

# Sci|TECH

THE BATTALION

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## Computers heading for speed limits

By Brad Bennett  
THE BATTALION

The computer industry needs a breakthrough in chip design as chip manufacturers quickly approach the physical limitations of silicon processors, according to recent research from Texas A&M electrical engineering professor Laszlo Kish.

Moore's Law is the theory that computer processing speed will double every year, named after Intel co-founder Gordon Moore. The law has held fast since Moore made the prediction in 1965.

However, the law is becoming obsolete, Kish said. The law will become outdated in six to 10 more years as processors reach their physical limitation — their speed limit — somewhere around 10 gigahertz.

Currently, the fastest processor available from Dell is 3 gigahertz — gigahertz denoting one billion operations performed per second.

Kish's theory shows that as processors get smaller, thermal noise interference becomes more of a problem,

obstructing a processor's electrical signals. Thermal noise is caused by heat, which is a natural by-product of electricity moving through microchips while they perform calculations.

"Small noise spikes are present (in processors) now, but are negated because of their size," Kish said.

To combat problems associated with thermal noise, chip manufacturers have been lowering the voltage supplied to chips as the size drops, which creates problems with energy efficiency in the chip.

Energy-efficiency problems are caused when energy is wasted during normal processing of the chip. The amount of wasted energy due to inefficiency increases as the chip gets smaller.

Energy efficiency is a leading cause of the problem with chip progress, but it could be part of the solution.

"If there is a breakthrough that improves energy efficiency, we will be able to continue chip improvements," Kish said.

He said that if microchip innovation were to continue at pace with Moore's law, chips would shrink to less than 40 nanometers, or one ten-millionth of a meter. Transistors are currently 100 nanometers in size.

Nancy Forbes and Mike Foster discussed Moore's Law in Computing in Science & Engineering magazine.

Forbes said Moore's law would become void by the year 2010, but she claims his prediction of limitation was based on chip production becoming economically infeasible after a certain point — not on the physical limitations of microchips.

Besides a breakthrough in energy efficiency, Laszlo said, parallel processing is a possible direction to take in future chip development.

Parallel processing uses several chips or microprocessors operating simultaneously to complete a task.

In Computing in Science & Engineering, James Miendl of the Georgia Institute of Technology said

that new interconnections — the metal wiring between transistors — are the key to chip improvements.

Miendl said chip manufacturers are beginning to look at the importance of interconnections, which have been "benignly neglected" by chip designers for the past decade.

Miendl said he sees several areas where interconnections can improve chip performance, such as changing materials used, increasing the interconnect's cross-sectional dimensions, implementing multi-level interconnections that utilize chip wiring in two directions instead of one, and using three-dimensional structures composed of multiple wiring levels.

In the late 1990s, chip manufacturers' switch from aluminum to copper interconnections demonstrated chip manufacturers interest in improving interconnections, he said.

Miendl said seeking an alternative material to silicon, or at least a material to supplement silicon's shortcomings.

Chip development is assured as present transistors have evolved from vacuum tubes through three other stages of development to their present state, he said.

### NEWS IN BRIEF

#### Hacker compromised 8 million credit cards

OMAHA, Neb. (AP) — A hacker who gained access to millions of credit card numbers apparently did it by breaking into a computer system at a company that handles transactions for catalog companies and other direct marketers.

Data Processors International, based in Omaha, said Wednesday that "an unauthorized outside party" had tapped into its computer system.

Scott Jones, a company spokesman, refused to comment on when the hacker gained access and how many credit card account numbers may have been compromised.

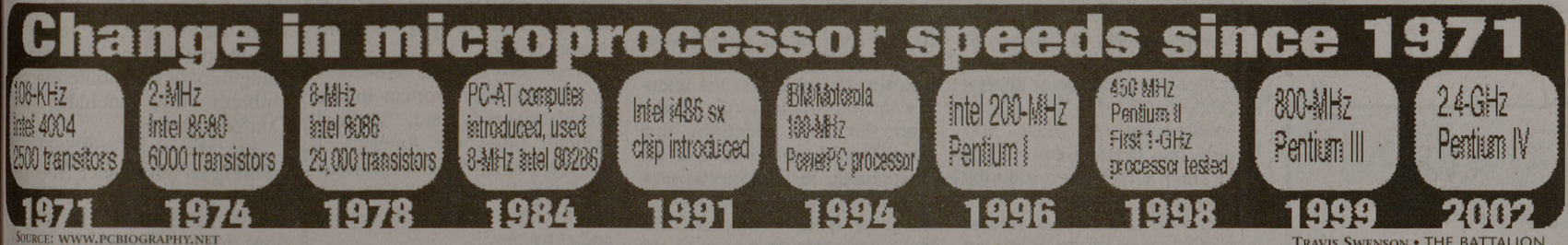
Credit card companies and the Secret Service have said that as many as 8 million account numbers were accessed.

#### Texas promotes smallpox vaccination

AUSTIN (AP) — More than 20 years after smallpox was considered eradicated, Texas is launching its immunization program to battle a potential new outbreak of the disease.

Dennis Perrotta, state epidemiologist and head of the bioterrorism preparedness program for the state health department, rolled up his sleeve and received his smallpox shot Tuesday.

"In these dangerous times, we must be prepared," said health commissioner Dr. Eduardo Sanchez.





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