

**INTRODUCTION**

This FAQ deals only with microchip units, referred to herein as "individual microchip devices," which can be used to store, record, or transmit information uniquely associated with an individual item, animal, or human. Generally, these fall under the classification of "Radio Frequency Identification" (RFID) and "Electronic Article Surveillance" (EAS) devices.

There are basically three categories of individual microchip RFID/EAS devices available today; they are: 1) implantable microchip capsules which are either injected or surgically imbedded subdermally for permanent applications; 2) insertable microchip capsules which may be introduced into body cavities or swallowed for temporary requirements; and, 3) attachable devices that can be either worn, carried, or attached to an individual or item for applications where only intermittent use is needed.

**IMPLANTABLE**

**CHIPS:**

Presently, the commercially available "implantable" chips have limited functionality. Typically, these chips are only capable of storing very small amounts of information. This information can then be transmitted to an external receiver up to 3 feet away.[1]

**INSERTABLE**

**CHIPS:**

One of the newest uses being made of microchip technology is in the field of medicine using "insertable" chips. These chips will be inserted into body cavities or swallowed for temporary monitoring of specific body functions.[5]

**ATTACHABLE**

**CHIPS:**

The "attachable" chips can be either worn, carried, or attached to an individual or item and are capable of storing very large amounts of information – in the range of 40 to 80 megabyte. These chips are often batter powered and can be used for a wide range of applications.[12]

This FAQ on "Individual Microchip Technology" and implantable IDs addresses issues that can be easily verified using the provided sources.

\*\*\*\*\*  
\*\*\*\*\*

**Frequently Asked Questions:**

- 1) What implantable microchip systems currently exist?
- 2) How do individual microchips work?
- 3) Who is presently using implantable ID chips?
- 4) Who keeps track of the animals using their implanted ID chips?
- 5) What new and future uses are emerging for individual microchips?

\*\*\*\*\*  
\*\*\*\*\*

**1) What implantable microchip systems currently exist?**

A. Several companies have developed animal identification systems which use implantable microchips; these are presently in widespread use in every part of the world today. The predominant players in this field are A.V.I.D. (American Veterinary Identification Devices), Trovan Identification Systems, and Destron Fearing Corporation.[1] As of the beginning of 1999, over 4,000,000 have been "tagged" using implantable RFID microchips.

The most recent development with regard to implantable microchips in humans was the announcement that a company will, in 2000, begin production of a miniature digital transceiver which it claims can be implanted in humans to provide a "tamper-proof means of identification" for enhanced e-business security, locating lost or missing individuals, tracking the location of valuable property and monitoring the medical conditions of at-risk patients and administration of criminal justice programs. The developer has namd the device the "Digital Angel."

\*\*\*\*\*

**2) How do individual microchips work?**

A. The technology varies depending on the type of microchip:

**IMPLANTED**

**ID**

**CHIPS**

-

**ANIMALS:[1]**

Implanted microchips used to identify and track animals only store a single, unique identification number; they do not store any additional information. Each chip includes an integrated circuit coil and capacitor which are hermetically sealed in a bio-compatible glass capsule. The chip capsule is roughly the size of a grain of rice

measuring 0.09 x 0.45 inches (2.2 x 11.5 mm) - this corresponds to the diameter of a pencil lead slightly less than one-half inch long.

Once injected under the skin, the implanted microchip is encased by a thin layer of protein which anchors it in place for the rest of the life of the animal. The microchip itself has no power supply or moving parts. They are expected to last for decades - well beyond the life span of the animals.

The computer "memory" in these microchips contains a unique identification number which is pre-programmed by a computer at the time of manufacture. According to one of the leading distributors of pet microchips, AVID, there are over 70 trillion possible ID codes that could be generated using their technology. A radio signal is used to read this number through the skin of the animal. In addition to the number, the microchip generates a reliability check to guarantee that the identifying number is read accurately.

The numbering system used by AVID is in the format: NNN-NNN-NNN where "N" represents a numerical digit. According to promotional material, the chips are "suitable for injection into virtually all animals, including parakeets and up to the size of a Killer Whale. Additionally, "more than ten years of testing in a wide variety of animals has shown no adverse side effects to the health of the animal."

A standard hypodermic needle is used to insert the capsule into the subcutaneous layer or intramuscular site, usually at the back of the neck on domestic cats and dogs. Other locations may also be used.

The identity tag reader, or "scanner," generates a low energy signal. As it is passed over the animal, this signal activates the chip causing it to transmit its identification number. Once received, the number is then displayed on the scanner's LCD screen. Reading time is less than 40 milliseconds (.04 seconds). The battery-powered identity-tag readers, which operate on either 9 volt alkaline batteries or 110/220 volt AC adapters, can be activated using either manual, remote, or computer-based controls.

The AVID system operates under the following U.S. patent: "Animal Identification Transponder Tag," Inventor: Hannis L. Stoddard, III, Norco, Calif., Patent No: Des. 321,069, Date of Patent: Oct. 22, 1991

INSERTED FETAL MONITORS - HUMANS:[5]

NASA's has developed a pill-sized transmitter that is small enough to be introduced into the uterus to monitor high-risk unborn children while still in the mother's womb. NASA's implantable biotelemetry device will allow monitoring of a human fetus and its uterine environment. The device will provide the ability for doctors to measure intra-uterine conditions in order to evaluate and treat preterm labor. The Sensor2000 (or S2K as it's called) can measure intra-uterine pressure changes, body temperature, and the heart rate of the fetus.

The final "pill" version of the transmitter is small enough to fit through a 10mm trocar. The circuits of the PCB prototype and of the pill transmitter are identical. The pill, however, uses Chip-on-Board technology (COB) to reduce the size of the printed circuit board from 38 x 28 mm to 22 x 8 mm. Unpackaged dies are bonded directly onto the printed circuit board, along with surface mount resistors and capacitors. A pressure transducer die is rebonded to the PCB. The batteries and the PCB are placed into a pill-shaped shell, which is then encapsulated in biocompatible silicone.

Power is supplied by two silver-oxide batteries. The inserted capsule sends a signal to an external receiver using a pattern of low-frequency radio waves that can be transmitted from between 3 to 10 feet away. The average power consumption of the current design is less than 40 microW., which yields a lifetime of approximately 4-6 months.

ATTACHABLE STORAGE DEVICES:

Microchips that can be hung from a key chain are already in use for a wide variety of applications. For example, some of the major gasoline companies offer a key chain microchip encapsulated in a plastic housing which allows the user to "purchase" gasoline on their account without using cash or credit cards. These "loyalty devices" can recognize the user when they pull up to the pump. Some of the systems even give a personalized, computerized salutation when the customer begins to operate the pump.

One of the newest, most advanced developments in the field of attachable RFID microchip devices is for use in tracking goods and products. A company called Trolley Scan is marketing a group of RFID devices which it says can be used to: itemise and verify the contents of your loaded truck by scanning automatically from the outside in a couple of seconds; make an accounting of a pile of unsorted books or files in a couple of seconds by scanning them into your computer; provide access control without the need of a "single-person" turnstile; automate checkout at supermarkets; and, replace barcodes for identification requirements. The company claims their tags can be reliably scanned, sorted and identified from up to 6 meters away.[1]

[picture of a Trolleyponder - note: this is a slow file to load.]

<http://trolleyvscan.co.za/evalhar5.html>

Other uses being made of attachable devices include the following:

*Military*

*Dog*

*Tags-*

Also, the Pentagon has undertaken a program to issue new, high-tech dog tags to all military personnel. These microchip devices, which will be worn around the neck on a chain like conventional dog tags, will store the soldier's medical records in addition to all other relevant identifying data. The chips can even store digitized copies of x-rays and a personal photograph.[13]

*iButton-*

Another company, Dallas Semiconductor, is marketing a microchip device which it promotes for use in a large number of applications. The "iButton" is a 16mm computer chip housed in a stainless steel can. The iButton can be worn by a person or attached to an object such as a ring or bracelet for up-to-date information at the point of use. The steel button is can withstand harsh outdoor environments; it is durable enough for a person to wear everyday on a digital accessory like a ring, key fob, wallet, watch, or badge.

The company offers a variety of buttons with different features. Each has a "guaranteed-unique" registration number engraved into the silicon. Some buttons have computer memory to store typed text or digitized photos. Information can also be updated as needed with a simple, momentary contact with an iButton terminal. Other buttons contain a real-time clock to track the number of hours a system is turned on; a temperature sensor for applications where spoilage is a concern, such as food transport; a transaction counter that allows the button to be used as a small change purse; or complete cryptographic circuitry to secure Internet transactions.[14]

*Smart*

*cards-*

The one application where microchip technology is already making its way into everyday personal use is with "smart cards." In all likelihood, these smart cards, which themselves contain a small computer chip, will soon replace the ubiquitous magnetic stripe credit and debit cards.[15]

\*\*\*\*\*

3) Who is presently using ID chip technology?

A. Microchip implants have been in use for a number of years. Microchips are being experimented with for use in both animals and humans. Following are some of the examples that have been reported in major news outlets and reliable news sources:

- o Veterinarians, Animal Shelters, and thoroughbred animal organizations are all promoting the use of implantable ID chips. To date, over 4 million animals have been implanted.
- o Many zoos use implanted chips to keep track of their animals.
- o More and more laboratories are using implanted chips to track research animal inventories.
- o Horse associations in Canada and the USA have begun utilizing microchip technology as a means of identifying and registering horses within their individual associations.
- o Most kennel clubs and "purebred" dog breeders advocate microchip IDs.
- o In the U.S., some municipalities have adopted or considered ordinances to require microchipping all animals within their jurisdictions.[2]
- o In 1998, the British government approved a law to require all domesticated animals be given chip implants under the "Pet Passport" program.[3]
- o In Britain, the head of the Cybernetics Department at the University of Reading, Professor Kevin Warwick, had himself injected with a encapsulated microchip measuring approximately 23 millimeters long and 3 millimeters wide. The capsule held an electromagnetic coil and a silicon chip which was inserted into his arm in August of 1998. The experiment was only scheduled to last for ten days at which time the chip was to have been removed. The implant allowed him to turn on lights and open doors which had been linked to computers that would automatically sense his presence.[4]
- o NASA has developed a "pill transmitter" which will be used to monitor a fetus in problem pregnancies while the child is still in the mother's womb. The initial application was developed for use after certain types of high-risk fetal surgery procedures. The "pill" will be inserted at the time of the operation where it will monitor body temperature, pressure and other vital signs in the womb. It will then radio this information to a remote terminal for recording.[5]
- o A Georgia man was able to control a computer by thought alone after receiving an electronic implant that fused with his brain cells.[6]
- o Biomedical engineers have built a prototype drug pump the size of a contact lens, a miniature, closed-loop implant that could monitor its own flow rate to ensure a steady stream of medicine.[7]
- o The Electronic Telegraph reported in October 1998 that "dignitaries who fear being kidnapped are having microprocessor homing devices planted in their bodies so police can track them down if they are abducted." According to the story, the microchips - called Sky-Eyes - were originally developed for intelligence use by Israeli researchers. Rome's La Repubblica newspaper described the latest development as a "biological adaptation" of the Global Positioning System, which is already in use to protect luxury cars from being stolen.[8]

\*\*\*\*\*

4) Who keeps track of implanted animal ID chips?

A. The predominant central database system being used to track microchipped animals is PETtrac. PETtrac is a worldwide computerized tracking system for companion animals identified with the AVID Microchip. The "international master databank" is located in Norco, California, USA. The Canadian counterpart databank is located in Calgary, Alberta. All Canadian data is downloaded into the master databank in California (backed up information system), as well as the CVMA in Ottawa, Ontario.

When a chip is injected into an animal, the microchip number is entered in the patient records and is also recorded on a PETtrac Registration form which is forwarded to AVID. Each animal is registered in the PETtrac database, using the clinic as a tracking site.

PETtrac World Wide Recovery Service  
 "Over 4,000,000 microchips implanted with over 25,000 documented recoveries."  
 Suite 204, 615 - 11 Avenue S.E.  
 Calgary, AB Canada T2G 0YB  
 Ph (403) 264-6300 or 1-800-338-1397  
 Fax (403) 263-2055

\*\*\*\*\*

5) What new and future uses are emerging for individual microchips?

A. There are very few official public reports which reveal exactly what is being considered for possible future uses of microchip technology. Several reasons exist for this secrecy. One is that such information is generally proprietary and companies do not want to expose their technology.

On December 15, 1999, Applied Digital Solutions, Inc. announced that it has acquired the patent rights to a miniature digital transceiver -- named "Digital Angel" -- that can be used for a variety of purposes, such as providing a tamper-proof means of identification for enhanced e-business security, locating lost or missing individuals, tracking the location of valuable property and monitoring the medical conditions of at-risk patients. Production is to begin in 2000.

Some current uses for microchip implants that have been reported in public news outlets include:

o At least one researcher, Professor Kevin Warwick (the same on who was injected with a microchip in the ten-day test) has publicly discussed using microchip implants to: control gun ownership; regulate access to public facilities; and, monitor employees.[4]

o The National Aeronautics and Space Administration (NASA) is developing implantable microchip technology for a number of new monitoring applications for both space-related and commercial use. NASA is very close to completing work on a microchip monitor pill which can be swallowed to monitor stomach pH levels (acidity) and temperature.[5]

o A newly developed technology will allow prescription drugs to be automatically dispensed and administered using implanted microchips. The chip itself will store concentrated doses in hundreds of individuals compartments. The chip can be programmed to release the drug upon command or on regularly scheduled intervals.[7]

o International bankers may be considering using implantable ID chips for financial transactions.[9]

o General Motors, Toyota, and Ford Motor Company are among the major automakers using microchip technology in conjunction with the Global Positioning (satellite) System (GPS) to locate stolen automobiles. Additionally, the system can lock and unlock car doors, start or stop the automobile's engine, or summon emergency personnel in the event the vehicle is involved in an accident - which can also be detected by the system. Monitoring is handled at a single, central loction.[10]

o Another company, GlobalTrak, claims to have a similar system in place that can be used to locate children, dignitaries, and senior citizens who wear one of their chip-imbedded bracelets.[11]

[END OF FAQ]

=====

S O U R C E S

=====

[1]

-----

**IMPLANTABLE CHIPS - MANUFACTURERS AND DISTRIBUTORS**

<u>Applied</u>	<u>Digital</u>	<u>Solutions</u>	(the	"Digital	Angel")
Lynn Anderson,	561/366-4800	or	Crawford	Public	Relations
Jim Crawford,			703/318-5460		or
Ovations International, Inc., Matthew Cossolotto, 914/245-9721					
A.V.I.D.	(American	Veterinary	Identification	Devices)	
AVID	Identification		Systems,	Inc.	
3179		Hamner		Avenue	
Norco,		California		91760	
Telephone	(United		States)	800.336.AVID	
Telephone		(International)		909.371.7505	
Fax				909.737.8967	
E-mail				avid@avidid.com	
<u><a href="http://www.avidid.com/index.html">http://www.avidid.com/index.html</a></u>					
AVID				Canada	
Suite	204,	615	-	11 Avenue	S.E.

Calgary,	AB	Canada	T2G	0YB
Ph	(403)	264-6300	or	1-800-338-1397
Fax		(403)		263-2055
<u><a href="http://avidcanada.com">http://avidcanada.com</a></u>				
Trovan		Identification		Systems
Electronic		Identification	Devices,	Ltd.
Telephone:		+1		805-565-1288
Fax:		+1		805-565-1127
e-mail:				eidltd@aol.com
<u><a href="http://www.trovan.com/companyinfo.html">http://www.trovan.com/companyinfo.html</a></u>				
Destron		Fearing		Corporation
South	St.		Paul,	Minn.
<u><a href="http://destronfearing.com/index.html">http://destronfearing.com/index.html</a></u>				
ATTACHABLE	CHIPS	-	MANUFACTURERS	AND
Trolley	Scan		(Pty)	DISTRIBUTORS
P.O.		Box		Ltd
Kengray		Johannesburg		59227,
South				2100
				Africa
Tel	(+27)		(11)	648-2087
Fax	(+27)		(11)	648-2085
<u><a href="http://trolleyscan.co.za/">http://trolleyscan.co.za/</a></u>				

=====

C U R R E N T A N I M A L A P P L I C A T I O N S

=====

[2]

**Detroit May Track its Dogs with Microchips**

<http://www.govtech.net/onlineservices/news/sept1198-5.shtm>

9/11/98 - A microchip implanted in dogs may be used to trace the identity of the canine and its owner under a plan being developed by Detroit Health Department officials. Dr. Angela Hines, a veterinarian with the Detroit Health Department, said the city is considering an ordinance that would make it mandatory to have dogs implanted with microchips. She added that St. Louis is already implanting dogs with microchips.

[3]

**Pets to get anti-rabies passports in four years**

By David Brown, Agriculture Edi

London Telegraph, UK News Telegraph

Electronic September 24, 1998 - Issue 1217

<http://www.telegraph.co.uk:80/et?ac=000118613908976&rtmo=kJqJbZ1p&atmo=99999999&pg=/et/98/9/24/npet24.html>

PETS should be able to travel freely to and from the European Union and selected rabies-free countries within four years under sweeping plans announced by the Government yesterday.

"Passports for pets", forecast by The Telegraph last Saturday, would allow dogs and cats immediate entry to Britain if they were fitted with electronic identity chips. They would also have to be vaccinated against rabies and other diseases and have the appropriate veterinary certificates.

=====

C U R R E N T H U M A N A P P L I C A T I O N S

=====

HUMAN EXPERIMENTATION

[4]

**Professor Kevin Warwick claimed today to be the first person in the world to have a computer chip surgically implanted into his body.**

<http://abcnews.go.com/sections/tech/DailyNews/chiptransplant980825.html>

Reading, England, Aug. 25, 1998 - Professor Warwick told a press conference that a glass capsule about 23 millimeters long and 3 millimeters wide containing an electromagnetic coil and a silicon chip was inserted into his arm on Monday.

"It is a research experiment. I don't know how long we will leave the implant in but it's looking at what's possible now in terms of communicating between a computer and myself," Warwick told a press conference.

Warwick is head of the Cybernetics Department at the University of Reading. He demonstrated the chip in action by walking through the front door of his department.

[snip]

**Chips for Gun Control?**

"Possibilities could be that anyone who wanted access to a gun could do so only if they had one of these implants. Then if they actually try and enter a school or building that doesn't want them in there, the school computer would sound alarms and warn people inside or even prevent them having access," Warwick said in an interview. "The same could be true at work where employees could be tracked in and out of the building to see when they are there."

"This is a technology where there are big positives but there are also big negatives. Do we want to hand over control to machinery or to have buildings telling us what we can do or can't do."

"I'm really looking at what's technically possible. I'm excited about the future prospects, particularly the human body communicating and interacting with a computer. There are a lot of exciting possibilities."

---Related Story---

**Professor Feels Himself Become Closer to the Machine Chipping at the Future**  
ABC News online

<http://abcnews.go.com/sections/world/DailyNews/cyborgman.html>

Warwick was prepared to watch for the physical, but not the mental changes during the experiment.

**I Feel Strange, Now**

"I feel mentally different. When I am in the building I feel much more closely connected with the computer. I am not a separate thing. I am a scientist, so that is strange for me, but that's how I feel. It changed what I feel like mentally which I hadn't expected and which is very strange and a bit scary."

As scary — or liberating — as the new technology may be, Professor Warwick has opened a door to the future. Cyborg technology has arrived. It may be only a matter of time before we have to ask ourselves if we are willing to join this new frontier.

---Related Story---

CNN

interactive-

**Is human chip implant wave of the future?**

January 14,

1999

<http://cnn.com:80/TECH/computing/9901/14/chipman.idg/>

MEDICAL

USES

-

HUMANS

[5]

**NASA - Implantable Biotelemetry System for Preterm Labor and Fetal Monitoring**

<http://ctoserver.arc.nasa.gov/techopps/biotelemetry.html>

**Potential Commercial Uses**

NASA's pressure/temperature pill is the first of a family of pill transmitters that will measure a variety of physiological parameters. Subcutaneous pH-monitoring of the fetus, for instance, is of great importance in fetal surgery. A pH/temperature pill, similar in design to the pressure/temperature pill, is currently being developed by S2K! A pill transmitter that measures pressure, temperature, and pH has already been designed. Another parameter of interest is the heart rate of the fetus. An ASIC (Application Specific Integrated Circuit) will be developed to incorporate four physiological parameters- pressure, temperature, pH and heart rate - into one pill transmitter.

The applications of these new pill transmitters are numerous and go beyond fetal surgery. Since they are small enough to be swallowed, the pills can easily provide information on stomach-acid, for instance, without the need for surgery. Intestinal pressure changes could be monitored as well. Future pill versions could measure ECG, blood gas (O2, CO2), and blood glucose, as well as ions like potassium, calcium, and sodium.

**Options**

**for**

**Commercialization**

This technology opportunity is part of the NASA Technology Commercialization Program. The program seeks to stimulate development of non-aerospace commercial applications from NASA developed technology. NASA Ames Research Center is currently seeking partnerships to develop commercial applications for the Implantable Biotelemetry System for Preterm Labor and Fetal Monitoring.

[More NASA links:]

**Space Biomedical Research and Women's Health:  
Better Fetal Monitoring Techniques**

[http://weboflife.arc.nasa.gov/EXPLORATIONS/EARTH\\_BENES/fetal\\_sensors.html](http://weboflife.arc.nasa.gov/EXPLORATIONS/EARTH_BENES/fetal_sensors.html)

**Sensor Saves Lives**

Lives

<http://spacelink.msfc.nasa.gov/NASA.News/NASA.News.Releases/Previous.News.Releases/95.News.Releases/95-08.News.Releases/95-08-15.Sensor.Saves.Lives>

**Miniaturized**

transmitter

[http://www-sisn.jpl.nasa.gov/ISSUE50/medical\\_tools.html](http://www-sisn.jpl.nasa.gov/ISSUE50/medical_tools.html)

[Close-up picture of NASA-developed chip]  
[http://ccf.arc.nasa.gov/dx/basket/storiesetc/98160\\_1.html](http://ccf.arc.nasa.gov/dx/basket/storiesetc/98160_1.html)

-----  
BRAIN

IMPLANT

[6]  
Brain implant lets man control computer by thought  
By Aisling Irwin, Science Correspondent

London Telegraph  
<http://www.telegraph.co.uk:80/et?ac=000118613908976&rtmo=aw3wHaxL&atmo=rrrrrrYs&pg=/et/98/10/15/wchip15.html>

A MAN has been able to control a computer by thought alone after receiving an electronic implant that fused with his brain cells.

The most immediate application of this marriage of man and machine would be for people who are totally paralysed, enabling them to express their thoughts or even control artificial limbs. The American surgeons involved say it is the first time that such a connection has been made directly in the brain, rather than with nerves in the spine or limbs.

"If you can run a computer you can talk to the world," said Dr Roy Bakay, of Emory University in Atlanta, Georgia, whose team developed the implants. He told a meeting of brain surgeons that he had performed two of the operations in which he persuaded the patients' brain cells to grow into his implant, linking up with its electronics.

One of the patients, a 53-year-old man known only as JR, was almost totally paralysed by a stroke. He is dependent on a ventilator and cannot speak, although he is fully alert and intelligent and knows everything that is going on around him. Once he received the implant he could control a cursor on a computer screen and point at different icons, triggering a computer voice to make comments such as "I'm thirsty".

Now that JR, who is in the Atlanta Veterans Affairs Medical Centre in Georgia, can select phrases, his favourite is: "See you later. Nice talking with you." The first volunteer, a woman suffering from a neuro-degenerative disease, was given the implants 18 months ago and has since died.

---Related Article---

Think and it's done - October 17, 1998

By Duncan Graham-Rowe

<http://www.newscientist.com/ns/981017/nbrain.html>

Brain implants are making it possible for severely disabled people to use the power of thought to communicate through a computer. The researchers responsible hope that the technology will eventually allow people who are totally paralysed to operate artificial limbs.

So far, two incapacitated people have received the implants. This gave them the power to control a cursor on a computer screen by thinking about moving parts of their body. By pointing the cursor at different icons, the patients could make the computer voice phrases such as "I'm thirsty" or "Please turn off the light". "If you can run a computer, you can talk to the world," says Roy Bakay of Emory University in Atlanta, Georgia, whose team developed the implants.

The implants consist of two hollow glass cones, no bigger than the tip of a ballpoint pen, placed into the brain's motor cortex, which controls body movements. The glass cones are laced with neurotrophic chemicals extracted from the patients' own knees. These chemicals encourage nerve growth so, over several months, neurons in the cortex grow pathways into the cones and attach themselves to tiny electrodes mounted inside.

-----  
IMPLANTABLE

DRUG

PUMPS

[7]  
A Drug Pump on a Computer Chip  
Biomedical Engineering News

<http://www.whitaker.org/news/huff.html>

ROSSLYN, Va., March 20, 1997---Biomedical engineers have built a prototype drug pump the size of a contact lens, a miniature, closed-loop implant that could monitor its own flow rate to ensure a steady stream of medicine.

The pump is still considered large as a microelectromechanical system, in which sensors, actuators and electronics are merged onto a single silicon wafer. The next step will be to shrink the device so it can be mass produced like a computer chip.

The research, in the laboratory of Whitaker Investigator Michael Huff at Case Western Reserve University, is driven partly by managed health care, which wants to keep people out of hospitals, and partly by the needs of diabetics and other patients on regular, intravenous medication.

[snip]

The field of microelectromechanical systems and micro fabrication research has led to the development of micro devices which have feature sizes down to a micrometer or less. The field, which developed from integrated circuit fabrication techniques, has recently expanded into the medical device market.

"No company wants to build hospital infusion pumps any longer, since the whole health care system is striving to keep people out of hospitals," Huff said. "Drug delivery systems should be based on ambulatory delivery."

Medical care has already begun to feel the influence of microelectromechanical systems. Ten-dollar disposable blood pressure instruments with microscopic pressure sensors are replacing conventional \$600 devices that, while reusable, cost another \$50 to sterilize and tune up before each use.

About 20 million miniature blood pressure sensors are now being used each year, in addition to other downsized pumps and sensors. But there are still no closed-loop systems on the market that can regulate themselves without a doctor's intervention.

Contact: Frank Blanchard (703) 528-2430, fb@whitaker.org

---Related Article---

Pharmacy on a chip

Popular Science, April 1999 edition, page 33.

[article not available online]

NEWSFRONTS

Science and Technology (Medicine)

Imagine a drugstore that fits on a dime: That's one potential application for a controlled release microchip invented at MIT. Made in much the same way as computer chips, the prototype "pharmacy" contains 34 reservoirs, each the size of a pinprick and capable of holding about 25 nanoliters of chemical. On the front side of the dime size microchip, the reservoirs are covered with tiny gold caps. On the reverse side, the reservoirs have larger openings that are sealed with a waterproof material after chemicals are added. The entire chip is bathed in a salt solution. To release a chemical such as a prescribed drug, a small voltage is applied between the gold cap and one of the three gold bars on the microchip. The cap dissolves and the chemical is released. Implanted under the skin, such a chip could be programmed to released precise amounts of drugs at prescribed times.

=====

I M P L A N T A B L E M I C R O C H I P S I N T H E N E W S

[8]

Microchip implants to foil VIP kidnaps  
By Bruce Johnston in Rome

<http://www.telegraph.co.uk:80/et?ac=000118613908976&rtmo=aw3wHaxL&atmo=r-----Ys&pg=/et/98/10/6/wchip06.html>

Electronic Telegraph - October 6, 1998 - Issue 1229

ITALIAN dignitaries who fear being kidnapped are having microprocessor homing devices planted in their bodies so police can track them down if they are abducted.

The microchips - called Sky-Eyes - were originally developed for intelligence use by Israeli researchers. Rome's La Repubblica newspaper described the latest development as a "biological adaptation" of the Global Positioning System, which is already in use to protect luxury cars from being stolen.

Sky-Eyes are sold by a company called Gen-Etics, which has patented the device for private use but which is cautious about supplying further details, in order to protect its clients.

Sky-Eyes are said to be made of "synthetic and organic fibre". They reportedly run on such a small amount of energy that this can be "borrowed" from the human body. The chip is supposed to be invisible to both the naked eye and to X-rays. A person who carries it is supplied with an eight-digit code by the company. He, or she, is advised to divulge this only to next of kin or a trusted legal representative.

In case of the person's disappearance, those in possession of the code are supposed to contact the company's control centre, so that the kidnapped victim's whereabouts may be pinpointed, and the police informed. The Sky-Eye is said to have a margin of error of just 150 yards. Kidnapping is still common in Italy.

One recent victim, Giuseppe Soffiantini, an elderly northern industrialist, was wary when asked if he would buy one. At the weekend he said: "As they also know about the discovery, the kidnappers will find a counter system to use against it. They are treacherous."

During his long captivity, his kidnappers cut off pieces of his ears and sent them to his family. Mr Soffiantini, was released earlier this year after a £2 million ransom was paid. He said: "But if the microchip worked, then of course I'd get one."

© Copyright of Telegraph Group Limited 1998.

=====

F U T U R E U S E S - F I N A N C I A L T R A N S A C T I O N S

[9]

TIME

Magazine

COVER: The Giants Want Your Money - The Future of Money  
<http://cgi.pathfinder.com/time/magazine/1998/dom/980427/cover1.html>

BUSINESS - APRIL 27, 1998 - VOL. 151 NO. 16  
By JOSHUA COOPER RAMO

In this important article, the author interviewed some of the world's most powerful international bankers providing us with an unusual insight into where they intend to direct. The article reveals the direction the world will likely move in with regard to electronic money.

According to these powerful bankers, in the future...

"Your daughter can store the money any way she wants--on her laptop, on a debit card, even (in the not too distant future) on a chip implanted under her skin."

"...every financial asset, from the mortgage you hold on your house to the items you've charged on your credit card, will become part of a giant, interconnected financial universe. ...your superportfolio, called a wealth account...."

Other quotes from the TIME article...

"Cash is already headed for a whole new dimension..."

"...E-cash system called Mondex...."

"... tiny embedded microchips that can store not only electronic dollars but also five other types of currency, an abbreviated medical history and even a personalized electronic "key" that can open everything from your apartment to your office...."

"...global access: "The chip that we are putting on the card now will form the platform for the ultimate in remote access for consumers to their funds, anytime, anywhere. What we really see happening in the future is consumers being able to design their cards to meet their individual needs. We refer to that as moving more toward life-style cards." E-cash is already everywhere...."

"...conflict between consolidation and disintermediation... the removal of intermediaries, such as banks, from financial transactions...."

"...smart software will reshape the relationship between banks and customers...."

"The distinction between software and money is disappearing...."

"...digital cash is endlessly mutable...."

"...one of the great things about traceable, bit-based cash is that it will do away with whole categories of cash-based crime.... But who really wants to leave "money tracks" wherever he goes? ...."

=====

## T R A N S I T I O N A L T E C H N O L O G I E S

=====

Before personal microchips ever come into widespread use, there will be many transitional technologies in the interim. Some of these are mentioned below:

-----

TRACKING                      CELLULAR                      PHONES                      &                      CARS

-----

[10]

OnStar

<http://www.onstar.com/index.htm>

Automatic notification of air-bag deployment is one of the most important features of OnStar. In the event of an accident in which your front air bag deploys, we will attempt to contact you to inquire whether you need assistance. Even if you can't answer, we'll contact emergency help and provide them with your exact location.

Suppose you've locked your keys in your car. The solution: Call OnStar with your Personal Identification Number or Security Code Word. An OnStar Advisor can send a signal to unlock your door; OnStar can also flash your exterior lamps\* and sound your horn if you are having trouble locating your vehicle.

This new service can store your personal medical history (e.g., your physician's name, your allergies, chronic conditions and medications) and will provide it to hospital emergency rooms in an emergency situation. Emergency room personnel will have direct and secure access to your medical information by providing OnStar MED-NET Advisors with your Personal Identification Number.

-----

Cell Phone Tracking - Deals to Move Global Positioning Technology Toward Everyday Use

<http://www.nytimes.com/library/tech/vr/mo/biztech/articles/10geo.html>

New York Times - August 10, 1998

SANTA CLARA, Calif. - The world's two largest digital cellular phone companies and a Japanese microelectronics giant plan on Monday to announce separate deals with a three-year-old Silicon Valley start-up to produce global positioning system chips inexpensive enough to be installed in cellular telephones.

-----  
**LOCATING LOST AND ABDUCTED CHILDREN, DIGNITARIES, AND SENIORS**  
-----

[11]

GlobalTrak-

<http://www.americaol.com/>

A company called GlobalTrak International Corporation is marketing a devise called "KidTrak" which it claims will allow a parent or authorities to locate a lost or abducted child. The system is also being marketed for use by celebrities, executives, and seniors. The company, located in California, claims its devices will work "at home or abroad." The system reportedly uses satellites to located a bracelet worn by participating children. Their literature talks about a "command center" and a "satellite" but little in the way of detailed information about these is provided in their online material.

-----  
**BARCODES FOR TRACKING**  
-----

Wile barcode systems do not utilize microchips, they are the forerunner for microchip identification systems. And, unquestionably, Symbol Technologies is one of the leaders in this field. They feature "The BEAST" which uses Symbol's industry standard PDF417 barcode.

The

BEAST-

<http://www.symbol.com/solution/032SS.HTM>

Unique marriage of Porter Lee Corporation software and PDF417 produces the Crime Fighter BEAST - "Barcoded Evidence Analysis Statistics & Tracking" - an application that automates evidence data acquisition and tracking at the Northern Illinois Police Crime Lab (NIPCL), Highland Park, Ill.

-----  
**KEY CHAIN CHIPS**  
-----

[12]

"Store 80 megabytes on a key chain"

<http://www.erols.com/tfclark/>

Just a Sample of the Benefits-

- o Carrying complete individual medical history on a key chain - up to 40 thousand pages, including dental records, X-rays, MRI's, EKG's
- o Storing and accessing more data at remote locations using palmtops, subnotebooks and personal digital assistants (PDAs) - changes paradigm of data capture and delivery
- o Replacing dozens of credit cards - secures financial data with biometric authentication
- o Storing digital photographs - no need to process film
- o Recording automobile problems as they occur - saving time and money by showing service technicians exactly what's wrong

Examples of emerging applications for Data-Disk Technology -

- o Providing critical medical information at the point of contact. In emergency situations, this can save lives.
- o A replacement for film. There is a critical need for a memory device to store digital photographs.
- o A replacement for credit cards. Credit card fraud is rampant because there is no secure way to identify users; this is particularly true of telephone purchases. Data-Disks permit authorized persons to authenticate their identity with voice prints or finger prints.

-----  
**DIGITAL DOG TAGS**  
-----

[13]

Defense Department to Issue High-tech, Microchip Dog Tags

<http://www.erols.com/tfclark/medi.htm>

The Department of Defense (DOD) has placed a priority on maintaining the integrity and reliability of combat care information. In recent conflicts, including "Desert Storm," medical record information was frequently lost when injured combatants were transferred from the battle zone to Mobile Army Surgical Hospital (MASH) units and to stateside hospitals. Pen-and-paper records did not always travel with the injured, nor did they always survive battlefield environments. When the paper records did survive, they were frequently illegible.

The DOD has spent millions of dollars and ten years of research and development investigating hardware and software solutions to meet the need for medical storage systems in battlefield environments. To date, no solution has been accepted or deployed because no solution has been found to survive the harsh conditions of the mobile military environment. Medi-Tag technology meets this need.

As part of the DOD's technology investigation in 1995, the Medical Advanced Technology Management Office (MATMO) spent \$150,000 to demonstrate the Medi-Tag concept and display the existing working prototype. The Company plans to Capitalize on the success of its prototype by completing its commercial development and subjecting it to field tests.

MATMO has indicated that if the Medi-Tag meets the environmental requirements of the field validation tests, it will recommend to the U.S. Secretary of Defense that the Medi-Tag be adopted as the standard technology for medical dog tags to be used by all U.S. soldiers.

---Related Article---

Pentagon introducing high-tech dog tags - December 27, 1997  
<http://www.cnn.com/TECH/9712/27/high.tech.dog.tags/index.html>

[photo included]

WASHINGTON (CNN) -- Through triumph and tragedy and two world wars, the military dog tag has been an American icon for generations of soldiers and sailors.

Today's armed forces wear the same basic dog tag that their great-grandparents wore. But that's about to change.

By 1999, the 1.4 million members of the active duty military will be issued a high-tech dog tag that contains a computer chip.

The old dog tags had just five lines for information, which included spaces for name, religion and blood type. The new digital tags, however, can contain volumes of multi-media information, including medical histories, X-rays and cardiograms.

Using a hand-held devices, medics in the field can access the information, empowering them to give injured soldiers better treatment.

However, with the new technology also comes new concerns over possible dangers in making such sensitive information so readily available by hanging it on chains around the neck.

"We have to be very concerned about how we protect the information -- in who's hands would it be, should it be encrypted, could the encryption be broken, what would happen if it ended up in the wrong hands," says Defense Secretary William Cohen.

Another issue that needs to be worked out is the cost of the new tags. Several companies are bidding on the project, and one company has told the Pentagon that they could produce a device with a capacity of 20 megabytes for \$10 or less.

If issues of cost and privacy can be solved, the old metal dog tags seem certain to become just another piece of military history.

---Related Article---

Proving Ground Tests DoD's Digital Dog Tags  
<http://www.dtic.mil/afps/news/9807291.html>

"DoD has been working for nearly a decade on a suitable personal information carrier -- a high-tech "digital dog tag" containing a member's full or partial medical history. One of the seven candidate devices being tortured now may someday hang from the neck of every service member."

[http://www.dtic.mil/afps/afps\\_tools/photos\\_N\\_caption/9807291a.jpg.html](http://www.dtic.mil/afps/afps_tools/photos_N_caption/9807291a.jpg.html)

[photo]

-----  
THE

iBUTTON

-----  
[14]

What is an iButton?

<http://www.ibutton.com/overview.html>

The iButton is a 16mm computer chip housed in a stainless steel can. The iButton can be worn by a person or attached to an object for up-to-date information at the point of use. The steel button is rugged enough to withstand harsh outdoor environments; it is durable enough for a person to wear everyday on a digital accessory like a ring, key fob, wallet, watch, or badge.

There are a variety of buttons with different features. Each starts with a guaranteed-unique registration number engraved in the silicon. Some buttons add computer memory to store typed text or digitized photos; information can be updated as often as needed with a simple, momentary contact. Other buttons contain a real-time clock to track the number of hours a system is turned on for maintenance and warranty purposes; a temperature sensor for applications where spoilage is a concern, such as food transport; a transaction counter that allows the button to be used as a small change purse; or complete cryptographic circuitry to secure Internet transactions.

[15]

Gemplus-

<http://www.gemplus.com/>

"The World Leader in Smart Card Solutions"

Gemplus Smart Card Links: <http://www.gemplus.com/links.htm>

SmartGov-

<http://policyworks.gov/org/main/me/smartgov/>

"Creating a Community of Interest in Smart Card Technology to Benefit Government, Business, Education, and Citizens"

Smart Card Forum-

<http://www.smartercd.com/>

"The mission of Smart Card Forum is to accelerate the widespread acceptance of multiple application smart card technology by bringing together, an an open forum, leading users and technologists from both the public and private sectors."

Mondex-

<http://www.mondex.com/>

"Mondex electronic cash is the secure, convenient and cost effective alternative to traditional notes and coins worldwide."

Mondex can be used for simple, everyday cash transactions. The Mondex electronic cash system operates on a smart card - a plastic card which looks like an ordinary debit or credit card which stores information on a microchip.

The microchip contains a 'purse' in which Mondex value is held electronically. The purse is divided into five separate pockets, allowing up to five different currencies to be held on the card at any one time. The microchip also contains the Mondex SECURITY programmes; these protect transactions between one Mondex card and another.

Global Chip Card Alliance-

<http://www.chipcard.org/>

"The Global Chipcard Alliance (GCA) today, August 20, 1998, announced its Netuser Identifier Module (NIM) project, a collaborative effort by the GCA member organizations to design a single application that will enable smart card terminals worldwide to identify and grant access to "foreign" application providers. The NIM is a significant step in providing true freedom of access for smart card applications by virtually linking terminals and application providers across networks worldwide. The NIM is important for achieving global network-enabled interoperability and worldwide chip card acceptance.

Military "M.A.R.C." Smart Cards-

<http://www.senate.gov/member/va/robb/speeches/sp0622.html>

<http://www.networkusa.org/fingerprint/page1/fp-marc-card.html>

"...the real strength of smart cards like the MARC card lies not in the convenience of carrying so much information on a single card, but in the money that we can save as a result. By harnessing the strength and memory of a small computer inside of a portable plastic card, a multitude of new applications can be offered that will increase the efficiency of government, cutting down expensive and unnecessary administrative costs while reducing waste, fraud and abuse at all levels of government."

D I S T A N T - F U T U R E P O S S I B I L I T I E S

Death has had its chips, say computer scientists  
By Robert Uhlig, Technology Correspondent

<http://www.telegraph.co.uk:80/et?ac=000118613908976&rtmo=kJqJYkLp&atmo=HXaxeHwL&pg=/et/96/7/18/nsou18.html>

The Electronic Telegraph - July 18, 1996, Issue 430

A computer chip implanted behind the eye that could record a person's every lifetime thought and sensation is to be developed by British scientists.

"This is the end of death," said Dr. Chris Winter, of British Telecom's artificial life team. He predicted that within three decades it would be possible to relive other people's lives by playing back their experiences on a computer. "By combining this information with a record of the person's genes, we could recreate a person physically, emotionally and spiritually."

Dr. Winter's team of eight scientists at BT's Martlesham Heath Laboratories near Ipswich calls the chip the 'Soul Catcher.' It would be possible to imbue a new-born baby with a lifetime's experiences by giving him or her

the Soul Catcher chip of a dead person, Dr. Winter said. The proposal to digitize existence is based on a solid calculation of how much data the brain copes with over a lifetime.

Ian Pearson, BT's official futurologist, has measured the flow of impulses from the optical nerve and nerves in the skin, tongue, ear, and nose. Over an eighty year life, we process 10 terrabytes of data, equivalent to the storage capacity of 7,142,857,142,860,000 floppy disks.

Dr. Pearson said, "If current trends in the miniaturization of computer memory continues at the rate of the past 20 years - a factor of 100 every decade - today's 8-megabyte memory chip norm will be able to store 10 terrabytes in 30 years."

British Telecom would not divulge how much money it is investing in the project, but Dr. Winter said it was taking 'Soul Catcher 2025' very seriously. He admitted that there were profound ethical considerations, but emphasized that BT was embarking on this line of research to enable it to remain at the forefront of communications technology.

"An implanted chip would be like an aircraft's black box and would enhance communications beyond current concepts," he said. "For example, police would be able to use it to relive an attack, rape, or murder from the victim's viewpoint to help catch the criminal."

Other applications would be less useful but more frightening. "I could even play back the smells, sounds, and sights of my holiday to my friends," Dr. Winter said.

=====

A D D I T I O N A L A R T I C L E S & I N F O R M A T I O N

=====

**Beastly Implants**

<http://www.metroactive.com/papers/metro/12.12.96/implants-9650.html>

**Cashing**

In-

**Chips:** Pets and wildlife have become the official guinea pigs for implanted microchips, which are injected under the skin by a syringe and contain ID information. Animal-control agencies say the chips help return pets to owners, but others fear more apocalyptic uses for the technology.

Illustration by Mott Jordan

Implanted ID tags have become all the rage for saving precious pets. Internal homing devices have the ability to thwart kidnapers. Now that the future has arrived, would you prefer your chip in your wrist or forehead?

By Michael Mechanic

**SURFERS AND KAYAKERS WHO FREQUENT** the kelp-filled waters of the Monterey Bay Marine Sanctuary often have the pleasure of coming face to face with sea otters, the playful marine mammals that have so charmed tourists and locals. Unknown to most is that each of these wild animals has been implanted with a tiny microchip and neatly cataloged in a computer database.

The chip, a powerless device the size of a grain of rice, is injected under the animal's skin with a special syringe. Each chip is programmed with a distinctive ID number that can be read using a scanner. The number is linked to a database containing information about each animal.

By this time next year, your family pet will probably have such a chip. "The goal is to microchip all animals," says Lindy Harton, western regional manager for Infopet Identification Systems, one of three major suppliers in the animal microchip market.

Within the next decade, human implants are almost certain to become available, too.

Think it couldn't happen-

Think again. In October 1987, Daniel Man, an Israeli-born plastic surgeon practicing in Boca Raton, Fla., patented a homing device implant designed for humans under the name "Man's Implanted." Unlike the animal chip, the human device runs on long-lasting lithium batteries and periodically transmits a signal that would allow authorities to pinpoint a person's exact location using cellular phone towers or helicopters carrying triangulation equipment. The batteries, Man says, could be replenished twice a year--"like an electric toothbrush"--using a charger held against the skin.

-----

**Moving Towards a Cashless Society**

<http://www.bgw.net/archives/articles/economy/33b.htm>

Possibly the most frightening aspect of the movement toward a cashless society is the emergence of technology that would allow a microchip to be placed in the human hand that would identify every human being on the planet and allow them to buy and sell without coins, paper or a card.

One expert on this new "biochip" technology charged that the U.S. government will introduce a national I.D. card, supposedly to end illegal immigration, that will extend into commercial activity. This card will be the last step before the government will move to place a biochip in the right hand of every American, said Terry Cook, a retired Los Angeles deputy sheriff and a former fraud investigator.

Already throughout the world, a number of biochip programs have been instituted on animals. In Los Angeles, the name of the program is INFOPET. In this program an I.D. chip is injected into animals in order to identify them. The chip is made by a Destron company based in Boulder, Colorado. Destron was taken over by Hughes

Aircraft Corp. of southern California. Hughes is a major defense contractor of the U.S. government. Destron also has licensed computer giant Texas Instruments. These are the two largest manufacturers of this type of technology in the world.

Convenience or conspiracy, you decide. But like it or not the cashless society is on its way. Those who still disbelieve should go through their records asking themselves, "How did I make my last purchase, cash or credit?"

[The above is based on an article of the same title by Cedric X of The Final Call.]

[Extracted from New Dawn No. 33 (November-December, 1995)  
[© 1995 by New Dawn International News Service]  
[GPO Box 3126FF, Melbourne, 3001, Australia]

-----  
**America's Identity Crisis And The Coming National I.D. Chip**

By: Terry L. Cook

<http://www.best.com/~ray673/search/database/is47.4.html>

"We are not part of a military program to implant [biochip I.D.] tags in humans. In fact, we are not part of any plan to implant transponder tags in humans. But a glass encapsulated animal tag only begs the question of the definition of what kind of animal, and if that definition is a 'mammal,' certainly it would include man. Are humans running around somewhere on the globe with tags---radio-frequency tags---implanted in them?"

"Yes! Absolutely, conclusively so!"

Donald G. Small, Vice-President  
Hughes Identification Devices, Southern California  
Excerpted from the video The Mark of the New World Order

-----  
**The Testimony of Carl Sanders**

[http://www.trumpetmin.org/trumpet\\_testimony.html](http://www.trumpetmin.org/trumpet_testimony.html)

There is a microchip now in the hands of the government that has the potential of becoming the "mark of the beast" where you 'Can not "buy or sell" without it. Carl Sanders, was a top electronics engineer and inventor for the U.S. government, who worked with the FBI, CIA, IRS and other government agencies designing spy technologies and surveillance equipment. He holds several patents and has been presented with the President's and Governor's Awards for Merit and Design Excellence.

[snip]

Carl Sanders, with a team of engineers behind him, with U.S. grant monies supplied by our tax dollars, took on this project and designed a microchip which is powered by a lithium battery rechargeable through the temperature changes in our skin without the knowledge of the Bible, (Bro. Sanders was not a Christian at the time) these engineers spent a one and half million dollars doing research on the best and most convenient place to have the microchip inserted. Guess what? These researchers found that the forehead and the back of the hand (i is not just the most convenient place but is also the only viable place for rapid, consistent temperature changes in the skin to recharge the lithium battery. The microchip is approximately 7mm in length, .75 mm in diameter, about the size of a grain of rice. It is capable of storing pages upon pages of information about you kill your general history, work history, crime record, health history and financial data can't be stored on this chip.

-----  
**Nanotechnology and the Battle to Build Smaller-Discovery Online**

<http://www.discovery.com/stories/technology/nanotech/nanotech.html>

Cornell is one of five nanofabrication facilities in the country funded by the National Science Foundation. Researchers from IBM, AT&T and Raytheon, among others, utilize the \$20 million worth of equipment housed there as an incubator for projects such as the disposable medical laboratory on a chip. This invention would allow a medical technician to place a drop of blood on a \$5 chip, measuring the width of a dime, and connect it to a computer that would immediately process a diagnosis. Such a device is "no more than five years away," says Dr. Lynne Rathbun, the program manager at Cornell.

===== R U M O R S =====

<http://prophecyclub.com/july97/36.html>

IBM chip implants in prisoners