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.

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 (see Insomnia).

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 persons, lasting four, seven or ten days. . On awaking the patient is exhausted and pale, with cold extremities, and not infrequently, 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. (See also Dreams, Somnambulism and Hypnotism.)

Among older works, see article "Sommeil ” in the *Dictionnaire encyclopédique des sciences médicales*, where a 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 Guy’s *Hospital Reports* (i860); Kohlschütter, “ Die Mechanik des Schlafes,” in Z.*f*. *ration. Med.,* vol. xxxiii. (1869) ; Pflüger, “ Theorie des Schlafes,” in *Pflüger's Archiv,* vol. x. (1875); Mosso, *Über den Kreislauf des Blutes im menschlichen Gehirn* (Leipzig, 1881). Also Manacéïne, *Sleep, its Physiology, Pathology, Hygiene and Psychology* (Eng. trans. 1897), with bibliography. (J. G. Μ.)

**SLEEPER,** a term used with many technical applications for a piece of timber, metal, &c., used as a support; in carpentry it is such a piece of timber laid on low cross walls as a plate to receive ground joists; in shipbuilding, a strengthening timber for the bows and stern frame; the most frequent use of the term is for a timber or steel support on which the chairs are fixed for carrying the rails on a railway; in America these are called “ ties ” (see Railways). The common explanation of the origin of the word is to connect it with “ sleep,” the timbers supposed to be lying at rest. The real source of the word is the Norwegian *sleip,* a piece of timber used for dragging things over, a roller, especially used of timbers laid in a row in making a road. This word Skeat (*Etymol. Dict.,* 1898) connects with "slab,” a flat piece of stone or wood. The French term *dormant* is used in carpentry, but as part of the frame of a window or door.

**SLEEPING-SICKNESS (***Trypanosomiasis),* a remarkable para­sitic disease, familiar among West African natives since the beginning of the 19th century, and characterized by protracted lethargy, fever and wasting. It is attributed to the *trypanosoma gambiense,* a parasite which was discovered in the frog by Gruby in 1847, and in 1880 by Griffith Evans in horses afflicted with the disease called “ surra ” in India. In 1895 Surgeon-Major (afterwards Sir) D. Bruce found a trypanosoma similar to Evans’s in cases of what was known in cattle as “ tsetse-fly disease and though the trypanosoma had not then actually been found in man, Bruce suggested that this was akin to the human “ sleeping-sickness ” which had now extended into the Congo Free State, Uganda and elsewhere, and was causing great mortality, many Europeans having died of the disease. In 1903 Castelani found the trypanosoma in the cerebro-spinal fluid of human patients afflicted with the disease. The question of the pathology of “ sleeping-sickness ” was vigorously taken up, and in June 1907 an international conference was held in London for the purpose of organizing research on the subject. As was pointed out by Lord Fitzmaurice (18th of June), in his opening address, it was already accepted that *trypanosoma gambiense* was the cause of the disease, and it was even then “ all but proved ” that the parasite was conveyed by at least one species of tsetse fly (*glossina palpalis),* the distribution of which was limited to the neighbourhood of open water. It had further been ascertained, experimentally in animals, and therapeutically in man, that the infection once acquired could be controlled, tosome extent, by various substances—arsenic, certain colours, dyes, in combinations of arsenic and colour dyes, *e.g.* atoxyl— and by mercury. It remained a question how far certain un­ascertained factors were at work in the spread of the disease, and for this purpose the British government invited the co-operation of all the powers interested in tropical Africa in considering certain problems, annual or biennial conferences being suggested, and the formation of a central bureau, in order to organize the research. These problems were: (1) to determine whether the tsetse fly (*glossina palpalis)* was a direct or indirect conveyor of the parasite; (2) whether the parasite underwent necessary developmental changes in the tsetse fly; .(3) if so, whether the developed germs were conveyed by the original fly or its larva when arrived at the imago stage; (4) how long an infected *glossina palpalis* remained infected; (5) whether other species of *glossina* were concerned; (6) the geographical distribution and habits of the fly; (7) whether and how far the spread of infection was the work of any of the vertebrate fauna (other than man); (8) to suggest preventive methods for exterminating the *glossina,* or protecting uninfected districts by segregation or otherwise; (9) to study the therapeutics of the disease. In the history of modern pathology, this organization of research in respect of “ sleeping-sickness ” must hold an important place as the application of state effort on behalf of the advancement of science. (See Neuropathology and Parasitic Diseases.)

Authorities.—Sir P. Manson, *Lane Lectures on Tropical Diseases* (1905) ; W. F. Μ. Marshall, "Trypanosomiasis or Sleeping-Sickness,” in *Review of Neurology and Psychiatry* (February 1906) ; F. W. Mott, *Archives of Neurology,* vol. iii. (1907) ; *Reports of the Sleeping-Sickness. Commission;* Castellani, “ Researches on the Aetiology of Sleeping- Sickness,” *Journal of Tropical Medicine* (June 1903).

**SLEET** (either from Nor. *sletta,* of the same meaning, or related to Ger. *Schlosse,* hailstone), that form of precipitation of water vapour condensed from the atmosphere, which reaches the ground in a partly frozen condition. Sleet may originate in the upper atmosphere either as rain, in which case, to become partly frozen, it must have fallen into a stratum of air colder than that in which it originated, or as snow, when the opposite must have