What makes us tick

A&M biologists conduct evolutionary study of biological cloc

PATRICE PAGES
The Battalion

It is 7:50 in the morning, the alarm was set for 8 a.m. but a student wakes up 10 minutes early for an exam.

The process just described is possible because of the student's circadian rhythm, or internal biological clock.

Researchers at Texas A&M recently received a $5 million grant from the National Institute of Health to study the gears driving such biological clocks.

Professors Dr. Vincent Cassone, Deborah Bell-Pedersen, Susan Golden, Terry Thomas and Mark Zoran of the Department of Biology and Dr. David Earnest of the Department of Human Anatomy have pooled their efforts to study the genes involved in biological clock functioning in different types of organisms, ranging from bacteria to mammals.

All living organisms have an internal biological, or circadian clock, which allows organisms to tell time.

A&M is ready to do comparative studies to analyze these circadian clocks using an integrated approach, combining the different features of their model organisms to understand the nature of the circadian clocks that drive people and animals alike.

Scientists now know clocks are regulated at the cellular level. In mice and rats, these clock cells are mainly located in a region of the brain called the Supra-Chiasmatic Nucleus (SCN). In birds and chicken, clock cells are in the pineal gland, a pea-sized structure in the center of the brain.

The circadian clock in these animals follows a light-dark cycle.

During the day, light hits the eyes and is converted to electrical signals that travel through optic nerves to the clock cells. In the clock cell, the electrical signal activates proteins that switch on genes called clock genes, which make other proteins: the clock proteins.

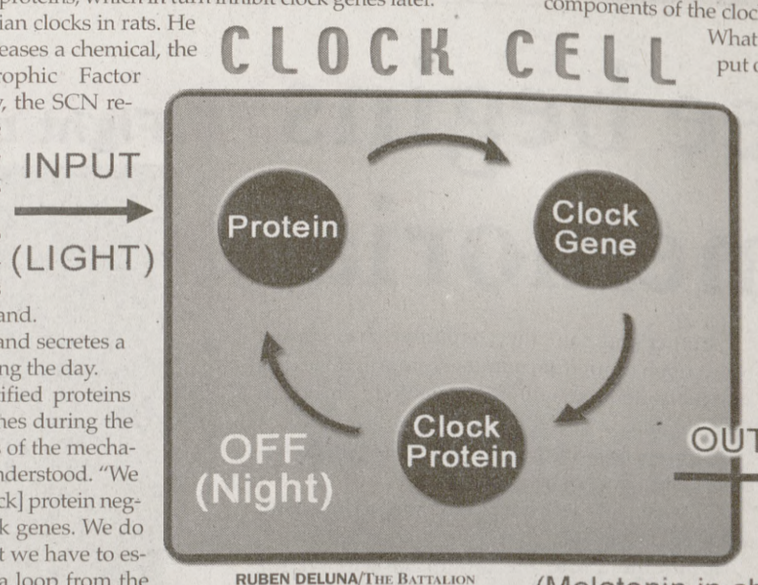
When night begins, these clock proteins turn the clock genes off, stopping clock protein production.

Thus circadian clock functions as a loop, where initial proteins activate clock genes, which create clock proteins, which in turn inhibit clock genes later.

Earnest studies circadian clocks in rats. He showed that the SCN releases a chemical, the Brain-Derived Neurotrophic Factor (BDNF). During the day, the SCN releases BDNF to make connections with the optical nerve, but not during the night.

Cassone and his group are working on the circadian rhythm mechanisms in the chicken pineal gland. Like in rats, the pineal gland secretes a chemical, melatonin, during the day.

They also have identified proteins that activate the clock genes during the day. However, the details of the mechanisms have to be better understood. "We do not know how the [clock] protein negatively regulates the clock genes. We do know that it happens, but we have to establish that there is also a loop from the clock protein to the clock genes," Bell-Pedersen said.



RUBEN DELUNA/THE BATTALION

Studies of circadian clocks in other organisms all show both internal and external effects of circadian rhythms. The first is in the form of an internal loop in the cell, and the second is an effect visible from outside, like the secretion of BDNF or melatonin.

"A good analogy is your watch," Bell-Pedersen said. "If you opened up the back of your watch, you would see these gears that go through each other. They are the components of the clock loop. They keep everything running at the corr... What they regulate are the hands that you look at. That is... put of the clock."

Comparing the results obtained with differ... ganisms also shows that the involved clock ge... similar from one organism to another, thou... number of genes increases with the size and com... ity of the organism.

Many questions remain unanswered, said Ste... pert, a Harvard Medical School researcher workin... cadian clocks in mice.

"Even if we have a handful of genes now, we... the beginning stages in terms of understanding h... gene products interact with each other to mak... loops," he said.

Earnest said that studying how cir... rhythms control physiology and behav... mammals could help scientists under... sleep disorders of aging people, or the ef... alcohol on the 24-hour rhythm of devel... brains in infants. Bell-Pedersen said circ... rhythms also effect medications.

"Most asthma attacks occur in the... morning. So if patients take one dose of... right before they go to sleep, the effect... drug is much better," she said.

Bell-Pedersen is enthusiastic about the future perspectives in the st... biological clocks.

"What is particularly exciting is that we will get information on how... evolved, by being able to compare from a prokaryote to a low eukaryote to... to a mouse. This is unique in the field," she said.

Industries attempt to end music piracy with watermarkin

JENNIFER BALES
The Battalion

Metallica is not the only group that dislikes pirated MP3s.

MPEG 1 layer 3 files, commonly known as MP3s, are used by hundreds of thousands of people across the United States and the world as a way of acquiring their favorite songs by downloading them to their computers instead of paying the price of a store-bought CD.

Over 180 music and technology companies have recently banded together to prevent the "pirating," or stealing, of music through this means by attempting to ensure that only legal MP3s with a specific code, or "watermark," can be played by software and portable MP3 players.

This watermarking technique is called the Secured Digital Music Initiative (SDMI).

See related column on Page 5

The Motion Pictures Experts Group (MPEG) developed a method of compressing audio and visual content. The compression of data allows users to save space and time when dealing with large files.

Rather than working with a large file that uses between 30 and 50 megabytes of memory, compression allows for the manipulation of data into five megabytes or less. MP3 utilizes the structure developed by MPEG to compress the audio portion of the data.

MP3s work by compressing a track on a CD, creating a compression ratio of about 11 to one. This compressed data produces sound that is almost indistinguishable from a CD's.

With the pending case against Napster, Inc., and the constant media attention to digital-music controversies, there has been pressure for all parties involved to find an amicable agreement.

"We're in the middle of a 'never-never land' right now. We have large numbers of people breaking the law and saying they don't care," said Thomas Putnam, director of computing and information services at Texas A&M. "We're hoping that somebody comes up with something workable that walks that fine line between allowing artists to make money off of their art and allowing people to listen to the music and not paying excessive amounts for it."

SDMI resulted from a forum of more than 180 companies and organizations representing various members of the music and technology fields that have collaborated to develop open technology specifications to protect the distribution of digital music.

SDMI focuses its efforts on providing record companies with a way to distribute high-quality music without allowing illegal copies to be spread among listeners.

However, watermarking is only a small component of the solution. The primary goal of SDMI is the prevention of casual piracy — not the elimination of piracy by professionals. SDMI intends to publish guidelines explaining how digital music security tasks should be performed rather than strict implementation procedures.

On June 28, 1999, SDMI completed Phase I of the project which detailed initial specifications for portable devices (PD). Popular PDs among consumers include Diamond Multimedia's Rio 500 and Creative Lab's Nomad DAP-3201. These PDs allow users to listen to digital music while away from their computers — much like a portable CD player.

Phase I SDMI-compliant devices will enable users to play both protected and unprotected music, meaning that MP3s created before the launch of SDMI technology can be played on first generation SDMI-compliant devices.

Phase II will begin when technology that filters out illegally copied music is available to device manufacturers. Music that is released with a watermark that identifies it as SDMI-compliant will be the only files able to be played by this technology.

However, PDs will also retain the ability to play music that is unprotected, such as the current MP3 format, which was released before the implementation of Phase II.

RUBEN DELUNA/THE BATTALION

Consumers will be allowed to make an infinite num... copies as long as they retain the original disc from wh... music file was originally produced. Three additional c... are permitted from each copy stored on the user's com... If the consumer needs more copies, the CD can be re-...

A copy permission counter may also be implemen... usage rules will define how many times a file may be ... and show the number of times the content was replic...

The user may "check out" the content a specific nu... of times, and the identification associated with the w... mark will enable the file to p... portable devices installed o... user's computer only. Wit... technology, SDMI is worki... force all copies to be created... the original, decreasing the a... of pirated material.

SDMI protocol merely c... guidelines for manufacturers... corporate security measures... distributing digital music.

"My attitude is that the... dard should define a techn... that is neutral. It is up to a... layer to set rules about the... the technology. SDMI is a te... ogy platform where every t... possible, but it's up to soci... the technology, to decide w... right and what's wrong," said Dr. Leonardo Chiari... the founder of MPEG and executive director of SDM... interview with Wired News, an online news Website... focuses on science and technology issues.