Universal Process for Fingerprint Detection

Inventors: George C. Saunders, International Technology Division, and Antonio Cantu*

The fingerprints on this plastic credit card were developed by the Universal Process.

Law enforcement agencies throughout the world will benefit from a fingerprint detection technique developed by a researcher at Los Alamos National Laboratory. The Universal Process for Fingerprint Detection is a simple, inexpensive, and highly sensitive chemical technique that can be used to detect latent fingerprints on a large variety of surfaces where conventional methods fail. A United States Secret Service representative called the invention one of the top five developments in the fingerprint field in the past one hundred years. In addition to earning the praises of this premiere law enforcement agency, the Universal Process for Fingerprint Detection received a 1990 R&D 100 Award. Each year, *Research and Development Magazine* presents these awards to recognize the one hundred most significant technical innovations of the year.

The Process

In the Universal Process for Fingerprint Detection, fingerprints become visible when gold particles adhere to proteins in secretions left on an object by the touch of a finger. The object to be examined is first washed for about 30 minutes in colloidal gold, a buffer solution of citric acid containing minute gold particles (about 20 to 100 billionths of a meter in diameter). During this washing, the gold binds to the protein in the latent prints. The object is then rinsed in distilled water, which removes any unbound gold particles, and bathed in a silver solution for five to fifteen minutes. The silver enhances the image by filling in around the bound gold particles and highlighting the fingerprint features. The result is a well-defined print, which is not affected by the object's color—prints developed on a dark surface appear light, and prints developed on a light surface appear dark.

In addition to fingerprints, the Universal Process will detect palm and footprints. In fact, the first arrest of a criminal suspect resulting from the Universal Process occurred after palm prints were developed on a blank government check stolen from a military facility in Pennsylvania.

Advantages

The Universal Process is more sensitive than conventional fingerprint detection techniques such as fingerprint powders, lasers, Ninhydrin sprays, and Super Glue vaporization. Because the Universal Process can detect less than a trillionth of a gram of protein, it will readily develop faint prints that escape detection by conventional methods.

Except for certain laser applications, conventional fingerprint detection techniques will not work equally well on porous and nonporous surfaces. The Universal Process, however, produces prints on both porous and nonporous surfaces: wet or dry paper; metals; glass and ceramics; smooth, rough, hard, and soft plastics; and both the smooth and adhesive sides of all tapes. Some computer disks have a combination of surfaces, such as metal, paper, and plastic. Detection of fingerprints on these disks with conventional methods requires at least two techniques—the Ninhydrin process for the paper surfaces and the Super Glue process for the metal and plastic surfaces. One application of the Universal Process will reveal latent prints on all three surfaces.

The Universal Process also successfully detects fingerprints on credit cards and bullet cartridges. Genuine currency is one of the few materials that this detection technique cannot be used on because genuine bills contain protein-bearing flax and cotton, which the gold particles will bind to along with any fingerprints. The Universal Process works well, however, on counterfeit currency.

* *Antonio Cantu works for the United States Secret Service Technical Services Division.*

For more information about the Universal Process for Fingerprint Detection, please contact Dr. Ronald E. Barks, Industrial Applications Office, Los Alamos National Laboratory, P. O. Box 1663, Mail Stop M899, Los Alamos, NM 87545, Telephone (505) 667-3839.

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The Universal Process can be successfully applied to surfaces after detection techniques using sprays and glues have been applied, and it does not generate the toxic vapors produced by these substances. Unlike some other fingerprint detection techniques, the Universal Process requires no expensive readout instrumentation. And the colloidal gold used in the process is inexpensive, costing $35 a liter at the current price of gold.

Technology Transfer

Components of the Universal Process have applications for molecular biology. For example, the technique's extreme sensitivity may enhance the staining of protein bands obtained by electrophoresis, the migration of colloidal particles in a solution under the influence of an electric current. The Universal Process may therefore help researchers identify the protein gene products responsible for the expression of genetic diseases such as Huntington's chorea and cystic fibrosis.

Los Alamos National Laboratory has applied for a patent on the Universal Process for Fingerprint Detection, and a license with ODV Corporation has been signed. The commercial introduction of Universal reagent kits to process crime evidence is likely to result in worldwide use of this unique fingerprint detection technique.

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George Saunders

INVENTOR George Saunders brought an extensive background in diagnostics and ultrasensitive detection to his research on the Universal Process for Fingerprint Detection. Antonio Cantu of the U.S. Secret Service Technical Services Division helped in research and development of the Universal Process, which resulted in a 1990 R&D 100 Award, one of seven such awards earned by Los Alamos scientists that year.

Saunders received a V.M.D. degree from the University of Pennsylvania in May 1964. He then spent eight years at the University of Colorado as an assistant professor of pathology. In October 1972, Saunders joined Los Alamos National Laboratory as a staff member. Before his work on the Universal Process for Fingerprint Detection, most of which he performed while in the Life Sciences Division, Saunders developed diagnostic tests for animal diseases and then worked in various national security programs. He is currently in the International Technology Division, working on narcotics detection.

Saunders received the Office of National Drug Control Policy Federal Laboratory Consortium 1990 Award for Excellence in Technology Transfer. He has some forty publications in the fields of immunology and serology and has been granted a patent on an ultrasensitive immunoassay procedure that he developed. The U.S. Secret Service has invited him to visit the forensic laboratory in Washington, D.C. to discuss current research efforts and trends in fingerprint technology.

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