

# CRIME SCENE INVESTIGATION LABORATORY MANUAL

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# Preface and Introduction

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Over the last ten years, colleges and universities across the world have experienced exponential growth of forensic science and criminal justice programs. All of these programs include at least one crime scene investigation course, and an essential part of the growth of these programs has been the demand for textbooks and materials. Additionally, the demand and need for a laboratory manual of practical, tactile, crime scene relevant exercises has been strong. Recently, numerous new publications or texts about crime scene investigations have arrived on the market, but most of them lack the necessary hands-on exercises supplied here. It has been up to instructors or training officers to develop their own exercises. This laboratory manual will meet and exceed this demand for high school students, college and university programs, and even for training purposes for law enforcement.

## PURPOSE/SUMMARY OF THE MANUAL

This laboratory manual will provide laboratory or application exercises for users that will supplement *any* crime scene course offered in high school, in college, and even for law enforcement training. Crime scene investigation requires practice and hands-on learning experiences. This manual offers a large number of proven exercises to provide hands-on learning that will correspond to the main topics and basics of crime scene investigation. There are only a limited number of laboratory manuals (fewer than a dozen) to supplement the textbooks that are published on crime scene investigation. What is unique about this manual is that it will allow a student to apply the basic science necessary for each exercise. Based on my experience over 30 years as a crime scene investigator/forensic scientist and a college professor, I have amassed a huge amount of practical application exercises that work nicely in a classroom or training situation.

## COVERAGE AND APPROACH/TABLE OF CONTENTS

The table of contents is arranged by topic, and within each exercise are expected competencies for the exercise. There will be many parts or sections for the exercises. Each exercise will have material from actual crime scene investigations that will engage the student to critically analyze and solve problems. Discussion questions for each exercise are also included.

The exercises cover most of the basic concepts and foundational knowledge necessary for most scientific crime scene investigation courses or training sessions. Included in the manual is the use of 3-D laser scanners for crime scene documentation and investigation.

These scanning lasers are finding their way into the larger law enforcement agencies, and for that reason they are covered briefly. There is widespread use of computer-aided drawing programs for sketching crime scenes. These programs are widely varied and constantly evolving, and as such, they are not part of this manual. These exercises will be technically correct and suited for high school seniors as part of a forensic science course, any college-level criminal justice or forensic science curriculum, and especially for law enforcement training needs. The exercises have been vetted and tested based on previous use in existing courses taught by an experienced educator and former crime scene investigator/forensic scientist. All current market manuals in this area are written by law enforcement personnel and sometimes do not work well in an academic setting. Conversely, some existing manuals are written by academics who have no actual crime scene experience and therefore lack credibility in law enforcement training courses. This manual will satisfy both stakeholders.

# Foreword

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I met Marilyn Miller in 1996. I was the lead attorney for defendant George Earl Goode, Jr., a former Marine, who had been convicted of two violent murders and was awaiting execution on death row. Soon after reading the file, it seemed clear to me that based on the science, he could not have been involved in the killings as the state alleged and the jury found. His lawyers at trial had not sufficiently challenged the forensic evidence and later admitted they had not previously cross-examined a blood-spatter expert who was the state's main witness. At that time, virtually no one challenged forensic evidence in North Carolina courts. Finding an expert to support such a challenge was considered almost impossible. The O.J. Simpson case, however, was recent then, and I watched the testimony of Dr. Henry Lee, known as the go-to expert for challenging crime scene evidence. I asked one of the Duke Law School students working on the Goode case with me to contact Dr. Lee for help on Mr. Goode's behalf. He referred us to Marilyn Miller. It was our lucky day.

At that time, Dr. Miller was assistant professor and program director for the Forensic Science Program at the School of Public Safety and Professional Studies at the University of New Haven in Connecticut. I would soon discover that Dr. Miller would help me (and my team) dissect the capital conviction of Mr. Goode. Since Mr. Goode was indigent and I was court appointed, there was little money to pay Dr. Miller for her services. That didn't deter her. She came to North Carolina to look at the evidence. I watched as she meticulously pored over it, making superbly scripted, detailed notes to memorialize her findings. She later prepared an affidavit discussing those findings. She essentially confirmed the theory that the state had put forth false and misleading evidence at Mr. Goode's trial, through the testimony of an agent at the North Carolina State Bureau of Investigation, an agent who was later fired. I was certain that the agent's testimony and faulty forensic evidence had put Mr. Goode on death row, where he was waiting to be executed when I met him. With Dr. Miller on our team, I began feeling optimistic about saving Mr. Goode from the death chamber. Even before the National Academy of Sciences (NAS) Report "Strengthening Forensic Science in the United States: A Path Forward" came out in 2009, citing her first book as an authority in the section on bloodstain pattern analysis, it was clear that she knew the discipline inside and out and was interested in making sure that bad science shouldn't be tolerated in any courtroom. Little did she know what a tough road it would be for the next decade to convince a court in North Carolina that Mr. Goode's death sentence had to be undone.

A short discussion about the background of Mr. Goode's case is important because it paved the way for similar cases built on bad science to be exposed. The state's forensic evidence was twofold: first, that there was "invisible" blood on Mr. Goode's boot, found only by phenolphthalein testing and second, even if a defendant didn't have blood on

him, that didn't mean he wasn't involved in the stabbing of the two decedents, who were stabbed in total about 30 times.

In her affidavit, and in live testimony in 2004, Dr. Miller specifically stated that phenolphthalein, the presumptive test for blood, was not a confirmation or identification of blood. Although that seemed obvious to scientists, it was not for most judges, attorneys, laypersons, and jurors. Hearing the words "positive for the presence of blood" made them assume blood was present. It would take years to debunk that premise. Dr. Miller also testified that in Mr. Goode's case, the scene was so bloody that the killer would definitely have had blood on him, crushing the state's theory that a person could be involved in such a horrific stabbing and not have blood on him.

At the time of the hearing in 2004, Dr. Miller was an associate professor in the Department of Forensic Science at Virginia Commonwealth University. Once again, she came to North Carolina with little pay, a cold reception from the judge and district attorney, and faced a local community who supported keeping Mr. Goode on death row. Many experts would have politely reneged on their offer to help. As a lawyer for more than 26 years now, I can say unequivocally that I have never seen anything like it.

The state fought very hard to quash Dr. Miller and me in ways that neither of us ever experienced or expected. We were chastised for going against an establishment that had put forth this type of evidence for decades—evidence that both of us were convinced was faulty. With nothing to gain for herself, Dr. Miller stuck with the case, and with me and Mr. Goode, for many years. It was another five years before a courageous federal judge set aside the death sentence for Mr. Goode. Dr. Miller was the first person I called to tell the news. We were both in shock. I knew how important Dr. Miller's testimony was. Had it not been for her, Mr. Goode would still be awaiting execution.

Forensic evidence is now a hot topic, so the timing of Dr. Miller's new laboratory manual couldn't be more appropriate, and it is much needed. Folks in all walks of life are eager to learn about forensic science and how to correct the problems that were addressed in the NAS report that found a current system with "serious deficiencies."

When Dr. Miller co-authored her first book with Dr. Henry Lee, she wrote this in my copy in August 2001:

This book was partially inspired by you. You are the "dream" defense attorney who knows how crime scene investigation, physical evidence, and forensic science are supposed to work in our criminal justice system. Thank you for giving me the inspiration and "keeping the faith" in the system.

How ironic to read those words, I thought. Besides feeling humbled by her words, I had actually grown tired of challenging the evidence without results. I was in fact losing faith in the system and wondered why I ever left working in a laboratory in New York City for 12 years to ultimately attend Georgetown law school in the mid-80s. As a new lawyer then, I imagined the court system was fair and that "scientists" testified to the facts as scientists, not as advocates. In other words, they did their testing and reported the results: no hiding of evidence, no stretching the truth, no talk about invisible blood. That was my experience. It wasn't until I was cross-examining a state expert in a heroin case in the Washington, D.C. superior court that I realized forensic scientists overstated their findings in some cases or stated results without any support. The eye opener for me came during

that case, when I asked the analyst if she was guessing that the evidence was heroin and after pausing for a moment, she stated: "It's an educated guess." From that day on, I knew not to take as gospel words from state experts as they opined about scientific results.

Dr. Miller has been a determined advocate for making sure science is not twisted in a classroom or a courtroom to merely advance the wishes of a party to a lawsuit. She is an advocate for the evidence, plain and simple. I am thrilled to know that the next generation of students will have easy access to such comprehensive materials. Dr. Miller's laboratory manual teaches the importance of implementing and strengthening rigorous scientific procedures to produce valid results because, simply stated, that is good science.

Because of its hands-on quality, I am certain this manual will become a go-to authority for everyone taking courses in forensics. They will learn from actual crime scene investigations what will enable them to decisively examine and solve problems. They will learn the importance of proper documentation and how contamination plagues the forensics community and what can be done to avoid it. They will gain the principal knowledge necessary for most scientific crime scene investigation courses or training.

Dr. Miller's extensive experience as a forensic chemist, an instructor, a lecturer, a professor, an author, and a winner of many awards in her field makes her uniquely qualified to write this manual. I look forward to seeing it on the desks of everyone interested in advocating for the evidence.

*Diane MB Savage, J.D.*  
President, North Carolina Attorneys for Science and Technology (NCAST)

# Acknowledgements

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How does a crime scene investigator get practice before being faced with a real case? How can I give a student a “real-life” experience in a classroom?

This laboratory manual that attempts to address these questions represents a project that I have worked on for the better part of 19 years as an educator and 14 years as a forensic scientist responding to crime scenes.

Many thanks to Virginia Commonwealth University for having the foresight to establish the best forensic science program in the United States—okay...the world. The graduate and undergraduate Forensic Science Programs in the College of Humanities and Sciences at VCU are both FEPAC accredited, and that is a significant accomplishment. Thanks to VCU, the College, and the Department for allowing me the sabbatical time to write this manual. Special thanks to Dr. Michelle Peace for backing this project 100% without any doubts and Dr. Tracey Dawson Cruz for acknowledging and pushing me to take the sabbatical. Also, thanks to Julissa Armstrong Snell for covering my classes. The amazing original artwork was prepared by Allyson Parrott.

Any long-term project must have support at home. Paula, thanks for the support and the occasional push.

Finally, a thank you to the thousands of former and current students, my kids, who are the reason I really like going to work each day and want to do the best I job I can.

EXERCISE

A

# Defining a Crime Scene

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*The use and limitations of various definitions used to describe a crime scene and its physical evidence.*

## Objective

To apply the various definitions to a sample crime scene by recognition of a variety of types of physical evidence found in the scene.

The site of criminal activity is the traditional definition of a crime scene. This definition allows the crime scene investigator to anticipate the presence of physical evidence, but offers no assistance or help in describing what types of evidence might be present. A definition based on physical evidence anticipation can be constraining in that it may inadvertently cause an investigator to miss crucial, unanticipated evidence. Definitions of this type include defining a scene based on evidence size (macroscopic or microscopic), type of crime (shooting, stabbing, beating, sexual assault, etc.), or type of evidence (blood, drugs, explosives, etc.). Crime scenes can also be defined based on location (inside, outside, underwater, in cars, etc.). This offers clues to accessibility, but offers no assistance with physical evidence anticipation. The determination of sequence can often be useful as a definition, especially for investigative or reconstruction purposes.



FIGURE A.1 Crime scene to define.

All these definitions can be used for investigations of a wide variety of crime scenes. They can assist with anticipation of supplies or equipment that might be needed at the scene. They give clues to assist the investigators in their preparations for specific types of “difficult” evidence that may be present. The practical use of the definitions is that a thoughtful, science-based crime scene investigator will need to be prepared to apply all definitions to any possible crime scene.

This exercise will provide you with an image of a crime scene. You will be asked to define the crime scene based on the various definitions. There will be advantages and disadvantages to each definition as it is applied to the crime scene illustrated. See [Figure A.1](#).

## LABORATORY DATA SHEET

Definition Type	Definition Identifiers	Advantages	Disadvantages
Traditional			
Physical Evidence Types Present			
Physical Evidence Sizes Present			
Physical Evidence Type of Crime			
Location			
Sequence			

