



## Siniša Franjić\*

Faculty of Law, International University of Brcko District, Brcko, Bosnia and Herzegovina, Europe

Received: 22 February, 2018

Accepted: 25 April, 2018

Published: 26 April, 2018

\*Corresponding author: Siniša Franjić, Faculty of Law, International University of Brcko District, Brcko, Bosnia and Herzegovina, Europe, Tel: +387-49-49-04-60; Fax: +385-31-51-28-33; E-mail: [sinisa.franjic@gmail.com](mailto:sinisa.franjic@gmail.com)

Keywords: Forensics crime; Evidence; The investigator

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## Review Article

# Legal aspects of Forensics

## Abstract

Forensics is the scientific discipline concerned with proving criminal offenses. It proves in a way that an investigator collects, documents and analyzes all facts related to the crime. The most important task of the investigator is to collect the largest possible number of pieces of evidences that connect to a criminal offense. They are mostly found at the site of criminal events, and in technical terms, is called physical evidence. Based on these sets hypotheses that connect one fact with another, and then we come to the theory that explains the nature of the criminal acts. Forensic proof of crimes are very complex transaction with the ultimate goal to prove or disprove the offense and find the perpetrators.

## Introduction

Forensic science is simply defined as the application of science to the law or legal matters [1]. In today's CSI and Forensic Files world, this area of science is much more widely known to the general public. However, it is also misunderstood due to Hollywood's resolve to complete every case within the context of a one-hour, commercials included, pseudo-real-life crime drama. When the actual real-life judicial system needs science to resolve a question, the person who is called upon to bring science into the courtroom is often a forensic scientist. The law and science are strange bedfellows. Science is an empirical method of learning, anchored to the principles of observation and discovery as to how the natural world works. Scientific knowledge increases human understanding by developing experiments that provide the scientist with an objective answer to the question presented. Through the scientific method of study, a scientist systematically observes physical evidence and methodically records the data that support or not support the scientific process. The law, on the other hand, starts out with at least two competing parties with markedly different views who use the courthouse as a battleground to argue factual issues within the context of constitutional, statutory, and decisional law.

Forensics involves the application of knowledge and technology from different scientific disciplines in jurisprudence. These are, for example, biology, pharmacy, chemistry, medicine, etc., and each of them applies in the present, increasingly complex legal proceedings in which the required knowledge and skills of experts from these areas to prove offenses. For the purposes of this article, we will hold on the biology or forensic biology, which is the most important branch of the DNA analysis. Forensic biology deals

with serological and DNA analysis of physiological fluids in the human body in order to identify and individuate people, animals and microorganisms. It should be added that the application of certain procedures dates back to the earliest history of medicine, but it is still used today. These are, for example, methods in which the examination of the body (depending on its conditions) can determine gender, race, age of the person, analysis of the tooth, or the determination of blood group testing, and the presence of specific antibodies in the body.

Medicine encompasses the science of the structure, the function and on the development of man, of all phenomena and events of man's interior and environment that affect health and disease, the lesions in man, then the study of drugs and their actions, as well as the art of recognizing, evaluation, relieving or curing diseases, social rehabilitation of patients, prevention of disease, improve health conditions of life and improvement of physiological processes and biological evolution of man; it is also the professional execution of these skills in the individual and in the social scale. The development of medicine throughout history, have formed the special branches that now make up modern medicine. With them were created and profiles of experts whose work made a significant contribution to medical practice, but also in medicine as a scientific discipline. Thanks to their academic and professional achievements, medicine today can provide answers to questions that were once unimaginable.

DNA analysis indicates a molecule containing nucleotides with the elements that determine the development and functioning of all living beings. DNA analysis is used to cause the blood, hair follicles, saliva or semen linked to the suspects to commit crimes.

In the criminal sense, DNA analysis confirms the fundamental principle of modern criminology, and that is “no perfect crime”. This sends a clear message to perpetrators and potential perpetrators that any criminal offense will be revealed and the perpetrator will be punished.

### The distinction of forensics and criminology

Criminology is the study of crime, as indicated by the formative Latin terms *crimin* (accusation or guilt) and *-ology* (study of). As an intellectual domain, criminology comprises contributions from multiple academic disciplines, including psychology, biology, anthropology, law, and, especially, sociology [2]. Although the defining statements of criminology are rooted across these diverse areas, contemporary criminology is becoming ever more intertwined with still additional sciences and professional fields such as geography, social work, and public health.

This plurality of influences, often referred to as multidisciplinary, is altogether logical given the complex subject matter and diverse nature of crime. Scholarly attention to crime from various perspectives allows for an extensive range of research questions to be addressed, making possible a fuller understanding of the criminal mind, the nature of crime, and social control processes. Legal scholarship, for example, ranges from philosophical attention to social justice issues to technocratic factors determinant of case outcome. Alternatively, psychology approaches the topic of crime with a focus on individual-level maladjustment and behavioral abnormality. Sociological criminology differs still by concentrating on the multiple causes and nature of crime, as well as society's reaction to it.

Criminology's subject matter is elastic [3]. Unquestionable core components include: (1) the definition and nature of crime as harm-causing behavior; (2) different types of criminal activity, ranging from individual spontaneous offending to collective organized criminal enterprises; (3) profiles of typical offenders and victims, including organizational and corporate law violators; (4) statistical analysis of the extent, incidence, patterning, and cost of crimes, including estimates of the “dark figure” of hidden or unreported crime, based on surveys of victims and self-report studies of offenders; and (5) analysis of crime causation. Less agreement exists about whether the scope of criminology should be broadened to include society's response to crime, the formulation of criminal laws, the role of victims in these processes, and the extent to which criminology needs to adopt a comparative global perspective.

The use of modern information technology allows to collect and processing large amounts of different data in various fields of human activity. The emergence of the Internet is largely open up the possibility of access to such information. The vast amount of data, and some of the databases contained the most intimate personal details become available throughout the world, and on the protection of the abuse was not taken into account. Although the emergence of the Internet has enabled the use of a multitude of useful information, the same phenomenon is practically at the same time allow for the

emergence of computer crime. Modern information technology is very simple to use, and their prices is more accessible and is as such exposed to a variety of criminal activities. Computer crime today is a very serious global social problem.

Criminalistics is a scientific discipline that systematically explores and applies the scientific methodology in detecting and clearing up crimes and determining their perpetrators. Forensics is a scientific discipline which could in the same way can be defined, but with a note that with criminalistics dealing people who have basic criminal education and forensic professionals who have specific expertise and skills. If you are investigating a murder, a criminalist can only conclude death, and forensic expert must prove the facts associated with a fatal outcome. For example, investigates the murder by poisoning. An expert toxicologist can clarify several important facts, among which the most important what kind of the poison used and in which time there was a death. These are the facts of the exceptional importance for the criminal proceedings and of that facts depend judgment that will be imposed on a perpetrator. Toxicologist is, therefore, an expert who has special expertise with which can explain in detail the specific facts of the exceptional importance for the criminal proceedings.

One of the functions of the medical examiner, as just alluded to, is to estimate when death occurred [4]. Determining the time of death can be crucial to placing a suspect at the crime scene and in eliminating the innocent. The most familiar way of estimating when a person died is by gauging the degree to which the body has succumbed to rigor mortis—the stiffening of the body brought on by a rigid interaction between the muscle proteins actin and myosin. Depending on the surrounding temperature (heat accelerates the process), rigor mortis usually sets in within 2–4 h after death, becoming first apparent in the lower jaw and neck muscles and then spreading downward. The entire body is usually completely rigid by 6–12 h. However, after roughly 48–72 h, the body becomes limp again as enzymes eventually break down the connection between the myosin and actin molecules.

Forensic has several meanings, one of which pertains to courts of judicature [5]. However, Webster includes “relating to or dealing with the application of scientific knowledge to legal problems” in its more modern definition. The application can be in one or more of many specific fields of study or branch of specialized knowledge such as science, technology, medicine, or other area of knowledge used to assist courts to resolve disputes, whether criminal, civil, or administrative. The term used in the book title is criminalistics, which is the application of forensic science to criminal matters. The term criminology is sometimes inaccurately used as a synonym for criminalistics but refers to the social science study of crime and criminal behavior, whereas criminalistics is the application of science to the solution of crimes.

Criminalistics is a discipline that systematically explores and applies scientific methods and rules of experience in discovering and clarifying the phenomenon of criminal offences and establishing their perpetrators [6]. For criminalistics is essential 1) knowledge of the phenomenon of crimes (which are

data important to clarify certain criminal offenses), 2) research methodology (by means of screening and data collection are on available) and 3) elaboration ways of detecting, clarifying and recording (as in the present case has a handle).

Criminal investigation deals with the offense as a real phenomenon, i.e., external and internal real changes that the criminal offense caused and that can be known. In this study included actions undertaken to clarify issues related to the emergence of a criminal offense, the perpetrator, the victim and other circumstances.

### Criminal investigation

Criminal investigation deals with the offense as a real phenomenon, and in him they included actions which should clarify all issues related to the appearance of the offense, the offender, the victim and other circumstances. Criminal investigation include microanalysis criminal offense because it directly reconstructed the actual structure of the offense. Criminal Investigation is microanalysis, the reconstruction of the past - a possible criminal offense. She research directly reconstruction the real, objective and subjective structure of the offense.

The application of science to the legal arena is fundamentally one of reconstruction, that is, trying to assist in determining what happened, where it happened, when it happened, and who was involved [7]. It is not concerned with, and cannot determine, why something happened (the motivation). When science is applied in this way, the adjective "forensic" is added, which means that it is applicable to a court of law. Forensic analysis is performed on evidence to assist the court in establishing physical facts so that criminal or civil disputes can be resolved. The legal question determines the direction of scientific inquiry. It is the job of the forensic scientist to translate the legal inquiry into an appropriate scientific question, and to advise the judiciary on the capabilities and limitations of current techniques.

In forensic science, the laws of natural science are considered in making a determination about the state of a piece of physical evidence at the time of collection. Using the scientific method, inferences are made about how the evidence came to be in that state. These inferences then limit the events that may or may not have taken place in connection with said evidence. The law defines elements of a crime; science contributes information to assist in determining whether an element is present or absent.

The first few minutes of a crime scene's processing can be the most critical moments of an entire investigation [4]. At no other period will the investigators be closer to the moment the crime was committed. Investigators will never have the area more pristine or more unfettered from contamination. In those first few minutes, fingerprints, shoe prints, tire prints, trace evidence, and the state of the victim are all at their most informative. And yet, at no other time are mistakes more likely made that can potentially jeopardize successful prosecution of the crime's perpetrator.

Once the area is secure, investigators can then perform an initial walk-through in which they try to glean an understanding of the nature and scope of the crime and determine what evidence should be collected and from where. Prior to removing any evidence, however, it should be photographed or videotaped to document its state and its position within its surroundings. Much of the crime scene can also be recorded by 3D laser scanning to give investigators an even more refined image of the crime scene and its overall layout.

To fully appreciate the potential value of physical evidence, the investigator must understand the difference between class and individual characteristics [8]. Characteristics of physical evidence that are common to a group of objects or persons are termed class characteristics. Regardless of how thoroughly examined, such evidence can be placed only into a broad category; an individual identification cannot be made because there is a possibility of more than one source for the evidence. Examples of this type of evidence include all unworn Nike athletic shoes of a particular model, the new, unmarked face of a manufacturer's specific type of hammer, and soil. In contrast, evidence with individual characteristics can be identified, with a high degree of probability, as originating with a particular person or source. The ability to establish individuality distinguishes this type of physical evidence from that possessing only class characteristics. Some examples of evidence with individual characteristics are fingerprints, palm prints, and footprints.

Conceptually, the distinction between class and individual characteristics is clear. But as a practical matter, the crime scene technician or investigator often may not be able to make this differentiation and must rely on the results yielded by crime laboratory examination. Thus, although the investigator must recognize that physical evidence that allows for individualization is of more value, he or she should not dismiss evidence that appears to offer only class characteristics, because it may show individual characteristics through laboratory examination. Furthermore, a preponderance of class-characteristic evidence tying a suspect (or other items in the suspect's possession) to the scene strengthens the case for prosecution. Note also that occasionally class-characteristic evidence may be of such an unusual nature that it has much greater value than that ordinarily associated with evidence of this type. In an Alaska case, a suspect was apprehended in the general area where a burglary had been committed; the pry bar found in his possession contained white stucco, which was of considerable importance, since the building burglarized was the only white stucco building in that town. Finally, class-characteristic evidence can be useful in excluding suspects in a crime, resulting in a more effective use of investigative effort.

### Criminal procedure

Criminal law is divided into two major components that are interrelated yet serve different functions [8]. The substantive criminal law deals with those elements that describe and define a crime. When an investigator has the needed proof to satisfy the particular elements of an offense, it can then be said that the crime did occur.

The other component of criminal law is procedural criminal law. It is not enough to know whether a crime has been committed. The investigator must understand what and how things need to be done with the people involved in an investigation, be it a victim, a witness, an informant, or a suspect. Thus, the procedural part of criminal law defines what can and cannot be the defendant or the accused. The procedural law changes much more rapidly than does the substantive criminal law. Procedural law deals with processes of arrest, search and seizure, interrogations, confessions, admissibility of evidence, and testifying in court.

Once a criminal offense has been committed, three immediate outcomes are possible; it may: (1) go undetected, as in the case of a carefully planned and conducted murder by organized-crime figures, in which the body is disposed of in such a way that it will remain undiscovered; (2) be detected, but not reported, for example, because the loss is minor or the victim wants to avoid contact with the police, or (3) come to the attention of the police through their observation, a complaint by the victim or witnesses, or a tip [8].

The area and the subject of criminal investigation is bounded by criminal law [6]. Special importance in that they have regulations on crimes. Legal descriptions of criminal acts are composed of abstract concepts. These terms of specificity act of a criminal offense and to provide other its ingredients.

Criminal charges are a notice to the state attorney of the existence of reasonable suspicion that a person has committed a criminal act. The application may be submitted by any person as it is in the interest of the country to discover the perpetrators of criminal acts that are prosecuted *ex officio*. The application can be submitted to the District attorney and the police. District attorney is obliged to act on it and must determine whether it is founded. If established, the District attorney to initiate criminal procedure. If it finds that there is no reasonable suspicion that a criminal offense are committed, District attorney shall reject the application and notify the applicant. Criminal charges are filed when there is useful information about the offense and the offender. If the applicant is not sure whether it is a criminal offense or a civil-law relationship/nature, about the need to ask the police or the District attorney where they will get the right information. In the event that a police officer or a prosecutor consider that it is not a criminal act, the applicants are required to notify. If it happens anonymous criminal complaint, it will be considered only if it brings a reasonable suspicion that an offense was committed and that, accordingly, to collect the necessary data. It should be noted also that the District attorney is considering an anonymous criminal charges with special attention because there is always the possibility of a false report of a criminal offense and false reporting specific person as the perpetrator.

Criminal procedure shall be conducted at a time when the only probable guilt of the perpetrator of a criminal act [9]. He must be so arranged that until to its completion has considered the defendant innocent (presumption of innocence), but also to provide the necessary interventions in his rights without which clarify the initial probability would not be possible.

In terms of criminal procedure described the system of protection of rights and freedoms regulated through rules of procedure to the only probable perpetrator. Therefore, in the arrangement of the rules must always take into account the possibility that the defendant might be innocent and it is weaker in the confrontation with the authorities of criminal procedures and in that sense a confusing situation resolved in a manner favorable to the defendant (*favor defensionis*). Modern criminal procedures are therefore focused effort to achieve equality position of prosecutor (who is usually a public authority) and the defendant which is referred to as equality of arms or weapons (equality of arms).

Criminalistics is immanent specific criminal proceedings [6]. She it is: his reality, technological component, specific procedures. If exposed to the earlier criminal law determines the subject and frames criminal investigation, criminal procedure law sets conditions and data collection, and thus regulates the framework and form forensics research.

In criminal procedure is also possible violation of rights. The protection of fundamental human rights violations in the procedure before the criminal courts, the Constitutional Court is realized in a special constitutional court procedure. Protection of the rights and freedoms of violations in the criminal procedure is carried out and before the European Court. The European Court and the Constitutional Court to rule implemented testing process as a whole, so it is possible that at some stage of the proceedings has been a violation of law, but that it was later removed from what remains the conclusion that the process as a whole was still fair.

In addition to the right punishment, conflict arose by criminal act is solved in other ways in the context of activities which do not apply or only partially apply the rules of criminal procedure. The criminal procedure is the most important form of law regulated conduct on the occasion of the crime. However, acting on the occasion of a criminal offense may have other forms of agreement conflicted person, settlement, conciliation, mediation, arbitration.

We should also point out that the subjects of the criminal proceedings in the strict sense of the court, the prosecutor and the defendant. These are the main subjects of criminal procedure [10]. In the process of work and the participants of the proceedings, which are not the main subjects. Procedural steps are carried out (in the criminal proceedings before that), and the relations arising in the case of the probability that a criminal act. Their purpose is to determine: (1) whether is the committed criminal act, (2) who is the perpetrator of the crime, (3) whether the perpetrator is guilty, and (4) whether the conditions for the application of criminal sanctions. The answers to all four questions can only be given a real criminal case. Only in this process the offender who is crooked committed an offense can be convicted on the criminal sanction.

Verification of the results of the investigation was done professionally if on that occasion used criminal methods and resorts [11]. The Trial Chamber further applied, consciously or unconsciously, more or less qualified, court tactics, planning the



trial, constantly operates with versions, questioning witnesses, expert witnesses, examined the defendant, shall recognize and confrontations, carries out inspections (investigations) of real evidences, the court experiments, analyzes the expertise and so on. If you want to this activity, which is very complex and fraught with numerous cognitive problems, organize and carry out *lege artis*, the presiding judge must adopt a truly sovereign Criminology. Defender and the public prosecutor, representing each his own version in procedural battle, also applied forensic findings, data, methods and tools. From the intensity and quality of the application depends largely on the level of a specific process and outcome of the proceedings. Knowledge and application of criminology at the trial provided a real opportunity to establish the truth. Truly sovereign Criminology is perhaps seemingly a little unclear. However, that term means a good understanding of Criminology.

### Determining maternity and paternity

The accusation to establish maternity or paternity may be submitted by a child up to 25 years of life, while the welfare center can file a lawsuit to establish maternity or paternity until they reach 18 years of age and in this case there is a party to the procedure. A woman who considers herself the mother can file a lawsuit to establish maternity until the child reaches 18 years of age. The same deadline applies to the mother of the child submitting a lawsuit to establish paternity.

The accusation to establish paternity may be filed by a man who considers himself the father of the child if he could not enter that fact in the birth register of a child based on the declaration of recognition of paternity, which is the day on record before the court, the social services center or the registrar, or in other cases, but no later than the age of 18 a child.

If the child is a minor or is totally deprived of legal capacity or the decision on partial incapacity determined that it can not take any action relating to personal status, a claim for paternity or maternity in behalf of the child by a person it represents by law (mother or father, guardian or legal representative who is designated by law or by a competent state authority).

In such cases, the court will order the implementation of the medical expertise of DNA analysis. DNA analysis is the only reliable method of proving maternity or paternity.

### DNA analysis

All cells, other than mature red blood cells, contain a nucleus that is where the body's DNA is located [5]. The DNA molecule is a double helix, each strand being composed of four bases, or nucleotides: cytosine, guanine, thymine, and adenine. They are usually referred to by the first letter of their name: C, G, T, and A. The two strands are held together by chemical bonding in which T always pairs with A and G always pairs with C. A gene is a part of the DNA strand in which the order of C, G, T, and A is ultimately responsible for defining which amino acids are assembled in the synthesis of a specific protein. All of the DNA in a cell is known as the genome, and there are

approximately 3 billion base pairs in the human genome. This description applies only to nuclear DNA.

The history and role of deoxyribonucleic acid (DNA) as the material that carries the genetic blueprint of all biological organisms has been known since Crick and Watson's research that was published in 1953. However, the basis of its use in forensic science is much more recent, beginning just 5 years before the Pitchfork case. Subsequent research showed that genes occupied only a very small part of the total material in a DNA molecule, and in 1980 Dr. Ray White and colleagues at the University of Utah found that some parts of the noncoding DNA were highly variable between individuals. White, a geneticist, suggested that these regions could be used in parentage testing. Dr. Jeffreys went further and showed how the variability could be used to type blood and body fluids in criminal cases.

DNA analysis used in forensics for linking suspects to samples of blood, hair, saliva or semen. It is used to prove guilt or innocence, and in a variety of cases that require the identification of human remains, determine maternity and paternity, establish matching organ donors and recipients, etc.

Blood patterns can be very helpful in the investigation of homicides [12]. Passive drops, transfer/contact patterns, swipe patterns, wipe patterns, and void patterns are examples of characteristic patterns to note. Passive drops, also known as 90 degree blood drops, indicate the blood source was at a 90 degree angle from the surface of the body. Ninety degree blood drops are not likely to be the decedent's blood and should be collected. Transfer/contact patterns are also important blood patterns. These patterns appear when a bloody surface is transferred to another surface. This type of pattern may indicate an area where the assailant's DNA transferred to the decedent. Swipe patterns are similar to transfer patterns, but the transfer pattern is directional. Directionality may be seen as pattern feathering at the edge where movement ended. Wipe patterns are similar to swipe patterns, except that the wet blood isn't transferred; it is already present as another object moves through the stain.

DNA analysis begins by extracting DNA from samples of blood, hair, saliva, semen or a tissue. This is, in scientific terms, a simple procedure, but problem may occur due to poor quality or small amounts of sample. By using special techniques and careful analysis, it is possible to separate the DNA of several people, or called "mixed of DNA" but the results are often insufficient for its conclusion.

The tools of molecular biology now enable forensic scientists to characterize biological evidence at the DNA level [13]. These DNA typing techniques and their genetic markers are more sensitive, more specific, and more informative than the available battery of protein markers. Currently, the methods available to the forensic scientist include restriction fragment length polymorphism (RFLP) typing of variable number of tandem repeat (VNTR) loci, and amplification of the number of target DNA molecules by the polymerase chain reaction (PCR) and subsequent typing of specified genetic markers. Any material, including a hair follicle that contains nucleated

cells potentially can be typed for DNA polymorphisms. There are a few reports of successful DNA typing of hairs, but these hairs usually contain sheath material. However, telogen phase hairs contain very little quantity of DNA such that most DNA markers cannot be detected, even with the use of PCR.

When sexual assault is alleged, the perpetrator's pubic hair provides a link between the victim and the perpetrator [14]. Taken alone, it does not prove the allegation. In concert with other evidence, however, it may prove that the sexual assault was, indeed, perpetrated by a certain individual. Likewise, dirt, paint chips, or blunt force injuries may link the victim to a scene or weapon. Such evidence may also lead investigators to discover the scene location or the object used as a weapon. For instance, a patterned injury of a belt buckle, may lead to the actual belt used and possibly to its owner.

Semen comprises seminal fluid with or without the presence of spermatozoa [15]. Samples containing spermatozoa are rich in DNA and DNA analysis of such samples, where sperm are visible, is nearly always successful using polymerase chain reaction (PCR) techniques. A differential lysis treatment is commonly used on samples of this type in order to separate the female epithelial material from the spermatozoa, thus simplifying the interpretation of the resultant DNA profiles.

Saliva is a secretion of the mouth that is important in digestion and comprises cells and secretions from the salivary and parotid glands. Saliva has a high proportion of water and a low level of dissolved substances and cellular material, which can make it difficult to locate visually. Saliva is commonly encountered as a source of DNA evidence.

DNA extraction has two main aims: first, to maximizing the yield of DNA from a sample and in sufficient quantity to permit a full DNA profile to be obtained – this is increasingly important as the sample size diminishes; and, second, to extract DNA that is pure enough for subsequent analysis: the level of difficulty here depends very much on the nature of the sample [16]. Once the DNA has been extracted, quantifying the DNA is important for subsequent analysis.

The first step in any DNA extraction method is to break the cells open in order to access the DNA within [17]. Although DNA may be isolated by 'boiling' cells, this rather crude means of disrupting the cell does not produce DNA that is always of sufficient quality and purity to be used in downstream analytical techniques such as polymerase chain reaction (PCR) amplification. DNA isolated by simple boiling generally fails as a substrate for further analysis because it has not been sufficiently separated from structural elements and DNA-binding proteins, and these impurities compromise downstream procedures. In order for DNA to be released cleanly, the phospholipid cell membranes and nuclear membranes have to be disrupted in a process called lysis, which uses a detergent solution (lysis buffer), often containing the detergent sodium dodecyl sulphate (SDS), which disrupts lipids and thus disrupts membrane integrity. Lysis buffer also contains a pH-buffering agent to maintain the pH of the solution so that the DNA

stays stable: DNA is negatively charged due to the phosphate groups on its structural backbone, and its solubility is charge-dependent and thus pH-dependent. Proteinases, which are enzymes that digest proteins, are generally added to lysis buffer in order to remove proteins bound to the DNA and to destroy cellular enzymes that would otherwise digest DNA upon cell lysis. The lysis procedure sometimes calls for the use of heat and agitation in order to speed up the enzymatic reactions and the lipid solubilization.

### Forensics in dentistry

Dental, oral, and maxillofacial medicine is concerned with the regular development, preservation, and rehabilitation of the stomatognathic system, which is the functional system of the teeth, periodontium, jaw, and jaw joint; the jaw and facial muscles, glands, soft tissue, and mucous membranes; and their blood, lymphatic, and nerve supply [18].

Forensic odontostomatology (different international terms are used: forensic dentistry, forensic dental medicine, forensic odontology, and odontologie médico - légale, each with different content and scientific-theoretical functions) as a specific modification of dentistry, oral, and maxillofacial medicine is an independent field of knowledge within the forensic sciences. It provides scientific and research findings of oral and maxillofacial medicine in civil or criminal law cases and has a key role in the context of criminology. Physicians (forensic medicine), dentists (forensic odontologist), and the investigating authorities (criminologists) supply the court (defense, judge, and prosecutor), as well as insurance companies and the students of these disciplines, with their knowledge in the field of forensic odontostomatology.

The specialty of maxillofacial surgery is centered on the bones and soft tissues of the jaws and face but traditionally includes surgery from the clavicles to the skull vertex [19]. Thus the specialty currently enjoys a position in the head and neck not dissimilar from that of the general surgery of yesteryear before subspecialization removed urology and vascular surgery from the generality of general surgery.

Maxillofacial surgeons might thus be viewed as the "general surgeons" of the head and neck region. Due to the dense complexity of the structures in the head and neck region, certain organs are excluded from this generality. The brain and cervical spine, globe and middle and inner ears are properly the domain of the neurosurgeon, eye surgeon, and ear, nose, and throat surgeon. However, inevitably, subspecialization within maxillofacial surgery is also possible with the evolution of cancer surgeons specializing in head and neck malignancy, orthognathic surgeons treating jaw disproportion, facial esthetic surgeons normalizing facial deformity, trauma surgeons dealing with head and neck damage, and even salivary gland surgeons.

Dental surgery is the biggest factor in the uniqueness of each tooth and along with developmental characteristics makes it the key to the identification of unknown corpses by means of teeth.

An important feature of the teeth is that they are the hardest part of the body and that after death remain almost unchanged despite the action of thermal changes and despite the fact that, for example, thousands of years lie in the country [20]. This is why the teeth are very important in the identification of dead bodies, individually or in accidents when involving larger group of people.

The wars, large and small traffic accident, and sometimes natural disasters also cause teeth to serve in the identification procedures to establish the true identity of the “missing” and / or killed.

The existence of dental records and their proper availability and data on other dental characteristics are important in the process of identification [21]. The role of the dentist in this process is repeated, and when it comes to therapeutic procedures, the data on them in the dental records, and as regards the procedure for Postmortem analysis of teeth, comparisons before death and postmortem data, and the final determination of the identity of unidentified human remains.

### Expert testimony

The court determines the expert, ex officio or at the request of the parties, and in the case of civil proceedings, the party has the possibility to propose presentation of evidence by expert testimony.

An expert is a person invited to the court using its expertise, submit its present observations or findings and opinion on the facts that may be relevant to determining the truth of the allegations that are the subject of proof.

The term “expert” means an expert whose professional (not jurisprudence) knowledge helps resolve legal issues [22]. A lawyer is obliged to consult with an expert witness on any matter for which there is no solution on professional competence. Thus, the expert may be a member of each profession: engineer, sculptor, compositor, an art historian, but also a doctor. The doctor is called upon as an expert in all cases where the subject of discussion physical or mental health, or their death.

The Court will take the evidence by expert testimony when to establish or clarify any facts necessary expertise which the court does not have.

Before the start of expertise, expert witness will be called an expert to study the subject of his testimony carefully to accurately present everything he knows and finds, and to present his opinion impartially and in accordance with the rules of science and the skills. It will be particularly alert to the perjury is criminal act too. The court before which the procedure is managed by expert testimony, expert shows items that will study, puts his questions and seek explanations on its findings and opinion. An expert may be given clarifications, and he may be allowed to review documents. An expert may propose that evidence be presented or acquire objects and data that are of importance to the opinions and findings. If he is present at the crime scene investigation, reconstruction, or

other investigative proceeding, the expert may propose that certain circumstances be clarified or that the test person asked certain questions.

### Responsibility of forensic experts

Contemporary law enforcement has greatly expanded its ability to solve crimes by the adoption of forensic techniques and procedures [23]. Today, crimes often can be solved by detailed examination of the crime scene and analysis of forensic evidence. The work of forensic scientists is not only crucial in criminal investigations and prosecutions, but is also vital in civil litigations, major man-made and natural disasters, and the investigation of global crimes. The success of the analysis of the forensic evidence is based upon a system that emphasizes teamwork, advanced investigative skills and tools (such as GPS positioning, cell phone tracking, video image analysis, artificial intelligence and data mining), and the ability to process a crime scene properly by recognizing, collecting and preserving all relevant physical evidence.

Recognition of physical evidence is a vital step in the process. If potential physical evidence is not recognized, collected or properly preserved and tested, the forensic value of the evidence may be greatly reduced or even lost forever. Numerous routine and high profile cases have demonstrated the harsh reality that despite the availability of current crime scene technologies, specialized equipment, and sophisticated forensic laboratory analysis, the effective utilization of physical evidence in crime solving is only as good as the knowledge and integrity of the crime scene personnel and the objective legal system that supports those functions. In some cases, evidence has been falsified or results tainted, misleading the justice system.

Social and ethical implications of computers is fast deep and irreversible [24]. Mankind stepped into the information age – an age of sharing knowledge and integration of the system where they information quality and speed of decision-making decisive parameters. Traditional jobs industrial era disappear and appear in a new, automatised jobs with contemporary technologies. For this profound, fundamental changes are responsible computers over all other technologies that affect directly or indirectly through developments in telecommunications, genetic engineering, medicine and atomic physics, but which are unthinkable without the use of powerful computers. The biggest changes in daily life brought the results of development artificial intelligence, multimedia and robotics. However, it is equally important to understand all the potential risk factors of the coming changes in the social and personal life, which bring modern Internet and other related technologies, such as: invasion of privacy, high-tech crime and the difficulties of maintaining security information, protection of intellectual property in the digital environment, the inevitable bugs in the development of complex software, automation and dehumanization of labor, abuse information for the realization of political and economic power, too much dependence on complex technology, blurring the physical reality with virtuality and create even greater



depending on the people of the computer and the Internet and the appearance of bio-digital (nano) technology, where researchers are trying to develop a computer instead of electronics used biological cells as the supporting technology.

How we can connect forensics, artificial intelligence and high tech crime? Intelligent forensics is an inter-disciplinary approach, which makes use of technological advances and applies resource in a more intelligent way to solve/help an investigation [25]. Intelligent forensics encompasses a range of tools and techniques from artificial intelligence, computational modelling and social network analysis in order to focus digital investigations and reduce the amount of time spent looking for digital evidence.

The application of intelligence in computer forensics investigations takes on a number of components at various stages of the investigation life cycle—the gathering of digital evidence, the preservation of digital evidence (evidential integrity and evidential continuity), the analysis of digital evidence and the presentation of that evidence. In each of these stages the skill and knowledge of the computer forensics investigator is fundamental to the success of any investigation. However, it is hoped that the application of artificial intelligence to digital forensic investigations will provide a useful set of tools to the investigator to address complexity issues and more importantly will address the issues associated with speed and volume (size of data being investigated rather than backlog of cases which is a separate issue) of digital investigation cases, by identifying the most relevant areas for investigation and excluding areas where results are less likely. This approach has been used previously to a certain extent by the application of hash algorithms to eliminate dormant files and “static” systems files from digital investigations.

## Conclusion

When it happens a crime, on the location of criminal event out police officers, detectives, investigators and forensic technicians. They collect evidences that will be processed and analyzed in the forensic lab, and then, in the form of findings or opinions presented in court.

In criminal and civil proceedings, forensic findings and opinions are a very important means of proof. Forensics, under similar legal requirements, and engage in criminal and civil proceedings and results of their work in the same way must be present during the procedure for which they are engaged. Expert testimony is considered good quality and if the expert witness, among other things, knows the legal regulations in this area.

Thanks to the rapid development of modern science and modern technological innovations, and forensics are also developing rapidly. Thanks to that, forensics becomes simple, reliable and inexpensive way of clarifying crimes. Participation forensics in civil proceedings, in which no crime, are also seen as crucial because, thanks to its findings or opinion, shall determine the material truth.

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