FRSC1011HB INTRODUCTION TO CRIME SCENE INVESTIGATION

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Lecture Overview

- Introduction to the area of Crime Scene Investigation from a historic perspective
- Definitions, key individuals, crime scene laboratories, analyzing evidence, admission of evidence
- Overview of expectations for your labs starting January 20th with a list of questions to answer – similar to online assignment 1

What is Forensic Science

- In its broadest definition, forensic science is the application of science to criminal and civil laws.
- Forensic Investigation requires
  - Development of the principles and techniques to identify and compare physical evidence
  - Combining these principles in a manner that can be practically applied in a criminal justice system.

Application of Science

- For a very long time applying science to investigation of evidence was the exception not the rule

Early developments

- 3rd century China – Yi Yu Ji “A collection of criminal cases”
- Woman suspected of killing and then burning the body of her husband, she claimed he died accidentally in the fire

Evidence and Experiments

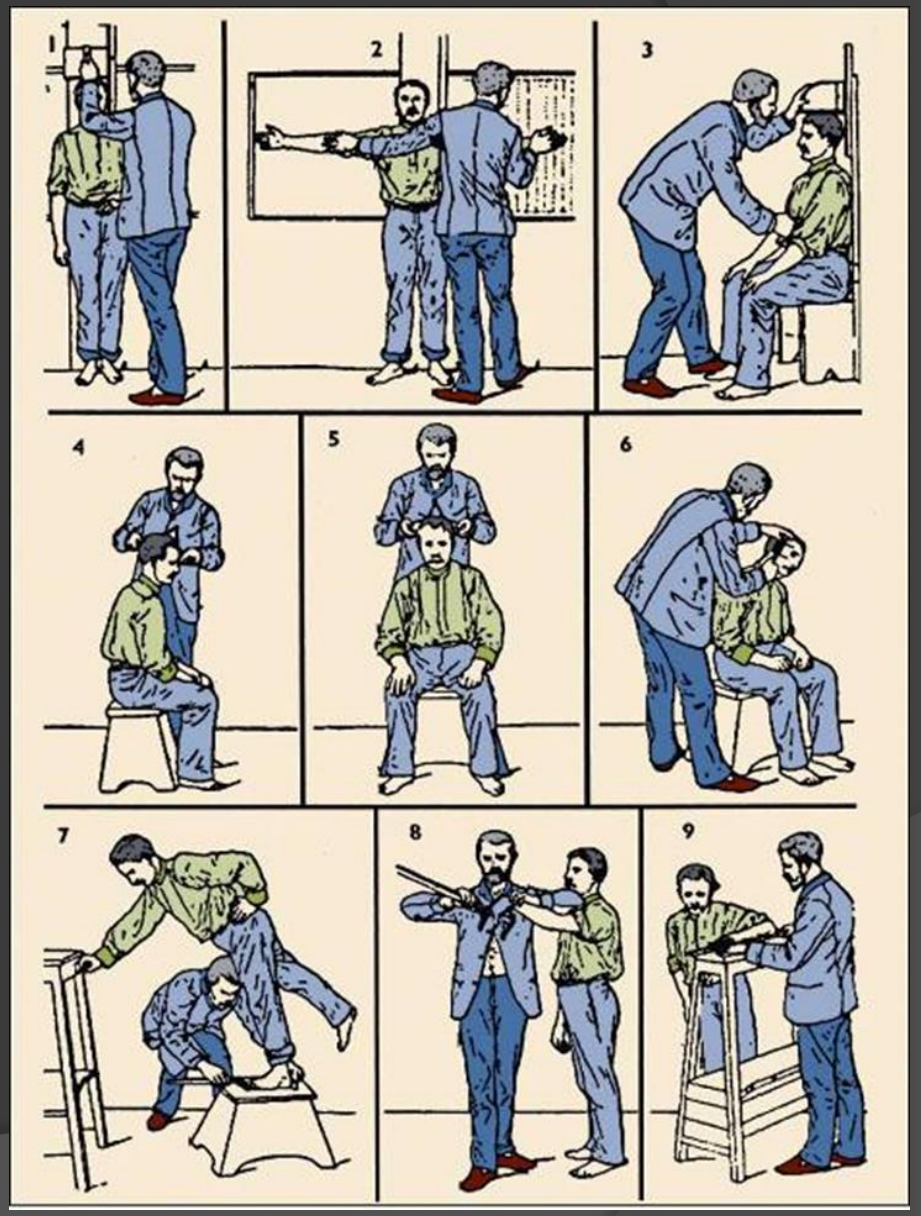
- Lack of ashes in the mouth
- Test, burned pigs before and after killing them

Human Identification: Fingerprints

- First recognized by the Chinese
- First recorded notes regarding ridges, spirals and loops in fingerprints in 1686 - Marcello Malpighi, Professor of Anatomy University of Bologna, Italy
- First scientific paper a century later
- In the late 1800's US microscopist Thomas Taylor and, later, Scottish physician Henry Faulds (Nature publication) suggested fingerprints could be used in human identification
- Englishman Francis Henry Galton's investigations provided statistical evidence for the uniqueness of fingerprints. His book *Finger Prints* (1892) outlined a means of classifying and filing fingerprints that is the basis of current day systems

Human identification and Criminal Investigation

- Anthropometry - Alphonse Bertillon
  - The first system of personal identification
  - Based upon a series of body measurements and devised in 1879



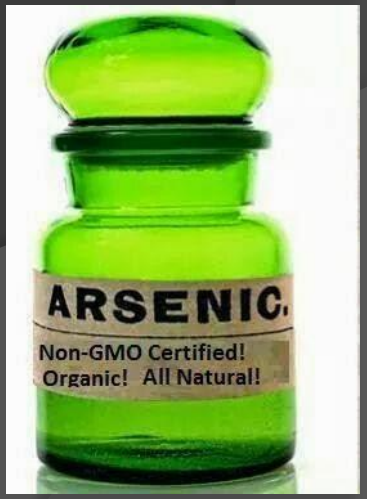
- Figure Courtesy Sirchie Finger Print Laboratories, Inc., Youngsville, N.C., www.sirchie.com.

Further Advances

- 1893 Hans Gross an Austrian public prosecutor
  - *Handbuch für Untersuchungsrichter als System der Kriminal Anthropologie und Kriminalistik* which was republished in English as *Criminal Investigation*
  - Discusses how microscopy, chemistry, physics, mineralogy, zoology, botany, anthropometry and fingerprinting could be used to assist forensic investigators

Scientific Advances in Chemistry

- 1775 - Swedish chemist Carl Wilhelm Scheele first successfully detected arsenic in corpses
- 1798 - French physician Francois-Emanuel Fodere published:
  - "A Treatise on Forensic Medicine and Public Health"
- 1806 - German chemist Valentin Ross - precise method of detecting small amounts of arsenic in a victim's stomach
- 1814 - Spaniard Mathieu Orfila (father of forensic toxicology) published a treatise on the detection of poisons and their effects on animals



Sherlock Holmes (late 1800's to 1920s)

- Sir Arthur Conan Doyle's imaginary London-based consulting detective who was famous for his:
  - 1) astute logical reasoning,
  - 2) ability to take on almost any disguise,
  - 3) use of forensic science skills to solve difficult cases.
    - http://en.wikipedia.org/wiki/Sherlock_Holmes
- Many believe that Conan Doyle had considerable influence on popularizing scientific methods of crime detection

Twentieth Century Breakthroughs

- Blood grouping, now blood types A, B, AB and O
  - 1901 discovery by Dr. Karl Landsteiner
  - Dr. Leon Lattes discovered a simple method for determining blood types from dried bloodstains, immediate criminal applications
- Albert S. Osborn developed the fundamental principles of document examination – *Questioned Documents*
- Frenchman Edmond Locard demonstrated how principles described by Gross could be incorporated within a workable crime laboratory
  - Locard was the founder and director of the Institute of criminalistics at University of Lyons,
  - Locard's institute was the inspiration for several other police labs in Europe
  - **Locard's Exchange Principle** states that when a criminal comes in contact with an object or person, a cross-transfer of evidence occurs.

Twentieth Century breakthroughs

- Microscopy - Dr. Walter C. McCrone
  - Leading figure, applied microscopy to analytical problems including forensics he was also an exceptional communicator and instructed many forensic scientists around the world
  - Examined thousands of cases using microscopy with other analytical tools
- U.S. Army Colonel Calvin Goddard
  - Refined firearms examination using comparative microscopic analysis of crime scene bullets versus test fired bullets to see if the bullets could have been fired from the same gun

More Modern Scientific Advances

- Computer technology – knowledge analysis
- Chromatography, spectrophotometry and electrophoresis
  - Allow the connection of tiny fragments of evidence to a specific person or place
- DNA Typing –the most significant modern advance - Sir Alec Jeffreys
  - Jeffreys developed the first DNA profiling test in 1984 and two years later used it to identify Colin Pitchfork as the murderer of two young English girls
- Computerized databases
  - Physical evidence such as fingerprints, markings on bullets and shell casings and DNA

Crime Laboratories

- US examples discussed in the text
- In Canada forensic services are provided by government-funded institutes
  - 1) Three Royal Canadian Mounted Police regional laboratories across Canada
  - 2) The Centre of Forensic Sciences (CFS) in Toronto (https://www.mcscs.jus.gov.on.ca/english/centre_forensic/CFS_intro.html) also Northern Regional Laboratory (NRL) of Forensic Sciences in Sault Ste. Marie.
  - 3) The Institute of Legal Medicine and Police Science in Montreal

13 OPP Forensic Identification Laboratories in Ontario

http://www.timminstimes.com/2013/06/14/opp-officially-open-new-forensic-crime-labs-at-south-porcupine-location

Info on Peterborough Forensic identification unit at : http://news.ontario.ca/mcscs/en/2011/04/new-opp-facility-in-peterborough-creating-construction-jobs.html

http://www.thepeterboroughexaminer.com/2013/04/05/opp-offer-look-inside-new-forensics-laboratory-building

Basic Services of a Crime lab USA

- The physical science unit
  - Use the techniques of chemistry, physics and geology, examine drugs, glass, paint, explosives, soil etc.
- The biology unit
  - DNA profiling, bodily fluid analysis as well as hair and fibers and botanical material (wood and plants)
- The firearms unit
  - Firearms, ammunition of all types, discharge residues, tool marks
- The documentation examination unit
  - Hand writing, typewriting - document source and authenticity, paper ink, indent writing
- The photography unit
  - Regular and highly specialized photographic techniques using UV and X-rays etc. to make the invisible visible

Optional services

- Latent fingerprint Unit
- Polygraph unit
- Voiceprint Analysis unit
- Crime-scene investigation unit
  - See anthrax letter example in text for things that can be investigated
- Specialized services
  - Forensic pathology, anthropology and entomology
  - Forensic Psychiatry, odontology, engineering, computer and digital analysis

Forensic Units CFS

- Biology Section
- Chemistry Section
- Physical Sciences Section
- Toxicology Section

Analyzing Evidence

- Avenues of police investigation
  - Confessions, eyewitness accounts by victims or witnesses and the evaluation of physical evidence retrieved from the crime scene
  - Only physical evidence is free from inherent error or bias – faulty memories or lapses of judgement have lead to many incorrect charges and convictions

Physical Evidence

- Hallmark of physical evidence is that it must undergo scientific inquiry

The Scientific Method <u>as presented in text</u>

1. Formulate a question worthy of investigation.
2. Formulate a reasonable hypothesis to answer the question.
3. Test the hypothesis through experimentation.
4. "Upon *validation* of the hypothesis, it becomes suitable as scientific evidence." ☹ ☹

- Barry's thought : Think 'failure to reject'

Admissibility of evidence

- Frye v. United States
  - Rejected the scientific validity of the lie detector (polygraph)
  - Established that “in order to be admitted as evidence at a trial, the questioned procedure, technique or principle must be “generally accepted” by a meaningful segment of the relevant scientific community” (from Saferstein)

Admissibility of evidence

- A witness “qualified as an expert by knowledge, skill, experience, training, or education” may offer expert testimony on a scientific or technical matter if:
  - 1) the testimony is based upon sufficient facts or data;
  - 2) the testimony is the product of reliable principles and methods; and
  - 3) the witness has applied the principles and methods reliably to the facts of the case

(Saferstein)

Admissibility of evidence

- Daubert v. Merrell Dow Pharmaceuticals
  - Contention was that Bendectin caused birth defects, Merrell Dow responded that there are no published studies that confirm this
  - Daubert and Schuller provided evidence that suggested it did, however, their evidence was based on *in vitro* and *in vivo* animal studies, pharmacological studies, and reanalysis of other published studies, and these methodologies had not yet gained acceptance within the general scientific community.
  - After lower courts sided with Merrell Dow, supreme court ruled for Daubert and Shuller
  - **General acceptance is not the absolute standard**

  - More recent reanalysis of Daubert and Schuller's results question their interpretation
  - Diclectin in Canada – vitamin B6 derivative and an antihistamine

Providing Expert testimony

- Lay witness testimony must be factual and not contain personal opinions of the witness
- In contrast an expert witness is called upon to evaluate evidence when the court lacks the expertise to do so
- The expert expresses opinion as to the significance of the findings
- Note: an expert cannot render any view with absolute certainty – reasonable scientific certainty derived from training and experience

Fingerprint Evidence Questioned

- Several cases where fingerprint evidence led to incorrect identification and even false conviction – e.g. 2004 Madrid train bombing
- Why? – no universal standardization or statistical evaluation of the assessments
- The individualization may be real, the question is does this allow the people making the call to distinguish among similar prints given the quality of evidence from a crime scene

Review

- Definitions, key individuals, crime scene laboratories, analyzing evidence, admission of evidence
- Forensic science owes its origins to individuals such as Bertillon, Galton, Lattes, Goddard, Osborn, and Locard, who developed the principles and techniques needed to identify or compare physical evidence.
- Frye v. United States, Rule 702, Daubert v. Merrell Dow Pharmaceuticals
- Read Chapter 1, answer questions at the back of the chapter, REVEL

FRSC1011H Lab Questions

- What is the proper procedure to follow when an error is made during note taking?
- What information is not typically included in a crime scene investigators notebook?
- What is the purpose of a chain of custody?

Note taking

- Time and location of scene must be recorded, along with the weather
- Before the scene is sketched, photographed or searched the lead investigator should do a walk through and make notes on many aspects of the scene In its original condition
- Notes should be in ink (preferably black or blue) and written in a bound notebook
- Most importantly, notes must be written at the time of the crime scene investigation and NOT left to memory to record at a later time
- Before evidence is collected each item must be fully described, indicating if the evidence underwent any field testing and noting the time the note was taken

Note taking (from Saferstein)

- The note taker must keep in mind that this written record may be the only source of information for refreshing their memory months or years after the crime scene has been processed.
- The notes must be sufficiently detailed to meet this need if it arises

I ♡ C.S.I. 09

Jan. 9
Supervisor: Vy Suthayakumar
Location: Trent University

12:56 Enter room

1:20 Team members: Kitty Cheung, Caroline, Diego, and Colleen

1:22 Make notes about crime scene. Room is an office. There is a desk and chair. Huge mess.

1:28 Found blood on desk.

... Take pictures - lots of them.

... Collect blood evidence on desk. Used a swab to ~~swipe blood~~ put in bag ~~labeled as~~ evidence.

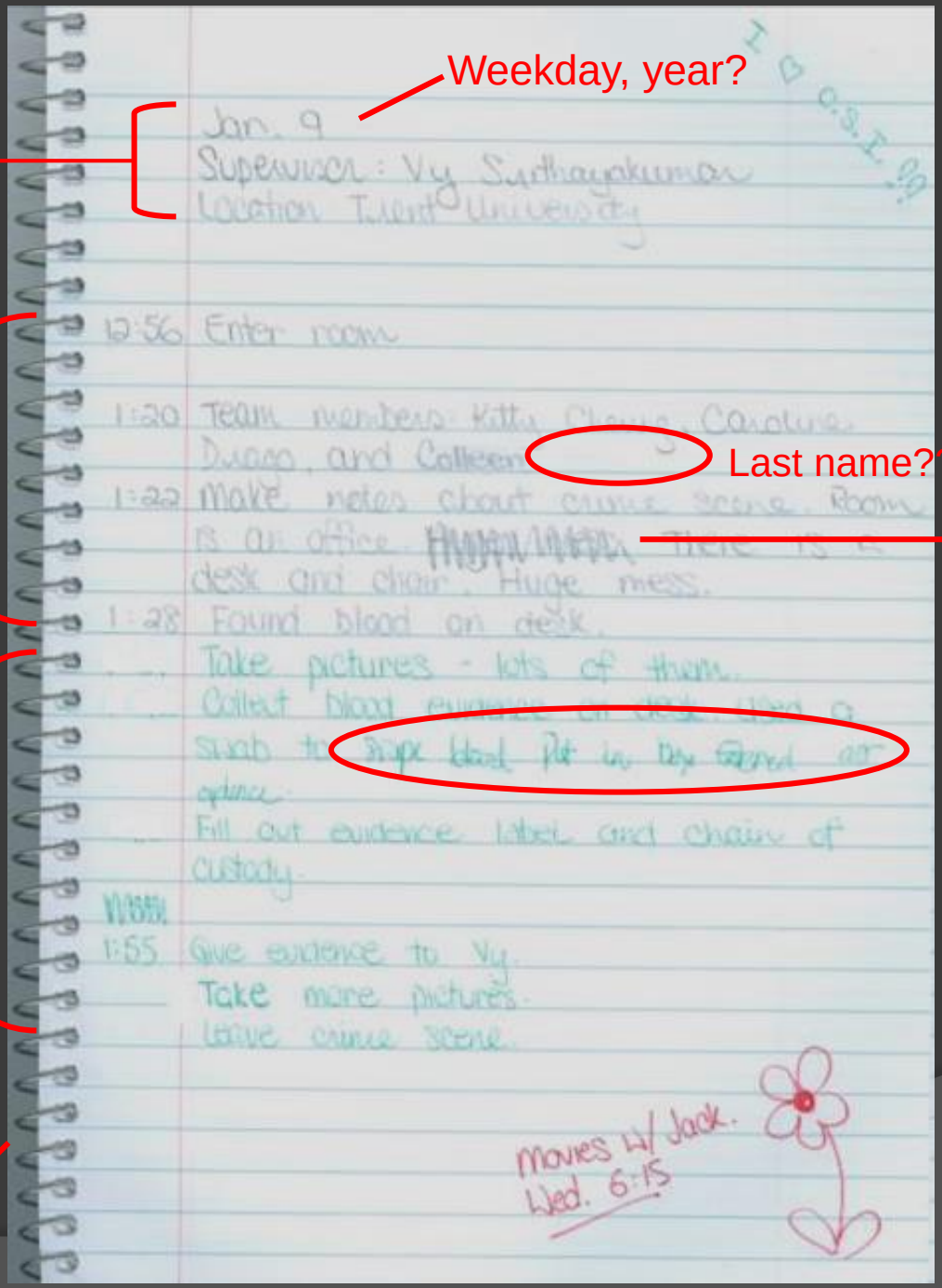
... Fill out evidence label and chain of custody

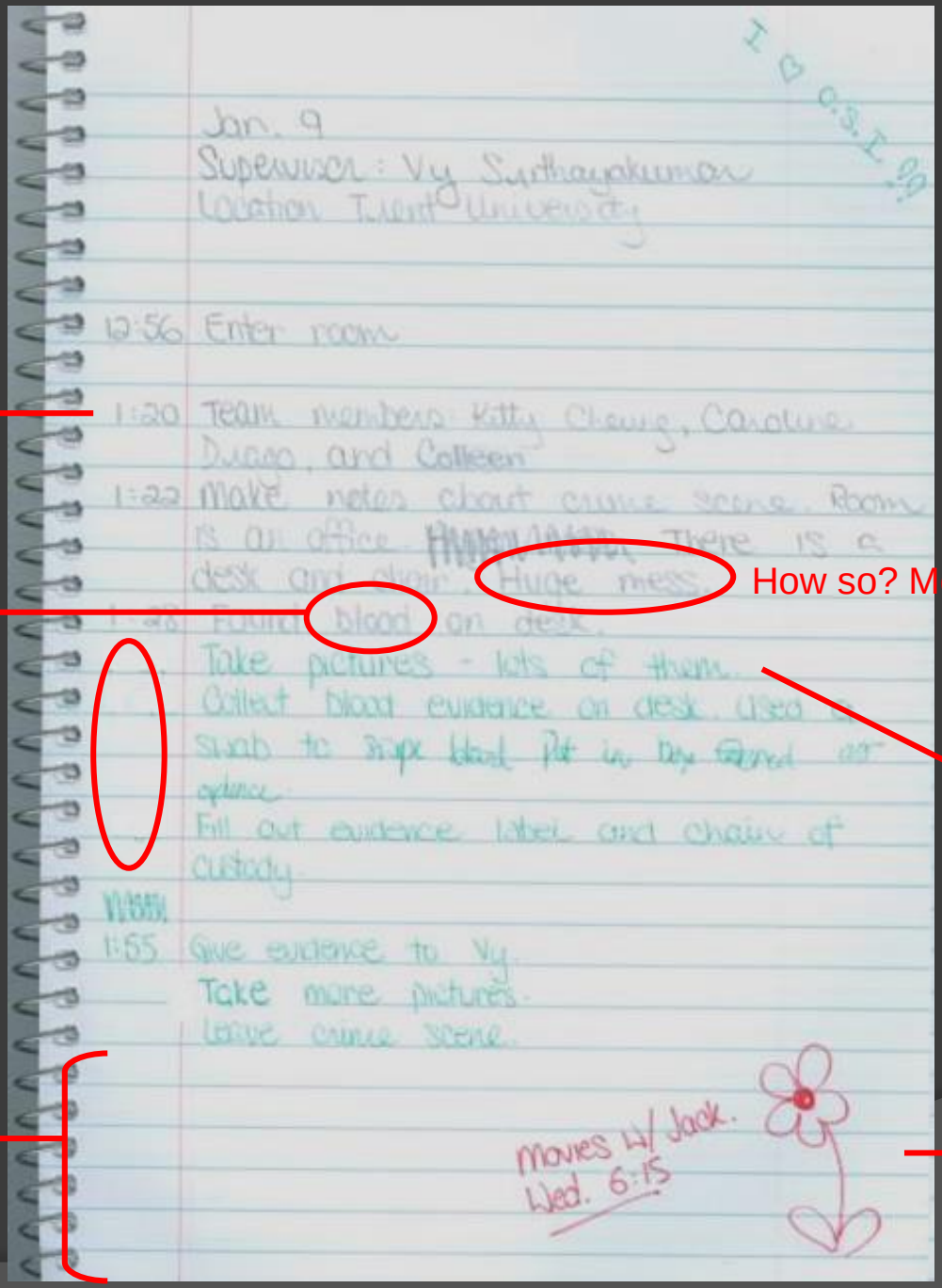
1:55 Give evidence to Vy.

Take more pictures.

Leave crime scene.

Movies w/ Jack.
Wed. 6:15


Incomplete header: missing weather and shift time
Weekday, year?
Jan. 9
Supervisor: Vy Suthaykumar
Location: Trent University
Blank lines
12:56 Enter room
1:20 Team members: Kitty, Chevy, Caroline, Diana, and Colleen
Last name??
1:22 Make notes about crime scene. Room is an office. There is a desk and chair. Huge mess.
Mistake scribbled out
1:28 Found blood on desk.
Take pictures - lots of them.
Collect blood evidence on desk.
Swab to
Illegible writing
Fill out evidence label and chain of custody.
1:55 Give evidence to Vy.
Take more pictures.
Leave crime scene.
Movies w/ Jack. Wed. 6:15
Pencil
Green pen
Spiral bound notebook



Times in 12 hr clock

Did you do a presumptive test? How do you know it's blood?

How so? More details needed

Missing times

Insufficient details

Blank lines not crossed out

Doodles and notes irrelevant to case

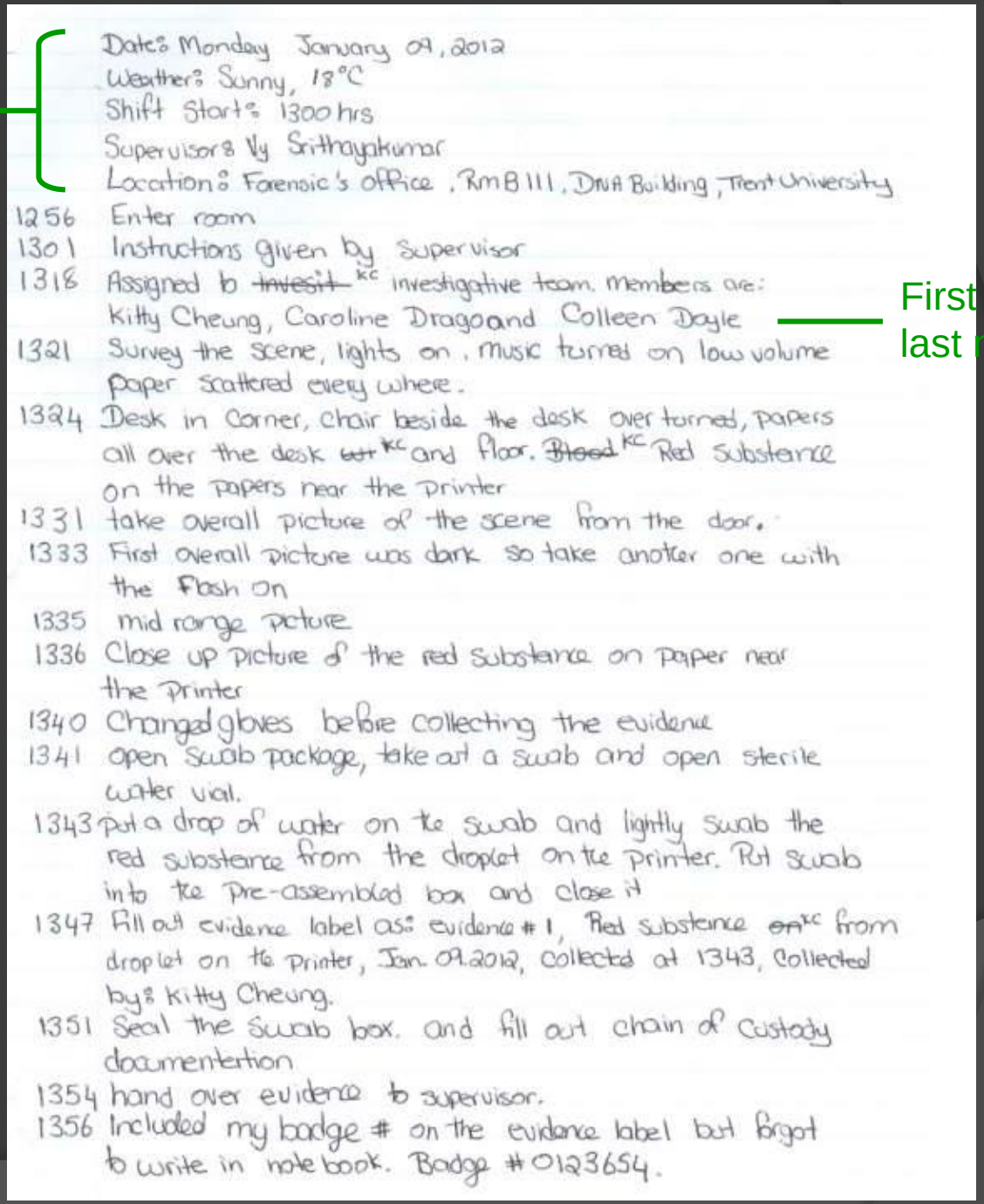
Date: Monday January 09, 2012
Weather: Sunny, 18°C
Shift Start: 1300 hrs
Supervisor: Vy Srithayakumar
Location: Forensic's office, Rm B 111, DNA Building, Trent University

1256 Enter room
1301 Instructions given by Supervisor
1318 Assigned to ~~invesit~~ KC investigative team. Members are:
Kitty Cheung, Caroline Drago and Colleen Doyle
1321 Survey the scene, lights on, music turned on low volume
paper scattered every where.
1324 Desk in corner, chair beside the desk over turned, papers
all over the desk ~~out~~ KC and floor. ~~Blood~~ KC Red substance
on the papers near the printer
1331 take overall picture of the scene from the door.
1333 First overall picture was dark so take another one with
the flash on
1335 mid range picture
1336 Close up picture of the red substance on paper near
the printer
1340 Changed gloves before collecting the evidence
1341 open swab package, take out a swab and open sterile
water vial.
1343 put a drop of water on the swab and lightly swab the
red substance from the droplet on the printer. Put swab
into the pre-assembled box and close it
1347 Fill out evidence label as: evidence # 1, Red substance ~~on~~ KC from
droplet on the printer, Jan. 09.2012, collected at 1343, collected
by: Kitty Cheung.
1351 Seal the swab box. and fill out chain of custody
documentation
1354 hand over evidence to supervisor.
1356 Included my badge # on the evidence label but forgot
to write in note book. Badge # 0123654.

Complete heading : date, outdoor weather conditions, shift time, supervisor, scene location

Times for all activity in 24 hr clock

Notes are legible, in black ink, no blank areas



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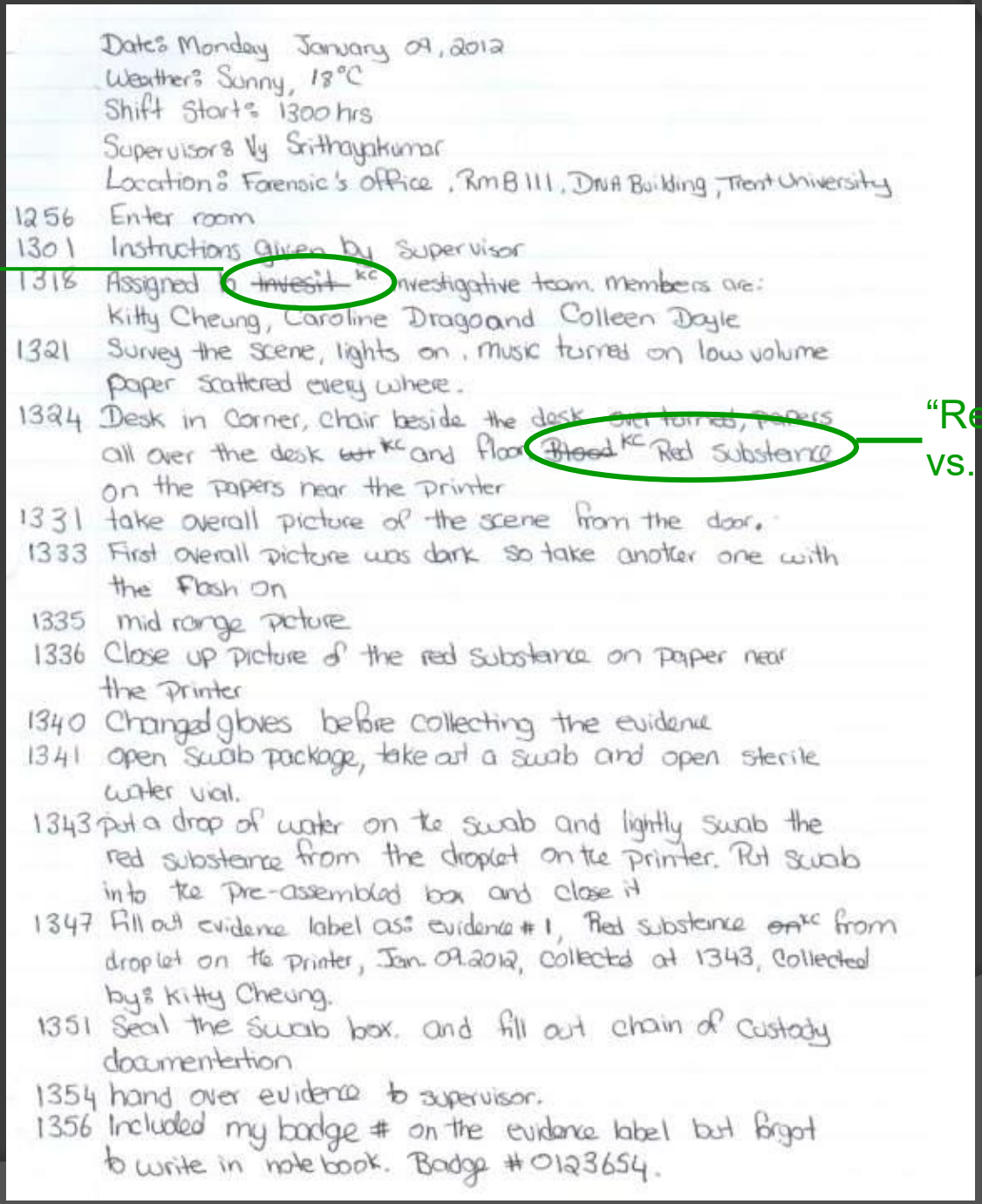
First and last names

Mistake neatly crossed out and initialled

"Red substance" vs. "blood"

DETAILS!!!



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