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# Cellular Biology

By STUART HUTSON

## The Battalion

As dozens of students lined up to purchase their textbooks at a local bookstore last week, the low murmur of complaints about class schedules and overinflated prices was shattered by a digital rendition of "Ode to Joy."

Immediately, more than half the students made a simultaneous motion to check a piece of electronic equipment that, in the Bryan-College Station community, has become as common a sight as a used textbook: the cellular phone.

From the breadbox-size car phones in the '80s to the sleek, credit-card-size phones of today, cellular technology continues to offer the ability to communicate with the world. Costas Georghiadis, Texas A&M professor of electrical engineering and a cellular technology expert, said the full potential of that ability has yet to be reached.

## How it works

Georghiadis said cellular phones work with a network of base stations, large antennas that transmit signals to and receive signals from the phone. The area in which a phone can interact with a station is called a cell.

"The cell ranges of these stations depend upon the strength of the signal and the geography of the landscape," he said. "When you are moving out of a cell, the base station will either hand you over to another station or, if there isn't another station, it will cut you off and give you an 'out of range' or some other message."

The base stations constantly emit a radio signal that indicates their presence. When a cellular phone user turns on the phone within range of a station, the phone receives this signal and then returns a signal of its own, basically telling the station that it is ready to receive and send calls. This signal carries a signature or number that identifies the phone.

At this point, the reception indicator on the phone (usually a bar similar to the battery indicator) shows the strength of reception.

Georghiadis said that, when a call is made from a cellular phone, the base station receives the signal from the phone and then sends the call through the normal "wired" phone system.

If the call is to another cellular phone, the call may be routed from the wired system to a main computer station that monitors the connections between base stations and cel-

lular phones. This station sends the call through the appropriate base station. The call may also be broadcast by several base stations covering the particular cellular phone's usage area.

## Digital vs. analog

Those shopping for a new cellular phone may notice that cellular phones not boasting the catch word "digital" are in small supply. Phone suppliers claim that digital service is clearer and more dependable and will offer more options. Georghiadis agrees.

the same way that the code is compressed by a personal computer before being stored in a zip file.

This compressed format is beneficial to cellular phone companies because it allows several cellular phone users to carry on conversations in the place of one.

When this digital format is received, it is converted back into analog signals that are carried to the speaker of the receiving phone. The resulting sound can be much clearer because additional noise is filtered out during the conversion process.

"With the analog signal, any interference caused by the atmosphere during transmission will show up in the final product because what you are sending is what you are going to hear," Georghiadis said. "But with digital signals, the signal only has to be clear enough for the computer to recognize a signal meaning one or a signal meaning zero. It then interprets those signals and reconstructs what you hear."

Georghiadis said another benefit of digital technology is that it allows information to be passed easily between cellular phones and computers. "They are both speaking the same language, so it is easy for them to talk," he said. "This is probably one of the most exciting aspects for the future of digital cellular phones."

## A digital future

The digital connection between cellular phones and computers now allows wireless connections to the Internet and email, but Georghiadis says he expects new applications as both the phones and the services improve. "You have a computer chip in your phone that allows it to act as a computer," he said. "A major hindrance now is the screen not being able to display the information that the phone can receive. But the ability to have a hologram or something like it on your phone is not science fiction anymore; it is a science possibility."

As for the next few years, Peirre Catala, a telecommunications expert, said research is being done to improve the rate at which cellular phones can transfer information. The fastest laboratory speed is 144 kilobits per second, or fast enough to teleconference. The fastest phone-line modem for a personal computer is 56 kilobits per second.

Catala said the researchers hope to achieve a speed of 384 kilobits per second in the next few years. He said the speed is comparable to a cable modem.

"There is some fascinating stuff coming," Catala said. "People are finding more ways to carry with them all the tools of the home computer and then some."



— Peirre Catala  
telecommunications expert

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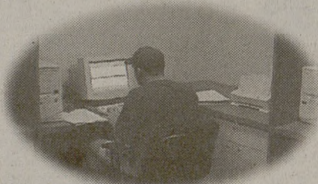
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