# ***Forensic Ballistics***

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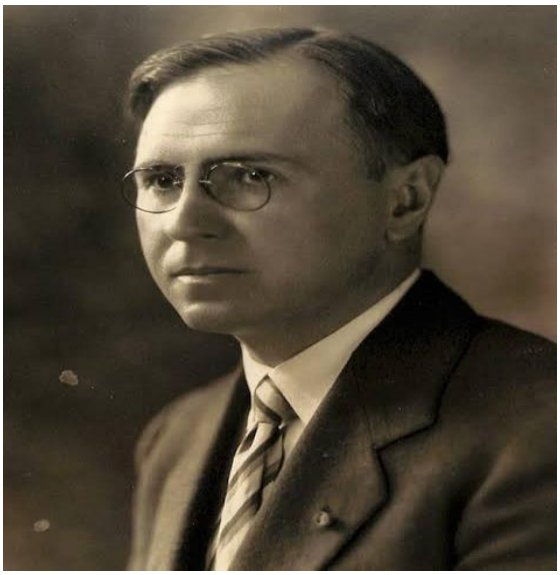
## I) Introduction

Weapons like Guns, rifles, Bombs are both manufactured and used in a larger scale which also leads to crimes in society. In order to find culprits of these kind of crimes, we use Forensic Ballistics. Forensic ballistic is a science concerned with launching, flight behaviour and impact effect of projectiles especially weapons such as Bullets, Ammunitions and Explosives. Forensic ballistic involves examination of left evidences at the Crime scene like used Bullets, Cartridges and so on to study their characteristics . Forensic Ballistics is used to match the weapon to it's rightful owner. With the help of Ballistics evidence, it is possible to determine the Angle of firing, direction, distance of firing and result of impact of the projectile

## II) Father of Forensic Ballistics



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Calvin Goddard - He was a scientists, Army officer and an important pioneer, he is the father of Forensic Ballistics. Goddard is responsible for many significant developments. He worked closely with police officers and helped them to solve many cases. He helped to create Bureau of Forensic Ballistics in New York and Comparison microscope. He also established United States 1st Independent Forensic Crime Laboratory. Goddard also explored and collected databases of Guns from many gun makers which was one of the complete database at that time

## III) History and development of Forensic Ballistics

- **Matchlock firearms**

These are the first to have a trigger which is used to ignite the primer. The trigger is attached to a S - Shaped serpentine which has burning wick at it's end. When the trigger is pressed, the serpentine along with burning wick will move towards the flash pan with has the primer. Burning wick will get inside the flash cover and touch the primer which causes ignition

- **First use of Forensic Ballistics Evidence**

At older times, there wasn't mass production of firearms , so they had very unique characteristics to each firearm which lead to match of firearm to culprits. The first case of forensic firearm examination is happened in 1853 by Henry Goddard. He found a Bullet in victim's body which had a defect on it's surface. It didn't seem like that of barrel or cause of impact. Henry concluded that it must be due to manufacturing defect of that specific firearm and matched it with the culprits weapon

- **Magnifications**

When firearms are mass produced, it was hard to match the Bullets to firearms of specific manufacturers, so this became a reason to the usage of magnifications of bullets. In 1902 , Oliver Wendell Holmes used magnification glass to compare his bullets and in 1912 , professor Balthazar would take pictures of bullets and enlarge it to analyse his markings of bullets.

- **Bureau of Forensic Ballistics**

In 1915 Charles E. Waite, a Ballistic Evidence Examiner made a mistake in ballistic fingerprinting which nearly lead to death sentence to a innocent Charles F. Stielow but the evidence was reevaluated by microscopy expert, Dr. Max Poser . Dr. Max found bullet wasn't shot by stielow's Gun and then he was released. Waite felt embarassed so he catalogued manufacturing data on guns and ammunitions , he also included imported firearms. Waite along with physicist John Fisher, Major Calvin Goddard, and chemist Philip Gravelle created Bureau of Forensic Ballistics in New York in 1925.

- **Comparison microscope**

Even though Microscopes were available at that time, scientists have to compare the bullets found at crime scene and the standard bullets at separate times. They have to remember the characteristics of one bullet while analysing the other, this obstacle was solved by the invention of Comparison microscope which helped to compare both bullets simultaneously.

Philip Gravelle along with his partner Major Calvin Goddard made Comparison microscope to compare bullets at New York after the saint Valentine's Day massacre which happened in 1929. Calvin Goddard analysed the Cartridges case in the site and identifed the weapons used as a 12gauge shotgun and two Thompson submachine guns.

## IV) Advancements in Forensic Ballistics

- **IBIS**

IBIS or integrated ballistic identification system ia an automated firearms identification system. it was manufactured by forensic Technology WAI, inc. of Montreal, Canada. IBIS is used as a platform for National Integrated Ballistic Information Network ( NIBIN ) program which is used in USA. It has an image analysing system to store, analyse video images of bullets and Cartridge cases. It has two systems -

i)Bulletproof which analyse striations present in bullets. ii)
Brass catcher which analyse marks in cartridge cases.
It tracks nearly 100,000 guns used in crime in 220 sites of various law enforcement agencies and retrieve 10 possible matches with 75 - 95 % chance of accurate match.

- **ALIAS**

Advanced Ballistic Analysis System or ALIAS is strong visualization system that helps to compare slugs and marks in their database with the evidence from the crime scene. With a help of SWISS built interferometer, scientists upload images of evidence. It can be analyse in different ways with ALIAS software. ALIAS offers resolution of 2 microns or 1/50 of diameter of human hair. It also has the ability to compare images in 3D and examiners say it's better than IBIS. It will take an examiner only hours to train on how to use a ALIAS system.

- **ASPEX Gun Shot Residue Testing**

When a ammunition is fired, there will be residues of Gun powder and it will adhere to our skins, clothes and objects in close proximity. Gun shit residue might have lead, Barium and antimony from primer. In older times scanning electron microscope and atomic absorption were used but now there is more advansed system which is called ASPEX GSR. It will create a unique profile for the residue and identify the presence of GSR. This system can analyse 30 stubs simultaneously and it is most accurate method for testing Gun shot residue. This system also focuses on development of energy dispersal x-ray analysis combined with scanning electron microscope to increase resolution.

- **Evofinder Automated Ballistics Identification System**

1. Evofinder is made by ScannBi technology. It stores 2D and 3D images of cartridge cases and bullets in a database which can later be used for comparison and matching of ballistic evidence. Even strongly deformed cartridge cases, back and side portion of cases and bullets can also be stored in this database. This system also has 2 sided separate lighting for bullets and 4 sided separate lighting for cartridge cases. It has an removable cassette to hold bullets and cases inside the Evofinder system and scanning only takes 2 - 3 minutes approximately.

## V) Conclusion

This articles tells you about the historical developments of Forensic Ballistics and pioneers who spent their lives in this field of study. There are so many advancements in forensic ballistics in recent times which helps examiners to easily compare and match evidences found from crime scene. Forensic Ballistics is essential for finding the culprits and serve Justice to the victims of the crime.

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