



Basic principles of forensic science for an introductory overview course

## OVERVIEW

### Key Concepts of Forensic Science

- Application of a scientific method, tool, or technique to aid an investigation or judicial proceeding
- Used to support or refute hypotheses about how an event occurred
- Results integrated into the investigation, part of a larger story
- Many subdisciplines

#### Forensic laboratory



#### Medical examiner



### Characteristics of Forensic Data and Results

- Specific and complete, including caveats or limitations
- Reproducible; another forensic scientist provided with the same evidence and information should obtain the same results
- Falsifiable; results must be stated such that they can be tested for accuracy and completeness. A specific DNA profile or a specific blood alcohol measurement is falsifiable because the results can be confirmed by scientific testing
- Relevant to the case at hand. The analysis of a bloodstain sample would be done to obtain the DNA profile; cholesterol level in the blood is irrelevant

### Selected Historical Figures

- **Alphonse Bertillon (1853–1914; French)**
  - Used measurements of physical features for identification called **anthropometry** or **Bertillonage**. Replaced by fingerprinting
- **Francis Galton (1822–1911; English)**
  - Fingerprints
- **Alexander Gottler (1882–1968; American)**
  - Forensic toxicology. Performed chemical analysis for the New York Office of Chief Medical Examiner (OCME)
- **Calvin Goddard (1891–1955; American)**
  - Comparison microscopy and firearms
- **Hans Gross (1847–1915; Austrian)**
  - Coined the term **criminalistics**

- **Alec Jeffreys (1950–; English)**
  - Developed early DNA testing methods
  - First to use DNA typing in a criminal matter (Colin Pitchfork case)
- **Paul Kirk (1902–1970; American)**
  - Generalist and educator
- **Edmond Locard (1877–1966; French)**
  - Trace evidence. Opened an early forensic laboratory
  - Credited for Locard's Exchange Principle, paraphrased as "every contact leaves a trace"
- **Charles Norris (1867–1935; American)**
  - Physician. Early head of the OCME
- **Mathias Orfila (1787–1853; Spanish)**
  - Worked in Italy and France. Forensic toxicologist and educator
  - Utilized the Marsh test for arsenic in the Lufarge case
- **Bernard Spilsbury (1877–1947; English)**
  - Physician and forensic pathologist

### Bias and Human Error

- **Bias** can cause results of a forensic analysis to be influenced by factors other than evidence and testing results
- Usually unintended and unconscious
- Can be caused by **contextual information** irrelevant to the case
- **Confirmation bias** can occur if a specific result is anticipated or expected
- Prosecutorial bias/defense bias favors a specific side in the dispute

### Interface with the US Legal System

#### US legal system

- Legal system designed to settle disputes
- **Adversarial**: based on comparing competing arguments
- **Criminal cases**
  - Accused/defendant vs. government (local/state/federal)
  - Prosecution vs. defense
  - **Burden of proof** on prosecution
  - Standard of proof: beyond a reasonable doubt
- **Civil cases**
  - Individual vs. individual, corporations, companies, etc.
  - Plaintiff vs. defense

### Quality assurance/quality control (QA/QC)

- Practices and procedures used to ensure that forensic data are relevant and trustworthy
- **Cradle-to-grave process**—from evidence creation to final disposition
- Forensic laboratories can be **accredited**
- Analysts may be **certified** in some disciplines

- Burden of proof on prosecution
- Standard of proof: preponderance of evidence
- **Jurisdiction**: the entity empowered to hear a case—local (town, city, county), state, and federal
- Decision rendered by **trier-of-fact** (judge or jury)
- Rules on precedent—rulings by previous courts

#### US Rules of Evidence

- Process to allow evidence to be presented in a legal proceeding
- Evidence is admissible if it meets **admissibility standards**
- Applies to forensic results and data
- Admissibility standards vary across jurisdictions
- **Frye standard**
  - Informally called **general acceptance** admissibility standard
  - 1923 ruling
  - Decision to reject admission of polygraph (lie detector) test
  - Court ruled that to admit new type of test, it must have been accepted within that scientific discipline
- **Federal Rules of Evidence**
  - Congressionally enacted 1975
  - Frequently updated
  - Applies to federal jurisdictions
  - Adopted by other jurisdictions
  - Guidelines for expert testimony
- **Daubert standard**
  - Informally called **gatekeeper standard**
  - 1993 ruling in civil case
  - Trial judge to make admissibility decision; judge as **gatekeeper**
  - Ruling provided guidelines for making this decision
  - Included general acceptance, validation of method, standards, limitations, and potential errors
  - Part of **Daubert trilogy** of cases
- **Joiner decision**
  - Second of Daubert trilogy
  - 1997 ruling in civil case
  - Scientific evidence must be directly relevant
- **Kumho decision**
  - Third case of Daubert trilogy
  - 1999 ruling in civil case
  - Extended definition of expert beyond traditional sciences

- Methods created by **standard operating procedure (SOP)**
- **Traceability**: ability to trace result directly to nationally/internationally accepted standard
- **Control samples** analyzed with evidence
- Results reviewed by colleagues (**peer review**)
- Data reviewed and confirmed

### Laboratory accreditation



# Forensic Science Study Guide

**RD Boyd**



## **Forensic Science Study Guide:**

*Forensic Science* Suzanne Bell, 2022-11 Essential principles of forensic science for core crime scene evidence collection and evaluation concisely written by expert in the field Suzanne Bell PhD from Los Alamos National Laboratory then professor at Eastern Washington University and Chair of the National Commission on Forensic Science The wealth of answers in this 6 page laminated color coded outline format including diagrams and photos cannot be missed for those studying in this field or for the serious and curious true crime fans looking for the facts about crime scene investigation QuickStudy guides are proven to improve retention test scores and act as a refresher for those professionals beyond study Also buy her Forensic Chemistry Toxicology guide to dig even deeper into evidence analysis and add these powerful and simple to use tools to your library for a price so low it's a crime 6 page laminated guide includes Key Concepts Data Results Historical Figures Bias Human Error Interface with the US Legal System Crime Scenes Processing Evidence Collection Bloodstain Pattern Analysis BPA Pattern Evidence Successive Classification Fingerprints Firearms Toolmarks Tread Pattern Medicolegal Death Investigation Biological Evidence Types of Fluids Presumptive Screening Testing Genetic Marker Systems DNA Typing Chemical Evidence Seized Drug Analysis Toxicology Fire Debris Analysis Explosives Trace Evidence Trace Transfer Evidence Microscopy Analysis Types of Trace Evidence Other Forensic Disciplines Questioned Document Examination Forensic Anthropology Forensic Entomology Forensic Engineering Computer Forensics Behavioral Science [Studyguide for Fundamentals of Forensic Science by Houck, Max M.](#) Cram101 Textbook Reviews, 2013-05 Never HIGHLIGHT a Book Again Virtually all testable terms concepts persons places and events are included Cram101 Textbook Outlines gives all of the outlines highlights notes for your textbook with optional online practice tests Only Cram101 Outlines are Textbook Specific Cram101 is NOT the Textbook Accompany 9780521673761 **Studyguide for Forensic Science** Cram101 Textbook Reviews, 2013-05 Never HIGHLIGHT a Book Again Includes all testable terms concepts persons places and events Cram101 Just the FACTS101 studyguides gives all of the outlines highlights and quizzes for your textbook with optional online comprehensive practice tests Only Cram101 is Textbook Specific Accompanies 9780872893795 This item is printed on demand *Study Guide to Digital Forensics* Cybellium, 2024-10-26 Designed for professionals students and enthusiasts alike our comprehensive books empower you to stay ahead in a rapidly evolving digital world Expert Insights Our books provide deep actionable insights that bridge the gap between theory and practical application Up to Date Content Stay current with the latest advancements trends and best practices in IT AI Cybersecurity Business Economics and Science Each guide is regularly updated to reflect the newest developments and challenges Comprehensive Coverage Whether you're a beginner or an advanced learner Cybellium books cover a wide range of topics from foundational principles to specialized knowledge tailored to your level of expertise Become part of a global network of learners and professionals who trust Cybellium to guide their educational journey [www.cybellium.com](http://www.cybellium.com) [Forensic Science](#) Jay Siegel, 2016 Real life examples come under the

scalpel as forensic scientist Jay Siegel follows the course of evidence all the way from the crime scene to the court judgement His guide covers all the major areas of forensic science including drugs trace evidence pathology entomology odontology anthropology crime scene investigation and the law He explains the many types of evidence how they occur how they are collected and analysed and how the results are presented in court **The Official CHFI Study Guide (Exam 312-49)**

Dave Kleiman,2011-08-31 This is the official CHFI Computer Hacking Forensics Investigator study guide for professionals studying for the forensics exams and for professionals needing the skills to identify an intruder s footprints and properly gather the necessary evidence to prosecute The EC Council offers certification for ethical hacking and computer forensics Their ethical hacker exam has become very popular as an industry gauge and we expect the forensics exam to follow suit Material is presented in a logical learning sequence a section builds upon previous sections and a chapter on previous chapters All concepts simple and complex are defined and explained when they appear for the first time This book includes Exam objectives covered in a chapter are clearly explained in the beginning of the chapter Notes and Alerts highlight crucial points Exam s Eye View emphasizes the important points from the exam s perspective Key Terms present definitions of key terms used in the chapter Review Questions contains the questions modeled after real exam questions based on the material covered in the chapter Answers to the questions are presented with explanations Also included is a full practice exam modeled after the real exam The only study guide for CHFI provides 100% coverage of all exam objectives CHFI Training runs hundreds of dollars for self tests to thousands of dollars for classroom training Effective Police Supervision Study Guide Chris Rush Burkey,Larry S. Miller,Michael C. Braswell,2017-03-16 Good police officers are often promoted to supervisory positions with little or none of the training it takes to be a good manager An understanding of group behaviors and organizational dynamics is necessary to grasp the fundamentals of managing police officers The Effective Police Supervision Study Guide coordinates with the core text used in many college level classes and police departments to teach supervisory practices in criminal justice This study guide prepares both students and professionals for academic or promotional exams offering them an opportunity to fully review the material so that they are well prepared for testing This new edition like the new edition of the textbook it accompanies includes information on the following topics police accountability police involvement with news media the challenges of dealing with social media updates on legal considerations and ways to avoid another controversy like Ferguson Dallas or Baltimore **Forensic Chemistry and Toxicology** Suzanne Bell,2022-11 Essential principles of forensic chemistry and toxicology for core crime scene evidence analysis concisely written by expert in the field Suzanne Bell PhD from Los Alamos National Laboratory then professor at Eastern Washington University and Chair of the National Commission on Forensic Science The wealth of answers in this 6 page laminated color coded outline format including equations graphs and diagrams cannot be missed for those studying in this field and well beyond school for a quick look up and refresher QuickStudy guides are proven to boost retention and test

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*Fundamentals of Forensic Science* Max M. Houck, Jay A. Siegel, 2009-11-30 *Fundamentals of Forensic Science* Second Edition provides an introduction to the basic principles of forensic science The book begins at a crime scene and ends in the courtroom The book is divided into six parts Part 1 provides an overview of criminal justice and forensic science covering the basics of crime scene investigation and the nature of evidence Part 2 discusses analytical tools including microscopy Raman spectroscopy mass spectrometry atomic spectroscopy and separation methods Parts 3 to 5 discuss the various types of forensic evidence collected categorized by the types of science employed in their analysis physical science chemical science and biological science These include pathology anthropology and odontology entomology serology and bloodstain pattern analysis DNA analysis forensic hair examinations forensic toxicology fiber and paint analysis friction ridge examination and firearms and tool marks Part 6 discusses the legal aspects of forensic science The book is written for students with a background in basic science and it can be used in a one semester or two semester format Vivid full color illustrations that diagram key concepts and depict evidence encountered in the field Straightforward unit organization that includes key terms numerous feature boxes emphasizing Internet resources historical events in forensic science practical issues in laboratory analysis and topics for further reading Effective pedagogy including end of chapter questions paired with a clear writing style makes this an invaluable resource for professors and students of forensic science [Gale Researcher Guide for: Overview of Criminal Investigation and Forensic Science](#) Julie Campbell, 2018-08-30 [Gale Researcher Guide for Overview of Criminal Investigation and Forensic Science](#) is selected from Gale s academic platform Gale Researcher These study guides provide peer reviewed articles that allow students early success in finding scholarly materials and to gain the confidence and vocabulary needed to pursue deeper research *Self Study Guide For LLB Entrance Examination 2020* Arihant Experts, 2019-07-22 Choosing profession like Law especially in a country like India then comes it with great sense

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