# Sensing Trouble

## Traffic lab fights roadway congestion

STUART HUTSON
*The Battalion*

Urban communities around the country have a growing problem — traffic.

"It used to be that in order to solve traffic-congestion problems, a city would just build more or expand the roads they have," said Robert Brydia, assistant researcher at the Texas Transportation Institute's (TTI) Translink Research Center. "Now, it has just become too costly and, in some situations, just impossible to do that. So, a way of efficiently using the roads they have is now a necessity. That is our task here (at the Translink Research Center)."

The center, stationed in the TTI building on Texas A&M's West Campus, is researching methods to better chart and control traffic in urban and rural areas.

"All of College Station is really a testing ground," Brydia said. "We have sensor test patches set up in strategic locations so that we can test how different methods of detecting traffic work in real-world situations."

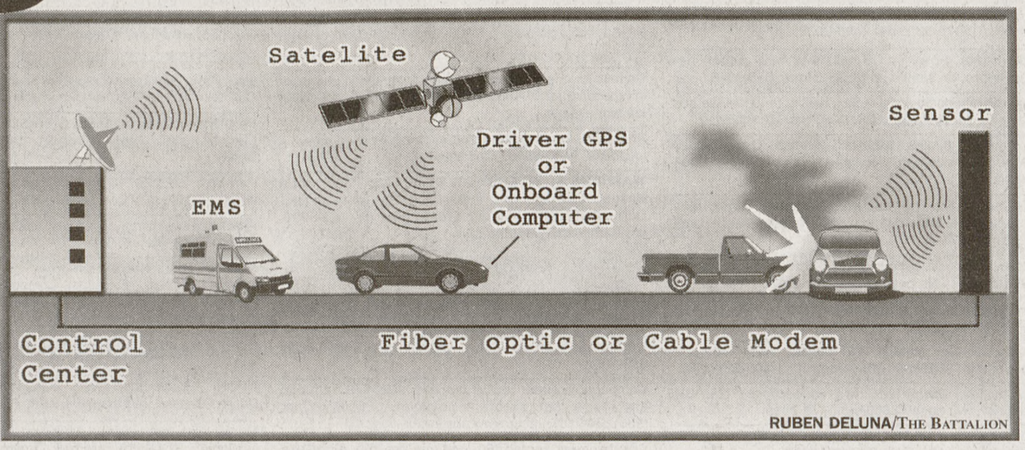
The sensor test patches (set up along Highway 6 and Wellborn Road, among other locations) consist of different arrays of sensors (including radar, acoustic, induction-loop and microwave) along with video cameras.

The radar and microwave sensors work in a way comparable with the radar gun used by police.

The sensor sends out a radio wave that bounces off a car and returns to the sensor. The change in frequency of the wave is then measured and the speed of the vehicle is determined.

"The problem with the microwave sensor is that every time it rains, each raindrop is read as a moving vehicle, so software has to be written to allow for bad-weather conditions," Brydia said.

The acoustic sensor listens to the noise made by passing vehicles. Different noises mean different speeds. Higher pitches generally mean faster speeds, while lower pitches mean slower speeds.



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Induction loop sensors are loops of wires buried under concrete that carry an electrical current.

When a large metallic object passes over one of these loops, it alters the current, indicating the presence of a vehicle.

These sensors are beneath the squares in the road commonly seen at intersections.

The center is developing ways of using these sensors to identify problem situations on city roads.

"One system we are working on is a delay of the green light at an intersection if a large truck is approaching. The sensor determines how far away the truck is and how fast it is going, and allows the light to stay green until the truck passes through," said Brydia. "This saves wear and tear on the road and trucks, while saving money on gas that would be expended while the truck was slowing down, waiting and then re-accelerating."

The center is also developing ways to communicate information obtained from the sensors to emergency response teams and personal vehicles with onboard computers.

"We can receive signals from the sensors via cable modems and fiber optics," Brydia said. "If we could then send that information to cars, it would allow them to avoid congestion and find the quickest route to their destination. We are also working with EMS and fire personnel to use the information to reroute them through the fastest path if an obstacle, such as a train, is in their path."

Systems for regulating traffic similar to ones under development at the center are already in use in major metropolitan areas like Dallas and San Antonio.

Brydia said the center's research is not designed to be used by law enforcement, but only to help regulate traffic congestion.

"A lot of people see that they are being watched and have flashbacks to Orwell's *1984*," he said. "But this isn't Big Brother. This is technology designed to help make people's lives easier and safer."

# Snails aid in nerve cell research

PATRICE PAGES
*The Battalion*

The human body contains miles of nerve cells, called neurons, that help the body to breathe, move, learn and think. But how these neurons carry out their process of transferring data within and outside the brain remains one of the most mysterious and complex processes of the human anatomy.

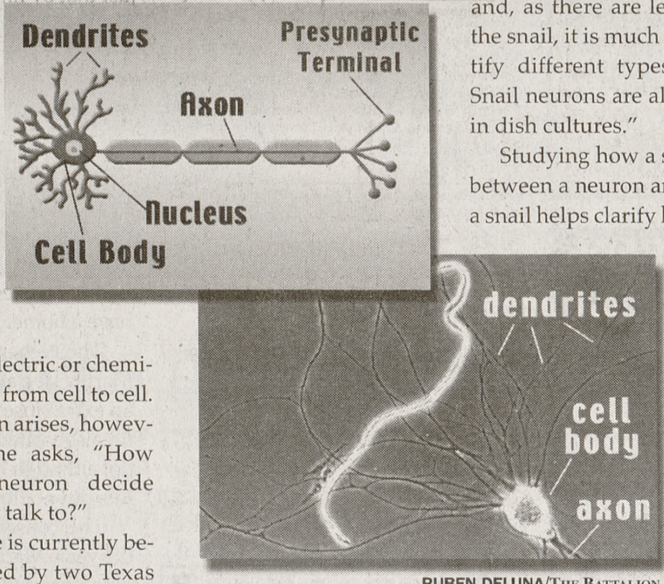
Understanding this process can aid in determining how learning and memory work, and it can also lead to important medical advances.

University of Calgary neurologist Andrew Bulloch said possible applications are the improvement of nerve cell repair in the body's nervous system after an accident, and a better understanding of why neurons in the brain do not repair themselves. Studies on growing neurons might also enable replacement of neurons lost or damaged by degenerative diseases.

"If this idea of therapy to correct Alzheimer's or Parkinson's or Huntington's goes forward, or if one can figure out how to get new connections in the spinal cord to alleviate traumas resulting from, say, falling off a horse, that will be a gigantic breakthrough," said Ken Lukowiak, one of Bulloch's colleagues at the University of Calgary.

Neuron cells can relay and store electrical messages by receiving an electrical or chemical connection from another neuron through projections called dendrites.

The cell then carries the message through its body and releases the message through projections, called, axons at its other end.



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The junctions between the dendrites and axons are called synapses. Synapses contain chemicals called neurotransmitters that convey the electric or chemical messages from cell to cell.

A question arises, however, when one asks, "How does one neuron decide which cell to talk to?"

This issue is currently being addressed by two Texas A&M neurobiologists, associate professor Dr. Mark Zoran and Ph.D. student Theresa Szabo, both from the Department of Biology.

Zoran has been studying connections between neurons and muscles in the Helisoma snail for more than 20 years.

"Snail neurons have many advantages with respect to mammalian neurons," he said. "They are 10 times larger in size, and, as there are less neurons in the snail, it is much easier to identify different types of neurons. Snail neurons are also easy to use in dish cultures."

Studying how a synapse forms between a neuron and its target in a snail helps clarify how a synapse can form in a human being.

"Though complexity increases, there are not many more basic cellular or molecular mechanisms," Zoran said. "There are many more neurons added to the network, so the computational capabilities of the network become more complex, and emergent properties arise. But the simple functions of the nervous system are probably the same."

Zoran showed that neurons could have totally different ways to connect to their muscle targets. In one case, they connect only to very specific muscle fibers. In another case, they connect to almost any target, and later break off those communications when they are no longer needed.

These "selective" and "promiscuous" behaviors have been observed in neurons found in the mouth of the snail, labeled neurons 19 and 5 respectively.

"These neurons can be compared to a postman having to deliver mail," Zoran said. "Neuron 19 will only go to the house having the right address, while neuron 5 will knock on almost any door on the block."

Neuron 19 arrives at the right target because certain signaling molecules direct it where to go.

"It is like the story of Hansel and Gretel, where bread crumbs are markers guiding them on the right way," Zoran said.

Szabo is studying how neurons behave when clusters of neurons, called ganglia, are injured. She discovered that during formation or regeneration of ganglia, neurons will often communicate via an electrical connection.

After a series of electrical connections are established, the connection between neurons will become a more permanent chemical transfer.

# Scientists work on genome

(AP)—With the announcement that the entire human genetic code has been assembled, scientists now have a thrilling "to do" list for the 21st century. But it will take years before such dreams become reality.

"It's the end of the beginning," Human Genome Project director Francis Collins said Monday at a White House briefing. "Together we must develop the advances in medicine that are the real reason for doing this work."

The genes have not actually been decoded but entered, letter by letter, into an enormous computer database. The public effort headed by Collins has mapped 97 percent of the human genome and thoroughly covered, or sequenced, 85 percent. A for-profit rival, Celera Genomics of Rockville, Md., announced Monday that it has completed 99 percent of the genetic sequence.

In the near term, the new information is expected to revolutionize drug development, making it much easier for pharmaceutical companies to target their products at the actual causes of disease. Today, most drugs are developed by a trial-and-error method that simply throws thousands of compounds at a biochemical problem until one fixes it.

But most of the benefits of the human genome are further down the road. In the coming years, researchers hope to determine:

- Which genes do what. Genes code for proteins, which do the actual work of the body by building tissues and catalyzing biological reactions. In many cases, a gene will be valuable only when scientists understand what protein it synthesizes and what that protein does.
- The role of "junk" DNA. Only about 3 percent of the genetic information actually encodes proteins. Another small percentage regulates genetic activity, turning other genes on and off. The remainder may consist of typographic errors that have arisen in the genetic code over billions of years, strings of "spacers" that increase the reliability of the gene copying process or something completely unexpected.
- Where and when genes are activated. Any given cell only uses a fraction of all the human genes, and which ones are turned on determines what type of cell it is. A heart cell, for example, uses a set of genes that allow it to contract in response to electrical signals. A cancer cell turns on genes that allow it to reproduce uncontrollably.