PAGE a01md1mn0125

MORE THAN 2,700 CAR LISTINGS IN POST CLASSIFIEDS

EARLY EDITION

SUNDAY POST-DISPATCH

www.STLtoday.com JANUARY 25, 2004 $1.25

BUSINESS

You don't have to be a med student to wear scrubs

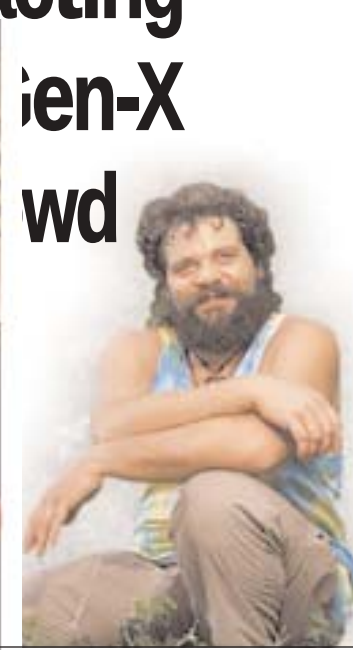
INSIDE, A8

ASBESTOS

Government knew plant here spewed fibers over city neighborhood

A&E

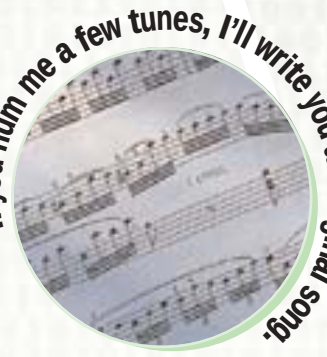
CBS is finally attracting ien-X wd



THE MACHINE THAT INVENTS

A St. Louis physicist has created a computer program called the Creativity Machine that simulates what goes on in the human brain. It has invented new products, composed music, coined new words and frightened some who fear such self-aware machines could take over the world.

I can pick out suspicious characters at the airport and scan luggage.



If you hum me a few tunes, I'll write you an original song.

By Tina Hesman
Of the Post-Dispatch

Technically, Stephen Thaler has written more music than any composer in the world. He also invented the Oral-B CrossAction toothbrush and devices that search the Internet for messages from terrorists. He has discovered substances harder than diamonds, coined 1.5 million new English words, and trained robotic cockroaches. Technically.

Thaler, the president and chief executive of Imagination Engines Inc. in Maryland Heights, gets credit for all those things, but he's really just "the man behind the curtain," he says. The real inventor is a computer program called a Creativity Machine.

What Thaler has created is essentially "Thomas Edison in a box," said Rusty Miller, a government contractor at General Dynamics and one of Thaler's chief cheerleaders.

"His first patent was for a Device for the Autonomous Generation of Useful Information," the official name of the Creativity Machine, Miller said. "His second patent was for the Self-Training Neural Network Object. Patent Number Two was invented by Patent Number One. Think about that. Patent Number Two *was invented* by Patent Number One!"

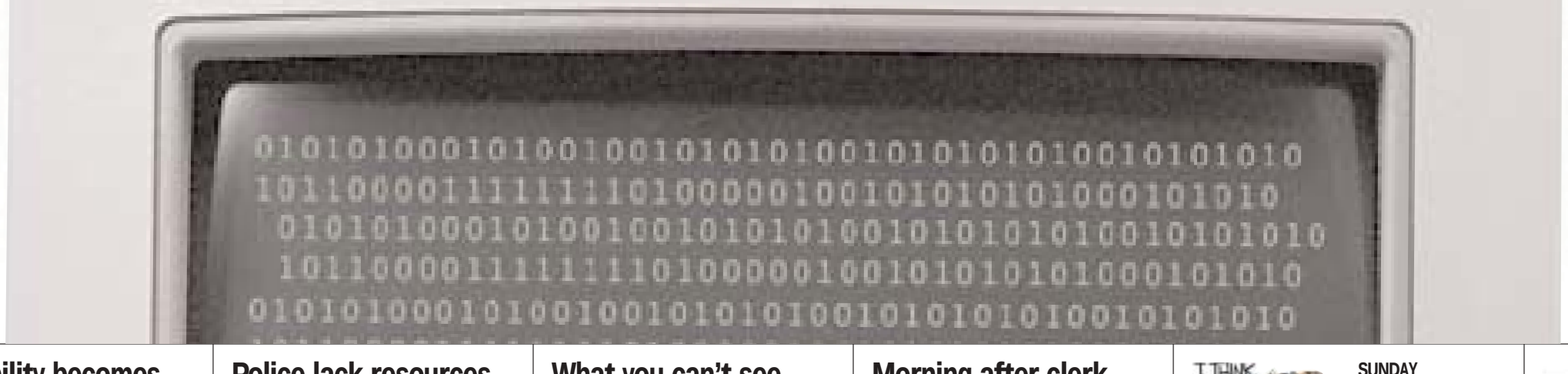
Supporters say the technology is the best simulation of what goes on in human brains, and the first truly thinking machine.

Others say it is something far more sinister — the beginning of "Terminator" technology, in which self-aware machines could take over the world.

See Think, A9

I can find new ways to find the enemy — even when he's hiding underground.

an think of
etter way
help you
sh your
eth.



Electability becomes key issue as voters in New Hampshire look for man to beat Bush
INSIDE, A5

Police lack resources to keep up with dealers, producers in Missouri's meth belt
INSIDE, A10

What you can't see from the steps of the Art Museum: the Grand Basin
NEWSWATCH

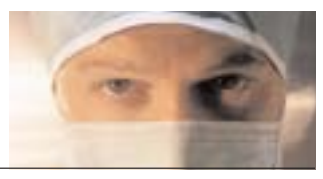
Morning after clerk at store was robbed, boss calls to say that she's fired
METRO

SUNDAY
Freezing rain.
High 34.
MONDAY
Light snow.
Low 28. High 36.

WEATHER | B8

MED SCHOOL FOR AMATEURS

BUSINESS



CBS FINALLY ATTRACTS THE GEN-X CROWD

A&E

SUNDAY POST-DISPATCH

www.STLtoday.com JANUARY 25, 2004 $1.25

THE MACHINE THAT INVENTS

A St. Louis physicist has created a computer program called the Creativity Machine that simulates what goes on in the human brain. It has invented new products, composed music, coined new words and frightened some who fear such self-aware machines could take over the world.

■ It can find new ways to find the enemy — even when he's hiding underground.

■ It can pick out suspicious characters at the airport and scan luggage.

By Tina Hesman
Of the Post-Dispatch

Technically, Stephen Thaler has written more music than any composer in the world. He also invented the Oral-B CrossAction toothbrush and devices that search the Internet for messages from terrorists. He has discovered substances harder than diamonds, coined 1.5 million new English words, and trained robotic cockroaches. Technically.

Thaler, the president and chief executive of Imagination Engines Inc. in Maryland Heights, gets credit for all those things, but he's really just "the man behind the curtain," he says. The real inventor is a computer program called a Creativity Machine.

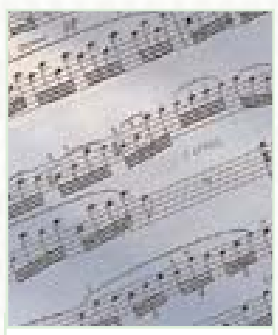
What Thaler has created is essentially "Thomas Edison in a box," said Rusty Miller, a government contractor at General Dynamics and one of Thaler's chief cheerleaders.

"His first patent was for a Device for the Autonomous Generation of Useful Information," the official name of the Creativity Machine, Miller said. "His second patent was for the Self-Training Neural Network Object. Patent Number Two was invented by Patent Number One. Think about that. Patent Number Two was invented by Patent Number One!"

Supporters say the technology is the best simulation of what goes on in human brains, and the first truly thinking machine.

Others say it is something far more sinister — the beginning of "Terminator" technology, in which self-aware machines could take over the world.

See Computer, A9



■ If you hum a few tunes, it will write you an original song.

■ It can think of a better way to help you brush your teeth.

U.S. knew of asbestos threat from plant here

Officials gave no warning decades ago about the former W.R. Grace and Co. plant in St. Louis. But now, public health experts say health risks could be significant.

By Andrew Schneider
Of the Post-Dispatch

About 24 years ago, federal health investigators learned that a vermiculite processing plant in south St. Louis was spewing potentially lethal asbestos fibers over homes, schools and businesses. The government warned no one.

But that will soon change.

The plant, at Manchester and Sulphur avenues, was owned by W.R. Grace and Co. It is one of 750 facilities in North America that processed trainloads of asbestos-contaminated vermiculite ore from a mine in Libby, Mont. About 250 of those plants are scheduled to be evaluated by physicians, epidemiologists and scientists from the Agency for Toxic Substances and Disease Registry and their state partners.

The St. Louis plant, according to the EPA, received more than 200 million pounds of the tainted ore. It is one of 28 plants that received the largest amount of dangerous ore and are at the top of the government's list for examination.

The St. Louis study should be out by March, said state officials working with the federal investigators.

The Agency for Toxic Substances and Disease Registry, which Congress created to evaluate the risk to public health at

See Asbestos, A8

WEAPONS OF MASS DESTRUCTION

Powell now hedges on Saddam's arms

Maybe they didn't exist, he says

By Warren P. Strobel
Knight Ridder Newspapers

TBILISI, Georgia — Secretary of State Colin Powell acknowledged Saturday that former Iraqi leader Saddam Hussein may not have had the massive weapons stockpiles that the United States claimed before it went to war to topple his regime.

While making clear he believes that the war was justified nonetheless, Powell said that if caches of chemical and biological arms are not found, the reasons for the error must be determined.

Powell's remarks, made to reporters as he flew to this nation in the Caucasus, appeared to be the farthest any top U.S. official has gone in publicly acknowledging questions about the case President George W. Bush made against Iraq before last March's invasion.

The secretary of state's comments came a day after David Kay, who led the team searching for weapons of mass destruction in Iraq, said he does not believe that Iraq had chemical and biological arms when the war started last year.

See Iraq, A14

Many Democrats say the deciding factor is: Who can beat Bush?

By Karen Branch-Brioso
Post-Dispatch Washington Bureau

NASHUA, N.H. — Deciding among the Democratic candidates for Tuesday's first-in-the-nation presidential primary is causing inner turmoil for some New Hampshire voters.

"I really struggle with what my gut or heart tells me and what my head tells me," said Nancy Granada, 36, a marketing coordinator for Daniel Webster College in Nashua. She said she was undecided between Wesley Clark and Massachusetts Sen. John Kerry.

"My gut says Clark, because I really feel like he's moderate enough for my liking, and he really does a very good job of speaking about the issues I care about, like national security. My head is saying that Kerry's a more viable candidate to give George Bush a run for his money."

All across New Hampshire, the quandary is the same: Do I go with the one who inspires me — or the

See Democrats, A6

Campaign 2004: More coverage on **A5-8**

Although the state leads the nation in raids on methamphetamine labs, law enforcement officers say they're barely making a dent. This week, Gov. Bob Holden will call for a renewed offensive against the drug.

LAURIE SKRIVAN / POST-DISPATCH

Texas County sheriff's deputies, part of the self-described "Dope Posse," head out after midnight, looking for suspicious drivers. The posse is composed of any deputy willing to volunteer, often off-the-clock.

Police in meth belt scramble to keep up

By Matthew Hathaway
Of the Post-Dispatch

HOUSTON, Mo. — Deep in the Ozarks, most of Texas County's 23,000 residents are asleep by midnight, and the sheriff's department stops patrols around 3 a.m. That's about the time the county's fastest-growing industry gets cooking.

The nightly narcotics ritual varies. Whether it's January or July, outdoor Christmas lights might go on at one drug house; someone will screw a red bulb into a porch light at another. Just like the coded messages sprayed painted on the gravelly pavement of one desolate ridge road, they're signs that a methamphetamine market is open for business.

Meth — often called glass, ice, crank or speed — is sold in powder, crystal and liquid form. Users can snort it, but more often they smoke it from pipes or inject it into their veins. It's a cheap high that, for the cost of a single dose of crack, can keep users in a state of sleepless euphoria — or manic paranoia — for days.

This week, Missouri Gov. Bob Holden will call for a renewed offensive against meth. He's

See Meth, A10

Second rover reaches Mars; first lander improving, Mission Control reports
INSIDE, A2

Blasts kill five American soldiers as U.N. weighs return to Iraq
INSIDE, A15

As Bush lays out his goals, Democratic challengers say he's far from invincible
NEWSWATCH

Morning after clerk at store was robbed, boss calls to say that she's fired
METRO

POST-DISPATCH WEATHERBIRD ®

SUNDAY
Freezing rain.
High 32.

MONDAY
Chance of snow.
Low 27. High 30.

WEATHER | B8

St. Louis Post-Dispatch

January 25, 2004

THE MACHINE THAT INVENTS

Author: Tina Hesman

A St. Louis physicist has created a computer program called the Creativity Machine that simulates what goes on in the human brain. It has invented new products, composed music, coined new words and frightened some who fear such self-aware machines could take over the world.

Technically, StephenThaler has written more music than any composer in the world. He also invented the Oral-B CrossAction toothbrush and devices that search the Internet for messages from terrorists. He has discovered substances harder than diamonds, coined 1.5 million new English words, and trained robotic cockroaches. Technically.

Thaler, the president and chief executive of Imagination Engines Inc. in Maryland Heights, gets credit for all those things, but he's really just "the man behind the curtain," he says. The real inventor is a computer program called a Creativity Machine.

What Thaler has created is essentially "Thomas Edison in a box," said Rusty! Miller, a government contractor at General Dynamics and one ofThaler's chief cheerleaders.

"His first patent was for a Device for the Autonomous Generation of Useful Information," the official name of the Creativity Machine, Miller said. "His second patent was for the Self-Training Neural Network Object. Patent Number Two was invented by Patent Number One. Think about that. Patent Number Two was invented by Patent Number One!"

Supporters say the technology is the best simulation of what goes on in human brains, and the first truly thinking machine.

Others say it is something far more sinister -- the beginning of "Terminator" technology, in which self-aware machines could take over the world.

Thaler's technology was born from near-death experiences of dying computer programs. Its foundation is the discovery that great ideas are the result of noisy neurons and faulty memories.

The invention began to take shape in the 1980s. By day, thephy! sicist worked at McDonnell Douglas Corp., where he wielded a powerful laser beam to crystallize diamonds. He built elegant computer simulations, called neural networks, to guide his experiments.

But at night, things were different. Shirley MacLaine and her ilk were all over the TV and on magazine covers talking about reincarnation and life after death and near-death experiences. It madeThaler wonder: "What would happen if I killed one of my neural networks?"

Neural networks can be either software programs or computers designed to model an object, process or set of data Thaler reasoned that if a neural network were an accurate representation of a biological system, he could kill it and figure out what happens in the brain as it dies.

In biological brains, the information-carrying cells, called neurons, meet at junctions, called synapses. Brain chemicals, such as adrenaline and dopamine, flow across the junctions to stimulate or soothe the cells. In the computer world, there are switches instead of cells. The switches are ! connected by numbers or "weights."

So after work, Thaler went home and created the epitome of a killer application -- a computer program he called the Grim Reaper. The reaper dismantles neural networks by changing its connection weights. It is the biological equivalent of killing neurons. Pick off enough neurons, and the result is death.

On Christmas Eve 1989,Thaler typed the lyrics to some of his favorite Christmas carols into a neural network. Once

he'd taught the network the songs, he unleashed the Grim Reaper. As the reaper slashed away connections, the network's digital life began to flash before its eyes. The program randomly spit out perfectly remembered carols as the killer application severed the first connections. But as its wounds grew deeper, and the network faded toward black, it began to hallucinate.

The network wove its remaining strands of memory together, producing what someone else might interpret as damaged memories, but what Thaler ! recognized as new ideas. In its death spiral, the program dreamed up new carols, each created from shards of its shattered memories.

"Its last dying gasp was, 'All men go to good earth in one eternal silent night,'" Thaler said.

But it wasn't the eloquence of the network's last words that captured Thaler's imagination. What excited him was how noisy and creative the process of dying was. It gave Thaler ideas. What if, he asked, I don't cut the connections, but just perturb them a little?

Thaler built another neural network and trained it to recognize the structure of diamonds and some other super-hard materials. He also built a second network to monitor the first one's activities.

Then he tickled a few of the network's connections, and something began to happen. The tickling, akin to a shot of adrenaline or an electrical jolt in the brain, produced noise. In this sense, noise is not sound, but random activity. An the noise triggered changes in the network.

The result was new ideas. The computer dreamed up new ultra-hard materials. Some of the materials are known to humans, but Thaler didn't tell the network they existed. Other materials are entirely new, unknown to humans or computers before.

"A little elbow room"

When Rusty Miller went to lunch one day in 1998, he picked up a specialized computer magazine called PCAI journal. He flipped through the pages and came across a story about Thaler and his Creativity Machine inventing the ultra-hard substances. Instantly, Miller knew that Thaler had taken a step beyond other artificial intelligence technologies, such as fuzzy logic or genetic algorithms, he said.

The brilliance of Thaler's invention is the noise he introduces into the system, Miller said.

"Noise allows neurons to have a little elbow room to dream up new ideas," Miller said.

Other researchers have come to the same conclusion.

Good old-fashioned artificial intelligence uses human experts to input huge quantities of data and a list of rules to create a model, said Robert Kozma, a computer scientist at the University of Memphis. Kozma is experimenting with a similar technology.

The rigidity of traditional artificial intelligence technologies holds back creativity, Kozma said.

"This type of rule-based system is frozen. It's dead and cannot get to the essence of intelligence," Kozma said. "Creativity cannot be derived in a logical way, in a step-by-step fashion." You need a little noise to come up with good ideas, he said.

Human brains are also noisy places, said Dr. Walter J. Freeman, a neurobiologist at the University of California at Berkeley. A debate has raged for half a century about what the brain does with noise.

Many biologists see noise as just a nuisance or a necessary evil, Freeman said. The brain devotes many neurons to the same task so it can swamp out that random activity, those scientists argue.

But Freeman subscribes to an alternative theory -- that noise is essential for the brain to function properly. Noise provides ! variability that allows organisms to adapt to new situations, he said.

Kozma has replaced the brain of a robotic toy dog with this new technology. The idea is to create a robot that can

explore a new environment, such as the surface of another planet, without human guidance. NASA is funding Kozma's efforts.

Thaler believes that Kozma's research is derivative of his seminal work.

It's not merely noise that makes Thaler's Creativity Machines so ingenious, he argues. He has discovered a mathematical equivalent to the fleeting signals that work on neurons -- a special kind of noise.

And Creativity Machines are their own best critics. In fact, they have critic networks built right in. The critics select the best ideas generated by the noisy networks and reward good work. The feedback helps the network dream up even better ideas.

Bunker-busting robots

Thaler, too, is engineering independent robots. A glossy, black, plastic cockroach named! H3 could be the prototype for swarms of bunker-busting robots that could seek out, explore and use collective intelligence to defeat an enemy target. The U.S. Air Force has contracted Thaler to create such robots.

Robots, including Mars rovers, have been programmed with artificial intelligence before, Thaler said. But those robots require human engineers to program in leg movements and rules for getting around obstacles. Each unique encounter requires new programming, new rules, and time.

H3 gets no tutelage from Thaler at all. A sonar beacon beckons the robot, and H3's legs begin to flail. Every time the robot makes a movement that carries it closer to the signal, it learns the value of the move. Within a few seconds, th cockroach coordinates enough good moves to scuttle toward the signal.

But Thaler hasn't stopped with robots. Creativity Machines can solve just about any problem in any field, he says.

* A Creativity Machine used two neural networks to study toothbrush design and performance. A brainstorming sess! ion between the two produced the idea to cross the bristles of the toothbrush for optimal cleaning. That toothbrush became the Oral-B CrossAction toothbrush.

* In one weekend, a Creativity Machine learned a sampling of some of Thaler's favorite Top 10 hits from the past three decades and then wrote 11,000 new songs. Some are good, Thaler said. Miller confesses to being haunted by one of the melodies in a minor key. Other offerings are the musical equivalent of a painting of dogs playing poker, Thaler said.

But computer-composed music doesn't have to be bad. Human mentors with good taste could train a critic network t grade the Creativity Machine's songs, punish it for bad tunes and reward it for harmonious melodies. The feedback would hone the machine's composing skills.

Such a self-training system was the Creativity Machine's first invention, and the subject of Thaler's second patent.

* Carmakers and security industries want to use machines to! identify obstacles, pedestrians or intruders. Some machines can ident ify certain objects, but change lighting conditions or mist the lens with water, and the system falls apart.

Thaler spins a collection of toy cars, trucks and planes on an old turntable in his office while a Creativity Machine watches. The computer learns to distinguish Hummers from pickups and F-18s from 747s, no matter if the object is by a searchlight or sits in shadow or if rain spatters the windshield. The technology could alert drivers to whether the are about to back over a boy or a bicycle. Battlefield commanders might use similar technology to assess damage and decide whether to send in more bombs.

Machines trained to detect dangerous objects could replace humans at baggage screening stations or watch for suspicious behavior.

* Thaler's first contract with the Air Force used a Creativity Machine to help design warheads that reconfigure the pattern of shrapnel scattering. That's important to limit collateral damage and to save money by ailo! ring bombs to destroy a target in one hit.

* Thaler's machines engage in the guilty pleasure of reading supermarket tabloids. The networks learn how to write tabloid headlines. The "International Expirer" quickly became a hit on the Internet. But the computer reporters of the tabloid "have no shame," and generated such celebrity-skewering headlines that Thaler removed the Expirer to avoid libel and slander suits.

* Spy agencies want to use Thaler's technology to map the Internet and detect unusual activity.

* Thaler coined more than a million new English words by showing a network a list of words. It learned rules of spelling and pronunciation and generated new words. In one trial, the network came up with a name for one of Thaler's spinoff companies -- Synaptrix. The words are nonsense now, but Thaler predicts that companies could use them to name products. The machine also liked "eggo." Too bad that one is already taken.

The technology is not r!eady for widespread commercial use yet, say some supporters.

"I t's got extraordinary potential. Right now the holdup is packaging the technology as a tool that somebody can actually pull off the shelf and use," said Lloyd Reshard, the Weapons Platform Integration Team Lead at the Air Force Research Laboratory Munitions Directorate at Eglin Air Force Base. With other artificial intelligence technologies, "software is commercially available on the street, but if you want to apply a Creativity Machine to your problem, there's no software package you can go out and buy."

The Air Force is working with Thaler now to solve that problem, Reshard said.

"I might lose my job"

All of the possible applications for Creativity Machines make some people uneasy. The machines could easily supplant people for many mundane jobs, and Thaler predicts that some traditionally human-only jobs, including laboratory scientist, could be up for grabs. Computer chemists could soon design new compounds and figure out ho to make them.

The ! machines could even be used to solve pressing societal problems, Thaler says.

The prospect is just too much for people who see machines as a possible threat to humans.

The normal human response is, "Don't want it. No thanks. I might lose my job," Miller said.

Or worse, sentient machines could decide that they don't need humans at all and do away with people. That fear is fueled by the plots of science-fiction movies, such as "The Terminator." In that movie, a satellite called Skynet became self-aware, saw humans as a threat and destroyed more than 3 billion people.

Sci-fi fans see similarity between Thaler's thinking machines and Skynet. There's even an eerie coincidence between the fictional satellite's Judgment Day -- August 29, 1997 -- and the date the patent for Creativity Machine became final -- August 19, 1997.

But Thaler doesn't see the world ending at the hands of the machines.

"I can never imagine a world that looks like 'T!erminator.' What do people want? Food. Land. Mates. Machines aren' in terested in that," Thaler said.

Miller, who is in the business of protecting U.S. computers from foreign attackers, agrees that machines are not the real threat. He worries more about humans with malicious intent turning Creativity Machines into weapons. Other countries are already studying U.S. patents and experimenting with revolutionary technologies. Terrorists could follo suit, he says.

"If the U.S. doesn't wake up and pay attention, we're going to get smoked," Miller warns. "It's important for people to understand. It doesn't have anything to do with the business of business. It's about America."

Some people are threatened by the idea that machines could think like humans, Kozma said. They don't like the idea of computers out-creating humans, he said.

7 But Thaler's machines may never match the unique qualities of humans, no matter how clever they are at designir toothbrushes or warheads, Miller said.

Miller, a former ballet dancer! and Green Beret, says he enjoys competing against Thaler's neural networks, even when they beat him. Miller will always have a toe up on the machines, he says.

"None of his computers can do ballet."

Yet.

===

Stephen Thaler

Age: 52

Born: St. Louis

EDUCATION

High school: University City High School

Undergraduate: Westminster College, graduated summa cum laude with majors in chemistry, mathematics and Russian

Graduate: University of California at Los Angeles, master's degree in chemistry

University of Missouri at Columbia, Ph.D. in nuclear physics

Company: Imagination Engines Inc.

www.imagination-engines.com

Personal: Married to Karen Thaler, no children

===

Record Number: 0401250357