**Case Number 306400 Fingerprint Identification**

A piece of artwork was recently stolen from Rich and Ann Fluential’s home. (Rich and Ann are prominent members of the Winona community.) Search of the crime scene did not reveal anything remarkable except a party glass and a folded up piece of paper at the crime scene. Both of these pieces of evidence were brought into police custody. There are numerous suspects in the case, all of whom have a set of fingerprints on the Integrated Automated Fingerprint Identification System, or IAFIS for short. IAFIS is a state-of-the-art computer technology which houses in digital form more than 46 million sets of fingerprints that can be searched and matched in a matter of minutes. With the exception of Rich and Ann, none of the suspects have any reason for being in their house. Placing them at the crime scene would go a long way toward convicting them of the crime.

The tiny ridges on the fingertips of each human being are unique. Even identical twins have different fingerprints. Because a copy of these ridges is left on just about

everything we touch, fingerprints at a crime scene are important evidence that can be used to identify the criminal. Fingerprints may be visible, but are more often invisible or *latent,* consisting mostly of sweat. Sweat secreted by the eccrine glands on the fingertips is deposited on surfaces the fingers touch. The deposition is in the form of contours which are the mirror images of the ridge patterns on the fingers. The patterns formed by fingerprints fall into three well-defined categories: arches, loops, and whorls (Figure 1). The constituents of sweat may be selectively fixed by different chemical reagents so as to make *latent* (invisible) fingerprints visible. In this experiment you will use two latent fingerprint developing techniques to identify fingerprints left at the scene of the crime.

Figure 1. Ridge patterns: arches (left), loops (center), and whorls (right).

Figure 2. Basic characteristics in fingerprints: a. ridge termination; b. fork; c. lake;

d. island; e. short independent ridge; f. hook; g. crossover.

**SAFETY:**

This forensic investigation will require you to work with ninhydrin in an ethanol solution. Report on the safety precautions of all including waste disposal for your pre-lab.

**Pre-lab:** See below.

**Exploration:**

 Before you analyze the evidence for latent fingerprints, you need to add to our “IAFIS” database by obtaining the fingerprints of your colleagues. Keeping in mind the principles displayed in class, obtain a ten print card for a classmate. Be sure to roll the fingers so as to get the complete fingerprint. Turn in the card with the person’s name who’s fingerprints are on them and your name as the collector as soon as you are satisfied with the results so they can be entered into our IAFIS system. Verify with the instructor that your fingerprint card contains the necessary quality of prints. Everyone in the class needs to have their fingerprints taken. On the second day of lab, everyone in the class will have their fingerprints available on line at the following web address: http://course1.winona.edu/jfranz/Present/fingerprints.htm.

 The different techniques for lifting latent fingerprints require a little bit of practice. Before obtaining the evidence from the crime scene, practice these techniques with “evidence” you create yourself.

***Be sure that you obtain the paper from the crime scene on the first day and spray it with the ninhydrin (after you have had a chance to practice with the ninhydrin on evidence you create yourself) so that you allow adequate time for the color to develop.***

**Magnetic Powder Method:**

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| Fingerprint powder can be applied with fiberglass, camel hair, and feather brushes. A magnetic wand is used with magnetic powder. A large piece of cotton can be used for developing latent prints over a large area.To use the magnetic brushes, do the following. Place a clean sheet of paper underneath your work surface to catch extraneous pieces of magnetic powder. Insert the magnet stem into the clear cover |  |

and dip into a jar of magnetic powder to collect powder to the tip. Gently “paint” surface with powder until the print becomes visible. Just touch the tips of the brush to the powder. Then shake off the excess powder. The key to proper print development is to use a small amount of powder and a delicate touch. Using a smooth stroke, guide the brush over the suspected area or over the barely visible print. Get enough ridge detail to see the direction of flow of the ridges. The brushing, if continued, should follow the ridge flow. When the ridge detail is complete, photograph it. After the photograph you may use more powder to make the print more visible. Then photograph it again. Protect the print with lifting tape before sending it to the lab. To release the powder, with tip pointed down over your magnetic powder container, move the magnet in and out past the cover flare until all powder releases.

**Ninhydrin method:**

Procedure:Obtain a fingerprint free piece of paper from the instructor. Place your fingerprints all over it (be careful no one else touches it.) **Label the piece of paper with a pencil.** Spray the paper with ninhydrin solution from a distance of about 6 inches. Wait a few moments until most of the solvent evaporates, then spray again. Allow it to dry completely. The print will appear only after the surface is completely dry—this may take a hour or more. (You can dry it more quickly in an oven at 50–70 C.) Ninhydrin is an organic compound that reacts with amino acids to form a deep purple complex. **Caution: ninhydrin stains skin and other things.**

Once you are satisfied with your technique for the two latent fingerprint techniques, obtain the evidence from your instructor. Because you are analyzing the evidence for fingerprints, it is imperative that you do not leave any fingerprints on the evidence. To help achieve this wear gloves when working with the evidence. Analyze the evidence as you did above. A digital camera will be available to document your evidence if you so desire.

After you have developed the fingerprints from the two pieces of evidence, your task is to identify who’s fingerprints they are. Identify the minutia. Look at the 10 print fingerprints of your suspects, identify their minutia. Look for a match. Make well supported conclusions from your data for your report. You may work on this lab and the lab report with a partner but each of you will be getting a set of evidence and each of you will have your fingerprints recorded.

**Prior to lab** in your notebook or a separate sheet of paper (everyone must do a pre-lab) write the experiment name, the purpose of the experiment, the major experimental steps used to achieve this purpose and a summary of the safety precautions for dealing with ninhydrin and with ethanol including any waste disposal information.

During lab record any observations you and your partner make about the experiment.

At the conclusion of the experiment, in your notebook, identify whose fingerprints you have on the beaker and the piece of paper. (They should be the same.) In order to identify the person, find and identify at least 8 points of minutia on the pieces of evidence and the same eight points of minutia on the suspect’s fingerprint card. Summarize your conclusions in paragraph form with key supporting evidence.

Finally, answer this post-lab questions in your notebook.

1. We used ninhydrin and magnetic powder as ways to develop latent prints in this experiment. What are two other methods for developing latent prints?