

The rhythm of life: on the Nobel Prize in Medicine

Time and clocks have held a special fascination for humankind down the ages. So, it is particularly revealing that two of the three Nobel Prizes for the sciences announced this year have been linked to time. While the [Nobel Prize for Physics](#) was awarded to a trio of physicists for their work in the detection of gravitational waves emanating from the recesses of the space-time continuum, the 2017 [Nobel Prize in Physiology or Medicine](#) was won by a triumvirate of chronobiologists for their work in discovering the mechanisms controlling the internal clocks that keep time in all living organisms, including humans. Jeffrey C. Hall, Michael Rosbash and Michael W. Young, three Americans born in the 1940s, made pioneering contributions in helping unravel the genetic coding and protein pathways that regulate the circadian rhythm — that rhythm which tells us when it is time to eat and sleep, or wake up even when we have no bedside alarm. Working with the humble fruit fly, the three scientists isolated a gene named *period* that studies had shown disrupted the fly's circadian clock. Dr. Hall and Dr. Rosbash then went on to discover that the protein PER, which acts as a functional communicator for this gene, accumulated at night and then diminished during the day. Independently, Dr. Young made a couple of seminal breakthroughs that helped complete the jigsaw puzzle — first by identifying a second gene *timeless* that through its TIM protein, working in conjunction with PER, helped engender the seesawing of cellular protein levels. He then spotted the third gene, *doubletime*, which through an encoded protein served as the regulator of the frequency of the oscillations.

In its nod to the trio's contributions, the Nobel Assembly at Sweden's Karolinska Institute referred to how their work had led to circadian biology developing into a "vast and highly dynamic research field, with implications for our health and well-being." It is this crucial human health angle that has spawned a mushrooming body of science centred on understanding the linkages between sleep and normal metabolic activity, and the potentially deleterious effect of sleep deprivation. From "jet lag", when people travel across different time zones challenging the internal biological clock, to the difficulties people engaged in shift-based jobs have in resetting their sleep-wake cycles, contemporary medical science acknowledges the hazards that lack of adequate sleep can pose. The ubiquitousness of the smartphone, tablet, computer and TV screens that may disrupt the circadian rhythm because of the light they emit is being studied extensively. The Nobel-winning researchers' contributions have also led to an improved understanding of the link between peak physical performance in sport and the time of the day. Ultimately, the prospect that the circadian rhythm may well hold the key to future breakthroughs in the modulation and treatment of various diseases is truly tantalising.

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