



## Engineering Sciences Section - 2014

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### **C14 Investigation of Ear Witness Testimony With Regard to Sounds Heard During a Shooting Incident**

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The goal of this presentation is to demonstrate the benefits of the application of established scientific knowledge to aid in the understanding of a complex situation.

This presentation will impact the forensic science community by affecting the way that witness interpretations of noises heard during shooting incidents are investigated.

The paper focuses on an actual case study to demonstrate the relationship between different noises reaching witness' ears during shooting incidents. Witnesses often misinterpret what they hear and this can have an impact on their testimony, charges filed, and the outcome of litigation.

The subject incident arose from a single-shot event. An armed suspect was holed up in a house that was surrounded by law enforcement officers. Two groups of three officers were located approximately 100 yards from the rear of the house, and 100 yards apart. The suspect discharged one round from his firearm in the general direction of the officers. The officers subsequently filed statements making contradictory claims about what they had heard, and what the implications of those sounds were. Officers in both groups said they heard a projectile whistle over their heads. Others said they heard a crack as the bullet passed over them, or perhaps a crack of a door banging on a house to their rear, or a bullet impacting a wall behind them. A search of the area revealed no spent bullet, and no impact damage to the walls of residences to the rear of the officers. It was cold and windy at the time of the incident, and there was considerable activity in the area due to the presence of law enforcement and their vehicles.

The question was, just what did/could the officers hear at the time of the incident? The model and caliber of the firearm used were known and there were two possible types of ammunition that could have been used. Weather data for the time of the incident was available. Two analyses were performed and the results combined so that what the officers could possibly have heard could be ascertained. The first analysis was to determine the time of flight of the bullet to reach the officers' location and the location of the residences behind them. This was accomplished using trajectory modeling software. The second analysis was to determine the time that the gunshot noise took to reach the witnesses' locations and the time that any bullet impact noise from behind the witnesses took to reach their ears. This was accomplished using established physical relationships for the velocity of sound at specified temperatures.

The results of these two analyses were tabulated and used to determine what the officers may have heard. It was established that the gunshot noise (loud) and the bullet would take the same time to reach the witnesses. The bullet was subsonic at the time it reached the witnesses and, consequently, there would be no sonic crack to hear. Any "woosh" or "whistle" sounds would be minimal, and far quieter than the noise from the gunshot. It was concluded that the witnesses could not have heard a bullet passing close to their heads because any such noise would have been drowned out by the gunshot noise originating from the discharging firearm. Whatever noises the witnesses heard would have been before or after the bullet had been in their proximity.

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#### **Bullet Trajectory Modeling, Speed of Sound, Gunshot Noise**