Time marches on

A&M professor in a race against biological clocks

By David Barry
THE BATTALION

Last week, Professor Susan Golden of the Texas A&M Department of Biology went where few biologists have gone before – across the street to the physics department. The reason for her visit was a "crossing of mutual interests," physics professor Valery Pokrovsky said. Like many physicists, Golden studies the universal mystery of time, albeit from a uniquely biological perspective. She reported her findings on how some of the simplest forms of life on earth use internal biological clocks to tell time.

"We don't know the answer of how does a cell keep time, and nobody knows it. And that's really fun, having questions and trying to get the answers," Golden said.

Biological clocks have been around for eons. They operate inside many living things, from college students to lowly bacteria, keeping biological processes in harmony with the 24-hour cycle of nature.

Anyone who has flown across several time zones has probably experienced a disruption of their biological clock. Jetlag occurs when the body's daily cycle, or circadian rhythm, is thrown out of synch with the surrounding environment. Jetlag sufferers feel a strong urge to sleep at unusual times because their biological clock is set to a different time zone.

But biological clocks do serve an important purpose, judging by their prevalence in nature. Golden said clocks appear to have evolved at different times in different organisms.

The natural tendency for clocks to evolve suggests that living things gain a powerful competitive advantage by having a circadian clock. Golden explained that organisms benefit by using their internal clocks to anticipate changes in the environment, like sunrise or sunset.

"They aren't caught off guard when the light comes on," she said.

A biological clock also allows cells to separate incompatible processes, much like a factory does with day and night shifts. For example, some kinds of bacteria produce oxygen through photosynthesis during the day and "fix" nitrogen at night. Together these two vital processes would interfere with each other, Golden said.

The remarkable thing about biological clocks is that they continue to tick in the absence of environmental cues like sunrise and sunset. Even when placed in perpetual daylight, some bacteria will regulate their internal processes on a 24-hour basis.

To find the series of chemical events that underlie circadian rhythms, Golden and other scientists have spent more than a decade collecting clues about the inner workings of tiny, single-celled organisms called cyanobacteria.

Cyanobacteria have had plenty of time to perfect the biological clock. Recently unearthed fossil records may contain the imprint of cyanobacteria-like organisms from over three billion years ago.

Initially, scientists thought cyanobacteria were too primitive to support a biological clock, Golden said. Skeptics of a bacterial clock also noted that the typical cyanobacterium dies or divides into daughter cells within six to 18 hours, well before a single 24-hour cycle can run its course. However, further study revealed that the "setting" of the clock is transferred to both daughter cells upon cell division, so that a sense of time is transferred from generation to generation, Golden said.

The investigation of the circadian clock of cyanobacteria started in 1992, according to the TAMU Clocks Project website, Golden and other scientists began to poke and prod the genome of cyanobacteria, seeking the genetic components of circadian clocks. Golden said her lab has produced thousands of mutated versions of the cyanobacteria "Synechococcus elongatus" in order find about a dozen mutants with malfunctioning biological clocks. After scientists learn which genes are vital to the clock's operation, they can build models of the clock's inner workings.

In little more than a decade of research, scientists have determined that three essential clock proteins in cyanobacteria accumulate, form large, organized conglomerations and dissipate over a regular 24-hour cycle. Golden said many smaller pieces of the clock are still missing. Her lab is conducting a systematic survey of the "S. elongatus" genome to find the missing pieces.

At the same time, scientists at Vanderbilt University, Tennessee and a university in Japan are racing with Golden's group of researchers to make the next big discovery about the cyanobacterial clock. Golden said the three labs both cooperate and compete.

"Sure, everybody wants their lab to be the one to make the big discovery, but there is still a lot of communication and cooperation."

In addition to running their own "good-natured race," the three labs are united against a common competitor, Golden said.

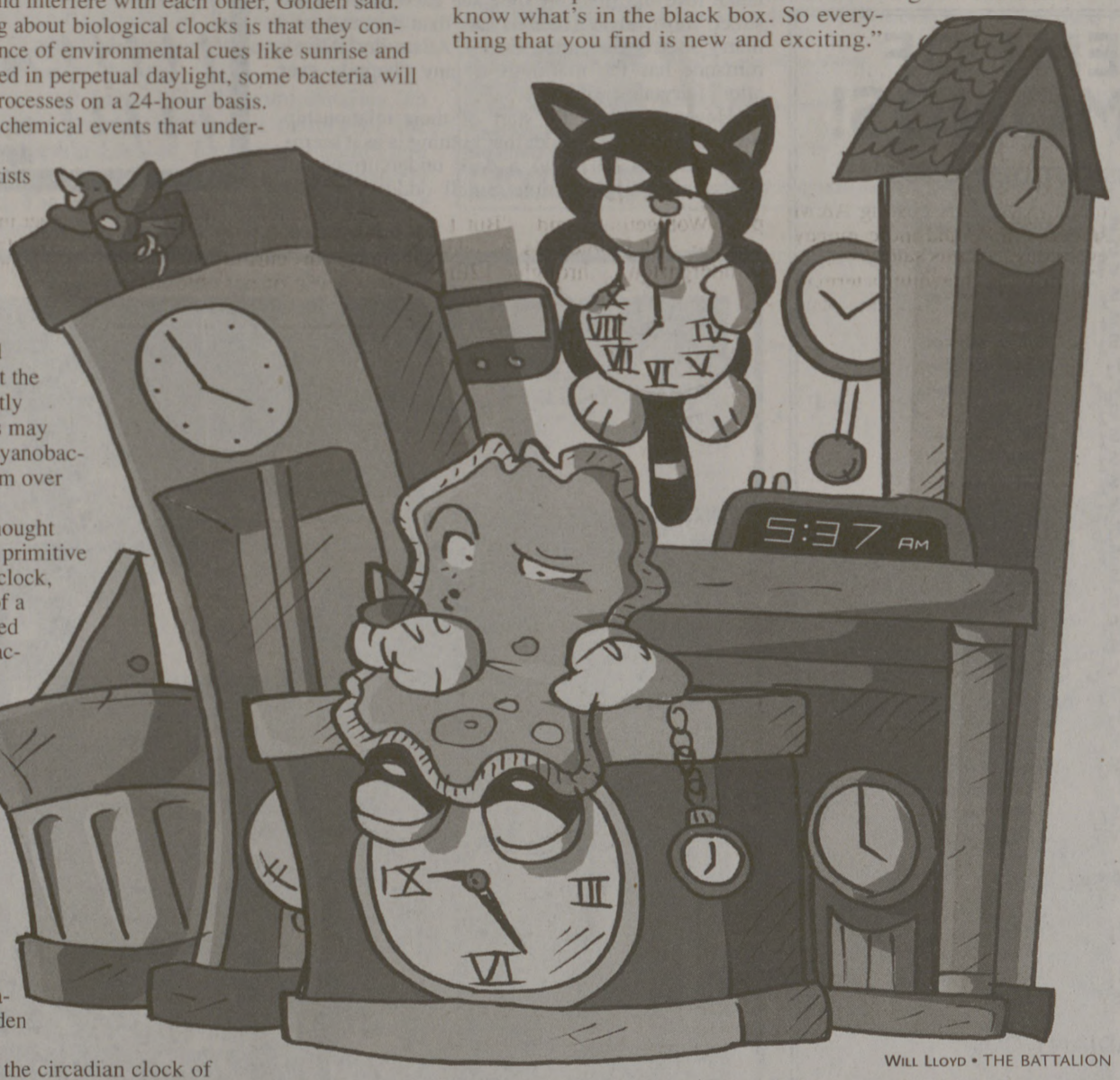
"All of us working on the bacteria want to figure out our clock before the animal people or the plant people figure out their clock."

Even though the field of bacterial clock research is 10 to 20 years younger than the plant and animal fields, Golden said working with bacteria carries certain advantages that may allow her team of biologists to play catch-up.

"We can engineer a mutant within a week, but it you want to engineer a mouse, it takes many weeks, many months to get that mouse," she said.

Inter-lab competition aside, Golden said there is plenty of excitement in the quest to uncover the secret inner workings of biological clocks.

"At this point we're at the black box stage ... You don't know what's in the black box. So everything that you find is new and exciting."



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Was Atkins overweight?

Atkins medical records spark another round in diet fight

By Sara Kugler
THE ASSOCIATED PRESS

NEW YORK — The debate over Dr. Robert Atkins' popular high-fat, low-carb diet flared posthumously Tuesday when it was learned that Atkins himself was a bloated 258 pounds at his death.

A city medical examiner's report filed after Atkins' 2003 death from a fall showed the 6-foot doctor was at a weight normally considered obese. A physicians group that is highly critical of the diet released details of the report, claiming the Atkins diet led to weight and heart troubles for its 72-year-old creator.

The Atkins Physicians Council said the carbohydrate-shunning doctor gained more than 60 pounds through fluid retention in the eight days he spent in a coma before dying last April. He had slipped on an icy street and hit his head.

Atkins weighed 195 pounds when he was admitted, the group's chairman said.

"Critically ill patients, when sustained on fluids in the hospital, gain weight," said Dr. Stuart Trager, chairman of the Atkins Physicians Council, a group affiliated with the Atkins diet empire. "He was grossly swollen, so much so that his family and associates barely recognized him."

The medical examiner's report also noted that Atkins had a history of heart trouble, including congestive heart failure and high blood pressure. The Wall Street Journal first reported on the records on Tuesday.

The doctor's heart troubles had been previously known publicly, and the council asserted Tuesday that they were a result of cardiomyopathy, or an enlarged heart, which it said stemmed from a viral infection, not diet.

"We need to set the record straight. This is a man who managed his weight," Trager said. "Isn't it time to let this man rest in peace?"

Atkins was the author of the best-selling "Dr. Atkins' New Diet Revolution," which advocates meat, eggs and cheese and discourages bread, rice and fruit. His books sold 15 million copies and attracted millions of followers.

Physicians for Responsible Medicine, the group that released the report and promotes a vegetarian diet, acknowledged that fluid retention may have been responsible for some of Atkins' weight gain, but probably not all of it. The group maintains that the Atkins diet poses weight and health risks to the millions who follow it.

A healthy 6-foot man weighing 258 pounds would normally qualify as obese, according to the Centers for Disease Control and Prevention. At 195 pounds, he would be considered overweight.

The medical examiner's report was not based on an autopsy but on an external exam. Conditions such as congestive heart failure and high blood pressure would not be observed by the medical examiner in such a case, but would be drawn instead from previous doctors' observations and records.

In April 2002, a year before he died, Atkins issued a statement saying he was recovering from cardiac arrest related to a heart infection he had suffered from "for a few years." He said it was "in no way related to diet."

For years nutrition experts and doctors have debated the Atkins diet, which allows up to two-thirds of calories from fat, or more than double the usual recommendation. Atkins argued that carbohydrates generate too much insulin, which makes people hungrier and encourages them to put on fat.

When Atkins' book was first published in 1972, the medical mainstream was promoting a low-fat, high-carbohydrate diet. The American Medical Association labeled the Atkins' diet "potentially dangerous" and Congress summoned him to Capitol Hill to defend the plan.

The Atkins diet recently gained renewed popularity after studies showed that people lost weight without compromising their health. The studies showed that Atkins dieters' cardiovascular risk factors and overall cholesterol readings changed for the better.

Last month, the doctor's widow, Veronica Atkins, demanded an apology from Mayor Michael Bloomberg after he called her late husband "fat." She declined comment on Tuesday's disclosure.

Ellen Borakove, a spokeswoman for the medical examiner, declined to comment on the report, which she said was erroneously released to a doctor in Nebraska who requested it and apparently gave it to the vegetarian group.

It was later discovered that the doctor was not "the treating physician" and should not have had access to the report. Borakove said her office planned to complain to Nebraska health officials.

The mayor said the report "should not have been released."