

sometimes called Serbs and Sorbs. They are the remnants of the powerful tribes which once occupied nearly the whole of north Germany. The Lusatians in the earlier period of their history were under the dominion of the Poles and afterwards of the Chechs. In the early part of the 17th century the bulk of them had been annexed to the electorate of Saxony, with the exception of the small part about Kottbus, which had belonged to Brandenburg since 1445. In 1815, however, when the states of Europe were rearranged, in most instances with very small regard to the nationalities under their sway, many more of the Lusatians were handed over to Prussia; and, according to the statistics of Boudilovich, at the present time (1886) all the Lower Lusatians, amounting to 40,000, belong to Prussia, as well as 44,000 of the Upper Lusatians. Besides the two dialects specified there are other minor ones, to judge from an article in the Bohemian Literary Journal; but they are too minute to be specified here. The Upper Lusatian dialect shows most affinity with Chekh, especially in substituting *h* for *g*; the Lower more resembles Polish, and has the strong or barred *z*, as in *tos*, "hair." The Upper dialect has been the most cultivated; some good grammars have been published by Seiler, Jordan, and Pfuhl, and there is a copious dictionary edited by Pfuhl in conjunction with others. The language is full of Germanisms and German words and cannot hold out long against the vigorous attempts at denationalization made by its Teutonic neighbours. There is a small Lower Lusatian dictionary by Zwahr, a posthumous work of very little merit. The *Macica Serbska*, the literary society of the Sorbs, founded on the model of the Bohemian Society in 1847, publishes its journal twice a year, which contains interesting articles on folk-tales and folk-lore generally, with popular songs taken down from the mouths of the people.

The first printed book in the Upper Sorbish language was the little catechism of Luther, published in 1597 by the pastor Worjeh. This was not, however, the first time that any Lusatian or Sorbish words had been printed, for we find the names of plants in that language given in Franke's *Hortus Lusatiae*, published in 1594. In 1706 Michael Brancel or Frenzel published a translation of the New Testament into Sorbish; a little before, in 1689, a grammar had appeared by Zacharias Bierling, entitled *Didascalia seu Orthographia Vandalica*. In 1693-96 Abraham Frenzel, son of Michael, published a dictionary. In 1806 Mohn translated some extracts from Klopstock's *Messiah*. From 1837 a new impulse was given to Sorbish literature: newspapers were printed in the language and useful books translated into it. One poet has appeared among them, Andrew Seiler, a clergyman, who died in 1872. Lower Sorbish has always been much less developed than Upper. The first book printed in it was a collection of hymns and a catechism, by Albin Moller, in 1574. Chojan, a pastor in Lubin, wrote the first

SLAVYANSK, a town of Russia, in the government of Kharkoff, situated 158 miles by rail to the south-east of the town of Kharkoff, on the Torets river and close by several salt lakes. From these salt is extracted to the annual value of more than £10,000; there are also several tallow-works in the place. The Slavyansk merchants carry on a brisk trade in salt, cattle, and tallow. The population (11,650 in 1870) reached 15,400 in 1883.

The ancient name of Slavyansk was Tor. The town, which is supposed to occupy the site of a former settlement of the Turks (Turks) who inhabited the steppes of the Don, was founded in 1676 by the Russians to protect the salt marshes. Having an open steppe behind it, this fort was often destroyed by the Tatars. Its salt trade became insignificant in the 18th century and has only revived during the last twenty years since coal was brought from Ekaterinoslaff.

SLEEP is a normal condition of the body, occurring periodically, in which there is a greater or less degree of unconsciousness due to inactivity of the nervous system and more especially of the brain and spinal cord. It may be regarded as the condition of rest of the nervous system during which there is a renewal of the energy that has been expended in the hours of wakefulness. For in the nervous system the general law holds good that periods of physiological rest must alternate with periods of physiological activity, and, as the nervous system is the dominating mechanism in the body, when it reposes, all the other systems enjoy the same condition to a greater or less extent. Rest alternates with work in all vital phenomena. After a muscle has contracted frequently at short intervals, a period of relaxation is necessary for the removal of waste products and the restitution of energy; the pulsating heart,

grammar between 1642 and 1664; in the latter half of the same century Körner compiled a dictionary. At the commencement of the 18th century Bohumil (Gottlieb) Fabricius published his translation of the New Testament (first edition in 1709); at the end of the same century a version of the Old Testament by Fric appeared. A good collection of Sorbish songs has been edited by Haupt and Schmalzer. According to an interesting article by Hornik in the second volume of the *Slavianski Sbornik*, a number of these Wends emigrated to America and settled in Bastrop county, Texas, where they have divine service performed in their own language, and publish some newspapers.

Polabish.—Of the Slavonic languages spoken in the north of Germany the Lusatian Wendish and Kashoubish are alone living. Of those which are extinct Polabish is the only one of which any memorials have come down to us, and these are but scanty. The language affords a parallel to Cornish, not only in the few fragments which remain, but also in the date of its decline and extinction. It is considered by Schleicher,¹ who has written an excellent grammar by piecing the scanty materials together, just as geologists restore an ichthyosaurus, to have more affinity to Polish than to Chekh, owing to the possession of nasals. This interesting language² expired in the first quarter of the 18th century in the eastern corner of the former kingdom of Hanover, principally in the circuit of Lüchow, which even at the present time is called Wendland. Between 1691 and 1786 certain vocabularies and dialogues in this language (including also a song) were taken down, and from them Schleicher has taken the materials for his grammar and the valuable little dictionary appended to it. Dr Pfuhl printed these memorials in their entirety in 1863-64. The spelling is altogether phonetic, and, owing to the ignorance of the Slavonic peasant and his German interrogators, the former of German and the latter of Slavonic, there are some ludicrous blunders. The two most important of these documents are a German-Wendish dictionary, compiled at the end of the 17th century by Christopher Henning, by birth a Lusatian, and pastor of Wustrow near Lüchow. Divine service is said to have been held in that town in Wendish as late as 1751. Secondly, we have the Slavonic words and dialogues collected by a farmer named Johann Parum-Schultz. His manuscript is still in the possession of his descendants. There is a valuable monograph on the dialect of the Lüneburg Slavs by Biskupski. In the 15th century Slavonic had ceased to be spoken in the island of Rügen, and in the same century it could only be heard from peasants in the market-place of Leipsic, a town (as already stated) with a Slavonic name. What the Slavs, however, have lost in the West they have partly gained in the East, and few languages have a more magnificent prospect than Russian,—the dignity and strength of which fit it to be the tongue of an imperial people. (W. R. M.)

apparently working without intermission, is in reality not doing so, as there are short intervals of relaxation between individual beats in which there is no expenditure of energy; the cells in a secreting gland do not always elaborate, but have periods when the protoplasm is comparatively at rest. Nervous action also involves physico-chemical changes of matter and the expenditure of energy. This is true even of the activity of the brain associated with sensation, perception, emotion, volition, and other psychical phenomena, and therefore the higher nervous centres require rest, during which they are protected from the stream of impressions flowing in from the sense-organs, and in which waste matters are removed and the cerebral material is recuperated for another time of wakeful activity.

The coincidence of the time of sleep with the occurrence of the great terrestrial phenomena that cause night is more apparent than real. The oscillations of vital activity are not correlated to the terrestrial revolutions as effect and cause, but the occurrence of sleep, in the majority of cases, on the advent of night is largely the result of habit. Whilst the darkness and stillness of night are favourable to sleep, the state of physiological repose is determined more by the condition of the body itself. Fatigue will normally cause sleep at any time of the twenty-four hours. Thus many of the lower animals habitually sleep during

¹ *Laut- und Formen-Lere der Polabischen Sprache*, St Petersburg, 1871.

² To avoid confusion it must be remembered that the word "Polabish" is used somewhat carelessly by ethnologists to denote (1) the Slavonic tribes in north Germany generally, (2) the particular Slavonic tribe on the Elbe (Slav. *Laba*).

the day and prowl in search of food in the night; some hibernate during the winter season, passing into long periods of sleep during both day and night; and men whose avocations require them to work during the night find that they can maintain health and activity by sleeping the requisite time during the day.

The approach of sleep is usually marked by a desire for sleep, or sleepiness, embracing an obscure and complicated group of sensations, resembling such bodily states of feeling as hunger, thirst, the necessity of breathing, &c. All of these bodily states, although on the whole ill defined, are referred with some precision to special organs. Thus hunger, although due to a general bodily want, is referred to the stomach, thirst to the fauces, and breathing to the chest; and in like manner the desire for sleep is referred chiefly to the region of the head and neck. There is a sensation of weight in the upper eyelids, intermittent spasm of the sub-hyoid muscles causing yawning, and drooping of the head. Along with these signs there is obscuration of the intelligence, depression both of general sensibility and of the special senses, and relaxation of the muscular system. The half-closed eyelids tend more and more to close; the inspirations become slower and deeper; the muscles supporting the lower jaw become relaxed, so that the mouth opens; the muscles of the back of the neck that tend to support the head also relax and the chin droops on the breast; and the limbs relax and tend to fall into a line with the body. At the same time the hesitating utterances of the sleepy man indicate vagueness of thought, and external objects gradually cease to make an impression on the senses. These are the chief phenomena of the advent of sleep. After it has supervened there are many gradations in its depth and character. In some cases the sleep may be so light that the individual is partially conscious of external impressions and of the disordered trains of thought and feeling that pass through his mind, constituting dreams, and these may be more or less vivid according to the degree of consciousness remaining. On the other hand, the sleep may be so profound as to abolish all psychical phenomena: there are no dreams, and when the sleeper awakes the time passed in this unconscious state is a blank. The first period of sleep is the most profound. After a variable period, usually from five to six hours of deep sleep, the faculties awaken, not simultaneously but often fitfully, so that there are transient periods of consciousness. This is the time of dreaming. As the period of waking approaches the sensibility becomes more acute, so that external impressions are faintly perceived. These impressions may influence and mould the flow of images in the mind of the sleeper, frequently altering the nature of his dreams or making them more vivid. The moment of waking is usually not instantaneous, but is preceded by an intermediate state of partial consciousness, in which there are feelings of a pleasant lassitude, a sense of repose, a luxurious abandonment of the body to any position in which it may happen to be; and a strange play of the mental faculties that has more of the character of an "intellectual mirage" than of consecutive thought.

The intensity of sleep has been measured by Kohlschütter by the intensity of the sound necessary to awaken the sleeper. This intensity increases rapidly during the first hour, then decreases, sometimes rapidly, sometimes slowly, during the next two or three hours, and then very slowly until the time of waking. This statement agrees generally with experience. As a rule the deeper the sleep the longer it lasts.

Various physiological changes have been observed during sleep, but much remains to be done in this direction. The pulse becomes less frequent; the respiratory movements are fewer in number and are almost wholly thoracic,

not abdominal; all the secretions are reduced in quantity; the gastric and intestinal peristaltic movements are less rapid; the pupils of the eye are contracted and during profound sleep are not affected by light; and the eyeballs are rotated upwards. The pupils dilate slightly when strong sensory or auditory stimuli are applied, and they dilate the more the lighter the sleep; at the moment of waking they become widely dilated. Whilst muscular relaxation is general, there seems to be increased contraction of certain sphincter muscles, as the circular fibres of the iris and the fibres concerned in closing the eyelids. The state of the circulation of the brain has been frequently investigated. The older view was that there was a degree of plethora or congestion of the vessels of the brain, as is the state of matters in coma, to which the state of sleep has a superficial resemblance. Coma, however, is not sleep, but a condition of inactivity of the cerebral matter owing to the accumulation of dark venous blood in its vessels. This has been actually observed in cases where it was possible to see the brain. During sleep the surface of the exposed brain has been observed to become pale and to shrink somewhat from the sides of the opening (Blumenbach). A careful experimental re-
search was conducted by Arthur E. Durham in 1860, in which he trephined a portion of bone as large as a shilling from the parietal region of a dog, and, to obviate the effects of atmospheric pressure, inserted a watch glass into the aperture so that the surface of the brain could be seen. His results are summarized thus:—

(1) Pressure of distended veins on the brain is not the cause of sleep, for during sleep the veins are not distended; and, when they are, symptoms and appearances arise which differ from those which characterize sleep. (2) During sleep the brain is in a comparatively bloodless condition, and the blood in the encephalic vessels is not only diminished in quantity, but moves with diminished rapidity. (3) The condition of the cerebral circulation during sleep is, from physical causes, that which is most favourable to the nutrition of the brain tissue; and, on the other hand, the condition which prevails during waking is associated with mental activity, because it is that which is most favourable to oxidation of the brain substance, and to various changes in its chemical constitution. (4) The blood which is derived from the brain during sleep is distributed to the alimentary and excretory organs. (5) Whatever increases the activity of the cerebral circulation tends to preserve wakefulness; and whatever decreases the activity of the cerebral circulation, and, at the same time, is not inconsistent with the general health of the body, tends to induce and favour sleep. Such circumstances may act primarily through the nervous or through the vascular system. Among those which act through the nervous system may be instanced the presence or absence of impressions upon the senses, and the presence or absence of exciting ideas. Among those which act through the vascular system may be mentioned unnaturally or naturally increased or decreased force or frequency of the heart's action.

Dr William A. Hammond and Dr Weir Mitchell have repeated and extended Durham's observations, with the same general results (1866), and more recently Ehrmann, Salathé (1877), François Franck (1877), and Mosso (1881), by more refined methods of observation, have arrived at the same general conclusions. Mosso in particular has applied with great success the graphic method of registration to the study of the movements of the brain and of the circulation during sleep. He made observations on three persons who had lost a portion of the cranial vault and in whom there was a soft pulsating cicatrix. They were a woman of thirty-seven years of age, a man of thirty-seven years, and a child of about twelve years. By special arrangements, Mosso took simultaneous tracings of the pulse at the wrist, of the beat of the heart, of the movements of the wall of the chest in respiration, and of the movements of the denuded brain. Further, by means of the plethysmograph,—an instrument of Mosso's own invention,—he obtained tracings showing changes in the volume of the hand and forearm; and he succeeded in showing that during sleep there is a diminished amount

of blood in the brain, and at the same time an increased amount in the extremities. He showed further that there are frequent adjustments in the distribution of the blood, even during sleep. Thus a strong stimulus to the skin or to a sense organ—but not strong enough to awaken the sleeper—caused a contraction of the vessels of the forearm, an increase of blood pressure, and a determination of blood towards the brain; and, on the other hand, on suddenly awakening the sleeper, there was a contraction of the vessels of the brain, a general rise of pressure, and an accelerated flow of blood through the hemispheres of the brain. So sensitive is the whole organism in this respect, even during sleep, that a loudly spoken word, a sound, a touch, the action of light, or any moderate sensory impression modified the rhythm of respiration, determined a contraction of the vessels of the forearm, increased the general pressure of the blood, caused an increased flow to the brain, and quickened the frequency of the beats of the heart. These observations show how a physiological explanation can be suggested of the influence of external impressions in modifying the dreams of a sleeper. Further, Mosso found that during very profound sleep these oscillations disappear: the pulsatory movements are uniform and are not affected by sensory impressions, and probably this condition exists when there is the absolute unconsciousness of a "dead" sleep. By such methods as have been employed by Mosso, the movements of the brain have been observed,—(1) *pulsations*, corresponding to the beats of the heart; (2) *oscillations*, or longer waves, sometimes coinciding with the heart beats, or more generally consisting of longer festoons, carrying each a number of smaller waves, and believed to correspond generally to the respiratory movements; and (3) *undulations*, still longer and less marked elevations and depressions, first clearly observed by Mosso, and believed by him to indicate rhythmic contractions of the vessels of the pia mater and of the brain. This view is in keeping with the observations of Donders, Kussmaul, Tenner, and others on changes of calibre observed in the cerebral vessels, and with the experiments of many physiologists, showing that the vessels of the pia mater, like other vessels, are controlled by the vaso-motor system of nerves (see *PHYSIOLOGY*, "Nervous System"). It may therefore be considered certain that during sleep there is an anaemia, or partially bloodless condition, of the brain, and that the blood is drawn off to other organs, whilst at the same time this anaemic condition may be modified by changes in the circulation or in the respiratory mechanism caused by position, by sensory impressions, or by sudden changes in the state of repose of the muscles. The examination of the retina (which may be regarded as a cerebral outwork) by the ophthalmoscope during sleep also shows a comparatively bloodless condition. Such are the facts; the deficiency in the way of a theoretical explanation is that physiologists cannot satisfactorily account for the anaemic condition causing unconsciousness. Sudden hæmorrhage from the brain and nerve-centres, or a sudden cessation of the supply of blood to the brain, as occurs in syncope (failure of the heart's action,—a faint), no doubt causes unconsciousness, but in these circumstances there is a tendency to convulsive spasm. Such spasm is usually absent in sleep, but sudden jerks of the limbs may sometimes be observed during the time when there is the confusion of ideas preceding the passage into sleep.

During sleep the amount of carbonic acid eliminated is very much reduced, indicating that molecular changes in the tissues do not occur to the same extent as in the waking state. This is also shown by the fact that less heat is produced. Helmholtz states that the amount of heat produced by a man weighing 67 kilogrammes (147·4 lb) is

about 40 calories per hour during sleep, as against 112 calories per hour while awake. This diminished production of heat may be largely accounted for by the quiet condition of the muscles of locomotion, but it also indicates diminished tissue changes throughout the body. In profound sleep the bodily temperature may fall from 6° to 2° Fahr. In consequence of diminished oxidation changes during sleep, it is not improbable that excess of nutrient matter may then be stored up in the form of fat, and that thus the proverb "He who sleeps dines" is based on a correct appreciation of the fact that sleep tends to produce plethora or obesity.

Whilst it is easy to state that sleep is caused by fatigue of the nervous system, it is a more difficult matter to explain what the precise changes are that produce the state of unconsciousness. Various hypotheses have been advanced, but it cannot be said that any one is wholly satisfactory. Aware that the fatigue of muscle is associated with the accumulation of sarcolactic acid, Preyer surmised that the activity of nervous matter might be interfered with by the accumulation in the nerve-centres of some such acid, or of its soda salt (lactate of soda), but this view has not been supported by the results of experiment, as the injection into the blood of a dose of lactate of soda has not produced sleep. Pflüger has observed that frogs deprived for a considerable time of oxygen passed gradually into a state resembling profound sleep, and he has advanced the theory that there is no organ of the body so quickly affected by deprivation of oxygen as the brain. According to Pflüger, the phenomena of life depend on a dissociation of living matter, and in particular the activity of the cerebral substance connected with psychical states depends on dissociation changes in the grey matter. To excite the dissociation, however, oxygen is necessary. The oxygen unites with certain of the compounds set free by the dissociation, forming, amongst other substances, carbonic acid. If such matters as these that unite with oxygen are in sufficient amount to use up all the oxygen, the grey matter of the brain suffers from a deficiency of oxygen (or from its absence), and also from the accumulation of carbonic acid. According to such a theory, cerebral activity depends on cerebral respiration, and sleep is a kind of cerebral asphyxia. Some such condition is not improbable, but it must be stated that the evidence at present in support of it is meagre. Possibly, in attempting to account for the phenomenon of sleep, too much importance has been attributed to the changes occurring in the brain, forgetting that not merely brain matter but every tissue of the body becomes exhausted by work, and that sleep may be partly due to phenomena occurring throughout the body and not in the brain alone. Some more comprehensive hypothesis than any yet advanced may be possible when the condition of all the functions during sleep has been more thoroughly investigated.

All the phenomena of sleep point to a diminished excitability of the cerebral nerve-centres and of the spinal cord. Contrary to what is often stated, there can be no doubt that reflex action is in partial abeyance and that the spinal cord is in a state of partial inactivity as well as the brain. The only nerve-centres that do not sleep are those absolutely essential to life, such as those connected with the heart, with respiratory movements, and with the distribution of blood by the vaso-motor arrangements; and Mosso's experiments indicate that even these have a certain amount of repose in profound sleep.

There is little doubt that all living beings require periods of repose alternating with periods of activity. Many plants close their flowers and bend their petioles at certain times of the day. These phenomena, called "the sleep of plants," depend apparently on changes in solar radiation,

and there is no reason to believe that during the time of quiescence any reparative processes go on, as during the sleeping period of animals. Naturalists have observed many of the lower animals apparently in a state of sleep. Insects, crustaceans, fishes, reptiles, may all be observed occasionally to be almost motionless for considerable periods of time. The sleeping of birds is familiar to all, and in these there are anatomical arrangements by which the bird may, like the crane, sleep perched on one leg, or grasping a branch with both feet, like perching birds generally, without any muscular effort and consequently without fatigue.

The amount of sleep required by man varies according to age, sex, and habit. The popular notion that a child sleeps half its time, an adult one-third, whilst an old person may do little except eat and sleep is not far wrong. In early life the cerebral faculties appear to be easily exhausted and during the frequent and prolonged sleeps of infancy the brain rests and the vegetative changes connected with nutrition and growth go on actively. As life advances, less sleep is required, until in adult life a period of seven or eight hours is sufficient. As a rule, women require more sleep than men; but much depends on habit. Thus most women bear the loss of sleep in the first instance better than men, because they have been accustomed more to loss or irregularity of sleep. The effect of habit is well seen in nurses, both male and female, who will often be able to work for weeks continuously with snatches of sleep, not amounting to more than two or three hours daily. Sooner or later, however, even in these cases nature asserts her demands, and prolonged sleep is necessary to maintain health and vigour.

Wakefulness during the time when one ought to be asleep is frequently a distressing condition, undermining the strength and incapacitating for active and efficient work. Insomnia or sleeplessness often afflicts those of active mental habits and lays the foundation of premature decay. From what has been stated as to the cause of sleep it is evident that whatever tends to augment unduly the circulation through the brain may cause wakefulness. Thus long-continued or excessive intellectual action, or any powerful emotion, may be injurious. Moderate intellectual work is favourable to sleep. The remedy in such cases is to avoid as far as possible the exciting causes or to counteract them by bodily exercise and attention to the general health. When sleeplessness overtakes a brain-worker it is a sure indication that less intellectual work must be done, and that he ought to betake himself, if possible, to out-of-door exercise in the pure air of the country. It is dangerous to persist, and still more to induce sleep artificially by drugs, as the overworked organ may become the seat of permanent disease or pernicious habits may be formed. The posture of the body in bed may influence sleep. Thus such positions as impede the flow of blood from the brain without affecting the supply of blood to it by the arteries may cause sleeplessness. Sometimes in cases of insomnia from excessive mental work there is the distressing condition that sleep disappears when the person lies down in bed, although before lying down he felt drowsy. In such a case resting with the head high may produce the desired result. Insomnia may also be caused by various functional diseases, whereby the amount of blood in the brain is increased. Thus in young females derangement of the menstrual functions may cause a hyperæsthesia or increased sensibility to such an extent that the sufferer cannot sleep, or, if sleep be obtained, it is so light as to be dispelled by weak sensory impressions that would fail to arouse a healthy person. Again, an irregular or deficient action of the heart may cause wakefulness, especially if associated with coldness of the extremities. In such cases the application of heat to the feet and attention to the digestive organs may produce refreshing sleep. Lastly, the excessive use of various drugs, such as alcohol, opium, belladonna, Indian hemp, tea, and coffee, may cause sleeplessness. In these cases a moderate dose usually acts as a hypnotic, whilst frequently repeated doses have the reverse effect. Thus sleeplessness is one of the most distressing symptoms of delirium tremens, and it occurs also in those in the habit of indulging in opium, morphia, chloral, or Indian hemp. The general correctives of sleeplessness are active work, a moderate amount of bodily exercise, freedom from worry and anxiety, the use of the warm bath in some cases to allay irritability before going to bed, and such a posture in bed as the individual has found in his own case to be favourable. Sometimes a light but nutritious meal about an hour before retiring may con-

duce to sleep, but as a rule late suppers are unfavourable. The use of drugs should be indulged in only with medical advice. It is not too much to say that the injudicious use of bromide of potassium, chloral, opium, morphia, and stimulants by literary persons to procure sleep has often been productive of sad results, such as shattered health, an incurable habit of self-indulgence, and even accidental death (see Hammond, *On Wakefulness*).

It is a matter of common observation not only that certain persons require more sleep than others but that they have less power of resisting its onset and of awaking. This condition may become morbid, constituting a veritable nervous disease, to which the name "maladie du sommeil" or *hypnosia* may be given. It may be described as invincible sleep, and it may continue for weeks and for months, terminating in convulsive seizures, and even death. A persistent drooping of the upper eyelid has been observed even during waking hours. Dr W. Ogle has observed in such cases an engorgement of the cervical ganglia of the sympathetic; but this may have nothing to do with the condition. Cases of very prolonged sleep are not uncommon, especially amongst hysterical females, lasting four, seven, or ten days. On awaking the patient is exhausted and pale, with cold extremities, and not unfrequently, after a brief interval of waking, passes off into another lethargic sleep. Something similar to this may be seen in very aged persons towards the close of life.

Dreams (cf. *DREAM*, vol. vii. p. 452 sq.) only occur when sleep is light, and they indicate that consciousness is still continued. The characteristic feature of dreaming is that the mind has no control over the groups of images that crowd upon it. These images are either revivals of old sensory impressions that have been stored up in the brain or they are the result of an untrammelled imagination. The will has lost the power of direction and control; ideas, often grotesque, always confused, rise apparently spontaneously, are vivid for an instant, and then disappear. Dreaming may be described as a kind of physiological delirium. A consideration of the state indicates that the cerebral hemispheres are partially active and that it is the inhibitory power that is deficient (see *PHYSIOLOGY*, "Nervous System"). A further explanation cannot be given in the present state of our knowledge of cerebral physiology, but some of the more evident conditions or laws of the dreaming state may be indicated.

(1) The character of dreams is often determined by a predominant thought or train of ideas that has occupied the mind before going to sleep. Thus the events of the preceding day may produce a particular kind of dream, and not unfrequently when a person attempts on waking to unravel his dream he may find the connecting thread in an occurrence or in a conversation or in the thoughts suggested by a book on the previous day. It would thus seem that the memory of recent things (and physiologically there must be an organic basis for memory) may revive old and apparently forgotten impressions. (2) In dreaming, the train of thought may be influenced by impressions made on the senses of the sleeper, sufficiently intense to produce this result, but not intense enough to awake him. Thus a sudden sensory impression, such as a loud sound, a current of cold air, a restrained position of one of the limbs, a word or sentence uttered by a familiar voice, may arouse a dream or turn the disordered throng of fancies in a new direction. In some instances, the dreamer is peculiarly susceptible to such external impressions, so that the same stimulus will always give rise to the same kind of dream. (3) It has frequently been observed that in dreaming there may be memories of old impressions, scenes, faces, words, that have long since faded from the recollection during waking hours, showing that many impressions that are supposed to be lost are only forgotten and require but the appropriate stimulus to cause them to start vividly into mental life. (4) In rare instances there may be consecutive thought in dreams, so that the dreamer may write verse, frame speeches, or even work out mathematical problems. Most persons have had experience of this strange kind of power and have regretted, in the partially conscious state before awaking, that they could not preserve some of the results, feeling assured that the sober reality of waking life would dispel the vision. (5) Dreams make only a feeble impression on the memory, so that on awaking what is at first vivid and distinct fades insensibly and rapidly away. This may be accounted for by the evanescent character of the mental "stuff" of dreams. In the waking state an act of attention is required to fix anything in the memory, and, as this is absent in dreaming, the impressions do not leave a permanent effect. For this reason also in dreams we have no memory of former dreams. (6) All have observed that there is no feeling of time or of space in dreams. We live in an ideal world. This probably arises from the absence of fixity of thought, so that there is no apparent connexion between the successive pictures of the imagination. (7) In some dreams the activity of the cerebrum is such that the train of thoughts prompts to movement, and the sleeper may be heard muttering in his sleep or tossing the arms or making gestures. There are gradations between this condition of a "troubled" dream and that of true somnambulism.

Somnambulism.—Some persons rise during sleep, walk about, apparently unconscious of all external impressions, after a time

return to bed, and when they are awake they have no recollection of any of these occurrences. Sometimes the actions performed are of a complicated character and bear some relation to the daily life of the sleeper. Thus a cook has been known to rise out of bed, carry a pitcher to a well in the garden, fill it, go back to the house, fill various vessels carefully and without spilling a drop of water, then return to bed, and have no recollection of what had transpired. Again, somnambulists have been observed to write letters or reports, execute drawings, and play upon musical instruments. Frequently they have gone along dangerous paths, executing delicate movements with precision. Four types of somnambulist may be noticed,—(1) those who speak without acting, a common variety often observed in children and not usually considered somnambulist; (2) those who act without speaking, also well known and the most common type; (3) those who both act and speak, more exceptional; and (4) those who both act and speak and who have not merely the sense of touch active but also the senses of sight and hearing. The fourth class is the most extreme type and merges into the physiological condition of mesmerism or hypnotism. This peculiar condition has already been fully described under animal magnetism (see MAGNETISM, ANIMAL), and it is necessary here only to notice it in connexion with the subject of sleep. Many observations indicate that, at all events in some cases, the somnambulist, engaged, for example, in writing, has a mental picture of the page before him and of the words he has written. He does not see what he really writes. This has been proved by causing persons to write on a sheet of paper lying on the top of other sheets. After he has been allowed to write a few sentences, the sheet was carefully withdrawn and he continued his writing on the next sheet, beginning on the new sheet at the corresponding point where he left off on the first one. Moreover, the somnambulist, by force of habit, stroked t's and dotted i's at the exact places where the t's and i's would have been had he written continuously on one sheet, showing that what he was conscious of was not what was before him but the mental picture of what he had done.

The following table, modified from two such tables given by Ball and Chambard in their exhaustive article "Somnambulisme" in the *Dictionnaire Encyclopédique des Sciences Médicales*, shows the relation of the various intermediate conditions of sleeping and awaking and of the dreaming and somnambulist states. The horizontal stroke indicates the presence of the condition the name of which heads the column:—

	Organic Life.	Consciousness.	Imaginative Faculties.	Co-ordinating Faculties.	Power of Movement and Sensibility.
Normal waking state	—	—	—	—	—
Sleep, 1st degree	—	—	—	—	—
" 2d degree	—	—	—	—	—
" 3d degree	—	—	—	—	—
Deep sleep	—	—	—	—	—
Waking, 1st degree	—	—	—	—	—
" 2d degree (specially dreaming state)	—	—	—	—	—
" 3d degree	—	—	—	—	—
Complete waking	—	—	—	—	—
Dreaming state	—	—	—	—	—
Ordinary somnambulism—(2) above	—	—	—	—	—
Profound somnambulism (perfect unconsciousness)	—	—	—	—	—
Somnambulist dream (movements in a dream)	—	—	—	—	—

The somnambulist acts his dream. His condition is that of a vivid dream in which the cerebrum is so active as to influence centres usually concerned in voluntary movements. Under the dominant idea he executes the movements that this idea would naturally excite in the waking state. Many of his movements are in a sense purposive; his eyes may be shut so that the movements are executed in the dark, or the eyes may be open so that there is a picture on the retina that may awaken no consciousness, and yet may, by reflex mechanisms, be the starting-point of definite and deliberate movements. In many cases he does not hear, the auditory centres not responding; but in others suggestive words may alter the current of his dream and lead him to perform other actions than what he intended to do. On awaking there is either no memory of what has taken place or the dim recollection of a fading dream.

It is important to notice that there is scarcely any action of which a somnambulist may not be capable, and immoral acts from which the individual would shrink in waking hours may be performed with indifference. Considering the abrogation of self-control peculiar to the physiological condition, it is evident that no moral responsibility can be attached to such actions. In cases where somnambulist propensities place a person in danger, an endeavour should be made to induce him to return to bed without awaking him; as a rude awakening may produce a serious

shock to the nervous system. Inquiry should then be made into the exciting cause of the somnambulist dream, such as a particular train of thought, over-excitement, the reading of special books, the recollection of an accident or of a crisis in the person's history, with the view of removing the cause if possible. It should never be forgotten that somnambulism, like chorea, hysteria, and epilepsy, is the expression of a general morbid predisposition, an indication of a nervous diathesis, requiring careful treatment so as to avoid more dangerous maladies.

See article "Sommeil" in the *Dictionnaire Encyclopédique des Sciences Médicales*, where a full bibliography is given and where also there is an account of the medico-legal questions connected with sleep and somnambulism; Macnish, *Physiology of Sleep*; Durham, "On the Physiology of Sleep," in *Gay's Hospital Reports*, 1860; Kohlschütter, "Die Mechanik des Schlafes," in *Z. f. ration. Med.*, vol. xxxiii., 1869; Pfleger, "Theorie des Schlafes," in *Pflüger's Archiv*, vol. x., 1875; Mosso, *Ueber den Kreislauf des Blutes im menschlichen Gehirn*, Leipsic, 1881. As to somnambulism, see the article on the subject in the *Dictionnaire* both for full details and a copious bibliography. (J. G. M.)

SLEIDANUS, JOHN (c. 1506-1556), the annalist of the Reformation, was born at Schleiden (now a small village in the Oleffthal, about 42 miles south-west of Cologne) in 1506 or 1508. Passing from the village school, he studied at Liège, Cologne (?), Louvain (where he became tutor to the son of Count Manderscheid of Schleiden), Paris, and Orleans (where he studied law). In 1536 he became secretary to Cardinal du Bellay, minister of Francis I., and spent five years with him and with his brother Cardinal Guillaume du Bellay. The cardinals Du Bellay belonged to that party among the French nobility who desired on political grounds an alliance between the German Protestants and Francis against the emperor Charles V., and who employed the leaders of the Strasburg citizens as intermediaries. Sleidanus, whilst among the humanists of Liège, had adopted Protestant opinions, had learned to distrust the Romanist policy of Charles V., and was himself a strong supporter on religious and political grounds of the plans of the brothers Du Bellay. Their confidence in him was such that he was sent (1540) to watch the conduct of the French ambassador at Hagenau, and this brought him into personal relation with the German Protestant leaders. Next year Du Bellay sent him to confer with the heads of the Schmalkaldic League, when he found his patron's ideas unacceptable. Philip of Hesse and the elector of Saxony would make no alliance with a foreign power against the emperor, and distrusted Francis personally because of his persecution of French Protestants. It is possible that this news made Du Bellay feel that he had no further need for his secretary, for we find Sleidanus leading a wandering life for two years, and finally making Strasburg his home, although he still kept up a political correspondence with France. Sleidanus had been accustomed to copy all documents bearing upon the Reformation to which he had access, and Bucer, who had seen his collection, proposed to Philip of Hesse to appoint him historian of the Reformation, giving him a salary and access to all necessary documents. After some delay the heads of the Schmalkaldic League agreed to Bucer's proposal, and Sleidanus began his great work and finished the first volume in 1545. In that year he was again recalled to diplomacy and went to England in a French embassy to Henry VIII. While there he diligently collected materials for his history. On his return to Strasburg he was sent by that city as one of its representatives to the diets of Frankfort and Worms; and thence he proceeded to Marburg to explore the archives of Philip of Hesse. The Schmalkald War interfered with this work and also prevented the payment of Sleidanus, who in his difficulties applied to England for aid, and at Cranmer's intercession received a yearly pension (not long continued) from Edward VI. In 1551 Sleidanus went to the council of Trent as representative from Strasburg, charged also with full powers to act for the imperial cities Esslingen, Ravensburg, Reutlingen, Biberach, and Lindau. On his return his friends got him appointed professor of law in Strasburg, and he was once more able to give his whole attention to his great work, which he finished for the press

in 1554. But want of money, the death of his wife—whom he had married in 1546 on his return from the diet of Frankfort—and other misfortunes compelled him to delay printing. The book at length appeared,—*Commentarium de statu religionis et reipublice, Carolo V. Cesare, Libri XXVI.* (translated into English by John Daws in 1560 and by G. Bohm in 1689). But the troubles of Sleidanus were not ended. The work was too impartial to please any one, and even the gentle Melancthon was unable to praise it. It remains notwithstanding the most valuable contemporary history of the times of the Reformation, and contains the largest collection of important documents. The author died at Strasburg in October 1556 in poverty, and inconsolable since the death of his wife.

See H. Baumgarten, *Ueber Sleidanns Leben und Briefwechsel* (1878), and *Sleidanns Briefwechsel* (1881).

SLIGO, a maritime county in the north-west of Ireland, in the province of Connaught, is situated between 53° 54' and 54° 28' N. lat. and between 8° 10' and 9° 10' W. long., and is bounded N. by the Atlantic, E. by Leitrim, S.E. by Roscommon, and S. and W. by Mayo. The total area is 451,129 acres, or nearly 705 square miles. Its greatest length from north to south, between Mullaghmore Head and Lough Gara, is 38 miles and its greatest breadth from east to west is 41.

The coast-line is very irregular and in some places rises into grand escarpments and terraces. The principal inlets are Killala Bay and Sligo Bay, the latter subdivided into Brown Bay, Drumcliffe Bay, and Ballysadare Bay. Near the coast are the islets of Inishmurray, Coney, and Oyster. Though Sligo cannot be compared for scenery with the western parts of Mayo, it is in many places charmingly picturesque, being well wooded and possessing several fine lakes and rivers, as well as some ranges of hills which from their situation and grouping have a very striking effect. In the north are the limestone elevations of Benbulbin (1722 feet) and Knocknarea (1078), contrasting finely with the adjacent rugged gneiss mountains, among which are King's Mountain (1965 feet) and Gullagherboy (1430). In the west are the ranges of the Slieve Gamp and Ox Mountains, 1300 and 1600 feet respectively. The Curlew Mountains (nearly 900 feet high) separate Sligo from Roscommon. The principal rivers are the Moy, forming for a part of its course the boundary with Mayo, and flowing south-westwards and then northwards into Killala Bay; the Easky, flowing northwards from Lough Easky; the Ballysadare, with its branches the Owenmore, Owenbeg, and Arrow or Unshin; and the Garvogue, flowing from Lough Gill. Except the finely situated Lough Gill (3130 acres) extending into Leitrim, Lough Arrow (3010), and Lough Gara (3683), none of the lakes have so large an area as 400 acres.

The Carboniferous Mountain Limestone forms the basis of a great part of the county, and includes the Lower Limestone calp or black shale series and the Upper Limestone, which rises occasionally into a lofty tableland. There is a small tract of Yellow Limestone in the extreme north, as also on the north and north-east of Lough Gara, whence it extends into Mayo. The Old Red Sandstone appears in two masses near Lough Arrow. A small tract of granite enters the county on the south-west, coming from between Lough Conn and Foxford in Mayo, giving place to a broad belt of trap porphyry bounded by a narrow fringe of Old Red Sandstone, which stretches in a north-easterly direction along the line of the Ox Mountains to Ballysadare Bay. Iron is abundant, especially in the neighbourhood of the Ox Mountains, but from want of fuel is not worked. Pure copper is found in the beds of some of the rivers, and sulphate of copper and iron pyrites occur in some places.

Agriculture.—There is considerable variety both in the character of the soil and in the agricultural advancement in different parts of the county. In some parts it is a light sandy loam resting on a freestone bottom, and in the lower districts a rich and deep mould prevails resting on a substratum of limestone. Owing to the moistness of the climate cattle feeding is found to be the most remunerative method of farming. Out of a total of 451,129 acres

231,753 or 51.3 per cent. in 1884 were under grass, 86,365 under crops, 38,431 bog and marsh, 70,599 barren mountain land, 7577 woods and plantations, and 417 fallow, the remaining 16,987 acres being under water, roads, fences, &c. The total number of holdings was 15,352, there being 752 under 1 acre, 1443 between 1 and 5 acres each in extent, 5834 between 5 and 15, 4592 between 15 and 30, 1520 between 30 and 50, and 1211 of 100 acres and upwards. The total area under corn crops in 1884 was 24,324 acres, while in 1875 it was 30,810; under green crops 25,897, in 1875 30,491; under meadow and clover 36,120, in 1875 32,396; and under flax 24, in 1875 175,—the total area under tillage having decreased between 1875 and 1884 from 93,872 to 86,365 acres. Of the corn crops in 1884 oats occupied 23,055 acres, and green crops and potatoes 19,335. The number of horses between 1875 and 1884 increased from 7244 to 8292, of asses from 7588 to 8471; cattle decreased from 97,658 to 89,458, sheep from 65,857 to 64,324; pigs, again, increased from 19,726 to 26,996, goats from 3081 to 4745, and poultry from 277,113 to 305,509. According to the landowners return Sligo was divided among 856 proprietors, possessing 448,397 acres at an annual value of £210,382, or about 9s. 4½d. per acre. The principal proprietors were Colonel E. H. Cooper, 34,120 acres; Sir Robert Gore Booth, 31,774; Charles W. O'Hara, 21,070; W. R. O. Gore, 21,019; Owen Wynne, 12,982; Colonel King-Harman, 12,629; Hon. Evelyn Ashley, 12,426; and William Phibbs, 10,507.

Manufactures and other Industries.—Coarse woollens and linens are manufactured for home consumption, and there are tanneries, distilleries, and breweries in the principal towns. A considerable general trade is carried on at the ports of Ballina (on the Moy) and Sligo. The fisheries on the coast are valuable, and there are important salmon fisheries at the mouths of the rivers.

Administration and Population.—The county is divided into 6 baronies, and contains 37 parishes and 4 parts of parishes, and 1292 townlands. The county has three poor-law unions—Dromore West, Sligo, and Tobercurry—with parts of the unions of Ballina and Boyle (Roscommon). It is in the Connaught circuit, and assizes are held at Sligo and quarter sessions at Ballymote, Easky, and Sligo. It is in the Dublin military district, and there are barracks at Sligo. For parliamentary representation the county has since 1885 formed two divisions (North and South), each returning a member. Between 1841 and 1851 the population decreased from 180,886 to 128,515 or 29 per cent., and by 1881 it had decreased to 111,578 (55,144 males, 56,434 females), or 38.3 per cent. since 1841. In 1881 the number of persons who could read and write was 52,602, who could read only 15,574, who could neither read nor write 43,402. There were 2326 who could speak Irish only, while 24,263 could speak Irish and English. There were 10 superior schools with 266 pupils, of whom 142 were Catholics and 124 Protestants, and 211 primary schools with 13,714 pupils, of whom 12,070 were Catholics and 1644 Protestants. The principal towns are Sligo (population 10,808 in 1881), Ballina (1442 in Sligo and 4318 in Mayo), Ballymote (1145), and Tobercurry (1081).

History and Antiquities.—In the time of Ptolemy the district was inhabited by the *Nagnatae*, the capital *Nagnata* being somewhere near the site of the present town of Sligo. Afterwards it was possessed by a branch of the O'Connors, called O'Connor Sligo. On the landing of Henry II. it gradually fell into the power of the De Burgos. The district formed part of Connaught, which, in the reign of Elizabeth, was divided into seven counties. On the lands of Carrowmore, between Sligo and Ballysadare, there is a remarkable collection of Druidical remains, consisting of cairns, a circle, cromlechs, and pillar stones. At Drumcliffe is the only round tower now remaining in the county, and a beautiful Celtic cross 13 feet in height. The principal monastic ruins are the abbey of St Fechan at Ballysadare, with an ancient church displaying some curious architecture of the 11th or 12th century; the remarkable group of buildings on Inishmurray; and the abbey of Sligo, noticed under the town below. There are a considerable number of old castles, but none of special interest.

SLIGO, the chief town of the above county and an important seaport, is finely situated at the mouth of the Garvogue, near Lough Gill, 137 miles north-west of Dublin by rail. The town is rather irregularly built and has a decayed appearance, which somewhat belies its actual prosperity. Formerly it was fortified by a castle and walls, but of these there are now no remains. The abbey, founded in 1252 by Maurice Fitzgerald, lord-justice, is one of the finest monastic ruins in Ireland. It was partly destroyed by fire in 1414 and again in 1642. Within recent years measures have been taken to preserve it. Three sides of the cloister of the quadrangle still remain, and the lofty quadrangular tower at the junction of the nave and chancel is entire. The eastern window, still very perfect, is of the date of the original structure. The