the left shoulder, and wide areas on the cheeks and nose. The treatment was carried out by a friend, who described rubbing the areas with the ointment till they