

SCIENTISTS ROBE the MYSTERIES of SLEEP

Normal Loss of Consciousness Which Constitutes Sleep Is Being Stripped of It's Ancient Secrets.



LACK OF SLEEP IS THE WORST FORM OF "THIRD DEGREE"

Absolute sleeplessness is fatal to human beings in half the time that starvation takes to kill.

The maximum time which man can live without sleep is nine consecutive days and nights.

The Chinese punish some of the higher forms of crime by keeping the convicted awake until they die. In the majority of cases six days suffice.

Nothing breaks down the human physical and mental structure so quickly as lack of sleep. "Third degree" torture by depriving the prisoner of sleep extracts the innermost secrets of his mind and leaves no mark. It is more effective than the grill and rack of medieval times.

BY GORDON LESLIE.

As civilization becomes more and more complex, sleep becomes more and more elusive to many. Man will steal and kill if driven to necessity in order to get food, but no amount of plunder will win him sleep if sleep does not come naturally. And sleep is just twice as important to life as food—a man can exist without food for double the time that he can exist without sleep.

So it is that scientists are endeavoring to fathom the world-old-mystery of sleep. Already these clever locksmiths have opened the door of the stronghold which has defied the ages, and their keen analytical minds are probing the secrets, beyond that their work will bring insomnia under control and so save the sanity and life of many is assured. What further results the solving of the mystery of sleep will have is a question of the future. It is quite possible that by scientifically arranged sleep man may be able to dispense with some of the sleep that is now vitally needful.

Some people cannot sleep enough. Insomnia wastes their tissues and brain power and threatens life. Other people sleep too much. Sleep overpowers them at any and all times in the day and sometimes for weeks at a stretch. This affliction is called narcolepsy, and although it is not as dangerous as insomnia, it is a disease that renders its subjects listless and inert and gradually saps their vitality.

Scientists have but recently turned their attention to sleep. Dr. Boris Sidis, the psychologist, declares that as man spends one-third of his life in sleep it is high time that more was known about sleep. From the earliest times man has held sleep an inexplicable mystery. Many have been the interesting explanations. Among the ancients and even among some of the wild tribes of the Pacific Islands today sleep has been considered as a form of temporary death.

Superstition Barred Research.

Sleep was held to be a condition of the body with the soul on a vacation, wandering in the celestial realms and there holding converse with the gods. It was thus that the augury of dreams became first established, the fragmentary reminiscences of those nocturnal meetings in the spirit world. Some primitive tribes believe that if a sleeper is awakened forcibly death will instantaneously result—for how can a body

live without a soul, unless it be in sleep.

That we do not know more about sleep today scientists ascribe partly to the old superstition which held sleep beyond the terrestrial sphere and hence forbidden to prying, and the fact that the most evident functions of life are manifested in the waking hours. Man lived when he was awake; he was as good as dead when he was asleep, so what use to study sleep. Moreover the waking hours were so busily occupied that little time has been left the investigator to study sleep.

No scientist will prophesy that the study of sleep will do away with sleep as a necessity, but the adoption of a regimen of sleep may serve to bring more benefit out of less sleep than the average person obtains.

Every once in a while will come a report that some person has gone without sleep for 20 or perhaps 30 years and is still hale and hearty. But investigation never bears out these reports. People are found who really think they have gone without sleep for years, but physicians and psychologists declare that such a thing is an illusion. These people sleep and do not know it.

The maximum time which a human being can live without sleep is nine days, but all depends on physical condition and environment. A polar explorer might exist for six days without food and travel some distance over the ice fields the first three days, provided he obtained sleep and water. But without sleep he would perish in half the time. To live nine days without a wink of sleep a man must exert little energy, have plenty of food and comfortable surroundings. It is generally conceded that a man can live twice as long without food, provided he has more sleep than normally to make up for lack of the other bodily restoratives.

Sleep the Most Important Function. By finding the sleep is more important than food, investigators believe that many disorders of the body and brain are brought on by lack of proper sleep, just as acute indigestion is usually attributable to improper eating, and that sleep is the most important function to look out for in treating any disease.

Experiments have been and are being conducted in an effort to get to the bottom of the sleep question. Beginning with crabs, frogs, and dogs, the investigators have carried their work to human beings. Dr. Sidis has made a series of experiments with babies from a few days to a few years old. A torture which is attributed to Oriental origin which is very ancient and very cruel is enforced sleeplessness. So insidious is this method of extracting secrets from unwilling prisoners that it is still extant in the world of modern crime. The harassed subject bears no mark of the abuse except a general debility and, perhaps, if it is carried too far, becomes mentally deranged. But who

can trace such things to the guilty party?

In applying the sleepless "third degree" the subject is shut up without anything more comfortable to recline on than a hard floor. If rats inhabit his place of confinement, so much the better. Then by a variation of sounds he is kept awake for perhaps two days and nights. By this time he is very weak, for little if any food is allowed. Then comes the walking. When the subject is so fatigued that he sinks to the floor content to sleep anywhere he is picked up and with a man on each side made to walk, walk, walk. His struggles are small and it is not necessary to use much violence to keep him awake. If he faints, stimulants are poured down his throat and then the walking goes on until finally, his resistance broken down, his vision wildly impaired, despair drives his tongue to give up what his mind wishes to withhold.

At the University of Iowa five members of the faculty volunteered to become subjects for experiment. They went without sleep 30 hours. Each was constantly attended by one of the investigators who made a record of temperatures and other physical conditions.

The subjects were kept awake by their own will power and the ever present attendants. Toward the end of the time one professor was so deranged mentally that he saw gaily plumed birds flying around his head. The others were normal mentally, but their attentive powers were lowered. It was found that after going without sleep for some time the brain became unusually active and the lapsed below normal. Physically the subjects showed loss of weight, subnormal temperature and poor heart action. It was estimated that for two of the subjects it would have been dangerous to continue the experiments longer, but the others could have stood the ordeal for at least two days more. After the test the subjects fell into a sound, untroubled, dreamless sleep, which lasted about 35 hours. At the end of this time they were all again normal physically and mentally. It was found in this way that after going without sleep for a long period the quality of the subsequent sleep was better than usual—that the subject obtained better benefit than under normal conditions.

Insomnia Interrupts Tissue Building. Marie de Manacine, a Russian scientist, has devoted several years to

the study of sleep and insomnia. Out of 167 cases of insomnia, made up of 71 men and 96 women, she found that 19 were due to neurasthenia, 18 to chronic gout, 17 to overwork, 10 to alcoholism, 10 to dyspepsia and eight to other diseases.

Insomnia is generally interrupted sleep, according to Dr. Manacine. Her observations have shown that when the power of sleep is weakened it becomes light and fugitive so that the slightest noise, the least impression from without, awakens the sleeper. Such sleep is hurtful since the rebuilding of the tissues is interrupted when it is scarcely begun. Although such patients in the aggregate get considerable sleep they are awake so often that they get the opinion that they have not slept at all. Insomnia, if prolonged, is injurious to health, especially to the brain. Psychic derangement of a serious character often results.

People who blush frequently are liable to insomnia, according to the Russian scientist. Blushing causes a flow of blood to the head and diminution of the amount of blood in the brain is a requisite of sleep. It has been noticed that in the heads of chickens and dogs, amputated when the animals are asleep, the brain shows a paleness due to lack of blood, whereas in heads taken off while the animals are awake the brain shows considerable blood.

An accident in Paris served to corroborate this theory. A man's lost part of his skull, exposing the brain, but lived for several days. When he was asleep a small amount of blood showed in the arteries of the brain, but when he awoke the flowing back of the blood was visible.

Intense joy or anxiety are causes of insomnia. Prisoners lose weight before and during their trials on account of insomnia, but after they receive sentence they usually sleep well and regain their weight even though corporal punishment awaits them. On the other hand several who have been acquitted of serious charges have been unable to sleep well for several nights.

The Fallacy of Using Drugs. Many who cannot sleep resort to the use of drugs. Narcotics do not produce true sleep, but only a temporary interruption of consciousness. Habitual use of such drugs leads to the loss of power to sleep without them, and the dose must be constantly augmented until finally no amount will give the

desired effect and the wasted subject dies.

Not every interruption of consciousness is sleep, says Dr. Manacine. Besides the unconscious state sleep consists of a flowing of the blood from the brain to the outer parts of the body, active nutrition or building up of the body tissues and of the blood. Sleep makes more red corpuscles in the blood.

The Russian scientist's theory of sleep is based chiefly on the blood action flowing to and from the brain. Hot baths before going to bed help the subject of insomnia by causing a dilation of the blood vessels of the skin and drawing the blood from the brain. In a like manner drinking a glass of milk or taking some other light food draws the blood to the digestive organs and away from the brain. Conversely, it is true that a cold bath awakens by driving the blood to the brain, and a craving for food will awake a person if nothing else will.

Other scientists declare that this blood action is secondary to psychological phenomena which cause sleep. In order properly to treat sleep disorders it is necessary to know what sleep is. "Sleep is due to absence of outside stimulation to the receptor nerves of the body which normally keep the brain in activity," says Dr. Isador H. Coriat, a Boston physician who is conducting researches on the subject.

As a result of a series of experiments which he has just completed, Dr. Coriat believes that insomnia can not exist if there is a complete relaxation of the muscles of the body and if all external disturbances are shut out. He carried on his experiments at night with his subject undressed and in a comfortable bed in a dark room. In the first experiment the subject was told to relax all muscles and remain as quiet as possible. An electrical coil was switched on which made a monotonous buzzing noise. Sleep resulted in 15 minutes.

Why We Sleep in Church.

Then the doctor tried the experiment with the subject's ears stopped up with cotton and without the buzzing noise. Sleep resulted even more quickly. With all light and sound shut out, but with some of the muscles of the body made tense by uncomfortable position, sleep did not come. A galvanic current causes a tightening of the muscles, and the

doctor found that sleep did not result when the current was passed through the body and that a person already asleep was instantly awakened by the turning on of such a current, although not enough force was used to cause any pain.

By the use of an ingenious instrument Dr. Coriat learned that the greatest depth of sleep is reached in 70 minutes from the time a first becoming unconscious. According to Dr. Coriat it is not the monotony of a sermon or lecture that makes us fall asleep, but because inattention from lack of interest causes the muscles to relax and this relaxation produces sleep.

We fall asleep more easily in a reclining position because this position is more conducive to muscular relaxation. All attentive processes involve a certain tension on the nerves of various muscles. When the muscles are relaxed, the nerves are relaxed, and the telegraphic nerve system which conveys outside impressions to the brain is broken. Closing the eyes shuts out other stimuli. The nerve endings in the muscles and skin are complex and numerous and a great part of the impressions from which we think and act are communicated to the brain by these nerves. Thus when the muscle nerves are sending, the brain receiving station is active, and activity is not sleep. Dreams take place because the brain or a part of it is somewhat active. In deep sleep the brain is completely at rest and dreams do not occur at all. Great fatigue tends to wakefulness because the muscles are knotted and mechanically refuse to relax.

Just where sleep began in the evolution of life is still a question. At first glance it would seem that sleep is somewhat a modern function. The first forms of life were one-celled organisms so minute as to be invisible to the naked eye in most forms. The creatures are still extant and under the microscope they manifest unceasing motility.

True Sleep and Apparent Sleep.

Going higher in the scale we find species of life which seem to sleep and yet do not. Worms are sensitive to light rays and are active in light, and passive when a deep shadow is thrown over them, but this is not sleep. It is merely a dormant reaction due to the absence of light which the lower forms of life are sensitive to if to nothing else.

In man and the other higher animals, the spinal cord has become a complicated mechanism, and the brain the dominant organ of consciousness. Worms have no brain and their actions are unconscious. With the various receptor organs—nerves which convey impressions—becoming more numerous and complicated, there arose rhythmic states of activity alternating with sleep.

Genuine sleep only exists in organisms with the subject's ears stopped up with cotton and without the buzzing noise. Sleep resulted even more quickly. With all light and sound shut out, but with some of the muscles of the body made tense by uncomfortable position, sleep did not come. A galvanic current causes a tightening of the muscles, and the

activity. The building up of the body cells goes on night and day, but in sleep less is wasted than when awake because of inactivity. To replace the energy exerted by the body in the activities of daily life a constructive process goes on continuously, the stomach and lungs acting as furnaces in which food, water and air are the fuels. All fuel which digestion and heart action turn into energy at night goes to store energy for the next day, except a comparatively small amount, which heats the body and keeps the breathing engine going.

But Dr. Coriat says that something still more important goes on while we sleep. In the nerve cells there is a peculiar substance called Nissl bodies, which are necessary to brain energy. These Nissl bodies accumulate during repose and disappear in activity, particularly under conditions of fatigue. In the brains of animals which have been killed during or directly after sleep, Nissl bodies are shown under microscope with great clearness. It is only in the fatigued cell or the cell poisoned by toxic substances in various diseases or through the influence of increased temperature in fever that these Nissl bodies disintegrate and in some instances disappear. Thus insomnia is often the result of high fever. As yet no way has been discovered to increase artificially the creation of Nissl bodies.

Insomnia is just beginning to be appreciated in its bearing on ill health, according to Dr. A. K. Bond, a Baltimore more scientist. He declares that the human body and brain were originally moulded for sleep and not for waking, and it is only through some higher development that we live and do not sleep twice as much as we do.

Dr. Bond points out that the new born baby sleeps all the time when it is not eating and is only awakened by the necessity for food. The body and brain become increasingly sensitive as the child grows older, and it sleeps less and less until as an adult it sleeps but one-third of the day. This being awake is due to nervous excitation which the body can stand to a certain extent, but when insomnia occurs the strain is too much for the system, which becomes the ready prey to disease. Thought and will power often drive the weary body away from slumber. It requires until body and brain are a hopeless wreck.

Dr. Bond believes that the whole universe is based on different stages of sleep. "The lowest form is the mineral kingdom, which is absolutely inert," he says. "Then come the plants, which live their lives in unbreakable sleep, growing and reproducing. Sleep as we know it in man is a form less sound than in plants and only intermittent. Heaven is only a form of complete and continuous wakefulness. If science can discover a way to wake man up so that he can go without sleep entirely, our brain power will be as much greater than at present as it is greater than the lower forms of life."

"Once asleep there is a clearly classified series of sensations that awaken us. Hunger and thirst will wake a human being before anything else, then come sound, light and touch. In waking, the breathing first becomes more rapid, and last of all consciousness returns. We may even get up and walk around before we are fully awake, and for some minutes the brain is below par in comprehension."

Dr. Bond says that the brain is about two-thirds of the way between wakefulness and sleep. Uninfluenced by outer happenings the brain plays. This faculty has been in wide use of in diagnosing diseases where the seat of the trouble was hard to find. A man dreamed continually that he had an

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How JOHN PIERPONT MORGAN SPENT THIS WEEK'S VACATION



SOMETIMES HE COMES DOWN FROM EAST 25TH STREET IN AN AUTOBOMB BUT MORE OFTEN IN THE SECOND AVENUE ELEVATOR

JOHN PIERPONT MORGAN, head of the most powerful financial interests in the world, has returned from his vacation.

He got one week this year. The junior office boy in the Morgan offices got three.

But if Mr. Morgan did happen to be limited to only a week's holiday, he spent that in a true multi-millionaire fashion. With his family and some

friends, he made the cruise with the New York Yacht Club's flotilla on his steam yacht the Mermaid.

For years the American public has been accustomed to think of the Corsair when the name Morgan was coupled with yachting. But the days of splendor for the Corsair, if not passed, are very limited. This splendid yacht is too large for everyday use, in the estimation of the present head of

the great financial dynasty. So she is moored at the New York Yacht Club anchorage in the East River and is only used on state occasions. So, for the first time in a long while, the annual cruise of the yacht club is taking place without the Corsair.

But to return to the matter of the millionaire's vacation, it is interesting to review the causes of his summer holiday. Nobody thinks of J. P. Morgan without associating with the name independence enough to take as much holiday as could be desired. But, as a matter of fact, few salaried employees are so closely confined to work as the successor of the great financier. Certain it is that none of Mr. Morgan's subordinates have as little time to devote to their families, to their pleasures and to the pleasure of their friends as J. P. Morgan, the son of his father.

Since the death of his father in Rome, Mr. Morgan has had the great responsibility of the vast Morgan interests entirely on his shoulders. It is true that for several years before his father's death he had taken over the most of his father's work. But there was always his great father to fall back on in matters of particular moment. But when that prop was taken from under him he buckled down to work harder than ever. Now he works from sun to sun, and often the

day is not finished for him until long after other men are sleeping. For years—in fact, since he joined the yacht club in 1882—he has not missed a cruise. This annual affair has always been one of peculiar pleasure for him, because of his fondness for the sea. After the elder Morgan died his son, shackled by the cares of business, did not see how he could spare the time for any vacation this Summer. In other years since he entered the Morgan offices he had taken a month, and sometimes longer. As the weeks passed into months the work of the head of the Morgan firm became more exacting, and instead of decreasing in volume it kept increasing. The number of serious charges have been on hand at one time. As senior partner, his wishes, of course, were to be consulted first.

Mr. Morgan disposed of this question by explaining that he would not have time to take any vacation at all. But for this once the head of the firm was not the boss of the establishment. His partners told him very curtly that he was going to take a vacation whether he had time or not. There was more bickering between Morgan and his

partners over this question than ever would occur over a deal involving many millions of dollars. Finally, Mr. Morgan gave in and consented to go away.

But when he left the office he took his secretary with him and informed his subordinates that he would be gone a week.

When he returned to his desk in Broad street, after seven days' absence, he took up his regular routine, which is more confining than that of any of his clerks. The "Jack" Morgan family lives at East Island Long Island Sound, in the summer. This island is just opposite Oyster Bay. The Morgans go down to it about the middle of May and remain there until the middle of October.

The financier reaches his office in New York every morning at 10 o'clock. To do this he has to get up shortly after 7 o'clock. After a light breakfast at home he hurries down to the East Island pier and is taken out to the Mermaid in a launch. As soon as he gets aboard the Mermaid gets under way. It is a little after 8 o'clock by the time the trip from East Island to the anchorage in the East River at the foot of Twenty-fifth street comes. A galvanic current causes a tightening of the muscles, and the

on the way down Mr. Morgan takes very little time admiring the scenery or commenting on the weather. When he boards his yacht his crew gets a



AFTER DINNER HE GOES TO HIS STUDY AND POURS OVER THE PAPERS HE HAS BROUGHT HOME WITH HIM

pleasant "good morning" and then he is busy with his secretary, and by the time New York is reached a great deal of correspondence has been taken care of.

Sometimes he comes down from East Twenty-fifth street in an automobile, but more often he and his secretary take the Second-avenue elevator, and it is seldom that the attention of his fellow-passengers is attracted to him, so unobtrusive is his demeanor and so quietly and inconspicuously dresses. Once he is at his desk, he buckles down to work and he keeps at it until 1 o'clock.

As soon as the lunch, which always is very light, is finished, Mr. Morgan resumes his work and he keeps at it until 4 o'clock in the Summer months.

After dinner and an hour or so with his family, he goes to his study and pores over the papers he has brought home with him until some member of his family, generally Mrs. Morgan, impresses upon him that he has done enough for the day. In the Fall and Winter, when he is at his Madison-avenue home, Mr. Morgan travels in the subway. Often he has to hang on a strap, just the same as some of his clerks, but he seldom attracts any attention.