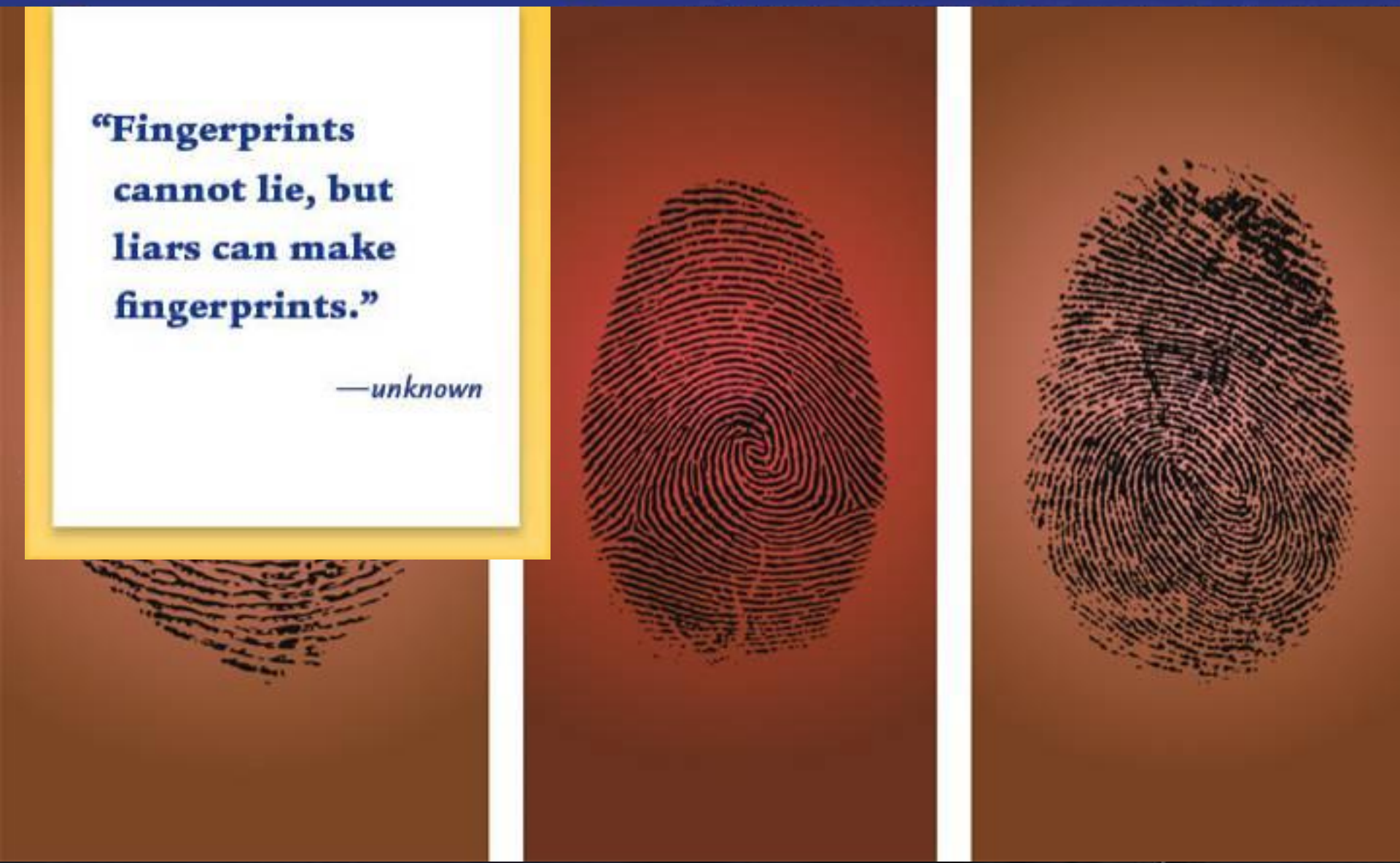
- alternative light source
- powder
- iodine fuming
- superglue fuming
- silver nitrate
- ninhydrin,
- DFO
- physical developer
- Developing vs lifting: latent, visible, plastic
- AFIS

Chapter 4 Fingerprints

"Fingerprints cannot lie, but liars can make fingerprints."

—*unknown*



DEVELOPING VS LIFTING
VISIBLE, PLASTIC, LATENT

Three Types of prints – Visible, Plastic, Latent

Latent prints are invisible to the eye and are usually obtained from hard surfaces such as glass or wood. The skin's sebaceous glands produce natural oils which, together with the salts produced by our sweat glands, leave a fingerprint residue when we touch most objects.

Visible prints are those that result from fingers stained with blood, ink, paint or similar.

The **plastic** or molded print is an impression made on a soft surface like putty, soap or cheese.

Types of Fingerprints

VISIBLE -

RIDGES PLACED ON A SURFACE AFTER CONTACT WITH A COLORED MATERIAL

(blood, paint,grease, ink)

Types of Fingerprints

PLASTIC -

RIDGES LEFT ON A SOFT MATERIAL

(putty, wax, soap, dust)

- Plastic prints are ridge impressions left on a soft material, such as putty, wax, soap, or dust.
- Locating visible or plastic prints at the crime scene normally presents little problem to the investigator, because these prints are usually distinct and visible to the eye.

Types of Fingerprints

LATENT -

HIDDEN OR INVISIBLE

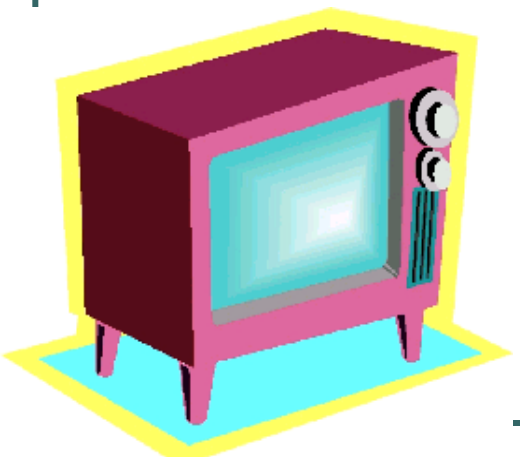
TRANSFER OF BODY PERSPIRATION OR OILS

MUST BE ENHANCED

Types of Surfaces

NON-POROUS

GLASS, MIRROR, PLASTIC, PAINTED SURFACES



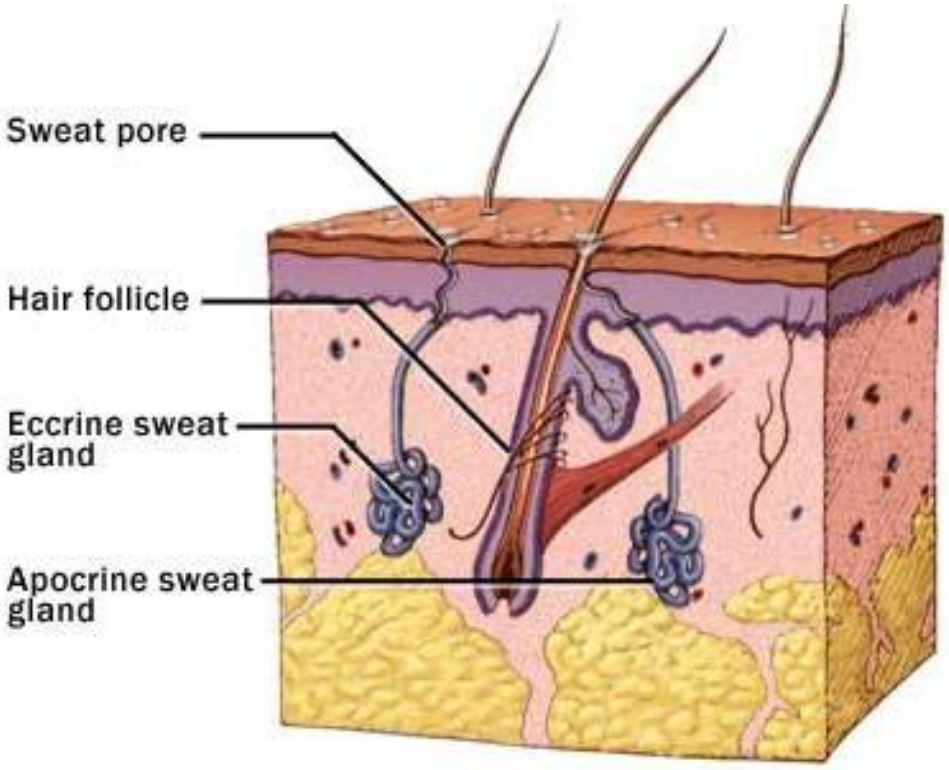
ENHANCE WITH SUPER GLUE and/or POWDER

Types of Surfaces

POROUS

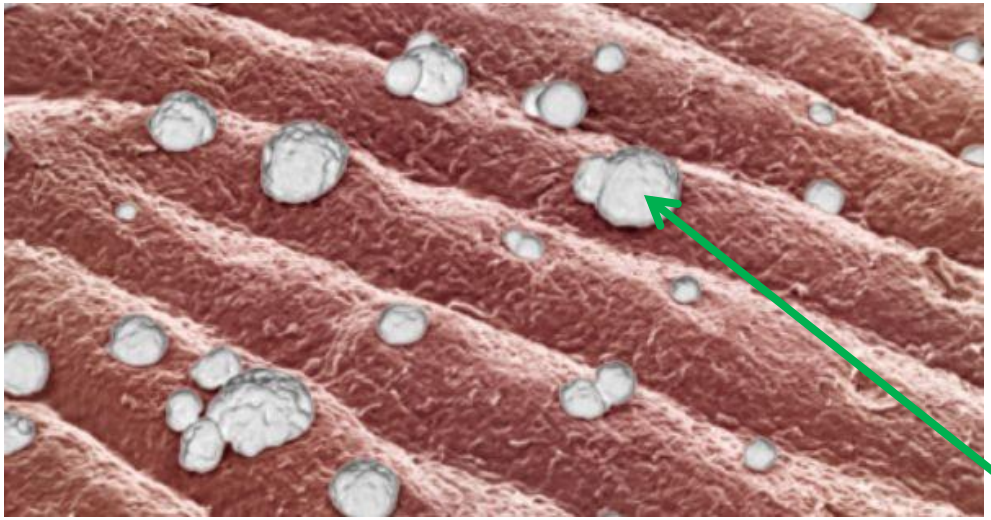
PAPER, CARDBOARD, CLOTH

ENHANCE WITH CHEMICALS



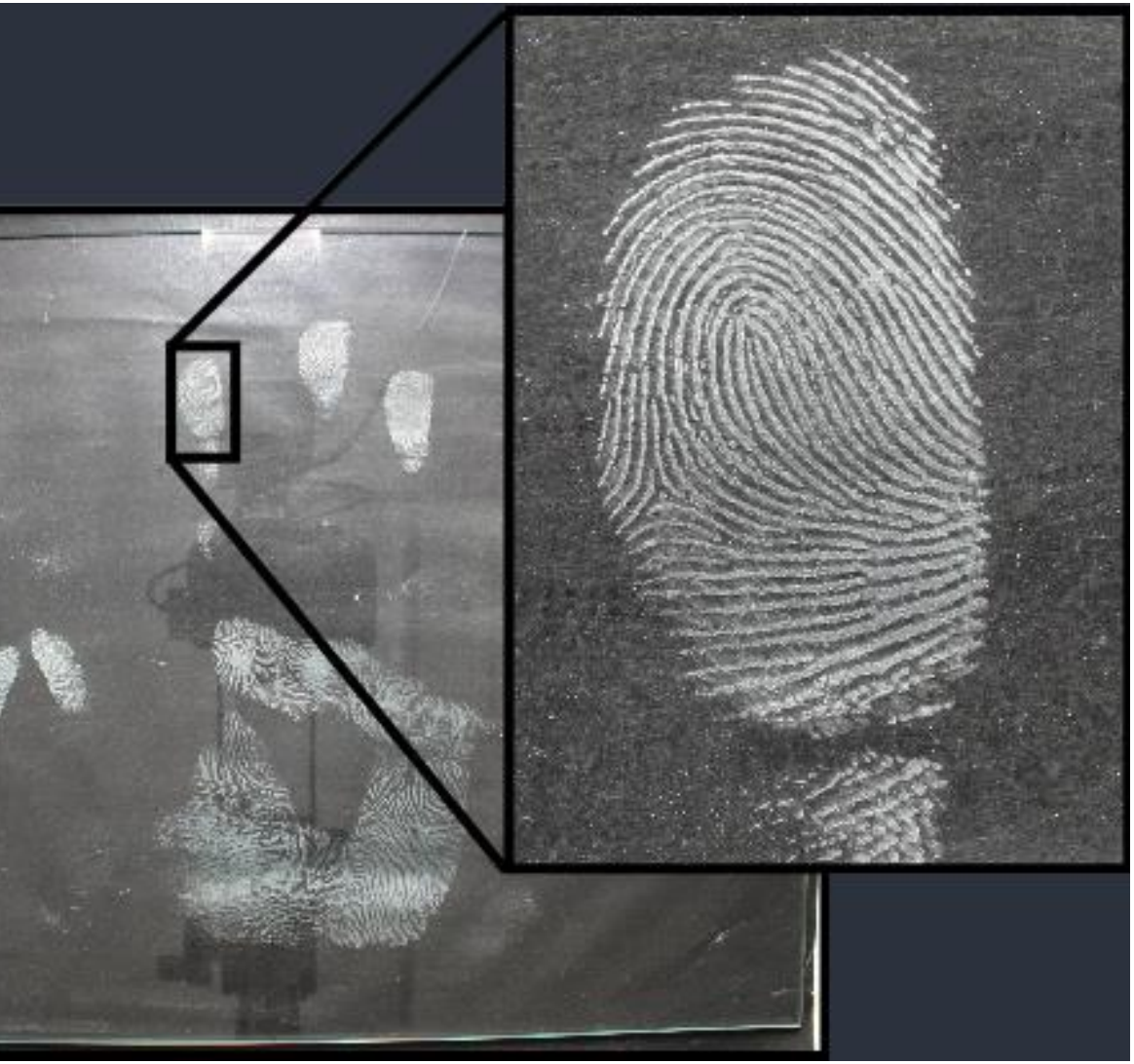
Latent Prints

- Our skin is constantly secreting oil, sweat, protein, etc from glands located deep in the skin. Whenever we touch something, Locard's Principle states that some of our secretions are transferred to the surface we touched. Nearly 99% of a fingerprint is composed of water, but there are several trace elements that react well with various chemicals.
- Developing a print requires substances that interact with secretions, causing the print to stand out against its background. It may be necessary to attempt more than one technique, done in a particular order so as not to destroy the print



Sweat from sweat pores on pressure ridges on tip of finger

Developing and Lifting Prints



Latent prints must first be developed (made visible) and then lifted (transferred to a permanent surface so they can be used in court).

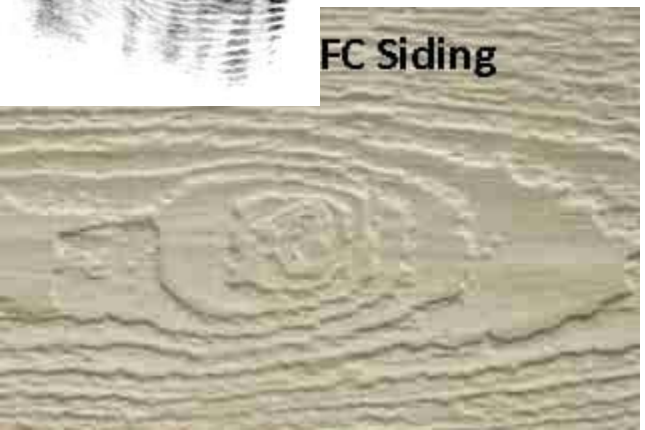
Since **Visible prints** can be seen, they only need to be transferred to a permanent surface. They do not need to be developed**.** It can be as simple as taking a photograph and uploading the image to a computer..

plastic prints are already visible, but require special materials to lift (move to a permanent surface for court).

Developing Fingerprints depends on surface

Dusty surfaces cause problems because the dust will move around under the fingerprint causing it to be smudged

Parts of this print are missing because it was lifted from a textured surface



- Hard and nonabsorbent surfaces
  - Glass
  - Metal
  - Mirror
  - Tile
  - Painted wood
  - Fingerprint on surface is vulnerable to being smudged or damaged
- Soft and porous surfaces
  - Papers
  - Cardboard
  - Cloth
  - Fingerprint absorbed into material is a little more durable

PRESERVING DEVELOPED PRINTS

- Once a print is developed it must be preserved as evidence
- STEP ONE: photograph developed print
- STEP TWO is determined by the size of the object the print is on
- If the object the print is on is small – the entire object should be taken to the laboratory
- If the object is too large - then the developed print must be “lifted”.
- Can use special clear tape to lift a print developed with a powder
- Tape with print is placed on a card with good background contrast

Permanent Record of Print

- If on small surface- transport without destroying the print
- Protect with cellophane bag
- If large surface (door, wall, etc) objects that have been developed with a powder can best be preserved by ‘”lifting”.
- Done with broad adhesive tape
- Fingerprint covered with adhesive side and pulled up, the powder will be transferred to the tape.
- Digital imaging may be used to enhance contrast, enlarge detail and compare individual points on prints to others in question.

Preservation of Developed Prints

- Once the latent print has been visualized, it must be permanently preserved for future comparison and possible use in court as evidence.

- A photograph must be taken before any further attempts at preservation.

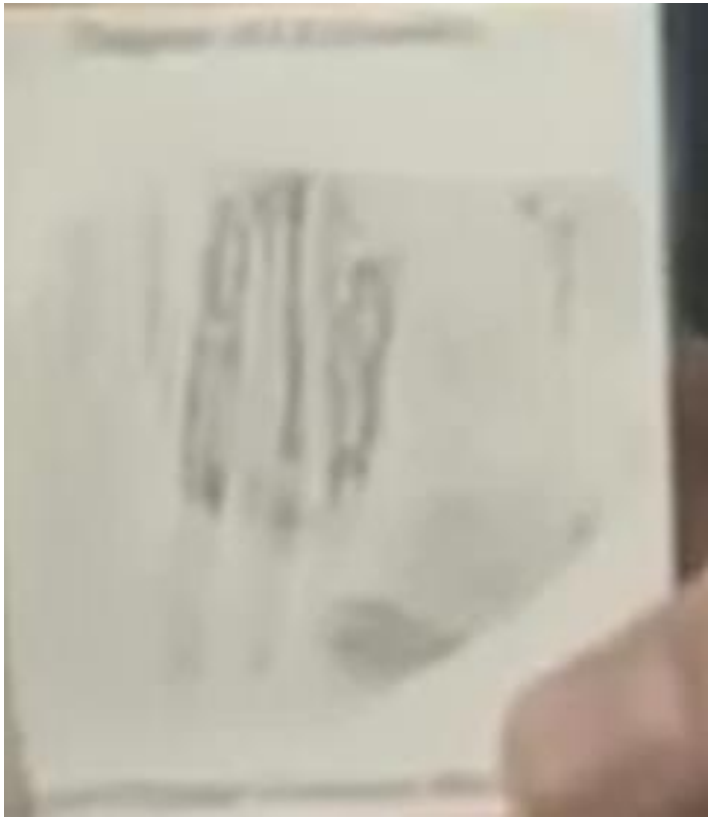
Lifting Prints

Lifted fingerprints

1. Formed when a piece of adhesive tape is placed over a developed latent print and pulled away.
2. The latent print adheres to the tape and then the tape is placed upon a glossy white or black “latent lift backer” card.

A print lifted with traditional flat tape from siding. Note the detail that is lost because of the texture of the material.

Accu-Trans - AccuTrans®, a liquid casting compound, can be used to lift powdered latent prints from rough, textured or curved surfaces. AccuTrans® is basically a very thick liquid that fills in the nooks and crannies of rough or textured areas where conventional print lifting tape encounters difficulty.



For many technicians, the gel products known as Accutrans and Forensic Sil are among their top choices for lifting prints from difficult surfaces. First, you dust the print and then apply the gel. It only takes about five minutes to dry—and when you pull it off, you have the powdered impression. Stapleton said they had even recovered a print from a tree leaf using Forensic Sil. The same individuals who find these products to be their favorites do caution that the product is expensive—and they recommend taking care to cap the tube so the gel does not harden

Lifting Method	Use for	Notes
Tape	Powders	Powder color should contrast with background
Photograph	All methods	Do not use flash, take at an angle to get good ridge definition
Accu-Trans	Rough, textured, or curved surface	Goes on as liquid.
Forensic Sil	Rough, textured, or curved surface	Goes on as gel

Lifting does not actually remove the latent print. The oils and moisture simply hold powder grains, which are in turn picked up by the adhesive tape. The powder and not the latent image is lifted. If the process is repeated, each lift becomes progressively weaker.

- Once the print is developed, always take a picture before lifting and/or preserving
- This protects against mishaps during the lifting process

LATENT PRINTS

Latent finger prints are those that are not visible to the unaided eye.

When you touch things you leave traces of proteins (amino acids), oils, sweat and acids coming from the pores of your ridges.

If they are not smeared, the residue oils and proteins can react with chemicals and even UV light to become visible.

Finding latent prints can be time consuming

FINDING LATENT PRINTS

VIDEO

Because they are invisible to the naked eye, these prints are difficult to find for further study and analysis.

The old method is to just lightly dust around a crime scene with black powder and see what develops.

Newer methods include using a portable UV optical system named RUVIS (Reflected Ultraviolet Imaging Syst[illegible] that makes [illegible]w as they a[illegible]ct UV

Developing Latent Prints

Prints on a hard and nonabsorbent surface such as glass, tile and painted wood require different development procedures from soft and porous surfaces such as papers, cardboard and cloth.

--Developing prints on hard surfaces that do not absorb the oils is easier than porous things.

--Powders work well on hard surfaces.

--Porous things require development by precipitating chemical reactions, such as Physical Developer (silver nitrate) or superglue.

Latent Prints

- A variety of techniques use powder and chemicals to develop latent fingerprints.
  - A. Lifted fingerprints
    - 1. Formed when a piece of adhesive tape is placed over a developed latent print and pulled away.
    - 2. The latent print adheres to the tape and then the tape is placed upon a glossy white or black “latent lift backer” card.

Latent Prints

- 3. Photography is used during the development and lifting process.

Latent Prints

- Developing Latent Prints
  - Chemicals and powders can be used to develop latent fingerprints on contact or “touch” surfaces.
    - Hard and nonabsorbent surfaces
      - Glass
      - Mirror
      - Tile
      - Painted wood.

Latent Prints

- Soft and porous surfaces
  - Papers
  - Cardboard
  - Cloth
- Some of these materials are hazardous and must be handled and used with proper protective equipment.
- The Material Safety Data Sheet (MSDS) for all chemicals must be consulted for appropriate precautions.

Alternate Light Source (ALS)
Iodine Fuming
DFO
Ninhydrin
Physical Developer - last resort.

SEQUENCING ORDER OF TECHNIQUES:

Surfaces for fingerprint Powder
NON-POROUS surfaces: sliding glass door, automobile exteriors, counter-tops, t.v. sets, metal filing cabinets, painted doors, mirrors, broken glass, metal window frames, plastics, glass, metal, smooth surfaces and objects etc.

POWDERS

Dusting powders consist of an adhesive and a contrast agent or colorant. When dusting for fingerprints, contrast is the key. Dark powders, such pulverized charcoal, are applied to light-colored surfaces. Light colored powders, such as talcum powder, would be applied to dark-colored surfaces. The dusting agent is gently applied with a brush and either adheres to or reacts with components in the fingerprint, giving definition to the ridge pattern.

Many common powders are formulated with metals. Aluminum agents are generally adherents, while silver salts may be used to actually react with the print. Despite their toxicity and expense, these powders offer great stability. On rough surfaces, or to avoid smudging the print with a bristled brush, a criminalist can employ magnetic-sensitive powder using a magna brush, or magnetic wand.

Newer powders are formulated with a variety of fluorescent and phosphorescent dyes. Once these agents fix to a print, they can be illuminated and photographed under various light sources. These powders give good contrast for prints on uneven or multicolored surfaces.

C. DEVELOPING LATENT PRINTS

1. POWDERS:

- Adhere to perspiration and body oils
- Almost any color – grey and black being most common
- Grey – aluminum dust
- Black –carbon or charcoal
- Fluorescent – glow under UV light

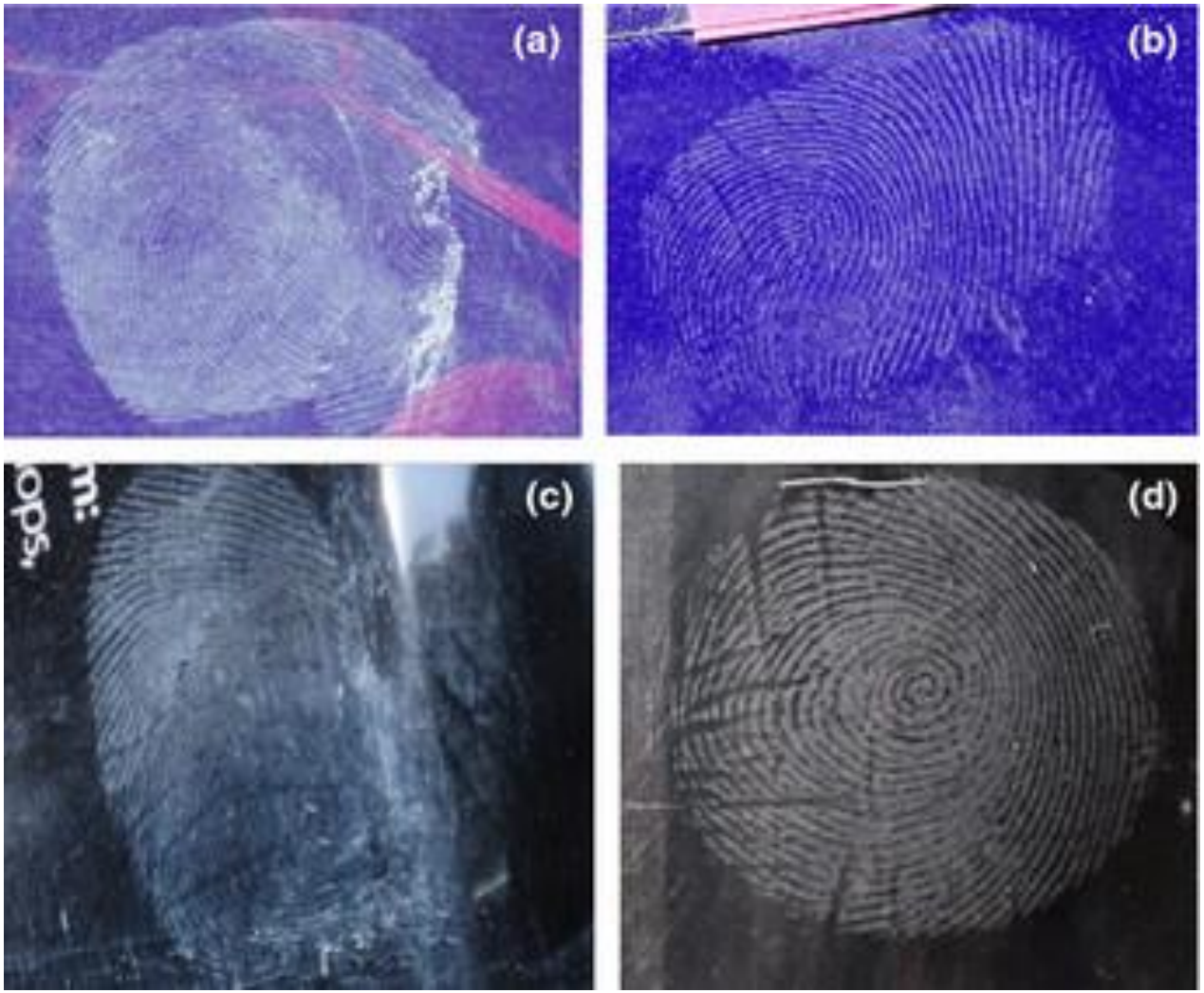
Video – Developing Fingerprints with Powder

Developing Latent Prints - Powders

fingerprint powders are fairly easy to use since they stick to water, oils, and fat deposits. Most fingerprint powders are black (for use on lighter surfaces) and white (for use on darker surfaces). On multi-colored surfaces, use **florescent powders**. the developed prints must be viewed with an alternate light source.

- After the excess powder is removed, the fingerprint is revealed and can be photographed or lifted.
- Powder is not a good choice for textured surfaces, delicate surfaces, or old, dried-out prints.

The finer (small-grained) the powder, the better the print



Comparison with (a) regular fingerprint powder on cardboard surface, (b) Fine grained powder on cardboard surface, (c) regular powder on metallic can, and (d) fine grained powder on metallic can

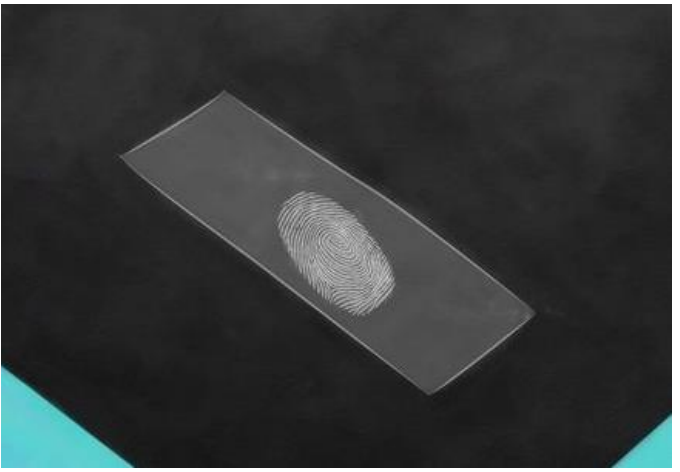
Magnetic powder

- Magnetic fingerprint powders are used with magnetic brushes, which allow excess powder to be removed without actually touching the print. Magnetic powders are often used to raise latent fingerprints on paper surfaces.
- **Magnetic powders** can be used when investigators are worried about the possibility of damaging a print by using the normal brushing techniques
- Most experts consider magnetic powder to be a little bit more sensitive and that it tends to work better on some of the harder surfaces.
- It will not work well, however, on any surface that is wet or even slightly magnetized.

Magnetic Powders

- **Magnetic powders**- Magna Brush- since there are no bristles there is less chance of destroying print.

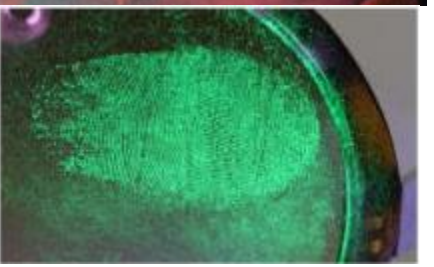
- Fluorescent powders that fluoresce under ultraviolet light- used when color or pattern of background obscures visibility of the print. (plaid, newsprint, etc).



Powders

- Use black powder for light-colored surfaces.
- Use white powder for dark-colored surfaces
- Use magnetic powder for areas where brushing could smudge the print, like plastic

- Use fluorescent powders where the background is neither dark or light



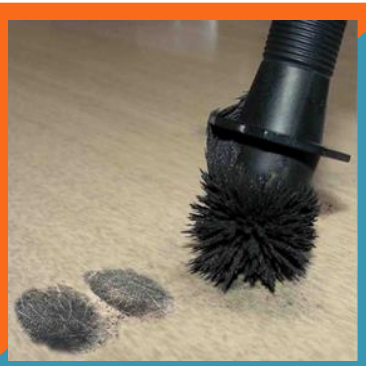
DUSTING FOR LATENT PRINTS

Prints may be collected from hard non-porous surfaces by revealing them with a dusting of **black powder** and then lifted with a piece of **clear tape**. Fluorescent colors of powder are easily seen with UV radiation.

Did you know? <u>Camel hair</u> is the most common animal hair used to make fingerprint brushes. Now many brushes (like the one above) are made out of fiberglass.

DUSTING FOR LATENT PRINTS

Some investigators use **fluorescent** powder and UV lights to help them find latent prints on multi-colored or dark surfaces. **Powders, available in a variety of colors, can be applied with a brush or magnetic wand, and adhere to perspiration and/or body oils of the print. Always take a picture of the print before tape lifting it.**



Magnetic powder can also be used to reveal latent prints. This type of powder works better on **shiny** surfaces or **plastic** baggies or containers.

METHODS OF ENHANCEMENT

FINGERPRINT POWDERS

- BLACK (white surfaces)
- GRAY (dark surfaces)
- FLUORESCENT (multi-colored surfaces)
- MAGNETIC (leather or rough plastic)
- ADHERES TO PERSPIRATION and/or BODY OILS

Fingerprint Powders

- **Commercially available in a variety of colors and textures**
- **Lightly applied to nonabsorbent surfaces with camelhair brush will ADHERE TO PERSPIRATION RESIDUES AND BODY OILS.**
- **Black, white and gray for photographing on surfaces- produce contrast.**

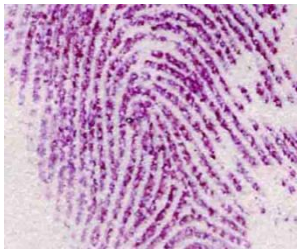
Only works if MOISTURE is present!

White powder on dark surface

Some investigators use **fluorescent** powder and UV lights to help them find latent prints on multi-colored or dark surfaces.

Magnetic powder can also be used to reveal latent prints. This type of powder works better on **shiny** surfaces or **plastic** baggies or containers.

The **cyanoacrylate** fuming method (often called the super glue method) is a procedure that is used to develop latent fingerprints on a variety of objects.



Ninhydrin is a chemical that bonds with the amino acids in fingerprints and will produce a blue or purple color. It is used to lift prints from surfaces such as paper and cardboard.

Click the icon to view the Crime 360 Super Glue Video

Top Left: http://www.stapletonandassociates.com/images/MagPowder.jpg

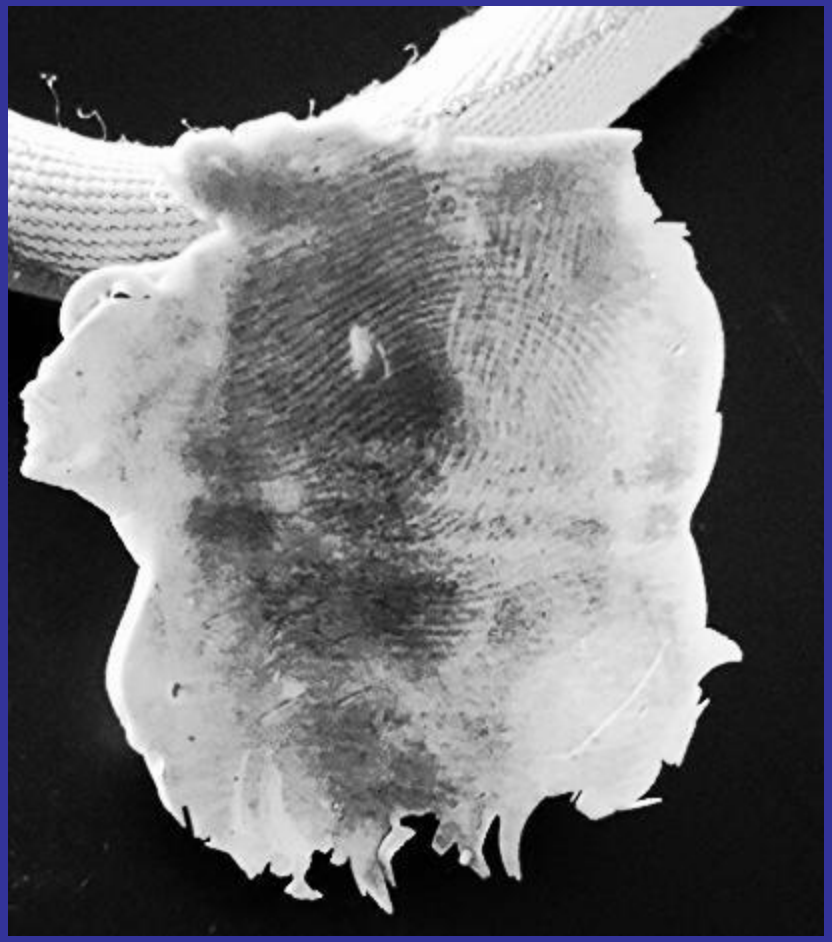
Bottom Left: http://www.ok.gov/osbi/images/ninhydrin%20print.jpg

Bottom Right: http://www.forensicsrus.com/images/SupergluePrint.jpg

Mikrosil

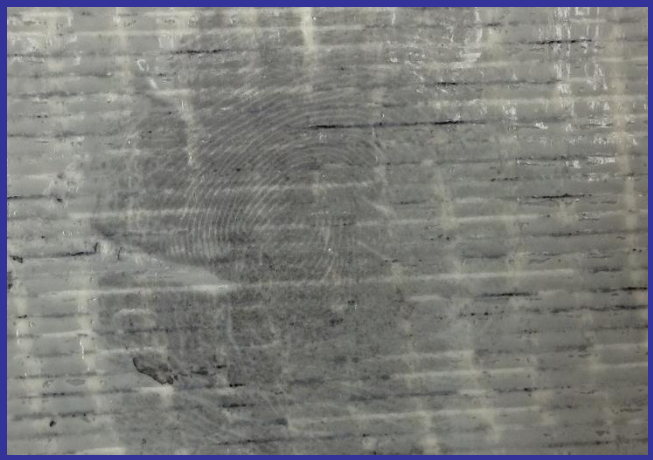
- Lifting dusted prints from irregular or curved objects can be performed with a casting compound called Mikrosil.

Mikrosil



STICKY SIDE POWDER

- Sticky-side powder is used for developing fingerprints found on adhesive surfaces.
- Leaves a black print that can be photographed easily



Dusting

- Appropriate Surface:
  - Ridged/non-porous such as glass, plastic, or metal
- Theory:
  - Dust will adhere to sweat & oils left behind

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Cover Surface With Dust

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Remove Excess Dust

Brush or Blow

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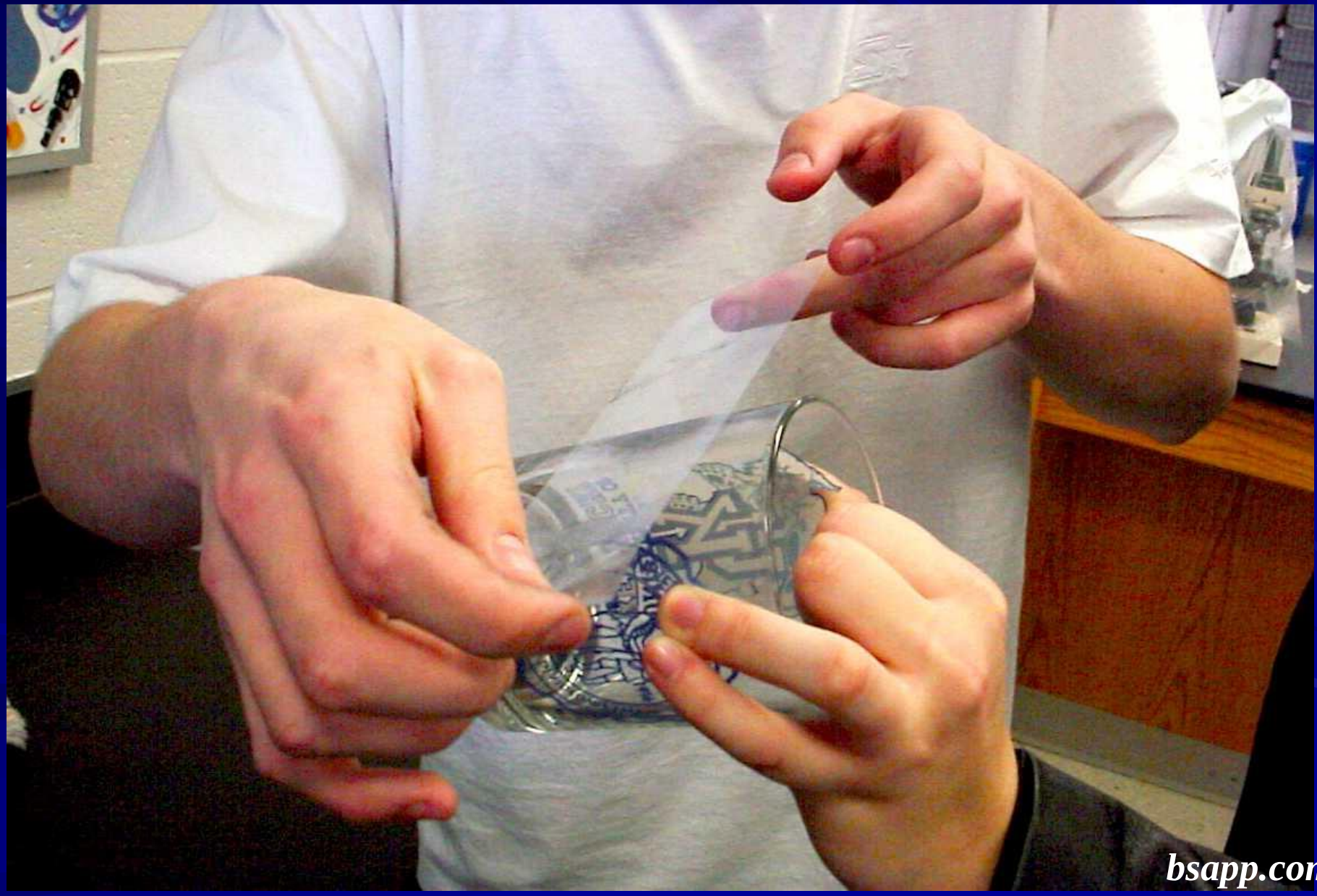
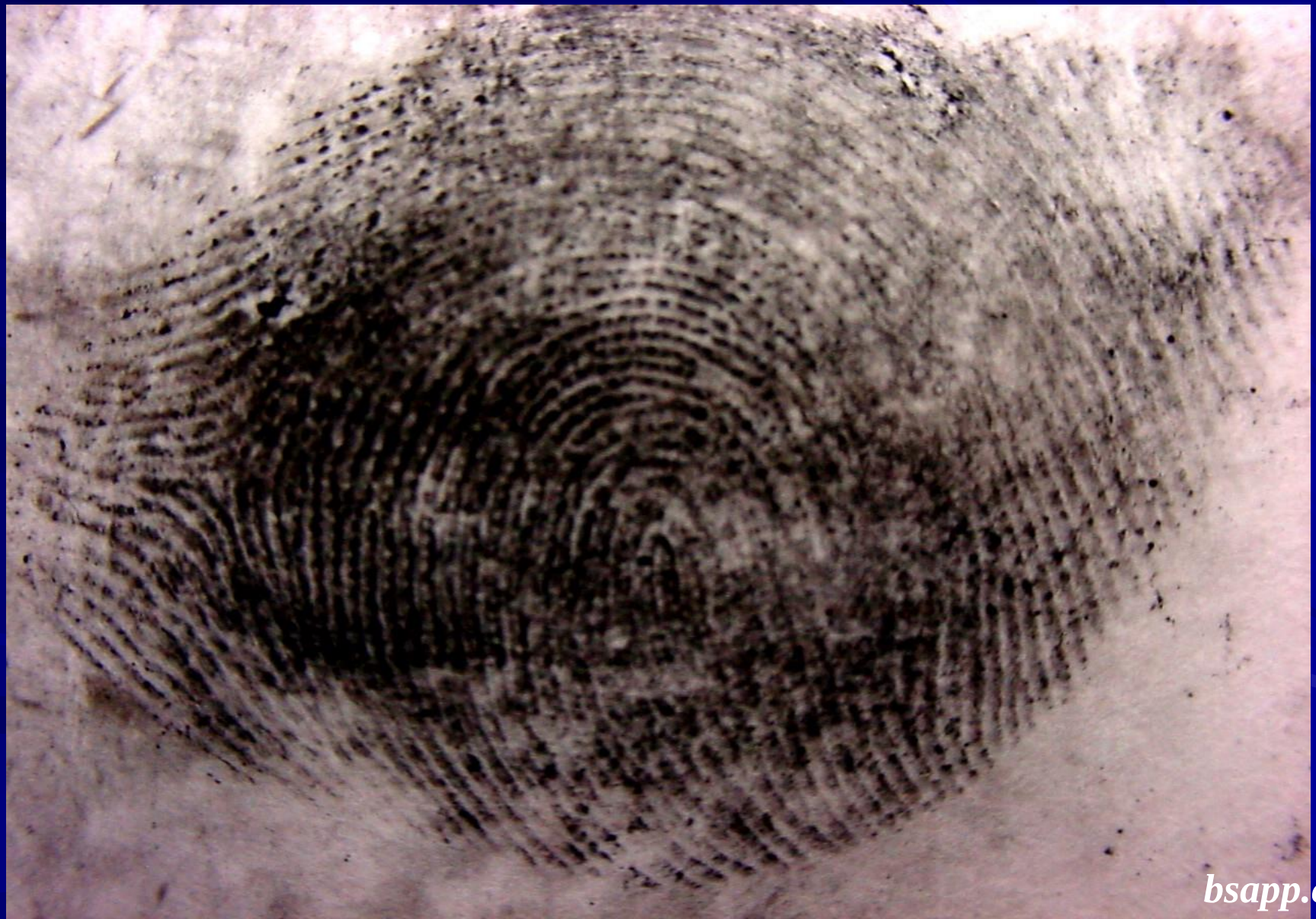
Use Tape to Lift the Print



Place Print on a Card



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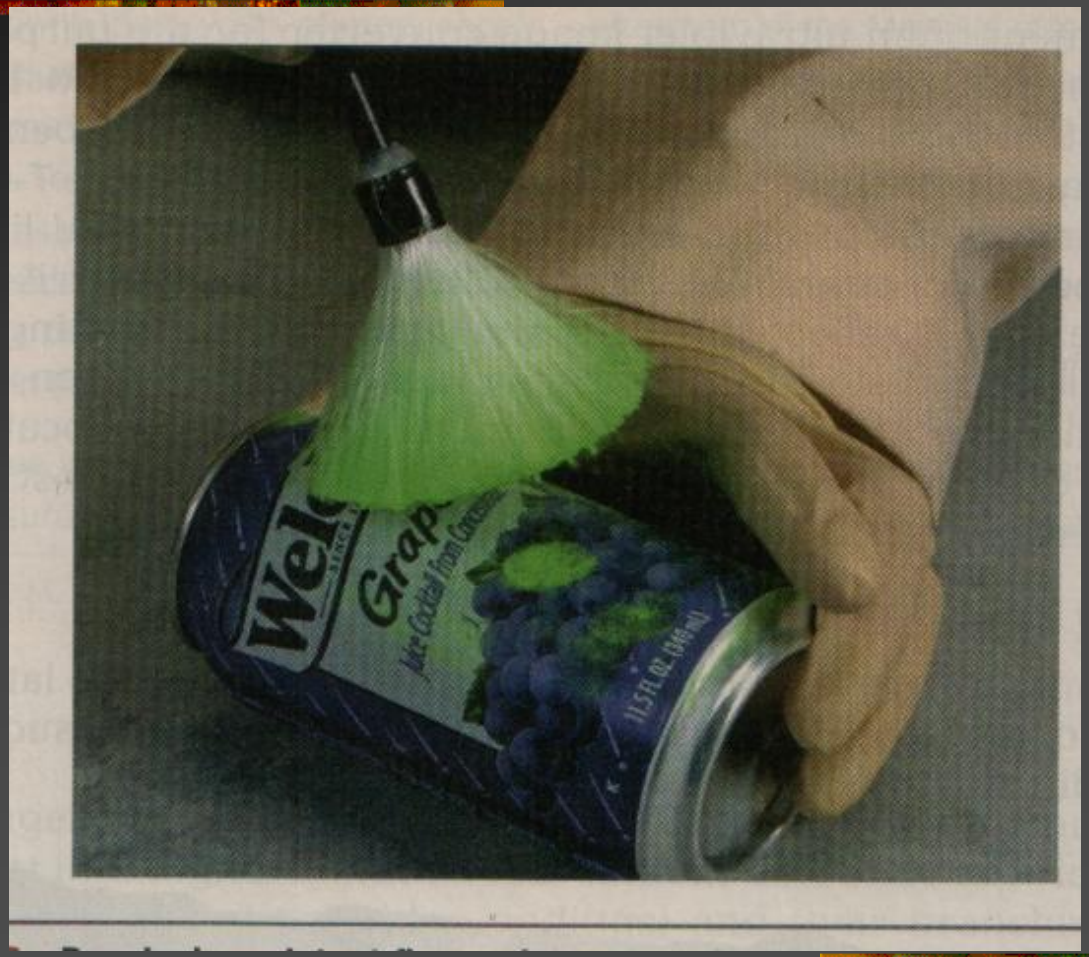
Latent Prints

- Techniques range from chemical methods such as powders and iodine fuming to the use of laser light.
  - Fingerprint powders
    - The powders, when applied lightly to a nonabsorbent surface with a camel's-hair or fiberglass brush, readily adhere to perspiration residues and/or deposits of body oils left on the surface.

Latent Prints – Fingerprint Powder with Fiberglass bush



Latent Prints – Fingerprint Powders

- Experienced examiners find that gray and black powders are adequate for most latent-print work
  - 1. Gray powder, composed of an aluminum dust, is used on dark colored surfaces. It is also applied to mirrors and metal surfaces.

Latent Prints – Fingerprint Powders

- 2. The black powder, composed basically of black carbon or charcoal, is applied to white or light colored surfaces.

- 3. Fluorescent powders are also used to develop latent fingerprints. These powders fluoresce under ultraviolet light.

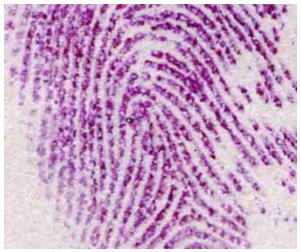
DEVELOPING LATENT PRINTS

- POWDERS:
  - Adhere to perspiration and body oils
  - Almost any color – grey and black being most common
  - Grey – aluminum dust
  - Black –carbon or charcoal
  - Magnetic – charged
  - Fluorescent – glow under UV light

Some investigators use **fluorescent** powder and UV lights to help them find latent prints on multi-colored or dark surfaces.

Magnetic powder can also be used to reveal latent prints. This type of powder works better on **shiny** surfaces or **plastic** baggies or containers.

The **cyanoacrylate** fuming method (often called the super glue method) is a procedure that is used to develop latent fingerprints on a variety of objects.



Ninhydrin is a chemical that bonds with the amino acids in fingerprints and will produce a blue or purple color. It is used to lift prints from surfaces such as paper and cardboard.

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Bottom Left: http://www.ok.gov/osbi/images/ninhydrin%20print.jpg

Bottom Right: http://www.forensicsrus.com/images/SupergluePrint.jpg

IODINE FUMING

CONS - Toxic
Corrosive
Allergic Reactions

PROS -
Easy to use
Cheap
Easy to build gun
Easy to transport
Reusable (Iodine crystals, drie-rite)
Can be used **repeatedly** on paper
Any surface that isn't wet
use on dead people
can be made permanent using Spray Starch
can be for any size
non-destructive - does not inhibit other techniques

Works Immediately

Reacts with Lipids/Fats through physical attraction

Reaction: Physical Attraction

Do not inhale fumes - Fume Hood or ventilated area. Harmful to mucous membranes

Porous and Non-porous surfaces

The oldest chemical technique is the use of iodine. Fuming iodine is an excellent method for finding fingerprints on paper and cloth. Iodine reacts with fatty acids and moisture, visualizing a latent print with a yellow to brown color within a few seconds. However, because iodine sublimates so easily, developed prints will fade. The visualized prints must be immediately photographed or fixed with chemicals.

3. Chemical treatments

- Prints on porous surfaces (e.g., papers, cardboard, and cloth) generally require treatment with a chemical.

- Examiners use various chemical methods to visualize latent prints on porous surfaces, such as:

  - iodine fuming
  - ninhydrin
  - Physical Developer

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Iodine Fingerprint

- *Iodine fuming* is used to reveal prints on porous and semiporous surfaces such as paper, cardboard, and unfinished wood. For items too big for a fuming chamber, there is an idoine spray available
- **Iodine**—fumes react with oils and fats to produce a temporary yellow-brown color.
- natural body fats and oils (from sebaceous glands) of a latent print temporarily absorb the iodine vapors, non-destructive

Latent Prints – Iodine Fuming

- Of the several chemical methods used for visualizing latent prints, iodine fuming is the oldest.
  - Iodine is a solid crystal that, when heated, transforms into a vapor without passing through a liquid phase; such transformation is called sublimation.

Latent Prints – Iodine Fuming

- Most often, the suspect material is placed in an enclosed cabinet along with iodine crystals.
- As the crystals are heated, the resultant vapors fill the chamber and combine with constituents of the latent print to make it visible.

Latent Prints – Fuming Cabinet

A heated fuming

Courtesy Sirchie Finger Print Inc., Youngsville, N.C.,

Latent Prints – Iodine Fuming

- Iodine prints are not permanent and begin to fade once the fuming process is stopped.

  Must photograph immediately on development.

  Prints can be fixed with a 1 percent solution of starch in water, applied by spraying.

Iodine fuming

- iodine is a solid crystal that when heated, turns into a vapor without passing through a liquid phase
  - this transformation is called Sublimation.

- Suspect material is placed in an enclosed cabinet with iodine crystals
- Once heated, vapors fill the chamber and combine with latent print to make it visible.

- Iodine prints are not permanent and begin to fade once fuming is stopped.
  - NECESSARY TO PHOTOGRAPH IMMEDIATELY

- Can be fixed with 1% solution of starch in water applied by spraying- this will turn blue and last for several weeks or longer.

https://www.youtube.com/watch?v=SQ9dYQ_OSPg

DETECTING PRINTS

Iodine fuming involves heating iodine crystals that cause vapors which combine with latent prints to make them visible. Iodine prints are not permanent and will fade, making it necessary to photograph the prints immediately. These fumes are very toxic to breathing humans.

•Physical Developer is a silver nitrate-based reagent used to develop prints when other chemical methods are ineffective. It is used on porous items that may have been wet. It washes away proteins and is therefore a last resort.

Iodine Fuming

- Appropriate Surface:
  - –porous and non-porous such as paper, index cards, magazines, and cardboard.
- Theory:
  - –Sweat and oil will absorb iodine vapors

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Place the Object in an Enclosed Container with Iodine Crystals

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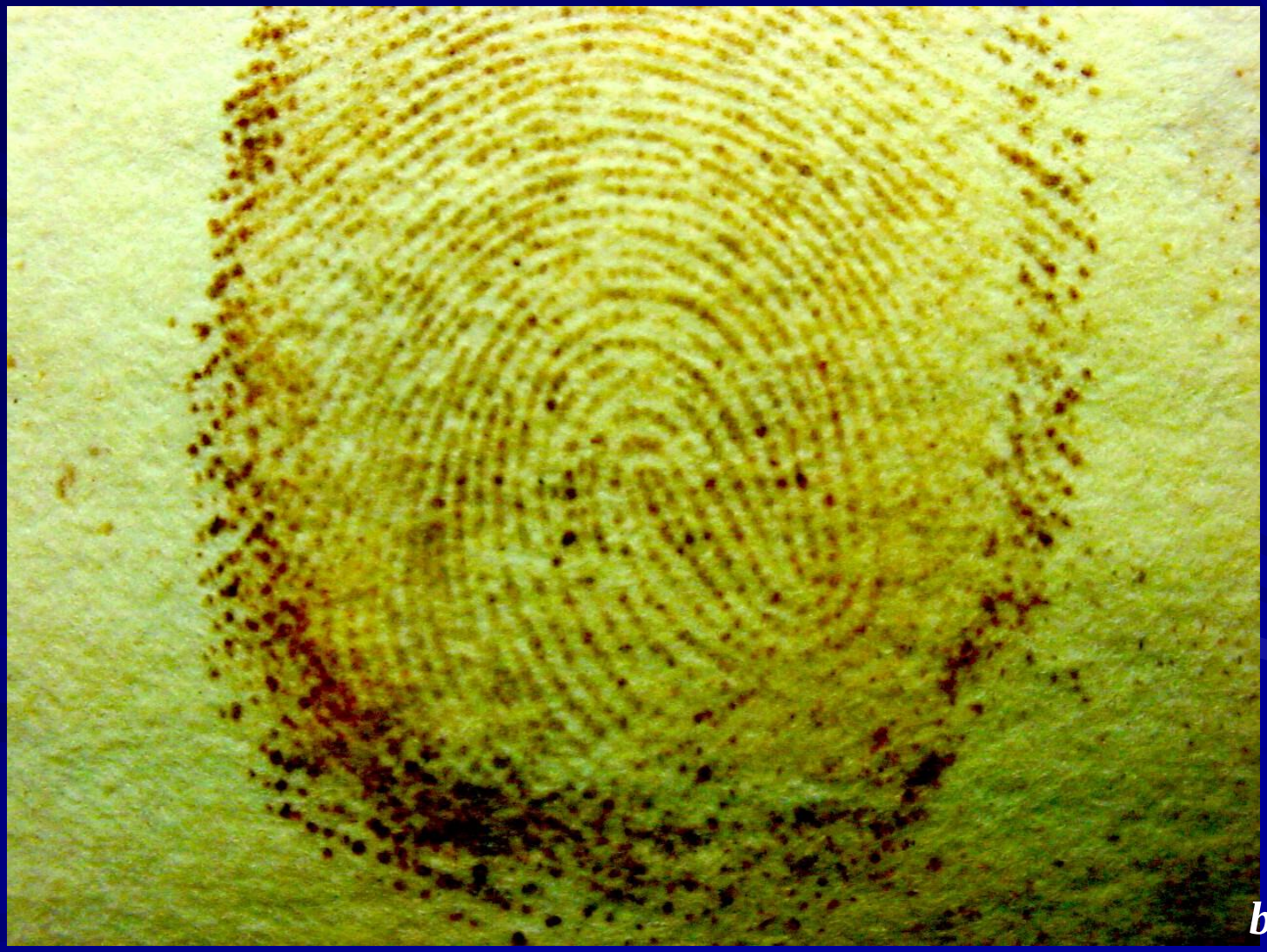
Print Should Develop in a Few Minutes



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CHEMICAL METHODS FOR VISUALIZING LATENT PRINTS

new fingerprinting technology

DEVELOPING LATENT PRINTS

- FUMING:
  - Iodine
    - iodine sublimates when heated giving off fumes.
    - The iodine fumes adhere to the latent print
    - Old technology – does not last long print visible fades in minutes

- FUMING:
  - Super glue (Crazy glue)
    - can visualize a print on non-porous surfaces as well as metals, tape, leather and plastic bags
    - Heating the Super glue releases cyanoacrylate ester fumes
    - Fumes produce a white fluffy print

Chemical Treatment

- **Iodine fuming** involves heating iodine crystals that cause vapors which combine with latent prints to make them visible.
  - **Iodine prints** are not permanent and will fade, making it necessary to photograph the prints immediately.
- **Ninhydrin** reacts chemically with trace amounts of amino acids present in latent prints to produce a purple-blue color.
- **Physical Developer** is a silver nitrate-based reagent used to develop prints when other chemical methods are ineffective.

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NINHYDRIN

Porous surfaces

95% of fingerprints on paper are developed with the Ninhydrin technique

delayed 24 hours - 10 days to develop

reacts with **Amino Acids**

Is cheaper than DFO

Cannot use on items that have been wet (amino acids are water soluble)

Develops Purple

Ninhydrin has surpassed iodine as the most popular chemical method for processing latent fingerprints on porous, absorbent surfaces like paper, cardboard, and wood. It is commonly sprayed onto the porous surface from an aerosol can. Ninhydrin reacts with amino acids in sweat, coloring the print purple. The color develops slowly and may take several hours to fully react. Because amino acids do not react with the cellulose in paper or wood, the technique can be used on old prints. To increase their contrast, the prints may be treated with metal salts to form photo-luminescent complexes that reflect well when illuminated with laser light..

NINHYDRIN

- The most cost effective chemical development method is Ninhydrin
- Ninhydrin is used on paper, cardboard, or other porous surfaces.
- The problem with spraying Ninhydrin solutions is that, since Ninhydrin reacts with amino acids, any exposure to your body, especially to your eyes or lungs, could have serious results. This potentially dangerous exposure is minimized by dipping or painting.

https://www.youtube.com/watch?v=o89J3dmKCHM

Ninhydrin Fingerprint

- **Ninhydrin is a chemical developer and** reacts with amino acids to produce a purple color.
- Best used with porous surfaces because amino acids tend to remain stationary when absorbed and do not migrate.
- Since Ninhydrin reacts to the water-soluble portion of the fingerprint, if the substance has been immersed in water, this chemical will not work.
- Ninhydrin can reveal prints that are many years old
- some formulations of ninhydrin will cause certain inks to run, thus destroying the writing

Paper treated with ninhydrin reagent reveals latent prints after being processed with a household steam iron

DEVELOPING PRINTS

- FUMING:
  - NINHYDRIN
    - The chemical reacts with amino acids to produce a purple-blue color
    - Usually used as an 0.6 % solution sprayed as an aerosol on porous surfaces
    - Takes 1 to 48 hours can increase developing by heating in an oven
    - Effective on paper that was 15 years old

Latent Prints - Ninhydrin

- For most fingerprint examiners, the chemical method of choice is ninhydrin.
- Its extreme sensitivity and ease of application have all but eliminated the use of iodine fuming.
- Ninhydrin is a chemical reagent used to develop latent fingerprints on porous materials by reacting with amino acids in perspiration.
- It is commonly sprayed onto the porous surface from an aerosol can.

Latent Prints - Ninhydrin

- The development of latent prints with ninhydrin depends on its chemical reaction to form a purple-blue color with amino acids present in the trace amounts in perspiration.

- Generally, prints begin to appear within an hour or two after ninhydrin application.

Chemical Treatment

- **Iodine fuming** involves heating iodine crystals that cause vapors which combine with latent prints to make them visible.
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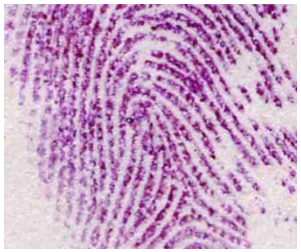
Some investigators use **fluorescent** powder and UV lights to help them find latent prints on multi-colored or dark surfaces.

Magnetic powder can also be used to reveal latent prints. This type of powder works better on **shiny** surfaces or **plastic** baggies or containers.

The **cyanoacrylate** fuming method (often called the super glue method) is a procedure that is used to develop latent fingerprints on a variety of objects.



Ninhydrin is a chemical that bonds with the amino acids in fingerprints and will produce a blue or purple color. It is used to lift prints from surfaces such as paper and cardboard.

Click the icon to view the Crime 360 Super Glue Video

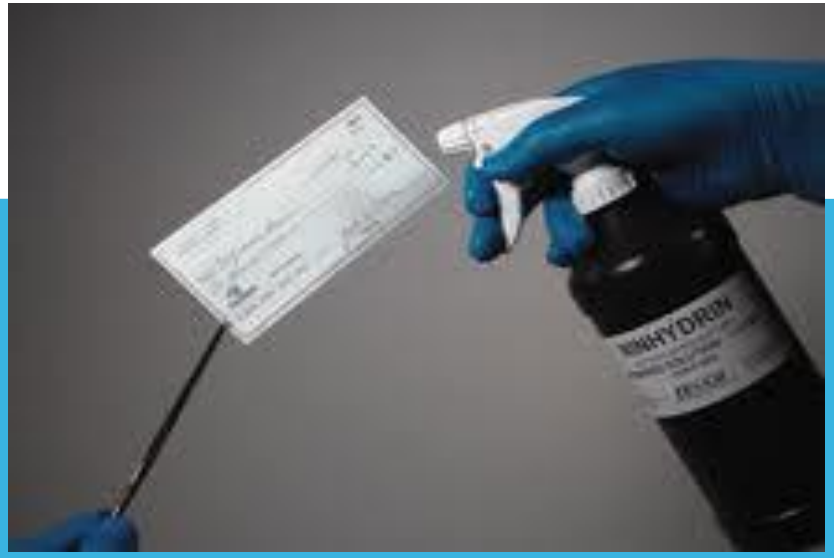
Top Left: http://www.stapletonandassociates.com/images/MagPowder.jpg

Bottom Left: http://www.ok.gov/osbi/images/ninhydrin%20print.jpg

Bottom Right: http://www.forensicsrus.com/images/SupergluePrint.jpg

Detecting Prints

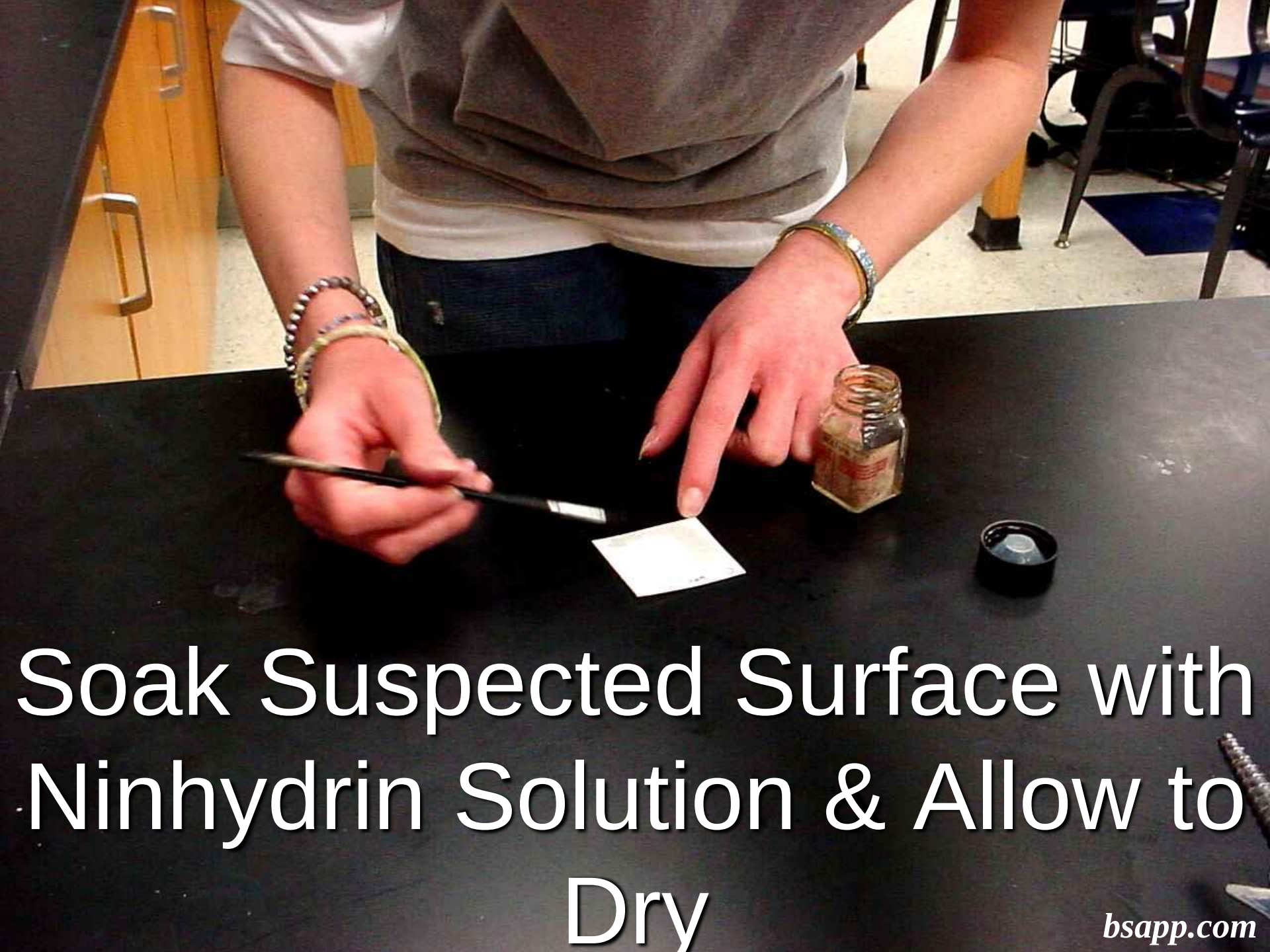
- **Ninhydrin reacts chemically with trace amounts of amino acids present in perspiration. It produces a purple-blue color. Very popular today due to sensitivity and ease of application.**



Ninhydrin

- Appropriate Surface:
  - –porous such as paper, tissue, and clothing
- Theory:
  - –ninhydrin reacts with amino acids to form a purple compound

bsapp.com



Soak Suspected Surface with Ninhydrin Solution & Allow to Dry

bsapp.com

Print Should Develop Within 24 Hours

bsapp.com

METHODS OF ENHANCEMENT

CHEMICALS

IODINE FUMING

NINHYDRIN -

- REACTS WITH PROTEINS

PHYSICAL DEVELOPER -

- SILVER NITRATE BASED
- USED WHEN OTHER METHODS UNSUCCESSFUL

Some investigators use **fluorescent** powder and UV lights to help them find latent prints on multi-colored or dark surfaces.

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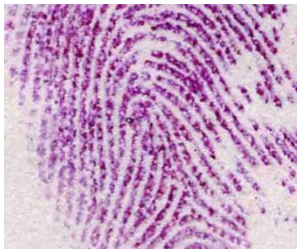

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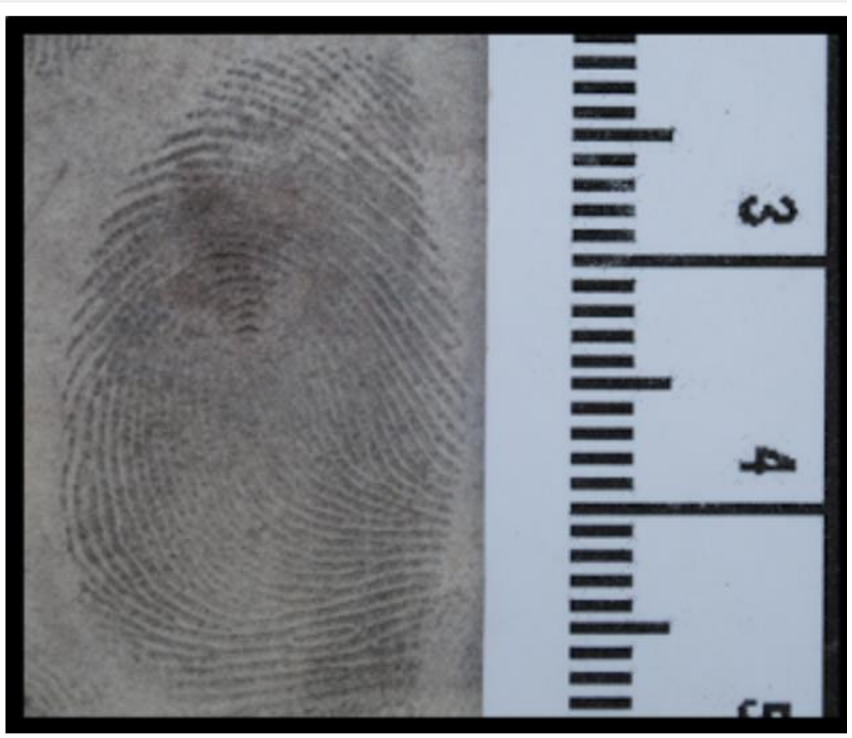

PHYSICAL DEVELOPER

When ninhydrin does not work, chemists often to to physical developer, an excellent reagent for paper and wood surfaces. Since PD reacts with oils, it can be used on wet paper or paper that has been washed. Unfortunately, PD is a destructive method. Because it destroys all the trace proteins, it must be used last. Further, the reagent solution is both difficult to prepare and unstable once made.

Used on Porous Objects

Reacts with Lipids/Fats, Oils, and Waxes

Only technique useful on currency

Cannot be used on metal (interrupts ionic suspension) or Thermal/carbon paper

Bad for grooves/folds on paper. Seeps and stains them

Will **overdevelop if soaked too long** and become solid black

Develops quickly

Only develops ~25% or prints

Cannot use any other techniques after Physical Developer. **LAST RESORT**

Latent Prints – Physical Developer

- Physical developer is a silver nitrate-based reagent formulated to develop latent fingerprints on porous surfaces.
- This technique is very effective for developing latent fingerprints on porous articles that may have been wet at one time.
- LAST IN SEQUENCING ORDER
- Alternate Light Source (ALS)
- Iodine Fuming
- DFO
- Ninhydrin
- **Physical Developer**

Physical Developer

- Physical developer (PD) is useful for developing latent fingerprints on most porous surfaces and some nonporous surfaces. It is particularly useful for revealing latent prints on paper currency, paper bags, and porous surfaces that have been wet.
- PD is a destructive process, and so is always used last if at all.
- PD is normally used after DFO and/or ninhydrin, and often reveals latent prints that neither of these methods revealed.

- The “physical” part of the name is a misnomer. PD is not a physical process (like dusting), but a chemical one. It depends on a redox reaction that reduces silver ions to metallic silver, which stain the latent fingerprints a gray-black color. The PD working solution is unstable, in the sense that it must be used immediately after it is made up, but it is this very instability that allows PD to work as well as it does. PD is expensive, complex, finicky, destructive, and requires a great deal of experience to get good results. Despite these criticisms, PD is used because it often gets results when no other method works. For this reason, many forensics labs routinely use PD as the final step in processing latent prints

- physical developer in the 1970s, is a reliable method for recovering prints from water-soaked documents.

- physical development technique where **small** black **particles** adhere to the fatty substances left in fingerprint residue.

DETECTING PRINTS

Iodine fuming involves heating iodine crystals that cause vapors which combine with latent prints to make them visible. Iodine prints are not permanent and will fade, making it necessary to photograph the prints immediately. These fumes are very toxic to breathing humans.

•Physical Developer is a silver nitrate-based reagent used to develop prints when other chemical methods are ineffective. It is used on porous items that may have been wet. It washes away proteins and is therefore a last resort.

METHODS OF ENHANCEMENT

CHEMICALS

IODINE FUMING

NINHYDRIN -

- REACTS WITH PROTEINS

PHYSICAL DEVELOPER -

- SILVER NITRATE BASED
- USED WHEN OTHER METHODS UNSUCCESSFUL

DEVELOPING PRINTS

- PHYSICAL DEVELOPER
- Chemical mixture – silver nitrate based
- Works even if item was wet –then dried.
- Used as the “last resort” because washes away all traces of proteins

- NEWEST TECHNOLOGY

Laser light can detect latent prints that fluoresce with certain components of sweat.

Alternate light sources:

High-intensity quartz halogen

Xenon-arc

LED’s (light emitting diodes)

DFO (1,8-diazafluoren9-one)

Chemical works with alternate light sources

Chemical Treatment

- **Iodine fuming** involves heating iodine crystals that cause vapors which combine with latent prints to make them visible.
  - **Iodine prints** are not permanent and will fade, making it necessary to photograph the prints immediately.
- **Ninhydrin** reacts chemically with trace amounts of amino acids present in latent prints to produce a purple-blue color.
- **Physical Developer** is a silver nitrate-based reagent used to develop prints when other chemical methods are ineffective.

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SUPERGLUE FUMING

WILL NOT WORK on porous surfaces!

Recommended Surfaces: metals, leathers, purses, plastics and plastic bags, cash drawers, vinyl, aluminum cans, rubber, gun grips, electrical tape, colored paper, glass

Also called the "fuming Superglue technique," cyanoacrylate is used for processing latent prints on paper, plastic, and skin. Cyanoacrylate undergoes base-catalyzed polymerization. The polymer binds with sweat to visualize a latent print in a flat, white color or a few hours. To improve the visibility and contrast, the white prints can be dusted with fluorescent or crystal violet dye and then photographed using an appropriate light source. The technique is so successful that small handheld devices have been created to allow the criminalist to work on prints in place at the scene.

Cyanoacrylate— “superglue” fumes

- used to develop latent prints on nonporous glossy surfaces such as glass, plastic, and polished metal. Cyanoacrylate vapor is selectively attracted to fingerprint residues, where it builds up as a crystalline white deposit. The developed latent prints may be photographed as is, or may be dusted or treated with various dyes that enhance the visibility and contrast of the prints.
- One of the advantages of superglue fuming is that you can fume a piece of evidence and still send it to the laboratory for DNA testing. (Several studies show that testing for DNA actually goes better after the fuming.)
- Superglue fuming is also effective on items that have been outside or are wet, like beer bottles or broken window glass.
- Disadvantages: If you fume evidence too long, you will probably end up with a chalky mess. Also, this technique will not work on porous items (try ninhydrin, instead).
- The item you are going to fume is limited to the overall size of your fuming tank

It all started with a guy named Fuseo Matsumur who was a hair and fiber expert in Japan. One particular workday, he was tasked to glue hair samples from the crime scene for routine microscopic examination.

It wasn’t too long before he noticed his own powdery but detailed fingerprints becoming visible on the edges of the slides he was using. He became the first to determine that using fumes from Superglue (or cyanoacrylate adhesive) constituted a reliable fingerprint recovery method.

Latent Prints – Super Glue Fuming

- Super glue fuming is a technique for visualizing latent fingerprints on nonporous surfaces by exposing them to cyanoacrylate vapors; named for the commercial product Super Glue.

Latent Prints – Super Glue Fuming

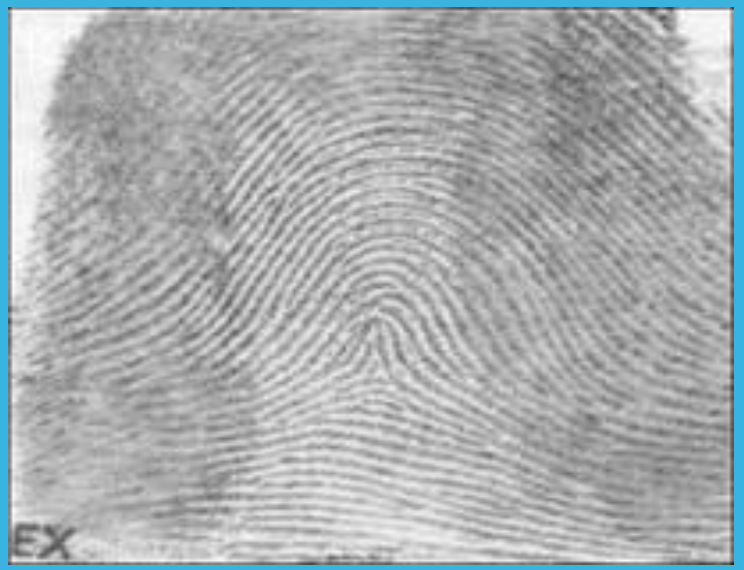
- Super glue is placed on absorbent cotton treated with sodium hydroxide. The fumes can be fumes can also be created by heating the glue.
- The fumes and the evidential object are contained within an enclosed chamber for up to six hours.

DEVELOPING LATENT PRINTS

- **Super Glue® fuming develops latent prints on nonporous surfaces, such as metals, electrical tape, leather, and plastic bags. The active ingredient is cyanoacrylate**
  - **Development occurs when fumes from the glue adhere to the print, usually producing a white latent print. Super Glue® is approximately 98 to 99 percent cyanoacrylate ester, a chemical that actually interacts with and visualizes a latent fingerprint. Very dangerous to breath.**

Figure 1: Super glue chamber in Drew Science Center Room 205.

video



2. Super Glue

- Super Glue fuming develops latent prints on nonporous surfaces, such as metals, electrical tape, leather, and plastic bags.

  - Development occurs when fumes from the glue adhere to the print, usually producing a white latent print.

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Latent Prints – Super Glue Enclosed Chamber

disposable cartridges containing cyanoacrylate

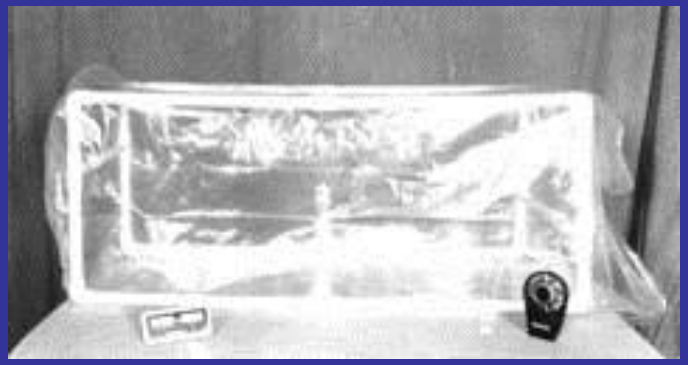
Wand can be used at Crime Scene to develop prints

Latent Prints – Super Glue Fuming

- Super glue is approximately 98 to 99 percent cyanoacrylate ester, a chemical that interacts with and visualizes a latent fingerprint.
- Development occurs when fumes from the glue adhere to the latent print, usually producing a white-appearing latent print.

Cyanoacrylate (Super Glue) Fuming

- Super Glue fuming- works great on nonporous surfaces- metals, leather, plastic bags.
- Created when superglue is placed on cotton and treated with sodium hydroxide.
- Created when heating- produces toxic vapors- cyanide.
- Fumes and object contained within an enclosed chamber for up to 6 hrs.
- Produces white latent print.



Prints can last for years if stored properly!

DEVELOPING LATENT PRINTS

- FUMING:
  - Iodine
    - iodine sublimates when heated giving off fumes.
    - The iodine fumes adhere to the latent print
    - Old technology – does not last long print visible fades in minutes

- FUMING:
  - Super glue (Crazy glue)
    - can visualize a print on non-porous surfaces as well as metals, tape, leather and plastic bags
    - Heating the Super glue releases cyanoacrylate ester fumes
    - Fumes produce a white fluffy print

METHODS OF ENHANCEMENT

CHEMICALS

SUPER GLUE FUMING -

- CYANOACRYLATE ESTER
- NON-POROUS SURFACES
- CREATE FUMES WITH HEAT
- PORTABLE WAND AVAILABLE

Latent Prints – Other Chemical Techniques

- Silver nitrate
- Luminescence
- Amido black
- Gentian Violet
- Ardrox
- Rhodamine G

DFO

Diazafluoren-9-One (DFO)

Similar to Ninhydrin but more sensitive, DFO reacts with the amino acids and can be used to visualize fingerprints on paper using a tunable light source.

Develops **2.5x** more prints than Ninhydrin

Flammable - used in film hood, full-face mask, gloves

Reacts with **Amino Acids** in fingerprint

takes 24 hours to process without oven/hair dryer to accelerate development

cannot be used on previously wet items (washes off amino acids)

Shelf life - 6 months

More sensitive to amino acids than Ninhydrin

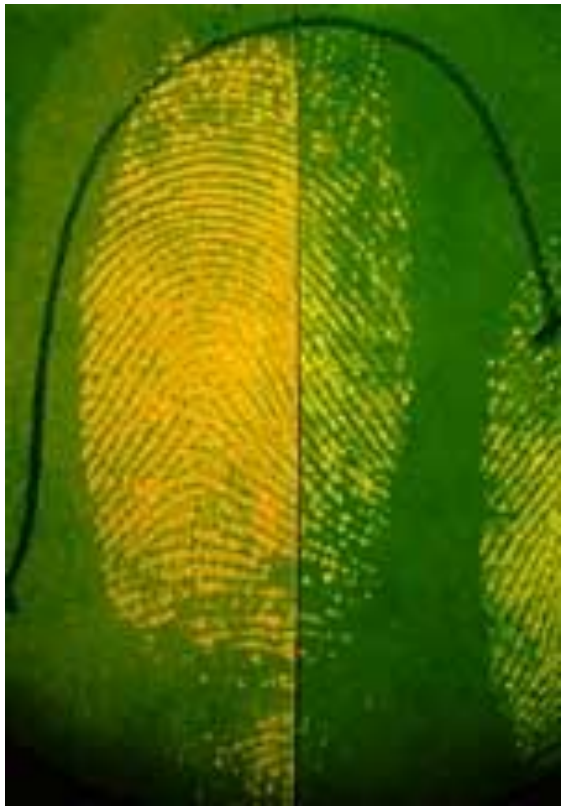
.

When to use DFO over Ninhydrin?

Since Ninhydrin dries purple, use DFO on dark, purple or busy backgrounds

DFO (1,2-diazafluoren-9-one)

- DFO (1,2-diazafluoren-9-one) is another chemical used to locate latent fingerprints on porous surfaces; it causes fingerprints to fluoresce, or glow, when they are illuminated by blue-green light.

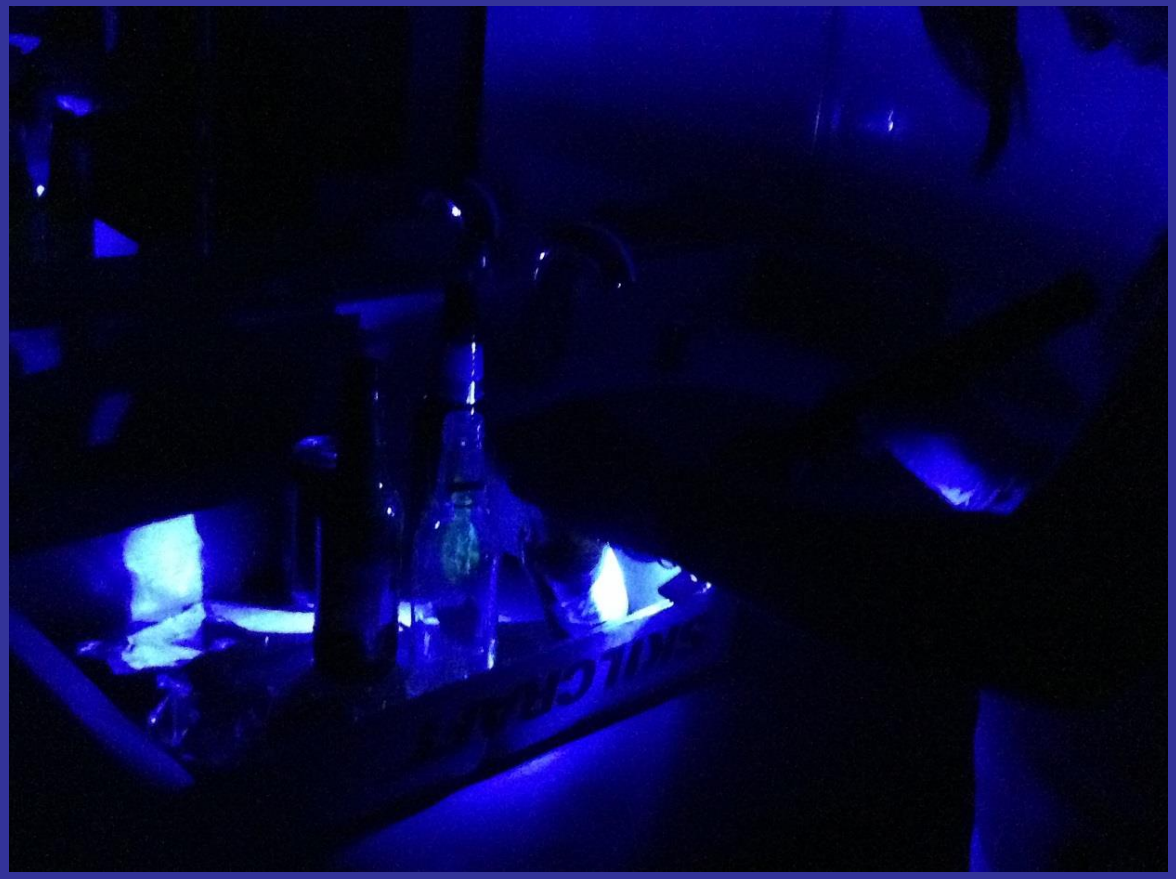


DFO Chemical Treatment

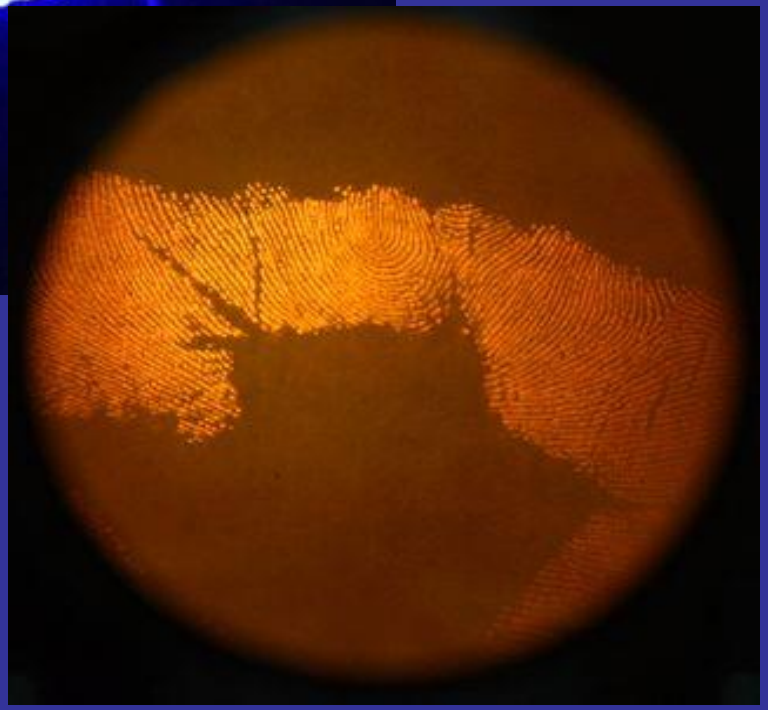
1,2-Diazafluoren-9-ONE (DFO)

- Detection of latent fingerprints on porous or non porous exhibits.
- DFO reacts with the amino acids to produce a light pink colored product that fluoresces yellow under blue/ green light.
- Process requires spraying with DFO, rinsing and drying, then examining with UV light.
- Works well for prints that have no moisture left or can't be seen with naked eye.

- **DFO (1,8-diazafluotrn-9-one)** – newer chemical than ninhydrin. It is 2.5 times more sensitive than ninhydrin.



DFO Prints



SILVER NITRATE

The development of the latent print is caused by reaction between the solvent and chloride ions in sweat in the latent print. The silver chloride is light sensitive and turns black on exposure to light. The reaction deposits metals on the sample and ruins the sample for any further testing, so other non-destructive methods should be tried first. But silver nitrate will work on very old prints when nothing else will.

Silver Nitrate

- Silver nitrate development is based on the reaction of soluble silver nitrate with the sodium chloride (salt) that is present in most latent fingerprints to form silver chloride.
- Exposing the silver chloride to sunlight or an ultraviolet lamp causes the silver chloride to be reduced to metallic silver, making the latent prints visible as black or dark gray traces.
- Very old latent fingerprints retain it and can be developed by silver nitrate. Accordingly, silver nitrate development may work when iodine fuming and ninhydrin fail completely.
- (Note that failure of these other reagents says nothing about the age of the latent prints; even prints that are only hours or days old may respond only to silver nitrate development.)
- Silver Nitrate is destructive, so used as last resort

Silver Nitrate

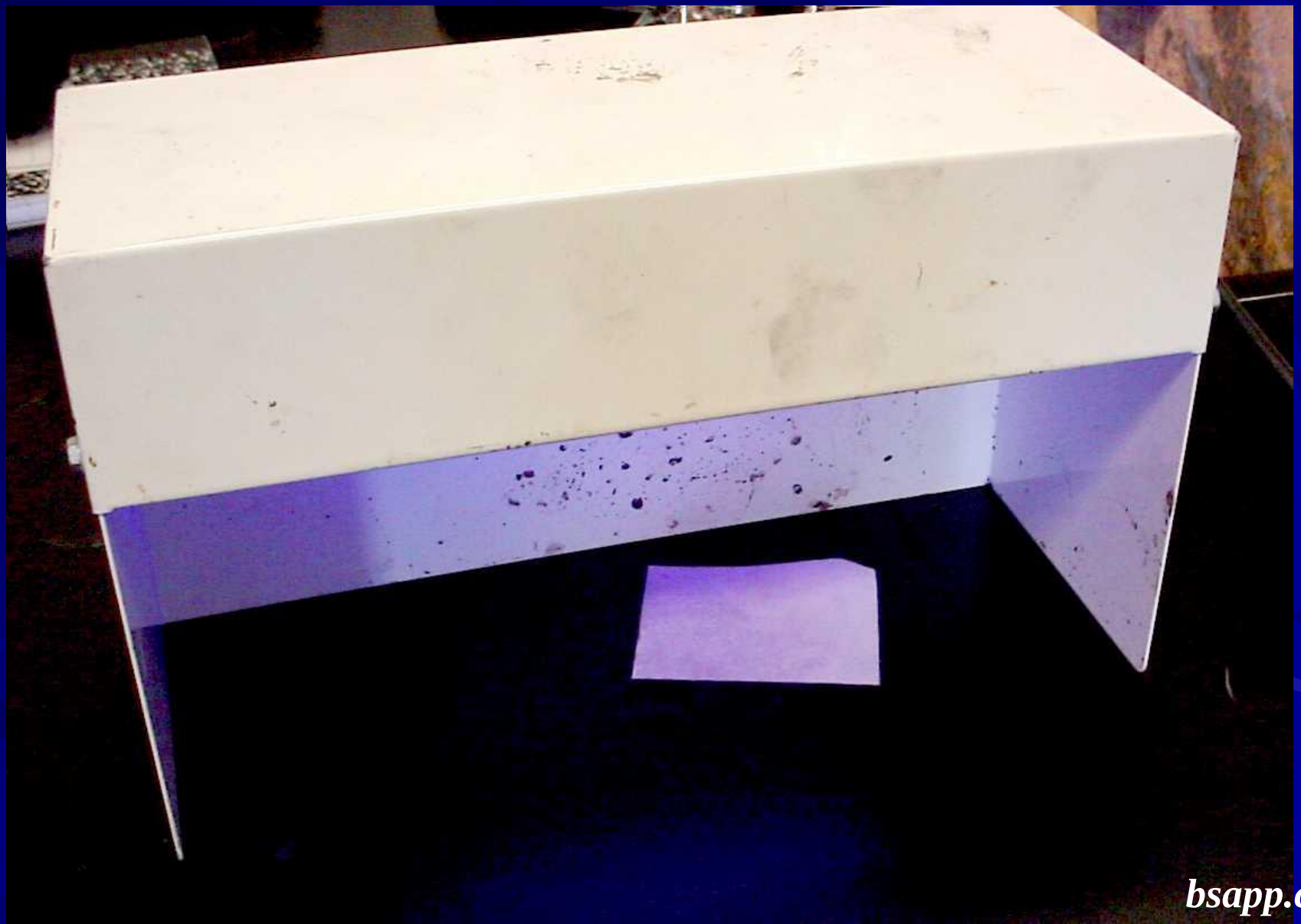
Silver nitrate may succeed where other development methods fail, because silver nitrate reacts with the non-volatile sodium chloride present in fingerprint residues. Very old fingerprints may have lost all of their volatile residues, but the sodium chloride residue remains

- The fingerprint will appear gray when exposed to light.
- Silver nitrate is destructive – only get one chance, so it is used last, if it is used at all.
- has been used successfully to develop latent prints that are years, decades, even centuries old.

Spray Surface With Silver Nitrate Solution

bsapp.com

Expose to UV-Light



Print Should Develop in 5-10 Minutes

bsapp.com

AMIDO BLACK, CRYSTAL VIOLET, HUNGARIAN RED, ETC

Sudan black
If the print is greasy, sudan black will react with the fatty components and give good ridge definition.

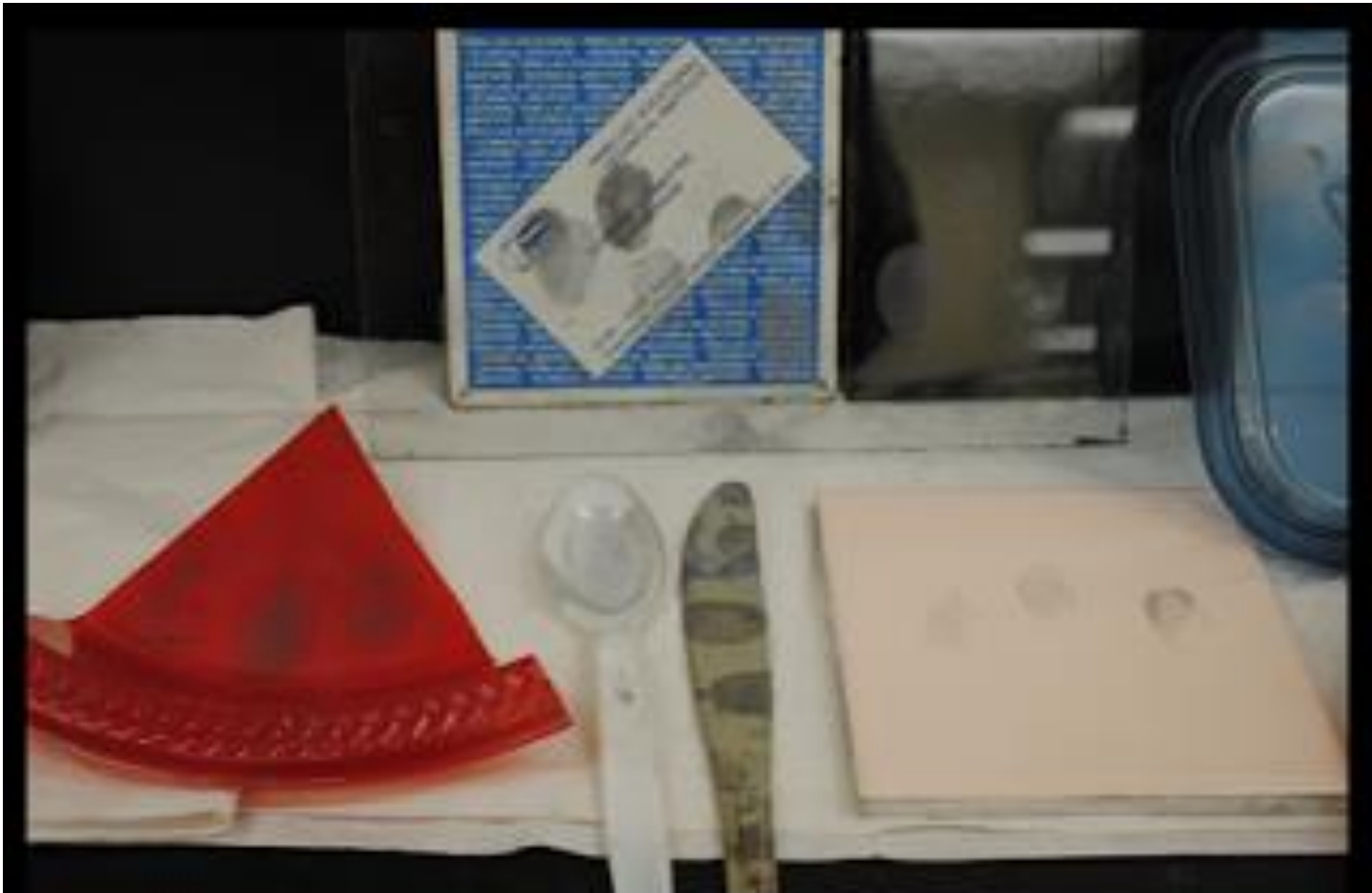
Amido black
If the print is bloodstained, use amido black. It reacts with proteins in blood, but not with other material typically left in a fingerprint, so good ridges can be obtained. It is very good on plastics and cotton.

Small particle reagent
A small particle reagent is a suspension of small particles of molybdenum disulfide that adheres physically to fatty substances in the latent print. It is notable for being resistant to water and can even work under water.

Sudan Black

- Is for greasy, sticky and waxy surfaces (bag of potato chips)
- Is mixed with methanol, the alcohol evaporates and only the Sudan Black stain remains
- Non-porous surfaces - glass, metal, plastic and the inside of latex gloves
- can be used on wet or dry surfaces
- reacts with the lipids/fats to develop print

Sudan Black



Crystal Violet

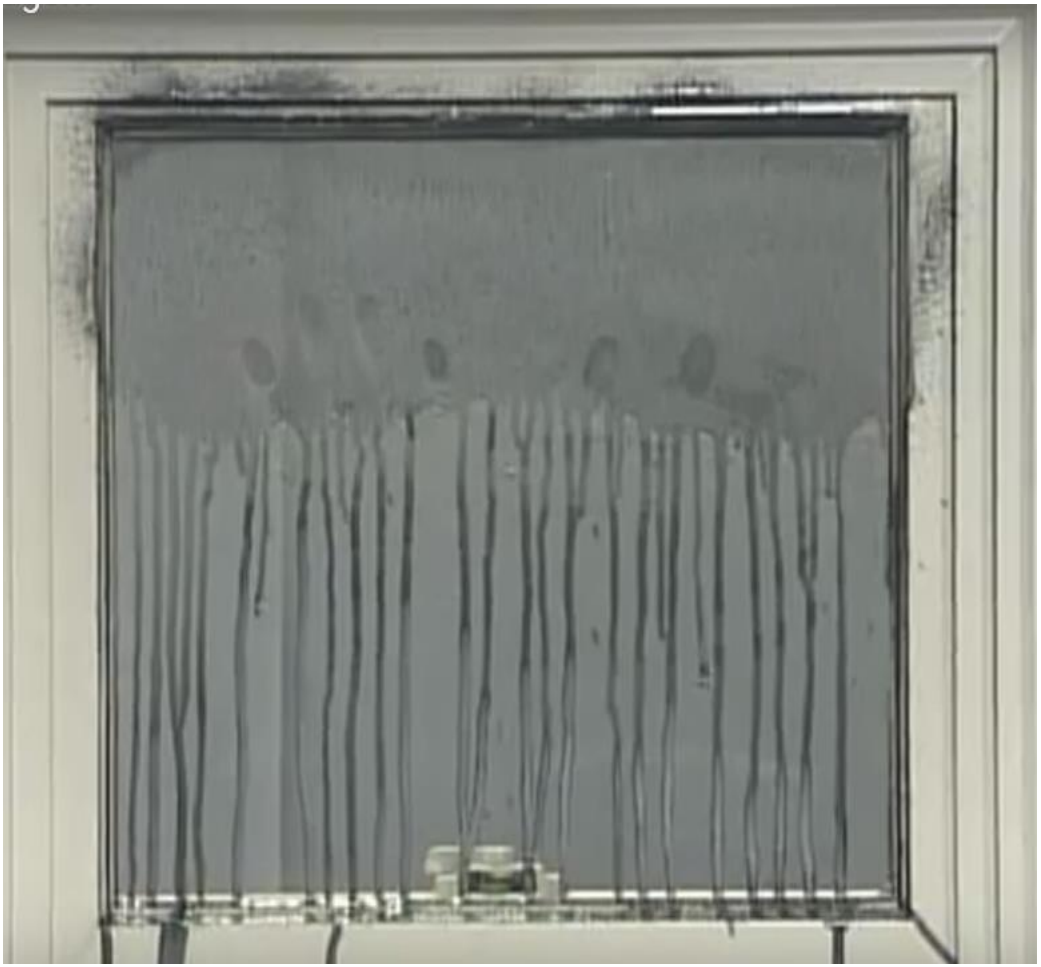
- Used to develop fingerprints on **Adhesive Surfaces**
- Reacts with sebaceous **Lipids/Fats**
- Stains proteins from dead skin cells
- Opaque, dark **background staining** is main concern from technique
- Effectiveness varies depending on of tape/adhesive surface
- If tape is on glass, Freeze the tape before removing to prevent damage to fingerprint
- best on **Non-Porous** surfaces
- Stains. Wear gloves
- **Develops Purple**

Fingerprint lifted from duct tape

Small Particle Reagent

- liquid fingerprint powder
- develop fingerprints on wet surfaces
- Develop prints on submerged objects
- Very messy.

- physical development technique where **small** black **particles** adhere to the fatty substances left in fingerprint residue.



Small Particle Reagent

- Used when item is **wet** or on wet surfaces
- More commonly used over Sudan Black
- Reacts with Lipids/fats
- Non-porous surfaces

- Can be sprayed using a spray bottle, a compressed-air spray system, or dipped if small enough

Small Particle Reagent

- PROS -
- Easy cleanup - soap and water
- Can be used underwater
- Immediate reaction

- CONS -
- Very messy
- Stains
- Needs gloves and safety glasses

Especially Tricky – bloody fingerprints on non-porous surfaces

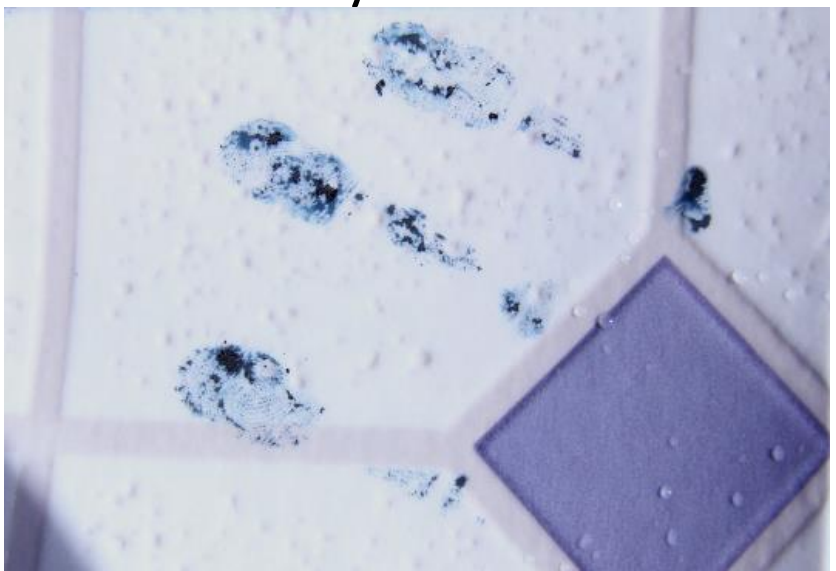
Problems:

The print has texture, so powders won't work

Chemicals that react with fingerprint ridges also react with blood, so you can't get a print

Solutions

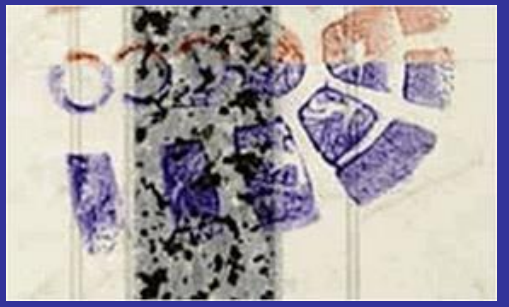
- Amido Black is a protein stain
- Leuco Crystal Violet reacts with the blood and ignores regular fingerprint components
- Hungarian Red is very sensitive to blood residue and is less toxic than other chemicals
- All of these destroy DNA



Other fingerprint chemicals

- **Gentian violet (or crystal violet)** – used for developing latent prints on the adhesive side of tape. An aqueous solution of crystal violet is sprayed directly onto the adhesive.

- **Amido Black** – protein dye stain that can develop faint bloody fingerprints on porous and nonporous surfaces.



Fingerprint Chemicals (continued)

- **LCV (Leuco Crystal Violet)** – a protein stain spray that can develop faint or invisible bloody fingerprints on non-porous surfaces

ALTERNATIVE LIGHT SOURCE

Developing Prints - Alternative Light Source

- **Alternate Light Source (ALS):** It is becoming more commonplace for investigators to examine any likely surfaces (doors, doorknobs, windows, railings, etc.) with an alternate light source. These are laser or LED devices that emit a particular wavelength, or spectrum, of light.
- Some devices have different filters to provide a variety of spectra that can be photographed or further processed with powders or dye stains. For example, investigators may use a blue light with an orange filter to find latent prints on desks, chairs, computer equipment or other objects at the scene of a break-in.

Using a fluorescent dye stain and an orange alternate light source helps this latent print appear clearly so that it can be documented

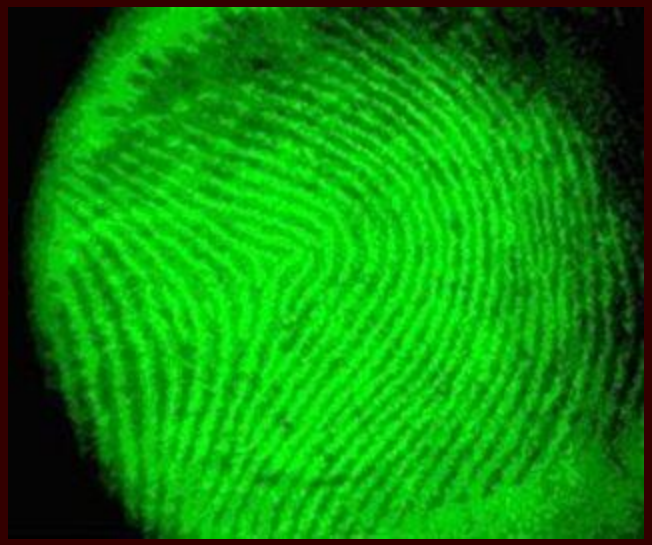
DETECTING PRINTS WITH FLUORESCENCE

- The high sensitivity of fluorescence serves as the underlying principle of many of the new chemical techniques used to visualize latent fingerprints.
- Fingerprints are treated with chemicals that would induce fluorescence when exposed to lasers, or high-intensity light sources ("alternate light sources") such as quartz halogen, xenon arc, or indium arc light sources.
- Once the latent print has been visualized, it must be permanently preserved for future comparison and for possible use as court evidence.
- A photograph must be taken before any further attempts at preservation are made, such as tape lifting.

DETECTING FINGERPRINTS

- Can use RUVIS (Reflected Ultraviolet Imaging System) which locates prints on soft surfaces without the use of chemicals with UV light

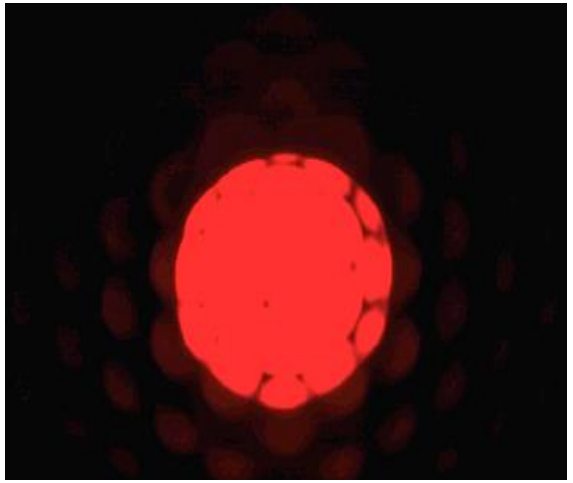
RUVIS



METHODS OF ENHANCEMENT

FLUORESENCE

- PERSPIRATION CONTAINS COMPONENTS THAT FLUORESCE WHEN ILLUMINATED WITH LASER LIGHT
- HIGHLY SENSITIVE
- ALTERNATE LIGHT SOURCE
  - QUARTZ HALOGEN
  - ZENON ARC
  - INDIUM ARC
- DOES NOT INTERFERE WITH DNA TESTING



DEVELOPING PRINTS

- PHYSICAL DEVELOPER
- Chemical mixture – silver nitrate based
- Works even if item was wet –then dried.
- Used as the “last resort” because washes away all traces of proteins

- NEWEST TECHNOLOGY

Laser light can detect latent prints that fluoresce with certain components of sweat.

Alternate light sources:

High-intensity quartz halogen

Xenon-arc

LED’s (light emitting diodes)

DFO (1,8-diazafluoren9-one)

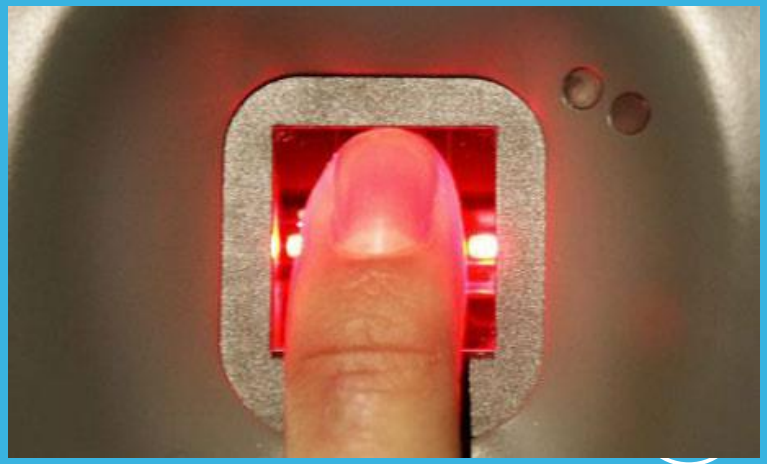
Chemical works with alternate light sources

DIGITAL IMAGING

- **Digital imaging is the process by which a picture is converted into a digital computer file.**

- **With the help of digital imaging software, fingerprints, which are often not in perfect condition, can now be enhanced for the most accurate and comprehensive analysis.**

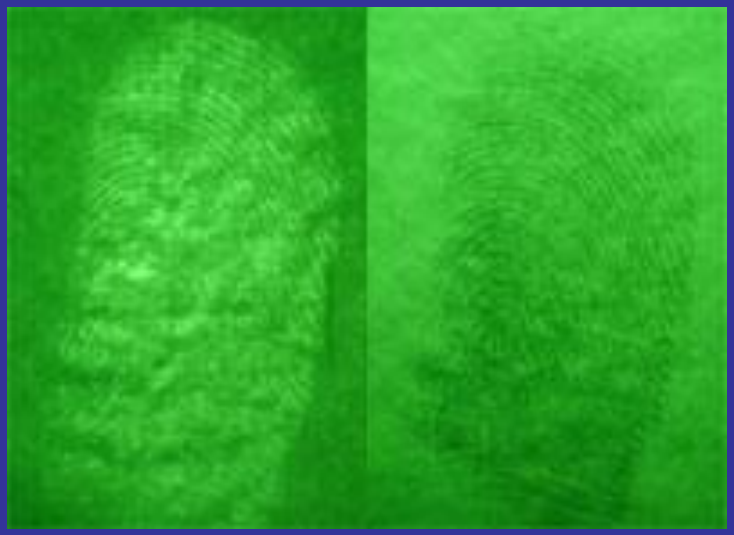
- **An important and useful tool, especially for fingerprint identification, is the compare function that places two images side by side and allows the examiner to chart the common features on both images simultaneously.**



Ultraviolet Imaging Systems

- Reflected Ultraviolet Imaging System- locates prints on nonabsorbent surfaces without chemical or powder treatments.
- When UV light strikes the fingerprint, light is reflected back to the viewer- differentiating the print from its background surface.
- UV light is converted into visible light by image intensifier.

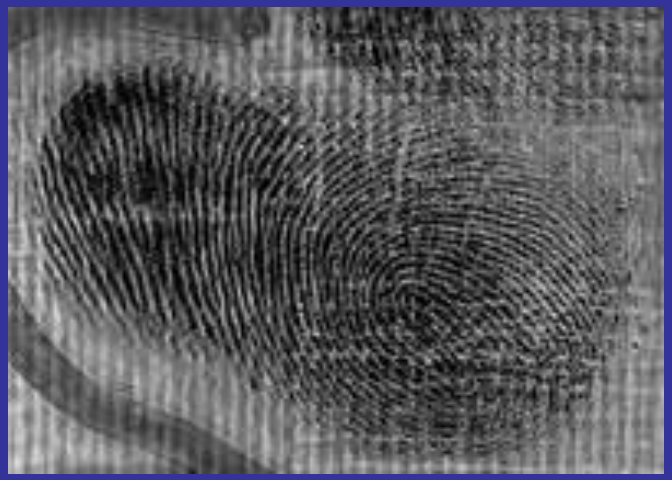
Ultraviolet Imaging Systems



Latent fingerprint on Painted Wall.
Illustration of Contrast Effect due to variation of illumination angle.

Depending on what angle the user holds the light, a print can either appear white or black.

Ultraviolet Imaging Systems



Untreated Oily Print on sticky side of Duct (Duck) tape.

35mm Black and White film.
Scene Scope excels at detecting prints on surfaces that a forensic light source would find difficult or impossible.

Ultraviolet Imaging Systems

- Hand held Forensic Light Sources

ADDITIONAL INFORMATION: ALL THE METHODS

Summary of Fingerprint Development

- **smooth, Non-Porous**
  - This category includes glass, hard plastic moldings (bare metals are not included) and surfaces treated with paint or varnish.
  - Powders, iodine, small particle reagent and cyanoacrylate and fluorescent dyes may be used on these surfaces.
- **rough, non-porous**
  - Rough or textured surfaces and grained plastic moldings are included in this category.
  - Regular powders are usually unsuitable on these surfaces. Use small particle reagent, magnetic powders or cyanoacrylate with fluorescent dyes.
- **paper and cardboard**
  - These surfaces include paper and cardboard (including plaster board) that have not been waxed or plastic-coated.
  - Treat with iodine, ninhydrin, DFO, silver nitrate or physical developer. Powders are generally insensitive to older fingerprints.
- **plastic packaging material**
  - This category includes polyethylene, polypropylene, cellulose acetate and laminated paper surfaces.
  - Use iodine, small particle reagent, cyanoacrylate and fluorescent dyes and powders. Cyanoacrylate is especially useful on Styrofoam.
- **soft vinyl (PVC), rubber and leather**
  - These surfaces include simulated leather and cling film.
  - Use iodine, small particle reagent, cyanoacrylate and powders.
- **metal (untreated)**
  - These surfaces include untreated, bare metal surfaces—not metal surfaces that have been painted or lacquered.
  - Use small particle reagent, powders, cyanoacrylate/fluorescent dyes and powders.
- **polished or plated metals**
  - The most effective method for latent development on these surfaces (chrome plated, silver, etc.) is a metallic powder such as Silver, Gold or Copper powders.
  - Magnetic powders should not be used on ferrous metals such as iron or steel
- **unfinished wood**
  - This category includes unfinished wood surfaces—that have not been painted or treated. Treat with ninhydrin.
  - Use powders on smooth wood and silver nitrate or small particle reagent on light woods.
- **wax and waxed surfaces**
  - This category includes items made of wax (such as candles) and wax-coated paper, cardboard and wood surfaces.
  - Treat with nonmetallic powders or cyanoacrylate/ fluorescent dyes.
- **adhesive-coated surfaces**
  - This category includes tapes and similar surfaces that are not likely to dissolve in water. Use adhesive side powders

	Powders	Iodine	Ninhydrine	Physical Developer	Super Glue
What Reacts With	Perspiration and oil	Fats	Amino Acids	Sodium Chloride	Fats
Surface	Nonporous	Porous	Porous	Porous	Porous and Nonporous
Notes		Not permanent	Very sensitive	Use Last OR Use if item was wet	

Development Method	Physical/ Chemical	Destructive/ Not-Destructive	Fresh / Older	Field/ Lab	Use For
Powder	P	ND	F	F	Non-Porous surfaces
Iodine Fuming	P	ND	F	F	Paper
Silver Nitrate	C	D	O	L	Paper
Ninhydrin	C	ND	F	L	Paper
DFO	C	ND	R	L	Porous
Superglue fuming	P	ND	O	F	Non-Porous
Alternative Light source	P	ND	F	F	All
Physical Developer	Ch	D	O	L	Have been wet
Small particle reagent	P	ND	F O	F	Submerged or wet

Development Method	Surface	Notes
Powder	Non-porous	Powder color should contrast with background. Standard, florescent, magnetic
Iodine Fuming	paper	temporary
Silver Nitrate	paper, cardboard, plastics and unvarnished wood	It is not useful on items which have been exposed to water.
Ninhydrin	paper	not useful on items which have been exposed to water, can destroy ink on document
DFO	porous surfaces, especially paper	requires a specialized light source, can destroy ink on document
Superglue fuming	Non-porous, Styrofoam and plastic bags	Use to fix prints on surfaces before sending them to the lab. If done too long, destroys print
Alternative Light source	Non porous surfaces	Always use first, UV light can destroy DNA
Physical Developer	paper currency, paper bags, and porous surfaces that have been wet.	Works well on items exposed to water, destroys DNA
Small particle reagent	Non-porous	Powder color should contrast with background

harden.

This print was developed after a fire. The technician simply wiped the soot from the bottle – no powder was used

This print was developed from a feather!

Prints in difficult places

Adhesive side developer was used to recover prints from the sticky side of electrical tape that the criminal used to bind the victim.

From http://www.evidencemagazine.com/index.php?option=com_content&task=view&id=22

Prints on difficult surfaces

Human skin

There is specially treated paper that can be pressed onto the skin, and then powder applied to the paper. But after a few hours the skin's normal secretions will displace the print.

Tough, pebbled surface such s a car dashboard or football

Use magnetic powder that will get into all the tiny creavases

Pour silicon gel, let set, and peel the gel off

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How old is the fingerprint?

Fingerprints degrade over time, so you would think determining the age of a fingerprint would be a simple matter

However, it has been a huge frustration to investigators all over the world that this cannot be done! The reasons are:

- Each fingerprint is a unique combination of the amount of dirt, sweat, and other items that were one the person's skin when it was deposited. Each of these components degrades at different rates.
- Fingerprints also depend on the humidity, temperature, and atmosphere conditions when it was deposited.
- There are so many variables, that we have not yet developed a test for fingerprint age, other than
  - "fresh" (within one day)
  - Within a week (maybe)
  - Within a month (possibly) or
  - Old and dried-out – which can happen in days depending on the conditions!

The myth of getting prints from firearms

Firearms are perhaps among the most difficult objects to yield good latent fingerprints. technicians will typically get prints on only about ten percent of the guns that are inspected. “Why are guns so difficult?

- The textured nature of the area where the gun is being held. That area is not good for prints.
- Another factor has to do with how the firearm was treated before the crime. If the person took good care of it, then it probably has oil on it—which makes it almost impossible to get a good print.
- And if they have not taken care of it, the surface might be rusty—and rust is not good for lifting prints.

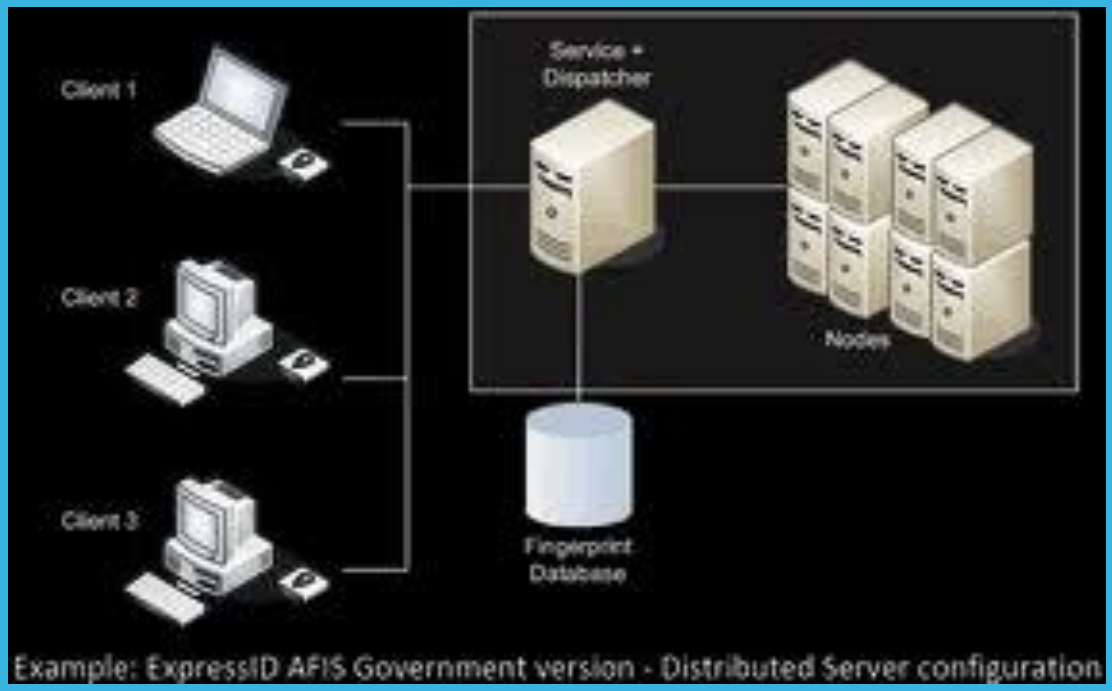
AFIS AND IAFIS

AFIS COMPUTERIZED FINGERPRINTS

- The heart of AFIS technology is the ability of a computer to scan and digitally encode fingerprints so that they can be subject to high-speed computer processing.

- AFIS aids in classifying and retrieving fingerprints by converting the image of a fingerprint into digital minutiae that contain data showing ridges at their points of termination (ridge endings) and their branching into two ridges (bifurcations).

Video

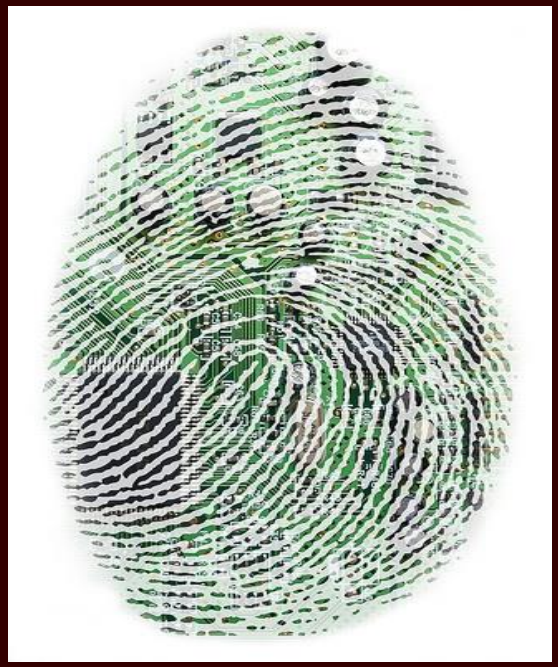


Integrated Automated Fingerprint Identifcation System (IAFIS)

- Ability of the computer to scan and digitally encode fingerprints
- The encoding allows ridges to be rapidly scanned
- Can screen a set of 10 prints against a file of 500,000 sets of 10 prints in .08 seconds
- Ridge endings (terminations)
- Branching of ridges (bifurcations)
- Screen out imperfections in latent prints
- Can send prints immediately to FBI database

DIGITAL IMAGING

- Lifted fingerprints are not usually in perfect condition – making analysis even more difficult
- Digital imaging programs can now enhance the lifted/partial prints to make identification more accurate
- Digital imaging converts a fingerprint image into pixels
- Can be done with a scanner or digital camera



10 Card prints vs Image Scanning

The traditional or most common technique of fingerprinting involves pressing fingers covered in ink onto paper.

Digital Scanning Technique

A sensitive touch -pad is used to capture the finger prints of a person or a suspect. The impression of the fingerprint is recorded on the touch-pad and then compared with thousands stored in the system.