

Products and Technologies of the Forensic Division

Nicolas Vezard

The Forensic Division has been focused on Identification Instruments since its beginnings in the early 90's. The Core business for Jobin Yvon (JY) Forensics has been the Forensic Light Sources, or FLS for short, first designed for the laboratory market, then expanded to cover the larger crime scene market. The applications of FLS's are broad ranging from fingerprint development to forged documents and body fluids detection. The successful sales of FLS's has fueled the design and launching of several other products starting with Shortwave UV intensifier for the viewing of untreated fingerprints, and followed with software based products such as AFIS (Automated Fingerprint Comparison on Desktop PC's and Server based databases) and ImaQuest (Image Enhancement Software for treatments prior to AFIS submissions).

1 Forensic Light Sources “CrimeScope Series”

John Yvon (JY)-SPEX® introduced its first Forensic Light Source in 1991. Since, JY has become the worldwide leader. In the US, the Federal Bureau of Investigation (FBI) alone has purchased 140 Mini-CrimeScope 400 W systems (Fig. 1) for its Evidence Response Teams over the past 4 years. The Italian Carabinieri have purchased 107 units in 2002. The MCS-400 is the brightest light source on the market, making it the most sensitive unit for crime scene searching in fluorescence mode.

The CrimeScope CS-16, available in 300, 400, 500 W is a laboratory unit with unmatched number of filters, fine tune capability and computer interface. Fig. 2 shows the CS-16-400. The National Japanese Police Agency has purchased 48 units in 1997 and the FBI laboratories have purchased about 25 units over the past years. The HandScope 100 W unit is a low cost tool, still featuring 12 filters running on 12 V batteries. This unit is less sensitive than the MCS-400, but is a perfect complement for the Mini-CrimeScope when there are no power outlets on the crime scenes.

All versions allow fingerprint identification on most surfaces, body fluids detection and other crime scene evidence detection using Fluorescence techniques. Intense light illumination of areas exhibiting evidence normally invisible to the naked eye, can produce fluorescence from the evidence, using proper filtering in front of the human eyes or in front of cameras.

To process a crime scene, the police technician will scan the carpeted floor for example to detect body fluid stains which exhibit natural (inherent) luminescence. A narrow band of light (Blue : 450 nm with 40 nm band pass) will generate green fluorescence from semen (peak around 550 – 575 nm and broadband) which can be clearly seen by the investigator wearing orange colored glass goggles (long pass filter cutting on around 530 – 550 nm and therefore blocking the blue light from the light source).



Fig. 1 Mini-CrimeScope MCS-400



Fig. 2 CrimeScope CS-16-400

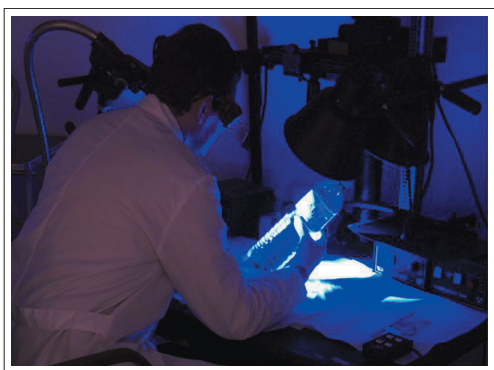


Fig. 3 Fluorescence Examination in the Identification Lab (Courtesy of Carabinieri - Italy)

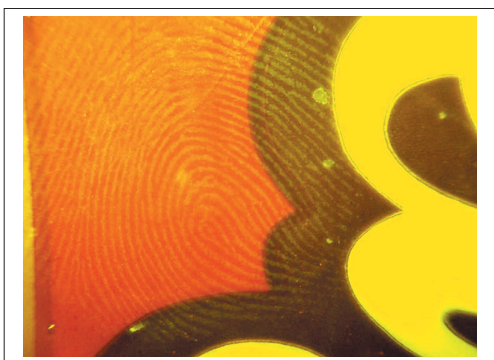


Fig. 4 Fluorescent print treated with RAY (Rhodamine-Ardrox-Basic Yellow)



Fig. 5 Vehicle Examination at a Scene of a Crime (Courtesy of Carabinieri - Italy)

The infrared options allow forged document examination using Fluorescence, and Absorption/Transmission/Reflectance. In such case the light source will be tested at all narrow bands of excitation light available in the unit, and an IR sensitive camera, used in combination with long pass and band pass filter slides will allow to visualize difference in various inks present on a document. Some ink will look transparent (invisible thanks to full transmission of light), black (absorption) or white (fluorescent) therefore allowing the investigator to prove two inks come from different pens.

Fig. 3 shows an examination process in the identification lab and Fig.4 shows a RAY treated print developed with the CS-16. Fig. 5 shows a vehicle examination at a scene of a crime using the MCS-400 and Fig. 6 shows traces of semen.

2 | Reflected UV Imaging Systems “SceneScope Series”

Shortwave UV intensified light allows crime scene technicians to detect and capture untreated latent fingerprints on non-porous surfaces, in room or bright sun light. In the laboratory, fingerprints treated with Cyanoacrylate are strongly enhanced with the SceneScope (Fig. 7). A patented high resolution photography set-up allows capture of large palmprints as well.

Most National Police agencies as well as many US state and city police departments successfully use this UV reflectance technique which is the ideal complement to forensic light sources. RUVIS uses the natural strong UV reflectance of amino-acids left in a latent print to view untreated, invisible prints, which then show as white ridges on a dark background. Oils also left in many latent prints will on the contrary show as black ridges on a reflective background due to strong UV absorption by oils. Fig. 8 shows an untreated fingerprint, captured by UV reflectance.

3 Automated Fingerprint and Palmprint Identification Systems “AFIS and APIS”

The PrintQuest™ AFIS and APIS systems (Fig. 9) allow small and large police agencies to create databases of ten print cards from suspects and to search crime scene latent fingers and palms, with unmatched accuracy. Linux was selected as the operating system for its high reliability and security qualities for database protection. The system comes with scanner and printer, with optional digital capture equipment, and runs on a desktop PC, Notebook or a Server with multiple workstations.

PrintQuest™ is fully compatible with the FBI’s IAFIS system and has been awarded Scanner, EFTS and WSQ certifications by the FBI. One of our Federal users is connected live to the FBI IAFIS database which contains more than 40 million + ten print cards. LiveScan units, for inkless capture of ten print images, are available for fast and high quality card entry, including rolled prints, slaps and palmprints. The Palm algorithm used in PrintQuest™ makes it a very unique high end system. It is capable of matching tough latent prints from crime scene both in the palm area and in any of the finger phalanx areas, a capability not present in competitive systems such as Sagem, Phoenix, NEC and Motorola.

PrintQuest™ algorithms allow latent prints from crime scenes to be matched with cards, even if these prints are very partial, small and therefore containing few characteristics (minutiae points): A Palm card which main contain 1000 points can be found in a large database with a very small palm print from the scene, using just 9-10 minutiae points! Coordinates, direction of the point, type of points [line end, bifurcation], and local flow are just some of the parameters that PrintQuest™ uses.

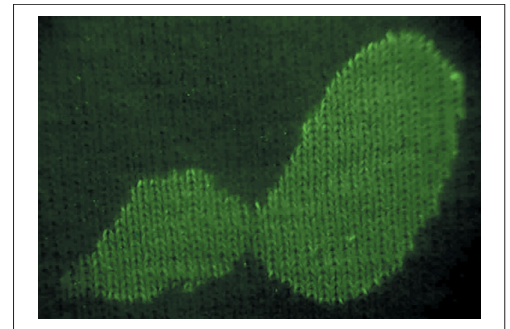


Fig. 6 Fluorescent Traces of Semen



Fig. 7 Reflected UV Imaging System - SceneScope

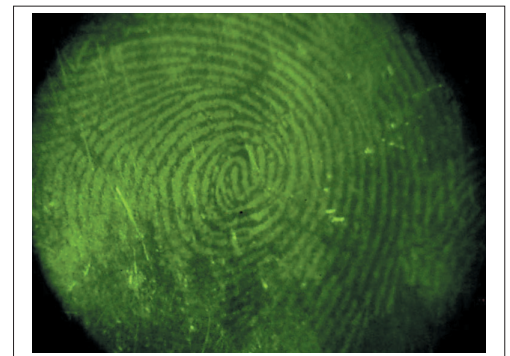


Fig. 8 Untreated Fingerprint Capture by Short-wave UV Reflectance



Fig. 9 PrintQuest™ AFIS and APIS System

Grating & OEM

Emission

Raman

Fluorescence

Thin Film

Optical Spectroscopy

Forensic

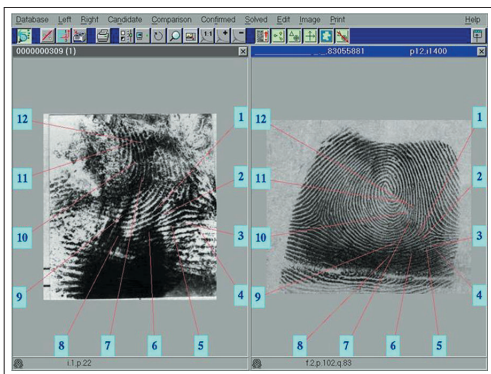


Fig. 10 Fingerprint Identification using PrintQuest™

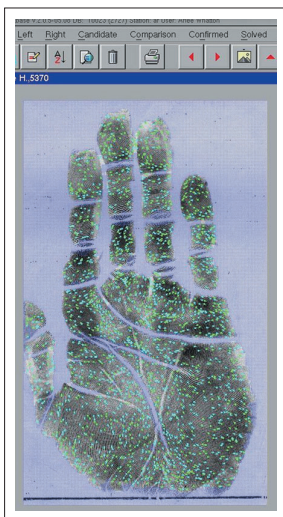


Fig. 11 Palmprint Auto-extracted Characteristics using PrintQuest™

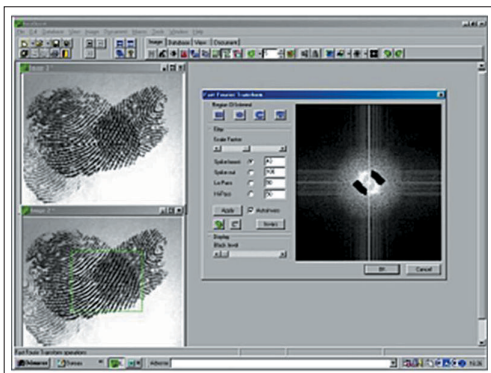


Fig. 12 Image Processing Result – Overlapping Prints Separation

Fig. 10 shows a latent fingerprint identification and Fig. 11 shows a palmprint with all its characteristics (minutiae points) using PrintQuest™. JY offers the optional service to create the database prior to delivery.

4 | C.D.I.S. Fingerprint Imaging Systems “Crime Scene and Laboratory Digital Capture and Enhancement Systems”

ImaQuest, JY’s image enhancement software allows users to optimize fingerprints prior to AFIS submissions. Features include mathematical enhancements such as Fast Fourier Transform, digital filters, and background elimination. All enhancements having one purpose: Entering latent prints from the scene with the maximum number of minutiae points to increase chances of hits on the real criminal, if present in the database of suspect of course.

JY offers both laboratory grade capture systems incorporating a high dynamic range CCD and portable digital camera systems; all featured with optical enhancement components, compatible with the Fluorescence technique (FLS) and the Reflectance technique (RUVIS). An extra software module called IdentQuest allows side by side comparisons for latents and records, with minutiae extraction, edition and charting of the 12 – 16 points typically required to go to court. All enhancements are tracked via a special format, which users cannot edit, showing all individual steps to justify them in court.

Fig. 12 shows an image enhancement result for overlapping prints using the FFT (Fast Fourier Transform) technique. Fig. 13 shows an example of periodic background removal.

5 | Police Equipment and Supplies for Crime Scene “Security Equipment”

From fingerprint powders, brushes, fingerprint dyes and chemicals to crime scene presumptive identification kits to night vision and lighting equipment, our catalog line expands JY’s focus on Forensics into new police fields for 2003. The consumables and supply market has the potential for large growth of our division. More than 850 items are carried in the catalog, most of them being consumables and promising repeat orders in the coming years. With 140 pages, the catalog enhances our company’s image in the forensic market and will help boost our instrument sales. A section on security products such as metal detectors is present in the catalog and we may develop this line further in the growing market of security systems.

Note

Spex® is registered in the USA and European Union.

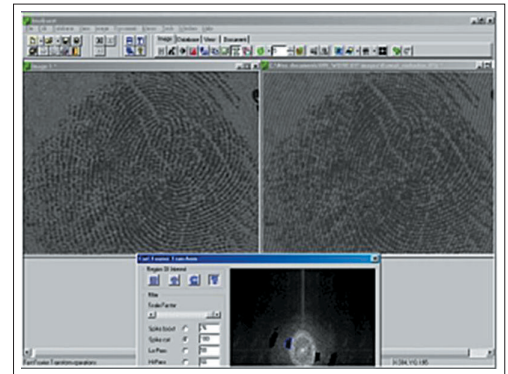


Fig. 13 Periodic Background Removal



Nicolas Vezard

Jobin Yvon Inc.
Forensic Division
Director