

Student Handbook
Master of Science in Forensic Science Program
Cedar Crest College
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Approval Page

Lawrence Quarino

Lawrence Quarino, Ph.D.
Director of Forensic Science Program

6-8-10

Date

Kim Spiezia

Kim Spiezia, Ph.D.
Dean of Graduate Studies

6.7.10

Date

Preface

Welcome to Cedar Crest College. We are pleased that you have chosen Cedar Crest College to pursue a Master of Science in Forensic Science. Your acceptance into the program means that we believe that you can make a valuable contribution to the program and that you have the knowledge and skills to succeed.

The demand for forensic science services has continued to grow since the advent of forensic DNA testing in the late 1980s. The success of DNA technology in solving cold cases, identifying perpetrators of crime through DNA databases, and overturning wrongful convictions, has galvanized political leaders and criminal justice professionals into supplying the resources for infrastructure, capital expenditures, and yearly operating costs for maintaining the current demand for forensic services. As a result of the impact of forensic DNA testing on the criminal justice system, other areas of forensic science are beginning to attract interest. Particularly within the private sector, new technologies in areas such as biometrics and drug testing are becoming available. Although the country has met the challenge of creating better technologies and constructing new laboratories, there is a shortage of intellectual capital needed to staff forensic science positions. Properly educated scientists are needed not only to fill new positions but also to fill existing position due to retirement and turnover. As a result of greater scrutiny of forensic science work by the legal community and the onslaught of accreditation mandates from the professional community, a better educated scientist is needed and desired by laboratory staffing personnel. We hope that this program will help meet that need.

The goals and objectives of this program can be found on page 6 of this handbook. This program is not geared toward any one particular discipline in forensic science. Although specialization is the order of the day among forensic science practitioners, the program is taught from a generalist perspective. Given that physical evidence can take an endless array of forms, we strongly believe that a knowledge base in all the requisite forensic science disciplines is important for the practitioner. A forensic biologist, for example, should never anticipate that biological evidence will be devoid of trace or pattern evidence. In practice, an item of physical evidence is likely to contain probative information in a variety of forms, whether it is physical, biological or chemical. Furthermore, we believe that there are certain philosophical tenets that are common to all forensic science disciplines and that forensic science is a separate and unique science. We do not subscribe to the idea that forensic science is simply an “applied science”.

We believe the program differs from most others of its kind due to the emphasis this program places on research and developing leadership qualities in students. We believe that there is no better way to develop scientists than by placing research as the foundation for the program. It is also our hope that this program will prepare you not only for a career in forensic science but to inspire you toward leadership positions in the field as well. Given the pertinent role that Forensic Science now plays in the criminal justice system, the development of future leaders is necessary for the field to continue to fulfill its professional mandate.

Again welcome to Cedar Crest College. We look forward to having you as a student.

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Mission Statement

Cedar Crest College is a liberal arts college for women dedicated to the education of the next generation of leaders. Cedar Crest College educates the whole student, preparing women for life in a global community.

Philosophy of Graduate Education

Building upon the college's tradition of teaching excellence, graduate education at Cedar Crest aspires to provide students with the expertise, judgment, vision, and inspiration to participate actively and responsibly within the diverse communities and dynamic knowledge networks wherein their professional lives will unfold. Institutionally, this commitment rests upon four values which serve as the foundation for the college's philosophy of graduate education:

Scholarship: Graduate programs should ensure that students master the theoretical perspectives, methodological techniques, and professional practices essential to the production of knowledge within their disciplines. This includes exposing students to an expanded definition of scholarship, which moves beyond the traditional emphasis upon discovery to include the integration, application and dissemination of knowledge within and across disciplines.

Innovation: Graduate programs should ensure that students recognize the role that creativity, and the entrepreneurial spirit more generally, plays as a catalyst for the advancement of knowledge. While programs should acknowledge the value of risk-taking as an inherent element of scholarly practice, students also should learn that professional conduct must be tempered by an ethic of responsibility for the communities within which they live, work and learn.

Collaboration: Graduate programs should ensure that students understand how the revolution in information technology is profoundly altering the nature of professional practice by empowering epistemic communities from around the world to respond to issues of local, national and global significance. Programs should equip students with the communications and technological skills needed to collaborate within the context of transnational and interdisciplinary networks that serve as sites for the production, application and dissemination of knowledge.

Professionalism: Graduate programs should impress upon students that graduate school itself is but the prelude to a lifetime of ongoing professional development. Faculty should convey this message by modeling professional practices within the context of an active research agenda and other forms of scholarly activity which contribute to the production, dissemination and application of knowledge within and across disciplines. Similarly, the college should demonstrate its commitment to educational leadership by providing academic programs, faculty, and the graduate community more generally, with the institutional support needed to sustain high levels of academic achievement in the face of evolving professional, societal, and global standards.

Program mission statement

To teach and continually emphasize forensic science foundational principles in all aspects of instruction to students who have a solid background in the natural sciences to help produce a future generation of competent, credible and ethical forensic scientists.

Program educational goals and objectives

After completing the Masters of Science Program in Forensic Science students will:

1. *Have the necessary theoretical and practical background in all the primary areas of Criminalistics for a career in Forensic Science. These topics include crime scene reconstruction, pattern analysis, microscopy, forensic molecular biology, and forensic chemistry.*
2. *Have an understanding of proper expert witness courtroom testimony and have demonstrated the ability to provide testimony.*
3. *Know the value of professional ethics as guidelines for professional conduct and the personal characteristics expected of professionals in the Forensic Science community. Graduates will also be knowledgeable of professional codes of ethics outlined by various professional forensic science organizations.*
4. *Understand the value of research in forensic science and demonstrate the ability to be research scientists.*
5. *Know the necessity of good oral and written communication skills for Forensic Science professionals and show proficiency in both.*
6. *Realize the importance of aspiring to leadership positions in forensic science research, administration, and public policy.*

Administration of the program

The program will have a Program Director who in consultation with an Advisory Committee (made up of 4 full and 2 half-time faculty in the Program) will determine academic policy. Prior to implementation, the Dean of Graduate Studies must approve all academic policy decisions.

New course proposals must be approved by the Graduate Programs Committee, which will also serve in an advisory capacity to the program.

Admission to the program

The minimal admission criteria for the program are outlined below:

1. B.S. degree in a natural or forensic science (or its equivalent coursework in a relevant field).
2. A minimum cumulative GPA of 3.0.
3. Completion of the GRE General Test.
4. Two letters of recommendations from individuals who can attest to the candidate's scientific ability.

The following coursework is recommended at the undergraduate level:

1. Two semesters of general (freshman) chemistry and two semesters of organic chemistry.
2. Two semesters of calculus (differential and integral preferred).
5. Two semesters of physics.
6. Two semesters of general (freshman) biology.

The courses listed must be suitable for an undergraduate science curriculum.

Students from institutions other than Cedar Crest under consideration for admission may be asked to undergo a successful interview with members of the forensic science faculty before acceptance into the program. Results of the GRE General Test will be used as a comparative parameter between candidates.

Although it is recognized that some students may not finish the designed program in the desired two-year time frame, it is not designed to be a part-time program. Students wishing to enter the program part-time will be considered but must complete the program in the required time frame (see *maximum period of candidacy*).

The Program Director and the Advisory Committee will make all admissions decisions.

Matriculation

Students are matriculated into the program once they have registered for classes during their first semester of academic study.

Requirements for continued matriculation and completion of program

Students must repeat any course they receive a grade of C. No more than 3 grades of C are allowed in different classes and no single course can be repeated more than once. Accumulation of 4 grades of C and receiving a grade of C in the same class twice will result in dismissal from the program. All classes must be completed with at least a B-. Students receiving a grade of F in any course will automatically be dismissed from the program.

Grades and grade points

A = 4.0

A- = 3.7

B+ = 3.3

B = 3.0

B- = 2.7

C = 2.0

F = 0.0

W = 0.0 (withdrawal)

I = Incomplete

Acceptance of thesis

The thesis component of the program is not completed until all three members of the student's thesis committee approve the final draft of the thesis. This approval is noted by the signatures of each member of the committee on the Approval Page of the thesis. Once approved, a minimum of three copies of the thesis will be bound (the Program Director is responsible for the binding of the thesis). One bound copy will be sent to the library, one to the primary reader, and one to the student.

Maximum period of candidacy

Unless compelling and exigent reasons exist, students must complete the program in three academic years beginning from the semester of matriculation. Requests for a waiver of the maximum period of candidacy must be made in writing to the Director and approved by both the Director and the Dean of Graduate Studies. Such requests must clearly explain the reason(s) for the extension. Unless a waiver is granted, a student will be dropped from the program after the maximum period of candidacy has expired.

Transfer credit policy

Students entering the program may transfer up to 6 credits of coursework. The transferred coursework, however, must be equivalent to courses listed in the curriculum and must have been completed within ten years of the date of enrollment in the program (the first day of classes of a student's first academic year). Once matriculated in the program, students will not receive any credit for coursework taken at another institution.

Course withdrawal policy and leaves of absence

Students wishing to take a leave of absence from the program may request to do so in writing to the Director of the program. The granting of the requested leave is at the discretion of the Program Director and Advisory Board pending approval from the Dean of Graduate Studies. The time frame associated with a leave of absence is not counted in the three years necessary to complete the program.

Students can withdraw from no more than 2 courses during any one semester. The final day for withdrawal will be two weeks from the last day of classes. If students need to withdraw from more than 2 courses during any semester for any reason, they should request a leave of absence from the Director.

Students receiving an incomplete for a course must complete the course in the required timeframe as determined by the College. Students failing to complete the course in the required timeframe will receive a grade of F in the course.

Refund policy for course withdrawals

Please consult the College Catalog for a complete description of the refund policy.

Reinstatement

If a student has been dismissed from the program for any reason, no future application will be considered. Students coming back from a leave of absence will be reinstated into the program and will continue at the point where they left off.

Program requirements

First year

The curriculum is a two-year program including summer (although it is possible that some students who have completed the undergraduate forensic science program at Cedar Crest College to complete the program in one-year). A student's academic program will be determined on a case-by-case basis and may not be the same for every student. In general, year one will consist of completing undergraduate prerequisites, the writing of a thesis proposal, and the selection of a thesis committee. Depending on a student's background, some graduate courses may be taken in the first year. The writing of the thesis proposal and the selection of the thesis committee will occur in the 2-credit Thesis Prospectus course (FSC 500) which is offered during the spring semester. The thesis committee will consist of a primary mentor and two other individuals. All members of the thesis committee must have at a minimum a master's degree. The primary mentor must be a member of the Cedar Crest College faculty and the second reader must be external to the Forensic Science Program and the Department of Chemical and Physical Sciences. The selection of the second reader may, for instance, be a faculty member from another department at Cedar Crest College, a faculty member from another institution, or a forensic science practitioner. The role of the second reader is to provide the student with technical guidance in consultation with the primary reader. The third reader must be a faculty member from the Cedar Crest College Forensic Science Program who will perform an administrative review of the thesis. The composition of the thesis committee must be approved by the Advisory Committee.

Undergraduate prerequisites include three advanced natural science courses, one statistics course, and subject matter in forensic science, which are necessary for success in the program. The advanced natural science courses include Biochemistry, Genetics,

and Instrumental Analysis. Students accepted into the program without these courses must register for these courses at the undergraduate level during the first year. In addition, students will need background in crime scene reconstruction, pattern evidence, trace evidence analysis, microscopy, and forensic biology. Students without sufficient undergraduate background in any of these areas will also be asked to register for undergraduate courses offering this background during the first year.

Summer Term

Students will be required to perform the bulk of their master's thesis research during the summer between the first and second year. Research can be performed on campus or at an external laboratory (requires prior approval from the Program Director and Advisory Committee). Cedar Crest offers two summer sessions and students will be required to register for both sessions in the following format:

Summer Session I

FSC 501 Forensic Science Research I (4 credits)

Summer Session II

FSC 502 Forensic Science Research II (4 credits)

During the second year Graduate Seminar courses, each student will be required to present a one-hour seminar on the results of their research. However, the seminar will only be conducted with the approval of the primary mentor. Students requiring additional time to prepare for the seminar may do so as long as they do not exceed the required timeframe for completion of the degree. A committee of faculty is responsible for writing a review of the seminar and providing a grade to the instructor of the Graduate Seminar. Students will also be required to write a thesis during the second year. The progress of the thesis writing will be monitored during the seminar courses. Students requiring additional time to complete the thesis may do so as long as they do not exceed the required timeframe for completion of the degree.

The thesis component of the program represents the Capstone experience for the program and supports the goals and objectives of the program. Thesis and seminar presentation guidelines are given in the Appendix.

Second year

In addition to completing the writing of the thesis, the second year of the curriculum will consist of completing the remainder of required coursework. Students must submit the first draft of their thesis to their primary mentor by **February 1**. In order to guarantee graduation, students must have their primary mentor and their second reader sign off on the thesis by **April 15**. *The March 1 and April 15 deadlines can be modified at the discretion of the primary mentor as long as the student has been made aware of the change in deadline prior to the beginning of the academic year.* Students fulfilling

curricular requirements for the degree must complete the following fall semester, winter session, and spring semester courses.

Fall Semester

| <i>Course #</i> | <i>Course Title</i> | <i>Credit Hours</i> |
|-----------------|-------------------------------------|---------------------|
| FSC 503 | Graduate Seminar I | 1 |
| FSC 505 | Separations Chemistry | 2 |
| FSC 506 | Analytical Spectroscopy | 2 |
| FSC 508 | Forensic Toxicology | 3 |
| FSC 510 | Recent Advances in Forensic Biology | 3 |
| FSC 515 | Advanced Forensic Pattern Analysis | 2 |

Winter Session

| <i>Course #</i> | <i>Course Title</i> | <i>Credit Hours</i> |
|-----------------|-------------------------------------|---------------------|
| FSC 509 | Advanced Crime Scene Reconstruction | 1 |

Spring Semester

| <i>Course #</i> | <i>Course Title</i> | <i>Credit Hours</i> |
|-----------------|---|---------------------|
| FSC 504 | Graduate Seminar II | 1 |
| FSC 507 | Forensic Chemistry | 3 |
| FSC 511 | Molecular Biology | 3 |
| FSC 512 | Forensic Science Administration | 2 |
| FSC 513 | Advanced Microscopy | 3 |
| FSC 514 | Legal and Ethical Issues in the Forensic Sciences | 2 |

In addition, students will be required to register for 1 credit of continuing research in both semesters under FSC 599 in the academic year immediately after summer research.

Forty graduate credits (beyond the undergraduate prerequisites) are needed for completion of the degree. The breakdown of credits is as follows:

FSC 500 (Thesis Prospectus) – 2 credits

| | |
|---------------------------------------|------------|
| Research (Summer and Academic Year) - | 10 credits |
| Required Coursework - | 28 credits |

Course descriptions

FSC 500 Thesis Prospectus

An introduction to scholarly and research manuscript writing, forensic science literature, and documentation styles and techniques. Discussion will center on current research trends within the forensic science community. Each student will write a thesis proposal by the end of the semester and select a thesis committee.

Prerequisites: Acceptance into the master's program in forensic science and completion of or taking concurrently all undergraduate prerequisites.

FSC 501 Forensic Science Research I

First-half of laboratory research in forensic science subject areas. Data generated from research will form the basis of a master's thesis needed for degree completion.

Prerequisites: Successful completion of FSC 500.

FSC 502 Forensic Science Research II

Second-half of laboratory research in forensic science subject areas. Data generated from research will form the basis of a master's thesis needed for degree completion.

Prerequisites: Successful completion of FSC 500 and FSC 501.

FSC 503 Graduate Seminar I

A lecture series involving presentations from students on their master's thesis research and from invited speakers. Student progress toward the completion of the master's thesis is monitored.

Prerequisites: Successful completion of FSC 500, FSC 501 and FSC 502.

FSC 504 Graduate Seminar II

A lecture series involving presentations from students on their master's thesis research and from invited speakers. Student progress toward the completion of the master's thesis is monitored.

Prerequisites: Successful completion of FSC 500, FSC 501, FSC 502 and FSC 503.

FSC 505 Separations Chemistry

An advanced study of the various types of separation methods used in chemistry with attention to specific types of applications to forensic evidence and modern methods of forensic chemical analysis. This course will challenge and advance the students understanding of the analytical separation methods and analyses of forensic science from a fundamental, chemical perspective. Students will learn from a scientific analytical perspective the theoretical and practical aspects in the concepts of separating analytes in forensic evidence. Topics will be presented to include modern separation methods, concepts, and techniques such as sample preparation techniques, extraction methods such as liquid-liquid, solid-phase, and micro-extraction, precipitation separations, ion-exchange separations, electrochemical and gravimetric separation methods, and chromatographic separations such as gas chromatography, liquid chromatography, supercritical fluid and capillary electrophoresis.

Prerequisites: Completion of undergraduate prerequisites for the program.

FSC 506 Advanced Analytical Spectroscopy

An advanced study of the various types of spectroscopy methods used in chemistry with attention to specific types of applications to forensic evidence and modern methods of forensic chemical analysis. This course will challenge and advance the students understanding of the analytical spectroscopy methods and analyses of forensic science from a fundamental, chemical perspective. Students will learn from a scientific analytical perspective the theoretical and practical aspects in the concepts of analyzing specific analytes in forensic evidence through spectroscopy. Topics will be presented to include modern spectroscopy methods, concepts, and techniques such as molecular spectroscopy, ultraviolet spectroscopy, infrared spectroscopy, mass spectrometry (MS), atomic emission spectroscopy, atomic MS, atomic X-Ray spectrometry, inductively coupled plasma (ICP), ICP/MS, Raman spectroscopy, and surface characterization by spectroscopy.

Prerequisites: Completion of undergraduate prerequisites for the program.

FSC 507 Forensic Chemistry

A study of the chemistry of certain types of forensic evidence and modern methods of forensic chemical analysis. This course will challenge and advance the students understanding of the analytical methods and analyses of forensic science from a fundamental, chemical perspective. Students will learn from a scientific analytical perspective the analysis of materials such as drugs, glass, paints and plastics, fire debris, explosives, fibers and other types of physical evidence. The student will learn the meaning and significance of analytical data from a fundamental approach. Topics will be presented to include modern reactions, concepts, techniques and instrumentation such as chromatography, infrared spectroscopy, and ultraviolet spectroscopy.

Prerequisites: Completion of undergraduate prerequisites for the program.

FSC 508 Forensic Toxicology

The course will introduce students to principles and methods in the area of forensic toxicology. The course will introduce pharmacological and toxicological principles as they pertain to commonly encountered abused and toxic substances. Discussions will focus on the toxicants, their mechanism of action, post-mortem characteristics, methods of collection and methods of preservation and analysis. The course will review basic concepts of analytical chemistry as it applies to drug and body fluid analyses. Specific methods for the analysis of alcohol, barbiturates, benzodiazepines, opioids, cocaine, marijuana, amphetamines, and hallucinogens will be presented.

Prerequisites: Completion of undergraduate prerequisites for the program.

FSC 509 Advanced Crime Scene Reconstruction

There are various types of analysis a forensic scientist might perform when reconstructing a crime scene, all of which depend on the type of analysis that may be needed in a particular case. For example, reconstruction of violent crimes such as homicides often involves advanced techniques such as bloodstain pattern analysis (BPA) which may be accomplished by direct scene examination and/or scene photographs in conjunction with examination of clothing and weapons from the scene. Knowledge of BPA is also crucial to analysts choosing bloodstains from clothing and other items submitted to crime laboratories for serological and DNA testing. Training and experience are essential to properly reconstruct a crime scene. This course will begin with an introduction to basic crime scene investigation as it relates to crime scene reconstruction followed by an in-depth study of specialized techniques such as bloodstain pattern analysis, bullet trajectory analysis, and motor vehicle accident reconstruction. Students will then use this knowledge in hands-on exercises dealing with many of these topics. The course will end with a discussion on report writing and courtroom testimony of reconstruction cases.

Prerequisites: Completion of undergraduate prerequisites for the program.

FSC 510 Recent Advances in Forensic Biology

An advanced forensic biology course that will deal primarily with newer techniques used in body fluid stain identification, DNA extraction, DNA quantitation, PCR, and genotyping. Emphasis will be placed on state-of-the-art technologies and their application to common forensic biological issues such as degradation, sensitivity, specificity, and variation in sample type. Advanced DNA topics including SNPs, microbial DNA, Y-STRs, mitochondrial DNA, and plant and animal DNA will also be discussed. The course will also focus on population statistics used in forensic DNA analysis with an emphasis on statistical interpretation of mixtures.

Prerequisites: Completion of undergraduate prerequisites for the program.

FSC 511 Molecular Biology

The course begins with an examination of basic molecular biology including the structure of DNA, methodology of DNA replication, regulation of gene expression, and consequences of DNA mutations. The use of recombinant DNA and its applications in the study of human genetics will be explored as well as the impact of biotechnology on society.

Prerequisites: Completion of undergraduate prerequisites for the program.

FSC 512 Forensic Science Administration

Theoretical and practical applications of forensic science laboratory management. Scenarios of actual issues confronted by forensic science laboratory managers will be discussed as well as economic and business considerations in the administration of a forensic science laboratory. Discussion will also include prioritizing resource allocation, management of personnel, forensic science laboratory facility issues, building relationships with outside agencies, leadership in a crime laboratory, and crisis response.

Prerequisites: Completion of undergraduate prerequisites for the program.

FSC 513 Advanced Microscopy

An advanced study in the theory and practical application of microscopy methods. The course will focus on polarized light, stereo-, phase contrast, fluorescence, and scanning electron microscopy. Emphasis will be placed on spectroscopic methods that can be interfaced with microscopy such as micro-FTIR, microspectrophotometry and x-ray microanalysis. Additionally, digital imaging and photomicrography will be discussed. Each student will separate and identify components of a general unknown using microscopic techniques discussed in the course.

Prerequisites: Completion of undergraduate prerequisites for the program.

FSC 514 Legal and Ethical Issues in the Forensic Sciences

The role that a forensic scientist plays in the litigation process will be discussed. Students will learn the appropriate guidelines for professionalism and conduct in expert witnessing. All students will participate in a moot court exercise. The course will also address standards of reliability and relevance of scientific evidence in court and the distinction between good science, bad science and junk science. Legal rules regarding the search and seizure of physical evidence and the development and application of professional codes of ethic will also be discussed.

Prerequisites: Open to students in their last semester of academic study or permission of instructor.

FSC 515 Advanced Forensic Pattern Analysis

This course will concentrate on mathematical methods of analysis of various types of forensic pattern evidence including fingerprints, footwear impressions, tiremarks, and fired bullets and cartridges. The student will be exposed to (1.) digital imaging theory, (2.) data preprocessing and exploitation methodologies (e.g. principle component analysis, frequency filtering, etc.), and (3.) classical and post-classical decision metrics. Basic digital image processing (DIP) and algorithm development will also be discussed.

Prerequisites: Completion of undergraduate prerequisites for the program.

FSC 599 Continuing Research

Continuation of summer thesis research into the academic year.

Prerequisites: FSC 500, 501 and 502.

Advising

Students coming into the program will be asked to attend an orientation prior to their first semester of academic study. During this time, each student will be assigned an academic advisor who will be a member of the Forensic Science program faculty. Students are required to meet with their faculty advisor prior to registering each semester.

Tuition and fees

Fee Assessment

Application fee (non-refundable).....\$50

Graduate Tuition per credit: \$627

Deposit (non-refundable) due upon acceptance to the program

(The deposit is credited toward the tuition cost for the first term) \$500

Thesis Fee (non-refundable) \$300

Prerequisite courses that are required for

the Master of Science in Forensic Science Program. per credit: \$795

Student Activity Fee..... per semester: \$10

Technology Fee.....\$100

Note to Fee Structure: The College reserves the right to change fees and charges when necessary. Books, supplies, lab materials and other program costs are not included in the tuition

Financial aid

Students accepted to the program may apply for graduate level federal Stafford Loans. Student can contact the Financial Aid Office at 610-740-3770 for information.

Graduate assistantships

Graduate assistantships are designed to promote the educational goals and objectives of the masters program by providing students with opportunities to actively participate in a range of instructional and research activities which serve to promote mastery of knowledge in the field of forensic science. To this end, graduate assistants are placed with individual forensic science faculty and are expected to work a minimum of 10 hours per week. Duties of a graduate assistant may include:

1. The development of new laboratory exercises for undergraduate forensic science students.
2. Assisting faculty in the instruction of undergraduate coursework laboratories as well as help in the assessment of student performance in the laboratories.
3. Serve, as a lecturer or primary lab instructor in the event that assigned faculty is absent.
4. Provide background information in the form of literature searches for faculty projects.
5. Assist in the implementation and development of workshops for the Forensic Science Training Institute as well as other professional activities associated with the Forensic Science Program.

Students wishing to apply for a graduate assistantship may do so as part of the admissions process or can apply directly through the Program Director. To be eligible to receive an assistantship, a student must:

1. Students must be taking a minimum of 9 credits during each semester of the academic year they are applying for the assistantship.
2. Have completed all undergraduate prerequisites for the master's program.
3. Successfully interview with the faculty member with whom the student will be placed.

Assistantships are awarded on a per semester basis and recipients are selected on a competitive basis by the Program Director in consultation with the faculty to whom graduate assistants will be assigned. The number of assistantships available in any academic year and the stipend to be awarded to each graduate assistant is determined by the Program Director in consultation with the Dean of Graduate Studies and the Provost. The decision of the Program Director in regard to award recipients is final and is not subject to appeal.

Program resources

Student research and laboratory coursework are performed in a variety of laboratories available to students in the forensic science program. In January 2005, two brand new state-of-art laboratories were opened. In addition to existing crime scene reconstruction and forensic science research laboratories, students in the forensic science program have more than adequate laboratory space for coursework and research. Students also have use of several computer labs on campus including the Allen Center for Nutrition Computer Lab located in the Miller portion of the Science Center. In addition, the Forensic Science Program has the following instrumentation available for student use:

Chromatography/Spectroscopy

Atomic Absorption - Buck Scientific ACCUSYS 211 Atomic Absorption Spectrophotometer
Fluorimetry - Turner Quantech Digital Filter Fluorometer; Hitachi F2500 Fluorometer
Fourier Transform Infrared Spectroscopy - Nicolet Impact 410 FTIR; Perkin Elmer 1600 Series FTIR
SensIR IlluminatIR (micro-FTIR)
Gas Chromatography - Hewlett Packard 5890A GC; Buck Scientific 310
GC/MS - Agilent Technologies 6890N Network GC System/5973 Network Mass Selective Detector
High Performance Liquid Chromatograph - Buck Scientific BLC-20 HPLC; Waters 490 HPLC
LC/MS/MS - Applied Biosystems 3200 Q Trap
Mass Spectrometer- Finnigan INCOS 50 Mass Spectrometer
Near Infrared Spectroscopy – Foss 6500 Near IR Spectrometer
Nuclear Magnetic Resonance - Varian EM-390, 90-mHz, CW NMR Spectrometer
Pyrolysis GC/MS - CDS Pyroprobe 5000
UV/Visible Spectrophotometry - Beckman Coulter DU 800 Spectrophotometer
Cecil 2041 UV/Vis Spectrophotometer
Unicam Helios Alpha UV/Vis Spectrophotometer

Biology/DNA Analysis

310 Capillary Electrophoresis Genetic Analyzer
Real-time PCR - Corbett Rotor-Gene 6000 Real-Time Rotary Analyzer
Thermal Cyclers – Applied Biosystems Veriti, Perkin Elmer 2700, Perkin Elmer 2720
Immunoassay Technology - BioRad ImmunoWash Model 1575; BioRad Microplate Reader 680

Microscopy

Fluorescence Microscopy - Leica DM1000 Fluorescent Light Microscope
Polarized Light Microscopy - Leica DMEP Polarizing Light Microscopes
Stereoscopes – Fisher, Leica, & Omega Stereomicroscopes
Scanning Electron Microscopy (SEM-EDS) - Philips XL-20 Scanning Electron Microscope w/EDS

Crime Scene/Photography

Sirchie Electrostatic Dust Print Lifter
Digital Cameras - Fuji IS Pro IR/UV; Nikon D70; Nikon D200

The program also has excellent forensic science resources in the Cedar Crest College Cressman Library. The library now has over 250 hard copies of books with forensic science subject matter. In addition, the Library carries subscriptions to 8 forensic science journals and several other journals of forensic science interest. The Library also has purchased FORENSICnetBase which contains on-line copies of many forensic science textbooks from CRC Press.

Student complaints, appeals and due process

A student who has a disagreement with a faculty member about an academic matter should first attempt to resolve the matter through discussion with the instructor. If the issue is not resolved satisfactorily between the student and the instructor, the student may specify in writing the basis for the disagreement and request a review by the Program Director. If the issue is an appeal of the final grade received in a course, this request must be submitted within three months of the date that term grades are issued by the Registrar.

A student who wishes to appeal the decision of the Program Director must write to the Dean of Graduate Studies within a month of the date of the Program Director's decision, enclosing copies of the written documents and requesting a review. The Dean of Graduate Studies, in consultation with the Program Director, will arrive at a final decision in the matter.

The Program Director and the Dean of Graduate Studies will each act within one month during the academic year of receiving a written student request pertaining to the matter. If the instructor is no longer employed by the College, the Program Director is empowered to act in his or her behalf.

Specific complaints regarding non-academic matters should be made in writing and sent to the Director. The Director will address the complaint in writing to the student. Both the original complaint and response will be sent to the Dean of Graduate Studies. A copy of the original complaint and response will also be kept in the Director's office. If the student is not satisfied with the Director's resolution of the complaint, the student is advised to appeal in writing to the Dean of Graduate Studies. Any correspondence between the student and Dean of Graduate Studies will be documented and kept in the Dean's Office.

Personal, academic, and professional characteristics

Students in the program are required to read Section I of the TWGED (technical working group on education) document titled, "*Qualifications for a Career in Forensic Science*" (see Appendix). Section I of the document details the personal, academic, and professional characteristics needed for the model candidate for a career in forensic science. Students wishing to enter a career in forensic science should strive to achieve and maintain these standards. If it is proven that a student in the forensic science program has engaged in behavior contrary to these standards (for instance, illegal drug use), the Director of the Forensic Science Program at his discretion may recommend to the Dean of Graduate Studies that the student not be allowed to continue in the program.

In 2001, the Technical Working Group on Education and Training in Forensic Science (TWGED) was created by the Department of Justice and West Virginia University to develop models for training and education in forensic science. The planning panel for this organization brought together a diverse group of individuals from various disciplines in the forensic sciences with the common thread that each member has a stake in the future of education and training in the forensic sciences. The group consisted of laboratory directors, educators, and trainers and produced a document addressing

qualifications for a career in forensic science, undergraduate curriculum in forensic science, graduate education in forensic science, and training and continuing education. Guidelines were recommended for each category and have become the basis for accreditation of educational programs in the forensic sciences through the Forensic Science Education Programs Accreditation Commission (FEPAC). The undergraduate Forensic Science Program at Cedar Crest College is FEPAC accredited.

The TWGED document states, “A model candidate for all forensic science practices should have personal integrity. Because forensic science is part of the criminal justice system, personal honesty, integrity, and scientific objectivity are paramount” (www.aafs.org/pdf/NIJReport.pdf). In this spirit, deliberate violations of the Cedar Crest College Honor Code by students in the program cannot be tolerated. If a student is found guilty of an Honor Code Violation by any professor, the Director of the Forensic Science Program at his discretion may recommend to the Dean of Graduate Studies that the student not be allowed to continue in the program.

It is also expected that when program students represent Cedar Crest College at professional events both on and off campus, that they will do so in a professional manner. At such events, students must be professionally dressed (business casual will usually suffice) with no display of piercings (with the exception of the lobe of the ear) or tattoos. Conduct must also be consistent with that expected of a professional.

Cedar Crest College Honor Code

The Cedar Crest Honor Code Philosophy states that students shall uphold community standards for academic and social behavior in order to preserve a learning environment dedicated to personal and academic excellence. Individuals who accept the honor of membership in the Cedar Crest College community of scholars pledge to accept responsibility for their actions and the effect their actions may have on other members of the College community.

Housing facilities

Campus housing is available to female students on a first-come, first-serve basis. Those students interested in campus housing should contact the Director of Residence Life at 610-606-4666, ext. 3351.

Professional organizations

Student memberships are available with the national forensic science organization, the American Academy of Forensic Sciences. Applications for membership are available through the Director of the program or on-line at www.AAFS.org and all students are encouraged to apply.

Students are also encouraged to attend the annual meeting of the American Academy of Forensic Sciences held every February as well as the annual meeting of the applicable regional professional organizations, the Northeastern Association of Forensic Scientists (NEAFS) and the Mid-Atlantic Association of Forensic Scientists (MAAFS).

NEAFS has their annual meeting in the fall and MAAFS holds their annual meeting in the spring.

Intellectual property rights

It is the policy of Cedar Crest College to create an environment that encourages the generation of new knowledge by faculty, staff, and students, and facilitates the transfer of useful inventions and writings to society. To motivate the development and dissemination of intellectual property, the College seeks to ensure that the creators receive proper credit and financial rewards for their work.

For purposes of this policy the term intellectual property includes any patentable invention, any copyrightable subject matter, or valuable technology. It also includes works of art, inventions or creations that might normally be developed on a propriety basis because copyright or patent protection is not available. This policy applies to any full-time or part-time student, regardless of whether the student receives financial aid from the College or from outside sources.

A student retains all rights to intellectual property created solely by herself. This includes rights to articles, and other writings of which the intended purpose is to disseminate the results of student research or scholarly work. A student also retains all rights to popular nonfiction, novels, poems, musical works, dramatic works including any accompanying music, pantomimes and choreographic works, pictorial, graphic and sculptural works, motion pictures and other similar audio-visual works, and sound recordings. The use of College owned computers and other facilities in the preparation of such works does not alter this provision, though other College policies may limit such use or require reimbursement to the College.

In cases where the College provides funding or facilities for a particular student research project that are in excess of those normally available to students working in that area, the College may choose to act as a sponsor for that research and therefore own the rights of such property. Where student research is subject to an agreement between an external sponsor and the College that restricts the disposition of rights to intellectual property, the rights will be handled in accordance with that agreement. If a student is employed by the College specifically for the purpose of working as a research assistant, the College retains the rights of such property.

Issues not covered by any of the above provisions are subject to the policies which apply to the intellectual property rights of faculty and staff at the College.

APPENDIX

Preparation of Master's Thesis

Guidelines are a modification of the manuscript format used by the Journal of Forensic Sciences made suitable for use in a thesis.

Print out the manuscript on white 24 lb. bond paper, 8 1/2 X 11 inches, with 1 inch margins. Use double-spacing in all areas containing text. All text must be fully justified. Single-spacing may be used in the Title and Approval Pages, in individual entries in lists (i.e. Table of Contents), and in the legends of tables and diagrams. Number pages consecutively, beginning with the Approval Page. Small Roman numerals are to be used in manuscript components before the Introduction. Arabic numerals will begin on page 1 of the Introduction. All page numbers will be placed in the center at the bottom of each page. Unless otherwise designated, text must be in Times New Roman and 12 point.

Each manuscript component should begin on a new page, in the following sequence: title page, approval page, abstract and key words, acknowledgments, table of contents, list of tables, list of diagrams, introduction, survey of literature, material and methods, results (including statistics), discussion of results, significance of study and future considerations, references, and appendices.

Title Page

The title page should carry: (a) the title of the thesis in all capitalized letters (*center justified and bold*); (b) first name, middle initial, and last name of the author, with highest academic degree; (c) the following language:

A thesis submitted to the Graduate Faculty in Forensic Science in partial fulfillment of the requirements for the degree of Master of Science, Cedar Crest College. (*center justified and bold*)

(d) the year the thesis was approved.

All letters should be 14 point.

An example of a Title Page is provided.

**DETECTION OF MALE DNA AT EXTENDED POST-COITAL
INTERVALS WITH Y CHROMOSOME SHORT TANDEM
REPEATS**

by

Janine M. Kishbaugh, B.S.

**A thesis submitted to the Graduate Faculty in partial fulfillment of the
requirements for the degree of Master of Science, Cedar Crest College.**

2009

Approval Page

The approval page should begin the title of thesis (center justified, bold capital letters, 14 point) with the following language:

This manuscript has been read and accepted by the Graduate Faculty in Forensic Science in satisfaction of the thesis requirement for the degree of Master of Science. (*center justified, bold capital letters, 14 point*)

After this statement, signatures with date signifying the approval of the thesis must be placed. The order of signatures is as follows: student's primary mentor, second reader, and third reader. Below the signatures, Cedar Crest College must be typed in bold capital letters. An example of an Approval Page is provided.

**DETECTION OF MALE DNA AT EXTENDED POST-COITAL
INTERVALS WITH Y CHROMOSOME SHORT TANDEM
REPEATS**

by

Janine M. Kishbaugh, B.S.

**This manuscript has been read and accepted by the Graduate Faculty in
Forensic Science in satisfaction of the thesis requirement for the degree
of Master of Science.**

Lawrence Quarino, Ph.D.
Primary Mentor

Date

Pasquale Buffolino, Ph.D.
Second Reader

Date

K. Joy Karnas, Ph.D.
Third Reader

Date

CEDAR CREST COLLEGE

Abstract and Key Words

The abstract should be between 300 and 500 words. The abstract should briefly state the purposes of the study or investigation, basic procedures (selection of study subjects; observational and analytical methods), main findings (give specific data and their statistical significance, if possible), and the principal conclusions. Emphasis should be placed on new and important aspects of the study or observations.

Below the abstract, and identified as such, 3 to 10 key words or short phrases must be placed in bold. The first key word is forensic science; the second and subsequent words should properly categorize the work in increasing order of specificity. Frequently, the second key word represents a subfield of forensic science, e.g. forensic anthropology, forensic pathology, or DNA typing. In manuscripts on DNA typing, every locus involved in the study should be listed as a separate key word. Do not use abbreviations for key words, e.g., polymerase chain reaction, not PCR; gas chromatography-mass spectrometry, not GC-MS.

Acknowledgments

The Acknowledgements section should include specific contributions that individuals make to the completion of the thesis. Acknowledgements can be given to individuals who provide technical and research assistance but they can also be personal in nature.

Acknowledgements of financial support should appear as footnotes to the title of the paper on the Title Page.

Table of Contents

Individual sections of the text should be identified in bold capitalized Roman numerals with the corresponding page number the section begins on. An example is provided:

V. Materials and Methods.....p. 53

Subsections of individual manuscript components should be indented and listed with capitalized letters beginning with A and in italics. Additional subsections will be further indented and listed with Arabic numerals in normal font followed by subsections with small Roman numerals. Only the first letter of the first word in all subsections should be capitalized unless required to do so. An example is provided:

| | |
|--------------------------------------|--------------|
| V. Materials and Methods..... | p. 53 |
| <i>A. Spectroscopic methods.....</i> | <i>p. 55</i> |
| 1. Mass spectroscopy..... | p. 56 |
| 2. Infrared spectroscopy..... | p. 65 |
| i. Analysis of spectra..... | p. 65 |

Formatting of titles in the text of the thesis should be consistent with the Table of Contents.

The first entry in the Table of Contents is the List of Tables (listed as I.; page number is a small Roman numeral). Students may find the use of the Microsoft Table of Contents Formatting Tool helpful in preparing the Table of Contents.

List of Tables (I)

A list of tables will be placed after the Table of Contents to provide accessible reference to the reader. Tables are listed in the order they appear in the thesis in the following format:

Table 1a – Distribution of SE33 alleles in a Caucasian Database
from the Lehigh Valley Section of Pennsylvania.....p. 16

Tables placed in the appendix must also be listed.

List of Diagrams (II)

In similar fashion, a list of diagrams (including graphs) will be placed after the List of Tables to provide accessible reference to the reader and are listed in the order they appear in the text. Diagrams placed in the appendix must also be listed.

Introduction (III)

Clearly state the purpose and the objectives of the thesis. Summarize the rationale for the study.

Survey of Literature (IV)

An exhaustive literature search of all previous work relevant to the topic of the study must be provided. Citations should include data and conclusions from the work being reported.

Material and Methods (V)

Describe your selection of the observational or experimental subjects clearly. Identify the methods, apparatus (manufacturer's name and address in parentheses), and procedures in sufficient detail to allow other workers to reproduce the results. Give references to established methods, including statistical methods (see below); provide references and brief descriptions for methods that have been published but are not well known; describe new or substantially modified methods, give reasons for using them, and evaluate their limitations. Generally avoid the overuse of subheadings in the Methods section. Describe the methods and materials in narrative style, not in the style of a laboratory procedure handout.

Results (VI)

Present your results in logical sequence in the text, tables, and figures. Explanations of tables and figures should be provided in the text.

Describe statistical methods with enough detail to enable a knowledgeable reader with access to the original data to verify the reported results. When possible, quantify findings and present them with appropriate indicators of measurement error or uncertainty (such as confidence intervals). Also, provide data for significance testing where appropriate and state whether populations are normal or non-parametric.

Give details about randomization of samples. Describe the methods for and success of any blinding of observations. Report sample complications. Give numbers of observations. Report losses to observation (such as dropouts from an experimental trial or identification of outlier or spurious data). References for study design and statistical methods should be to standard works (with pages stated) when possible rather than to papers in which the designs or methods were originally reported. Specify any general-use computer programs used.

When data are summarized in the Results section, specify the statistical methods used to analyze them. Where appropriate, present statistical analysis in tables. Define statistical terms, abbreviations, and most symbols.

Tables

Number tables with Arabic numerals consecutively in the order of their first citation in the text and supply a brief title for each. Tables should be placed in the document contiguous to their mention in the text. Give each column a short or abbreviated heading at the top of the table. Place explanatory matter in footnotes, not in the heading. Explain in footnotes all nonstandard abbreviations that are used in each table. For footnotes use the following symbols, in this sequence: *, †, ‡, §, ¶, **, ††, ‡‡.

Identify statistical measures of variations such as standard deviation and standard error of the mean. Be sure each table is cited in the text.

Figures

Figures (including graphs) should be computer generated. Figures should be numbered consecutively (in Arabic numerals) according to the order in which they have been first cited in the text. Figures should be placed in the document contiguous to their mention in the text. If a figure has been published, reference the original source. Each figure must be titled at the top of the figure. Letters, numbers, and symbols should be clear and even throughout. Axes on graphs must be clearly labeled with proper units of measurement. All detailed explanations including the title are placed below the base of the figure. Legends can be incorporated below the figure if appropriate. Xerox copies of figures and dot-matrix printer generated figures (including spectra, chromatograms, etc.) are not acceptable.

When symbols, arrows, numbers, or letters are used to identify parts of the illustrations, identify and explain each one clearly in the legend. Explain the internal scale and identify the method of staining in photomicrographs.

Units of Measurement

Measurements of length, height, weight, and volume should be reported in metric units (meter, kilogram, or liter) or their decimal multiples. Temperatures should be given in degrees Celsius.

Abbreviations and Symbols

Terms and nomenclature in all disciplines should be in accordance with the current standards and lists approved or adopted by appropriate national or international committees or organizations, such as the International Anatomical Nomenclature Committee, I.U.P.A.C., I.U.B., the Enzyme Commission, the Committee on International Standardization of Gene Nomenclature (ISGN), etc.

Use only standard abbreviations. Generally, avoid abbreviations in the title, abstract and key words. The full term for which an abbreviation stands should precede its first use in text unless it is a standard unit of measurement. Liter(s) is abbreviated L, not l. Micro should be abbreviated with u.

Discussion of Results (VII)

Provide scientific interpretation of results including statistical interpretation. Provide experimental support for conclusion. Do not repeat in detail data or other material given in the Results section

Significance of Study and Future Considerations (VIII)

Emphasize the new and important aspects of the study and the conclusions that follow from them. Include the implications of the findings and their limitations, including implications for future research. Relate the observations to other relevant studies. Link the conclusions with the goals of the study but avoid unqualified statements and conclusions not completely supported by your data. Avoid alluding to work that has not been completed. State new hypotheses when warranted, but clearly label them as such. Recommendations for future study, when appropriate, may be included.

References (IX)

The heading of the reference list should be "References," and it should contain only published or in-press references cited by number in the text. Published abstracts (duly noted as being abstracts), printed manufacturers' protocols or instructions, and internet URLs may be validly cited as references. Personal communications and submitted

manuscripts may be cited only if it is essential and a published or in-press reference is not available.

Number references consecutively in the order in which they are first mentioned in the text. Identify references in tables, and legends by Arabic numerals. References cited only in tables or legends should be numbered in accordance with a sequence established by the first identification in the text of the particular table or figure. Within the text, tables, or figures, cite references by Arabic numeral in parentheses. Within the reference list, number the references 1., 2., 3., etc.

References in the reference list should be in accord with Uniform Requirements for Biomedical Journals style. This style is based with slight modifications on the formats used by the U.S. National Library of Medicine in Index Medicus. The titles of journals should be abbreviated according to the style used in Index Medicus.

Examples of correct forms of references are given below.

Articles in Journals

1) **Standard journal article** (List all authors, but if the number exceeds six, give six followed by et al.)

You CH, Lee KY, Chey RY, Menguy R. Electrogastrographic study of patients with unexplained nausea, bloating and vomiting. *Scand J Gastroenterol* 1980 Aug;79(2):311-4.

As an option, if a journal carries continuous pagination throughout a volume, the month and issue number may be omitted.

You CH, Lee KY, Chey RY, Menguy R. Electrogastrographic study of patients with unexplained nausea, bloating and vomiting. *Scand J Gastroenterol* 1980;79:311-4.

Goate AM, Haynes AR, Owen MJ, Farrall M, James LA, Lai LY et al. Predisposing locus for Alzheimer's disease on chromosome 21. *Lancet* 1989;1:352-5.

2) **Organization as author**

The Royal Marsden Hospital Bone-Marrow Transplantation Team. Failure of syngeneic bone-marrow graft without preconditioning in post-hepatitis marrow aplasia. *Lancet* 1977;2:742-4.

3) **No author given**

Coffee drinking and cancer of the pancreas [editorial]. *BMJ* 1981;283:628.

4) **Article not in English**

Massone L, Borghi S, Pestarino A, Piccini R, Gambini G. Localisations palmaires purpuriques de la dermatite herpétiforme. *Ann Dermatol Vénéréol* 1987;114:1545-7.

5) Volume with supplement

Magni F, Rossoni G, Berti F. BN-52021 protects guinea-pig from heart anaphylaxis. *Pharmacol Res Commun* 1988;20 Suppl 5:75-8.

6) Issue with supplement

Gardos G, Cole JO, Haskell D, Marby D, Paine SS, Moore R. The natural history of tardive dyskinesia. *J Clin Psychopharmacol* 1988;8(4 Suppl):31S-37S.

7) Volume with part

Hanly C. Metaphysics and innateness: a psychoanalytic perspective. *Int J Psychoanal* 1988;69(Pt 3):389-99.

8) Issue with part

Edwards L, Meyskens F, Levine N. Effect of oral isotretinoin on dysplastic nevi. *J Am Acad Dermatol* 1989;20(2 Pt 1):257-60.

9) Issue with no volume

Baumeister AA. Origins and control of stereotyped movements. *Monogr Am Assoc Ment Defic* 1978;(3):353-84.

10) No issue or volume

Danoek K. Skiing in and through the history of medicine. *Nord Medicinhist Arsb* 1982;86-100.

11) Pagination in Roman numerals

Ronne Y. Ansvarsfallen Blodtransfusion till fel patient. *Vardfacket* 1989;13:XXXVI-XXVII.

12) Type of article indicated as needed

Spargo PM, Manners JM. DDAVP and open heart surgery [letter]. *Anaesthesia* 1989;44:363-4.

13) Article containing retraction

Shishido A. Retraction notice. Effect of platinum compounds on murine lymphocyte mitogenesis [Retraction of Alsabti EA, Ghalib ON, Salem MN. In: Jpn J Med Sci Biol 1979;32:53-65]. Jpn J Med Sci Biol 1980;33:235-7.

14) Article retracted

Alsabti EA, Ghalib ON, Sale MN. Effect of platinum compounds on murine lymphocyte mitogenesis [Retracted by Shishido A. In: Jpn J Med Sci Biol 1980;33:235-7]. Jpn J Med Sci Biol 1979;32:53-65.

15) Article containing comment

Piccoli A, Bossatti A. Early steroid therapy in IgA neuropathy: still an open question [comment] Nephron 1989;51:289-91. Comment on: Nephron 1988;48:12-7.

16) Article commented on

Kobayashi Y, Fujii K, Hiki Y, Tateno S, Kurokawa A, Kamiyama M. Steroid therapy in IgA neuropathy: a retrospective study in heavy proteinuric cases [see comments]. Nephron 1988;48:12-7. Comment in: Nephron 1989;51:289-91.

17) Article with published erratum

Schofield A. The CAGE questionnaire and psychological health [published erratum appears in Br J Addict 1989;84:701]. Br J Addict 1988;83:761-4.

Books and Other Monographs

18) Personal author(s)

Colson JH, Armour WJ. Sports injuries and their treatment. 2nd rev. ed. London: S. Paul, 1986.

19) Editor(s), compiler as author

Diener HC, Wilkinson M, editors. Drug-induced headache. New York: Springer-Verlag, 1988.

20) Organization as author and publisher

Virginia Law Foundation. The medical and legal implications of AIDS. Charlottesville: The Foundation, 1987.

21) Chapters in a book

Weinstein L, Swartz MN. Pathologic properties of invading microorganisms. In: Sodeman WA Jr, Sodeman WA, editors. Pathologic physiology: mechanisms of disease. Philadelphia: Saunders, 1974;457-72.

22) Conference proceedings

Vivian VL, editor. Child abuse and neglect: a medical community response. Proceedings of the First AMA National Conference on Child Abuse and Neglect; 1984 Mar 30-31; Chicago. Chicago: American Medical Association, 1985.

23) Conference paper

Harley NH. Comparing radon daughter dosimetric and risk models. In: Gammage RB, Kaye SV, editors. Indoor air and human health. Proceedings of the Seventh Life Sciences Symposium; 1984 Oct 29-31; Knoxville (TN). Chelsea (MI): Lewis, 1985;69-78.

24) Scientific or technical report

Akutsu T. Total heart replacement device. Bethesda (MD): National Institutes of Health, National Heart and Lung Institute; 1974 Apr. Report No.: NIH-NHLI-691 218514.

25) Dissertation

Youssef NM. School adjustment of children with congenital heart disease [dissertation]. Pittsburgh (PA): Univ. of Pittsburgh, 1988.

26) Patent

Harred JF, Knight AR, McIntyre JS, inventors. Dow Chemical Company, assignee. Epoxidation process. US patent 3,654,317. 972 Apr 4.

Other Published Material

27) Newspaper article

Rensberger B, Specter B. CFCs may be destroyed by natural process. The Washington Post 1989 Aug 7; Sect. A:2 (col. 5).

28) Audiovisual

AIDS epidemic: the physician's role [videorecording]. Cleveland (OH): Academy of Medicine of Cleveland, 1987.

29) Computer file

Renal system [computer program]. MS-DOS version. Edwardsville (KS): MediSim, 1988.

30) World Wide Web address or URL

<http://www.uocf.edu/pharmacy/depts/drugdose/barbitutuates/index.html>.

31) Legal material

Toxic Substances Control Act: Hearing on S. 776 Before the Subcomm. on the Environment of the Senate Comm. on Commerce. 94th Cong., 1st Sess. 343 (1975).

32) Map

Scotland [topographic map]. Washington: National Geographic Society (US), 1981.

33) Book of the Bible

Ruth 3:1-18. The Holy Bible. Authorized King James version. New York: Oxford Univ. Press, 1972.

34) Dictionary and similar references

Ectasia. Dorland's illustrated medical dictionary. 27th ed. Philadelphia: Saunders, 1988;527.

35) Classical material

The Winter's Tale: act 5, scene 1, lines 13-16. The complete works of William Shakespeare. London: Rex, 1973.

Unpublished Material

36) In press

Lillywhite HD, Donald JA. Pulmonary blood flow regulation aquatic snake. Science. In press.

Appendix (X)

Tables and graphs of raw data too large or not necessary to place in the body of thesis can be placed in an appendix. All tables and graphs placed in the appendix must be clearly referenced to data contained within the body of the thesis. Multiple appendices may be assembled and designated as Appendix A, B, C,....

Guidelines for Projection of Seminar Presentation

1. Dark background and light text give good contrast and show up well in a darkened room. Avoid color combinations such as red and blue, yellow and green, etc.
2. Times New Roman is the recommended font style.
3. Do not use a font below 24 pt.
4. Limit a frame to a single idea or point.
5. Do not crowd the frame. Limit the number of text lines per frame to a maximum of seven.
6. Use simple graphs and illustrations with a minimum of captions. Avoid using thin lines, dots, dashes, or other specialty lines unless they are very bold and black.

Guidelines for Format of Seminar Presentation

Students should prepare a 60-minute presentation. References should be placed on slides at the point when they are discussed in the presentation. The presentation should follow the following outline:

1. Title slide
2. Introduction

The Introduction should include the goals and objectives of the study. The introduction should explain the purpose of the study and why it is important to forensic science. Students should allocate 5 minutes for this section.

3. Survey of Literature

Students should allocate 10 minutes to discuss all previous published work that provided background for the study. A history of the topic should be provided as well as how the current study will contribute to the body of knowledge in the subject area.

4. Methods

Students should discuss the methods, instrumentation and procedures used in the study without excess detail. Students should treat the audience in a manner similar to a scientific meeting and assume that the listeners are familiar with typical scientific techniques and procedures. Explaining a method in detail is only needed if it is novel and it is reasonable to conclude that it is not familiar to the audience. Students should allocate 10 minutes for this section.

5. Data Analysis and Discussion

Data should be presented in graphs or chart when possible. Tabulated data is often hard to read and difficult to follow and should be avoided if possible. If the presentation

of tabulated data is necessary (such as in the case of some statistical testing), descriptive values (e.g. mean, confidence intervals, levels of significance) should only be given. Students should explain in detail all methods of data analysis (including statistical analysis) and any conclusions that can be drawn. Students should plan on spending 25 minutes on this section.

6. Significance of Study and Future Considerations

Students should allocate 10 minutes discussing the significance of the study. Discussion should focus on a comparison with past work and how the current study extends and contributes to the subject area. The future impact of the study can be addressed and future areas of research identified.

7. Acknowledgements

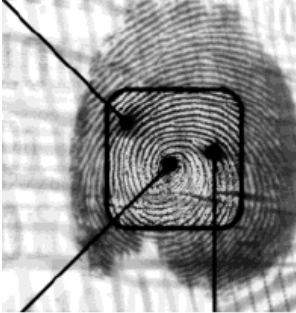
Students should include one slide acknowledging specific contributions that individuals made to the completion of the thesis. Acknowledgements can be given to individuals who provided technical and research assistance but they can also be personal in nature.

Evaluation of Seminar

A committee of faculty will provide a written review and a numerical grade which will be provided to yourself and the instructor of the seminar. The review will be partitioned into the following categories:

- A. Professionalism (maximum 20 points)
- B. Presentation (maximum 20 points)
- C. Data Interpretation (maximum 20 points)
- D. Ability to Answer Questions (maximum 20 points)
- E. Overall Evaluation (maximum 20 points)

Qualifications for a Career in Forensic Science



Introduction

Forensic science plays a crucial role in the criminal justice system. As an applied science, it requires a strong foundation in the natural sciences and the development of practical skills in the application of these sciences to a particular discipline. A forensic scientist must be capable of integrating knowledge and skills in the examination, analysis, interpretation, reporting, and testimonial support of physical evidence. A properly designed forensic science program should address these needs and strengthen the student's knowledge, skills, and abilities in these areas. A combination of education and practical training can prepare an individual for a career in forensic science.

Most of the Nation's practicing forensic scientists are employed in **crime laboratories** associated with law enforcement or other government agencies. Forensic scientists come to the profession with diverse undergraduate science degrees. They also may go on to earn graduate degrees. This document contains suggestions for model programs in forensic science at both the undergraduate and graduate levels. A combination of personal, professional, and academic criteria will influence a prospective forensic science examiner's suitability for employment.

Government entities' hiring processes are driven by civil service regulations or collective bargaining agreements that are specific to the branch of government, State, or locality. Private laboratories have their own

hiring processes. The hiring process may include written and practical tests, phone interviews, and one-on-one personal interviews or interviews conducted by a panel. New employees may be hired provisionally or go through a probationary period. **Provisional employment** offers may be revoked either before or after reporting for duty.

Model Candidate

A model candidate for all forensic science practices possesses personal integrity, holds a baccalaureate degree (at a minimum) in the natural sciences, and has additional KSAs that fulfill the recommendations set forth in this *Guide*.

Personal characteristics

Because forensic science is part of the criminal justice system, personal honesty, integrity, and scientific objectivity are paramount. Those seeking careers in this field should be aware that background checks similar to those required for law enforcement officers are likely to be a condition of employment. The following may be conducted and/or reviewed before an employment offer is made and may remain as ongoing conditions of employment (this list is not all inclusive):

- Drug tests.
- History of drug use.
- Criminal history.

www.aafs.org/pdf/NIJReport.pdf

- **Personal associations.**
- Polygraph examination.
- Driving record.
- Past work performance.
- Credit history.
- Medical or physical examination.

Personal candor in these areas is critical. In addition, an individual's history of community service and outside activities may also be considered.

Academic qualifications

Forensic scientists need to have a strong fundamental background in the natural sciences. For example, new hires who analyze drugs, DNA, trace, and toxicological evidence in forensic science laboratories typically have a degree in chemistry, biochemistry, biology, or forensic science from an accredited institution. Although forensic scientists involved in the recognition and comparison of patterns (such as latent prints, firearms, and questioned documents) historically may not have been required to have a degree, the trend in the field is to strengthen the academic requirements for these disciplines and require a baccalaureate degree, preferably in a science. The academic qualifications required for some of the emerging disciplines, such as digital evidence, are currently being defined and will be published by the appropriate groups. Achieving the appropriate academic qualifications is discussed in greater detail later in this *Guide*.

Copies of diplomas and formal academic transcripts are generally required as proof of academic qualification. Awards, publications, internships, and student activities may be used to differentiate applicants.

Claims in this regard are subject to verification through the background investigation process.

Professional skills

A variety of skills are essential to an individual's effectiveness as a forensic science professional, including:

- Critical thinking (quantitative reasoning and problem solving).
- Decisionmaking.
- Good laboratory practices.
- Awareness of laboratory safety.
- Observation and attention to detail.
- Computer proficiency.
- Interpersonal skills.
- Public speaking.
- Oral and written communication.
- Time management.
- Prioritization of tasks.

For some of these skills, systematic tools are available that may be used to measure skill or proficiency at or after the time of hire.

Model Career Path for Forensic Scientists

A model career path for a forensic scientist begins with formal education and continues with training, postgraduate education, certification, and professional membership. Exhibit 1 depicts stages of a career path in forensic science.