

me that the model asylum edifice of this era of psychological activity is perhaps erected both at the too great expense of the humane public, as well as opposed to the best hygiene and curative interest of the improved and chronic insane; or, in other words, I am almost persuaded to assert my belief that less expensive segregated cottages, erected on asylum farms for the treatment of the improved and chronic insane, sufficiently near the main edifice where all can be under one supervision, and where exchange of patients may readily be made, when the condition of the patient requires it, would be a very great improvement in the present mode of provision and treatment of the insane.

These experiments having shown such results become strong arguments in favor of a cottage plan, combined with the prevailing system so as to give more freedom and outdoor life, especially to the chronic insane. Such additional facilities need not cost over twenty per cent. of what the usual hospital structures cost the taxpayers of the country, which is on an average about \$1,000 per capita. Our building at Anna, which I neglected to state is furnished with hot and cold water, a system of sewerage, and is lighted by gas, cost thirty-seven dollars per capita, but is intended for summer use. If such accommodations were added to hospitals already built and in operation, but constructed to meet the emergencies of the winter season, it would result in materially diminishing the cost of maintenance, while the sanitary and hygienic conditions would no doubt be materially improved.

With us at Anna, the result of our experiment has been a strong argument in favor of such a plan, and has largely dispelled the doubts we have entertained as to its utility.

#### DEGENERATION AND REGENERATION OF SEVERED NERVES.

In a recent lecture on the functions of the nervous system the venerable Dr. John C. Dalton reviewed at some length the experimental investigations of Waller and Türck. It is forty years, Dr. Dalton said, since the present movement of experimental investigation as to the functions of the nervous system commenced. It had long been a familiar fact that if a nerve was cut the immediate consequence is a suspension of the functions of the section thus separated from the main trunk. If the nerve was motor the muscles supplied by it became palsied; if sensory, there was suspension of sensibility in the parts supplied. But this suspension was not always permanent. Sometimes, after a few days had elapsed, the interrupted function was restored, and this was soon ascertained, by examination, to be due to the uniting of the cut surfaces or ends by granulation and the formation of new fibers. For many years investigation was exclusively directed to the study of the cicatrix and its process; but at length one more curious than the rest extended his studies to the mode of degeneration in the portion of the nerve severed from its trunk, and made some striking revelations, finding that the retrogressive alteration consisted in the granulation of the nervous fibers and the development of fat globules. By experiments on rats it was discovered that section of the sciatic nerve was not only followed by granulation of the fibers, but that when this process was complete the nerve ceased to respond to galvanic stimulation, and had, in fact, lost its functional capacity. A few years later the celebrated Waller, English by birth and education, but for many years resident on the Continent, availed himself of the fact that such degeneration can always be distinguished by microscopic inspection to begin a new method of inquiry as to the anatomy and function of the nervous system, whose results were presented to the Academy of Sciences, France, in a brilliant series of communications. It was Waller who first traced the degeneration that follows section through the whole distribution, availing himself of the extensibility and transparency of the living frog's tongue for this purpose; who discovered that the process of regeneration was by the formation of new fibers, not by the rehabilitation of the old, and who first established the existence of special centers of nutrition. If, for example, the posterior root of a spinal nerve is cut external to the ganglion, the nerve degenerates throughout the whole length of the severed section; if, on the other hand, the section is made interior to the ganglion no such degeneration occurs. In connection with the remarkable experiments of Waller on dogs and cats, Dr. Dalton reviewed the equally important and nearly contemporary discoveries of Türck, of Vienna, who from studies of disease after death had arrived at very similar results. It was the latter who discovered that in some tracts of the nervous system degeneration is propagated from the surface toward the brain (centripetally), while in others the course of the destruction was centrifugal.

#### DISORDERS OF SLEEP.

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In olden times, when there were gods on Olympus, nay, even at an earlier period, before the Titanic divinities fell from their high estate to "wander in vain about bewildered shores," Sleep, the son of Erebus and Nox, gave rest to mortals and gods. Sleep, the brother of Death, dwelt in his dark cave with Dreams around him, and Morpheus as his minister to guard him from noise. Sleep and Death together bore Sarpedon's body to the land of the Lycians; and at the very vestibule and gate of Orcus did the pious Æneas see the same twin brethren seated when he visited Pluto's realm. Sleep was as godlike an agency to the nations of old as death itself. "So like death," says Sir I. Browne, "I dare not trust it without prayers, and a half-adieu unto the world, and take my farewell in a colloquy with God."

What is it? Sleep "which covers a man all over, thoughts and all, like a cloak, that is meat for the hungry, drink for the thirsty, heat for the cold, and cold for the hot."\* This sleep, modern observations and researches seem to prove, follows a diminution, both in quantity and rapidity of the circulating blood; and that if this reduced rate of circulation be increased by any cause, sleep departs. The writings and experiments of Mr. Durham, Dr. Jackson, and others, have thrown great light on this subject, and tend strongly to remove all doubt as to this being the true interpretation. Since it is clearly of great importance that we should know what it is that we want to bring about when we are trying to procure sleep, it will be well to examine the theory briefly. The principal evidence as to the state of the human brain in sleep is derived from observations of a woman at Montpellier, a case with which most physicians have become acquainted. She had lost a portion of the skull-cap, and the brain and its membranes were exposed. "When she was in deep or sound sleep, the brain lay in the skull almost motionless; when she was dreaming it became

elevated, and when her dreams, which she related on awaking, were vivid or interesting, the brain protruded through the cranial aperture." This condition has also been experimentally brought about and observed in animals, and the same result has been seen, namely, that in sleep the surface of the brain and its membranes became pale, the veins ceased to be distended, and only a few small vessels containing arterial blood were discernible. When the animal was aroused, a blush spread over the brain, which rose through the opening of the bone. The surface became bright red, innumerable vessels, unseen before, were now everywhere discernible, and the blood seemed to be coursing through them very rapidly. The veins, like the arteries, were full and distended, but their difference of color rendered them clearly distinguishable. When the animal was fed and again allowed to sink into repose the blood-vessels gradually resumed their former dimensions and appearance, and the surface of the brain became pale as before. The contrast between the appearance of the brain during its period of functional activity and during its state of repose or sleep was most remarkable.\*\*

These observations entirely contradict the theory that sleep is due to pressure from distended veins, to venous congestion; and further experiments made by Mr. Durham proved that when pressure was made upon veins and distention of them produced, the symptoms which followed were not those of sleep, but of torpor, coma, or convulsions.

And this view is completely corroborated by what we know of diseases which are accompanied by these symptoms. Common observation, too, confirms it; we must often have noticed when looking at a person asleep that the face appeared paler than usual, and that a flush came over it on waking; and all are agreed that the circulation is diminished, as also the respiration during sleep. A person in tranquil and natural sleep often breathes so slowly and so gently that we are obliged to listen attentively to discover that he breathes at all.

The disorders of sleep may be divided into four classes: namely, mental, physical, hygienic, and habit.

Mental disorders. The physician regards sleep as the rest, and the only rest, of the brain wherein reside those functions which we call mind. All parts of our bodies rest at one time or another; they cannot always work, but for their rest they need not all sleep. They rest when not in active work, between their work, some more, some less, but the brain proper, that is the higher mental part thereof, rests only in sleep. Healthy sleep presupposes a healthy state of brain, and we must carefully exclude from our notions of sleep all those phenomena which are the result not of healthy but of unhealthy processes going on in the brain, some of which though apparently akin to sleep nevertheless depend on an entirely opposite condition of things. And this brings us to consider what that is which either arouses us from sleep, or repels it, which keeps the brain at work, and hinders its repose. It appears to be a certain strong excitation of that function of the nerve centers, called feeling, whether it be the feeling of emotional excitement, such as the passions or sentiments, or fear of impending disaster, or hopes of good fortune, or the feeling of bodily pain, or even strong sensations of noise or light. All these may be grouped together under the head of feelings, and any one of them, if sufficiently potent, will prevent the access of sleep or banish it from the sleeper. Probably the most frequent cause which keeps awake those who possess neither the happy carelessness of childhood, nor the apathy of old age with its blunted sensibilities, is mental worry, or anxiety of some kind or other. The professional man, whatever his calling, has constantly some important matter on hand, which may turn out well or ill—with an increased or diminished reputation among men—about which he cannot help thinking. Another has been sitting up late at some brain-work, and though, perhaps, he has no great fears about it, yet he has been working hard and long, and he cannot forget it, and shake it off; it haunts him long after he has laid his head on the pillow longing for sleep. Anticipated pleasure, no less than fear, may excite and disturb us and banish sleep. Who does not remember such seasons during his youth and riper years?

Mental emotion quickens the brain circulation. It may be slight or violent, transitory or permanent, but it increases cerebral action. An instant conversion of fear or anxiety into certainty of prosperity or success may sometimes at once bring relief, and from sheer fatigue sleep may follow, but more frequently, the effect of the mental tension is kept up for some considerable time. In short everything which stimulates the brain to a certain amount of action prevents sleep, and this stimulus must be removed before sleep can be obtained.

Not only mental but physical causes also prevent sleep. There may be discomfort of every conceivable kind, from actual violent pain to the malaise of dyspepsia after an indigestible meal, or an uncomfortable position, or an ill-made bed. Most of us have been kept awake by pain of some kind—an aching tooth or a gouty toe. And most of us know the uneasiness attendant upon indigestion and gastric irritation, which though it may not amount to pain, does, nevertheless, by sympathy, react upon the nerve centers, and stimulate them sufficiently to banish sleep. And in the same way hunger, when there is nothing to be digested, will often keep us awake. Cold will prevent sleep; so also will undue heat. In short any irritation of the external senses will prevent sleep, and anything to which the senses are not accustomed will excite them.

Pursuing this point still further, "disorders of sleep" may be due to normal and abnormal conditions of the brain. The brain substance and its membranes may be perfectly free from disease, and yet the rest may be broken and sleep repelled by causes already referred to. These disorders of sleep may, therefore, be called normal. Arising from temporary causes, they excite no alarm as to the future; the causes being removed, the effects soon cease, and balmy sleep returns to bless and refresh the entire system.

But there is a class of disorders much more serious in their results. The advent of these disorders is announced by an invincible tendency to sleep. These disorders cast a pall over the entire system, stealthily but surely stealing a march on the physician who may not have had practical experience in their manifestation. Physical pain may be absent, or so slight as to excite little or no alarm, and yet the natural fount of intelligence, consciousness, and perception may be on the wane. The most acute and powerful intellects among men have thus failed in the noon-time of their being; the brilliancy of genius has been extinguished in youth, just when its possessors had climbed the steps and reached the pinnacle of fame, from causes at first unobserved or little heeded, but nevertheless most potent for evil. Such are plethoria, softening of the brain, coma, trance,

cataplexy, insensibility from apoplexy, alcohol, and poisons. All these orders may be regarded as abnormal, being due to unhealthy processes going on in the brain.

"Disorders of sleep" may also be due to defective hygiene. This is especially true of the condition of our crowded cities and towns, where the poor huddle together in small tenements, one room serving in many instances for laundry, cooking, dining, sitting, and sleeping. It is impossible for the occupants of such a place to have refreshing, healthful sleep; with an atmosphere reeking with unwholesome odors and noxious gases. Here the germs of fever are matured, and find in these blanched, attenuated forms a suitable soil in which to multiply and develop. This evil is not confined to large towns and cities. In almost every section of country, old and new, little or no attention is given to proper location, size, and ventilation of our bedrooms. The dining, sitting, and drawing rooms receive the lion's share of attention from architects and proprietors, but the rooms in which we are supposed to spend one-third of our life in health, and in sickness our only abode, are usually miserably small, dark, and without proper ventilation. How can sleep under such adverse circumstances be refreshing or invigorating? How can nature's daily waste be repaired excepting the material required to this end be possessed of all the health-giving elements so amply provided by a beneficent Creator?

Excess of heat and cold are to be avoided if we wish to sleep soundly; bedrooms must be warmed in winter and cooled in summer; people must get rid of the old prejudice about opening bedroom windows, and must eschew feather beds and heaps of spreads and comforters, if they would avoid disordered sleep.

Disorders of sleep may be due to habit. Many persons are habitually bad sleepers, and all know what it is to lie awake and be unable to sleep, even when they are in ordinary health. Nor is it difficult to form the habit. It is an established fact that drinking alcoholic liquors to excess, the use of tobacco, snuff, and opium eating are the result of habit, and even chronic constipation may be brought on by continuously neglecting the calls of nature for evacuation; but in like manner constipation in many instances may be relieved by a daily resort to the closet at a given hour. The habit of insomnia is no more difficult to form than any of these when any of the nervous exciting causes are present to which we have referred in another part of this paper.

The ailments of many persons are due to this habit; the cares and work of the day pursue them far into the night, and when morning dawns, it finds them unrefreshed. Nervous tension continued without intermission, the health gives way, nervous exhaustion ensues, sleep becomes next to impossible. If this condition continues unabated under suitable therapeutic treatment, the end advances with rapid strides.

A class of persons of highly nervous temperament have become so habituated to unrest that their nights are spent in semi-consciousness, their days in a tempest of excitement which all about them are made to feel. Can it be wondered at if the stomach fails to discharge its allotted task? if nutrition is ill performed? if a nervous system run at high pressure for years ultimately breaks down in either permanent imbecility or insanity?

Thus we learn that health, happiness, longevity are all more or less dependent on normal sleep, and anything that repels it should be avoided with all our powers, ever remembering the words of the Psalmist, "For so He giveth His beloved sleep."—*Therapeutic Gazette.*

#### THE BONE-CONDUCTION OF SOUND.

In the New York *Medical Journal and Obstetrical Review* for February, 1882, Dr. J. A. Andrews, Assistant Surgeon to the Manhattan Eye and Ear Hospital, gives an account of his investigations in regard to the intermittent perception of sound, as conveyed through the cranial bones—the observations having been mostly clinical, largely with the use of the tuning-fork. In order that an explanation for the phenomenon of intermittent bone conduction may be understood, he thus formulates the points in differential diagnosis between an affection of the middle ear and one of the labyrinth, as evidenced by examination with the tuning-fork:

1. If a vibrating tuning-fork, *c*, be placed between the teeth, the hearing power being normal on one side and diminished on the other, and its tone be intensified in the ear of which the hearing power is diminished, the cause is seated in the external or middle ear, and the labyrinth is unaffected.

2. If the hearing power be impaired in both ears, and the sound of the tuning-fork be heard better in the worse ear, and intensified on closure of the ear of which the hearing is most impaired, the cause is still located in the middle ear.

3. If under either of the above-mentioned conditions the vibrations of the tuning-fork be not heard better in that ear of which the hearing power is most impaired, even if its meatus be closed with the finger, and middle-ear disease as a cause can be excluded, there is an affection of the central apparatus of hearing. If the tone of the tuning-fork be still intensified by closure of the ear of which the hearing power is least impaired, there is disease of the central apparatus on one side only. Should the sound of the tuning fork not be intensified by closure of either ear, then the disease is on both sides, and has its seat in the labyrinth or in the brain.

In the first and second propositions the increased resonance results from the reflection of the vibration from the cranial bones upon the nerve. In the third proposition the reflection or condensation of the vibrations of the tuning-fork upon the nerve when the meatus is closed does not intensify their perception, because the function of the auditory nerve itself and not that of the conducting apparatus is impaired. The peculiarity that in some cases of middle-ear disease the watch is not heard by bone conduction, and in other cases examination with the tuning-fork gives the signs of labyrinth disease—*i. e.*, the tuning-fork being heard by bone conduction better in the ear which is normal as to hearing power, therefore diminished instead of increased in the ear of which the hearing capacity is impaired—can not, it seems to him, be explained by assuming an interference with the conduction through the chain of ossicles.

He inclines to the belief, based upon experiments, that this phenomenon is due to increased intra-labyrinthine pressure, brought about in those cases of middle ear disease in which there is an accumulation of fluid in the tympanum, or the membrana tympani is much depressed, in the former instance by the fluid in the cavity acting upon the oval or round window, or both, and in the latter instance by the plate of the stapes being forced against the membrane in the oval window. In both cases the terminations of the acoustic nerve suffer a mechanical irritation which gives rise on the one hand to subjective noises in the ear, and on the other hand

\* Cervantes.

\* Durham on the "Physiology of Sleep," Guy's Hospital Reports, 1860.