CHAPTER 1

FORENSIC SCIENCE

> Problems may be solved in the study which have baffled all those who have sought a solution by the aid of their senses. To carry the art, however, to its highest pitch, it is necessary that the reasoner should be able to utilize all the facts which have come to his knowledge, and this in itself implies, as you readily see, a possession of all knowledge, which, even in these days of free education and encyclopaedias, is a somewhat rare accomplishment.
>
> —*Sherlock Holmes*, "The Five Orange Pips"

> Problems cannot be solved by the same level of thinking that created them.
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> —*Albert Einstein, genius*

"Forensic science," often shortened to "forensics," is the application of a broad spectrum of sciences to answer questions of interest to the legal system. It may be in relation to a crime or to a civil action.

Definition

"Forensics" is science of interest to the legal system. Surveyors and many title people deal with the system on a daily basis, as decisions and procedures must be in accordance with law. Science—instrumentation, radio waves, light waves, declination, soils, wood processes, astronomy, and many others—have their bases

in the sciences. Title examiners and investigators may deal with forensics in finding missing heirs, analyzing questionable documents, and collecting extrinsic evidence to explain the meaning of items in documents.

The term "forensics" is derived from the Latin *forensic* (meaning "public"), from *forum,* the principal meeting place in ancient Roman cities. This is where legal disputes were settled at that time. The modern equivalent is court. According to some, the word "forensics" is misused, since the politically correct term is "forensic science."

Forensic science usually is concerned with finding out what happened in the usually recent past.

History of Forensic Science

Forensic science may have begun back with Archimedes (287–212 BC). Legend has it that he cried "Eureka" (I have found it) when, as a result of examining the displacement of water, he proved that a crown was not made of gold due to its density and buoyancy.

The earliest known use of fingerprints to establish identity was during the seventh century, where a debtor's fingerprints, according to an Arabic merchant, were affixed to a bill of sale given to the lender. The bill then was proof of the debt.

The first written account of using medicine and entomology to solve (separate) criminal cases is attributed to the book *Xi Yuan Ji Lu* (translated as "Collected Cases of Injustice Rectified") written in China in 1248 by Song Ci (1186–1249). One of the accounts had to do with a murder with a sickle. All the farmers were told to bring their sickles to one place, and the one with the blood on it attracted flies, whereupon the murderer confessed. The book also contained advice on distinguishing drowning (water in the lungs) and strangulation (broken neck cartilage).

In sixteenth-century Europe, medical practitioners began to gather information on cause and manner of death. Surgeons documented the results of violent deaths and diseases on the human body. Writings on the topics appeared in the late 1770s.

TYPES OF FORENSIC SCIENCE

Some of better-known branches of forensic science are described next.

Definitions

Forensic Accounting. With regard to the legal system, concern is about money in cases such as fraud, embezzlement, and other misuses or identification of funds.

Forensic Anthropology. This area of anthropology concerns itself with the identification of human remains, which may lead to identification and cause of death.

Forensic Archaeology. Involving the application of archaeological methods, this branch seeks to recover human remains and interpret their spatial relationships.

Forensic Art. The application of scientific procedures to the identification of art forms and particularly paintings in cases of potential fraud.

Forensic Ballistics. Deals with the investigation of firearms and ammunition.

Forensic Botany. The understanding of the use of botanical evidence as evidence in the judicial system. Included are species identification, tree ages, wood fragment analysis, and the application of wood products to boundary identification.

Forensic Economics. The study and interpretation of evidence of economic damage, including present-day calculations of lost revenue: earnings, benefits, business, profits, and replacement costs.

Forensic Engineering. An extremely wide area including several branches of engineering, such as bioengineering and biomedical, chemical, civil, electrical, mechanical, and metallurgical engineering. It has application in both civil and criminal investigations. While accident investigation may sometimes fall under this category, forensic surveying providing locations of certain objects may also apply.

Forensic Entomology. Primarily, the identification of insects, their stages, and their role in solving crimes through observations on dead bodies. However, certain destructive evidence with regard to wood evidence may be helpful regarding its age or deterioration

Forensic Evidence. Scientific evidence from a scene, generally applied to a crime scene.

Forensic Geology. Concerned with geological information and techniques that may be of interest to the legal system.

Forensic Odontology. Also known as forensic dentistry, this field has to do with anything related to the teeth.

Forensic Palynology. The science of pollen and spore evidence useful in legal cases. It also includes legal information derived from the analysis of a broad range of microscopic organisms found in both fresh and marine environments, and may involve soil, dirt, or dust.

Forensic Pathology. This area has to do with medicine and primarily deals with the investigation of causes of sudden and unexpected death.

Forensic Photography. Sometimes referred to as *forensic imaging* or *crime scene photography*. The art of producing an accurate reproduction of a scene or an accident for the benefit of a court or preservation of evidence. It is part of the process of evidence collection.

Forensic Psychiatry. The assessment and evaluation of people who are involved in legal matters, either civil or criminal.

Forensic Psychology. The application of psychological findings to the legal system. Handwriting analysis and the formation of written legal documents may fall under this category (e.g., the interpretation of wills and possibly other documents).

Forensic Soil Science. Also known as *forensic pedology.* Involves information relative to the properties of soils and related materials having application to the legal system.

Forensic Taphonomy. Concerning environmental aspects to postmortem as well as occasionally other studies. It has to do with the history of the body after death.

Forensic Toxicology. The analysis of drugs and poisons, often postmortem.

Questioned Documents. The science of analyzing the authenticity of origin of a particular document. Handwriting analysis, examination of paper, inks and other aspects are of concern.

For purposes of this treatise, I add these definitions:

Forensic Surveying. While surveying is often considered a branch of engineering, particularly *civil* engineering, due mostly to the measurements aspect, there is far more to the field than numbers and their application. Property line location, which may be important regarding jurisdiction in a criminal case or location of items in an accident investigation, has its foundation in real property law. Wherever location or pattern is a concern, a survey can depict the spatial relationship of objects.

Forensic Title Examination. Examining title documents to find missing heirs, locate unrecorded instruments, decipher handwriting, interpret words and phrases, and study family relationships to compile or complete chains of title within the requirements of a set of standards.

Knowledge of the procedures utilized in these forensic areas can provide insight to investigating other fields of endeavor, including title examination and boundary retracement. Some of the tools and techniques are directly applicable.

This book is about finding the traces that can lead to the discovery of the truth about past events—specifically, past events that are of interest to the law. It is related to other sciences, such as history and archaeology, the aim of which is to discover the course of events that took place long ago. The time scale may be much shorter in forensic science, but the thought processes involved are much the same. *Finding a wooden stake that turns out to be marking a property corner is a matter of law. If placed in the recent past, it is a question of law and of survey; if placed 100 or more years ago, and if nothing or only traces are left, it is of historical interest as well.* Forensic science and history merge at the edges, for where one ends, the other begins. It should be borne in mind that forensic science has an applicability far beyond the area of the law, for its techniques and thought processes are widely used to interpret facts—the traces available to us—in other historical subjects. These traces are often our only clues to the past, so we must make the most of them, knowing that they could easily mislead us. Our task is not only to find these traces, but to interpret them correctly and to attribute to them their true significance.

In the words of Dr. Zakaria Erzinçlioglu "The techniques of forensic science are the techniques of reconstructing the past, whether that past is of legal interest or not." Deed research, whether for title examination or boundary research, physical evidence marking a property or property rights or interests, and genealogical studies all fall into that category. Many of these studies are, or may become, of legal interest.

Learn to Be a Good Investigator and a Successful Retracement Surveyor—Read Everything You Can Get Regarding Sherlock Holmes

Reading about Sherlock Holmes has never been easier: Books on tape, stories online, videotapes of movies in addition to the many reprints of the stories by Sir Arthur Conan Doyle and his followers are entertaining and instructive.

Study Selected Forensics Texts and Criminal Investigative Texts for Proper Procedures

A host of titles on many aspects of forensic science and investigations can be found by perusing the Internet. Some lend insight into recent high-profile cases, while others are highly technical in nature but offer instruction in techniques and considerations that must be made when investigating a scene. Dr. Henry C. Lee has numerous titles to his credit, along with a television program.

Watch Television

Mentally filter out the "Hollywood" aspect and concentrate on the thought processes, the team effort, the analysis of evidence, and the rules, especially for the protection and presentation of evidence in court. Keep in mind that on television cases are solved in an hour, while in real life they may take weeks, months, even years, to solve depending on the circumstances.

Attend Seminars

Seminars and short courses are offered by professional societies, seminar companies, and colleges and universities. Some are general while others are very specific and very technical. With little research you can find specialized courses in almost every aspect of forensic science.

Participate in Online Programs

Online programs contain more offerings almost by the day. While not necessarily advertised as forensic courses, many of them contain techniques that can be extremely useful.

Enroll in an Academic Program

Many college and universities now have two-year and four-year programs in forensic science. In addition, private institutions also offer training programs.

Get Involved in Geocaching

People wishing to learn retracement skills or a retracement specialist wishing to hone his or her skills can get involved in one of the latest activities using GPS to locate hidden objects. It is not as simple as it might first sound, and some of the caches will tax the abilities of the very best and most experienced retracement individuals.

There are many available books on the subject along with several Web sites. To get started, visit *www.geocaching.com* and read the instructions.

An added feature of the geocaching sites is the reporting by searchers of nearby benchmarks and other control points. One needing information regarding nearby control, or if there is difficulty in finding an existing one, additional information may readily be available for assistance. Of the 736,425 markers in the database, nearly 100,000 have been recovered and reported on by geocachers.

At this writing, there are nearly 400,000 geocaches worldwide.