

Ballistics (forensic science)

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Ballistics: definition and history To begin with, “ ballistics, in the most general sense, is the study of firearms – ‘ guns’ in the vernacular. As a term of art, ballistics technically refers to the study of a bullet’s path from the firearm, through the air, and into a target” (Carlucci & Jacobson, 2007). From <https://assignbuster.com/ballistics-forensic-science/>

the viewpoint of forensics, ballistics comes up to represent a system of principles and calculations used to match recovered bullets (or their casings) to the firearms which were used to fire them.

To a large extent, the study of ballistics is based on the whole set of physical laws, starting with the law of ideal gas and up to the principles of explosion and pressure within the firearms. Currently, ballistics is used to resolve the major firearms complexities, which law enforcement professionals face in the process of investigating a crime. A professional in practical ballistics works to restore the picture of the crime using firearms, bullets, casings, or their residues, and to match them to the marks that had been left on the crime scene.

Despite the seriousness of the firearms identification process and the role which ballistics may play for the effectiveness of other forensic procedures, it was not before the beginning of the 1950s that the term “ ballistics” became a widely recognized description of firearms studies (Warlow, 2004). The history of ballistics dates back to the times, when firearms were made manually and individually and each bullet was unique. Gunsmiths were the ones to produce flintlocks and matchlocks, and each firearm bore the sign of its creator.

Early firearms could be readily compared to the works of art, for even “ the screws that held together early firearms were handmade and often specific in width and pitch of the threads” (Carlucci & Jacobson, 2007). In conditions where firearms could be distinguished from one another without a difficulty and where every gun bore a unique sign of its creator, matching bullets to

firearms was not a difficult task. As a result, early forensic scientists did not really need the knowledge of ballistics in its current form.

Matching bullets to their molds was an easy-to-accomplish procedure and did not require any specialized skills or calculations. At the beginning of the 19th century, however, bullets and firearms have turned into the products of mass production, and the form of the bullet was standardized (Carlucci & Jacobson, 2007). Although the amount of firearms models was rather limited and a criminal investigator could easily name the firearm from which specific bullets came, it was no longer possible to distinguish between different variations of firearms that had been produced by one manufacturer (Carlucci & Jacobson, 2007).

That is why forensic professionals have become increasingly interested in studying specific features of bullets and firearms that might have been concealed from the naked eye. Phillip Gavelle was one of the first to use microscopes to investigate the features of bullets and compare them to the details and characteristics of the crime scene (Warlow, 2004). With time, experts have also come to realize the role which firing pin and breech marks could play for the identification of firearms (Carlucci & Jacobson, 2007).

Unfortunately, the term “ ballistics” and the importance of firearms investigation did not attract public attention, and only after the Sacco and Vanzetti case, as well as the publication of the three firearms identification treatises, the court has officially recognized ballistics as a forensic science, giving law enforcement professionals a chance to improve the quality of all forensic procedures and to develop a new system of forensic methodology with regard to firearms (Warlow, 2004).

Ballistics in its modern form: internal, external, and terminal Certainly, with the scientific contribution which Goddard made to the development of ballistics, we would hardly be aware of how effective firearms identification could be for resolving the most complicated criminal cases. Now, as guns and firearms are mass-produced, and thousands and millions of individuals are given the legal right to carry concealed arms, ballistics gradually turns into the central component in the system of law enforcement principles used to reduce and prevent crime threats.

In its current form, ballistics is usually divided into the three distinct areas: internal, external, and terminal ballistics. This division is necessary to make the study of separate ballistics aspects more effective, and to provide forensic scientists with sufficient analytical instruments. Moreover, this division is based on the path, which a bullet usually passes down the barrel, through the air, and finally, through a target. Internal ballistics (or initial ballistics) is concentrated around the path, which a bullet passes within the gun (Carlucci & Jacobson, 2007).

Although measuring and describing the path of the bullet within the gun is very difficult and almost impossible, forensic scientists use velocity (or muzzle velocity) as the central forensic criterion in the study of internal bullet behaviors. Internal ballistics “ concerns what happens within a time p of in the region of 2 ms between the impact of the firing pin or striker and the exit of the bullet or shot charge from the muzzle end of the barrel” (Warlow, 2004).

Energy transfer, pressures and powders, combustion residues, as well as recoil in the weapon are the elements forensic professionals need to know, in <https://assignbuster.com/ballistics-forensic-science/>

order to relate the processes within the gun to the results they have produced on the crime scene. As soon as the bullet leaves the barrel, it becomes an object of external ballistics study. The latter is concerned with the pathway the bullet passes after leaving the barrel and involves the study of missile trajectory, and the impact which air gravity and resistance might have caused on it (Carlucci & Jacobson, 2007).

In terms of smooth-bored guns, forensic scientists are usually concerned about the changes that might have occurred in the spread of the shot charge (Warlow, 2004). Crosswinds and the way they change missile trajectory are just another subjects of forensic research in external ballistics. External ballistics usually seeks to determine the scope of influences other materials could produce on the bullet. For example, and Warlow (2004) emphasizes this fact, unburned propellant particles will tend to significantly affect the bullet at close range.

Bullet stability, flight, sectional density and shape, and even aerodynamic stabilization form the numerical basis of external ballistics and turn it into a distinctively mathematical field, well-known for its complex algebraic and geometric calculations. The study of the bullet path would be incomplete without researching the processes and changes the bullet undergoes after hitting a target. Upon striking a target, the bullet either deforms or disintegrates, simultaneously damaging or destroying the target (Carlucci & Jacobson, 2007).

These elements are the objects of terminal ballistics research. Terminal ballistics professionals work to link the character of the target destruction to the missile trajectory, its velocity, specific characteristics, design, and the <https://assignbuster.com/ballistics-forensic-science/>

features of the target itself. Given that the majority of targets which terminal ballistics investigates are humans, and taking into account the complex structure of the human body, terminal ballistics is probably the most complicated and the most responsible area of forensic firearms science.

Researchers suggest that the bullet's behaviors after hitting the human target are too unexpected and too unpredictable (Carlucci & Jacobson, 2007; Warlow, 2004). Forensic scientists are not always able to establish the link between the pathway the bullet has passed and the injuries found in a victim's body. That is why terminal ballistics is a complex study of ricochet, impact, penetration, and kinetic forces that are considered responsible for the major motional shifts the bullet undergoes after hitting a target.

Forensic ballistics: the new technological stage With the number of physical laws ballistics uses to match the bullets to firearms and to investigate the pathway the bullet passes from the barrel through a target, it is natural that ballistics professionals are involved into complex computation processes. However, with the advent of the new technological age forensic scientists have been offered an opportunity to use computer and software technologies for calculation purposes.

Now, ballistics software models are extremely sophisticated in contents, but extremely easy in use. IT professionals were able to simplify and integrate the complicated systems of motion, dynamics, gravity and location, as well as hundreds of other physical concepts and principles into a universal system of calculation, which specialists in ballistics use to compute and describe the missile trajectory and bullet flight performance.

Unfortunately, there is a whole set of problems to resolve before ballistics software turns into a reliable tool of forensic knowledge. For example, external ballisticstechnologyis concerned with the way equations of motion can be simplified to improve the quality of six-degrees-of-freedom equations and to speed up the process of their solution (Belzer, Holzman & Kent, 2006). “ There are also problems with fluid mechanics. These may include matters of universal interest, such as similarity principles, e. g. for transonic flow” (Belzer, Holzman & Kent, 2006).

In terminal ballistics, chemistry is the major obstacle IT designers and developers face on their way to creating an effective system of ballistics computation; fluid mechanics also makes it difficult to design complex equations that would take into account the principles of heat conduction, viscosity, chemical reactions, and temperature dependencies (Belzer, Holzman & Kent, 2006).

Nevertheless, it is with the emergence of new technologies that ballistics has been given a second breathe and it is in the current technological age that ballistics is likely to become a rapidly evolving area of forensic science and law enforcement, with the emphasis made on the speed and quality of ballistics solutions. Conclusion For many years, ballistics remained an area of knowledge mostly neglected by forensic professionals.

However, as firearms have been gradually turning into the objects of mass production, it was becoming more and more difficult to match bullets to the firearms from which they came. As a result, ballistics has come to represent a complex system of investigation principles aimed at researching the bullet behavior on its way from the barrel and through a target, as well as <https://assignbuster.com/ballistics-forensic-science/>

matching bullets to specific firearms and the marks they have left on the crime scene.

Now, under the impact of technological progress, ballistics has been successfully aligned with the complex computation models, and although there is still much to resolve before ballistics becomes a purely technological field, it is obvious that ballistics will remain one of the most rapidly evolving areas of forensic science, with the emphasis made on the speed and quality of ballistics solutions.

References

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