Prints in the Wild

Investigating Changes in Fingerprint Quality on Porous Surfaces Throughout the Day

BY

CHRISTOPHER AUSTIN RADFORD
B.S., Boise State University, 2016

THESIS

Submitted as partial fulfillment of the requirements
for the degree of Master of Science in Forensic Science
in the Graduate College of the
University of Illinois at Chicago, 2018

Chicago, Illinois

Defense Committee:

A. Karl Larsen, Ph.D., Chair and Advisor
Ashley Hall, Ph.D.
Donald Paul Waller, Ph.D.
Charles Steele, Purdue University

ACKNOWLEDGEMENTS

I would like to thank Dr. Karl Larsen, Charles Steele, and Jim Snaidauf for their mentorship throughout the research process. Special thanks to Jim for taking of his busy schedule to participate in the validation study. I would also like to thank Dr. Ashley Hall for her help and guidance in the IRB approval process, providing me with everything I needed to engage in a successful and ethical research project.

CAR

TABLE OF CONTENTS

LIST OF TABLES

LIST OF TABLES (continued)

LIST OF FIGURES

LIST OF ABBREVIATIONS

FBI	Federal Bureau of Investigation
ORO	Oil Red O
ACS	American Chemical Society
HPLC	High-Performance Liquid Chromatography
NTP	Normal Temperature and Pressure
CBD-IAI	Chesapeake Bay Division of the International Association for Identification
JPEG	Joint Photographic Experts Group
ISO	International Organization of Standardization
AATCC	American Association of Textile Chemists and Colorists
SAS	Statistical Analysis Software
ANOVA	Analysis of Variance
CI	Confidence Interval

SUMMARY

Fingerprints are a very common, yet important form of forensic evidence. While the science of fingerprint identification has been around for over a hundred years, there are still many facets that have yet to be researched or need further research in order to expand and enhance the science. One purpose of this study is to profile the overall quality of the typical latent fingerprint found in the field, specifically one that is deposited on a porous surface such as paper, and then compare it to that of the typical latent fingerprint used in laboratory research. The other purpose of this study is to investigate changes in the overall quality of fingerprints in the field (deposited on porous surfaces) over the course of an individual's typical day according to the time of day a fingerprint is deposited and the activity of the individual prior to deposition, determining whether or not there is a significant correlation between fingerprint quality and either of these two variables.

This study was accomplished by collecting over six thousand fingerprints from individuals. Fingerprint booklets were disseminated to volunteer subjects who deposited a set of all ten fingerprints on plain white copy paper several times per day over the course of a week, noting the date, time and any recent activity prior to each collection. Upon receiving the collection book back from a subject, the fingerprints were cut out of the book and then cut in half. Each fingerprint half was processed by different chemical reagent. The left half was processed with ninhydrin and the right by Oil Red O, visualizing amino acids and lipids found in fingerprint residue, respectively. Developed fingerprints were analyzed to assess the contrast between ridge detail and substrate background ("findability"), and the presence and clarity of developed ridge detail ("quality"). Findability was assessed using the AATCC Gray Scale for Evaluating Change in Color, and quality was assessed using the Bandey scale. Results were then compiled and documented, and statistical analysis was performed on the data.

The overall quality of the average latent fingerprint left in the field was successfully determined and it was found that the lipidic portion is significantly different from that of a charged fingerprint. It was also determined that there is no linear correlation between the overall quality (findability and quality) of a fingerprint and either the time of day or activity prior print deposition. Upon further investigation, however, it was found that certain activities such as phone usage and typing yield fingerprints that best emulate the average fingerprint found in the field.

I. INTRODUCTION

Out of all the types of evidence collected at crime scenes or in relation to a crime, fingerprints are some of the most frequent. They are also one of the few forms of evidence that can be used for identification of an individual. Fingerprints can be used as circumstantial evidence to link a suspect to a crime scene, another piece of evidence, etc. Items found to contain fingerprints may be directly related to a crime, such as a gun used in a homicide or a forged bank note, or they may be indirectly related to the commission of a crime. A prime example of the latter would be the 1986 Auburn cyanide murders. Stella Nickell had tampered with five bottles of Excedrin®, lacing the pills with cyanide, killing her husband and an unrelated woman. Nickell had been identified as a prime suspect during and FBI investigation due to some very suspicious coincidences and a failed polygraph examination, however there lacked any hard, physical evidence linking her to the homicides. That is, until her estranged daughter came forward with testimony that Nickell had discussed killing her husband several times before, and had even mentioned researching cyanide. Upon subpoenaing Nickell's records at the Auburn Public Library, the FBI investigation found that multiple books on poison had been checked out by her. One book, *Deadly Harvest*, was submitted to the FBI laboratory, and was found to contain eighty-four of Nickell's fingerprints. Most of these prints were found on the pages of the section talking about cyanide.[1] This break in the case provided the physical, albeit circumstantial evidence needed to help prove Nickell's guilt.

The Stella Nickell case is a reminder that evidence can be found in the most unlikely of everyday places and circumstances. That is especially true of fingerprint evidence. Nearly every time our hands come in contact with an object, a fingerprint is left behind. There are many instances in which a perpetrator will wear gloves or be sure to wipe off any prints on a gun or other

obvious piece of evidence, however the case mentioned above is a perfect example of the more common occurrence when people do not think about what they are touching. That is especially true of paper evidence. Paper is such an overly abundant and commonplace resource that we oftentimes don't consider the "paper trails" we leave behind, laden with the record of our fingerprints. Fingerprint residues are transferred upon contact with a surface, leaving behind the fingerprint trace. When deposited on paper, fingerprint residues are absorbed and become trapped in the cellulose matrix, which can later be visualized by chemical processing.[2]

Much research has been committed to the science of fingerprinting: the physiology of fingerprints, the chemistry of fingerprint residue, and the subsequent processing of latent prints. The term "latent" describes fingerprints that are not visible to the unaided eye and require either physical or chemical development. The processing method varies depending on the substrate on which the fingerprint is deposited. There are two main classes of substrates: porous and non-porous. Examples of porous substrates—those that can absorb liquid and other material—would be papers and carboards, whereas examples of non-porous substrates are glass, plastic, and metal. Most fingerprints on non-porous substrates are physically developed using fingerprint powder and are then lifted using a clear tape. Fingerprints deposited on porous substrates, however, require visual enhancement via chemical processing, wherein a chemical reagent reacts with a component of fingerprint residue to produce a colored fingerprint image. Perhaps more research has gone into chemical processing methods for porous substrates, and subsequently into the chemistry of fingerprint residues, as it is more complex than physical development.

What seems to be lacking in the field of fingerprinting, however, is a knowledge of the nature of fingerprints in the day-to-day, real-world scenario. This understanding is crucial in that forensic science is an applied science in which all of its cases of evidence come from everyday

scenarios that seldom, if ever, emulate laboratory conditions. When fingerprints are collected for laboratory research, be it fundamental research or a validation study for a new processing technique, the conditions for deposition and collection are tightly controlled. Fingerprints are more often than not washed and then "charged" (loaded with sweat by rubbing fingertips on the forehead), and variables such as deposition pressure, length of time in contact with the substrate, and area of deposition are also controlled.[3] While important for preliminary studies, using only charged prints in the lab may be hindering fingerprint science if the results of said research do not translate to the evidence samples that forensic scientists analyze in their work. This is especially true for validation studies. One of the most important pieces of any validation study is that it is proved to be robust, meaning that the method being validated is effective for a wide variety samples. Robustness isn't tested when there is no variability in samples.

Another important part of fingerprint research that needs to be considered is the representativeness of the samples. Are the fingerprints collected representative of what is obtained in the field? It would stand to reason that a majority of the fingerprints collected from crime scenes would not be charged as they are in the laboratory. A study on the variation in composition of fingerprint residue concluded that charged fingerprints "could seriously compromise the validity of fingerprint reagent assessments," as the authors found that certain residue components (particularly lipids) were grossly overrepresented quantitatively in charged fingerprints compared to natural or "uncharged."[4]

It is hypothesized that the quality of a fingerprint will vary significantly throughout the course of a day. These changes can be due to many factors including, but not limited to, the individual's recent activities, surfaces that the hands come in contact with, medications, and overall health.[5-10] The purpose of this study, therefore, is to investigate changes in fingerprint

quality within the field according to the time of day and an individual's activities, determining whether or not there is a significant correlation between said quality and the time of day a print is deposited and/or activity prior to print deposition, and also to assess the average quality of fingerprints deposited in the field, comparing it to the average quality of a charged fingerprint typical to that produced in laboratory research.

To that end, the goals of this study were to design a protocol to collect latent fingerprints from multiple volunteer subjects, develop latent fingerprints for analysis, and analyze visualized fingerprints and recorded deposition conditions. To develop a proper print collection protocol, a suitable medium (a print collection booklet) was designed to enable collection of multiple fingerprints over several days in the field, volunteer subjects from diverse backgrounds were found and given directions on how to collect fingerprints and record deposition conditions, and a suitable time-frame was established for collection of deposited fingerprints from subjects. To develop collected latent fingerprints, established chemical processing reagents were chosen and prepared to visualize the two primary chemical portions of fingerprint residue: the eccrine portion and the sebaceous portion. The eccrine portion (consisting primarily of amino acids and proteins) was processed using ninhydrin, the classic amino acid sensitive technique.[11] The sebaceous portion (made up of lipids) was processed using Oil Red O, a relatively new technique, but gaining in widespread use due to the technique's simplicity, efficiency, and quality results.[12,13] To analyze visualized fingerprints, they were evaluated based on the contrast between ridge detail and substrate background and on the presence and clarity of the developed ridge detail. Statistical analysis was then performed on the evaluated results and deposition conditions recorded by subjects. Additionally, fingerprint evaluations were validated by an experienced fingerprint examiner.

II. REVIEW OF LITERATURE

A. Fingerprint Physiology and Chemistry

A latent fingerprint is formed when sweat and oils from the skin are transferred to a substrate upon contact, deposited in the shape and form of friction ridge skin. Skin is made up of three distinct layers: the epidermis, dermis, and hypodermis. As the peripheral layer, the epidermis, consisting of stratified epithelium, serves as a protective barrier to prevent water loss and keep out bacteria and other foreign material. The dermis is made up of fibroelastic connective tissue which gives structural support and nutriment to the epidermis. The hypodermis lies below the dermis and contains a layer of fat for energy. Friction ridge skin originates as primary and secondary ridges that are interlocking with the dermis via dermal papillae. Primary ridges are found under the raised portions of friction ridge skin ("ridges") and secondary ridges are found under the depressed portions ("furrows"). Extending from the primary ridges into the dermis are sweat glands.[14,15] Refer to Figure 1 for a schematic of friction ridge skin.

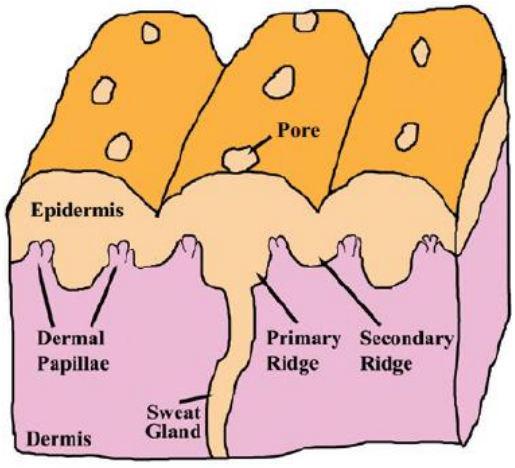

Figure 1. Structure of friction ridge skin.[a]

[a] Originally published by the National Institute of Justice, U.S. Department of Justice.

The only appendage of friction ridge skin is the eccrine sweat gland. Sweat is secreted from three glands: eccrine, sebaceous, and apocrine. Eccrine glands are located all over the body, but the densest concentrations of these glands are on the palms and soles. Their primary function is thermoregulation via perspiration.[14,15] Eccrine secretions are mostly water (99%), but also contain inorganic salts and various organic compounds including amino acids and proteins.[14-16] Sebaceous glands are primarily located in hair follicles, with the greatest densities at the face and scalp. They produce sebum, which is made up of multitudes of lipids including fatty acids, wax esters, sterols, and steroid precursors such as squalene.[15,17] The primary purpose of sebaceous secretions is to keep the skin moist by providing a hydrophobic layer. Apocrine glands are located in the axillary regions of the body and are not usually a significant constituent of fingerprint residue.[15]

Although friction ridge skin is devoid of sebaceous glands, sebaceous components are present in fingerprint residue due to contamination primarily via bodily contact with the hands, especially face touching.[15,18] A 1984 study comparing face touching in primates found that humans touch their faces an average of thirteen times every twenty minutes, the most common areas of contact being the chin, mouth, and nose.[19] A study that tracked face touching to predict respiratory tract infections in humans found that the average rate of contact to the eyes, lips, and nose was approximately 16 times per hour.[20]

While the chemistry of sweat is largely studied, the chemistry of latent fingerprints is less so. The composition of sweat secretions greatly influences the initial composition of fingerprint residue; however, there can be subtle differences over time on an aged print as the chemical components begin to react and break down from ultraviolet radiation, air and heat, are volatilized, solubilized in water, etc.[21] This poses a difficulty for fingerprint examiners when processing latent prints. As stated previously, currently the chemical composition of fingerprint residue is an

important factor primarily when the substrate on which the latent fingerprint was deposited is porous, as a chemical enhancement method will be used over physical development. Because the chemistry of a latent fingerprint is dynamic, multiple development methods have been researched and are used in the forensic laboratory for optimum visualization and enhancement.

B. Processing of Latent Fingerprints

There are two main components of fingerprint residue: the eccrine component, and the sebaceous component. The primarily targeted constituents of the eccrine portion are amino acids and proteins. Amino acids are largely stable over long periods of time and bind tightly with the cellulose substrate with little migration and diffusion, however they are water soluble and will rapidly solubilize out of the substrate or diffuse upon contact with water.[2,11,14] Amino acids have also been shown to degrade at high temperatures.[22] Porous substrates that are dry or known to have not been wetted at one point are most commonly treated first with amino acid sensitive reagents (non-specific to any particular amino acid) after a non-destructive visual inspection.[11,14] The oldest and standard amino acid sensitive technique is ninhydrin development, however several analogues to ninhydrin have emerged over time and are now employed in sequence after ninhydrin to enhance visualization. Some of the most common analogues are 1,8-diazafluoren-9-one, 1,2-indanedione, and 5-methylthioninhydrin.[2,14]

The sebaceous component of fingerprint residue is the water-insoluble portion made up of lipids. This portion is systematically subdivided into two fractions, the labile and robust fractions. The labile fraction consists of lipids that easily volatilize and/or oxidize in air, such as fatty acids, triglycerides, and squalene.[23,24] The robust fraction is made up of lipoproteins and other water-insoluble proteins that undergo hydrogen bonding to the cellulose in paper.[23] Until the last decade,

the standard method for developing the lipidic portion of prints has been physical developer, a technique that relies on the reduction of silver(I) ions to elemental silver, which binds to lipids and forms a black image of the fingerprint.[12,14] In 2004, a new processing technique emerged: Oil Red O (ORO), a lipophilic stain.[12] Both techniques can be used to develop the sebaceous component of fingerprints, however physical developer interacts with the robust fraction and ORO with the labile fraction.[13] While techniques such as physical developer and ORO are the only methods that are suitable for processing wet/wetted porous substrates, they are also used in sequence with amino acid sensitive techniques for all other items in the forensic laboratory as well.

Methods for developing the eccrine and sebaceous components of fingerprints are both used in conjunction in this study because both portions are thought to always be present to some amount in a latent fingerprint. Amino acids are present from the natural and continuous secretions of the eccrine sweat glands on friction ridge skin, and lipidic components result from touching the face, hair, and other areas of the body where sebaceous glands are present. But the composition of a latent print may prove to be significantly dynamic. There may be instances in which there are more or less of one or both of the two major components in a latent print. There may even be instances in which one or both are both absent in such quantities that no detectable fingerprint is left behind. Using development techniques for both eccrine and sebaceous components side by side allows for qualitative analysis of each component so as to track their presence and contribution to fingerprints deposited throughout the day. From that information, it may be possible determine activities and points in the day that have direct and indirect influences on fingerprint composition.

1. Ninhydrin

Ninhydrin development is the standard technique for processing latent fingerprints on porous substrates. The ninhydrin molecule (Figure 2) reacts with amino acids to produce a purple

ammonium salt called Ruhemann's purple. Ninhydrin was accidentally synthesized by Siegfried Ruhemann in 1910, who then was the first to observe ninhydrin's reaction with amino acids on the skin, and later proposed the structure for the byproduct (Ruhemann's purple).[2,11,14] The reaction mechanism was studied by others after that, as the use of ninhydrin became increasingly wide-spread in biochemistry and analytical chemistry laboratories. The currently accepted mechanism was proposed by Friedman and Williams, and was later modified by Grigg et al. (Figure 2).[11,25,26]

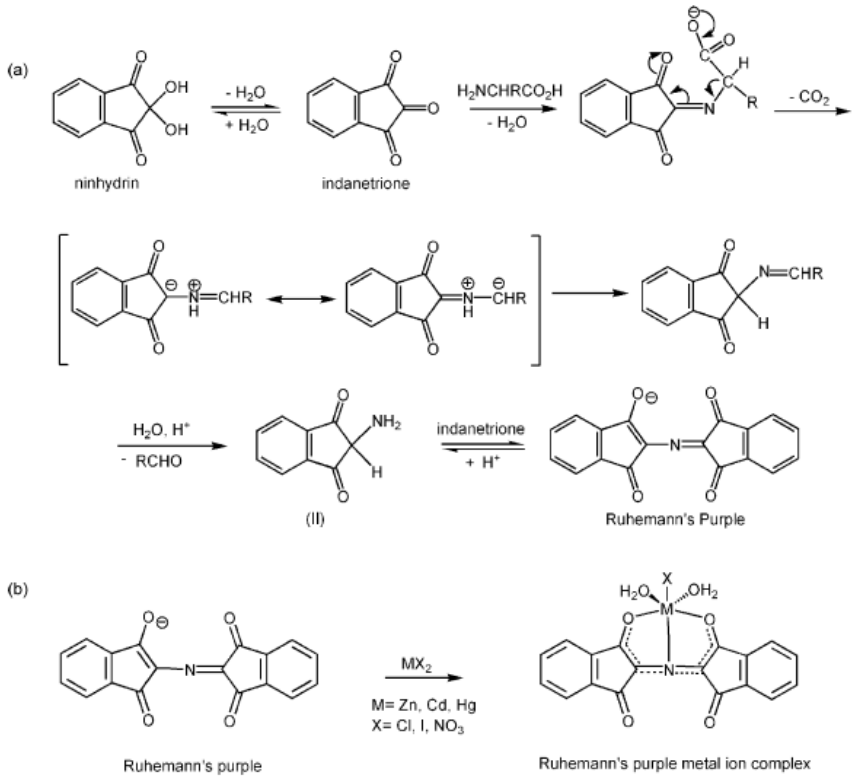

Figure 2. (a) The reaction mechanism of ninhydrin with amino acids to form Ruhemann's purple and (b) the reaction of Ruhemann's purple with metal salts to form a complex ion.[b]

[b] Reprinted from *Analytica Chimica Acta*, 652, Jelly, Renee, et al., "The Detection of Latent Fingermarks on Porous Surfaces Using Amino Acid Sensitive Reagents: A Review" / Amino acid sensitive reagents, p. 133, 2009, with permission from Elsevier.

Although ninhydrin was used widely in traditional chemistry laboratories after its initial discovery and characterization, it wasn't until 1954 that it was first suggested for use in the development of latent fingerprints on porous substrates.[27] Since then, ninhydrin has been extensively studied to optimize formulations and working conditions for its use in forensic science. The ninhydrin reaction is pH sensitive and occurs above pH 4, with pH 4.5-5.2 yielding the best results.[25,26] The reaction also requires heat and water, so a warm, humid environment is necessary as well. The consensus seems to be that 50-80% humidity is optimal.[14] While it is recommended to let the reaction proceed at room temperature for several days to prevent background interference and side reactions of the ninhydrin with paper additives, higher temperatures are often employed in forensic science labs for processing efficiency.[11,14,15] The acceptable range of heat is between 50-80 ℃ for no more than twenty minutes.

Ninhydrin processing is a bit of a complex method, and requires fastidious technique, however it is still the workhorse of amino acid sensitive techniques. Because of its position as the standard processing technique, it was chosen for this study as the method for processing the eccrine portion of latent fingerprints.

2. Oil Red O

Physical developer is known in the forensic science community to have several shortcomings as a latent fingerprint processing technique. It is often described as an exacting technique that can be quite destructive to the substrate and is also expensive.[12,28] Because of its destructive potential—dark background staining which can cover up any text and interfere with contrast, preventing further processing—it is typically performed as a last resort after all other processing techniques have been tried. For the most part, physical developer was historically the only method suitable for processing fingerprints on wet/wetted porous substrates, and these

limitations are what prompted Alexandre Beaudoin to pursue research in a more efficient and simplified method. He came across ORO, a lysochrome (Figure 3).[12] A lysochrome is a dye that is soluble in lipids. As the name suggests, ORO stains fats red upon dissolving in them.

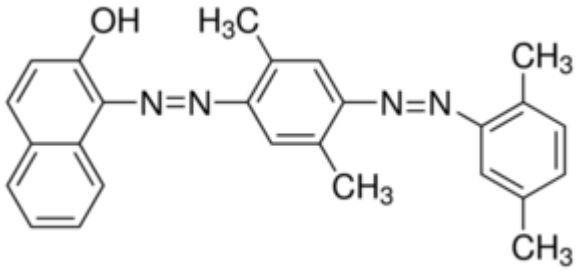

Figure 3. Structure of Oil Red O.

Beaudoin's research found that ORO produced equivalent results to that of physical developer. Although the development process for ORO is roughly equivalent to physical developer time-wise, it is a much less intricate method. Oil Red O treatment involves three steps: staining, neutralization, and drying (the neutralization step provides allows for neutralization of the basic solution that can be harmful to the paper substrate, while rinsing ORO from the substrate so as to reduce background interference). Oil Red O processing also provides excellent contrast between the ridge detail (red) and background (light pink) and is much less destructive to the substrate.[12] Studies on aged prints, however yield mixed results; in general, physical developer works better the older a fingerprint is, whereas ORO is less effective.[13,23,28] Although ORO's outperformance of physical developer is debated, the technique has gained general acceptance in the forensic science community. It is currently used in sequence after amino acid sensitive techniques and before physical developer.[13,28] Oil Red O was the choice technique for development of the sebaceous portion of fingerprints in this study due to its proven performance in successfully

developing latent prints efficiently with high contrast, paired with the fact that this study would not be working with fingerprints that are significantly aged.

C. Variability in Fingerprint Composition

The variability of fingerprint composition is a complex system. Girod et al. describes it as the result of "influence factors" in two fundamental stages that precede initial composition and aged composition: transfer and time.[3] Transfer is when the finger makes contact with the substrate surface, and the time between transfer and its discovery (e.g. visual enhancement in the case of latent prints) encompasses the aged composition. The initial composition at transfer is determined by three influence factors: donor characteristics, deposition conditions, and substrate nature. The aging process is affected by substrate nature, environmental conditions, and enhancement techniques. In turn, the composition of an aged print is affected by influence factors from transfer and the aging process.[3] Figure 4 summarizes the system of influence factors in composition.

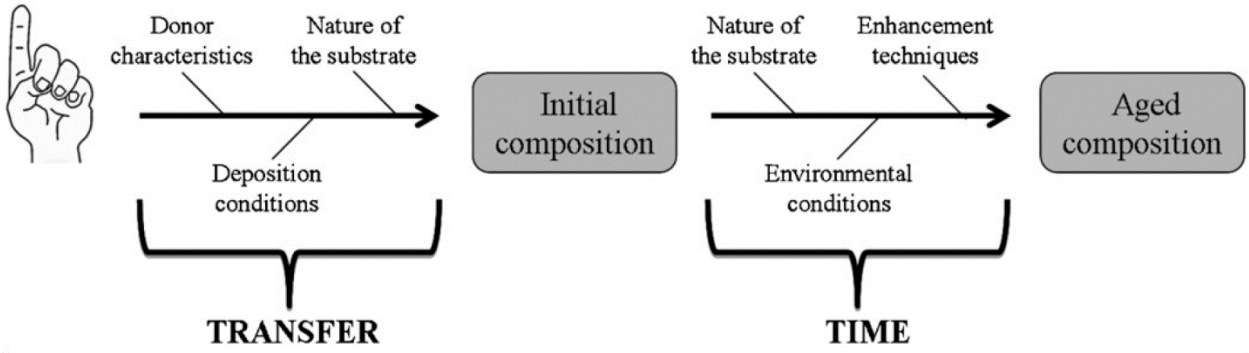

Figure 4. Representation of how variability of fingerprint composition is affected by influence factors during transfer and over time.[c]

[c] Reprinted from *Forensic Science International*, 223, Girod, Aline, et al., "Composition of Fingermark Residue: A Qualitative and Quantitative Review" / Fingermark Composition, p. 18, 2012, with permission from Elsevier.

Donor characteristics comprise of variables that arise from the individual donor and include things such as age, sex, diet, health, medication, and personal care products, along with habits and activities that affect sweat gland secretions and contact with surfaces that may contain amino acids and lipids.[3] A dermatological study in 1979 found that the composition and concentration of skin surface lipids in sebaceous sweat varies with age.[29] Specifically, it was determined that the total quantity of lipids increases in prepubescent children, reaching a maximum at puberty, stabilizes during maturity, and then falls off with old age. In very old individuals, the lipid content was similar to that of children, and it was noted that the lipid content in women tended to decrease more prominently at an earlier age then men.[29] While the influence of biological sex on eccrine sweat composition has been studied, there are conflicting results. A 1975 study by Liappis and Jäkel asserted that women excrete higher amounts of amino acids than men, with ten specific amino acids demonstrating statistically significant greater secretion.[30] Two more recent studies, however, concluded that there are no significant differences in amino acid concentrations in eccrine sweat between the sexes.[6,31] According to two studies, diet does not affect amino acid or lipid concentrations in sweat secretions.[4,32] The overall health of an individual, however does appear to affect the composition of sweat. A 1979 study by Liappis et al. showed that concentrations of amino acids in eccrine sweat were significantly higher in men who are not in shape than those who are, and a 2013 study by Harker and Harding suggests that amino acid composition in eccrine sweat is affected by conditions such as dry skin and atopic dermatitis.[6,9] Medications and personal care products also affect fingerprint composition. A study by Pelle et al. and another by Lee et al. demonstrate, from the knowledge that histamine-1 receptors are located in human sebocyte cell lines (present in sebaceous glands), that antihistamines cause a significant decrease in sebaceous activity, particularly in squalene levels.[7,8] The popular acne treatment,

isotretinoin, also inhibits the production of sebum, along with a notable reduction of wax ester concentration.[33,34] Being that sebaceous glands are controlled by androgenic activity, and also that sebaceous activity is suppressed by estrogens, pharmaceutical doses of androgens (i.e. testosterone) and estrogens will also affect sebaceous secretion.[35] Similarly, the antiandrogen, cyproterone acetate, inhibits sebaceous activity.[36] Eccrine activity is also affected by drugs and medications. Anticholinesterases, antidepressants, and bladder stimulants are known to cause excess sweating beyond normal levels needed for thermoregulation, while antiepileptics, antihistamines, antipsychotics, and muscle relaxants are known to decrease the level of normal sweating.[37] Lotions, creams, and other common moisturizers (i.e. shea butter) all have lipidic compositions, thus mimicking and enhancing sebaceous contributions to fingerprints.[5] Lastly, personal habits and activity also affect latent fingerprint composition. In their 1972 study, Liappis and Hungerland showed that amino acid concentrations in exercise-induced sweat are significantly higher than that of sweat produced without stimulation (at rest).[10] It has already been stated that face touching directly affects the sebaceous component; however, contact with food may very well also affect sebaceous and/or amino acid contributions. For example, a fingerprint deposited at least shortly after eating greasy french fries would certainly be affected.

Deposition conditions comprise such things as finger pressure and contact duration between the finger and substrate, the surface area of the finger that is in contact with the substrate, time of day, the individual finger making contact, and any washing of the hands.[3] A 2008 study found that there is a direct correlation between finger pressure and both color intensity and contrast quality. It was noted, however that there is a pressure threshold before print smudging occurs.[38] In other words, too little contact pressure may leave a low-quality print, but too much pressure will as well. While the amount finger surface area in contact with the substrate may not necessarily

affect the composition of a latent fingerprint, it certainly can affect the quality of the fingermark. "Partial prints," developed prints that represent only a portion of a typical "full print" (e.g. the tip or side of a finger pad) and provide limited ridge detail, are a common phenomenon that can cause difficulty for a fingerprint examiner to provide an identification. The contact surface area is at least one cause for a partial print, pressure being another factor. The individual finger itself may also affect fingerprint composition. The 1984 study on primate face-touching reported that humans on average touch their face twice as much with their left hand than with their right.[19] That, in turn, may result in a higher sebaceous contribution to prints from the left hand compared to the right hand. Also, whether an individual is left- or right-handed may also influence fingerprint composition, as they might use their dominant hand more often to touch food or objects that could "contaminate" their hands with amino acids or lipids. Then again, the more frequently a particular hand (or finger) is used, the more natural sweat secretions may be lost during transfer, as one study suggests.[39] Naturally, handwashing can affect the composition of a fingerprint up to a certain point. Washing one's hands will certainly rid friction ridge skin of water soluble amino acids, and use of surfactants such as soap will rid it of lipids as well. Eccrine sweat components will naturally deposit back on friction ridge skin as the eccrine glands continually secrete sweat, but sebaceous components are dependent on contact of the body with sebaceous activity.

Substrate influence on fingerprint composition is contingent on its porosity, which affects its ability to absorb and retain fingerprint residue. This is demonstrated by multiple studies. One study demonstrated that the higher a substrate's porosity, the higher the adhesion forces were to draw fingerprint residue in and trap them.[40] Another study corroborated that finding, showing that the smoother a paper's texture, the less residue penetration there is. It went on further to discover that there is a correlation between the penetration depth and development quality of the subsequent

latent print. The study determined that quality print development occurs at an optimal depth between 40-60 microns, while higher or lower penetrations result in lower quality.[41] A third study showed that squalene, a sebaceous component that is part of the labile fraction, is more stable in prints deposited on porous surfaces than on nonporous surfaces.[18]

Environmental conditions that affect fingerprint composition over time include factors such as temperature, light exposure, and humidity. As stated previously, amino acids are soluble in water, and thus will dissolve and wash away upon contact with water or in extremely humid conditions, and they also degrade at high temperatures.[11,22] Also previously mentioned, the labile fraction of sebaceous contributions will volatilize and oxidize in air. Squalene is also potentially photosensitive, as it was noticed to disappear from fingerprints at a faster rate when exposed to light as opposed to being stored in the dark.[23,24]

Enhancement techniques also affect fingerprint composition. One study showed that when indanedione (with dichloromethane as the carrier solvent) was used to develop latent fingerprints, significantly lower amounts of certain components of the sebaceous portion were detected than normal. Whether or not this loss of lipid material was due to extraction into the indanedione carrier solvent is currently unknown.[42] Another example of enhancement technique influence would be that amino acids will wash away from a fingerprint upon treatment with physical developer (an aqueous reagent). For this reason (as well as the technique's destructiveness to the document) physical developer is used last in the sequence of development techniques of porous substrates.

III. MATERIALS AND METHODS

A. Materials and Reagents

The paper used for this study was white copy paper (Hammermill® Copy Plus HAM 105007, 20 lb.). Ninhydrin crystals (ACS reagent) and absolute ethanol were obtained from Acros Organics. Oil Red O crystals and sodium hydroxide pellets were obtained from Sigma Aldrich. Sodium Carbonate (anhydrous), glacial acetic acid, concentrated nitric acid, methanol (HPLC grade), ethyl acetate (HPLC grade), and petroleum ether (E120-4) were obtained from Fisher Scientific. All water used in reagent preparation and latent fingerprint processing was ultrapure deionized. All reagent preparation was performed at normal temperature and pressure (NTP).

Ninhydrin reagent solution was made according to the following protocol, based off of formula #2 from the Chesapeake Bay Division of the International Association for Identification (CBD-IAI).[43] Ninhydrin crystals (7.5 g) were dissolved completely in 45 mL ethanol under moderate stirring, then 2 mL ethyl acetate was slowly added, followed by slow addition of 5 mL glacial acetic acid. The yellow ninhydrin solution was added to 1 L petroleum ether under moderate stirring, and then stored in an amber bottle.

Oil Red O stain was made according to the following protocol from the CBD-IAI.[43] Oil Red O crystals (1.54 g) were dissolved in 770 mL methanol. Sodium hydroxide (9.2 g) was dissolved in 230 mL water. The ORO and sodium hydroxide solutions were then mixed together under vigorous stirring. The stain solution was filtered (Fisher Scientific grade P8 qualitative filter paper) into an amber bottle. Sodium carbonate buffer (pH 7) used in ORO processing protocol was made by dissolving 26.5 g sodium carbonate in 2 L water, slowly adding 18.3 mL concentrated nitric acid (constant shaking), then adding water to increase the volume to 2.5 L.

B. Sampling and Data Collection

All human samples were collected and informed consent was obtained in accordance with the Institutional Review Board at the University of Illinois at Chicago. Fingerprints were collected from a mixed population of nineteen individuals, male and female over eighteen years of age, in compliance with approved protocol # 2016-0431 (Appendix D).

Fingerprint samples were deposited in print collection books. The books, printed on white office paper, contained twelve print collection pages and one control print page. The books also contained a page at the beginning with instructions and fingerprint collection protocol. Print collection pages consisted of labeled boxes for each digit, divided in half by dotted lines. Each box contained the subject number, book number, page number, and finger identifier, in order to relate developed print samples back to the specific collection sample. At the bottom of the page was an area with the volunteer, book and page information, as well as an area for the volunteer to fill out the date and time of fingerprint sample collection and the most recent salient activity of the volunteer within the last thirty minutes prior to collection. The thirty-minute window was chosen so as to be wide enough for inclusion of impactful activity that may otherwise be lost with a more restrictive window, based on the assumption that an activity undertaken within thirty minutes remains impactful to fingerprint composition. The control print page consisted of two boxes, divided in half, and labeled with the subject number, book number, and “index finger.” One box was labeled “uncharged control” and the other “charged control.” See Figure 5 for an example of a print collection page and control print page.

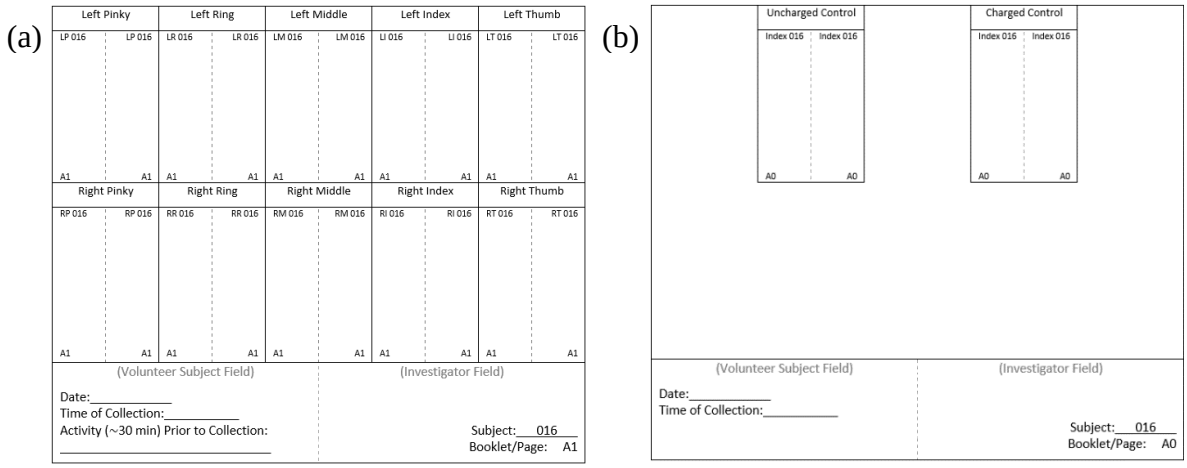

Figure 5. Scaled down representations of the (a) print collection cards and (b) control print page from the print collection booklet.

1. Sampling Protocol

Three books were given to each volunteer subject at the start of the study to be completed over six days (each book was designed to contain enough pages for two days of fingerprint collection). Subjects were instructed to collect 4-6 sets of fingerprints (all ten digits), once every 2-3 hours, each day (collection could be done in one week or spread out over three weeks). Immediately before or after depositing a set of prints, the volunteer was to fill out the volunteer subject field (date, time, activity). After completing a collection book, the volunteer was to complete the control print page by depositing a charged and uncharged print.

2. Fingerprint Collection Protocol

Volunteers were instructed to place each appropriate finger pad in the center of the corresponding on the print card. Fingerprints were to be deposited using moderate pressure for one second. The uncharged control print was to be collected following the same protocol for the other

print sets (using the index finger), while the charged print was collected following normal protocol with the index finger having been first rubbed on the forehead for several seconds.

C. Development of Samples

Completed print collection books were retrieved the day after completion and were processed the following day after receiving it back from the volunteer subject. Prior to processing, each box for every fingerprint on a collection card was cut out (including the control prints). The boxes were then cut down the middle, the left side processed with ninhydrin and the right with ORO. The strip at the bottom of each collection card containing sample and collection info was also cut out. All pages in the collection books were cut and processed, even if one or more collection cards was not filled out by the volunteer subject. See Figure 6 for an example image of a latent fingerprint developed with ninhydrin and ORO.

Figure 6. Image of a latent fingerprint developed with ninhydrin (left) and Oil Red O (right).

1. Ninhydrin Protocol

The following protocol was implemented according to that of the CBD-IAI.[43] Each print half (left side) from a book was dipped for one second in a glass tray filled approximately 1 cm deep with ninhydrin reagent and then placed on a paper towel to air dry (samples dried within 5-20 seconds). After all samples were dried, they were placed on a tray and heated in a humidity chamber for 20 minutes at 57 ℃ and 60% relative humidity. After 20 minutes, the samples were removed and laid flat on a paper towel sheet, then covered with several layers of paper towels for overnight storage. Fresh ninhydrin reagent was replenished between processing individual books.

Note, this protocol varies from that of the CBD-IAI, which calls for dipping samples in ninhydrin reagent for five seconds. This deviation was implemented because samples became completely saturated with reagent within one second and did not require the extra time in solution. In addition, dipping samples for one second allowed for faster processing, which in turn allowed for the conservation of the highly volatile reagent.

2. Oil Red O Protocol

The following protocol was implemented according to that of the CBD-IAI.[43] All of the print halves (right side) from the collection booklet were submerged in a glass tray of ORO stain, filled to adequately cover all samples with solution. Samples were soaked for one hour with agitation. After soaking, the samples were removed and immersed in a tray of pH 7 sodium carbonate buffer for 5 minutes. The samples were then removed from the buffer and immersed in a tray of water for another 5 minutes. After rinsing, the samples were laid flat on a paper towel, uncovered, to dry overnight.

D. Sample Archiving and Storage

All developed fingerprint samples were photographed and archived for later analysis the day following processing. Photography was performed with a Nikon D2X digital camera mounted on a camera holder station. The following station set-up was employed for all photography: the vertical distance between the camera lens (macro) and station base was 12.75 inches; an incandescent hood lamp was used for station lighting, and was kept at a fixed, oblique angle; all other lights in the lab were turned off and all blinds were closed. Fingerprint samples were individually photographed with corresponding sample halves placed side by side and secured on a black slide to keep them flat. The camera settings employed for all photography is listed in Table I. The camera was manually focused at the beginning of each photography session. No photographs were altered (sharpening, tone compensation, contrast, coloring, etc.) during or after image capturing.

TABLE I
CAMERA SETTINGS FOR SAMPLE ARCHIVING

Image Quality	Normal (JPEG)
Image Size	Large
White Balance	Auto
Focus Area	Auto Focus Single Servo (center)
Exposure Mode	Manual
ISO Rating	100
Aperture	F8
Shutter Speed	1/8 sec

After photographing a set of processed fingerprint samples, the prints were stored and sealed in plastic sandwich bags according to volunteer subject number and book identifier. The sample/collection information strips from each collection card were also stored with the fingerprint samples. All samples were stored in a drawer away from light. The following information from each fingerprint collection card was then entered into an Excel sheet master list: subject number, book identifier, page number, date of collection, time of collection, and activity prior to collection.

E. Data Analysis and Compilation

Upon archiving and storing developed fingerprint samples, they were analyzed. Analysis consisted of a visual inspection of the photographed samples. The overall quality/grade of the fingerprints was assessed by ranking the "findability"—the ability to observe the presence of a fingerprint based on color contrast between developed ridge detail and the substrate background—and "quality"—the amount of developed ridge detail that was present and visible. The findability of a print relates directly to the amount of fingerprint residue (eccrine or sebaceous) that was transferred to the substrate, and the quality relates more or less directly to the likelihood that a print could be identified by a trained fingerprint examiner when compared to a known print.

The quality of a print was assessed using the Bandey scale, a numeric ranking used by professional fingerprint examiners (Table II). The findability of each fingerprint was assessed using the American Association of Textile Chemists and Colorists (AATCC) Gray Scale for Evaluating Change in Color (Figure 7). The numeric grading on the scale was followed for color change, except that the intermediate values 1-2, 2-3, 3-4, and 4-5 were instead ranked as 1.5, 2.5, 3.5, and 4.5, respectively so as to retain computable numeric value. Typically, the average casual observer would not notice a contrast value of 4 or greater on this scale, and subsequent developed

latent fingerprints with such values would be deemed unfindable.[44] However, for this study, findability was held to a more stringent threshold of 4.5, as a trained observer can generally notice contrast up to that value.

TABLE II
BANDEY SCALE

Grade	Level of Detail
0	No visible evidence of fingerprint
1	Evidence of contact, no clear ridge detail
2	Fingerprint shows < 1/3 clear ridge detail
3	Fingerprint shows 1/3 - 2/3 clear ridge detail
4	Fingerprint shows > 2/3 clear ridge detail

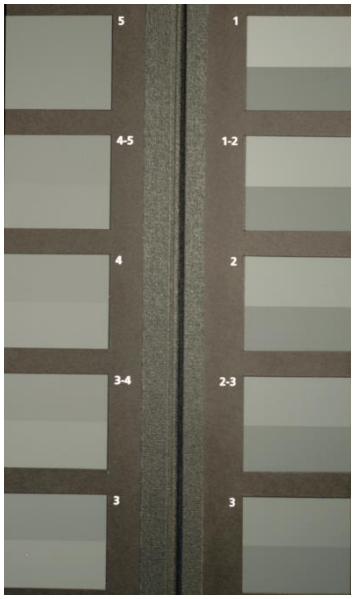

Figure 7. AATCC Gray Scale for Evaluating Change in Color.

The quality and findability rankings for each fingerprint were compiled in an Excel table organized according to the information from the master list (subject, date, time, activity). All information from the master list was transformed into numeric values for the purpose of running statistical analysis on all variables. Volunteer subjects were already listed from numbers 1-19. Print collection dates were transformed into numbers 1-8, so as to relate each fingerprint to a universal day in the sampling sequence. Most print sets contain only six collection days, as laid out in the collection protocol, however a few volunteers collected prints over seven or eight days. The print collection times were transformed into numbers 1-3. This transformation divides the data into values relating to times of day: morning (1), afternoon (2), and evening (3). This allowed for a simpler analysis when comparing time of day that a fingerprint was deposited to another variable. It was thought that a more meaningful correlation could be found comparing broader time zone rather than the specific time, as little change in findability or quality may be found over smaller intervals. The transformation also streamlines the data and helps rid any errors from the possibility that volunteers did not record the exact time of collection, instead rounding to the nearest hour, half hour, etc. For this study, waking hours were determined to be 0600-2400 hours. Morning was determined to be from 0600-1200 hours, afternoon from 1201-1800 hours, and evening from 1801-2400 hours. If a volunteer deposited a print outside of waking hours (0001-0559 hours), anything from 0001-0300 hours was included as evening and anything from 0301-0559 was included as morning. This was done because only 17 out of the 603 print collections were outside of waking hours, and thus was not was not a sizeable enough population to constitute assigning a fourth time zone. See Table III for time of day transformation info.

TABLE III
PRINT COLLECTION TIME OF DAY TRANSFORMATION FOR STATISTICAL ANALYSIS

Time of Day	Hours	Numeric Value
Morning	0600-1200	1
Afternoon	1201-1800	2
Evening	1801-2400	3

Activity prior to print collection was transformed into numeric values by grouping all listed activities into eight categories: washing (1), low contact (2), sleeping (3), grooming (4), food (5), physical activity (6), high contact (7), and gloves (8). The spectrum of all possible activities that volunteers wrote—some highly specific, others vague and generic—was vast and highly varied such that grouping into generalized categories made the data more manageable. The categories were assigned on the assumption that each type of activity would have a similar effect on a fingerprint's overall grade/quality. Washing describes any type of activity that involves washing with water and/or a surfactant, i.e. handwashing, dishwashing, showering, etc. This could be described as a "subtractive activity," an activity in which fingerprint residue is removed from the fingers. High contact describes a very general grouping of activities in which the fingerprint donor would typically have frequent, repetitive, and/or prolonged contact with any number of objects and surfaces, particularly ones that are touched often and rarely cleaned. This includes activity such as typing on a keyboard, playing a video game or card game, phone usage (esp. a phone with a touch screen), driving, and using public transit. It is thought that having high contact with a surface, particularly that of nonporous substrates on which compounds rest and are not absorbed, could result in depositing a higher quality fingerprint because there is more opportunity to pick up foreign residue (i.e. sebaceous material and other lipids). This is an instance of an "additive

activity," where residue is added to the fingers for later deposition. Low contact is another general grouping that includes activities where it is presumed that the donor would have little to no contact with any type of surface. Conversely to a high contact scenario, low contact could result in lower quality fingerprints because there is less opportunity for additive transfers from a substrate surface to the fingers. Examples of low contact activities include sitting, watching TV, reading, paperwork, note-taking, etc. Sleeping is a more specific category that includes waking up from nighttime sleeping or napping. It is thought that during prolonged relative inactivity, there would be a much longer time to accumulate fingerprint residue (eccrine secretion and bodily touching), paired with less frequent surface contact and residue transfer. This thinking would place sleeping as more additive and less subtractive. Grooming describes any type of additive activity that involves higher hand contact with the body and substances that could possibly provide sebaceous contamination to the fingers. This includes applying make-up, lotions, and hair products, dressing up and arranging one's hair, shaving, etc. The food category includes any activity in which there is contact with food: eating, cooking, and any other food contact—an additive activity. Physical activity descries any activity that would generally be associated with increased perspiration: gym, sports, running, jogging, walking, stair climbing, etc. With increased perspiration, there should also be an increase in eccrine contribution to a deposited fingerprint. Lastly, the gloves category is another highly specific category, encompassing any usage of gloves, be they latex, nitrile, or other rubber gloves, along with any other type of gloves or hand covering. For this activity group, the thought is that there will be increased eccrine contribution to a deposited print because hands typically get sweaty in gloves from the insulation of body heat and lack of breathability. It is also thought that there would able a decreased sebaceous contribution due to the inability of the hands to acquire sebaceous and other foreign lipidic material because of the membrane barrier. The number

assigned for each activity group was not altogether arbitrary, but rather ranked according to conjecture. Activities with lower values are expected to yield lower quality fingerprints on average, while those with higher values are expected to be represented by higher quality fingerprints. See Table IV for a summary of activity grouping and numeric transformation.

TABLE IV
PRINT COLLECTION ACTIVITY TRANSFORMATION FOR STATISTICAL ANALYSIS

Activity Group	Example Activities	Numeric Value
Washing	Handwashing, dishwashing, showering	1
Low Contact	Sitting, watching TV, reading, paperwork	2
Sleeping	After sleeping or napping	3
Grooming	Applying make-up, lotion, hair products	4
Food	Eating, cooking, other food contact	5
Physical Activity	Exercise, sports, walking, stair climbing	6
High Contact	Typing, gaming, phone usage, shopping, driving	7
Gloves	Wearing latex, nitrile gloves, other hand coverings	8

F. Statistical Analysis

Statistical analysis of the fingerprint data was performed using Microsoft® Excel and statistical analysis software (SAS). Single factor analysis of variance (ANOVA) (95% CI) was run in an Excel spreadsheet, along with simple average and standard deviation calculations. Linear correlation analysis using Pearson's correlation coefficient (95% CI) was run using SAS.

G. Bandey Analysis Validation

A set of twenty-five fingerprints representative of each Bandey scale ranking from the fingerprint population data was sent to a certified fingerprint examiner to be blindly evaluated using the Bandey scale. Upon receiving the blind analysis back from the examiner, the rankings were compared to the original rankings from this study using a modification to the Bandey scale.[45] The Snaidauf modified Bandey scale adds a second evaluation: identifiability of evaluated fingerprints. Fingerprints ranking 2-4 on the Bandey scale are determined to be usable to a fingerprint examiner for identification, while those ranking 0-1 are unusable for identification. Successful validation of the original analysis is determined by sufficient agreement between both evaluations. Sufficient agreement is defined as majority agreement of identifiability between the rankings, with those in disagreement differing by no more than ±1 Bandey ranking.

IV. RESULTS AND DISCUSSION

A. Fingerprint Population Study

The raw data collected from each fingerprint booklet (book, page, and print collection date, time, and activity) is listed in Table XI, Appendix E. The raw fingerprint data for ninhydrin and ORO is listed in Table XII, Appendix F and Table XIII, Appendix G, respectively. The averages and standard deviations were calculated for the quality and findability of the eccrine (ninhydrin) and sebaceous (ORO) print portions and are listed in Table V.

TABLE V
FINGERPRINT POPULATION AVERAGES

	Ninhydrin	**Oil Red O**
Findability	2 ± 1	3 ± 1
Quality	1.1 ± 0.7	1.1 ± 0.9

Table V describes what the average fingerprint in the field looks like upon processing. As can be seen from the data, the average eccrine portion of a fingerprint is clearly visible upon processing (contrast of 3-1), while the average sebaceous portion can be harder to see, ranging from faintly distinct (4) to clearly visible (2). This lower average findability could very well be attributed to the fact that ORO staining does produce mild to moderate background interference, unlike ninhydrin processing which produces no noticeable background interference. The average quality of the eccrine and sebaceous portions is nearly the same and surprisingly low, with little to no discernable ridge detail. This means that while the average fingerprint can be visualized with

ninhydrin and ORO, its usefulness to a fingerprint examiner for identification is strikingly low. Observing standard deviation across both processing techniques, there is a fairly wide spread in the in the quality and findability of the average fingerprint. This shows that there is indeed wide variability in the overall quality/grade of fingerprints in the field throughout a typical day.

Additionally, to help link the findability and quality of the average field print, the percent findability was calculated for both the eccrine and sebaceous portion, and the percent identifiability was calculated for findable prints (using the Snaidauf modified Bandey scale). The percent findability of eccrine prints was determined to be 92.3%, and the percentage of findable prints usable for identification is 15.5% (14% of prints deposited in the field). The percent findability of sebaceous prints is 81.2%, and the percentage of findable prints usable for identification is 19.7% (16% of prints deposited in the field). This shows that the majority of fingerprints deposited on porous surfaces in the field are not useful to a fingerprint examiner for identification purposes.

Single factor ANOVA was run on the raw fingerprint data for the findability and quality of both the eccrine and sebaceous portions for each hand to determine if there were statistically significant differences between the average fingerprints of individual fingers. The complete ANOVA test results can be found in Tables XIV – XXI, Appendix H. The p-values for each ANOVA test can be found in Table VI. Looking at the p-values for each test, it can be seen that only the fingerprints of the right hand for eccrine findability have a p-value greater than or equal to 0.05 ($p = 0.069947$), and the null hypothesis (that there is no statistically significant difference in the average findability between eccrine fingerprints of the right hand) fails to be rejected. For all other analyses, $p < 0.05$, therefore the null hypotheses are rejected and the alternative hypotheses are accepted: there are statistically significant differences in the average quality/findability between fingerprints deposited by at least two fingers from each hand. For each

ANOVA test, it was not able to be determined which finger(s) had different average values from each other because appropriate post-hoc tests were not available for use.

TABLE VI
ANOVA TEST P-VALUES BETWEEN FINGERS

Test	**p-value**
Left Hand Eccrine Findability	0.001246
Left Hand Eccrine Quality	0.005924
Right Hand Eccrine Findability	0.069947
Right Hand Eccrine Quality	0.000903
Left Hand Sebaceous Findability	0.006341
Left Hand Sebaceous Quality	1.499×10^{-6}
Right Hand Eccrine Findability	0.002022
Right Hand Sebaceous Quality	1.573×10^{-5}

B. Correlation Study

Correlation analysis was run on the fingerprint data and fingerprint collection data for the purpose of confirming linear independence of deposition variables from one another (subject, day, time of day, and activity) and determining whether or not there is a linear correlation between the variables and the subsequent quality and/or findability of an eccrine or sebaceous print for each finger. The correlation analysis data is listed in Table VII.

TABLE VII
CORRELATION COEFFICIENTS FOR FINGERPRINT POPULATION DATA

	Subject	Day	Time of Day	Activity
Subject	1	-0.03211 (p = 0.4382)	0.08409 (p = 0.042)	0.05705 (p = 0.1682)
Day	-0.03211 (p = 0.4382)	1	-0.02852 (p = 0.4912)	0.03799 (p = 0.359)
Time of Day	-0.08409 (p = 0.042)	-0.02852 (p = 0.4912)	1	0.04824 (p = 0.244)
Activity	-0.05705 (p = 0.1682)	0.03799 (p = 0.359)	0.04824 (p = 0.244)	1
Left Thumb Ninhydrin Findability	-0.27323 (p < 0.0001)	0.09048 (p = 0.0287)	0.10487 (p = 0.0111)	0.03343 (p = 0.4196)
Left Thumb Ninhydrin Quality	-0.11228 (p = 0.0066)	-0.12923 (p = 0.0017)	-0.03638 (p = 0.3797)	0.11368 (p = 0.0059)
Left Thumb Oil Red O Findability	-0.05296 (p = 0.2008)	-0.04573 (p = 0.2695)	-0.02878 (p = 0.4873)	-0.19139 (p < 0.0001)
Left Thumb Oil Red O Quality	-0.20946 (p < 0.0001)	0.08785 (p = 0.0336)	-0.01079 (p = 0.7945)	0.195 (p < 0.0001)
Left Index Ninhydrin Findability	-0.26716 (p < 0.0001)	0.07326 (p = 0.0772)	0.10545 (p = 0.0108)	-0.09621 (p = 0.0202)
Left Index Ninhydrin Quality	-0.0287 (p = 0.4892)	-0.05213 (p = 0.2089)	-0.05263 (p = 0.2045)	0.09218 (p = 0.026)
Left Index Oil Red O Findability	0.01386 (p = 0.7379)	-0.08507 (p = 0.0397)	-0.01224 (p = 0.7676)	-0.18934 (p < 0.0001)
Left Index Oil Red O Quality	-0.26571 (p < 0.0001)	0.08989 (p = 0.0297)	-0.0209 (p = 0.614)	0.15053 (p = 0.0003)
Left Middle Ninhydrin Findability	-0.28281 (p < 0.0001)	0.11572 (p = 0.0051)	0.10648 (p = 0.01)	-0.08703 (p = 0.0353)
Left Middle Ninhydrin Quality	-0.09027 (p = 0.029)	-0.07137 (p = 0.0846)	-0.01896 (p = 0.6473)	0.06134 (p = 0.1384)
Left Middle Oil Red O Findability	0.01931 (p = 0.6411)	-0.08051 (p = 0.0516)	-0.02224 (p = 0.5914)	-0.17705 (p < 0.0001)
Left Middle Oil Red O Quality	-0.30165 (p < 0.0001)	0.11584 (p = 0.005)	-0.01238 (p = 0.765)	0.1912 (p < 0.0001)
Left Ring Ninhydrin Findability	-0.21848 (p < 0.0001)	0.14605 (p = 0.0004)	0.10476 (p = 0.0112)	-0.12307 (p = 0.0029)
Left Ring Ninhydrin Quality	-0.10418 (p = 0.0117)	-0.09486 (p = 0.0217)	-0.03109 (p = 0.4529)	0.05318 (p = 0.199)
Left Ring Oil Red O Findability	0.01817 (p = 0.6612)	-0.10676 (p = 0.0098)	-0.01729 (p = 0.6767)	-0.16272 (p < 0.0001)
Left Ring Oil Red O Quality	-0.24781 (p < 0.0001)	0.07763 (p = 0.0608)	-0.01564 (p = 0.7061)	0.12112 (p = 0.0034)
Left Pinky Ninhydrin Findability	-0.29319 (p < 0.0001)	0.13139 (p = 0.0014)	0.04654 (p = 0.261)	-0.14058 (p = 0.0006)
Left Pinky Ninhydrin Quality	0.01825 (p = 0.6595)	-0.08255 (p = 0.046)	-0.0355 (p = 0.3914)	0.03808 (p = 0.3578)
Left Pinky Oil Red O Findability	-0.03707 (p = 0.3707)	-0.02143 (p = 0.605)	0.03331 (p = 0.4213)	-0.06284 (p = 0.129)
Left Pinky Oil Red O Quality	-0.19764 (p < 0.0001)	0.11334 (p = 0.0061)	0.00741 (p = 0.8581)	0.17774 (p < 0.0001)
Right Thumb Ninhydrin Findability	-0.25911 (p < 0.0001)	0.04152 (p = 0.316)	0.0723 (p = 0.0806)	-0.0947 (p = 0.022)
Right Thumb Ninhydrin Quality	-0.08601 (p = 0.0376)	-0.10475 (p = 0.0112)	-0.03962 (p = 0.3388)	0.05173 (p = 0.2115)
Right Thumb Oil Red O Findability	0.02906 (p = 0.483)	-0.07397 (p = 0.0738)	-0.01821 (p = 0.6603)	-0.11315 (p = 0.0062)
Right Thumb Oil Red O Quality	-0.2172 (p < 0.0001)	0.02106 (p = 0.6111)	-0.01953 (p = 0.6373)	0.10148 (p = 0.0141)
Right Index Ninhydrin Findability	-0.26206 (p < 0.0001)	0.09245 (p = 0.0255)	0.05889 (p = 0.1552)	-0.04709 (p = 0.2559)
Right Index Ninhydrin Quality	-0.08051 (p = 0.0518)	-0.09906 (p = 0.0166)	-0.06889 (p = 0.0963)	0.02849 (p = 0.492)
Right Index Oil Red O Findability	0.01307 (p = 0.7523)	-0.10987 (p = 0.0078)	-0.03217 (p = 0.4374)	-0.15266 (p = 0.0002)
Right Index Oil Red O Quality	-0.25119 (p < 0.0001)	0.09021 (p = 0.0291)	0.0306 (p = 0.46)	0.15355 (p = 0.0002)
Right Middle Ninhydrin Findability	-0.24577 (p < 0.0001)	0.13371 (p = 0.0012)	0.05803 (p = 0.161)	-0.0365 (p = 0.3782)
Right Middle Ninhydrin Quality	-0.07846 (p = 0.0579)	-0.09727 (p = 0.0186)	-0.03099 (p = 0.4544)	0.04069 (p = 0.3259)
Right Middle Oil Red O Findability	0.04627 (p = 0.2638)	-0.10726 (p = 0.0094)	-0.01715 (p = 0.6789)	-0.15941 (p = 0.0001)
Right Middle Oil Red O Quality	-0.27207 (p < 0.0001)	0.12284 (p = 0.0029)	0.00528 (p = 0.8985)	0.16408 (p = < 0.0001)
Right Ring Ninhydrin Findability	-0.16734 (p < 0.0001)	0.10689 (p = 0.0097)	0.05154 (p = 0.2132)	-0.08495 (p = 0.04)
Right Ring Ninhydrin Quality	-0.09596 (p = 0.0203)	-0.08397 (p = 0.0423)	-0.0503 (p = 0.2244)	0.0945 (p = 0.0223)
Right Ring Oil Red O Findability	0.04394 (p = 0.2887)	-0.10228 (p = 0.0133)	-0.06862 p = 0.0973)	-0.18925 (p < 0.0001)
Right Ring Oil Red O Quality	-0.26105 (p < 0.0001)	0.13083 (p = 0.0015)	0.03657 (p = 0.3773)	0.16115 (p < 0.0001)
Right Pinky Ninhydrin Findability	-0.099 (p = 0.0166)	0.12944 (p = 0.0017)	0.06092 (p = 0.1411)	-0.09898 (p = 0.0166)
Right Pinky Ninhydrin Quality	-0.1571 (p = 0.0001)	-0.09883 (p = 0.0168)	-0.03091 (p = 0.4555)	0.07688 (p = 0.0631)
Right Pinky Oil Red O Findability	0.02801 (p = 0.4989)	-0.0755 (p = 0.068)	0.04244 (p = 0.3055)	-0.16927 (p < 0.0001)
Right Pinky Oil Red O Quality	-0.0511 (p = 0.2171)	0.00377 (p = 0.9275)	-0.04473 (p = 0.2801)	-0.03687 (p = 0.3734)

The subject and print collection day, time of day, and activity were all determined to be linearly independent of one another, with all but one correlation coefficient p-values being greater than 0.05. In the case were $p \geq 0.05$, the null hypothesis (that the correlation coefficient is zero) fails to be rejected. The p-value for subject vs time of day is less than 0.05 ($p = 0.042$), so the null hypothesis is rejected, and the alternative hypothesis (that the correlation coefficient is nonzero, between -1 and 1) is accepted; however, the correlation coefficient is 0.08409, indicating no correlation as well. The data shows that each subject was depositing prints over various times of day and engaging in a range or various, yet random, activities across the study, helping to guarantee a normal distribution of fingerprint data that emulates those found in the day-to-day setting of the real world.

The correlation coefficients and p-values of the analysis between deposition variables and the individual fingers shows that there is a clear lack of linear correlation between all deposition variables and the quality and findability of eccrine and sebaceous prints from each finger. Looking at the data from Table VII, it can be seen that several p-values are greater than 0.05, meaning that the null hypothesis fails to be rejected, and no correlation can be found. For those correlation coefficients with statistical significance ($p < 0.05$, reject null hypothesis), none are found to have more than a weak or negligible correlation. The strongest correlation was between subject and left hand, middle finger for ORO quality (-0.30165, $p < 0.0001$) and was still a weak correlation. Most every other statistically significant correlation was less between 0.1 and -0.1. The lack of linear correlation between subject and fingerprint quality/findability and between activity and fingerprint quality/findability suggests those variables do not have a significant effect on the overall quality/grade of latent fingerprints deposited on paper, relative to a fingerprint examiner using traditional processing and subsequent visual inspection. The lack of linear correlation between the

collection day and fingerprint quality/findability shows that the overall quality/grade of the deposited fingerprints was not changing day to day throughout the course of the study. This can be roughly extrapolated to surmise that subjects weren't gaining or lessening in bias to attempt leave "better" or "worse" fingerprint samples as the study progressed. The lack of linear correlation between deposition time of day and fingerprint quality/findability suggests that this particular deposition condition does not have a significant effect on the overall quality/grade of latent fingerprints.

C. Charged Fingerprint Study

The charged fingerprint raw data is listed in Table XXII, Appendix I. The averages and standard deviations were calculated for the quality and findability of the eccrine and sebaceous print portions and are listed in Table VIII, along with the averages and standard deviations for the average print found in the field for comparison.

TABLE VIII
CHARGED FINGERPRINT AVERAGES TO COMPARE TO THE AVERAGE FIELD PRINT

	Charged	**Field**
Ninhydrin		
Findability	2 ± 1	2 ± 1
Quality	1.2 ±0.6	1.1 ± 0.7
Oil Red O		
Findability	1.2 ± 0.4	3 ± 1
Quality	3 ± 1	1.1 ± 0.9

Table VIII shows what the typical charged fingerprint looks like after processing. Comparing the charged print data to the field print data, it is observed that the quality and findability of the eccrine portion of a charged print are the same as that from the field. Unfortunately, this result cannot be discussed further, as there was a limitation in this piece of the study: the protocol for collecting charged prints was not guaranteed to emulate charged eccrine fingerprints produced in a laboratory setting. The typical protocol for collecting a charged eccrine print in the lab usually consists of having the subject cover their fingers with some sort of nonporous barrier (like a glove, bag, or other covering) that prevents the subject from touching other surfaces whilst waiting for eccrine sweat to be secreted onto the finger pad over a determined amount of time (generally several minutes). It was neither feasible nor practical to require subjects to wear protective coverings, and it was impossible to guarantee that subjects would abstain from touching anything for several minutes prior to the collection of the charged prints due to the fact that they were collected outside of the lab (in the field). The protocol for collecting charged prints in this study, however, did emulate the lab protocol for collecting charged sebaceous prints. Comparing the sebaceous charged print data to the field print data, however, it is observed that the quality and findability of a charged print is significantly different from that of the field, as the spread of two do not overlap. This is a crucial finding in that it verifies what previous research says about charged lipidic prints not being representative of what would be normally found in the field, highlighting the practical application and value to a fingerprint examiner.[4] If fingerprint research using sebaceous prints on porous surfaces—particularly research in developing new or improving current sebaceous processing techniques and subsequent validation studies—is using only charged prints, it is compromising the robustness of said research as it is not testing samples representative of what is found in the field and encountered by fingerprint examiners. Note,

ANOVA tests were not able to be run on the charged print data, comparing it to the uncharged field data, as the sample sizes were drastically different.

Finding that charged sebaceous fingerprints do not emulate sebaceous prints found in the field, the next logical step was to see if there were any conditions observed in the field data that that produced a fingerprint emulating the average field print. This was done so as to provide conditions that could be replicated in labs to produce representative samples (or a range of quality/grade) in future research. The only useful and practical deposition variable investigated in this study was activity prior to deposition. While it was shown that there is no correlation as a whole between activity and quality/findability for any fingerprint, the average and standard deviation for findability and quality of each type of print for each activity was calculated for a closer look to see if there are any activities that produce prints with similar averages that are within the spread of the average field print, or even activities that don't. That data is listed in Table IX.

TABLE IX
FINGERPRINT AVERAGES BASED ON ACTIVITY WITH COMPARISON TO THE AVERAGE FIELD FINGERPRINT

	Washing	**Low contact**	**Sleeping**	**Grooming**	**Food**	**Phys Act**	**High Contact**	**Gloves**	**Field**
Ninhydrin									
Findability	3 ± 1	2 ±1 *	2 ± 1 *	3 ± 1	3 ± 1	3 ± 1	2 ±1 *	1.6 ± 0.6	2 ± 1
Quality	0.9 ± 0.3 *	1.2 ±0.6 *	1.2 ± 0.4 *	1.0 ± 0.4 *	1.1 ± 0.4 *	1.2 ± 0.4 *	1.2 ± 0.5 *	1.7 ± 0.8	1.1 ± 0.7
Oil Red O									
Findability	4.4 ± 0.7	3.6 ± 0.9	3.4 ± 0.9	3 ± 1 *	3 ± 1 *	3 ± 1 *	3 ± 1 *	4.5 ± 0.6	3 ± 1
Quality	0.6 ± 0.6	1.1 ± 0.6 *	1.2 ± 0.7 *	1.3 ± 0.8 *	1.2 ± 0.7 *	1.2 ± 0.7 *	1.3 ± 0.8 *	0.5 ± 0.4	1.1 ± 0.9

* Indicates averages that are similar to and within the spread of those of the average print found in the field.

The best activities to emulate the average fingerprint are those that have all or the most averages that are close to and lie within the spread the average fingerprint (within ± 0.2 of the average). As can be seen from the data, the only activity group with all averages lying within the spread of the field is “high contact,” and is therefore the most emulative activity. Two very practical and feasible high contact activities research subjects can do in any laboratory are typing or using a cellular phone (preferably one with a touch screen) for a given period of time. Two activities that should be clearly avoided are hand washing and wearing gloves or other protective hand coverings.

D. Bandey Validation Study

The Bandey analysis validation study data is listed in Table X. As stated per the validation protocol, the validation was deemed successful in that there is sufficient agreement between the evaluations of the author and the professional fingerprint examiner. The percent agreement of identifiability between the two evaluations is 92%, and each ranking in disagreement differs by no more than ±1 Bandey ranking. In most cases of disagreement, the author was more conservative in evaluating whether or not a fingerprint was useful for identification.

TABLE X
BANDEY ANALYSIS VALIDATION RANKINGS

	Ninhydrin		**Oil Red O**	
Sample	Author	Expert	Author	Expert
1	1	1	3	2
2	4	3	0	0
2	2	3	1	2
4	2	2	2	2
5	3	2	4	3
6	0	0	1	0
7	3	2	2	2
8	1	0	4	3
9	4	4	3	3
10	2	2	3	3
11	4	4	2	1
12	3	3	1	0
13	1	2	4	4
14	3	3	2	2
15	1	2	1	0
16	2	2	3	3
17	3	3	4	3
18	4	3	1	1
19	2	2	2	2
20	1	1	3	3
21	2	2	4	4
22	4	3	1	1
23	1	1	2	2
24	4	4	3	2
25	4	3	4	3

V. CONCLUSION

This study sought to profile the overall quality/grade of the average latent fingerprint in the field that is deposited on a porous surface, comparing it to that of a charged fingerprint produced under laboratory conditions, and to determine if the time of day and activity prior to fingerprint deposition are significantly correlated to said quality/grade. The average fingerprint is described as the following overall quality/grade upon chemical development: an eccrine portion with a findability ranking of 2 ± 1 and a quality ranking of 1.1 ± 0.7, and a sebaceous portion with a findability ranking of 3 ± 1 and a quality ranking of 1.1 ± 0.9. The percentage of prints in the field that are usable for forensic identification is found to be 14% and 16% for the eccrine and sebaceous portions, respectively. The sebaceous portion of a charged print is observed to have an average findability of 1.2 ± 0.4 and quality of 3 ± 1, significant differences from that of the sebaceous portion of the average fingerprint in the field. It is concluded, therefore, that future research in processing techniques for latent fingerprints deposited on porous substrates should utilize not only charged fingerprints but also fingerprints that emulate the average print left in the field so as to be robust in validation. To that end, high contact activities such as phone usage and typing were found to be the best activities to engage in prior to deposition to ensure leaving a fingerprint that is most emulative to that found in the field. It was also determined from this study that there is no linear correlation between either time of day or activity and the quality or findability of a fingerprint.

APPENDICES

Appendix A

Dear Chris, 12/07/2017

Thank you for contacting the National Criminal Justice Reference Service (NCJRS).

All National Institute of Justice (NIJ) materials are in the public domain. We only ask that you adhere to the following when using our materials:

- Credit NIJ as follows: "Originally published by the National Institute of Justice, U.S. Department of Justice"

- Reproduce the materials in whole (do not revise the items)

Additional information on the NIJ copyright policy can be found on the NIJ website at http://www.nij.gov/publications/pages/reuse-policy.aspx.

Please let us know if you have any further questions.

Sincerely,

Wai
Information Specialist
National Criminal Justice Reference Service (NCJRS)
https://www.ncjrs.gov

Appendix B

ELSEVIER LICENSE
TERMS AND CONDITIONS

Feb 01, 2018

This Agreement between Mr. Chris Radford ("You") and Elsevier ("Elsevier") consists of your license details and the terms and conditions provided by Elsevier and Copyright Clearance Center.

License Number	4280400369790
License date	Feb 01, 2018
Licensed Content Publisher	Elsevier
Licensed Content Publication	Analytica Chimica Acta
Licensed Content Title	The detection of latent fingermarks on porous surfaces using amino acid sensitive reagents: A review
Licensed Content Author	Renee Jelly,Emma L.T. Patton,Chris Lennard,Simon W. Lewis,Kieran F. Lim ( )
Licensed Content Date	Oct 12, 2009
Licensed Content Volume	652
Licensed Content Issue	1-2
Licensed Content Pages	15
Start Page	128
End Page	142
Type of Use	reuse in a thesis/dissertation
Portion	figures/tables/illustrations
Number of figures/tables/illustrations	1
Format	both print and electronic
Are you the author of this Elsevier article?	No
Will you be translating?	No
Original figure numbers	scheme 1
Title of your thesis/dissertation	Prints in the Wild Investigating Changes in Fingerprint Quality on Porous Surfaces Throughout the Day
Expected completion date	Feb 2018
Estimated size (number of pages)	100
Requestor Location	Mr. Chris Radford 4443 N Wolcott Ave AUSTIN, IL 60640 United States Attn: Mr. Chris Radford
Publisher Tax ID	98-0397604
Total	0.00 USD

Appendix C

ELSEVIER LICENSE
TERMS AND CONDITIONS

Feb 01, 2018

This Agreement between Mr. Chris Radford ("You") and Elsevier ("Elsevier") consists of your license details and the terms and conditions provided by Elsevier and Copyright Clearance Center.

License Number	4280401460712
License date	Feb 01, 2018
Licensed Content Publisher	Elsevier
Licensed Content Publication	Forensic Science International
Licensed Content Title	Composition of fingermark residue: A qualitative and quantitative review
Licensed Content Author	Aline Girod,Robert Ramotowski,Céline Weyermann
Licensed Content Date	Nov 30, 2012
Licensed Content Volume	223
Licensed Content Issue	1-3
Licensed Content Pages	15
Start Page	10
End Page	24
Type of Use	reuse in a thesis/dissertation
Intended publisher of new work	other
Portion	figures/tables/illustrations
Number of figures/tables/illustrations	1
Format	both print and electronic
Are you the author of this Elsevier article?	No
Will you be translating?	No
Original figure numbers	figure 9
Title of your thesis/dissertation	Prints in the Wild Investigating Changes in Fingerprint Quality on Porous Surfaces Throughout the Day
Expected completion date	Feb 2018
Estimated size (number of pages)	100
Requestor Location	Mr. Chris Radford 4443 N Wolcott Ave AUSTIN, IL 60640 United States Attn: Mr. Chris Radford
Publisher Tax ID	98-0397604
Total	0.00 USD

Appendix D

UNIVERSITY OF ILLINOIS
AT CHICAGO

Office for the Protection of Research Subjects (OPRS)
Office of the Vice Chancellor for Research (MC 672)
203 Administrative Office Building
1737 West Polk Street
Chicago, Illinois 60612-7227

Approval Notice
Initial Review (Response To Modifications)

August 17, 2016

Ashley Hall, PharmD
Biopharmaceutical Sciences
UIC College of Pharmacy
833 South Wood Street
Chicago, IL 60612
Phone: (312) 996-6644

RE: Protocol # 2016-0431
"Collection of Fingerprints, Blood, Saliva, and Urine Samples for use in Forensic Science Research Projects"

Dear Dr. Hall:

Your Initial Review (Response To Modifications) was reviewed and approved by the Expedited review process on August 2, 2016. You may now begin your research

Please note the following information about your approved research protocol:

Protocol Approval Period: August 2, 2016 - August 2, 2017
Approved Subject Enrollment #: 500
Additional Determinations for Research Involving Minors: These determinations have not been made for this study since it has not been approved for enrollment of minors.
Performance Sites: UIC
Sponsor: None

Research Protocol(s):

a) Collection of Fingerprints, Blood, Saliva, and Urine Samples for use in Forensic Science Research Projects, V2; 5/31/2016

Recruitment Material(s):

a) Recruitment Scripts, Version 2; 5/31/2016

Informed Consent(s):

a) Forensic - fingerprints, blood, saliva, urine; Version 3;

Appendix D (continued)

Your research meets the criteria for expedited review as defined in 45 CFR 46.110(b)(1) under the following specific categories:

(2) Collection of blood samples by finger stick, heel stick, ear stick, or venipuncture as follows: (a) from healthy, nonpregnant adults who weigh at least 110 pounds. For these subjects, the amounts drawn may not exceed 550 ml in an 8 week period and collection may not occur more frequently than 2 times per week; or (b) from other adults and children, considering the age, weight, and health of the subjects, the collection procedure, the amount of blood to be collected, and the frequency with which it will be collected. For these subjects, the amount drawn may not exceed the lesser of 50 ml or 3 ml per kg in an 8 week period and collection may not occur more frequently than 2 times per week.

(3) Prospective collection of biological specimens for research purposes by noninvasive means. Examples: (a) hair and nail clippings in a nondisfiguring manner; (b) deciduous teeth at time of exfoliation or if routine patient care indicates a need for extraction; (c) permanent teeth if routine patient care indicates a need for extraction; (d) excreta and external secretions (including sweat); (e) uncannulated saliva collected either in an unstimulated fashion or stimulated by chewing gumbase or wax by applying a dilute citric solution to the tongue; (f) placenta removed at delivery; (g) amniotic fluid obtained at the time of rupture of the membrane prior to or during labor; (h) supra- and subgingival dental plaque and calculus, provided the collection procedure is not more invasive than routine prophylactic scaling of the teeth and the process is accomplished in accordance with accepted prophylactic techniques; (i) mucosal and skin cells collected by buccal scraping or swab, skin swab, or mouth washings; (j) sputum collected after saline mist nebulization.

Please note the Review History of this submission:

Receipt Date	Submission Type	Review Process	Review Date	Review Action
04/22/2016	Initial Review	Expedited	05/03/2016	Modifications Required
06/06/2016	Response To Modifications	Expedited	06/07/2016	Modifications Required
07/08/2016	Response To Modifications	Expedited	07/12/2016	Modifications Required
08/01/2016	Response To Modifications	Expedited	08/02/2016	Approved

Please remember to:

→ Use your **research protocol number** (2016-0431) on any documents or correspondence with the IRB concerning your research protocol.

→ Review and comply with all requirements on the enclosure,
"**UIC Investigator Responsibilities, Protection of Human Research Subjects**"
(http://tigger.uic.edu/depts/ovcr/research/protocolreview/irb/policies/0924.pdf)

Please note that the UIC IRB has the prerogative and authority to ask further questions, seek additional information, require further modifications, or monitor the conduct of your research and the consent process.

Please be aware that if the scope of work in the grant/project changes, the protocol must be amended and approved by the UIC IRB before the initiation of the change.

Appendix D (continued)

We wish you the best as you conduct your research. If you have any questions or need further help, please contact OPRS at (312) 996-1711 or me at (312) 996-0548. Please send any correspondence about this protocol to OPRS at 203 AOB, M/C 672.

Sincerely,

Brandi L. Drumgole, B.S.
Assistant Director
Office for the Protection of Research Subjects

Enclosure(s): documents will be forwarded electronically as an attachment to a separate email

1. **Informed Consent Document(s):**
   a) Forensic - fingerprints, blood, saliva, urine; Version 3;
2. **Recruiting Material(s):**
   a) Recruitment Scripts, Version 2; 5/31/2016

cc: William T. Beck, Biopharmaceutical Sciences, M/C 865

Appendix E

TABLE XI
PRINT COLLECTION BOOK DATA

Subject	Book	Page	Date	Time	Activity
1	A	1	13-Aug	0800	getting ready for church
1	A	2	13-Aug	1105	2 & 3 year old class
1	A	3	13-Aug	1415	typing on computer
1	A	4	13-Aug	1740	washed hands
1	A	5	13-Aug	1600	board game (quirkle)
1	A	6	13-Aug	2305	shower
1	A	7	13-Aug	0800	washed hands
1	A	8	14-Aug	1230	typing at work
1	A	9	14-Aug	1530	typing, at a snack
1	A	10	14-Aug	1820	ate dinner
1	A	11	14-Aug	2345	walked in rain, took CTA
1	B	1	20-Aug	1335	eating lunch
1	B	2	20-Aug	1600	sitting in the car
1	B	3	20-Aug	1900	CTA, unlocked apt.
1	B	4	20-Aug	2140	watching TV
1	B	5	21-Aug	0640	putting on make-up
1	B	6	21-Aug	0920	typing on computer
1	B	7	21-Aug	1240	organizing TMC Kids classrooms
1	B	8	21-Aug	1545	typing/writing
1	B	9	21-Aug	1905	taking the train
1	B	10	21-Aug	2230	washed dishes
1	C	1	27-Aug	0640	getting ready, make-up
1	C	2	27-Aug	0910	typing, washed hands
1	C	3	27-Aug	1320	taking the train/bus
1	C	4	27-Aug	1635	typing on computer
1	C	5	27-Aug	1955	ate dinner
1	C	6	27-Aug	2310	texting
1	C	7	28-Aug	0835	putting on make-up
1	C	8	28-Aug	1130	typing at work
1	C	9	28-Aug	1430	typing, snacking
1	C	10	28-Aug	1800	grocery shopping
1	C	11	28-Aug	2135	running
2	A	1	12-Aug	1012	doing my hair/make-up
2	A	2	12-Aug	1318	making a smoothie
2	A	3	12-Aug	1737	sitting in a park
2	A	4	12-Aug	1918	eating dinner
2	A	5	12-Aug	2315	playing a game
2	A	6	13-Aug	0750	sleeping, making coffee
2	A	7	13-Aug	1145	eating yogurt
2	A	8	13-Aug	1348	eating lunch
2	A	9	13-Aug	1551	sitting on the couch
2	A	10	13-Aug	1910	watching a movie
2	B	1	19-Aug	0855	making breakfast
2	B	2	21-Aug	0700	doing my hair/make-up
2	B	3	21-Aug	1000	typing on computer
2	B	4	21-Aug	1300	typing, eating grapes
2	B	5	21-Aug	1630	typing
2	B	6	21-Aug	1900	on my phone
2	B	7	21-Aug	2215	sitting in a bar
2	B	8	22-Aug	0705	doing my hair/make-up
2	B	9	22-Aug	1225	eating lunch
2	B	10	22-Aug	1548	typing, eating an apple
2	B	11	22-Aug	1919	on my phone
2	B	12	22-Aug	2050	running
2	C	1	28-Aug	0730	make coffee/ washed hands
2	C	2	28-Aug	1052	typing
2	C	3	28-Aug	1453	sorting classroom materials
2	C	4	28-Aug	1637	typing
2	C	5	29-Aug	0833	driving
2	C	6	29-Aug	1135	sorting curriculum
2	C	7	29-Aug	1305	cutting paper

Appendix E (continued)

TABLE XI
PRINT COLLECTION BOOK DATA

Subject	Book	Page	Date	Time	Activity
2	C	8	29-Aug	1535	typing, laundry, putting on lotion
2	C	9	29-Aug	1750	driving
2	C	10	29-Aug	1939	eating dinner
2	C	11	29-Aug	2230	sitting outside
3	A	1	11-Jul	1025	shower, hair gel
3	A	2	11-Jul	1455	typing
3	A	3	11-Jul	1739	washed hands
3	A	4	11-Jul	2100	typing
3	A	5	12-Jul	0015	gaming on pc
3	A	6	12-Jul	0924	shower, shave, hair
3	A	7	12-Jul	1250	in lab, typing
3	A	8	12-Jul	1529	typing
3	A	9	12-Jul	2016	dinner, nap
3	A	10	12-Jul	2331	pc gaming
3	A	11	13-Jul	0143	washed hands, typed for 15 min
3	B	1	18-Jul	0913	woke up
3	B	2	18-Jul	1153	in lab wearing gloves
3	B	3	18-Jul	1540	in lab wearing gloves
3	B	4	18-Jul	1813	dinner
3	B	5	18-Jul	2200	watching a movie
3	B	6	18-Jul	2340	brushed teeth, read
3	B	7	19-Jul	0835	woke up
3	B	8	19-Jul	1149	wearing gloves
3	B	9	19-Jul	1430	shopping, lunch
3	B	10	19-Jul	1809	on bus, outside
3	B	11	19-Jul	2103	talked on phone, nap
3	B	12	19-Jul	2345	midnight snack
3	C	1	25-Jul	0830	woke up
3	C	2	25-Jul	1145	typing
3	C	3	25-Jul	1419	washed hands, some computer
3	C	4	25-Jul	1740	typing
3	C	5	25-Jul	2130	ate cookies, pc gaming
3	C	6	26-Jul	0025	pc games
3	C	7	26-Jul	0934	shower
3	C	8	26-Jul	1213	wearing gloves
3	C	9	26-Jul	1545	lunch, sitting
3	C	10	26-Jul	1850	typing
3	C	11	26-Jul	2129	typing
3	C	12	27-Jul	0020	watching TV
4	A	1	14-Aug	0700	woke up
4	A	2	14-Aug	1022	worked w/ a patient in pt. room
4	A	3	14-Aug	1315	packed up patient belongings
4	A	4	14-Aug	1950	performed an EKG exam on patient
4	A	5	14-Aug	2335	organized office/school supplies
4	A	6	15-Aug	0915	drove to school
4	A	7	15-Aug	1320	taking notes in class
4	B	1	23-Aug	0810	cooked breakfast and drove to school
4	B	2	23-Aug	1150	writing notes
4	B	3	23-Aug	1711	attended a meeting
4	B	4	23-Aug	2025	working on homework
4	B	5	23-Aug	2312	ate dinner
4	B	6	24-Aug	0920	sat in group discussion
4	B	7	24-Aug	1251	ate lunch
4	B	8	24-Aug	1446	worked w/ lab dummies
4	B	9	24-Aug	2115	washed dishes
5	A	1	20-Aug	1020	BLANK
5	A	2	20-Aug	1235	Crossroads
5	A	3	20-Aug	1541	waiting for train
5	A	4	20-Aug	1806	woke up from nap, stretches on wood floor
5	A	5	20-Aug	2030	cooking/cleaning
5	A	6	20-Aug	2235	getting ready for bed, brush teeth

Appendix E (continued)

TABLE XI
PRINT COLLECTION BOOK DATA

Subject	Book	Page	Date	Time	Activity
5	A	7	21-Aug	0803	just woke up
5	A	8	21-Aug	1800	just got home/biking outside
5	A	9	21-Aug	2000	floor stretches
5	A	10	21-Aug	2220	just got home from jazz club outing
5	B	1	28-Aug	0824	making breakfast
5	B	2	28-Aug	1950	finishing dinner
5	B	3	28-Aug	2330	getting ready for bed
5	B	4	29-Aug	0840	just woke up
5	B	5	29-Aug	1415	just finished cooking lunch
5	B	6	29-Aug	1806	just got home from CTA bus
5	B	7	29-Aug	2050	typing on computer
5	B	8	30-Aug	0900	just woke up
5	B	9	30-Aug	1100	baking
5	B	10	30-Aug	1308	floor exercises
5	B	11	30-Aug	2104	just got home from biking
5	B	12	30-Aug	2311	getting ready for bed
5	C	1	31-Aug	0837	just woke up
5	C	2	31-Aug	1037	CTA train
5	C	3	31-Aug	1451	cleaning
5	C	4	31-Aug	1700	napping
5	C	5	31-Aug	2235	just got home from Crossroads
5	C	6	1-Sep	0835	just woke up
5	C	7	1-Sep	1035	getting ready to leave
5	C	8	1-Sep	1735	just got back from biking, groceries
5	C	9	1-Sep	2300	getting ready for bed
5	C	10	2-Sep	0815	just woke up
5	C	11	2-Sep	1618	biking
5	C	12	2-Sep	2127	CTA
6	A	1	4-Sep	0826	watching TV
6	A	2	4-Sep	1100	reading on tablet
6	A	3	4-Sep	1300	eating lunch
6	A	4	4-Sep	1515	typing on computer
6	A	5	4-Sep	1715	computer game
6	A	6	4-Sep	1930	dinner/shower
6	A	7	5-Sep	0530	sleeping
6	A	8	5-Sep	0730	taking notes
6	A	9	5-Sep	0950	notes/class
6	A	10	5-Sep	1155	eating lunch
6	A	11	5-Sep	2015	shower
6	A	12	5-Sep	2140	watching TV
6	B	1	16-Sep	0830	eating breakfast
6	B	2	16-Sep	1030	playing games on phone
6	B	3	16-Sep	1230	lunch/typing on computer
6	B	4	16-Sep	1450	shopping/driving
6	B	5	16-Sep	1720	typing on computer
6	B	6	16-Sep	1930	dinner
6	B	7	17-Sep	0845	playing w/ my child
6	B	8	17-Sep	1030	computer games
6	B	9	17-Sep	1516	watching football
6	B	10	17-Sep	1727	driving
6	B	11	17-Sep	1930	driving
6	B	12	17-Sep	2200	watching football
6	C	1	26-Sep	0700	driving
6	C	2	26-Sep	1000	class, lecture
6	C	3	26-Sep	1500	typing
6	C	4	26-Sep	1715	talking on phone
6	C	5	26-Sep	1900	driving
6	C	6	26-Sep	2150	watching TV
6	C	7	27-Sep	0800	workout/shower
6	C	8	27-Sep	1030	on computer
6	C	9	27-Sep	1300	on computer

Appendix E (continued)

TABLE XI
PRINT COLLECTION BOOK DATA

Subject	Book	Page	Date	Time	Activity
6	C	10	27-Sep	1500	driving
6	C	11	27-Sep	1800	talking on phone
6	C	12	27-Sep	2030	watching tv
7	A	1	7-Sep	0800	shower
7	A	2	7-Sep	0900	rode the CTA
7	A	3	7-Sep	1300	just had lunch
7	A	4	7-Sep	1530	class
7	A	5	7-Sep	2230	used phone
7	A	6	7-Sep	2330	washed hands, light moisturizer
7	A	7	8-Sep	0845	just woke up
7	A	8	8-Sep	1020	rode the divvy bike
7	A	9	8-Sep	1150	worked out at gym
7	A	10	8-Sep	1330	had pizza
7	A	11	8-Sep	1500	used microscope
7	B	1	21-Sep	1300	cleaned out desk
7	B	2	21-Sep	0800	washed hands
7	B	3	21-Sep	0900	shower, moisturize
7	B	4	21-Sep	1400	just had lunch
7	B	5	21-Sep	1600	took the CTA
7	B	6	21-Sep	2000	made dinner
7	B	7	22-Sep	0900	had breakfast
7	B	8	22-Sep	1030	rode the divvy
7	B	9	22-Sep	1200	just worked out
7	B	10	22-Sep	1300	ate pizza
7	B	11	22-Sep	1645	worked on laptop
7	B	12	22-Sep	1830	made dinner
7	C	1	23-Sep	1000	made breakfast
7	C	2	23-Sep	1200	had bath
7	C	3	23-Sep	1600	worked on laptop
7	C	4	23-Sep	1700	grocery shopping
7	C	5	23-Sep	2000	spoke on phone
7	C	6	23-Sep	2200	did dishes
7	C	7	24-Sep	0900	just woke up
7	C	8	24-Sep	1130	had breakfast
7	C	9	24-Sep	1600	had lunch
7	C	10	24-Sep	1730	washed hands
7	C	11	24-Sep	2000	had dinner
7	C	12	24-Sep	2315	washed hands, moisturized
8	A	1	2-Sep	1255	reading articles
8	A	2	2-Sep	1500	washing hands
8	A	3	2-Sep	1733	typing on laptop
8	A	4	2-Sep	2000	writing notes
8	A	5	2-Sep	2212	texting
8	A	6	2-Sep	2350	typing on laptop
8	A	7	3-Sep	1120	texting
8	A	8	3-Sep	1317	eating
8	A	9	3-Sep	1520	making food
8	A	10	3-Sep	1757	washing hands
8	A	11	3-Sep	2200	driving
8	A	12	3-Sep	2356	typing on laptop
8	B	1	8-Sep	1020	Texting
8	B	2	8-Sep	1149	washing hands
8	B	3	8-Sep	1336	ate pizza
8	B	4	8-Sep	1536	washing hands
8	B	5	8-Sep	1800	texting
8	B	6	8-Sep	2130	brushing teeth
8	B	7	9-Sep	0902	applied skincare
8	B	8	9-Sep	1121	exercise at gym
8	B	9	9-Sep	1349	riding CTA bus
8	B	10	9-Sep	1530	eating
8	B	11	9-Sep	1731	washing hands

Appendix E (continued)

TABLE XI
PRINT COLLECTION BOOK DATA

Subject	Book	Page	Date	Time	Activity
8	B	12	9-Sep	2211	texting
8	C	1	15-Sep	0803	washing hands
8	C	2	15-Sep	0938	applying make-up
8	C	3	15-Sep	1127	texting
8	C	4	15-Sep	1513	writing notes
8	C	5	15-Sep	1700	riding CTA bus
8	C	6	15-Sep	1852	eating
8	C	7	16-Sep	1124	applying skincare
8	C	8	16-Sep	1305	eating
8	C	9	16-Sep	1538	writing notes
8	C	10	16-Sep	1803	washing hands
8	C	11	16-Sep	2000	texting
8	C	12	16-Sep	2221	shower
9	A	1	2-Sep	1130	sleeping
9	A	2	2-Sep	1430	driving
9	A	3	2-Sep	1700	shopping
9	A	4	2-Sep	1900	after dinner
9	A	5	2-Sep	2100	typing
9	A	6	3-Sep	1130	sleeping
9	A	7	3-Sep	1300	cooking
9	A	8	3-Sep	1500	typing
9	A	9	3-Sep	1700	driving
9	A	10	3-Sep	1900	dinner
9	A	11	3-Sep	2300	watching TV
9	A	12	3-Sep	2100	showering
9	B	1	14-Sep	0730	sleeping
9	B	2	14-Sep	0945	driving
9	B	3	14-Sep	1337	washed hands
9	B	4	14-Sep	1500	lecture
9	B	5	14-Sep	1900	lab
9	B	6	15-Sep	0730	sleeping
9	B	7	15-Sep	0930	on subway
9	B	8	15-Sep	1130	studying
9	B	9	15-Sep	1330	in seminar
9	B	10	15-Sep	1530	driving
9	B	11	15-Sep	1730	making dinner
9	B	12	15-Sep	1930	watching TV
9	C	1	16-Sep	1030	sleeping
9	C	2	16-Sep	1230	cooking
9	C	3	16-Sep	1530	driving
9	C	4	16-Sep	1730	shopping
9	C	5	16-Sep	1930	out to dinner
9	C	6	16-Sep	2130	driving
9	C	7	17-Sep	1030	sleeping
9	C	8	17-Sep	1230	eating
9	C	9	17-Sep	1430	studying
9	C	10	17-Sep	1630	studying
9	C	11	17-Sep	1830	washing hands
9	C	12	17-Sep	2030	studying
10	A	1	5-Sep	1100	class lecture, note taking w/ pen
10	A	2	5-Sep	1300	class lecture
10	A	3	5-Sep	1500	typing on keyboard
10	A	4	5-Sep	2115	shower, applied lotion
10	A	5	5-Sep	2300	watching TV
10	A	6	6-Sep	0730	shower, applied lotion
10	A	7	6-Sep	0940	CTA train
10	A	8	6-Sep	1115	typing, working on computer
10	A	9	6-Sep	1330	eating lunch
10	B	1	9-Sep	1445	shower, applied lotion
10	B	2	9-Sep	1645	biking
10	B	3	9-Sep	1845	biking

Appendix E (continued)

TABLE XI
PRINT COLLECTION BOOK DATA

Subject	Book	Page	Date	Time	Activity
10	B	4	9-Sep	2045	eating food
10	B	5	9-Sep	2345	washed face and hands
10	B	6	10-Sep	0930	shower, lotion
10	B	7	10-Sep	1530	driving
10	B	8	10-Sep	1730	sleeping then dishes
10	B	9	10-Sep	1930	writing w/ pen and typing
10	B	10	10-Sep	2130	eating food
10	C	1	19-Sep	1200	typing, eating
10	C	2	19-Sep	1600	typing and paperwork
10	C	3	19-Sep	1808	public transportation
10	C	4	19-Sep	2000	public transportation, washed hands
10	C	5	19-Sep	2220	shower, lotion
10	C	6	20-Sep	0930	public transportation
10	C	7	20-Sep	1130	typing, eating
10	C	8	20-Sep	1330	typing
10	C	9	20-Sep	1530	washed hands, typing
10	C	10	20-Sep	2030	eating, typing
10	C	11	20-Sep	2230	wash face, lotion
11	A	1	12-Sep	0730	CTA, typing
11	A	2	12-Sep	0940	gym/shower
11	A	3	12-Sep	1115	reading
11	A	4	12-Sep	1500	sitting
11	A	5	12-Sep	1830	cooking
11	A	6	12-Sep	2130	computer work
11	A	7	14-Sep	0630	woke up/make-up
11	A	8	14-Sep	1300	ate pizza
11	A	9	14-Sep	1630	holding notebook
11	A	11	14-Sep	1830	lab work no gloves
11	B	1	18-Sep	0930	4 mi run
11	B	2	18-Sep	1130	pc work
11	B	3	18-Sep	1500	walking outside
11	B	4	18-Sep	1730	driving, washed hands
11	B	5	18-Sep	2000	shower, applied lotion
11	B	6	18-Sep	2130	pc work
11	B	7	20-Sep	1030	meeting, ate cookies
11	B	8	20-Sep	1230	snacking
11	B	9	20-Sep	1500	desk/pc work
11	B	10	20-Sep	1700	outside walk, snacking
11	B	11	20-Sep	1830	outside walk
11	B	12	20-Sep	2000	washed dishes
11	C	1	4-Sep	1030	cooking breakfast
11	C	2	4-Sep	1230	watching tv
11	C	3	4-Sep	1430	eating pizza
11	C	4	4-Sep	1730	working on computer
11	C	5	4-Sep	1930	washed hands
11	C	6	4-Sep	2130	drinking, washed hands
11	C	7	5-Sep	0630	made lunch
11	C	8	5-Sep	1000	gym/shower
11	C	9	5-Sep	1330	BLANK
11	C	10	5-Sep	1530	office work
11	C	11	5-Sep	2300	typing
12	A	1	6-Sep	0500	eating breakfast
12	A	2	6-Sep	0800	paperwork
12	A	3	6-Sep	1138	wearing nitrile gloves
12	A	4	6-Sep	1358	paperwork
12	A	5	6-Sep	1700	BLANK
12	A	6	6-Sep	1930	cleaning up dinner
12	A	7	8-Sep	0545	driving
12	A	8	8-Sep	0900	paperwork
12	A	9	8-Sep	1500	driving
12	A	10	8-Sep	1630	cooking

Appendix E (continued)

TABLE XI
PRINT COLLECTION BOOK DATA

Subject	Book	Page	Date	Time	Activity
12	B	1	11-Sep	0700	eating
12	B	2	11-Sep	1015	lab work
12	B	3	11-Sep	1345	paperwork
12	B	4	11-Sep	1900	tv
12	B	6	12-Sep	0645	lab work
12	B	7	12-Sep	1100	paperwork
12	B	8	12-Sep	1330	paperwork
12	B	9	12-Sep	BLANK	BLANK
12	B	11	12-Sep	1815	washing dishes
12	C	1	19-Sep	0545	driving
12	C	2	19-Sep	1005	paperwork
12	C	3	19-Sep	1245	lunch
12	C	4	19-Sep	1445	paperwork
12	C	5	19-Sep	1700	driving
12	C	6	19-Sep	2000	driving
12	C	7	20-Sep	0545	driving
12	C	8	20-Sep	1000	paperwork
12	C	9	20-Sep	1300	paperwork
12	C	10	20-Sep	1600	paperwork
12	C	11	20-Sep	1700	reading
12	C	12	20-Sep	2100	driving
13	A	1	14-Sep	0730	breakfast
13	A	2	14-Sep	1440	writing reports, computer
13	A	3	14-Sep	1540	washed hands
13	A	4	14-Sep	1640	biked home
13	A	5	14-Sep	1820	cooking
13	A	6	15-Sep	0704	making breakfast, showered
13	A	7	14-Sep	2200	watching tv
13	A	8	15-Sep	0925	collating case files, copying
13	A	9	15-Sep	1123	paperwork - washed hands
13	A	10	15-Sep	1451	paperwork
13	B	1	27-Sep	0747	shower and dress
13	B	2	27-Sep	1118	finished deposition
13	B	3	27-Sep	1423	lunch/meeting
13	B	4	27-Sep	1540	lab work gloves
13	B	5	27-Sep	1827	grocery shopping
13	B	6	27-Sep	2124	cooking
13	B	7	28-Sep	0645	shower
13	B	8	28-Sep	0907	data work up, computer
13	B	9	28-Sep	1415	set up sequence (GC/MS)
13	B	10	28-Sep	1736	cooking
13	B	11	28-Sep	2132	Xbox
13	C	1	5-Sep	0630	sleeping
13	C	2	5-Sep	0845	printing syllabi
13	C	3	5-Sep	1120	ate lunch - washed hands
13	C	4	5-Sep	1440	computer entry, washed hands
13	C	5	5-Sep	1755	reading on phone
13	C	6	13-Sep	0732	showered, made coffee
13	C	7	13-Sep	1000	lab work w/ gloves, washed hands
13	C	8	13-Sep	1626	eating
14	A	1	5-Sep	1006	computer/paperwork
14	A	2	5-Sep	1300	computer/paperwork
14	A	3	5-Sep	1600	computer
14	A	4	5-Sep	1720	washed hands
14	A	5	5-Sep	1916	dinner, washed hands
14	A	6	5-Sep	2100	laundry
14	A	8	5-Sep	2200	laundry
14	A	9	5-Sep	2335	computer
14	A	10	6-Sep	0050	BLANK
14	A	11	6-Sep	0600	woke up
14	A	12	6-Sep	0730	getting ready

Appendix E (continued)

TABLE XI
PRINT COLLECTION BOOK DATA

Subject	Book	Page	Date	Time	Activity
14	B	1	6-Sep	0900	arrived at work
14	B	2	6-Sep	1030	BLANK
14	B	3	6-Sep	1244	lab work
14	B	4	6-Sep	1400	lab work
14	B	5	6-Sep	1610	paperwork
14	B	6	6-Sep	1924	watching baseball
14	B	7	7-Sep	0450	BLANK
14	B	8	7-Sep	0820	leaving for work
14	B	9	7-Sep	0930	arrived at work
14	B	10	7-Sep	1500	lab work
14	B	11	7-Sep	1610	computer work
14	B	12	7-Sep	1850	relaxing
14	C	1	8-Sep	0500	woke up
14	C	2	8-Sep	0730	cleaned dishes
14	C	3	8-Sep	1210	paperwork
14	C	4	8-Sep	1340	paperwork
14	C	5	8-Sep	1646	computer work
14	C	6	8-Sep	1850	washed hands
14	C	7	8-Sep	2120	dishes
14	C	8	11-Sep	0600	getting ready for work
14	C	9	11-Sep	1130	paperwork
14	C	10	11-Sep	1545	computer work
14	C	11	11-Sep	1800	arrived home from commute
14	C	12	12-Sep	0620	woke up
15	A	1	26-Sep	1045	working on computer
15	A	2	26-Sep	1200	computer, stairwell railing
15	A	3	26-Sep	1335	computer
15	A	4	26-Sep	1522	eating, vigorous walking
15	A	5	26-Sep	1640	eating, computer
15	A	6	27-Sep	0950	computer, drinking coffee
15	A	7	27-Sep	1433	wash hands, computer, organize room
15	A	8	27-Sep	1545	computer, sweaty palms, touched hair
15	A	9	27-Sep	1652	driving, doing hair
15	A	10	27-Sep	2230	on phone, brush teeth, pet dog
15	B	1	11-Oct	0730	driving, opened doors
15	B	2	11-Oct	1100	writing, computer
15	B	3	11-Oct	1245	fixing glasses
15	B	4	11-Oct	1450	making copies
15	B	5	11-Oct	1620	ate food
15	B	6	12-Oct	0930	computer, writing
15	B	7	12-Oct	1135	eating
15	B	8	12-Oct	1345	opened door, writing
15	B	9	12-Oct	1530	driving, playing with dog
15	B	10	12-Oct	1730	hair and make-up
15	C	1	4-Oct	0800	on phone, brush teeth, pet dog
15	C	2	4-Oct	0950	writing, on phone
15	C	3	4-Oct	1210	computer, hair
15	C	4	4-Oct	1435	driving, eating
15	C	5	4-Oct	1545	cleaning, organizing
15	C	6	5-Oct	0930	reading, typing on computer
15	C	7	5-Oct	1145	typing, touched hair
15	C	8	5-Oct	1322	playing ball game, computer
15	C	9	5-Oct	1500	cleaning, organizing
15	C	10	5-Oct	1820	driving, on phone
16	A	1	27-Sep	1700	on phone, riding in car
16	A	2	27-Sep	1851	on phone and giving hugs
16	A	3	27-Sep	2118	eating a cupcake, scratching face
16	A	4	27-Sep	2249	eating fries and chicken, handling cash
16	A	5	28-Sep	1008	brushing hair, spraying perfume
16	A	6	28-Sep	1114	washed hands
16	A	7	28-Sep	1231	serving food, wiping table

Appendix E (continued)

TABLE XI
PRINT COLLECTION BOOK DATA

Subject	Book	Page	Date	Time	Activity
16	A	9	28-Sep	1415	wash hands, serve food
16	A	10	28-Sep	1525	wash hands, eat donut
16	A	11	28-Sep	1704	shower, pet dog
16	A	12	28-Sep	2145	eating veggies
16	B	1	13-Oct	1630	eat Reese's and pasta
16	B	2	13-Oct	2200	drawing
16	B	3	14-Oct	0030	washed hands
16	B	4	14-Oct	1130	wash hands
16	B	5	14-Oct	1400	serving food, handling money
16	B	6	14-Oct	1530	serving, handling money
16	B	7	14-Oct	1623	put dishes in sing
16	B	8	14-Oct	1931	cooking Chinese food
16	B	9	14-Oct	2020	cooking, cutting veggies, mopping
16	B	10	14-Oct	2130	degreasing and wiping tables
16	B	11	15-Oct	0842	brushing hair
16	B	12	15-Oct	1242	singing
16	C	1	20-Oct	0743	drink coffee
16	C	2	20-Oct	2117	going through papers, eating donuts
16	C	3	21-Oct	0903	waking up
16	C	4	21-Oct	1002	brushing hair
16	C	5	21-Oct	1104	brought coffee
16	C	6	21-Oct	1200	eat, wash hands
16	C	7	21-Oct	1330	clearing sauce/handling $
16	C	8	21-Oct	1443	drawing, eating
16	C	9	21-Oct	1607	eating Reese's
16	C	10	21-Oct	1717	brush hair
16	C	11	21-Oct	1832	showered, made coffee
16	C	12	22-Oct	0745	waking up
17	A	1	12-Jul	0945	typing
17	A	2	12-Jul	1234	eating
17	A	3	12-Jul	1520	wearing latex gloves
17	A	4	12-Jul	1845	typing
17	A	5	12-Jul	2135	typing, eating
17	A	6	13-Jul	0632	sleeping
17	A	7	13-Jul	0930	using phone
17	A	8	13-Jul	1245	typing, lab work
17	A	9	13-Jul	1530	riding public transportation
17	A	10	13-Jul	1835	typing
17	A	11	13-Jul	2145	typing
17	B	1	18-Jul	0645	sleeping
17	B	2	18-Jul	0945	public transportation, typing
17	B	3	18-Jul	1245	public transportation, washing hands
17	B	4	18-Jul	1545	typing
17	B	5	18-Jul	1845	pc gaming
17	B	6	18-Jul	2145	typing
17	B	7	19-Jul	0645	sleeping
17	B	8	19-Jul	0945	public transportation, phone usage
17	B	9	19-Jul	1224	typing
17	B	10	19-Jul	1545	public transport
17	B	11	19-Jul	1845	eating
17	B	12	19-Jul	2145	typing
17	C	1	26-Jul	0923	typing
17	C	2	26-Jul	1145	typing
17	C	3	26-Jul	1415	typing
17	C	4	26-Jul	1649	public transportation
17	C	5	26-Jul	1915	eating
17	C	6	26-Jul	2145	typing
17	C	7	27-Jul	0915	public transportation
17	C	8	27-Jul	1145	typing
17	C	9	27-Jul	1415	typing
17	C	10	27-Jul	1745	gaming

Appendix E (continued)

TABLE XI
PRINT COLLECTION BOOK DATA

Subject	Book	Page	Date	Time	Activity
17	C	11	27-Jul	2015	eating
17	C	12	27-Jul	2243	typing
18	A	1	11-Jul	0600	sleep
18	A	2	11-Jul	0830	paperwork
18	A	3	11-Jul	1130	wash hands, paperwork
18	A	4	11-Jul	1430	at dentist
18	A	5	11-Jul	1800	ate supper
18	A	6	11-Jul	2030	relaxing with tv
18	A	7	12-Jul	0600	sleep
18	A	8	12-Jul	0800	paperwork
18	A	9	12-Jul	1015	paperwork
18	A	10	12-Jul	1230	lunch, washed hands
18	A	11	12-Jul	1430	paperwork
18	A	12	12-Jul	1550	seminar
18	B	1	19-Jul	0100	paperwork
18	B	2	19-Jul	0300	wash hands, paperwork
18	B	3	19-Jul	0500	computer work
18	B	4	19-Jul	1100	sleep
18	B	5	19-Jul	1400	paperwork
18	B	6	19-Jul	1700	drove/wash hands
18	B	7	20-Jul	0700	sleep/shower
18	B	8	20-Jul	1200	at Dr. office
18	B	9	20-Jul	1500	paperwork
18	B	10	20-Jul	1800	dinner/washed hands
18	B	12	20-Jul	2100	relaxing
18	C	1	24-Jul	1200	BLANK
18	C	2	24-Jul	1500	paperwork
18	C	3	24-Jul	1800	after swimming
18	C	4	24-Jul	2130	watching tv
18	C	5	25-Jul	0700	drove to work
18	C	6	25-Jul	1000	travel to/from AFTL
18	C	7	25-Jul	1330	seminar
18	C	8	25-Jul	1730	work out
18	C	9	25-Jul	2100	relaxing
18	C	10	25-Jul	0000	relaxing, getting ready for bed
18	C	11	26-Jul	0600	sleeping
18	C	12	27-Jul	0930	paperwork
19	A	1	18-Jul	0720	shower
19	A	2	18-Jul	1100	nitrile gloves, hand wash
19	A	3	18-Jul	1600	typing
19	A	4	18-Jul	2030	gym
19	A	5	19-Jul	0850	writing in notebook
19	A	6	19-Jul	1200	typing
19	A	7	19-Jul	1500	typing
19	A	8	19-Jul	2000	public transit
19	A	9	19-Jul	2330	shower
19	B	1	26-Sep	0920	transit
19	B	2	26-Sep	1200	typing
19	B	3	26-Sep	1530	typing
19	B	4	26-Sep	1800	handling papers/writing
19	B	5	26-Sep	2000	transit
19	B	6	27-Sep	0915	typing
19	B	7	27-Sep	1500	typing
19	B	8	27-Sep	1200	typing

Appendix F

TABLE XII
NINHYDRIN FINGERPRINT DATA

				LT	LT	LI	LI	LM	LM	LR	LR	LP	LP	RT	RT	RI	RI	RM	RM	RR	RR	RP	RP
Sub	**Day**	**TOD**	**Act**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**
1	1	1	4	1	1	1	1	1	1	1	2	3	1	1	1	1.5	1	1	1	1	1	1	2
1	1	1	3	4.5	1	2	1	1	2	1	3	1	3	4	1	4	1	2	2	1	2	1	3
1	1	2	7	3	1	2	1	2	1	1	2	1	2	4	1	4	1	3	1	2	2	2	3
1	1	2	1	2	1	1	3	1	1	1	1	5	0	2	1	2	1	2	1	2	1	2	1
1	1	2	7	1	4	1	1	1	1	1	1	1	1	1	2	2	2	1	2	1	3	1	2
1	1	3	1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	2
1	2	1	1	2	2	2	1	4.5	1	2	1	2	1	1	3	2	1	2	1	1	1	2	1
1	2	2	7	2	4	1	4	1	2	1	2	2	1	3	2	3	1	1	3	1	3	1	2
1	2	2	7	2	3	2	1	2	1	1	1	2	2	4	2	3	3	3.5	3	1	3	1	2
1	2	3	5	4.5	1	2	1	1	2	2	2	3	1	4	1	4.5	1	2	1	3	2	4	1
1	2	3	7	4.5	1	2.5	1	1	2	1	1	1	2	2	2	2	1	1	1	1	1	1	2
1	3	2	5	4	1	3	2	3	2	3	2	2	3	4	1	4	1	2	3	2	3	2	1
1	3	2	2	1	2	2	2	1	3	1	2	1	2	2	3	3	1	1	2	1	4	1	4
1	3	3	7	2	3	1	3	1.5	4	2	3	4	1	1.5	4	2	3	2.5	4	1	4	1	4
1	3	3	2	1	2	1	3	1	3	1	4	1	3	1	4	1	4	1	4	1	4	1	3
1	4	1	4	2	2	1	2	1	2	1.5	1	2	1	2	3	1	3	1	3	1	2	1	1
1	4	1	7	2	2	1	1	1	1	1	1	1	1	5	0	5	0	2.5	3	2	3	1.5	2
1	4	2	7	3	2	2	2	1	2	1	3	2	2	3	1	2	2	1	3	1	3	2	2
1	4	2	7	1	3	1	2	1	3	1.5	2	1	3	3	2	4	1	1	4	1	3	1	4
1	4	3	7	4.5	1	5	0	2.5	2	3	1	1	2	1	1	4	1	1	3	1	3	1	3
1	4	3	1	2	1	1	1	1	3	1.5	3	3	1	3	1	2.5	1	2	2	3	1	4	1
1	5	1	4	4	1	2	1	3	1	3	1	5	0	4.5	1	-	-	2	1	3	1	3.5	1
1	5	1	7	4	1	2	2	1.5	2	1.5	1	2	1	4	1	4	1	3	1	2	1	1	1
1	5	2	7	2	2	1.5	2	2	1	2	2	1.5	1	2.5	1	4	1	4.5	1	1.5	2	1.5	3
1	5	2	7	2	1	1	2	1.5	1	2	1	3	1	2	1	1.5	1	1	1	1	1	1	1
1	5	3	5	2	2	1	2	1	3	1	1	1	2	3	1	2.5	1	1	1	1	1	1	1
1	5	3	7	3	1	3	1	2.5	1	1	1	2.5	1	3.5	1	3	1	2	2	1	1	1	1
1	6	1	4	2	1	1.5	1	2	1	2.5	1	1	2	2	3	2	3	2	2	2	1	1	3
1	6	1	7	3	1	1	2	2	1	1	2	1	1	1.5	1	4	1	2	1	1.5	2	1.5	2
1	6	2	7	2.5	2	1	1	1	2	1.5	2	1	2	1	3	3	1	1	3	1	3	1	4
1	6	2	7	4.5	1	2.5	2	1	2	1	3	1	2	4	1	5	0	4.5	1	2	2	2	1
1	6	3	6	2.5	1	1	2	1	2	1	1	1	1	3	1	1	4	1	3	1	2	2	1
2	1	1	4	2.5	1	4	1	2	2	3	1	5	0	5	0	2	1	5	0	5	0	2	1
2	1	2	5	2	1	2	1	1	1	1.5	1	3	1	1.5	1	5	0	2	1	1	2	1	1
2	1	2	2	5	0	4.5	1	3.5	1	4.5	1	5	0	3	1	4.5	1	4	1	3.5	1	2	1
2	1	3	5	2	1	4	1	2.5	1	2	1	3.5	1	3	1	3.5	1	2.5	1	2	1	1	3
2	1	3	7	3	1	3.5	1	3	1	4.5	1	4	1	4	1	4	1	5	0	4	1	1	3
2	2	1	3	2	1	3.5	1	2	2	3.5	1	5	0	1	2	1	1	3	1	2.5	1	1	2
2	2	1	5	4.5	1	4.5	1	4	1	3.5	1	1	2	4	1	4.5	1	4.5	1	4.5	1	3	1
2	2	2	5	5	0	5	0	5	0	5	0	5	0	4	1	5	0	5	0	5	0	4	1
2	2	2	2	3	1	2.5	1	2	1	1	3	1	1	2.5	1	2.5	1	3	1	1	1	1	2
2	2	3	2	3	1	4.5	1	4	1	4	1	2.5	1	1	2	1.5	2	2.5	1	2	1	1	4
2	3	1	5	1	3	2	1	1	2	1	3	2	2	1	2	3	1	1	1	1	2	1	3
2	3	1	4	3	2	4.5	1	3.5	2	3.5	1	4.5	1	2.5	1	4	1	4.5	1	2	1	2.5	1
2	3	1	7	3.5	1	3	1	3.5	1	4.5	1	5	0	2	2	4.5	1	4.5	1	4.5	1	3.5	2
2	3	2	7	2	2	4.5	1	3	1	3	2	3	1	1	2	4	1	4	1	3.5	1	4.5	1
2	3	2	7	4.5	1	5	0	4.5	1	4.5	1	4	1	4	1	4.5	1	4.5	1	4	1	4.5	1
2	3	3	7	2.5	3	3.5	1	3	1	4	1	4.5	1	2.5	1	2.5	1	4	1	3.5	1	2	2
2	3	3	2	4.5	1	-	-	4.5	1	4.1	1	5	0	5	0	4	1	5	0	4.5	1	5	0
2	4	1	4	4	1	3.5	1	3	1	4	1	4.5	1	1	2	2.5	1	4	1	4.5	1	4.5	1
2	4	2	5	4	1	5	0	4.5	1	4.5	1	4.5	1	1	2	3.5	1	3	1	3.5	1	4.5	1
2	4	2	7	4.5	1	5	0	5	0	5	0	4.5	1	3.5	1	5	0	5	0	4.5	1	4	1
2	4	3	7	2.5	1	2	1	2	1	1	3	2	2	3	2	5	0	5	0	4	1	2	1
2	4	3	6	5	0	5	0	4	1	3	1	4	1	3.5	2	4	1	2.5	1	2.5	1	2	2
2	5	1	1	3	1	4.5	1	2	1	2	2	4.5	1	5	0	5	0	1	1	2.5	1	3	1
2	5	1	7	3	1	4.5	1	5	0	5	0	5	0	4	1	5	0	5	0	5	0	4.5	1
2	5	2	2	3	1	5	0	5	0	5	0	4.5	1	2	1	3	1	4.5	1	3	1	2.5	1
2	5	2	7	4.5	1	5	0	5	0	5	0	4.5	1	4	1	4.5	1	5	0	5	0	5	0
2	6	1	7	4.5	1	4.5	1	4.5	1	4.5	1	5	0	3	1	2.5	1	4.5	1	4.5	1	2	1
2	6	1	2	3	1	2	1	3	1	4.5	1	5	0	1	2	2	1	4.5	1	1.5	1	1.5	1

Appendix F (continued)

TABLE XII
NINHYDRIN FINGERPRINT DATA

				LT	LT	LI	LI	LM	LM	LR	LR	LP	LP	RT	RT	RI	RI	RM	RM	RR	RR	RP	RP
Sub	**Day**	**TOD**	**Act**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**
2	6	2	2	2	1	4	1	2	1	4.5	1	4.5	1	1	1	4	1	4	1	2	1	1	2
2	6	2	4	3.5	1	4.5	1	5	0	4.5	1	5	0	1	2	2.5	1	5	0	4.5	1	3	1
2	6	2	7	4.5	1	4.5	1	4	1	4.5	1	4	1	4.5	1	4.5	1	4.5	1	4.5	1	4.5	1
2	6	3	5	5	0	5	0	5	0	4	1	4.5	1	4.5	1	5	0	4.5	1	5	0	4.5	1
2	6	3	2	3	1	4.5	1	4	1	3	1	5	0	3.5	1	2	1	4.5	1	4.5	1	4.5	1
3	1	1	1	4.5	1	5	0	2	1	4.5	1	4.5	1	4	1	2	1	1	1	2	1	1	1
3	1	2	7	1	1	1	1	1	1	1	2	1	1	1.5	2	1	1	1	1	1	1	1	1
3	1	2	1	2	1	2.5	1	3	1	2	1	4	1	4.5	1	4.5	1	4.5	1	4.5	1	4	1
3	1	3	7	1	4	1	2	1	4	1	4	1	1	2	2	1	2	2	1	1	3	1	2
3	1	3	7	4	1	4.5	1	1	1	2.5	1	3	1	1	4	1	4	1	3	1	1	1	4
3	2	1	4	2	1	2	1	1	1	2	1	4.5	1	4.5	1	4	1	2	1	4.5	1	3	1
3	2	2	7	3	1	4	1	2	1	3.5	1	4.5	1	4	1	1	1	4.5	1	4	1	4	1
3	2	2	7	3	2	2	1	2	1	1	1	1	1	2.5	1	3	1	2.5	1	4	1	1	1
3	2	3	3	1	1	1	1	1	1	1	2	1	1	1	1	2	1	1	1	1	1	2	1
3	2	3	7	4.5	1	4	1	4.5	1	4.5	1	4	1	5	0	4.5	1	4.5	1	4.5	1	2.5	2
3	2	3	7	1.5	1	2	1	2	1	3	1	2.5	1	1	1	1	1	1	1	1	2	1	2
3	3	1	3	2	1	1	1	1	2	1	1	2	1	2	1	2	1	1	1	1	3	1	1
3	3	1	8	1	3	1	3	1	3	1	3	1	3	1	2	1	4	1	4	1	4	1	2
3	3	2	8	1	2	1	2	1	2	1	4	1	4	1	3	1	3	1	2	1	2	1	3
3	3	3	5	2	1	2	1	2	1	4	1	4	1	2.5	1	2	1	2	1	1	1	2	1
3	3	3	2	1	1	2	1	1	3	3	1	4	1	4	1	4.5	1	3	2	3	1	1.5	1
3	3	3	2	2	2	2	1	2	1	1	1	4	1	1.5	1	1	1	1	1	1	1	1	1
3	4	1	3	1	1	1	1	1	2	1	1	1	1	1	3	1	2	1	1	1	1	1	1
3	4	1	8	3	1	4	1	3.5	1	3	1	3.5	1	3.5	1	2	3	2	2	1	4	1	4
3	4	2	5	2	1	1	1	1	2	1	1	1.5	1	1	1	1	2	1	1	1	2	1	1
3	4	3	7	3.5	1	2	1	3	1	3	1	5	0	4.5	1	2.5	1	2	1	2.5	1	3	1
3	4	3	3	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	4	3	5	2	1	4	1	3	1	2.5	1	3	1	3	1	2	1	1.5	1	1	1	1	2
3	5	1	3	2	1	1	1	1	2	1	2	1	2	2	1	1	1	1	1	1	2	1	1
3	5	1	7	4	1	4	1	2	1	3	1	4	1	2	1	2	1	3	1	2.5	1	2	1
3	5	2	1	2	1	1.5	1	2	1	4	1	4	1	1.5	1	1	1	1	1	1	1	2	1
3	5	2	7	1	2	1	3	1	2	1	1	1	1	1	4	1	2	1	2	1	2	1	2
3	5	3	5	3	2	3.5	1	3	1	3	1	3	1	4	1	4.5	1	3	1	2	1	2	1
3	5	3	7	4	1	4.5	1	3	1	4	2	4	1	1	2	2.5	1	3	2	2	2	3	1
3	6	1	1	1.5	1	2	1	2	1	2	1	3	1	5	0	3.5	1	3	1	2	1	2	1
3	6	2	8	3	1	2	1	2	1	1	3	1	3	2	3	2	2	3	1	2	1	2.5	1
3	6	2	5	2	1	1	2	1	3	2.5	1	2	1	2	2	1	2	1.5	1	1.5	2	3	1
3	6	3	7	2	4	1.5	3	1	3	1.5	2	2.5	1	2	2	1	1	1	1	2	1	3	1
3	6	3	7	4.5	1	2	1	4.5	1	4.5	1	2	1	2.5	1	2	1	3	1	2	2	4	1
3	6	3	2	2	1	1	1	1	1	2.5	1	3.5	1	2	1	1.5	1	1.5	1	2	1	2	1
4	1	1	3	5	0	4.5	1	3	1	3	1	5	0	3	1	2	1	3	1	2	1	2	1
4	1	1	2	5	0	5	0	5	0	5	0	5	0	5	0	4	1	4	1	4.5	1	3	1
4	1	2	2	5	0	3	1	4	1	3	1	4	1	4.5	1	3	1	3	1	2	1	1.5	1
4	1	3	7	4.5	1	4.5	1	4	1	4	1	5	0	4	1	4.5	1	3	1	3	1	4	1
4	1	3	2	4	1	3	1	2.5	1	2	1	2	1	4.5	1	4	1	4.5	1	3	1	2	1
4	2	1	7	1	2	1	1	1	2	1	2	1	1	1	2	2	2	1	2	1	1	1	3
4	2	2	2	2	1	2	1	2	1	1	1	2	1	3	1	3.5	1	2	1	2	1	1.5	1
4	3	1	7	5	0	4.5	1	4.5	1	4	1	4.5	1	3	1	5	0	4.5	1	4.5	1	4.5	1
4	3	1	2	2	1	2	1	2.5	1	4	1	5	0	2	1	2	1	4	1	4	1	3	1
4	3	2	2	3	1	3	1	3	1	2.5	1	4	1	2	1	1.5	1	2	1	4	1	4.5	1
4	3	3	2	3.5	1	2	1	2.5	1	3	1	4.5	1	2	1	2	1	2	1	3	1	2	1
4	3	3	5	4.5	1	4	1	4	1	4	1	5	0	4.5	1	4.5	1	4.5	1	4.5	1	4.5	1
4	4	1	2	4	1	4	1	4	1	4	1	2	1	4.5	1	3	1	3	1	3	1	1	1
4	4	2	5	2	1	2	1	2	1	1.5	1	5	0	2	1	2	1	3.5	1	4.5	1	4.5	1
4	4	2	7	3	1	3	1	2.5	1	1	1	2	1	2	1	2	1	3	1	4	1	2	1
4	4	3	1	2	1	2	1	3	1	4.5	1	5	0	4.5	1	3	1	3	1	4.5	1	4.5	1
5	1	1		2	3	1	2	1.5	2	1	1	1.5	1	2.5	1	2.5	1	3	1	2	1	1	2
5	1	2	2	1	1	3	2	2	1	2	1	2	1	3	1	3	1	3	1	1.5	1	1	2
5	1	2	2	3.5	1	3	1	5	0	4	1	4.5	1	3	1	1	1	4.5	1	4	1	4	1
5	1	3	3	3	1	4	1	3	1	1	3	2	1	2	1	2.5	1	3	2	3	1	3	1

Appendix F (continued)

TABLE XII
NINHYDRIN FINGERPRINT DATA

				LT	LT	LI	LI	LM	LM	LR	LR	LP	LP	RT	RT	RI	RI	RM	RM	RR	RR	RP	RP
Sub	Day	TOD	Act	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q
5	1	3	5	4	1	2.5	1	4	1	4	1	4.5	1	4	1	1	1	4.5	1	4	1	4.5	1
5	1	3	4	2	1	3	1	4.5	1	2	1	4.5	1	4.5	1	4	1	4	1	4	1	4.5	1
5	2	1	3	3	1	3	1	2	1	2.5	1	4	1	4	1	4	1	4.5	1	4	1	4.5	1
5	2	2	7	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
5	2	3	6	2	1	4	1	4	1	2.5	1	3	1	4.5	1	4	1	4	1	4	1	3.5	1
5	2	3	2	4	1	4	1	4	1	2	1	4.5	1	2.5	1	3	1	3.5	1	4	1	3.5	1
5	3	1	5	3.5	1	2	1	4	1	4	1	4	1	2.5	1	2.5	1	3.5	1	3.5	1	4	1
5	3	3	5	4	1	4	1	4.5	1	4	1	5	0	4	1	3	1	4	1	5	0	4.5	1
5	3	3	4	4.5	1	4.5	1	5	0	4.5	1	4.5	1	4	1	4.5	1	4.5	1	4	1	4	1
5	4	1	3	4	1	2.5	1	3	1	4	1	3	1	4	1	5	0	4.5	1	5	0	3.5	1
5	4	2	5	4	1	3	1	5	0	5	0	5	0	5	0	5	0	5	0	4	1	2	1
5	4	3	7	2	1	2	1	3.5	1	3	1	4	1	2	1	2	1	2.5	1	3	1	3	1
5	4	3	7	3	1	4.5	1	5	0	5	0	4.5	1	5	0	5	0	5	0	5	0	5	0
5	5	1	3	3	1	4.5	1	5	0	5	0	5	0	4	1	4	1	4	1	4	1	4	1
5	5	1	5	3.5	1	3	1	5	0	5	0	5	0	4	1	3.5	1	4	1	4.5	1	4	1
5	5	2	6	2	1	1	1	2.5	1	2.5	1	4	1	2	2	2	1	2	1	1.5	2	1	2
5	5	3	7	2	2	3	1	4	1	4.5	1	4.5	1	2	1	2	1	2.5	1	2	1	1	1
5	5	3	4	5	0	3	1	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
5	6	1	3	4.5	1	1	1	3	1	4	1	1	2	5	0	5	0	1	2	5	0	4.5	1
5	6	1	7	2	1	2	1	2	1	2	1	4.5	1	2	1	4	1	4.5	1	2	1	2	1
5	6	2	2	2	1	2	1	4.5	1	1	2	4	1	4	1	1	1	4	1	4.5	1	3	1
5	6	2	3	3	1	2	1	4	1	2.5	1	2.5	1	2	1	2	1	3	1	4	1	3	2
5	6	3	2	4.5	1	4	1	5	0	2	1	5	0	5	0	5	0	5	0	5	0	4.5	1
5	7	1	3	5	0	4.5	1	5	0	4.5	1	5	0	5	0	4	1	5	0	4.5	1	1.5	1
5	7	1	2	4	1	5	0	4.5	1	4	1	4.5	1	3.5	1	2	1	3.5	1	4	1	4	1
5	7	2	7	4	1	2	1	3	1	4.5	1	4.5	1	3	1	2.5	1	3	1	1	2	4	1
5	7	3	4	2.5	1	1	1	3	1	3	1	5	0	2.5	1	3	1	3	1	2.5	2	2.5	1
5	8	1	3	2.5	1	2	1	2.5	1	3	1	4	1	2	1	2.5	1	3	1	4	1	4.5	1
5	8	2	7	5	0	5	0	5	0	1	1	5	0	1	1	1	1	5	0	5	0	4.5	1
5	8	3	7	5	0	4.5	1	5	0	5	0	5	0	5	0	2	1	4.5	1	4	1	4.5	1
6	1	1	2	4	1	4	1	3	1	1	2	1	2	2	1	1	1	1	3	1	3	1.5	2
6	1	1	7	2.5	1	3.5	1	3	1	1.5	1	2	1	3.5	1	4.5	1	4	2	2	2	2	1
6	1	2	5	4	1	4.5	1	4	1	2	1	2	1	2	1	4	1	3.5	1	3	2	4	1
6	1	2	7	4	1	4	1	4	1	3	1	2	1	2	2	2	1	2	2	1.5	2	1.5	3
6	1	2	7	3.5	1	3	1	2	2	1.5	2	2	1	2	2	3	1	3	3	2	3	2	3
6	1	3	1	3	1	3.5	1	2	1	3	1	2.5	1	2	1	2	1	2	1	2	2	1	1
6	2	1	3	3	1	3	1	2	1	3	1	4	1	1.5	1	2	1	2	1	2	1	3	1
6	2	1	2	2	1	2	1	1	2	2	1	1	1	1	1	1.5	2	2	3	1	2	1.5	1
6	2	1	2	4	1	4.5	1	4	1	2	1	2	1	2	3	1	3	1	4	1	4	1	3
6	2	1	5	3	1	3.5	1	2.5	1	2	1	2	1	3	1	3	2	3	2	1	2	2	1
6	2	3	1	3	1	4	1	3	1	4.5	1	4.5	1	2	1	4.5	1	3	1	3	1	3	1
6	2	3	2	3	1	4.5	1	4	1	3	1	1	1	1.5	1	2	1	2	2	1.5	1	2	1
6	3	1	5	3	1	3	1	2	2	2	2	2.5	1	4.5	1	2	1	2	1	2	1	2	1
6	3	1	7	3	1	3	1	3	1	1	1	1	1	1.5	1	2	1	2	1	1.5	2	1	1
6	3	2	5	3	1	2	1	1	3	1.5	2	1	2	2	1	4	1	2	2	1	4	2	1
6	3	2	7	5	0	2.5	1	2	1	3.5	1	5	0	3.5	1	3	1	4.5	1	4.5	1	5	0
6	3	2	7	3.5	1	2	1	2	1	2	1	2	1	1	1	1.5	2	1	3	1	3	1	3
6	3	3	5	4.5	1	4.5	1	3	1	3	1	4.5	1	2	1	1.5	1	2.5	1	2	1	3.5	1
6	4	1	2	4	1	2	1	1	1	1	1	1	2	2	2	1	1	2	2	1	2	1	1
6	4	1	7	1	1	1	1	2	1	3	1	3	1	2	1	2	1	1	1	1	1	1	2
6	4	2	2	2.5	1	2	1	2	1	2	1	2.5	1	2	1	2	1	3	1	3	1	3	1
6	4	2	7	2.5	1	4	1	4	1	3.5	1	3	1	3	1	3	1	4	1	4	1	3.5	1
6	4	3	7	2	1	3	1	1	1	2.5	1	1	1	2	1	1	2	2	1	2	1	2	1
6	4	3	2	1	1	2	1	2	2	3	1	4.5	1	1	1	2	1	2	1	3.5	1	2	1
6	5	1	7	1	1	3	1	2	2	2	1	1	2	1	1	2.5	2	1	3	1	4	1	4
6	5	1	2	2.5	1	2.5	1	1	1	1	1	3	1	2	1	2	3	1	3	1	3	1	2
6	5	2	7	2	1	3	1	2	1	2	1	3	1	1	1	1	1	1	2	1.5	3	1.5	3
6	5	2	7	2.5	1	3	1	3	1	2.5	1	4	1	1	1	2	3	2	3	2	2	2	2
6	5	3	7	4	1	3	1	1	1	2	1	2	1	2	1	4	1	3	1	4.5	1	1	1
6	5	3	2	4.5	1	3	1	2	1	2	1	4.5	1	1.5	1	1.5	1	2	1	1	2	3	1

Appendix F (continued)

TABLE XII
NINHYDRIN FINGERPRINT DATA

				LT	LT	LI	LI	LM	LM	LR	LR	LP	LP	RT	RT	RI	RI	RM	RM	RR	RR	RP	RP
Sub	Day	TOD	Act	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q
6	6	1	1	2	1	1	1	1.5	1	3	1	4	1	2	1	4.5	1	2	1	2	1	4	1
6	6	1	7	2	1	2	1	1.5	1	1	2	2	1	2	1	2	1	2	1	1.5	1	3	1
6	6	2	7	4	1	3	1	1	1	1	1	2.5	1	1	1	2	1	1.5	1	3	1	4.5	1
6	6	2	7	1.5	1	2	1	1	3	1	1	3	1	1	1	2	1	2	2	1.5	2	3	1
6	6	2	7	1	1	1	1	1	1	1.5	1	3.5	1	1	2	1	2	2	3	2	2	2	2
6	6	3	2	2	2	1	2	1	3	1	2	1	2	1	2	1	3	1	4	1	3	1	3
7	1	1	1	2	1	2	1	2	1	2.5	1	4	1	2	2	2	1	3	1	4.5	1	4.5	1
7	1	1	7	1	3	2	1	1.5	1	2	1	2	1	1	4	2	2	2	2	2	1	3	1
7	1	2	5	2	3	4.5	1	3.5	1	4	1	3.5	1	1	3	3	2	2.5	2	3	1	4	1
7	1	2	2	2	3	2.5	1	2	3	2	2	2	2	2	2	3	1	3.5	1	3.5	2	4	1
7	1	3	7	3	1	4.5	1	3	1	5	0	1	1	3	1	5	0	5	0	5	0	3.5	1
7	1	3	4	5	0	4.5	1	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
7	2	1	3	1	2	1	1	1	4	2	3	1.5	1	5	0	1	2	4.5	1	5	0	4.5	1
7	2	1	7	3	2	1.5	2	2	4	2	2	3.5	1	2	3	1	1	3	1	5	0	4.5	1
7	2	1	6	3	1	3	1	2	1	2.5	1	4.5	1	2	1	4.5	1	5	0	5	0	5	0
7	2	2	5	3	1	3	1	3.5	1	4.5	1	3	1	2.5	1	3.5	1	3	1	4	1	1	4
7	2	2	2	2	2	1.5	2	2	2	2	2	3.5	1	1.5	3	4	1	3	4	3	3	1	3
7	2	2	2	1	2	1.5	1	2	1	2.5	1	2	1	3.5	1	2	1	3	1	4.5	1	4	1
7	3	1	1	2	1	2	1	2.5	1	4.5	1	3.5	1	2	1	2	1	4	1	4.5	1	2	2
7	3	1	4	2.5	1	3	1	3.5	1	5	0	5	0	4	1	4.5	1	4.5	1	5	0	4.5	1
7	3	2	5	2	1	3	1	2.5	1	2	1	3	1	3	1	2.5	1	2	1	3.5	1	4	1
7	3	2	7	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
7	3	3	5	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
7	4	1	5	2	1	1.5	1	3	1	3.5	1	4.5	1	3	1	2	1	3	1	4.5	1	4.5	1
7	4	1	7	2	1	3	1	2	1	3	1	2	1	2	1	3.5	1	1	1	2	1	4	1
7	4	1	6	5	0	4.5	1	4.5	1	4.5	1	4.5	1	4	1	4.5	1	4.5	1	5	0	5	0
7	4	2	5	2.5	1	2	1	1	1	2	1	3	1	4.5	1	3	1	2	1	4.5	1	1	1
7	4	2	7	3	1	3.5	1	4.5	1	5	0	4	1	2	1	2.5	1	3	1	4.5	1	5	0
7	4	3	5	4.5	1	4.5	1	4.5	1	4.5	1	4.5	1	5	0	5	0	4.5	1	5	0	5	0
7	5	1	5	3	1	4.5	1	2.5	1	4	1	4	1	3	1	2.5	1	4.5	1	5	0	4.5	1
7	5	1	1	2	1	2	1	2.5	1	4.5	1	4.5	1	3	1	3.5	1	3	1	4	1	4	1
7	5	2	7	3	1	2.5	1	1	1	2	1	3	1	5	0	4	1	5	0	4	1	3.5	1
7	5	2	7	2	1	1	1	2	3	2	1	3.5	1	3.5	1	2	1	2	1	2	1	2	1
7	5	3	7	3	1	4	1	2	1	4.5	1	4	1	2	1	1	1	4.5	1	4.5	1	3	1
7	5	3	1	4.5	1	4	1	4.5	1	4.5	1	4.5	1	3	1	3	1	4.5	1	4.5	1	4.5	1
7	6	1	3	4.5	1	4.5	1	4	1	4	1	3	1	3.5	2	4	1	4	1	4	1	3	1
7	6	1	5	5	0	4.5	1	4.5	1	4	1	4.5	1	2.5	1	5	0	5	0	5	0	5	0
7	6	2	5	2	1	2.5	1	2.5	1	4.5	1	3	1	4.5	1	3	1	2.5	2	2	1	2.5	1
7	6	2	1	4.5	1	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
7	6	3	5	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
7	6	3	4	5	0	5	0	5	0	4.5	1	4.5	1	5	0	4	1	5	0	5	0	5	0
8	1	2	2	1	3	1	2	1.5	1	1	1	1	2	1	4	1	3	1	3	1	2	1	3
8	1	2	1	1.5	2	1.5	2	3	1	2	1	1	2	1	3	1.5	1	1.5	1	1	1	1	2
8	1	2	7	1	4	1	3	1.5	1	1	2	1	2	1	4	1.5	2	1	2	1	1	1	2
8	1	3	2	1	2	2	2	1.5	1	1	1	1	1	1	3	1	2	1	1	1	1	1	1
8	1	3	7	1	1	1	2	1	1	1	1	1	1	1	2	1	2	1	1	1	1	1	1
8	1	3	7	1	3	1.5	3	1.5	1	1	1	1	2	2	3	2	2	1	2	1	2	1	1
8	2	1	7	1	3	1	2	2	1	1	2	1	2	1	3	2	1	1	1	1	2	1	3
8	2	2	5	1	3	1.5	2	2	1	1	1	1	1	1.5	2	2	2	1	1	1	1	1	1
8	2	2	5	1	2	1	2	1	2	1	1	1	1	1	2	1	1	1	1	1	1	1	1
8	2	2	1	2.5	1	3	1	3	1	2	1	2	1	2	2	2	1	2	1	2	1	2	1
8	2	3	7	1.5	3	1	2	1	2	1	1	1.5	1	1	4	1.5	1	1	1	1	1	1	1
8	2	3	7	1	2	1	1	1	2	1	1	1	2	1	2	1	1	1	1	1	3	1	1
8	3	1	7	2	3	2	1	2.5	1	2	1	1	1	4	1	3.5	1	1	1	1.5	1	1.5	1
8	3	1	1	2.5	1	2	1	2	1	2	1	2	1	2	2	2	2	2	1	2	1	3	1
8	3	2	5	3	1	2	1	2.5	1	2	1	3	1	3	1	4	1	3	1	2.5	1	3	1
8	3	2	1	1	1	1	1	1	1	1	1	1	1	1	3	1	1	1	1	1	1	1	1
8	3	2	7	1	1	1	1	1	2	1	2	1	1	1	2	1	1	1	1	1	1	1	1
8	3	3	4	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
8	4	1	4	4.5	1	4	1	4	1	2	2	4.5	1	3	1	4	1	4	1	4	1	3	1

Appendix F (continued)

TABLE XII
NINHYDRIN FINGERPRINT DATA

				LT	LT	LI	LI	LM	LM	LR	LR	LP	LP	RT	RT	RI	RI	RM	RM	RR	RR	RP	RP
Sub	Day	TOD	Act	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q
8	4	1	6	1	2	2	1	1	1	1	2	1	1	1	3	2	2	1	1	1	1	1	1
8	4	2	7	2	2	3	1	2.5	1	2.5	1	2	1	2	2	2	1	3	2	1	2	1.5	2
8	4	2	5	2	1	2	1	2	1	2.5	1	4	1	2	1	2	1	2	1	2	1	2	1
8	4	2	1	2	1	2.5	1	2	1	3	1	2.5	1	1	3	1	1	1	1	1	1	1	1
8	4	3	7	5	0	4.5	1	5	0	5	0	3	1	4.5	1	5	0	5	0	5	0	4.5	1
8	5	1	1	3.5	1	4.5	1	3	1	3.5	1	4	1	4	1	4.5	1	4.5	1	4.5	1	4.5	1
8	5	1	4	2	1	3	1	3	1	1	1	2	1	2.5	1	1	1	1	1	1	1	2	1
8	5	1	7	1	2	2	1	1	1	1	1	1	1	1	2	2	1	2	1	1	1	1	1
8	5	2	2	3	1	3.5	1	4	1	4.5	1	4	1	3	1	2	1	2	1	2	1	3.5	1
8	5	2	7	1	2	2	2	1.5	2	2	2	1	2	1	4	1	2	1	2	1	1	1	3
8	5	3	5	2	3	2	2	2	2	1	2	1	1	1.5	2	2.5	1	2	1	1	1	1	2
8	6	1	4	4.5	1	3.5	1	4.5	1	4.5	1	4.5	1	4.5	1	3.5	1	5	0	4	1	4.5	1
8	6	2	5	1	1	2	1	1.5	1	2	1	1.5	1	2	1	2	1	1	1	1	1	1.5	1
8	6	2	2	1	2	1	3	1	2	1	2	1	2	1	3	2	2	1	4	1	4	1	4
8	6	3	1	2	1	2	1	2	1	2.5	1	1.5	1	2	1	2	1	2	1	1.5	1	2	1
8	6	3	7	2.5	2	3	1	2.5	1	3.5	1	2	1	2	3	3	1	1.5	1	2	1	1	1
8	6	3	1	2	1	4	1	2.5	1	3	1	4	1	2	1	4	1	3	1	2	1	3	1
9	1	1	3	2	1	1.5	1	1	1	1	1	1.5	2	1.5	1	1	1	2	2	1	1	1	2
9	1	2	7	2	1	2	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1
9	1	2	7	1	1	1	1	2	1	2	1	1	1	2	1	1.5	1	1.5	1	2	1	2	1
9	1	3	5	1	1	1.5	1	2	1	1.5	1	2	1	2	1	1	1	1	1	2	1	3	1
9	1	3	7	1	1	1.5	1	1.5	1	1.5	1	1.5	1	1.5	1	2	1	2	1	2	2	1.5	1
9	2	1	3	1	1	1	1	1	1	1.5	1	1	1	2	1	1	2	2	1	1.5	1	2	1
9	2	2	5	1	1	1.5	1	2	1	1	1	1	1	1	1	1	1	1.5	1	1	1	1.5	1
9	2	2	7	1	1	1	1	1	1	1	2	1.5	1	2	1	2	2	1	2	1	1	1	2
9	2	2	7	1	1	1.5	1	2	1	1	1	1	1	1	1	1	2	1.5	1	1.5	1	2	2
9	2	3	5	1	1	1.5	1	1	1	1	1	1	1	1	1	1.5	1	1.5	1	1.5	1	1	1
9	2	3	2	2	1	1.5	1	1	1	2	1	2	1	2	1	1.5	1	1.5	1	2	1	3	1
9	2	3	1	1	1	1.5	1	1	1	1	1	1.5	1	1.5	1	1.5	1	1.5	1	1.5	1	1.5	1
9	3	1	3	3	1	4.5	1	4	1	2.5	3	2.5	1	2	1	4	1	3	1	2.5	1	2.5	1
9	3	1	7	1	4	1.5	1	4	1	3.5	1	3.5	1	2	1	4	1	2.5	1	2.5	1	2	1
9	3	2	1	3	1	4.5	1	4.5	1	4	1	4	1	4.5	1	4	1	4.5	1	4.5	1	4.5	1
9	3	2	2	4	1	2.5	1	2	1	3	1	3	1	4.5	1	4.5	1	4	1	5	0	5	0
9	3	3	2	2	2	3	1	3	1	4	1	2.5	2	2.5	1	3	1	4	1	3	1	2.5	1
9	4	1	3	1	4	1	4	1	4	1.5	3	2	2	2	2	1	2	1.5	1	2	1	4	1
9	4	1	7	1	4	1	4	1	4	2	2	4	2	2	1	2	2	3	1	3	1	2.5	1
9	4	1	2	1	2	1.5	1	2.5	1	2	1	2.5	1	1	1	1	1	1	1	1.5	1	1	1
9	4	2	2	1	2	2	2	1.5	1	1	1	1.5	2	2	1	2.5	1	2	1	1	1	1	1
9	4	2	7	2	1	4	1	1.5	1	1.5	1	2	1	2	1	1	1	2	1	2	1	1	1
9	4	2	5	2	1	4	1	2.5	1	2	1	4	1	3.5	1	2	1	2	1	2.5	1	2	1
9	4	3	2	5	0	5	0	4.5	1	5	0	5	0	4	1	4.5	1	5	0	5	0	2.5	1
9	5	1	3	2	1	1.5	3	2	1	1	3	1	2	1	1	2	1	1	1	3	1	1	1
9	5	2	5	2	1	2	2	3	1	2	1	2.5	1	2	1	2.5	1	2	1	2	1	1.5	1
9	5	2	7	2	1	4	1	3.5	1	1.5	1	3	1	2	1	3.5	1	2	1	1	1	1	1
9	5	2	7	2	1	3.5	1	2	1	2	1	1.5	1	2.5	1	2	1	2	1	3	1	2	1
9	5	3	5	2	3	3	1	2.5	1	3	1	1.5	2	1.5	1	4	1	2	1	4	1	1.5	1
9	5	3	7	2.5	1	2	2	1	4	1	3	1	2	1.5	2	3	1	2.5	2	2.5	2	3.5	1
9	6	1	3	2	2	2.5	1	2	1	2	2	1	1	1.5	3	1	1	1.5	1	2	1	2	1
9	6	2	5	3.5	1	4.5	1	2	1	1	2	1.5	1	1.5	1	2	1	3	1	1.5	1	4	1
9	6	2	2	2.5	1	4.5	1	3.5	1	2	1	2.5	1	3	1	3	1	3	1	4	1	2	1
9	6	2	2	3	1	4.5	1	3.5	1	4	1	2	2	2	1	3.5	1	2	1	2.5	1	2	1
9	6	3	1	3	1	4	1	4	1	2.5	1	4	1	2	1	2	1	1.5	1	2.5	1	2.5	1
9	6	3	2	2	1	2	1	3	1	2	1	3	1	1.5	2	2	1	2	1	1	1	3	1
10	1	1	2	1	4	1	4	1	3	1	4	2	3	1	2	1	4	1	4	1	4	1	4
10	1	2	2	1	4	1	3	1	3	1	4	1.5	3	1	2	1	3	2	4	2	3	1	4
10	1	2	7	2.5	2	2.5	2	2	2	2	2	3	1	2	1	4	1	2.5	2	2	3	2	3
10	1	3	4	2.5	1	2.5	1	2	2	2	3	3	2	3	1	3.5	1	3	1	3	1	3.5	1
10	1	3	2	1.5	3	1	3	1	2	1	2	1	1	1	1	2	2	1.5	2	1	1	1	1
10	2	1	4	2	2	2	2	2.5	1	2	1	3	1	2	1	2.5	1	2	1	2.5	1	2	1
10	2	1	7	3	1	2	1	2	2	2	2	2	1	2	1	2	2	2.5	2	2	4	2	2

Appendix F (continued)

TABLE XII
NINHYDRIN FINGERPRINT DATA

				LT	LT	LI	LI	LM	LM	LR	LR	LP	LP	RT	RT	RI	RI	RM	RM	RR	RR	RP	RP
Sub	**Day**	**TOD**	**Act**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**
10	2	1	7	2	2	2	1	2	1	2	2	2	1	1.5	1	2	1	2.5	1	3.5	1	1.5	2
10	2	2	5	2	2	2	3	1	2	1	2	1	1	1.5	1	3	1	2	2	2	2	1	2
10	3	2	4	3	1	2	1	2	1	2	1	2	1	1.5	1	2	1	1.5	1	2	2	2	1
10	3	2	7	2	1	2	1	1	1	1	1	1.5	1	2	1	2	1	2.5	1	2.5	1	1.5	1
10	3	3	7	1	4	1	2	1	3	1	4	1	2	1.5	1	2.5	2	1	4	1	4	1.5	2
10	3	3	5	3	1	2.5	1	3	1	3	1	3	1	2	1	3	1	1.5	1	2.5	1	2.5	1
10	3	3	1	1.5	1	3	1	2	3	1.5	2	2	2	2.5	1	3	1	3	1	2.5	1	3.5	1
10	4	1	4	1.5	1	1.5	1	1.5	1	1.5	1	2	1	2	1	4.5	1	3	1	5	0	2.5	1
10	4	2	7	2	1	1	2	1	2	1	3	1.5	1	1	2	2	1	1.5	1	1	2	1	1
10	4	2	1	2	1	4.5	1	2	1	4.5	1	3.5	1	3	1	4.5	1	3	1	4.5	1	4.5	1
10	4	3	7	2	1	2	1	1.5	1	1.5	2	3.5	1	2.5	1	3	1	2	2	2	1	2	1
10	4	3	5	1	2	1.5	2	1.5	2	1	2	2	1	1	1	2	1	1.5	3	2	1	1.5	2
10	5	1	5	3	4	2	2	2	2	2.5	1	2.5	1	1	3	2	3	2	4	3	2	3	1
10	5	2	7	2	1	1.5	1	2	1	2.5	2	4	1	2.5	1	3	2	3.5	2	2.5	2	2	2
10	5	3	7	3	1	3.5	1	2.5	1	3	3	3	2	3	1	3	1	4	1	3.5	2	3	2
10	5	3	1	5	0	5	0	4.5	1	4	1	5	0	3	1	4.5	1	5	0	4.5	1	4	1
10	5	3	4	2.5	1	2.5	1	2.5	1	2.5	1	3	1	2	1	2	1	2	1	2	1	2	1
10	6	1	7	2	1	2.5	1	2	1	2	2	3	1	2	1	2	1	3	1	2	1	2	2
10	6	1	7	1.5	2	2	1	1.5	1	1.5	1	1.5	1	1	1	1.5	1	2	1	1.5	1	1.5	1
10	6	2	7	3	1	1.5	2	1.5	2	1.5	1	2	1	2.5	1	2	2	2.5	1	1.5	2	1.5	1
10	6	2	7	1	3	1	1	2	3	2	1	3	1	3.5	1	2	1	3	1	2	1	2	1
10	6	3	5	1	1	2	1	3	1	3	1	3	1	4	1	5	0	5	0	4	1	3	1
10	6	3	4	2	1	2	1	2.5	1	3	1	3	1	2.5	1	2	1	2	1	1.5	1	2	1
11	3	1	7	5	0	5	0	5	0	4.5	1	5	0	5	0	5	0	5	0	4.5	1	4.5	1
11	3	1	1	5	0	5	0	5	0	1	1	5	0	5	0	5	0	5	0	1	1	5	0
11	3	1	2	2	1	1.5	1	2	1	2	1	1.5	1	1.5	1	2	1	2	1	2	1	1.5	1
11	3	2	2	5	0	5	0	5	0	5	0	5	0	4.5	1	4.5	1	5	0	5	0	4.5	1
11	3	3	5	1	1	2	1	2	1	2.5	1	3	1	2	1	3	1	2	1	1	1	1	1
11	3	3	7	2	1	1.5	1	1.5	1	1.5	1	1.5	1	1.5	1	1	1	1.5	1	1.5	1	2	1
11	4	1	4	2	1	4.5	1	1	1	3	1	4	1	2	1	3	1	3	1	1.5	1	4	1
11	4	2	5	4	1	5	0	5	0	2	1	2	1	5	0	5	0	4.5	1	5	0	5	0
11	4	2	2	5	0	5	0	4	1	4	1	3.5	1	2.5	1	3	1	3.5	1	1.5	1	1.5	1
11	4	3	2	5	0	5	0	5	0	4.5	1	3	1	4.5	1	5	0	5	0	5	0	4.5	1
11	5	1	6	1	1	1	3	1	2	1	2	1	2	1.5	1	2	1	1	3	1	2	1	2
11	5	1	7	5	0	4.5	1	2	1	2.5	1	2	1	3	1	5	0	3	1	2.5	1	1	1
11	5	2	6	4	1	1	1	2	1	2	1	1.5	1	1.5	1	5	0	4.5	1	4	1	3.5	1
11	5	2	7	5	0	5	0	5	0	4	1	5	0	5	0	5	0	5	0	5	0	5	0
11	5	3	4	5	0	5	0	4	1	5	0	5	0	4.5	1	5	0	3	1	5	0	2	1
11	5	3	7	3	1	2	1	2.5	1	2	1	2	1	1.5	1	2	1	2.5	1	2.5	1	2	1
11	6	1	5	5	0	5	0	4	1	5	0	3.5	1	3	1	4.5	1	3	1	3	1	2	1
11	6	2	5	1	1	2	1	2.5	1	2	1	2	1	3.5	1	4.5	1	5	0	4.5	1	3.5	1
11	6	2	7	2	1	2	1	2	1	2	1	2	1	1.5	1	2	1	1	1	1.5	1	1.5	1
11	6	2	6	2	1	3	1	3	1	3	1	2	1	2	1	1	1	2.5	1	2	1	2	1
11	6	3	6	2	1	2	1	2	1	2	1	2	1	3	1	3.5	1	3.5	1	2	2	1.5	2
11	6	3	1	2	1	5	0	5	0	5	0	4.5	1	4	1	5	0	4	1	4	1	5	0
11	1	1	5	2	1	1	1	1	2	1	1	1	1	2	1	1.5	1	2	1	1.5	2	2	1
11	1	2	2	1.5	1	1	1	1	2	1	1	1	1	1	2	1	3	1	2	1	2	1	2
11	1	2	5	3	1	2	1	2	1	1.5	1	2	1	1.5	1	2	1	2	1	1	1	1.5	1
11	1	2	7	2.5	1	2	1	2	1	1	1	1.5	1	1	1	1.5	2	1.5	1	1	1	1	1
11	1	3	1	3	1	3	1	3	1	2.5	1	2	1	3	1	3	1	5	0	3	1	2	1
11	1	3	1	4.5	1	4.5	1	3	1	3	1	4.5	1	2	1	3	1	3	1	3	1	3	1
11	2	1	5	5	0	5	0	5	0	5	0	5	0	4	1	4	1	5	0	2	1	2.5	1
11	2	1	1	4.5	1	4.5	1	5	0	4.5	1	4.5	1	5	0	5	0	5	0	4.5	1	5	0
11	2	2	-	5	0	2	1	2	1	2	1	2.5	1	2.5	1	2.5	1	4.5	1	2	1	2	1
11	2	2	2	5	0	5	0	5	0	5	0	4.5	1	5	0	5	0	5	0	5	0	2	1
11	2	3	7	4.5	1	2	1	2	1	1.5	1	1.5	1	3	1	3	1	3	1	3	1	3	1
12	1	1	5	1	1	1.5	1	1.5	1	2	1	1	1	2	1	1.5	1	2	1	2	1	1	1
12	1	1	2	1	1	1	1	1.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
12	1	1	8	2	1	1.5	1	1.5	1	2	1	1	1	2	1	1	1	1	1	2	1	2	1
12	1	2	2	2	1	2	1	1.5	1	2.5	1	2.5	1	2	1	3	1	3	1	2	1	2	1

Appendix F (continued)

TABLE XII
NINHYDRIN FINGERPRINT DATA

				LT	LT	LI	LI	LM	LM	LR	LR	LP	LP	RT	RT	RI	RI	RM	RM	RR	RR	RP	RP
Sub	Day	TOD	Act	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q
12	1	2	-	2	1	2	1	2	1	2	1	2	1	1	3	2	1	2	1	2	1	3	1
12	1	3	5	2	1	2	1	2	1	2	1	2.5	1	1	2	2	1	1.5	1	2	1	1	2
12	2	1	7	1	1	1	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1.5	1
12	2	1	2	1	1	1	1	2	1	2	1	2	1	1	3	1	1	1	2	1	2	1	2
12	2	2	7	1	1	1	1	2	1	3	1	2	1	2	1	3	1	3	1	3	1	3	1
12	2	2	5	1	1	1	1	2	1	2	1	2	1	1	2	2.5	1	2	1	2	1	2	1
12	3	1	5	2	2	1	1	1	1	1	1	1	1	1.5	3	1.5	1	1	1	1	3	1	1
12	3	1	2	2	1	2	1	1	1	3	1	3.5	1	5	0	3.5	1	4.5	1	4	1	5	0
12	3	2	2	3	1	4	1	4	1	3	1	3	1	2	1	3	1	2.5	1	2.5	1	1	1
12	3	3	2	1	2	1.5	1	2	1	1.5	1	2	1	1.5	2	1	1	1.5	2	1	1	1	1
12	4	1	2	1	1	1.5	1	1	1	2	1	1.5	1	1.5	1	1	1	2	1	1.5	1	2	1
12	4	1	2	1.5	1	3	1	3	1	4	1	3	1	2	1	4	1	4.5	1	4.5	1	5	0
12	4	2	2	1.5	1	3	1	3	1	3	1	2.5	1	2	1	2	1	2	1	2	1	2.5	1
12	4	2	-	1	1	2	1	3	1	1.5	1	3	1	1	1	1	1	2	1	1.5	1	2	1
12	4	3	1	1.5	1	1.5	1	1.5	1	2.5	1	2	1	2	1	3	1	2	1	2	1	2	1
12	5	1	7	3.5	1	1	1	2	1	3	1	3.5	1	1.5	1	1.5	1	1.5	1	1.5	1	1.5	1
12	5	1	2	2	1	2	1	1.5	1	1.5	1	2	1	1	2	1	1	2	1	1.5	1	1	2
12	5	2	5	5	0	4.5	1	3	1	2	1	2	1	2	1	2.5	1	5	0	2	1	2	1
12	5	2	2	2	1	2	1	2	1	2	1	1	1	2	1	2.5	1	3	1	2.5	1	2.5	1
12	5	2	7	1.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
12	5	3	7	1.5	1	1	1	3	1	1.5	1	2	1	2	1	2	1	1	1	2	1	1	1
12	6	1	7	1	1	2	1	2.5	1	2	2	2	1	1	1	1.5	1	1.5	1	2	1	1.5	1
12	6	1	2	1.5	1	1.5	1	1.5	1	2	1	2	1	1.5	1	1.5	1	2.5	1	2.5	1	1	2
12	6	2	2	2	1	2	1	3	1	3.5	1	2	1	2.5	1	2	1	3	1	3	1	3.5	1
12	6	2	2	2	1	2	1	2	1	2	1	2	1	1	2	1.5	1	2	1	1.5	1	2	1
12	6	2	2	1	1	1	1	1	1	1	1	1.5	1	1	2	1	1	1	1	1	1	1	1
12	6	3	7	1	1	1	1	2	1	2	1	2	1	1	1	1.5	1	1.5	1	2	1	2	1
13	3	1	5	1	1	1	1	2	1	1	1	1	1	1	1	1.5	1	1	1	1	1	1.5	1
13	3	2	7	5	0	1.5	1	2	1	2.5	1	1	1	2	1	5	0	3	1	5	0	4.5	1
13	3	2	1	5	0	4.5	1	4.5	1	4.5	1	5	0	4.5	1	5	0	5	0	4.5	1	5	0
13	3	2	7	4.5	1	2	1	2	1	1	1	1	1	1	1	2	1	4.5	1	2	1	2	1
13	3	3	5	1	1	1	1	1	1	2	1	1	1	1.5	1	2	1	1.5	1	1	1	2	1
13	4	1	1	2	1	2	1	1	1	4	1	2.5	1	1	1	2	1	2	1	3	1	4.5	1
13	3	3	2	4.5	1	2	1	2.5	1	2	1	2	1	3	1	3	1	1.5	1	4.5	1	2	1
13	4	1	2	2.5	1	2	1	2	1	1.5	1	2	1	1	1	1	1	1.5	1	1.5	1	2	1
13	4	1	1	2	1	1	1	2	1	2	1	5	0	2	1	1.5	1	1.5	1	1.5	1	1.5	1
13	4	2	2	1.5	1	1.5	1	2	1	2	1	2	1	2	1	2	1	1.5	1	1.5	1	1.5	1
13	5	1	1	1.5	1	5	0	5	0	4	1	5	0	3	1	4	1	5	0	4	1	5	0
13	5	1	2	5	0	5	0	1.5	1	2	1	2	1	4.5	1	4	1	1.5	1	5	0	1	1
13	5	2	5	2.5	1	1	1	1.5	1	1.5	1	1.5	1	1	1	2	1	4	1	2	1	1.5	1
13	5	2	8	1.5	1	1.5	1	1	1	1.5	1	2	1	1.5	1	4.5	1	5	0	2	1	3	1
13	5	3	7	5	0	4.5	1	4.5	1	3	1	1	1	2	1	5	0	5	0	4.5	1	3.5	1
13	5	3	5	1.5	1	2	1	1.5	1	2	1	2	1	1.5	1	5	0	5	0	1.5	1	4.5	1
13	6	1	1	5	0	5	0	2	1	5	0	4.5	1	5	0	5	0	5	0	5	0	5	0
13	6	1	7	1.5	1	1	1	1.5	1	1.5	1	1	1	1	1	1	1	4.5	1	4.5	1	5	0
13	6	2	7	1.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1.5	1	1.5	1	1	1
13	6	2	5	1	1	5	0	4.5	1	2	1	2	1	1.5	1	2	1	4.5	1	5	0	4.5	1
13	6	3	7	1	1	1	1	1.5	1	2	1	1	1	1.5	1	2.5	1	1.5	1	1.5	1	1	1
13	1	1	3	1	1	1	1	2	1	1	2	1	2	2	1	1	1	1	1	1.5	1	2	1
13	1	1	2	1.5	1	1	1	1.5	1	1.5	1	2	1	2	1	4.5	1	1	1	1.5	1	1.5	1
13	1	1	1	1.5	1	5	0	4	1	4	1	1	1	1.5	1	5	0	1.5	1	4.5	1	4.5	1
13	1	2	1	1	1	2	1	4.5	1	5	0	5	0	3	1	4.5	1	4.5	1	5	0	5	0
13	1	2	7	2	1	2	1	2	1	2	1	1	1	2	1	2	1	3	1	3	1	2	1
13	2	1	1	4	1	5	0	5	0	5	0	4.5	1	1.5	1	5	0	4	1	3	1	4.5	1
13	2	1	8	1.5	1	1.5	1	1	1	1.5	1	4	1	1	1	1	1	1	1	1.5	1	4.5	1
13	2	2	5	2	1	1.5	1	1.5	1	2.5	1	5	0	5	0	4.5	1	2	3	4.5	1	5	0
14	1	1	7	1	1	1.5	1	1	1	1	1	1	1	1.5	1	1.5	1	2	1	1.5	1	1.5	1
14	1	2	7	1	1	1	1	1.5	1	2	1	2	1	1	1	1	1	1.5	1	1	1	1	1
14	1	2	7	1	1	1	1	1	1	1.5	1	2	1	1	1	1.5	1	2	1	1	2	1	1
14	1	2	1	1	1	2	1	1.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Appendix F (continued)

TABLE XII
NINHYDRIN FINGERPRINT DATA

				LT	LT	LI	LI	LM	LM	LR	LR	LP	LP	RT	RT	RI	RI	RM	RM	RR	RR	RP	RP
Sub	**Day**	**TOD**	**Act**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**
14	1	3	1	2	1	2	1	2.5	1	2.5	1	3	1	2	1	4	1	3.5	1	4	1	2	1
14	1	3	2	1.5	1	1.5	1	1	1	1.5	1	1	1	1	1	1	1	1	1	1.5	1	1.5	1
14	1	3	2	4	1	4	1	3	1	3.5	1	2	1	2.5	1	2	1	2	1	2.5	1	3	1
14	1	3	7	4.5	1	3	1	2	1	3.5	1	3	1	2.5	1	3	1	2	1	4	1	2	1
14	1	3	-	1	1	1	1	1	1	1	1	1.5	1	1	1	1	1	1.5	1	1	1	1	1
14	2	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
14	2	1	2	1	1	1	1	1	1	1	1	2	1	1.5	1	1.5	1	1.5	1	1.5	1	1	1
14	2	1	7	1	1	1.5	1	1	1	1	1	1	1	1	1	1.5	1	2	1	2	1	1.5	1
14	2	1	-	1	1	1.5	1	1.5	1	1	1	1.5	1	1	1	1.5	1	1	1	1	1	1	1
14	2	2	8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
14	2	2	8	1	2	1	3	1	4	1	3	1	2	1	1	1	1	1	1	1	1	1	2
14	2	2	2	2	1	2	1	2	1	2	1	2	1	1.5	1	2	1	1	1	1.5	1	1.5	1
14	2	3	2	2	1	3	1	2.5	1	3	1	3	1	3	1	1.5	1	4	1	4	1	4.5	1
14	3	1	-	1	1	1	1	1	1	1	1	1.5	1	1	1	1	1	1	1	1	1	1	1
14	3	1	2	2	1	2.5	1	2.5	1	2.5	1	2	1	2	1	2	1	1.5	1	1	1	1.5	1
14	3	1	7	1.5	1	1	1	1	1	1.5	1	2	1	1.5	1	1.5	1	1.5	1	1	1	1	1
14	3	2	8	1	2	1	3	1	2	1	3	1	4	1	3	1	4	1	3	1	2	1	3
14	3	2	7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2
14	3	3	2	1	1	1	1	1	1	1.5	1	1.5	1	2	1	1.5	1	2	1	2	1	2	1
14	4	1	3	1.5	1	2	1	2	1	3	1	4.5	1	4.5	1	4.5	1	4.5	1	4.5	1	4.5	1
14	4	1	1	1.5	1	1.5	1	1	1	1	1	1	1	1	1	1	1	1.5	1	1.5	1	1	1
14	4	2	2	4	1	3	1	3	1	4	1	5	0	4.5	1	4.5	1	4	1	4.5	1	4	1
14	4	2	2	1	1	1	1	1.5	1	1.5	1	1.5	1	1.5	1	1.5	1	2	1	1.5	2	1	2
14	4	2	7	1.5	1	1.5	1	1	1	2	1	2	1	2	1	2	1	1.5	2	1.5	2	1.5	1
14	4	3	1	4	1	4	1	4.5	1	4.5	1	4.5	1	4	1	3	1	2.5	1	2	1	3	1
14	4	3	1	4.5	1	4	1	4.5	1	5	0	5	0	4	1	4.5	1	4.5	1	4	1	5	0
14	5	1	2	4	1	2.5	1	2	1	4.5	1	5	0	2	1	2.5	1	2	1	2	1	1	1
14	5	1	2	1	1	1	1	1.5	1	1.5	1	2	1	1	1	1	1	1.5	1	1	2	1.5	1
14	5	2	7	1	1	1	1	2	1	1.5	1	2	1	1	1	1.5	1	2	1	1.5	2	1	1
14	5	2	7	1.5	1	4	1	2	1	2	1	2	1	2	1	1.5	1	4	1	3	1	2	1
14	5	1	3	1.5	1	1.5	1	1.5	1	2.5	1	5	0	1.5	1	2	1	2	1	1	1	2	1
15	1	1	7	1.5	1	1.5	1	2	1	1	1	1	1	1	1	1	1	1.5	1	1	1	1	1
15	1	1	7	1	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	2	1	1
15	1	2	7	1	3	1	2	1	2	1	2	1	1	1	3	1	1	1	3	1	2	1	2
15	1	2	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.5	1	1.5	1	1	1
15	1	2	7	1	3	1	2	1	2	1	1	1.5	1	1	4	1	1	1	2	1	2	1	2
15	2	1	7	1.5	2	2	1	1.5	2	1	2	1	1	1.5	3	1.5	2	1	2	1	3	1.5	3
15	2	2	7	1.5	1	2	1	1.5	2	1.5	1	1	2	2	1	1.5	1	1.5	1	1.5	1	1.5	1
15	2	2	7	1.5	1	1	3	1	2	1	1	1	2	1.5	4	1.5	3	1	3	1	3	1	2
15	2	2	7	1	2	1.5	2	2	2	1.5	1	1.5	2	1	1	1.5	1	1.5	1	2	2	2	1
15	2	3	7	3	1	1.5	1	1.5	1	1	1	1	1	1.5	1	2	1	1.5	1	1.5	1	2	1
15	5	1	7	1	1	1	1	1	2	1	1	1	1	1	1	2	1	2	1	1.5	2	1	2
15	5	1	7	2	1	1.5	3	1	2	1	2	1	1	2	1	1.5	1	1	2	1	2	1	1
15	5	2	2	1.5	3	1.5	2	1	2	1	1	1.5	1	2	2	1.5	1	1.5	2	1.5	2	1	2
15	5	2	2	1.5	1	2	2	1	1	1	2	1	1	2	1	1	1	1.5	1	1.5	2	1.5	1
15	5	2	5	1.5	1	2	1	1.5	1	2	1	2	1	1.5	1	1.5	1	2	1	4.5	1	2	1
15	6	1	7	1.5	1	1	3	2	1	1	2	1.5	1	2	1	2	1	2	1	2	2	2	1
15	6	1	5	1	3	1.5	3	1	2	1	2	1	1	1.5	1	1	3	1	4	1	2	1.5	2
15	6	2	2	1	4	1	4	1	3	1	2	1	1	2	3	1.5	1	1	4	1	4	1	3
15	6	2	7	1	1	1	1	1.5	1	1	1	1.5	1	1	2	1	1	1.5	1	1	1	1.5	1
15	6	2	4	1.5	1	2	1	1.5	1	2	1	1.5	1	2	2	2	1	1.5	1	1.5	1	1.5	1
15	2	1	7	1	1	1	2	1	1	1	1	1	1	1.5	2	1.5	1	1	1	1	2	1	2
15	2	1	2	1.5	1	1	2	1	1	1.5	1	1	2	2	1	1	1	1.5	2	1.5	2	1	2
15	2	2	7	1.5	1	1	1	1	1	1	1	1	1	2	1	1	1	1.5	1	1	1	1	1
15	2	2	5	2	1	1.5	1	1	1	1.5	1	1	1	1.5	1	1.5	1	1.5	1	2	1	2	1
15	2	2	2	1.5	1	1.5	1	1.5	1	1	1	1	1	1.5	1	1	1	1.5	1	1.5	1	1.5	1
15	3	1	7	1.5	1	2	1	1	1	1.5	1	1.5	1	1	2	1	1	1	1	1	2	1	1
15	3	1	7	2	1	2	1	1.5	1	2	1	1.5	1	2	1	1.5	1	1.5	1	2	1	2	1
15	3	2	7	1	1	1.5	2	1	1	1	1	1	1	1	1	1.5	1	1	2	1	2	1	1
15	3	2	2	1.5	1	1.5	1	1.5	1	1.5	1	1.5	1	3	1	2	1	1.5	1	1	1	1	1

Appendix F (continued)

TABLE XII
NINHYDRIN FINGERPRINT DATA

				LT	LT	LI	LI	LM	LM	LR	LR	LP	LP	RT	RT	RI	RI	RM	RM	RR	RR	RP	RP
Sub	Day	TOD	Act	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q
15	3	3	7	1.5	2	1.5	1	1	1	1	1	1	2	1.5	2	2	1	1	1	1	3	1	1
16	1	2	7	2	1	2	1	1.5	1	2	1	2	1	1	2	1	1	1	3	1	1	2	1
16	1	3	7	2	1	1.5	1	1.5	2	2	1	2	1	2	1	1.5	1	1.5	1	2	1	2	1
16	1	3	5	2	1	1.5	1	1.5	1	2	1	2	2	1.5	1	1.5	1	1.5	1	1.5	3	2	1
16	1	3	5	1.5	1	2	1	1	1	1.5	2	1.5	1	1.5	1	1.5	1	1.5	1	1.5	1	1.5	1
16	2	1	4	1.5	1	2	1	2	1	2	1	4.5	1	2	1	2	1	2	1	2	1	2	1
16	2	1	1	2	1	1.5	1	1.5	1	1.5	1	2	1	1.5	1	1.5	1	2	1	1.5	1	2	1
16	2	2	5	2	1	4.5	1	1	2	1	1	1.5	1	2	2	2	1	1.5	2	1	2	1.5	1
16	2	2	5	1.5	2	4	1	1.5	1	2	1	2	1	2	1	2	1	2	1	2	1	2.5	1
16	2	2	5	2.5	1	4	1	2.5	1	3	1	2.5	1	1.5	1	2	1	1.5	1	3.5	1	4	1
16	2	2	1	1.5	1	1.5	1	1	1	1	1	1.5	1	1.5	1	1.5	1	1.5	1	1.5	1	1.5	1
16	2	3	5	1	1	2	1	1.5	2	1	1	1	2	1.5	1	1.5	1	2	1	1.5	2	2	1
16	3	2	5	2	1	1.5	1	1.5	1	2	1	1.5	2	2	1	2	1	2	1	2	1	2	2
16	3	3	2	4	1	2	1	1	1	1	2	1	1	1	1	1	1	1	2	1	2	1	2
16	3	3	1	5	0	3	1	1	1	4.5	1	1.5	1	2	1	2.5	1	3	1	2.5	1	4.5	1
16	4	1	1	2	1	3	1	2	1	3	1	4	1	4	1	4.5	1	2	1	2	1	2	1
16	4	2	5	2	1	2	1	1	1	2	1	1	1	3	2	2	1	2	3	2	4	2	2
16	4	2	5	4	1	3	1	2	1	2	1	2.5	1	1.5	2	2	1	1	2	2	2	2	1
16	4	2	7	4	1	4	1	2.5	1	4.5	1	4	1	4	1	3.5	1	4	1	3.5	1	1.5	1
16	4	3	5	4	1	5	0	3.5	1	4.5	1	4	1	1	1	3	1	2	1	2	1	3	1
16	4	3	5	2.5	1	2	1	2	1	4	1	3	1	3	1	3	1	1.5	1	2.5	1	1.5	1
16	4	3	1	5	0	5	0	5	0	5	0	5	0	2	1	2	1	2	1	5	0	3	1
16	5	1	4	1.5	2	2	1	1.5	1	2	1	4	1	2	2	2	1	2	1	1.5	2	2	1
16	5	2	2	1.5	1	2.5	1	1.5	1	1.5	2	2	1	2	1	2	1	2.5	1	2	1	2.5	1
16	6	1	2	2.5	1	2	1	1.5	2	1.5	1	2.5	1	2.5	2	3	1	3	1	2.5	1	3	2
16	6	3	5	2	1	3.5	1	2.5	1	2.5	1	2	1	2	2	1	1	2.5	2	2	2	2	3
16	6	1	3	1	1	2	3	1	3	2	1	1	4	1	1	2	1	1	1	1.5	3	1	3
16	7	1	4	2.5	1	2.5	1	1	1	1.5	1	1.5	2	1	3	1.5	3	1.5	1	1.5	1	2	1
16	7	1	2	1.5	1	2	1	2	1	2.5	1	2.5	1	2	1	4	1	2	1	2	1	1.5	1
16	7	1	5	1	1	1	1	1	1	1	1	5	0	1	1	4	1	4	1	4	1	4.5	1
16	7	2	7	2	1	2	1	2	1	3	1	2	1	1	2	2	1	2	1	2	1	4	1
16	7	2	5	1.5	1	1.5	1	1.5	1	2	1	2.5	1	1.5	2	1.5	1	2	1	2	1	2.5	1
16	7	2	5	1.5	2	1.5	1	1.5	1	1.5	2	2.5	3	1	2	1.5	1	1	2	2	1	2	2
16	7	2	4	2	1	1	3	1.5	1	2.5	1	1	2	4.5	1	2	1	2.5	1	2.5	1	2.5	1
16	7	3	1	5	0	1	1	1.5	1	5	0	1	1	5	0	4.5	1	3	1	4.5	1	4.5	1
16	7	1	3	1.5	1	2	1	2	2	2	1	2	1	1.5	1	1	1	1.5	1	1.5	1	2	2
17	1	1	7	1.5	1	1	1	2	1	2	1	3	1	1.5	1	1.5	1	3	1	4	1	3.5	1
17	1	2	5	4	1	2	1	3	1	4.5	1	4.5	1	2	1	3	1	3	1	4	1	4	1
17	1	2	8	1	1	2	1	2	1	2	1	2.5	1	1	1	1.5	1	1.5	1	2	1	2	1
17	1	3	7	1.5	1	1.5	1	1.5	1	1.5	2	1.5	1	1.5	1	1.5	1	1.5	1	1.5	1	1.5	1
17	1	3	7	3.5	1	2	1	3	1	3	1	2.5	1	2.5	1	3	1	2	1	2	1	2	1
17	2	1	3	2	1	2	1	2	1	1.5	1	1.5	1	1.5	1	2	1	2	1	2	1	2	1
17	2	1	7	2	1	1.5	1	1	1	1.5	1	2	1	1.5	2	1.5	2	1.5	1	1.5	1	1.5	1
17	2	2	7	1.5	1	1.5	1	1	1	2	1	2	1	1.5	1	2	1	2	1	2	1	2.5	1
17	2	2	7	4	1	2	1	3	1	2.5	1	2.5	1	2	1	2	1	2.5	1	2	1	3	1
17	2	3	7	2.5	1	2	1	1.5	1	1.5	1	1.5	1	1.5	1	1	1	1.5	1	1.5	1	1.5	2
17	2	3	7	2	1	1.5	1	2	1	1.5	1	1.5	1	2	1	3	1	3.5	1	4.5	1	3	2
17	3	1	3	2	1	1.5	1	1	1	1	2	1	2	1.5	1	1.5	1	1.5	1	1.5	1	1	2
17	3	1	7	4.5	1	4	1	3	1	2	1	2.5	1	2	1	1.5	1	2	1	1.5	1	2	1
17	3	2	1	2.5	1	2	1	2	1	3	1	3	1	3	1	4	1	3	1	2	1	2.5	1
17	3	2	7	1.5	1	1	2	1.5	2	1.5	2	2	1	2	1	2	1	2	1	3	1	2	1
17	3	3	7	2	1	2.5	1	2	1	2.5	1	2	1	2	1	2	1	2.5	1	2	1	4	1
17	3	3	7	2.5	1	1	1	2	1	3.5	1	2	1	2	1	3.5	1	3.5	1	2	1	4	1
17	4	1	3	2	1	1.5	1	2	1	3	1	2.5	1	3	1	3	1	2.5	1	2.5	1	2.5	1
17	4	1	7	2	1	1.5	1	2	1	1.5	1	1.5	1	2	1	1.5	1	1.5	1	1.5	1	1.5	1
17	4	2	7	1	1	1	1	2	1	2	1	2	1	1.5	1	1.5	1	1	1	2	1	1.5	1
17	4	2	7	1	1	1	1	1.5	1	1.5	1	1.5	1	1.5	1	2.5	1	2	1	2.5	1	2	1
17	4	3	5	1.5	1	2	1	1	1	3	1	2.5	1	1.5	1	3	1	2	1	2	1	2	1
17	4	3	7	2	1	2.5	1	2.5	1	2	1	2.5	1	3	1	2	1	2	1	1.5	1	2	1
17	5	1	7	2	1	1	1	2	1	2	1	2	1	1.5	1	2.5	1	2	1	2.5	1	2.5	1

Appendix F (continued)

TABLE XII
NINHYDRIN FINGERPRINT DATA

				LT	LT	LI	LI	LM	LM	LR	LR	LP	LP	RT	RT	RI	RI	RM	RM	RR	RR	RP	RP
Sub	Day	TOD	Act	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q
17	5	1	7	1	1	1.5	1	2.5	1	1.5	1	1.5	1	3	1	3	1	2.5	1	2.5	1	3	1
17	5	2	7	1	1	1	1	2	1	1	1	2	1	1.5	1	1.5	1	2	1	2.5	1	2	1
17	5	2	7	2	1	2	1	2	1	2	1	1.5	1	1	1	1.5	1	1.5	2	1.5	1	1.5	1
17	5	3	5	2	1	2	1	2	1	2	1	2	1	1	1	1.5	1	1.5	1	1.5	1	1.5	1
17	5	3	7	3	1	2	1	2	1	2	1	2	1	2	1	2.5	1	2	1	2	1	3	1
17	6	1	7	1.5	1	2	1	2	1	3	1	3	1	1	1	2	1	2	1	2.5	1	2	1
17	6	1	7	1.5	1	1	1	1.5	1	2	1	1	1	1.5	1	1.5	1	1.5	1	2	1	1.5	1
17	6	2	7	2	1	2	1	2	1	3	1	3	1	1.5	1	1.5	1	1.5	1	2	1	3	1
17	6	2	7	1.5	1	2	1	2	1	2	2	2	2	1.5	1	1.5	1	2	1	2.5	1	2	1
17	6	3	5	1.5	1	2	1	2	1	3	1	2	1	1.5	1	3	1	3.5	1	4	1	2	1
17	6	3	7	1	1	2	1	1.5	1	1.5	1	2	1	1.5	1	2.5	1	1.5	2	1.5	2	1.5	2
18	1	1	3	1	1	1	1	1	1	1	1	1.5	1	1.5	1	1	1	1.5	1	1.5	1	1.5	1
18	1	1	2	1	1	1	1	1	1	1	1	1.5	1	1.5	1	1	1	1	1	1	1	1.5	1
18	1	1	1	1	1	1	1	1	1	1	1	3	1	2.5	1	1.5	1	1.5	1	1	1	1.5	1
18	1	2	2	1	1	1	1	1	1	1	1	1.5	1	1	1	1.5	1	1	1	1	1	1.5	1
18	1	2	5	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1
18	1	3	2	1	1	1	1	1	1	1	1	1.5	1	1.5	1	1	1	1	1	1.5	1	1.5	1
18	2	1	3	1.5	1	1	1	2.5	1	1	1	1.5	1	4.5	1	1.5	1	1	1	1.5	1	1	1
18	2	1	2	2	1	1.5	1	1	1	1	1	1.5	1	4	1	2	1	1.5	1	2	1	2	1
18	2	1	2	4	1	4	1	1.5	1	2	1	4.5	1	5	0	2	1	2	1	4.5	1	4.5	1
18	2	2	4	2	1	1.5	1	1	1	1.5	1	1	1	2.5	1	2.5	1	2	1	4	1	2	1
18	2	2	2	4	1	2	1	1	1	2.5	1	2	1	2	1	1.5	1	3	1	2	1	1	1
18	2	2	2	1	1	2	1	1.5	1	1.5	1	1.5	1	1.5	1	2	1	1	1	1	1	2.5	1
18	3	3	2	2	1	2	1	1.5	1	1.5	1	2	1	2	1	1.5	1	1	1	2	1	2.5	1
18	3	3	1	2	1	1.5	1	1.5	1	2	1	2	1	2.5	1	2	1	2	1	2	1	2.5	1
18	3	1	7	4	1	4	1	2	1	2	1	2.5	1	2	1	2	1	2	1	3	1	3	1
18	3	1	3	1	1	1	1	1	1	1	1	1.5	1	1.5	1	2	1	4	1	1.5	1	1.5	1
18	3	2	2	1.5	1	1	1	1	1	1	1	1.5	1	1.5	1	2	1	1	1	1	1	2	1
18	3	2	1	1	1	1	1	1	1	1	1	1.5	1	1.5	1	1.5	1	1.5	1	1.5	1	1.5	1
18	4	1	1	1	1	1	1	1	1	1	1	1.5	1	1	1	3	1	1	1	1.5	1	1	1
18	4	1	2	1.5	1	1.5	1	1	1	1	1	1.5	1	2.5	1	2	1	2	1	2.5	1	2	1
18	4	2	2	1	1	1	1	1	1	1	1	2	1	2	1	2	1	2	1	2	1	1.5	1
18	4	2	5	2	1	2	1	1	1	1	1	2	1	4	1	3	1	2.5	1	2.5	1	4.5	1
18	4	3	2	1	1	1	1	1.5	1	2	1	1.5	1	1.5	1	1.5	1	1.5	1	1.5	1	4	1
18	5	1	-	1.5	1	1	1	1.5	1	1.5	1	2.5	1	2	1	2	1	1.5	1	1.5	1	2	1
18	5	2	2	1.5	1	1	1	1	1	1.5	1	2	1	2	1	1.5	1	1	1	1.5	1	2	1
18	5	2	1	2	1	1.5	1	1	1	1.5	1	1	1	2	1	1.5	1	1	1	1	1	1	1
18	5	3	2	1.5	1	1.5	1	1	1	1	1	1.5	1	1	1	1	1	1	1	1	1	2.5	1
18	6	1	7	1.5	1	1	1	1	1	1	1	1.5	1	1	1	1.5	1	1.5	1	1	1	1.5	1
18	6	1	7	2.5	1	2	1	2	1	1	1	1.5	1	2	1	2	1	2	1	2	1	1	1
18	6	2	2	2	1	-	-	2	1	2	1	2	1	2	1	1.5	1	1.5	1	1.5	1	1	1
18	6	2	6	4	1	2	1	1.5	1	2	1	1.5	1	2	1	1.5	1	1.5	1	1.5	1	2.5	1
18	6	3	2	2	1	1.5	1	1.5	1	1.5	1	2.5	1	1.5	1	1	1	1.5	1	1.5	1	1.5	1
18	6	3	2	3	1	2	1	1	1	1	1	1.5	1	1	1	1.5	1	1.5	1	1.5	1	2	1
18	6	1	3	2	1	1	1	1	1	1	1	1.5	1	1	1	1	1	1.5	1	1.5	1	1.5	1
18	6	1	2	2	1	1	1	1	1	1.5	1	1.5	1	1	1	1	1	1	1	1.5	1	1.5	1
19	1	1	1	5	0	5	0	5	0	4.5	1	2	1	4.5	1	5	0	4.5	1	5	0	4.5	1
19	1	1	8	4	1	2	1	2	1	2	1	4.5	1	1.5	1	1.5	1	2	1	2	1	1.5	1
19	1	2	7	2	1	2	1	1.5	1	1.5	1	2	1	1.5	1	1.5	1	1.5	1	2	1	2	1
19	1	3	6	2	1	2	1	2	1	2	1	4.5	1	2	1	1.5	1	1.5	1	1.5	1	2	1
19	2	1	2	5	0	4.5	1	4.5	1	5	0	4	1	4	1	5	0	5	0	5	0	4.5	1
19	2	1	7	2	1	2	1	1	1	2.5	1	3	1	1.5	1	2	1	2	1	2	1	2	1
19	2	2	7	5	0	5	0	4.5	1	5	0	5	0	4.5	1	5	0	5	0	5	0	5	0
19	2	3	7	2	1	2	1	1	1	1.5	1	2	1	2	1	1.5	1	1.5	1	4	1	2.5	1
19	2	3	1	4.5	1	4	1	3.5	1	3	1	2	1	2.5	1	4	1	4.5	1	3	1	5	0
19	3	1	7	2	1	2	1	2	1	2	1	2	1	2	1	2.5	1	1.5	1	2	1	2.5	1
19	3	1	7	2.5	1	2.5	1	2	1	2	1	2	1	2	1	2	1	1.5	1	2	2	2	1
19	3	2	7	1.5	1	1.5	1	1.5	1	1.5	1	2.5	1	2	1	2	2	2	1	2	1	2	1
19	3	2	2	1.5	1	3	1	2	1	2	1	1.5	1	1.5	1	2	1	2.5	1	1.5	1	2	1
19	3	3	7	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0

Appendix F (continued)

TABLE XII
NINHYDRIN FINGERPRINT DATA

				LT	LT	LI	LI	LM	LM	LR	LR	LP	LP	RT	RT	RI	RI	RM	RM	RR	RR	RP	RP
Sub	**Day**	**TOD**	**Act**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**
19	4	1	7	2	1	2	1	1.5	1	1.5	1	2	1	2	1	2.5	1	2	1	1.5	1	2	1
19	4	2	7	1.5	1	2	1	2	1	3.5	1	4.5	1	1.5	1	2.5	1	2	1	1.5	1	2	1
19	4	1	7	1.5	1	1.5	1	1.5	1	1.5	1	2	1	1.5	1	2	1	1.5	1	2	1	3	1

Appendix G

TABLE XIII
OIL RED O FINGERPRINT DATA

				LT	LT	LI	LI	LM	LM	LR	LR	LP	LP	RT	RT	RI	RI	RM	RM	RR	RR	RP	RP
Sub	**Day**	**TOD**	**Act**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**
1	1	1	4	3.5	2	3	3	3	4	2.5	4	2.5	2	3.5	4	3	3	2.5	4	2	2	2	1
1	1	1	3	4	2	3	2	3.5	2	2.5	3	4.5	1	3	3	2.5	3	2.5	3	3	2	2.5	3
1	1	2	7	3	1	2	2	2.5	2	2	3	2.5	2	3.5	3	3	2	2.5	1	2.5	2	2.5	2
1	1	2	1	3.5	1	3.5	1	3	2	2.5	2	4.5	1	3	4	3.5	1	3	2	3.5	1	3	1
1	1	2	7	1.5	4	1	4	1	3	1.5	3	1.5	4	1	4	1	3	1.5	3	1	3	3	1
1	1	3	1	4.5	2	4	3	4	1	4.5	1	4.5	1	4	3	4	2	4	2	4.5	1	4	1
1	2	1	1	3	2	2.5	2	4.5	1	4.5	1	3	2	4	2	3.5	1	2.5	2	3.5	1	4	1
1	2	2	7	1	4	1	2	1	2	2	1	2	2	2.5	4	2	4	2	2	1.5	2	2.5	2
1	2	2	7	2	4	1.5	3	1.5	3	2	2	2.5	1	2	4	1.5	4	1	4	1	3	1	3
1	2	3	5	1.5	4	1	3	1	4	1	3	2	1	1	4	1	4	1	2	1	3	1	1
1	2	3	7	3	4	2.5	1	1	3	1	4	1.5	2	3.5	3	1	1	2.5	1	2	1	2.5	2
1	3	2	5	3	1	2.5	2	2.5	3	2.5	2	2	4	2	4	1	3	1.5	4	2	4	2	2
1	3	2	2	2	3	1.5	2	1.5	2	3	2	2.5	2	3	3	2.5	4	2	4	2	4	2	4
1	3	3	7	2.5	4	2	2	2	4	2.5	4	2	4	2.5	3	1.5	4	2.5	2	2.5	2	2.5	2
1	3	3	2	2.5	2	3	1	3	1	3	2	3	1	2.5	4	2.5	3	2.5	2	2.5	2	3.5	1
1	4	1	4	1	4	1	4	1	4	1.5	3	1.5	2	1	4	1	3	1	4	1	4	1	4
1	4	1	7	1	4	1	4	1	4	1	4	1	3	1	4	1	4	1	4	1	4	1	4
1	4	2	7	1.5	4	1.5	4	1	4	1.5	4	2	4	3	4	1.5	4	1.5	4	2	4	2	4
1	4	2	7	1	4	1	4	1	4	1.5	4	1	4	2	4	1.5	4	1	4	1	4	1	4
1	4	3	7	1.5	4	2	3	1	4	1	4	1	4	2	4	1.5	4	1	4	1	4	1.5	3
1	4	3	1	1	4	1	3	1	4	1	3	1.5	3	1	4	1	4	1	4	1	3	2	2
1	5	1	4	4	2	3.5	2	3	2	3	3	3	2	3.5	1	3.5	2	2	2	3	2	2	4
1	5	1	7	4	2	3	2	3	4	3.5	3	3.5	1	4.5	1	3.5	2	2.5	3	3	2	3	1
1	5	2	7	3	4	2.5	3	3	4	2	1	4	2	4	1	3	2	3	1	3	2	3	3
1	5	2	7	3.5	1	3	1	3.5	1	4	1	3	1	3	1	2.5	1	2	2	2.5	2	2.5	1
1	5	3	5	2.5	4	1	4	1	4	1.5	4	1.5	4	2	4	1.5	3	1	4	1	3	2	4
1	5	3	7	2	4	2.5	3	2	4	3	1	2.5	2	3	2	1.5	3	2	3	1.5	2	1	1
1	6	1	4	1.5	4	1.5	4	1.5	4	2	4	2	2	3	2	1.5	3	1.5	2	1	3	1.5	2
1	6	1	7	2	4	1	3	1	3	1	4	2	3	3	4	2.5	3	2	4	1	4	2	2
1	6	2	7	1.5	4	1	4	1	4	2	3	2	3	3	4	2.5	3	2	4	2.5	2	2.5	2
1	6	2	7	3.5	1	2.5	3	2.5	3	3	3	3	2	3.5	2	3	2	2.5	2	2	3	1.5	4
1	6	3	6	3.5	1	1	2	2.5	2	2.5	2	2	2	2.5	4	1	4	1.5	4	1	4	3	2
2	1	1	4	5	0	4	1	4.5	1	5	0	5	0	4.5	1	4	1	5	0	5	0	5	0
2	1	2	5	4.5	1	4.5	1	3.5	1	4	1	3.5	2	4	2	4.5	1	4	2	3	2	3	2
2	1	2	2	5	0	4	1	5	0	5	0	5	0	4	1	4.5	1	4.5	1	5	0	5	0
2	1	3	5	2	2	4	1	4.5	1	4	1	3	1	1.5	4	2.5	1	2	1	3.5	1	3	1
2	1	3	7	4	1	3	1	4	1	4	1	4	1	3	3	4	1	3	1	3	1	3	1
2	2	1	3	4	1	3.5	1	4.5	1	4.5	1	5	0	4.5	1	4.5	1	3	3	4	1	3.5	1
2	2	1	5	5	0	4	1	4.5	1	4.5	1	4	1	4.5	1	3.5	1	3	1	4	1	4	1
2	2	2	5	1.5	1	3.5	1	1	1	2.5	1	5	0	2	1	4.5	1	2.5	1	4.5	1	3	1
2	2	2	2	4.5	1	4.5	1	4.5	1	-	-	4.5	1	5	0	5	0	1.5	1	4.5	1	4	1
2	2	3	2	4	1	4	1	4	1	3.5	1	4.5	1	4.5	1	3.5	1	4	1	4.5	1	4	1
2	3	1	5	2	2	3	2	1	3	2	3	3	2	3	2	2.5	2	1	3	1	3	2	4
2	3	1	4	1.5	4	2	4	1.5	3	1.5	1	5	0	2.5	2	2	4	2	2	1	2	2.5	1
2	3	1	7	3	2	1.5	4	2	4	3	1	3.5	1	2.5	3	3	2	4.5	1	5	0	4	1
2	3	2	7	3	2	2.5	1	4	1	3	2	2	3	2.5	2	4	1	4	1	4.5	1	3	4
2	3	2	7	5	0	5	0	4.5	1	4	1	4	1	3	2	3	2	4	1	5	0	4	1
2	3	3	7	3.5	2	3	2	2.5	2	2	2	2.5	1	3	3	4.5	1	3.5	1	3.5	1	3	2
2	3	3	2	3	1	4	1	3	1	4	1	1.5	1	4	2	3.5	2	2.5	2	4.5	1	3	1
2	4	1	4	3.5	2	2.5	1	3.5	1	2.5	2	4	1	2	4	1.5	4	2	3	3.5	1	3	2
2	4	2	5	4	1	2	1	2.5	1	2.5	1	3	1	2	3	3	2	2.5	2	2.5	1	3	1
2	4	2	7	4.5	1	4	1	4	1	5	0	4.5	1	3	2	4.5	1	2	2	4.5	1	4	1
2	4	3	7	4	1	3.5	1	2.5	2	3	2	3	4	2.5	1	4.5	1	3	1	2.5	1	3	1
2	4	3	6	5	0	5	0	4	1	2.5	2	5	0	2.5	3	4.5	1	3.5	1	4.5	1	5	0
2	5	1	1	3	2	2	1	3.5	1	2.5	1	2.5	2	4.5	1	4.5	1	4.5	1	4	1	4	1
2	5	1	7	2.5	1	2	1	2.5	1	2	1	3.5	1	4.5	1	4.5	1	4	1	4	1	4	2
2	5	2	2	4	1	3	1	4.5	1	4.5	1	4	1	4	1	3	2	3.5	1	4	1	3.5	1
2	5	2	7	2.5	2	1.5	1	3.5	2	4	1	4	1	1	1	3	1	4	2	4.5	1	4.5	1
2	6	1	7	3	2	3	1	4	1	4	1	4	2	4	2	3	2	3.5	1	5	0	4.5	1
2	6	1	2	4.5	1	3	2	4	2	4.5	1	4.5	1	4	1	4	1	3.5	2	4	1	3.5	1

Appendix G (continued)

TABLE XIII
OIL RED O FINGERPRINT DATA

				LT	LT	LI	LI	LM	LM	LR	LR	LP	LP	RT	RT	RI	RI	RM	RM	RR	RR	RP	RP
Sub	Day	TOD	Act	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q
2	6	2	2	4	3	3	2	3.5	4	3.5	4	3.5	4	3	4	3	4	2.5	4	2.5	3	3	4
2	6	2	4	4	1	3	1	3.5	1	3	1	2.5	1	1.5	2	1.5	2	1	2	1	2	2	3
2	6	2	7	3.5	1	3	1	4	1	3.5	1	2.5	1	4	1	1	1	2	2	1.5	2	2	1
2	6	3	5	2	4	2.5	1	1.5	1	1.5	3	2	4	1	3	3	3	2	2	1	2	1	3
2	6	3	2	2	4	2	2	3	2	2.5	2	3	1	1.5	4	2.5	1	1.5	3	2	4	1	3
3	1	1	1	5	0	5	0	5	0	5	0	5	0	5	0	5	0	4.5	1	5	0	5	0
3	1	2	7	2.5	2	4	1	3	2	4	1	5	0	3	2	4	1	5	0	4	1	1.5	2
3	1	2	1	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
3	1	3	7	3	1	3.5	1	3	2	4.5	1	3.5	1	3.5	1	3	1	4	1	4	1	4	1
3	1	3	7	5	0	4	1	3	1	4	1	4	1	3.5	1	2.5	2	3.5	1	4	1	4.5	1
3	2	1	4	4.5	1	4.5	1	4	1	5	0	5	0	4.5	1	4.5	1	4.5	1	4.5	1	5	0
3	2	2	7	4	1	4	1	5	0	4	1	5	0	4	1	4	1	5	0	4.5	1	3.5	1
3	2	2	7	3.5	1	3	3	1.5	3	2	4	2.5	2	3	3	2.5	2	3.5	1	3.5	1	3	1
3	2	3	3	4	1	3.5	2	2	4	2	4	2.5	3	4	2	1.5	2	2	1	2.5	1	4	1
3	2	3	7	5	0	5	0	4	1	4	1	4	1	4	1	4.5	1	5	0	4.5	1	4	1
3	2	3	7	4.5	1	4	1	4	1	4.5	1	5	0	4	1	2.5	2	3	1	1.5	4	3	3
3	3	1	3	3.5	2	4	1	3	3	3.5	1	4	1	4.5	1	4	1	3.5	1	3.5	1	3.5	1
3	3	1	8	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	4.5	1
3	3	2	8	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
3	3	3	5	2	2	2.5	2	2	3	3	1	1	1	5	0	4.5	1	4.5	1	5	0	4.5	1
3	3	3	2	4	1	4	1	1	1	2.5	1	3	1	1	2	1	1	1	1	3.5	1	3.5	1
3	3	3	2	4.5	1	3.5	1	4.5	1	4.5	1	5	0	4	1	4	1	3.5	1	4.5	1	4.5	1
3	4	1	3	3	3	2	4	1.5	4	2	3	2.5	2	3	1	3	3	3	3	2.5	3	3	2
3	4	1	8	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
3	4	2	5	3	1	2	3	2	4	3.5	1	4.5	1	4.5	1	3	3	4	1	3.5	1	4.5	1
3	4	3	7	2.5	2	3	3	3	1	4	1	4.5	1	4.5	1	4.5	1	3.5	1	4.5	1	4.5	1
3	4	3	3	3.5	2	3	3	3.5	3	2.5	3	3	3	2.5	4	2	3	2.5	4	2.5	1	4	1
3	4	3	5	2	2	2.5	3	2	4	3	2	3.5	2	1.5	1	2	2	2.5	1	2	2	3.5	1
3	5	1	3	2.5	3	1.5	4	2	3	2	4	1.5	4	4	2	3.5	3	3	1	2	4	1.5	3
3	5	1	7	3	1	2.5	4	3	2	2.5	2	1.5	4	4	1	3	2	3	2	3	1	2.5	1
3	5	2	1	4.5	1	4.5	1	4.5	1	4.5	1	4.5	1	4	1	4	1	4.5	1	4.5	1	3.5	2
3	5	2	7	2	4	3	3	2.5	4	3	4	3	3	3	4	2	4	3	4	2.5	3	2.5	2
3	5	3	5	1	1	1	3	1	4	1	4	1	4	2	3	1.5	4	1.5	3	1	2	1	2
3	5	3	7	2	4	2	4	3	4	3	2	2.5	2	2	3	2.5	3	2.5	3	2	2	2.5	2
3	6	1	1	4	2	3.5	1	3	1	4.5	1	4.5	1	3	4	3.5	2	3	2	3.5	2	4	1
3	6	2	8	5	0	5	0	5	0	5	0	5	0	5	0	4.5	1	4.5	1	4.5	1	4.5	1
3	6	2	5	3.5	2	2	2	2.5	4	3.5	1	4.5	1	3	4	2.5	3	3	3	2.5	1	2	2
3	6	3	7	2.5	4	3	3	2	4	2	4	3.5	2	4	1	3	2	2.5	3	3	3	4	1
3	6	3	7	1	4	1	4	4	1	3.5	2	3	2	4	1	3	1	3	1	2.5	1	4.5	1
3	6	3	2	2	3	2	4	2.5	4	3.5	3	4.5	1	4	1	2.5	4	2	3	2	3	3	2
4	1	1	3	4.5	1	3	1	3	1	3.5	1	4.5	1	4.5	1	4.5	1	4.5	1	3.5	1	3.5	1
4	1	1	2	5	0	4	1	3.5	1	5	0	5	0	4	1	5	0	5	0	5	0	1	1
4	1	2	2	4.5	1	2	2	4	1	4	1	4	1	4.5	1	4	1	3.5	2	3.5	2	4.5	1
4	1	3	7	1.5	3	2	3	1.5	1	2	1	3.5	1	2	2	3	1	1.5	1	1	1	1.5	1
4	1	3	2	4.5	1	4.5	1	5	0	5	0	4.5	1	4.5	1	4	2	4.5	1	3	1	4.5	1
4	2	1	7	3.5	1	4.5	1	4	1	4	1	4.5	1	3.5	1	3.5	1	3	1	4	1	4	1
4	2	2	2	5	0	5	0	5	0	5	0	5	0	4.5	1	4.5	1	4.5	1	4.5	1	5	0
4	3	1	7	3.5	3	4	1	3	2	2.5	1	3	1	3	3	2.5	3	2.5	1	2.5	1	3	1
4	3	1	2	4	3	3	2	4.5	1	4.5	1	4.5	1	3.5	4	3.5	4	4	1	3.5	2	3.5	2
4	3	2	2	4.5	1	4	1	4.5	1	4	1	4.5	1	3.5	4	3	3	3	1	3.5	1	4	1
4	3	3	2	3.5	2	3	1	3	1	3.5	1	3	1	3	3	3	3	2.5	2	3.5	1	4	1
4	3	3	5	1.5	3	3.5	2	4	1	4	1	5	0	2.5	2	2.5	1	3	1	2.5	1	3	1
4	4	1	2	4.5	1	4.5	1	3.5	1	4.5	1	3	1	3	4	3	3	4	2	3.5	1	4.5	1
4	4	2	5	3.5	3	3	4	2.5	3	3	2	3	2	3	4	3.5	4	3	3	2.5	3	3	2
4	4	2	7	2.5	1	3	1	3	2	3	1	3	2	3	4	3	3	3	3	3	4	3.5	2
4	4	3	1	4	1	1	4	4	1	4.5	1	5	0	4	1	3.5	1	4.5	1	3.5	1	4.5	1
5	1	1	-	3	1	3	2	3	1	2.5	1	3	1	4.5	1	3	1	2	1	3.5	1	3	1
5	1	2	2	2	1	2.5	1	2.5	1	3	1	3.5	1	3	1	2	1	3	1	2	1	1.5	1
5	1	2	2	1.5	3	2	2	2.5	1	2	1	3	1	4.5	1	1	2	2.5	1	3	1	3.5	1
5	1	3	3	3	1	4	1	3.5	1	3	1	3	1	4.5	1	2.5	1	3.5	1	3	1	2.5	1

Appendix G (continued)

TABLE XIII
OIL RED O FINGERPRINT DATA

				LT	LT	LI	LI	LM	LM	LR	LR	LP	LP	RT	RT	RI	RI	RM	RM	RR	RR	RP	RP
Sub	Day	TOD	Act	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q
5	1	3	5	4	1	3	1	4	1	3.5	1	3.5	1	1.5	1	2	1	2	1	2	1	4.5	1
5	1	3	4	3	1	1.5	1	2	1	3	1	3	1	4.5	1	3.5	1	4.5	1	4	1	3.5	1
5	2	1	3	2	1	2.5	1	2	1	2	1	4	1	2.5	1	2	1	2	1	3	1	4	1
5	2	2	7	3.5	1	4	1	3.5	1	4.5	1	4	1	5	0	3.5	1	4	1	4	1	4.5	1
5	2	3	6	1	1	3	1	1.5	2	1	1	1.5	1	2	1	2.5	1	2.5	1	2	1	2.5	1
5	2	3	2	1	1	3.5	1	2.5	1	2	1	3	1	1.5	2	1	4	2	1	1.5	1	1.5	1
5	3	1	5	4	1	3.5	1	4	1	4	1	4	1	4	1	1	1	4	1	4	1	4	1
5	3	3	5	4.5	1	4.5	1	4.5	1	4.5	1	5	0	5	0	4.5	1	4	1	4.5	1	4.5	1
5	3	3	4	5	0	4.5	1	5	0	5	0	4.5	1	5	0	4.5	1	5	0	5	0	5	0
5	4	1	3	4.5	1	4	1	4	1	4	1	4	1	4.5	1	4	1	4	1	4	1	4	1
5	4	2	5	4.5	1	4.5	1	4.5	1	5	0	4.5	1	4.5	1	4.5	1	4.5	1	4	1	4	1
5	4	3	7	4.5	1	4.5	1	4	1	4.5	1	4.5	1	4.5	1	4	1	4	1	4.5	1	4.5	1
5	4	3	7	4.5	1	4.5	1	4.5	1	4	1	4.5	1	4.5	1	4.5	1	4.5	1	4.5	1	4	1
5	5	1	3	4	1	4	1	4	1	4	1	5	0	4	1	3.5	1	4	1	4	1	4	1
5	5	1	5	5	0	4.5	1	4.5	1	4.5	1	4.5	1	4.5	1	1	1	3	1	4	1	4	1
5	5	2	6	3.5	1	4	1	3	1	3	1	3	1	4	1	3.5	1	4	1	3	1	3	1
5	5	3	7	4.5	1	3.5	1	4.5	1	4	1	4.5	1	4.5	1	4	1	4	1	3.5	1	4.5	1
5	5	3	4	3	1	3.5	1	3.5	1	3.5	1	4	1	4	1	3.5	1	4	1	4	1	4.5	1
5	6	1	3	4	1	2.5	1	1	1	1	3	1	3	1.5	1	1	1	1	1	1	1	1	1
5	6	1	7	3	1	3.5	1	2.5	1	1	1	2.5	1	2.5	1	2	1	1.5	2	2	1	1.5	1
5	6	2	2	3	1	3	1	2.5	1	2.5	1	2	1	4	1	4.5	1	3	1	3	1	2.5	1
5	6	2	3	4	1	4	1	3.5	1	4.5	1	3	1	4.5	1	5	0	4	1	4.5	1	4.5	1
5	6	3	2	4	1	3.5	1	4	1	4	1	4	1	4	1	3.5	1	2.5	1	1.5	1	2.5	1
5	7	1	3	5	0	3.5	1	4	1	3.5	1	5	0	5	0	3.5	1	4.5	1	4.5	1	2.5	1
5	7	1	2	2	1	3	1	2.5	1	2	1	3	1	3	1	2.5	1	2.5	1	3.5	1	3	1
5	7	2	7	3	1	2	1	2	1	2.5	1	3	1	3.5	1	2	1	3.5	1	1.5	1	3	1
5	7	3	4	3.5	1	3.5	1	3	1	3	1	4	1	3.5	1	1.5	1	3	2	3	2	3	1
5	8	1	3	4.5	1	4	1	4	1	4	1	4	1	4.5	1	4.5	1	3.5	1	4	1	4.5	1
5	8	2	7	4.5	1	5	0	5	0	5	0	5	0	4.5	1	3	1	4.5	1	4.5	1	5	0
5	8	3	7	4.5	1	4.5	1	5	0	5	0	5	0	4.5	1	3.5	1	4.5	1	4.5	1	4.5	1
6	1	1	2	3.5	1	4	1	3.5	1	3.5	1	3	1	4.5	1	3	1	3	1	3	1	3.5	1
6	1	1	7	3.5	1	2.5	2	2.5	1	1.5	1	1.5	1	4	1	4	1	4	2	3	1	3	1
6	1	2	5	2.5	2	2	1	2.5	1	3	1	2.5	1	2	3	2	2	2.5	1	2	1	2	1
6	1	2	7	2	2	1.5	2	1.5	3	1.5	2	2	1	2	3	1.5	2	3	2	4	1	3	2
6	1	2	7	2	1	3	3	3	2	3	1	3.5	1	2	2	3.5	2	3	2	3.5	1	4	1
6	1	3	1	4.5	1	5	0	5	0	4.5	1	4.5	1	4	1	4	1	4	1	4	1	4.5	1
6	2	1	3	4.5	1	4.5	1	4	1	4	1	5	0	4.5	1	3.5	1	4.5	1	3.5	1	4.5	1
6	2	1	2	4.5	1	3	1	4	1	3	1	3	1	2.5	1	4	1	4	1	4.5	1	4	1
6	2	1	2	4	1	3.5	1	4	1	4	1	3	1	3	1	4	1	3.5	1	4.5	1	4.5	1
6	2	1	5	2	1	1	2	2	2	3.5	1	2	1	2	1	2	2	2	3	2	2	1.5	3
6	2	3	1	4.5	1	3	1	3.5	1	4	1	4	1	3	2	2	1	3.5	1	4	1	3.5	1
6	2	3	2	4.5	1	4.5	1	3.5	1	4	1	4.5	1	3.5	1	3.5	1	3.5	1	3.5	1	3	1
6	3	1	5	4.5	1	4.5	1	4.5	1	4.5	1	4.5	1	5	0	5	0	4.5	1	4.5	1	4.5	1
6	3	1	7	5	0	4.5	1	4.5	1	4	1	2.5	1	5	0	5	0	5	0	4.5	1	5	0
6	3	2	5	5	0	4	1	4	1	4	1	4	1	4.5	1	4.5	1	4	1	4	1	4	1
6	3	2	7	5	0	4.5	1	4.5	1	1.5	2	5	0	5	0	5	0	5	0	5	0	5	0
6	3	2	7	1	3	1	2	1	2	5	0	1.5	2	4.5	1	4.5	1	3.5	1	4.5	1	4.5	1
6	3	3	5	5	0	5	0	4.5	1	4.5	1	5	0	5	0	5	0	5	0	4.5	1	4.5	1
6	4	1	2	4	1	2	1	3	2	2.5	1	2.5	1	3.5	1	3	1	3	1	3	2	2	4
6	4	1	7	1	4	1	3	2	2	2.5	1	3.5	1	2	1	1	2	1.5	2	3.5	1	4	1
6	4	2	2	2	2	1.5	2	1	2	2	1	1	1	3.5	1	3	1	2.5	2	3	1	3	1
6	4	2	7	3	1	4.5	1	3.5	1	4	1	4	1	4.5	1	4	1	5	0	5	0	4.5	1
6	4	3	7	3	1	3.5	1	2.5	1	3	1	2.5	1	4	1	4.5	1	3.5	2	3	1	3	1
6	4	3	2	4.5	1	4.5	1	4	1	5	0	4.5	1	5	0	4.5	1	4	1	4.5	1	4.5	1
6	5	1	7	4.5	1	4.5	1	4.5	1	4.5	1	4.5	1	4.5	1	4.5	1	4	1	4	1	3.5	1
6	5	1	2	4	1	4	1	4	1	3.5	1	4	1	4.5	1	4	1	3.5	1	3.5	1	3.5	1
6	5	2	7	3	1	2	2	1	2	2	1	1.5	1	4.5	1	4	1	2	2	3	1	3	1
6	5	2	7	4	1	3	1	3	1	3	1	4	1	3.5	1	3.5	2	3	2	2.5	1	3	1
6	5	3	7	4	1	3.5	1	2.5	1	2	1	3	1	3	1	4	1	4	1	3.5	1	4	1
6	5	3	2	3	1	2	1	3.5	1	3.5	1	5	0	3	1	1.5	2	3	1	4	1	4	1

Appendix G (continued)

TABLE XIII
OIL RED O FINGERPRINT DATA

				LT	LT	LI	LI	LM	LM	LR	LR	LP	LP	RT	RT	RI	RI	RM	RM	RR	RR	RP	RP
Sub	Day	TOD	Act	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q
6	6	1	1	3.5	1	3.5	2	3.5	4	4	1	3.5	1	4	1	2.5	1	3	3	3.5	2	4	1
6	6	1	7	3.5	1	2.5	2	3.5	3	3.5	1	4	1	4	2	3	3	3.5	1	3.5	1	4	1
6	6	2	7	4.5	1	4	1	4	1	4	1	4	1	4.5	1	4.5	1	4	1	4.5	1	4.5	1
6	6	2	7	4.5	1	4.5	1	3	4	2	2	4	1	4.5	1	4	1	4	2	3.5	1	4	1
6	6	2	7	3	2	3.5	1	3	2	3	1	3.5	1	4.5	1	4	1	3	1	3.5	1	4	1
6	6	3	2	2.5	2	2.5	3	2	4	1.5	2	1.5	2	2.5	2	2	4	2	3	3	2	3	2
7	1	1	1	4.5	1	4.5	1	4.5	1	4.5	1	4.5	1	4.5	1	5	0	4.5	1	5	0	5	0
7	1	1	7	5	0	5	0	4.5	1	5	0	5	0	4.5	1	5	0	4.5	1	4.5	1	5	0
7	1	2	5	4.5	1	5	0	5	0	5	0	5	0	4.5	1	5	0	5	0	5	0	5	0
7	1	2	2	5	0	4.5	1	5	0	4.5	1	5	0	5	0	5	0	4.5	1	5	0	5	0
7	1	3	7	4.5	1	4.5	1	4.5	1	4	1	4.5	1	5	0	4	1	4	1	4	1	4	1
7	1	3	4	3	1	3.5	1	4	1	4	1	4.5	1	5	0	4.5	1	4.5	1	3.5	1	3.5	1
7	2	1	3	2	1	1.5	1	1	4	2	1	2	1	4	1	2	1	3	1	3	1	2.5	1
7	2	1	7	4	1	4	1	4	1	3.5	1	4	1	4	1	4.5	1	3.5	1	4	1	4.5	1
7	2	1	6	4.5	1	3.5	1	3	1	3.5	1	4	1	4.5	1	4.5	1	5	0	5	0	4.5	1
7	2	2	5	4	1	3.5	1	5	0	5	0	4.5	1	4.5	1	4.5	1	4.5	1	4	1	4	1
7	2	2	2	4	1	4	1	4.5	1	4.5	1	4.5	1	3	1	3.5	1	3.5	1	4	1	4	1
7	2	2	2	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
7	3	1	1	4.5	1	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
7	3	1	4	4.5	1	5	0	5	0	5	0	5	0	4.5	1	4.5	1	5	0	5	0	5	0
7	3	2	5	3	1	5	0	4.5	1	5	0	5	0	5	0	4.5	1	4.5	1	4.5	1	5	0
7	3	2	7	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
7	3	3	5	5	0	4.5	1	5	0	5	0	5	0	5	0	5	0	2	1	5	0	5	0
7	4	1	5	4.5	1	4.5	1	4.5	1	4.5	1	4	1	4.5	1	4	1	4	1	4	1	4.5	1
7	4	1	7	4.5	1	4.5	1	4.5	1	4	1	4.5	1	5	0	4.5	1	4.5	1	5	0	4.5	1
7	4	1	6	5	0	5	0	5	0	4.5	1	5	0	5	0	2	1	5	0	5	0	5	0
7	4	2	5	2	1	2.5	1	2	1	2	1	2	1	4	1	1.5	1	1.5	1	1	1	2	1
7	4	2	7	4.5	1	4.5	1	4.5	1	4.5	1	5	0	5	0	5	0	5	0	5	0	5	0
7	4	3	5	3	1	4	1	3	1	4	1	3.5	1	5	0	4.5	1	4.5	1	4.5	1	5	0
7	5	1	5	4.5	1	4.5	1	3	1	4.5	1	4.5	1	5	0	4.5	1	4.5	1	4.5	1	4.5	1
7	5	1	1	3	1	3.5	1	3	1	3.5	1	3.5	1	4.5	1	3	1	3.5	1	4.5	1	3.5	1
7	5	2	7	4.5	1	4.5	1	4.5	1	5	0	4.5	1	5	0	4	1	4.5	1	4.5	1	4	1
7	5	2	7	3	1	3	1	2.5	2	2.5	2	3.5	1	5	0	4.5	1	3	1	4.5	1	3.5	1
7	5	3	7	4.5	1	4.5	1	3	1	3.5	1	4.5	1	5	0	4.5	1	5	0	5	0	4.5	1
7	5	3	1	5	0	5	0	5	0	5	0	5	0	5	0	3	1	3.5	1	4	1	3.5	1
7	6	1	3	1.5	1	1	4	1.5	3	1	2	1	1	1	2	1	4	1	4	1	1	1	3
7	6	1	5	5	0	5	0	4.5	1	2	1	2.5	1	4.5	1	3.5	1	2	1	3	1	3.5	1
7	6	2	5	1	1	4.5	1	4.5	1	3	1	2	1	3.5	1	1.5	1	2	1	4.5	1	4.5	1
7	6	2	1	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
7	6	3	5	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
7	6	3	4	5	0	3.5	1	3	1	2	1	2.5	1	4	1	2	1	3	1	2	1	3.5	1
8	1	2	2	4.5	1	3	1	3.5	1	4	1	4.5	1	4.5	1	4.5	1	4.5	1	4.5	1	4.5	1
8	1	2	1	5	0	5	0	5	0	4.5	1	5	0	5	0	5	0	5	0	5	0	5	0
8	1	2	7	4.5	1	4.5	1	4.5	1	5	0	5	0	4	1	1	1	4	1	5	0	5	0
8	1	3	2	5	0	4.5	1	4.5	1	4.5	1	5	0	4.5	1	5	0	4.5	1	4.5	1	4.5	1
8	1	3	7	3.5	1	4	1	4	1	4.5	1	4.5	1	4.5	1	4.5	1	4	1	3.5	1	4.5	1
8	1	3	7	3.5	2	3	1	4	1	4.5	1	4.5	1	3.5	1	3.5	1	3	2	2	1	3.5	1
8	2	1	7	4	1	2.5	1	3	1	3	1	3	1	1.5	2	1	1	3	1	2	3	1	1
8	2	2	5	4	1	3.5	2	3.5	1	4	1	4	1	1.5	1	4.5	1	4	1	4.5	1	1.5	1
8	2	2	5	3	1	1.5	2	1	1	4	1	2	1	1	4	1	2	1	1	1	2	1	1
8	2	2	1	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
8	2	3	7	1.5	2	1.5	1	1.5	1	4	1	4	1	2	3	1	1	2	1	4.5	1	1.5	1
8	2	3	7	2	1	1	2	2.5	1	4.5	1	4.5	1	1.5	3	1	2	2	1	1.5	1	2.5	1
8	3	1	7	4.5	1	4.5	1	4.5	1	4.5	1	4	1	4.5	1	4.5	1	4	1	4	1	4	1
8	3	1	1	4.5	1	4.5	1	4.5	1	4.5	1	4.5	1	4	1	1.5	1	4.5	1	4.5	1	4.5	1
8	3	2	5	4.5	1	4	1	4	1	4	1	4.5	1	5	0	4	1	5	0	5	0	5	0
8	3	2	1	4	1	4	1	4.5	1	4.5	1	4.5	1	1.5	3	3	1	2	2	1	2	1	2
8	3	2	7	4.5	1	2	2	2.5	2	4	1	4	1	2	2	2.5	1	3	1	2.5	2	1	4
8	3	3	4	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
8	4	1	4	4.5	1	2.5	1	3	1	2	1	2	2	4	1	4	1	4	1	4	1	2.5	1

Appendix G (continued)

TABLE XIII
OIL RED O FINGERPRINT DATA

				LT	LT	LI	LI	LM	LM	LR	LR	LP	LP	RT	RT	RI	RI	RM	RM	RR	RR	RP	RP
Sub	Day	TOD	Act	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q
8	4	1	6	4.5	1	3	2	4.5	1	4.5	1	3.5	1	4	1	4	1	4.5	1	4.5	1	4.5	1
8	4	2	7	4.5	1	4.5	1	4	1	4.5	1	4.5	1	4.5	1	4	1	4.5	1	4.5	1	4.5	1
8	4	2	5	5	0	4.5	1	5	0	4.5	1	5	0	4.5	1	4.5	1	4.5	1	4.5	1	4.5	1
8	4	2	1	4	1	4.5	1	4	1	4	1	4.5	1	4.5	1	4.5	1	4.5	1	4	1	4	1
8	4	3	7	5	0	3	1	3.5	1	3.5	1	4	1	3	1	3	1	4.5	1	2	1	4.5	1
8	5	1	1	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
8	5	1	4	4.5	1	4.5	1	4.5	1	4	1	4	1	5	0	5	0	4.5	1	4	1	3.5	1
8	5	1	7	3.5	1	4	1	4	1	4	1	4.5	1	4.5	1	4.5	1	4.5	1	4	1	4	1
8	5	2	2	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
8	5	2	7	5	0	5	0	4.5	1	4.5	1	4.5	1	5	0	5	0	5	0	4.5	1	5	0
8	5	3	5	1	1	1	2	2.5	1	4	1	5	0	4.5	1	4.5	1	5	0	2	2	4.5	1
8	6	1	4	5	0	4	1	4.5	1	3.5	1	4	1	5	0	5	0	4.5	1	4	1	3.5	1
8	6	2	5	5	0	4	1	4.5	1	4.5	1	5	0	5	0	5	0	5	0	4.5	1	4	1
8	6	2	2	4.5	1	4	1	4.5	1	5	0	5	0	4	1	4	1	4.5	1	4.5	1	4.5	1
8	6	3	1	4.5	1	5	0	3.5	1	4.5	1	4.5	1	4.5	1	5	0	4.5	1	4.5	1	5	0
8	6	3	7	5	0	4.5	1	5	0	5	0	5	0	5	0	5	0	5	0	4.5	1	5	0
8	6	3	1	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
9	1	1	3	5	0	4	1	3.5	1	3	1	3	1	4.5	1	3.5	1	3.5	1	3.5	1	1	2
9	1	2	7	4.5	1	5	0	5	0	4.5	1	5	0	5	0	1	1	5	0	4	1	3	1
9	1	2	7	4	1	5	0	4.5	1	5	0	1.5	3	5	0	5	0	1	1	4.5	1	4.5	1
9	1	3	5	3.5	1	5	0	4	1	4	1	4.5	1	5	0	4.5	1	4	1	4.5	1	5	0
9	1	3	7	1	4	1	4	1	4	1	3	1	1	1.5	2	1	3	1	2	1	2	1	4
9	2	1	3	2	2	2	2	1.5	2	1.5	1	1.5	1	2	1	1.5	2	4	1	1.5	1	1	1
9	2	2	5	2	1	3	1	2	1	2	1	1.5	1	4.5	1	1	1	2	1	2	1	2	1
9	2	2	7	4.5	1	4.5	1	1.5	1	1.5	1	2.5	1	4.5	1	4.5	1	4.5	1	4.5	1	2	1
9	2	2	7	4	1	4.5	1	4	1	4	1	3.5	1	4.5	1	4	1	4.5	1	4	1	4.5	1
9	2	3	5	1	2	5	0	5	0	3.5	1	1	2	4.5	1	4.5	1	4.5	1	4	1	4.5	1
9	2	3	2	5	0	5	0	5	0	4.5	1	4.5	1	5	0	5	0	4.5	1	4.5	1	4.5	1
9	2	3	1	4.5	1	5	0	4.5	1	4.5	1	4.5	1	4.5	1	4.5	1	4.5	1	4.5	1	4	1
9	3	1	3	5	0	4.5	1	4.5	1	4.5	1	4.5	1	4.5	1	4.5	1	4.5	1	5	0	4.5	1
9	3	1	7	4.5	1	5	0	5	0	5	0	5	0	5	0	5	0	4	1	5	0	5	0
9	3	2	1	4.5	1	5	0	5	0	5	0	5	0	4.5	1	4.5	1	4.5	1	4.5	1	4.5	1
9	3	2	2	4	1	4.5	1	3.5	1	2	1	4	1	5	0	4.5	1	4.5	1	5	0	5	0
9	3	3	2	4	1	4.5	1	4	1	4	1	5	0	5	0	4.5	1	4.5	1	5	0	4.5	1
9	4	1	3	2	3	4	1	4	1	4.5	1	4.5	1	5	0	5	0	4.5	1	4.5	1	5	0
9	4	1	7	1.5	4	2.5	2	4	1	4	1	4.5	1	1	1	3.5	1	4.5	1	4	1	4	1
9	4	1	2	3	1	2.5	2	3	1	2.5	1	3	1	2	2	2	2	2	1	2	2	1.5	1
9	4	2	2	3	2	3	3	3.5	1	2	1	2.5	1	2.5	2	2.5	1	3	1	1.5	1	3.5	1
9	4	2	7	3.5	2	4	1	3	1	3	1	4	1	2.5	2	3.5	1	3	2	3	1	2.5	1
9	4	2	5	3	2	4	1	3	1	2.5	1	4	1	3.5	1	3	1	3.5	1	1.5	2	1	2
9	4	3	2	5	0	5	0	5	0	5	0	5	0	5	0	4.5	1	5	0	5	0	5	0
9	5	1	3	1	4	2	1	3.5	1	3.5	1	4.5	1	3.5	1	3.5	1	2.5	1	4	1	4	1
9	5	2	5	2.5	3	2	1	4	1	3	1	4	1	3.5	1	4.5	1	3.5	1	3	1	2.5	1
9	5	2	7	3	2	5	0	4.5	1	4	1	4.5	1	4	1	4.5	1	3.5	1	4	1	3.5	1
9	5	2	7	4	1	5	0	5	0	4.5	1	5	0	3.5	1	4.5	1	4.5	1	4.5	1	4.5	1
9	5	3	5	1	2	4	1	4	1	3.5	1	4	1	3.5	1	5	0	4	1	3.5	1	2	1
9	5	3	7	3.5	1	4	1	4.5	1	4	1	4.5	1	3	1	4	1	3	1	4.5	1	2	1
9	6	1	3	3	1	4	1	3.5	1	4	1	3	1	3.5	1	3.5	1	4	1	2.5	1	3	1
9	6	2	5	4.5	1	3.5	1	3	2	4	1	4	1	4	1	4	1	4	1	4	1	3.5	1
9	6	2	2	4	1	4	1	3.5	1	1	3	4	1	3.5	1	3.5	1	4	1	4.5	1	4.5	1
9	6	2	2	5	0	5	0	5	0	5	0	3	1	5	0	5	0	5	0	5	0	3.5	1
9	6	3	1	3.5	1	5	0	4.5	1	2	1	5	0	3.5	1	5	0	5	0	5	0	4.5	1
9	6	3	2	4	1	5	0	4	1	2	1	5	0	4	1	5	0	5	0	5	0	5	0
10	1	1	2	2	1	1.5	2	1.5	1	4	1	3	1	3	1	3	1	2	2	3	2	4	1
10	1	2	2	3	2	2.5	1	4	1	4.5	1	4.5	1	1	3	4	1	3.5	1	2.5	1	4.5	1
10	1	2	7	2	1	1.5	1	3.5	1	3	1	3	1	1	3	1.5	1	1.5	2	4.5	1	4.5	1
10	1	3	4	3.5	1	5	0	4	1	5	0	4.5	1	4.5	1	5	0	4.5	1	4.5	1	5	0
10	1	3	2	4	1	4	1	2	1	4.5	1	4	1	2	1	2	1	2.5	1	1.5	1	1.5	1
10	2	1	4	2	1	2	2	1.5	1	2	1	2	1	2	1	2	1	1.5	2	1.5	1	1.5	1
10	2	1	7	2	3	2	1	2.5	1	1.5	1	3.5	1	3.5	1	2	1	2.5	1	3	1	2.5	1

Appendix G (continued)

TABLE XIII
OIL RED O FINGERPRINT DATA

				LT	LT	LI	LI	LM	LM	LR	LR	LP	LP	RT	RT	RI	RI	RM	RM	RR	RR	RP	RP
Sub	**Day**	**TOD**	**Act**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**
10	2	1	7	1	4	1	4	1.5	4	1	4	1	4	1	4	1	4	1	3	1	4	1	3
10	2	2	5	2	2	1.5	4	1	3	1	4	1	3	1	4	1	3	1.5	3	1	3	1	2
10	3	2	4	4.5	1	4	1	4	1	4.5	1	4.5	1	4	1	4	1	4.5	1	4.5	1	4	1
10	3	2	7	4.5	1	4	1	4.5	1	4	1	4	1	5	0	5	0	5	0	5	0	5	0
10	3	3	7	4.5	1	5	0	5	0	5	0	4.5	1	5	0	4	1	4.5	1	4	1	4.5	1
10	3	3	5	4.5	1	3.5	1	4.5	1	4.5	1	3.5	1	1	1	2	1	3.5	1	3	1	4	1
10	3	3	1	4.5	1	5	0	4	1	3.5	1	3	1	5	0	4	1	2.5	1	3.5	1	5	0
10	4	1	4	3	2	3	2	3	2	2.5	1	3	1	3	1	3	1	3.5	1	4.5	1	4	1
10	4	2	7	4	1	4	1	3.5	1	3.5	1	4.5	1	3.5	1	3	1	3.5	1	3.5	1	4	1
10	4	2	1	3	1	3.5	1	4.5	1	4.5	1	5	0	5	0	4	1	5	0	5	0	5	0
10	4	3	7	3.5	1	3	1	4	1	3.5	1	5	0	4.5	1	2.5	1	3	1	4	1	4	1
10	4	3	5	3	1	3.5	1	4	1	3.5	1	3.5	1	5	0	3.5	1	2	1	3	1	4	1
10	5	1	5	3	1	2	1	4.5	1	4	1	4	1	1.5	1	1	2	2	1	4.5	1	2.5	1
10	5	2	7	2	1	2	1	2.5	1	3	1	4	1	4.5	1	1.5	3	4	1	4.5	1	5	0
10	5	3	7	4.5	1	4.5	1	5	0	4.5	1	5	0	5	0	5	0	4.5	1	4.5	1	5	0
10	5	3	1	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
10	5	3	4	4.5	1	5	0	3.5	1	3	1	4.5	1	4.5	1	3.5	1	3.5	1	3.5	1	2.5	1
10	6	1	7	4.5	1	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
10	6	1	7	1	3	1	3	2	3	3	1	2.5	3	1.5	3	1.5	2	2	2	2.5	2	2	1
10	6	2	7	1	2	1	2	2	2	2	1	2.5	1	1.5	1	1.5	2	1.5	2	1.5	1	2	1
10	6	2	7	1	3	1	2	1	3	1.5	1	1.5	1	2	1	1	3	1.5	2	2.5	1	3	1
10	6	3	5	4	1	3	1	4	1	4.5	1	5	0	4	1	5	0	4	1	4	1	4	1
10	6	3	4	3.5	1	2.5	1	4.5	1	4	1	4	1	4	1	4	1	2	1	2	2	4.5	1
11	3	1	7	4.5	1	5	0	5	0	4.5	1	5	0	5	0	5	0	5	0	5	0	4.5	1
11	3	1	1	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
11	3	1	2	5	0	5	0	5	0	5	0	4	1	2	1	4	1	5	0	4.5	1	4	1
11	3	2	2	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	2	1
11	3	3	5	5	0	4	1	2	1	3	1	4	1	3.5	1	2	1	4.5	1	1.5	1	5	0
11	3	3	7	5	0	4	1	4.5	1	5	0	5	0	4.5	1	4	1	4.5	1	4.5	1	4	1
11	4	1	4	4	1	3.5	1	4	1	4	1	4	1	4	1	3	1	3	1	3	1	3	1
11	4	2	5	1	1	1	1	1	1	1	1	3	1	3.5	1	1	1	3	1	3	1	5	0
11	4	2	2	5	0	5	0	4.5	1	5	0	5	0	5	0	4.5	1	5	0	4.5	1	4	1
11	4	3	2	5	0	5	0	4.5	1	4.5	1	5	0	5	0	5	0	5	0	4	1	4	1
11	5	1	6	2	3	2	2	2	3	2.5	2	3	1	2	3	3	3	3	4	2	3	1.5	2
11	5	1	7	4.5	1	4	1	5	0	3	1	3	1	5	0	2	1	1	1	1.5	1	1	1
11	5	2	6	1	1	1	1	1	1	1	1	1.5	1	1.5	1	2	1	2	1	3	1	1.5	1
11	5	2	7	2	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	3	1	2	1
11	5	3	4	2	1	2	1	2	1	3	1	2.5	2	1	1	1	2	1	2	1.5	2	2.5	1
11	5	3	7	1.5	1	1.5	1	1.5	2	1	1	2.5	1	2	4	2	2	1	2	2	1	2	2
11	6	1	5	2	1	2.5	1	4.5	1	4.5	1	4	1	3.5	1	4	1	3	1	4.5	1	3	1
11	6	2	5	1	2	1	1	3.5	1	3	1	1	2	4	1	2.5	1	3	1	1.5	1	1	2
11	6	2	7	2.5	1	4.5	1	4	1	4	1	4	1	3	1	3.5	1	2	1	3.5	1	3	1
11	6	2	6	2	2	1.5	1	1	1	1.5	1	1	1	1	3	1	2	3	1	3.5	1	1	1
11	6	3	6	4.5	1	5	0	5	0	5	0	4	1	5	0	4.5	1	5	0	4	1	4	1
11	6	3	1	5	0	3	1	5	0	5	0	5	0	5	0	5	0	4.5	1	4.5	1	5	0
11	1	1	5	1	1	1	1	2	1	3	1	4	1	4	1	3.5	1	3	1	2	1	2	1
11	1	2	2	2	1	1.5	1	2.5	1	3.5	1	3	1	2.5	3	3	1	2	3	2.5	1	3	1
11	1	2	5	2	1	2	1	2.5	1	1.5	1	4	1	1	1	1	2	1	1	1	1	1.5	1
11	1	2	7	4.5	1	4.5	1	5	0	5	0	3	1	3.5	1	4.5	1	5	0	5	0	5	0
11	1	3	1	4	1	4	1	5	0	5	0	5	0	5	0	4.5	1	5	0	5	0	5	0
11	1	3	1	5	0	5	0	5	0	5	0	5	0	3.5	1	5	0	5	0	5	0	5	0
11	2	1	5	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	4.5	1	4.5	1
11	2	1	1	4.5	1	4.5	1	4.5	1	5	0	4.5	1	5	0	5	0	5	0	4.5	1	5	0
11	2	2	-	4	1	4	1	4	1	4.5	1	4.5	1	3.5	1	3.5	1	4.5	1	2.5	1	4	1
11	2	2	2	5	0	4	1	4	1	3.5	1	5	0	5	0	5	0	5	0	5	0	5	0
11	2	3	7	2	1	2	1	2	1	2	1	1.5	1	2	1	1.5	1	2	1	1	1	1	2
12	1	1	5	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
12	1	1	2	5	0	3.5	1	3.5	1	4	1	4.5	1	4	1	4.5	1	4.5	1	4.5	1	4	1
12	1	1	8	1	3	1	2	2.5	2	4	1	4	1	4.5	1	4	1	4.5	1	4.5	1	3	1
12	1	2	2	3.5	1	3.5	1	5	0	4.5	1	4.5	1	1	2	1	2	2.5	1	3	1	2	1

Appendix G (continued)

TABLE XIII
OIL RED O FINGERPRINT DATA

				LT	LT	LI	LI	LM	LM	LR	LR	LP	LP	RT	RT	RI	RI	RM	RM	RR	RR	RP	RP
Sub	Day	TOD	Act	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q
12	1	2	-	2	1	3.5	1	2	1	4.5	1	4	1	4	1	5	0	4.5	1	4.5	1	5	0
12	1	3	5	1	2	1	4	1	4	1	3	3.5	1	4.5	1	1	4	1	3	1	3	4.5	1
12	2	1	7	3	1	3	1	4.5	1	5	0	4	1	5	0	5	0	2	1	1	1	4	1
12	2	1	2	4	1	4	1	5	0	4	1	3.5	1	4	1	4	1	1	2	1	2	1	2
12	2	2	7	1	4	1	4	2	2	4	1	2.5	2	4	1	1.5	1	4	1	1	3	4.5	1
12	2	2	5	1	3	1	2	2	2	4	1	3.5	2	3.5	1	3.5	1	4	1	3.5	1	5	0
12	3	1	5	1.5	2	1.5	3	2	2	2	2	2	1	2	3	2	1	3	1	3.5	1	4	1
12	3	1	2	2	2	3.5	1	3	1	3.5	1	3	1	4	1	4	1	4.5	1	5	0	5	0
12	3	2	2	4	1	5	0	5	0	5	0	4.5	1	3.5	1	4.5	1	5	0	5	0	5	0
12	3	3	2	1	1	2	4	2.5	2	1	1	2	1	1	2	1.5	1	1.5	2	1.5	2	1	1
12	4	1	2	2.5	1	3	1	3.5	1	4	1	3.5	1	2.5	1	2.5	1	3	1	4	1	5	0
12	4	1	2	2	1	4.5	1	4	1	4	1	4	1	5	0	4.5	1	5	0	4.5	1	5	0
12	4	2	2	4.5	1	4.5	1	4.5	1	4.5	1	4.5	1	4.5	1	4.5	1	5	0	5	0	5	0
12	4	2	-	1	1	2	1	5	0	4	1	4.5	1	1	2	1.5	1	1.5	2	2.5	1	3.5	1
12	4	3	1	2.5	3	1	2	3.5	2	3.5	1	2	1	3	3	2	1	2.5	2	4	1	3	1
12	5	1	7	3	1	4	1	4.5	1	4.5	1	5	0	5	0	3	1	4.5	1	4.5	1	4.5	1
12	5	1	2	2.5	2	2	2	1.5	2	2	1	3	1	3	3	2	2	2.5	1	4	1	4.5	1
12	5	2	5	5	0	4.5	1	4.5	1	4	1	4.5	1	2	1	2.5	1	4	1	5	0	5	0
12	5	2	2	2	4	2.5	4	2.5	2	2.5	1	2	3	3	3	2.5	3	5	0	5	0	5	0
12	5	2	7	2.5	3	1.5	3	2.5	2	3	1	4	1	1	3	1	3	1.5	3	1.5	2	1.5	2
12	5	3	7	3.5	1	2	1	3	1	3	1	3	1	2	2	1.5	1	2	2	2	1	4	1
12	6	1	7	3.5	1	4	1	4	1	4.5	1	4	1	4	1	4	1	4.5	1	4	1	4.5	1
12	6	1	2	1	3	1	2	1	4	1	1	1	3	1.5	3	1	3	4	1	4	1	4.5	1
12	6	2	2	2.5	2	2.5	2	3.5	1	4	1	3	1	3.5	1	2.5	1	3.5	1	5	0	4	1
12	6	2	2	2	3	2	2	2.5	1	3.5	1	4	1	2.5	1	2	1	2.5	1	3.5	1	4.5	1
12	6	2	2	1	4	1	2	1	2	1	2	1.5	2	1	4	1	2	1.5	4	1.5	3	1	3
12	6	3	7	3.5	1	2	2	2.5	1	2.5	1	3.5	1	1	2	1	3	1	2	1	1	2.5	1
13	3	1	5	5	0	5	0	5	0	4.5	1	5	0	5	0	5	0	5	0	5	0	5	0
13	3	2	7	5	0	5	0	4.5	1	5	0	5	0	5	0	5	0	5	0	5	0	5	0
13	3	2	1	5	0	5	0	5	0	4.5	1	5	0	5	0	5	0	5	0	5	0	5	0
13	3	2	7	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
13	3	3	5	5	0	2.5	1	4	1	4.5	1	3	1	5	0	5	0	5	0	4.5	1	2	1
13	4	1	1	5	0	5	0	1	1	4.5	1	4.5	1	5	0	4.5	1	4.5	1	4	1	4.5	1
13	3	3	2	5	0	4.5	1	5	0	3.5	1	4	1	4.5	1	3	1	3.5	1	3	1	2.5	1
13	4	1	2	5	0	4.5	1	4.5	1	4.5	1	4.5	1	5	0	4	1	3.5	1	3.5	1	4	1
13	4	1	1	5	0	5	0	4.5	1	5	0	4.5	1	5	0	5	0	5	0	4.5	1	5	0
13	4	2	2	5	0	5	0	5	0	4.5	1	5	0	5	0	5	0	4.5	1	4.5	1	4.5	1
13	5	1	1	5	0	4.5	1	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
13	5	1	2	5	0	5	0	5	0	5	0	5	0	4	1	4	1	4	1	4.5	1	5	0
13	5	2	5	4	1	4	1	5	0	4	1	4	1	4.5	1	5	0	5	0	4	1	4	1
13	5	2	8	4.5	1	4.5	1	5	0	5	0	4.5	1	5	0	5	0	5	0	5	0	5	0
13	5	3	7	5	0	4	1	4	1	4	1	4	1	5	0	5	0	4.5	1	4	1	5	0
13	5	3	5	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
13	6	1	1	5	0	5	0	5	0	5	0	5	0	5	0	5	0	4	1	5	0	5	0
13	6	1	7	3.5	1	3	1	4.5	1	4	1	4	1	4	1	4	1	3	1	4	1	4	1
13	6	2	7	5	0	4.5	1	4	1	4.5	1	4.5	1	4.5	1	4.5	1	4	1	4.5	1	5	0
13	6	2	5	4.5	1	4.5	1	5	0	5	0	4	1	4.5	1	4.5	1	4.5	1	5	0	4.5	1
13	6	3	7	2.5	1	2	1	3	1	3	1	2	1	1.5	1	1.5	2	1.5	3	1.5	2	1.5	1
13	1	1	3	5	0	3	1	4	1	4	1	5	0	5	0	5	0	5	0	5	0	5	0
13	1	1	2	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
13	1	1	1	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
13	1	2	1	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
13	1	2	7	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
13	2	1	1	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	4	1	4.5	1
13	2	1	8	5	0	4.5	1	4	1	4.5	1	4.5	1	5	0	4.5	1	5	0	5	0	5	0
13	2	2	5	2	1	1.5	2	1	1	4.5	1	5	0	4	1	4	1	1	2	5	0	5	0
14	1	1	7	2	1	3	1	3.5	1	3	1	1	1	4	1	5	0	4	1	4	1	4	1
14	1	2	7	1	2	1.5	1	1.5	1	1.5	1	2.5	2	2	2	1	3	2.5	1	1.5	1	1	1
14	1	2	7	2	1	3.5	1	4	1	3.5	1	3.5	1	4	1	3	1	3.5	1	3.5	1	3	1
14	1	2	1	1	1	4	1	5	0	4	1	5	0	5	0	5	0	4.5	1	5	0	5	0

Appendix G (continued)

TABLE XIII
OIL RED O FINGERPRINT DATA

				LT	LT	LI	LI	LM	LM	LR	LR	LP	LP	RT	RT	RI	RI	RM	RM	RR	RR	RP	RP
Sub	Day	TOD	Act	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q
14	1	3	1	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
14	1	3	2	5	0	5	0	4.5	1	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
14	1	3	2	5	0	4.5	1	5	0	4.5	1	1	1	4.5	1	4.5	1	4.5	1	4.5	1	4.5	1	4	1
14	1	3	7	5	0	4	1	4.5	1	5	0	4.5	1	4	1	4.5	1	4.5	1	4.5	1	4.5	1	4.5	1
14	1	3	-	1	3	1.5	1	2	1	3	1	3.5	1	3.5	1	3	1	4.5	1	3	1	2.5	1		
14	2	1	3	2	1	2.5	1	3	1	1.5	1	2	1	2.5	1	3	1	2.5	1	4	1	2.5	1		
14	2	1	2	4.5	1	4	1	4.5	1	4.5	1	4	1	3	1	4.5	1	3	1	3.5	1	4.5	1		
14	2	1	7	4.5	1	4.5	1	4.5	1	5	0	5	0	2.5	1	4.5	1	4.5	1	4.5	1	4.5	1		
14	2	1	-	3.5	1	3	1	2.5	2	3.5	1	3.5	1	4	1	3.5	1	4.5	1	3.5	1	3.5	1		
14	2	2	8	4	1	3	1	5	0	4.5	1	5	0	5	0	5	0	5	0	5	0	5	0		
14	2	2	8	4.5	1	4	1	4.5	1	4.5	1	4.5	1	4.5	1	5	0	4.5	1	4.5	1	5	0		
14	2	2	2	2	1	3	1	2	1	1	1	1	1	4	1	4.5	1	5	0	5	0	4.5	1		
14	2	3	2	4	1	5	0	4	1	5	0	4	1	5	0	5	0	5	0	4.5	1	4.5	1		
14	3	1	-	1.5	2	1.5	1	3	2	3.5	1	2.5	1	1	1	2	1	1	2	2	2	1	1		
14	3	1	2	2	1	1.5	1	1	1	1	1	1	1	3	1	1.5	1	1.5	1	1	2	1	2		
14	3	1	7	3.5	1	3	1	3	1	2.5	1	3	1	3	2	3.5	1	3.5	1	3.5	1	2	1		
14	3	2	8	2.5	1	4	1	4	1	3.5	1	3.5	1	3.5	1	3.5	1	4	1	3.5	1	2.5	1		
14	3	2	7	2	1	1.5	1	3.5	1	4.5	1	3	1	4	1	2.5	1	4.5	1	4.5	1	4	1		
14	3	3	2	4	1	4	1	5	0	4.5	1	5	0	5	0	4	1	5	0	5	0	5	0		
14	4	1	3	4.5	1	3.5	1	3.5	1	3.5	1	4	1	4.5	1	4.5	1	5	0	4.5	1	4	1		
14	4	1	1	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0		
14	4	2	2	5	0	4.5	1	5	0	5	0	5	0	4	1	5	0	5	0	5	0	5	0		
14	4	2	2	1	2	2	1	1	1	1	1	1.5	1	2	1	3	1	4.5	1	3	1	1	1		
14	4	2	7	1	2	1	3	1	2	1	3	1	3	4	1	4.5	1	4	1	3.5	1	4	1		
14	4	3	1	5	0	5	0	4	1	5	0	5	0	5	0	5	0	5	0	5	0	5	0		
14	4	3	1	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0		
14	5	1	2	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0		
14	5	1	2	3.5	1	3.5	1	2	1	2.5	1	4.5	1	1.5	1	3	2	3	1	5	0	5	0		
14	5	2	7	2	1	3.5	1	4	1	2	1	3.5	1	2.5	1	3	1	4.5	1	4.5	1	4	1		
14	5	2	7	5	0	5	0	5	0	5	0	5	0	4.5	1	4.5	1	5	0	5	0	5	0		
14	5	1	3	4.5	1	4.5	1	4.5	1	3.5	1	5	0	5	0	5	0	5	0	4.5	1	5	0		
15	1	1	7	2.5	1	2.5	2	2.5	2	3	1	4	1	2.5	1	3	1	2	1	1	1	3	1		
15	1	1	7	3.5	1	3	1	3.5	1	4	1	2	1	3.5	2	3.5	1	2.5	3	3	1	2.5	1		
15	1	2	7	1	4	1	3	2	3	1.5	3	1	1	2.5	3	2.5	1	1	2	2	1	3	1		
15	1	2	5	3.5	1	4	1	4.5	1	3.5	1	2	1	4.5	1	4.5	1	3	1	3	1	4	1		
15	1	2	7	2.5	1	2.5	1	3	1	3.5	1	2	1	2	2	3.5	2	3	2	2.5	2	2.5	2		
15	2	1	7	3.5	1	4	1	4	1	4	1	3.5	1	4.5	1	4.5	1	4	1	3	1	3.5	1		
15	2	2	7	1	2	2	2	2	1	2	1	1	2	4.5	1	4.5	1	3	1	4	1	4.5	1		
15	2	2	7	4.5	1	4	1	3.5	1	1.5	1	3.5	1	4	1	3	1	1	3	1.5	3	2	1		
15	2	2	7	2.5	1	3	1	4	1	2	1	3.5	1	4	1	2	3	1.5	1	2.5	1	3	1		
15	2	3	7	5	0	3.5	1	4.5	1	1.5	1	2	1	3	1	4	1	3.5	1	1	1	4	1		
15	5	1	7	3.5	1	3.5	1	4	1	3.5	1	2.5	1	3	3	3	1	2.5	2	2.5	1	3.5	1		
15	5	1	7	1.5	2	1	2	2	1	1.5	1	2	2	2	2	2	2	1	2	2	1	2	1		
15	5	2	2	1.5	3	2.5	2	3	1	2	2	1	1	2.5	2	2.5	1	2	1	2	1	4	1		
15	5	2	2	2.5	1	3	1	4	1	2.5	1	3	1	3	1	3	1	2	3	2	1	3	1		
15	5	2	5	4.5	1	5	0	4.5	1	4	1	4.5	1	2	1	3	1	2	1	3.5	1	4	1		
15	6	1	7	4	1	2	1	2.5	2	2	1	2	1	3	4	3	2	3	1	3.5	1	3	1		
15	6	1	5	1	4	1	2	1	2	1	4	2	3	2	3	1	2	1	2	2	2	2	2		
15	6	2	2	3.5	1	3	1	3	1	3.5	1	2.5	1	4.5	1	4	1	3	1	3.5	2	3.5	1		
15	6	2	7	3.5	1	3	1	3	1	2	2	2.5	1	3	2	3	1	2.5	1	3	1	3.5	1		
15	6	2	4	3	2	2.5	1	3.5	1	3	1	3	1	3.5	1	2.5	1	3.5	1	2.5	1	2	1		
15	2	1	7	2	2	2.5	2	2.5	2	3	1	2.5	1	3	2	3	1	2	1	2	1	1	1		
15	2	1	2	2.5	4	2	3	3.5	2	2.5	1	3	2	3.5	4	3.5	1	3	1	3	1	3.5	1		
15	2	2	7	1.5	2	1	3	2.5	1	3	1	2.5	1	3.5	1	3.5	1	2.5	2	3.5	1	4	1		
15	2	2	5	5	0	4.5	1	4	1	4	1	4.5	1	3.5	1	3	1	2	2	3.5	1	2	2		
15	2	2	2	3	1	4	1	3.5	1	3	1	3	1	4	1	3	1	2.5	1	4	1	4	1		
15	3	1	7	3.5	1	3.5	1	4.5	1	3	1	2.5	1	4	1	4	1	2.5	1	3	1	3	1		
15	3	1	7	3.5	1	3.5	1	3	2	3	1	3.5	1	4	1	3.5	1	1	2	2.5	1	2.5	1		
15	3	2	7	2	2	2.5	1	3.5	1	3	1	3	1	3.5	2	2.5	1	2	2	2.5	1	2	1		
15	3	2	2	4	1	3.5	1	3	1	4	1	2.5	1	4.5	1	3.5	1	3	1	3.5	1	3.5	1		

Appendix G (continued)

TABLE XIII
OIL RED O FINGERPRINT DATA

				LT	LT	LI	LI	LM	LM	LR	LR	LP	LP	RT	RT	RI	RI	RM	RM	RR	RR	RP	RP
Sub	Day	TOD	Act	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q
15	3	3	7	3.5	1	4	1	3.5	1	3	1	2.5	3	3	2	3	2	2	2	3.5	1	2.5	1
16	1	2	7	2	1	3.5	1	2.5	1	3	1	3.5	1	2	1	1	2	2	2	3	1	2	1
16	1	3	7	4.5	1	4	1	4.5	1	4	1	4.5	1	4	1	3.5	1	4	1	2.5	1	3	1
16	1	3	5	3.5	1	4.5	1	4	1	4.5	1	4.5	1	4.5	1	4	1	4	1	3.5	1	2.5	1
16	1	3	5	3	1	2	1	2	1	2	1	2	2	4	1	2	2	2	1	3	1	3.5	1
16	2	1	4	3	2	4.5	1	3.5	1	4	1	4.5	1	4.5	1	4.5	1	4.5	1	5	0	4	1
16	2	1	1	4	1	3	1	3.5	1	4	1	3.5	1	4	1	4.5	1	4	1	3.5	1	3	1
16	2	2	5	2	3	2.5	1	2	2	2	2	1	2	2	3	2	2	2	3	1.5	3	1.5	3
16	2	2	5	1	3	1.5	1	1.5	3	1.5	2	2	1	2	4	2	2	1.5	2	1	2	2	2
16	2	2	5	4	1	4.5	1	3.5	1	3	1	3	1	3	1	3.5	1	3	1	3.5	1	2	1
16	2	2	1	3.5	1	4	1	4.5	1	4	1	3.5	2	4.5	1	4	1	3.5	1	4	1	4	1
16	2	3	5	3.5	1	3	1	3.5	1	3	1	2	2	3.5	1	4	1	3.5	1	2	2	2	2
16	3	2	5	4.5	1	5	0	5	0	2.5	1	4	1	5	0	5	0	4.5	1	4.5	1	4.5	1
16	3	3	2	5	0	3.5	1	2.5	1	4.5	1	2.5	1	5	0	4.5	1	3	1	3.5	1	3	1
16	3	3	1	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
16	4	1	1	3.5	1	3.5	1	3.5	1	4	1	4.5	1	4	1	4	1	2	1	3	1	3	1
16	4	2	5	3	1	2.5	1	1	2	1	2	1	2	1	3	2	2	2.5	1	2	1	1	3
16	4	2	5	1	2	3.5	1	2	2	2.5	2	1.5	2	2.5	3	1.5	3	1.5	2	2	2	1	3
16	4	2	7	1	4	1	2	1	3	1	3	1	3	1	4	1	3	1	4	1	2	1	3
16	4	3	5	1.5	1	1.5	2	1	2	1	1	1	1	2	1	1.5	2	1	1	1	1	1	1
16	4	3	5	1	2	2	1	1	2	1	1	1	1	1	2	1	1	1	1	1	1	1	1
16	4	3	1	5	0	5	0	4.5	1	5	0	5	0	5	0	4	1	5	0	4	1	5	0
16	5	1	4	2	3	2	2	2	2	2	2	1.5	2	3	2	2	3	2	1	1.5	2	1.5	3
16	5	2	2	2	3	3.5	1	2	2	1.5	2	2	2	2	4	2	4	1.5	3	1.5	2	1.5	2
16	6	1	2	3	1	3	1	3	1	4.5	1	4	1	3	1	2	1	2.5	1	3	1	3.5	1
16	6	3	5	4	1	3	1	3	1	3.5	1	3	1	1	3	1	1	3	1	2	1	2.5	1
16	6	1	3	3.5	1	3.5	1	3	1	2.5	1	2.5	1	3.5	2	3.5	1	3	1	2	2	2	1
16	7	1	4	3	2	3	2	2.5	2	2.5	2	2	3	3	3	2.5	2	2	1	2	1	1.5	4
16	7	1	2	3.5	1	2	4	2	2	2.5	3	3	3	2.5	2	4	1	2.5	2	3	1	2.5	1
16	7	1	5	1	1	4.5	1	4	1	3	1	2.5	1	1	1	2	1	1.5	1	4	1	1.5	1
16	7	2	7	4	1	3	1	2	1	3.5	1	1.5	1	1	1	1	1	1	1	1	2	1.5	2
16	7	2	5	5	0	5	0	5	0	5	0	4.5	1	5	0	5	0	4	1	4.5	1	4.5	1
16	7	2	5	3.5	1	3.5	1	2.5	1	4	1	3	1	1	3	1	2	1	2	1	1	3	1
16	7	2	4	2	1	1.5	3	2	1	2	2	1	2	2.5	2	2	1	1.5	1	1.5	2	1	2
16	7	3	1	5	0	4.5	1	4.5	1	5	0	5	0	3	2	1.5	1	3.5	1	4	1	4.5	1
16	7	1	3	3.5	1	3	1	2	1	2.5	1	1.5	1	3	2	2	1	2	1	2.5	1	1.5	1
17	1	1	7	3	2	2.5	1	3	1	3	1	3.5	1	3.5	1	4	1	4.5	1	3.5	1	4	1
17	1	2	5	4.5	1	4.5	1	4	1	4.5	1	4	1	4.5	1	3.5	1	3.5	1	4	1	4.5	1
17	1	2	8	4.5	1	4.5	1	5	0	4	1	5	0	4.5	1	3.5	1	4.5	1	4.5	1	5	0
17	1	3	7	3	1	3.5	1	3.5	1	4.5	1	3	1	4.5	1	4	1	3	1	4.5	1	4	1
17	1	3	7	1	1	2.5	1	2.5	2	3	1	2	1	4	1	3.5	1	3	2	4	1	3.5	1
17	2	1	3	2.5	1	3	1	3	1	4	1	3	1	3	1	1	1	2.5	1	2	1	1.5	1
17	2	1	7	3.5	1	3	1	3	1	2.5	1	3	1	2	4	1	4	3.5	1	3	1	2	1
17	2	2	7	3	1	3	1	3	1	3.5	1	4	1	3.5	1	3	1	4.5	1	4.5	1	4.5	1
17	2	2	7	4.5	1	5	0	4	1	4	1	4.5	1	4	1	3	1	3.5	1	4	1	3.5	1
17	2	3	7	1	3	1	1	1	1	1	1	1	2	3	3	1	4	1	3	1.5	2	1	1
17	2	3	7	1	3	1	2	1	2	1	2	1	1	4	1	3	2	3	1	4	1	4.5	1
17	3	1	3	4.5	1	4	1	4	1	4	1	3.5	1	4	1	3.5	1	4	1	2.5	1	2.5	1
17	3	1	7	4.5	1	4.5	1	4	1	4	1	4	1	4.5	1	3.5	1	3.5	1	3.5	1	4	1
17	3	2	1	4.5	1	4.5	1	4.5	1	4.5	1	5	0	4.5	1	4	1	4	1	4	1	4.5	1
17	3	2	7	2.5	1	2	1	1	2	3.5	1	3.5	1	4.5	1	4	1	3.5	1	3.5	1	3	1
17	3	3	7	2	1	2	1	2	1	2.5	1	2.5	1	4.5	1	3	1	3.5	1	4.5	1	5	0
17	3	3	7	2	1	1	1	2	1	2	1	3	1	3.5	1	4.5	1	3.5	1	4.5	1	4	1
17	4	1	3	5	0	4.5	1	5	0	5	0	5	0	5	0	4.5	1	4	1	4.5	1	5	0
17	4	1	7	4.5	1	3.5	1	4	1	3.5	1	2.5	1	4	1	2	1	3	1	3.5	1	2	1
17	4	2	7	2	1	2	1	2	1	3	1	3	1	3	1	2.5	1	2.5	1	2.5	1	2.5	1
17	4	2	7	4	1	4	1	4	1	4	1	2.5	1	4.5	1	3	1	4	1	3	1	1	1
17	4	3	5	2	1	1.5	1	2	1	2	1	3	1	4.5	1	4	1	3.5	1	3	1	2.5	1
17	4	3	7	2	1	2	2	2	2	3	1	2.5	1	4.5	1	1	2	2.5	1	1	1	2.5	1
17	5	1	7	2	1	2.5	1	1	1	1	1	1.5	1	3.5	1	3.5	1	2	1	2	1	1.5	1

Appendix G (continued)

TABLE XIII
OIL RED O FINGERPRINT DATA

				LT	LT	LI	LI	LM	LM	LR	LR	LP	LP	RT	RT	RI	RI	RM	RM	RR	RR	RP	RP
Sub	Day	TOD	Act	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q	F	Q
17	5	1	7	2	1	1	1	2	1	1.5	1	2.5	1	2	2	3	1	3.5	2	2	1	2.5	1
17	5	2	7	1.5	2	1	1	1	1	2.5	1	1.5	1	3.5	2	2	3	2	2	2	2	1.5	1
17	5	2	7	4	1	3.5	1	3.5	1	5	0	5	0	3.5	1	3	2	3.5	2	3	1	3.5	1
17	5	3	5	1	1	1	1	4	1	5	0	4	1	5	0	3	2	2.5	1	3	1	5	0
17	5	3	7	2.5	1	1	2	1	1	1	1	1	1	4	1	1.5	1	3	2	3	2	2.5	2
17	6	1	7	2.5	3	2.5	1	2	1	5	0	4.5	1	2	2	2	2	2	1	2.5	2	2	1
17	6	1	7	3	2	1	1	1	1	2	1	2	1	3	2	3	1	3	1	2.5	1	2.5	1
17	6	2	7	4	1	4	1	4.5	1	4.5	1	4.5	1	4.5	1	3.5	1	3	1	3	1	3.5	1
17	6	2	7	3	1	3	1	2	2	4.5	1	5	0	4	1	3.5	1	4.5	1	3	1	4.5	1
17	6	3	5	1	2	1	1	2	2	2.5	2	3	1	4	1	3	2	4.5	1	5	0	4.5	1
17	6	3	7	1	2	1.5	1	1	1	1	1	1.5	1	4	1	1	3	2.5	1	2	1	2.5	1
18	1	1	3	5	0	5	0	5	0	5	0	5	0	4.5	1	4.5	1	3	1	5	0	5	0
18	1	1	2	4	1	4	1	4	1	4.5	1	4.5	1	4	1	4.5	1	3.5	1	4	1	4	1
18	1	1	1	5	0	5	0	5	0	5	0	4.5	1	5	0	4.5	1	5	0	5	0	4	1
18	1	2	2	3	1	4	1	3.5	1	4	1	4	1	4	1	4.5	1	3.5	1	4	1	4.5	1
18	1	2	5	1	4	1	2	1	3	1	1	1	1	4	1	4.5	1	3.5	1	4	1	4	1
18	1	3	2	2	2	1.5	1	3	1	1.5	1	3.5	1	4.5	1	3.5	1	3	1	3	1	3	1
18	2	1	3	3.5	1	4.5	1	4	1	2.5	1	4	1	3.5	1	2	2	3.5	1	5	0	5	0
18	2	1	2	4.5	1	4.5	1	4	1	4	1	3.5	1	4.5	1	4	1	5	0	5	0	5	0
18	2	1	2	5	0	5	0	4	1	4.5	1	5	0	5	0	5	0	5	0	5	0	5	0
18	2	2	4	2	1	1	1	2.5	1	4.5	1	3.5	1	4	1	2	1	2.5	1	2.5	1	3	2
18	2	2	2	2	1	2	1	4	1	3	1	4	1	2	1	3	1	3.5	1	4	1	4.5	1
18	2	2	2	1	2	1	1	2	1	3	1	3	1	2.5	2	3	2	3	1	3.5	1	3.5	1
18	3	3	2	4	1	1	1	2	1	3.5	1	4.5	1	2	1	3	1	3.5	1	3.5	1	5	0
18	3	3	1	4.5	1	3	1	1.5	1	1	1	2	1	4.5	1	4.5	1	5	0	5	0	4	1
18	3	1	7	5	0	5	0	4.5	1	5	0	5	0	3.5	1	2	1	5	0	5	0	5	0
18	3	1	3	3	1	3.5	1	3.5	1	4	1	5	0	5	0	4	1	4	1	5	0	1.5	1
18	3	2	2	2.5	1	3	1	5	0	5	0	5	0	5	0	5	0	5	0	4.5	1	5	0
18	3	2	1	4.5	1	5	0	4.5	1	4.5	1	5	0	5	0	5	0	5	0	5	0	5	0
18	4	1	1	2	1	4.5	1	5	0	4.5	1	5	0	5	0	5	0	4.5	1	4.5	1	5	0
18	4	1	2	4.5	1	4	1	2	1	3.5	1	3.5	1	4	1	3.5	1	5	0	4.5	1	5	0
18	4	2	2	2	1	1.5	2	1	2	1	1	1	1	1	2	2.5	1	2	1	3	1	3	1
18	4	2	5	2.5	1	4	1	3	1	3.5	1	3.5	1	5	0	3.5	1	4	1	3	1	3	1
18	4	3	2	3	1	1	1	3	1	2	1	1	1	1	1	1	1	1	1	3.5	1	4.5	1
18	5	1	-	2	1	1.5	1	1.5	1	1.5	1	1.5	1	3	1	3.5	1	3	1	3.5	1	4	1
18	5	2	2	3.5	1	3.5	1	4	1	4	1	4.5	1	3.5	1	4.5	1	4.5	1	4.5	1	4.5	1
18	5	2	1	5	0	4.5	1	4.5	1	5	0	4.5	1	4.5	1	4	1	4.5	1	4.5	1	4.5	1
18	5	3	2	4	1	3.5	1	4	1	4	1	4	1	4	1	4	1	4	1	4.5	1	5	0
18	6	1	7	3	1	2.5	1	2	2	1.5	1	1.5	2	2	2	2.5	1	2	3	1.5	2	1.5	1
18	6	1	7	3.5	1	4.5	1	3.5	1	4.5	1	4.5	1	1	2	1	2	1.5	1	1	1	1.5	1
18	6	2	2	2	1	2	1	2	1	2.5	1	4	1	2.5	2	2	1	2.5	2	2	1	2	2
18	6	2	6	3	1	2.5	1	3	1	3	1	2	1	2.5	2	2.5	1	3	1	3	1	3	1
18	6	3	2	2.5	1	3	1	3	1	2.5	1	2	1	2.5	1	3.5	1	3	1	3	1	3	1
18	6	3	2	3.5	1	4	2	3	1	3.5	1	2.5	1	3	2	3.5	1	3	1	2	1	3.5	1
18	6	1	3	3	1	2.5	1	3	1	3	1	2.5	1	3	1	2	1	3	1	4	1	4	1
18	6	1	2	3	1	4	1	2.5	1	3	1	3	1	4	1	3	1	2	1	4	1	3.5	1
19	1	1	1	5	0	5	0	4.5	1	5	0	5	0	4.5	1	5	0	5	0	5	0	4.5	1
19	1	1	8	3.5	1	4.5	1	4	1	4	1	5	0	4	1	3.5	1	3	1	2.5	1	4	1
19	1	2	7	3	1	2.5	1	2	1	2	3	4.5	1	3	1	3	1	2.5	1	2	1	1.5	4
19	1	3	6	4	1	4.5	1	5	0	5	0	4.5	1	3	1	2	1	3.5	1	4	1	4	1
19	2	1	2	5	0	4.5	1	4.5	1	5	0	5	0	4.5	1	3.5	1	4	1	4	1	4	1
19	2	1	7	2	3	2	1	1	2	2	1	2	1	2.5	2	1.5	3	2	2	2.5	2	3	1
19	2	2	7	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
19	2	3	7	2	3	2.5	1	2	4	2.5	1	2.5	1	2.5	1	2	2	2	2	2	2	2.5	1
19	2	3	1	2.5	1	2.5	1	3.5	1	4	1	3	1	3	1	2	2	3.5	1	2.5	2	5	0
19	3	1	7	4.5	1	4.5	1	5	0	4.5	1	4.5	1	4.5	1	4.5	1	3.5	1	4.5	1	5	0
19	3	1	7	1	1	4	1	4.5	1	5	0	4.5	1	5	0	4.5	1	4.5	1	5	0	4.5	1
19	3	2	7	1	3	1	3	1.5	1	4.5	1	4	1	4.5	1	4	1	4.5	1	4.5	1	4.5	1
19	3	2	2	1	3	1	3	1.5	3	2.5	1	2	1	1	1	3	1	3	1	3	1	3.5	1
19	3	3	7	5	0	4.5	1	4.5	1	5	0	5	0	5	0	5	0	5	0	5	0	5	0

Appendix G (continued)

TABLE XIII
OIL RED O FINGERPRINT DATA

				LT	LT	LI	LI	LM	LM	LR	LR	LP	LP	RT	RT	RI	RI	RM	RM	RR	RR	RP	RP
Sub	**Day**	**TOD**	**Act**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**	**F**	**Q**
19	4	1	7	3.5	1	1	1	2	1	3	1	4	1	3	1	3.5	1	1.5	2	3	1	1	2
19	4	2	7	1	3	1.5	2	1.5	2	3.5	1	4.5	1	3	1	3	1	3	1	3.5	1	4	1
19	4	1	7	2.5	1	3	1	3	1	3	1	4	1	2	1	1	2	3	1	4.5	1	4	1

Appendix H

TABLE XIV
SINGLE FACTOR ANOVA FOR LEFT HAND ECCRINE FINDABILITY

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Left Thumb Findability	603	1461.5	2.423715	1.64948651
Left Index Findability	601	1442.5	2.400166	1.707516639
Left Middle Findability	603	1355.5	2.247927	1.546818785
Left Ring Findability	603	1401.6	2.324378	1.620783458
Left Pinky Findability	603	1535.5	2.546434	1.869933279

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	30.26542	4	7.566355	4.506764083	0.001246	2.374886
Within Groups	5050.097	3008	1.678889			
Total	5080.363	3012				

TABLE XV
SINGLE FACTOR ANOVA FOR LEFT HAND ECCRINE QUALITY

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Left Thumb Quality	603	694	1.150912	0.503765778
Left Index Quality	601	664	1.104825	0.367326678
Left Middle Quality	603	693	1.149254	0.416224525
Left Ring Quality	603	692	1.147595	0.385156168
Left Pinky Quality	603	626	1.038143	0.299207176

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	5.720038	4	1.430009	3.626207298	0.005924	2.374886
Within Groups	1186.217	3008	0.394354			
Total	1191.937	3012				

Appendix H (continued)

TABLE XVI
SINGLE FACTOR ANOVA FOR RIGHT HAND ECCRINE FINDABILITY

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Right Thumb Findability	603	1376	2.281924	1.484340479
Right Index Findability	602	1487	2.4701	1.627224283
Right Middle Findability	603	1474.5	2.445274	1.707963505
Right Ring Findability	603	1442	2.391376	1.793413883
Right Pinky Findability	603	1408.9	2.336484	1.68444742

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	14.40085	4	3.600213	2.169471543	0.069947	2.374886
Within Groups	4993.401	3009	1.659489			
Total	5007.802	3013				

TABLE XVII
SINGLE FACTOR ANOVA FOR RIGHT HAND ECCRINE QUALITY

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Right Thumb Quality	603	733	1.215589	0.504939312
Right Index Quality	602	645	1.071429	0.352626575
Right Middle Quality	603	702	1.164179	0.539445629
Right Ring Quality	603	731	1.212272	0.559516923
Right Pinky Quality	603	731	1.212272	0.496393999

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	9.196969	4	2.299242	4.686302538	0.000903	2.374886
Within Groups	1476.307	3009	0.49063			
Total	1485.504	3013				

Appendix H (continued)

TABLE XVIII
SINGLE FACTOR ANOVA FOR LEFT HAND SEBACEOUS FINDABILITY

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Left Thumb Findability	603	2048	3.396352	1.733840487
Left Index Findability	603	2000.5	3.317579	1.697564228
Left Middle Findability	603	2040	3.383085	1.626258244
Left Ring Findability	602	2095.5	3.480897	1.525008845
Left Pinky Findability	603	2154	3.572139	1.561647741

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	23.37324	4	5.843311	3.58727752	0.006341434	2.374886
Within Groups	4901.355	3009	1.628898			
Total	4924.729	3013				

TABLE XIX
SINGLE FACTOR ANOVA FOR LEFT HAND SEBACEOUS QUALITIY

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Left Thumb Quality	603	748	1.240464	1.073310083
Left Index Quality	603	723	1.199005	0.870630238
Left Middle Quality	603	733	1.215589	0.950122037
Left Ring Quality	602	639	1.061462	0.700043118
Left Pinky Quality	603	601	0.996683	0.644507253

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	27.70813	4	6.927033	8.170872019	1.49903E-06	2.374886
Within Groups	2550.945	3009	0.847772			
Total	2578.653	3013				

Appendix H (continued)

TABLE XX
SINGLE FACTOR ANOVA FOR RIGHT HAND SEBACEOUS FINDABILITY

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Right Thumb Findability	603	2189.5	3.631012	1.486960271
Right Index Findability	603	2029	3.364842	1.680622359
Right Middle Findability	603	2052.5	3.403814	1.541397387
Right Ring Findability	603	2102	3.485904	1.584933858
Right Pinky Findability	603	2129	3.53068	1.611598706

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	26.78557	4	6.696393	4.235268091	0.002022096	2.374885
Within Groups	4759.119	3010	1.581103			
Total	4785.904	3014				

TABLE XXI
SINGLE FACTOR ANOVA FOR RIGHT HAND SEBACEOUS QUALITY

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Right Thumb Quality	603	751	1.245439	1.185506576
Right Index Quality	603	733	1.215589	0.923543963
Right Middle Quality	603	704	1.167496	0.810768968
Right Ring Quality	603	645	1.069652	0.639658849
Right Pinky Quality	603	611	1.013267	0.650986485

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	23.25837	4	5.814594	6.904930831	1.57274E-05	2.374885
Within Groups	2534.7	3010	0.842093			
Total	2557.958	3014				

Appendix I

TABLE XXII
CHARGED FINGERPRINT DATA

		Ninhydrin		**Oil Red O**	
Subject	Book	Findability	Quality	Findability	Quality
1	B	3	1	1	4
1	C	3	1	1	4
2	A	4.5	1	1.5	4
3	B	1	2	2	4
3	C	2.5	1	1	3
5	A	2.5	1	1	2
5	C	4	1	1	1
5	D	2	1	1	1
6	B	3	1	1	4
6	C	2	2	1	4
7	A	2.5	2	1	3
8	A	1.5	4	1.5	3
8	B	1.5	1	1	2
8	C	3.5	1	1	3
9	A	1.5	1	1	1
9	B	1	2	1	2
10	A	3	1	1	3
10	B	2.5	1	1	4
10	C	3.5	1	1	3
11	A	4.5	1	2.5	1
11	B	3.5	1	1	3
11	C	2.5	1	1	3
12	A	1.5	1	1	1
12	B	2	1	1	4
12	C	1	1	1	4
13	B	4.5	1	2	4
16	B	1	1	1	2
17	B	1.5	1	1	4
17	C	1	1	1	1
18	B	1.5	1	1	3

CITED LITERATURE

1. Evans C. *The casebook of forensic detection: How science solved 100 of the world's most baffling crimes.* Penguin; 2007.

2. Hansen DB, Joullié MM. The development of novel ninhydrin analogues. *Chem Soc Rev*. 2005;34(5):408-417.

3. Girod A, Ramotowski R, Weyermann C. Composition of fingermark residue: A qualitative and quantitative review. *Forensic Sci Int*. 2012;223(1):10-24.

4. Croxton RS, Baron MG, Butler D, Kent T, Sears VG. Variation in amino acid and lipid composition of latent fingerprints. *Forensic Sci Int*. 2010;199(1):93-102.

5. Lodén M, Andersson A. Effect of topically applied lipids on surfactant-irritated skin. *Br J Dermatol*. 1996;134(2):215-220.

6. Harker M, Harding CR. Amino acid composition, including key derivatives of eccrine sweat: Potential biomarkers of certain atopic skin conditions. *Int J Cosmetic Sci*. 2013;35(2):163-168.

7. Pelle E, McCarthy J, Seltmann H, et al. Identification of histamine receptors and reduction of squalene levels by an antihistamine in sebocytes. *J Invest Dermatol*. 2008;128(5):1280-1285.

8. Lee HE, Chang IK, Lee Y, et al. Effect of antihistamine as an adjuvant treatment of isotretinoin in acne: A randomized, controlled comparative study. *J Eur Acad Dermatol Venereol*. 2014;28(12):1654-1660.

9. Liappis N, Kelderbacher SD, Kesseler K, Bantzer P. Quantitative study of free amino acids in human eccrine sweat excreted from the forearms of healthy trained and untrained men during exercise. *Eur J Appl Physiol Occup Physiol*. 1979;42(4):227-234.

10. Liappis N, Hungerland H. Quantitative study of free amino acids in human eccrine sweat during normal conditions and exercise. *Am J Clin Nutr*. 1972;25(7):661-663.

11. Jelly R, Patton EL, Lennard C, Lewis SW, Lim KF. The detection of latent fingermarks on porous surfaces using amino acid sensitive reagents: A review. *Anal Chim Acta*. 2009;652(1):128-142.

12. Beaudoin A. New technique for revealing latent fingerprints on wet, porous surfaces: Oil red O. *J Forensic Identif*. 2004;54(4):413.

13. Salama J, Aumeer-Donovan S, Lennard C, Roux C. Evaluation of the fingermark reagent oil red O as a possible replacement for physical developer. *J Forensic Identif*. 2008;58(2):203-237.

14. Holder EH, Robinson LO, Laub JH. *The fingerprint sourcebook.* Washington, DC: U.S. Dept. of Justice, Office of Justice Programs, National Institute of Justice; 2011.

15. Lee HC, Ramotowski R, Gaensslen RE. *Advances in fingerprint technology, second edition.* 2nd ed. Baton Rouge: CRC Press; 2001.

16. Hier SW, Cornbleet T, Bekgeim O. The amino acids of human sweat. *J Biol Chem*. 1946;166:327-333.

17. Nikkari T. Comparative chemistry of sebum. *J Invest Dermatol*. 1974;62(3):257-267.

18. Weyermann C, Roux C, Champod C. Initial results on the composition of fingerprints and its evolution as a function of time by GC/MS analysis. *J Forensic Sci*. 2011;56(1):102-108.

19. Dimond S, Harries R. Face touching in monkeys, apes and man: Evolutionary origins and cerebral asymmetry. *Neuropsychologia*. 1984;22(2):227-233.

20. Nicas M, Best D. A study quantifying the hand-to-face contact rate and its potential application to predicting respiratory tract infection. *J Occup Environ Hyg*. 2008;5(6):347-352.

21. Cadd S, Islam M, Manson P, Bleay S. Fingerprint composition and aging: A literature review. *Sci Justice*. 2015;55(4):219-238.

22. De Paoli G, Lewis Sr SA, Schuette EL, Lewis LA, Connatser RM, Farkas T. Photo-and Thermal-Degradation studies of select eccrine fingerprint constituents. *J Forensic Sci*. 2010;55(4):962-969.

23. Simmons RK, Deacon P, Farrugia KJ. Water-soaked porous evidence: A comparison of processing methods. *J Forensic Identif*. 2014.

24. Archer NE, Charles Y, Elliott JA, Jickells S. Changes in the lipid composition of latent fingerprint residue with time after deposition on a surface. *Forensic Sci Int*. 2005;154(2):224-239.

25. Friedman M, Williams LD. Stoichiometry of formation of ruhemann's purple in the ninhydrin reaction. *Bioorg Chem*. 1974;3(3):267-280.

26. Grigg R, Malone JF, Mongkolaussavaratana T, Thianpatanagul S. X= Y-ZH compounds as potential 1, 3-dipoles. part 23 1, 2 mechanisms of the reactions of ninhydrin and phenalene trion with∝-amino acids. X-ray crystal structure of protonated ruhemann's purple, a stable azomethine ylide. *Tetrahedron*. 1989;45(12):3849-3862.

27. Odén S, Von Hofsten B. Detection of fingerprints by the ninhydrin reaction. *Nature*. 1954;173(4401):449-450.

28. Guigui K, Beaudoin A. The use of oil red O in sequence with other methods of fingerprint development. *J Forensic Identif*. 2007;57(4):550.

29. Nazzaro-Porro M, Passi S, Boniforti L, Belsito F. Effects of aging on fatty acids in skin surface lipids. *J Invest Dermatol*. 1979;73(1):112-117.

30. Liappis N, Jäkel A. Über die ausscheidung der freien aminosäuren im menschlichen ekkrinen schweiß. *Arch Dermatol Res*. 1975;254(2):185-203.

31. Harker M, Coulson H, Fairweather I, Taylor D, Daykin CA. Study of metabolite composition of eccrine sweat from healthy male and female human subjects by 1H NMR spectroscopy. *Metabolomics*. 2006;2(3):105-112.

32. Hadorn B, Hanimann F, Anders P, Curtius H, Halverson R. Free amino-acids in human sweat from different parts of the body. *Nature*. 1967;215(5099):416-417.

33. Strauss JS, Stranieri AM, Farrell LN, Downing DT. The effect of marked inhibition of sebum production with 13Cis-retinoic acid on skin surface lipid composition. *J Invest Dermatol*. 1980;74(2):66-67.

34. Goldstein JA, Socha-Szott A, Thomsen RJ, Pochi PE, Shalita AR, Strauss JS. Comparative effect of isotretinoin and etretinate on acne and sebaceous gland secretion. *J Am Acad Dermatol*. 1982;6(4, Part 2):760-765.

35. Strauss JS, Kligman AM, Pochi PE. The effect of androgens and estrogens on human sebaceous glands. *J Invest Dermatol*. 1962;39(2):139-155.

36. Ebling FJ, Thomas AK, Cooke ID, Randall VA, Skinner J, Cawood M. Effect of cyproterone acetate on hair growth, sebaceous secretion and endocrine parameters in a hirsute subject. *Br J Dermatol*. 1977;97(4):371.

37. Cheshire WP, Fealey RD. Drug-induced hyperhidrosis and hypohidrosis: Incidence, prevention and management. *Drug-Safety*. 2008;31(2):109-126.

38. Jasuja OP, Toofany MA, Singh G, Sodhi GS. Dynamics of latent fingerprints: The effect of physical factors on quality of ninhydrin developed prints—A preliminary study. *Sci Justice*. 2009;49(1):8-11.

39. Cuthbertson F. *The chemistry of fingerprints.* United Kingdom Atomic Energy Authority, Atomic Weapons Research Establishment (AWRE); 1969.

40. Bobev K. Fingerprints and factors affecting their condition. *J.Forensic Identif.* 1995;45(2):176-183.

41. Almog J, Azoury M, Elmaliah Y, Berenstein L, Zaban A. Fingerprint's third dimension: The depth and shape of fingerprints penetration into Paper—Cross section examination by fluorescence microscopy. *J Forensic Sci*. 2004;49(5):5.

42. Koenig A, Girod A, Weyermann C. Identification of wax esters in latent print residues by gas chromatography-mass spectromertry and their potential use as aging parameters. *J Forensic Identif*. 2011;61(6):652.

43. Chesapeake Bay Division - International Association for Identification. Latent fingerprint processing techniques - selection and sequencing guide. http://www.cbdiai.org/Reagents/main.html. Updated 2013. Accessed March 22, 2017.

44. American Association of Textile Chemists and Colorists. *Technical manual of the american association of textile chemists and colorists.* Vol 72. Research Triangle Park, NC: American Association of Textile Chemists and Colorists; 1997.

45. Snaidauf J. *A comparison of oil blue A versus oil red O and physical developer on various porous substrates containing fresh and aged sebaceous latent prints.* University of Illinois at Chicago; 2015.

VITA

Education

Bachelor of Science, Chemistry, ACS Certified Professional Emphasis — *Boise State University*
Graduation from the Honors College with Distinguished Honors — *summa cum laude*
Cum GPA: 3.97 — *Graduated May 7, 2016*

Master of Science, Forensic Science — *University of Illinois at Chicago*
Cum GPA: 4.00 — *Graduated May 10, 2018*

Awards and Recognition

W.E. van Doren Scholar, University of Illinois at Chicago — *2016*
Dean's List with Highest Honors, Boise State University — *Fall 2011 – Spring 2012, Spring 2014 – Fall 2015*
Dean's List with High Honors, Boise State University — *Fall 2012 – Fall 2013*
Department of Chemistry and Biochemistry Undergraduate Research Fellowship, Boise State University — *2015*
Larry Arguinchona Honors Scholarship, Boise State University — *2013 – 2015*
Department of Chemistry and Biochemistry Scholarship, Boise State University — *2012 – 2015*
College of Arts and Sciences Scholarship, Boise State University — *2014*
Dean's Scholarship, Boise State University — *2011 – 2012*
Wayne Osborne Honors Scholarship, Boise State University — *2011*

Teaching and Related Experience

Teaching Assistant, UIC Department of Biopharmaceutical Sciences — *August 2016 – August 2017*

- Served as a teaching assistant for first year labs in the M.S. Forensic Science program. Duties included setting up/tearing down labs; assisting with questions during lab sessions; ordering, preparing, and maintaining lab supplies, chemical reagents, and instrumentation.

Lab Instructor, BSU Department of Chemistry and Biochemistry — *August 2015 – December 2015*

- Instructed a first-semester general chemistry laboratory. Duties included prepping for class, teaching, emailing students, attending bi-weekly organizational meetings, grading labs, and keeping track of assignments and grades via Blackboard.

Teaching Assistant, BSU Department of Chemistry and Biochemistry — *August 2015 – December 2015*

- Assisted in instructing the Honors first-semester general chemistry laboratory. Duties included going over safety presentations and pre-lab material, carrying out pre-lab demos, assisting in the laboratory with student questions and stockroom runs, and grading labs.

Peer Mentor, BSU Honors College — *August 2013 – December 2015*

- Served as a group leader and facilitator at the annual fall Honors retreat for incoming Honors student cohorts at the beginning of the school year.
- Instructed a ten-week seminar each fall semester on academic success in the Honors College and the university to new Honors students as part of their first year Honors course.

Lab Assistant, BSU Department of Chemistry and Biochemistry — *August 2013 – May 2014*

- Served as a lab assistant in one organic chemistry instructional lab each semester. Duties included setting up labs, assisting students with questions and learning relevant laboratory techniques, and instructing students in the operation of instruments such as rotovaps, refractometers, and FT-IR.

Research Experience

Graduate Research Assistant, UIC - Karl Larsen, Ph.D. *March 2017 – December 2017*

- Conducted a field study to determine the quality of the average fingerprint deposited on paper and investigate changes in the quality of individuals' fingerprints according to the time of day at deposition and activity prior to print deposition on paper.

Undergraduate Analytical Chemistry Research Assistant, BSU - Dale Russell, Ph.D. *January 2014 – May 2016*

- Worked on developing an analytical method to determine the sequence of intersecting ink lines in questioned documents utilizing colloidal silver nanoparticle substrates for surface-enhanced Raman scattering.

NSF Research Experience for Undergraduates, UCCS - Janel Owens, Ph.D. *May 2014 – August 2014*

- Compared the concentrations of chlorogenic acid and caffeic acid between organic and conventionally produced pome fruits, stone fruits, and tomatoes via microwave-assisted extraction technique and HPLC-DAD analysis.

Undergraduate Biochemistry Research Assistant, BSU - Ken Cornell, Ph.D. *September 2013 – December 2013*

- Analyzed LC-MS data for intra- and extracellular supernatants of E. coli to determine concentrations of intermediates and byproducts of MTA/SAH nucleosidase inhibitors.

Abstracts, Posters, and Presentations

Radford CA, Russell DD. "Determining the Sequence of Intersecting Ink Lines in Questioned Documents: A Problem in Forensic Science." *Department of Chemistry and Biochemistry Seminar*, Boise State University. *April 2016.*

Radford CA, Doverspike JC, Owens JE. "Determination of Chlorogenic Acid and Caffeic Acid in Fruits with Evaluation of Pesticide Concentration." *UCCS REU Research Symposium*, University of Colorado, Colorado Springs. *July 2014*.

Radford CA, Russell DD. "Forensic Application of Raman Spectroscopy to the Analysis of Intersecting Lines in Questioned Documents." *Undergraduate Research Conference*, Boise State University. *April 2014*.

Work Experience

Intern, Cadre Forensics *January 2018 – Present*

- Scan test fire firearm cartridge cases donated from forensic labs using Cadre's TopMatch-GS 3D virtual imaging and analysis technology to be used in the optimization of the instrumentation and comparison algorithms
- Perform data entry, cataloging information on forensic test fire cartridges provided by the donating labs

Peer Advisor, Boise State University Honors College *September 2013 – May 2016*

- Worked with and advised current and prospective Honors students on completing Honors requirements
- Completed Honors College graduation checks for junior and senior Honors students every semester
- Created Honors College probation and continuing probation reports for administrative staff every semester
- Completed various projects and reports for the Honors College administrative staff

Peer Advisor, Boise State University Advising & Academic Enhancement *May 2013 – May 2014*

- Worked with incoming undeclared freshman and transfer students during pre-advising, advising, and registration sessions at new student orientations
- Advised students regarding major exploration, class schedules, enrollment, academic probation, and academic appeals
- Completed various projects and reports for professional advising staff