**The Field of Forensic Science**

The word “forensic” means “pertaining to the law”; forensic science resolves legal issues by applying scientific principles to them. Forensic scientists perform comprehensive chemical and

physical analyses on evidence gathered at crime scenes. Their work is often instrumental in apprehending and convicting criminals.

“Who did what to whom, when?” This question is at the heart of many legal proceedings. Over the past 150 years, forensic scientists have developed several methods to identify persons from physical evidence left behind at a crime scene:

**Hair**: With a microscope, it’s possible to get some indication of age, sex, and race from hair.

**Bone**: Age, sex, race, and sometimes medical history can be determined from bones.

**Fingerprints**: Introduced in the late 1800s. Now widely used.

**Footprints**: For years the U.S. Air Force recorded the footprints of its pilots and other aircrew members before they began their flying careers. Because it is protected by a boot, the foot is more likely to be intact after an airplane crash than the fingers are.

**Blood**: It can help eliminate suspects. But, with only four possibilities per person (A, B, O, AB), there are many cases in which blood typing data is not helpful

Current DNA technology allows any individual to be distinguished from all other individuals, living or dead (except identical twins). DNA can be recovered from blood, semen, saliva, bone, teeth, or microscopic flecks of skin or other tissues. A cigarette butt causally discarded at a crime scene has enough DNA-containing saliva on it for analysis. So does the postage stamp or the flap of the envelope you just licked. A single hair with attached root is also adequate.

Because DNA analysis identifies individuals with such a great degree of accuracy, the FBI launched CODIS (**Co**mbined **D**NA **I**ndex **S**ystem), a database that contains the DNA derscription of over 250,000 convicted felons. Uses of “DNA Fingerprinting” include:

**1**. Identifying potential suspects from crime scene.

**2**. To exonerate persons **wrongly accused** of crimes. The Innocent Project has exonerated many convicted criminals (many off of death row).

**3**. Use of DNA forensic science in military matters. Use of DNA to **identify** victims of war, plane crashes, and other catastrophes (bodies that are fragmented or decomposed).

**4**. Family matters. By comparing DNA samples from offspring to DNA samples from suspected parents, paternity and maternity can be established. This method is not only used to identify the correct father in paternity cases, but also in cases of hospital mix- ups of newborn babies.

**The following are comments made by** [**Dale Nute**](http://mailer.fsu.edu/%7Ecrimdo/cr-ta-nute.html)**, Adjunct Faculty,** [**School of Criminology & Criminal Justice,**](http://www.criminology.fsu.edu)[**Florida State University**](http://www.fsu.edu/)

One thing that many young people don’t realize is, if you have a criminal record, you have virtually no chance of getting a job as a forensic scientist. You see, forensic scientists work in the justice system.  For example, if you get busted for drugs you usually can forget it.  Life ain't fair!  There are lots of good jobs that overlook youthful indiscretions but the justice system does not.

It all begins with what you want to do. There are six general areas of practice:

[medical examiner](http://www.criminology.fsu.edu/faculty/nute/FScareers.html#ME), [crime laboratory analyst,](http://www.criminology.fsu.edu/faculty/nute/FScareers.html#lab) [crime scene examiner](http://www.criminology.fsu.edu/faculty/nute/FScareers.html#cs), [forensic engineer,](http://www.criminology.fsu.edu/faculty/nute/FScareers.html#eng)academic assistance (psychology- including [psychological profilers](http://www.criminology.fsu.edu/faculty/nute/FScareers.html#psy), statistics), and technical assistance (computer analyst, polygraph, composite drawing).

**Medical Examiner** - The highest pay but you have to be able to handle cutting up dead bodies, 7+ years of college (the medical examiner requires a medical degree), and uncertain work hours.  Although there are routine protocols, the ingenious ways people kill people create sufficient variety to combat boredom and provide a problem-solving challenge.  Select a residency that provides a forensic emphasis. A chemistry or biology degree at the undergraduate level is a good major. As an undergraduate you should take any crime detection & investigation courses as one of your electives, as you will not have an opportunity for these types of courses in medical school.

**Crime Laboratory Analyst** -  Reasonably good pay and you generally work indoors with relatively stable work hours and relatively clean samples but the cases are often quite repetitive and routine. The microanalysis section probably provides the most variety but currently it is being phased out or scaled down in most crime laboratories.  The crime laboratory usually requires a bachelor's degree in a natural science for any of the specialties. The best degree overall is **chemistry**. If you are interested in DNA testing, then **biology** with genetics and biochemistry is required. If you are interested in trace evidence examination, good electives for the chemistry degree include optical mineralogy, microbiology, botany and textile courses. You should, of course, take some crime detection & investigation course as electives. Occasionally evidence is encountered that requires other specialties, such as **entomology (insects)**, **anthropology (the study of man, context,** [**cross-cultural comparisons**](http://en.wikipedia.org/wiki/Cross-cultural_studies)**),** **zoology** **(animals),** and **botany (plants)**. These areas may be adequate to obtain employment but do not expect to work exclusively in the specialty as not even a large laboratory receives enough evidence in those areas to fill an individual's time.  One combination that would probably get you a job in a crime lab would be a major that contained sufficient background to do both forensic archeology and DNA on the samples recovered.

**Forensic Engineer -** You will deal with traffic accidents, fire investigations, and a variety of wrongful injury cases. The work is much like that of the crime scene examiner but with fewer bodies and better hours and generally much higher pay.  You earn that pay by the degree you obtain.  The forensic engineer requires an engineering degree. The usual specialties include electrical engineering, mechanical engineering, civil engineering, materials engineering and traffic engineering.

**Crime Scene Examiner** - You will work whenever and wherever crime occurs, indoors or outdoors, day or night, and have to be able to deal with dead bodies and other messy situations but there certainly is a lot less routine.  The pay is not great but few folk voluntarily leave a crime scene section for other duties.  The intellectual challenge is still there and the scientific basis of the field is developing.  Some tasks will become more routine and more sophisticated but overall it could be an exciting time for the next decade.  The **crime scene examiner** should have a bachelor's degree either in a natural science with emphasis in law enforcement and crime scene processing or a criminal justice degree with emphasis in natural science. Currently some state agencies have such a requirement and I believe that most agencies soon will. Forensic **archeology** would be excellent preparation.

The **psychologist, social** **scientist** and **statistician** generally are in some academic setting and apply their specialty to an investigation or trial on a part-time basis. Psychological profilers, however, are becoming more involved with investigations on a full-time basis. **Technical analysts** usually are attached to an investigative unit and generally work in a lab-like environment but respond similarly to crime scene personnel. If you are interested in **psychological profiling**, my understanding is that those agencies hiring profilers actually want an investigator / crime scene analyst / psychologist. This means almost a double major in psychology and criminal justice and experience as an investigator.  Although the academic part could be accomplished with a major in psychology and a minor in criminology, it could better be accomplished with a psychology undergraduate degree and a criminology master's with electives in psychology. Electives at the undergraduate level should include crime scene processing and the crime detection and investigation course as these are not available at the graduate level. The criminology emphasis should be in law enforcement and forensic science.    
    Recognize that there are a very, very *limited* number of jobs available in profiling and none of them involve visions as portrayed on TV.  Rather they include science and statistics.  Right now you either better like straight criminal investigation &/or crime scene analysis and use your knowledge of psychology to enhance them, or look for another career. One school that you might check out for more information about a graduate degree is John Jay University in New York City.

I do not recommend taking a forensic science major at the undergraduate level because the trend appears to be in the graduate direction. For example, Michigan State University, one of the premier traditional schools in forensic science, dropped its undergraduate degree a couple of years ago. In my opinion, there are two reasons. One, the emphasis in forensic science is first on the science and then on the forensics. You hardly have time in four years to get a decent grounding in science. Two, the undergraduate degree is not fair to the student. If the job market for forensic scientists is weak, you will have trouble getting a job with a chemical firm with a forensic science degree. **On the other hand**, if you have a traditional **chemistry degree**, you can always get a job in a crime laboratory if they are available. And, if none are available, you are more likely to get a decent job somewhere and can then move into a forensic science career when crime laboratory jobs are more plentiful.  This is not a criticism of undergraduate forensic science programs.  Most of them produce students better qualified to be chemists than a straight chemistry degree but personnel officers do not think, they only follow their hiring manual and forensic science is not in it while chemistry is.

**Examples of courses that are available at Florida University:**

**Required Criminology Courses** Criminology (3)  
 Law Enforcement (3)  
 Courts (3)  
 Corrections (3)

**Recommended Criminology Courses** Crime Detection and Investigation (3)  
 Crime Scene Investigation (3)   
 Legal Aspects of Law Enforcement (3)  
 Internship in Criminology (15) (Intern in a crime scene unit for a semester)

**Elective Criminology Courses** (2 of the following courses)  
 Human Behavior  
 Criminal and Delinquent Behavior  
 Female Crime and Delinquency  
 Minorities, Crime and Social Policy  
 Substantive Criminal Law  
 Individual Rights and the Criminal Justice System  
 Police Problems and Practices

**Recommended Mathematics and Science Courses** (Some of these may be used as requirements for Liberal Studies)  
 Precalculus Algebra  
 Statistics through Example   
 General Chemistry  
 Introductory Biology  
 Introductory Physics  
 Introduction to Archaeology  
 Reasoning and Critical Thinking  
 Engineering Graphics

Computer-Aided Engineering Graphics   
 Modeling, Rendering and Animation (at TCC)

**Elective Mathematics and Science Courses**   
 Analytic Trigonometry (2)  
 Introduction to Philosophy of Science (3)   
 Physical Geology (lab) (4)  
 Plant Diversity (2)  
 Animal Diversity (2)  
 Human Physiology (3)  
 Microbiology(5)  
 Introduction to Biochemistry (lab) (3)   
 Survey Organic Chemistry (lab) (4)  
 General Physical Chemistry (4)  
 Anthropological Fieldwork: Archaeology (9)  
 Anthropological Fieldwork: Underwater Archaeology (6)  
 Nature & Properties of Soil (3)

**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Block: \_\_\_\_\_\_\_**

**Questions on “The Field of Forensics”**

**1**. What does the word “Forensics “mean? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (**1 pt**)

**2**. What are 5 examples of physical evidence that are mentioned that may be left behind at a crime scene: (**5 pts**)

**1) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 2) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 3) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**4) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 5) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**

**3**. What are six types of DNA samples that can be recovered from a crime scene? (**3 pts**)

**1) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 2) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 3) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**4) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 5) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 6) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**4**. What does CODIS stand for? (**1 pt**) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**5**. What is CODIS? (**1 pt**)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**6**. What program has exonerated many convicted criminals off of death row? (**1 pt**)

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**7**. How is DNA used in war situations? (**1 pt**) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**8**. What is one of the ways that DNA is used in family matters? (**1 pt**) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**9**. Forensic scientists can get into one of six general areas of practice. List those six job titles.

(**3 pts**)

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**3) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 4) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**5) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 6) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**10.** What do the following scientists study?(**4 pts**)

**1) Entomologist: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_2) Zoologist: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**3) Botanist: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_4) Anthropologist: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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**11.** To “cover all your bases”, what **traditional** undergraduate major did [**Dale Nute**](http://mailer.fsu.edu/%7Ecrimdo/cr-ta-nute.html)recommend, instead of an undergraduate degree in Forensic science. You would be qualified to work other jobs, then if a job in a crime laboratory became available you would be super qualified. (**1 pt**)

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**13**. Many Florida State Forensic Science classes were listed?List 5 that seem interesting to you that you would like to take. (**5 pts**)

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**3) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 4) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**5) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**