MIDNIGHT'S TURNING POINT

Tiredness and joy of life increase at night. Science speaks of “Mind after Midnight”, the state of mind after midnight. What is happening to us?

Text Max Rauner Photos Jacob Mitchell

A on the Reeperbahn at half past midnight. Perhaps Germany's best-known party zone in the St. Pauli district of Hamburg. Clubs, variety shows, musicals, police, bachelor parties, sex shops, kebab stalls, the cold bus for the homeless. At half past midnight everything is in its element here.

The taxi driver says: »People are normal during the day. In the evening it's more relaxed.<< The woman from the Hamburg cold bus: "Darkness gives security. People express themselves more openly.<< The sex worker: >>People are much more honest, not so uptight. They reveal what they don't want to reveal.<< The Dragqucen: >>During the day, people constantly have to play their roles. They are freer at night. They are then themselves.<<

People are different. This is less due to the Reeperbahn. It depends on the time.

At midnight people transform, a bit like Count Dracula or the little vampire. You don't necessarily want to drink blood, but your feelings change, your thinking, your behavior. Strictly speaking, the transformation does not happen as suddenly as the tower clock strikes twelve. Midnight is not a tipping point where the brain flips a switch. It is true that people go through a kind of psychological climate change during the night. In the early hours of the morning he stands next to himself.

Sure, alcohol is often involved. Alcohol stimulates the release of endorphins and makes you temporarily euphoric. It enhances the effect of the neurotransmitter Gaba, which has a calming effect. Stress and risks are perceived as less threatening. Alcohol also dampens the effect of the neurotransmitter glutamate, which activates the brain. As a result, you react more slowly, have cognitive lapses, and stumble. Some bachelors then come up with stupid ideas and jump into the nearby Elbe River in Lion King style.

But alcohol is only half the story. Even those who drink mineral water all evening experience a transformation at an advanced hour.

Psychologists and sleep doctors, brain researchers and chronobiologists are fascinated by the phenomenon because it touches on deep questions about our existence. Which part of your personality actually comes to the fore at night? The true me? The party self? The vulnerable self? The dark self? Why do inhibitions and control mechanisms that are still intact during the day fall? Is it because of the darkness? Lack of sleep? On the internal clock? What genetic programs are running there?

Sundown syndrome is known from people with dementia: as the sun goes down, nervousness, fear and disorientation increase. Those affected wander around aimlessly, are more aggressive and call for help. The night also poses a risk for mentally unstable people. Extreme example: suicide. In absolute terms, fewer people kill themselves at night than during the day, but that is only because most people are sleeping. If you count those who are awake, the picture changes. A research team at the University of Pennsylvania evaluated more than 35,000 suicides in the USA and found that the hourly suicide rate between midnight and 6 a.m. is four times higher than the rest of the time. Chronobiologist Martha Merrow from the University of Munich says: »I can only speculate about this, but evolution may have postponed depressive thoughts until the night so that we literally sleep through them.<<

Healthy people, on the other hand, lose cognitive performance late at night. Experiments show that they do well when it comes to solving routine tasks. But they make worse decisions in unexpected situations, take unnecessary risks, are more impulsive and have difficulty concentrating. They act like they're drunk. After 17 hours without sleep - at one in the morning,

When you are awake at eight in the morning - volunteers performed in psychomotor tests as if they had 0.5 per mille of alcohol in their blood.

It's not all that bad if you dance the night away on the weekend. It's practical if a lack of sleep can replace two beers, maybe it's healthier too. But the night owl becomes a problem when he pilots airplanes, operates on a heart, controls a nuclear power plant or leads coalition negotiations. The Chernobyl and Three Miles Island nuclear disasters were caused by human error in the early hours of the morning. Such errors probably do not appear to be due to sleepiness, but rather to more subtle effects in the cortex, speculated sleep doctor Jim Horne, who died in 2023. It's about the area of the brain behind the forehead that is active when planning and making decisions and uses a particularly large amount of energy, the prefrontal cortex.

Science is concerned with the following suspicion: that the prefrontal cortex switches to energy-saving mode after midnight, while other areas of the brain remain in operation. You shouldn't take the time of midnight too precisely. For late risers –

In the early hours of the morning, night owls perform in psychomotor tests as if they had alcohol in their blood

For the owl chronotype, the effect sets in after midnight, and for early risers, the larks, before. In any case, the prefrontal cortex has to take a break at night to recover from the synaptic storm of the day. Cleaning up takes place at night. The sleep researchers at the University of Pennsylvania speak of "hypofrontality (derived from the Greek hypo for "under") and ask the rhetorical question: "Is it good to be awake when the mind is asleep?"

As is so often the case, medicine approaches the matter by first looking at what happens when something breaks. In this case the internal clock.

Stephen Larroque often collapsed from fatigue after school and fell asleep. It started in elementary school, the family lived in Paris. While the others were meeting up in the afternoon or pursuing their hobbies, little Stephen couldn't be relied on. He missed appointments. This is what Stephen Larroque says in a video interview. He is now 36 years old and lives in Liège, Belgium, where he researches consciousness at the university clinic. A young man with a mustache and a kind of glasses frame to which an LED strip is attached. The lamp illuminates the area around his eyes. Looks futuristic.

"As a child, I needed all my strength for school," says Stephen Larroque. Get up early, show up on time, follow class. »I had no life outside of school. << When the other children talked about sports or other afternoon activities, he thought: How do they do that? I can not do this. At night, however, he was often wide awake for hours. Often - but not always.

Because his rhythm shifted imperceptibly from day to day, from week to week. Everything worked well for about a month, but the next month the daytime tiredness was back. His health followed the same pattern. Sick for a month, fit for a month; Infections for a month, healthy for a month and so on. The teachers joked about it," says Larroque. »I was like a sensor for the diseases of the season.<<

Apparently his parents should have suspected that something was wrong with the boy. The father, a computer scientist, also had a strange biorhythm. The blinds in the house were usually drawn. Stephen's friends joked that his father was a vampire. It was not funny. Larroque says his father was unemployed most of his life. He told his son: Work is good, health is better. He didn't notice that Stephen had the same problems as him because he himself slept through the days. And the mother? >>She said I shouldn't be on the computer so much at night. << And the doctors? >>Sleep doctors were not known back then. <<

After studying computer science, Stephen Larroque tried working a nine-to-five job. With a stable rhythm. It did not work. »I then convinced myself that I was something special: a night owl, how cool.<< As a consciousness researcher, he now knows that this was a self-deception, called an illusion of control: We construct a narrative, a story about ourselves, which suggests to us that we have our lives under control, even when things are completely out of control. I decide when to sleep and when not, Larroque thought. His girlfriend didn't buy this story. When she came home from work and bustled around the apartment they shared, her boyfriend would sleep like a log. sent At him to the doctor.

the age of 23, Stephen Larroque finally got a diagnosis: circadian sleep-wake rhythm disorder, type free-running sleep-wake rhythm, or Non-24 for short. "Free-running" because the internal clock doesn't care about the position of the sun, but literally rotates freely. "I live outside of time," says Larroque. >>My biorhythm is like a dance that alternately keeps up with the world and then falls out of rhythm again.<< A night person becomes a day person, becomes a night person, becomes a day person, and so on.

To understand what is happening here, it helps to travel back in time to 1961. On the evening of April 27th, behavioral biologist Jürgen Aschoff takes off his watch and goes into a bunker-like basement room at the University Hospital in Munich, equipped with a bed, cupboard, desk, Refrigerator, hotplate, toilet and laundry room. For nine days he just wants to follow his internal clock, isolated from appointments, news, clocks, temperature fluctuations and sunlight. Meals are served to him through a lock and communication takes place with notes. The test result is a sensation: Aschoff followed a stable sleep-wake period during isolation, but this did not repeat itself every 24 hours, but rather every 25. Seven other test subjects who followed him showed cycles between 24 ,7 and 26 hours.

Aschoff's research group then prepared an old Wehrmacht bunker in Andechs, Upper Bavaria, for such experiments. Elsewhere in the world, researchers are repeating the study with ever-improving methods, with up to five volunteers

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Spend weeks in isolation. At the end of the 1990s and with the involvement of hundreds of test subjects, it was clear that the human internal clock has an average cycle of 24 hours and ten minutes. It doesn't exactly follow the rhythm of the earth's rotation, but it's close. That's why we're talking about the circadian rhythm, derived from the Latin circa for about and this for day.

This rhythm is based on a sophisticated interplay of internal and external timers; the whole thing resembles a huge orchestra. Chronobiology locates the conductor in a brain arcal behind the root of the nose, as small as a grain of rice, the suprachiasmatic nucleus (SCN). It consists of 20,000 nerve cells and is considered the most important clock in all mammals. Among other things, it controls the periodic release of the hormones melatonin and cortisol. An increased melatonin level in the evening signals to the body that calm is about to return. Body temperature and blood pressure drop. In the morning, a cortisol peak prepares the body for the day. The pancreas begins to produce insulin. Wake up, breakfast is coming soon!

Clock genes control the human internal clock through a feedback mechanism. They don't like to get out of step

Even in a Petri dish with nutrient solution and in complete darkness, the nerve cells maintain an approximately 24-hour period. This is also how jet lag is explained: the SCN doesn't like to be thrown out of sync; after all, it has 500 million years of evolution behind it. Long-haul flights were not planned during this training period.

A dozen clock genes act as the orchestra's metronome. The period gene, for example, produces a protein that acts on the gene and inhibits its activity. In the morning, the concentration of protein in the body cell is low. The gene begins production. The protein concentration increases until it is so high at night that the gene stops working. The protein therefore blocks its own production. The concentration then drops until the gene becomes active again in the morning and everything starts again and go. Nobel Prize 2017.

The genetic clock ticks not only in the suprachiasmatic nucleus behind the bridge of the nose, but in every cell of the body. There, the clock genes control the activity of numerous other genes. Researchers estimate that around 20 percent of the entire genome is subject to circadian rule. The liver, the kidneys, that The immune system, the brain, – digestion all have their own routines. In addition, they get impulses from the meals we eat.

This is where the external clock comes into play, i.e. the alternation of day and night. The brain learns whether it is light or dark outside via the optic nerve. And it is connected to the SCN. This means that your internal clock is constantly synchronized with day and night.

In Stephen Larroque and other people with Non-24, this mechanism is defective. People who are completely blind are particularly affected, but in rare cases also Schende. Using a sleep diary, Larroque discovered that his body follows a cycle of 24 hours and 20 minutes, unaffected by light and dark. He ticks like a test subject in a bunker. Just without bunkers.

It is quite possible that a gene mutation is the cause. It is also said of his grandmother that she often slept in the car in broad daylight while accompanying her husband to business meetings. And a few years ago, chronobiologist Alina Patke discovered that a mutation in the clock gene CRYI is responsible for a similar sleep disorder: delayed sleep phase syndrome. Those affected are extreme owls. You don't get to sleep until late in the evening

Stephen Larroque has tried a few things to stabilize his rhythm. In the evening he took melatonin tablets and in the morning he worked next to a daylight lamp. The lamp brightened his mood, but it didn't help with the arrhythmia. The intensity was not enough. Then he came across the light therapy glasses, which use LEDs at eyebrow level to illuminate the eyes. He wore them for an hour a day. Still no effect. Finally, he decided to wear the glasses until the battery ran out. For twelve hours. That was the breakthrough.

"I went to sleep and the next day I woke up earlier for the first time than the day before," says Larroque. The light had altered his internal clock. He soon figured out the dose he needed so that he could fall asleep at about the same time every night and wake up at the same time in the morning: five hours a day in the dark season. At the end of 2023, Larroque celebrated its eighth consecutive month with a stable rhythm. He wears glasses at work, on the bus, in the supermarket - a man with shining eyes who can finally take part in social life. “A year ago, I wouldn’t have been able to reliably arrange to do this video interview,” he says. >>That's possible today.<<

For Stephen Larroque's social life, Non-24 is hell. But the illness also has something good, he thinks: “I am a walking self-experiment. I can test scientific hypotheses on myself.” He observed something that can provide information about metamorphosis after midnight.

Stephen Larroque felt most depressed when his circadian rhythm was off and he was taken out of deep sleep during the day. He felt best when his internal and external clocks matched and he was alert during the day. On the other hand, when he was awake and well-rested at night, his mood and productivity were only mediocre. His conclusion: It's not so much the lack of sleep that weighs on his mind, but rather the disruption to his internal clock. And the darkness makes the effect even stronger.

That sounds plausible to Martha Merrow from the University of Munich. She has dedicated her entire professional life to circadian rhythms and helped develop the concept of >>social jet lag: When people go to bed much later on the weekend than during the week, it is as if they were flying a few time zones west on Friday evening and Sunday evening back. Merrow says: “We change at night, but the same goes for any time of day. We are different people at different times in our circadian cycle.<< Everyone feels this intuitively. »That's why we schedule social encounters, work and physical activities at different times of the day. And when you're out

Does the mind take a break in the early hours of the morning? Statistics on suicides and eating habits suggest this

When you awaken from sleep, you open a window to the night side of your personality.<

The view from this window is Andrew Tubbs' specialty. He researches the dark side of our existence in the Department of Psychiatry at the University of Arizona. Tubbs came up with the Mind after Midnight hypothesis, which describes the state of mind after midnight. Accordingly, the mind tires in the early hours of the morning like a muscle that has done a lot during the day. The synapses that send nerve impulses through the cortex throughout the day need to recalibrate. In addition, dopamine levels in the brain change, further inhibiting the activity of the prefrontal cortex. The control mechanisms no longer work so well. The amygdala, the area of the brain that controls fear and emotions, turns on. We behave more impulsively, are more willing to take risks, are more emotionally unstable, get stuck in rumination loops, and make mistakes.

At night we would be a bit like dolphins, with half of their brains sleeping while the other half is on guard. In dolphins, however, the cerebral hemispheres can stand in for each other. This doesn't work with humans. For There is no substitute for the mind. Andrew Tubbs says, "We can be awake for a while, but then the system becomes uncontrollable and we have to shut it down and reset it."

Andrew Tubbs has collected many statistics to show that loss of control occurs after midnight. From the suicide rate in the USA to homicides in Italy to diet: At night, people choose higher-fat products and eat more excessively, leading to binge eating, the night eating syndrome. It's no coincidence, Tubbs speculates, that the casinos in Las Vegas have no windows or clocks, just constant artificial light. The mind should shut up when you bet a month's salary on red in roulette.

As further evidence for the "Mind after Midnight" lypothesis, Tubbs cites a Japanese study that examined the suicide rate at train stations in the greater Tokyo area. "In the USA, people kill themselves primarily with weapons; in Japan they jump in front of trains," he says. At some train stations with high suicide rates, the train companies installed blue light-emitting diodes that bathed the platforms in bright, short-wave light. The suicide rate promptly fell by an average of 84 percent, as data from 71 train stations show between 2000 and 2010.

>>The > Mind after Midnight perspective provides an explanation for this," says Tubbs: "Roughly speaking, the blue light simulates the blue sky and tells the circadian rhythm that it is daytime. The mind wakes up and inhibits the suicidal impulse. This explanation is speculative, and the Japanese study leader herself points out that blue light is not a miracle cure. If you want to prevent suicides at train stations, you also have to install physical barriers and sliding doors. Andrew Tubbs now hopes that scientists will devise further experiments and collect data to better understand the night owl.

Stephen Larroque, the man outside of time, looks to the future with confidence. He documented his long-term self and therapy attempts on 500 pages and posted them online to help other people with Non 24. He married his girlfriend, who sent him to the doctor at the time. And from their knowledge of the circadian rhythm, the two of them came up with a date. “If we have a conflict,” says Larroque, “we don’t discuss it in the evening or at night. We'll postpone the matter until the next day. That works much better.<< Arguing doesn't go well at night. ■

Max Rauner went on sailing trips in his youth He was assigned to the "dog guard" from midnight to four in the morning. It's a good thing he didn't know the "Mind after ¡Midnight" theory back then. The boat reached the harbor unscathed.

Collaboration: Nina Lennartz and Luisa Stamenkovic