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Evidence

Mr. Jerry McKnight
5439 Shookstown Road
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Dear Jerry,

I attempted to answer your questions on the analysis of the Kennedy bullets, by researching the subject in my collection of books on Criminalistics, when I discovered these facts (see enclosed copies). I hope this helps in your investigation, I acquired the information from an excellent source, *Criminalistics, An Introduction to Forensic Science* by Richard Saferstein.

I also spoke to an active member of the Police Lab, who was skeptical of the term "scientific match" and attempted to explain the change in weights of the evidence to the bombardment of radiation. This is a little beyond my expertise, to say the least, but he stated that he would need the before and after weights of the material and to review all of the submitted reports to make his judgement. You know how scientists are.

In closing, let me say that the maneuvering of the expert witnesses in this case was curious and somewhat confusing. Although not unique to the way a case can be investigated and presented, I've had first hand experience with a few myself, there are a few questions to be answered. In my own opinion, I do not feel that all the methods were sinister but maybe just an attempt to close the case with as few unanswered questions as possible. In my experience all that does is to raise more unanswered questions and doubt in the results. I wish you good health and luck, and hope that you will be successful in your research and publication.

Sincerely,

James Gannalo

may provide particularly meaningful data with respect to source or origin. Forensic investigators have examined the evidential value of trace elements known to be present in hair, soil, fibers, and glass, as well as in all types of metallic objects. One illustrative example of this application occurred with the examination of the bullet and bullet fragments recovered after the assassination of President Kennedy.

EVIDENCE IN THE ASSASSINATION OF PRESIDENT KENNEDY

Ever since President Kennedy was killed in 1963, questions have lingered about whether or not Lee Harvey Oswald was part of a conspiracy to assassinate the president or, as the Warren Commission concluded, a lone assassin. In arriving at their conclusions, the Warren Commission reconstructed the crime as follows: Oswald fired three shots from behind the president while positioned in the Texas School Book Depository building. The president was struck by two bullets, with one bullet totally missing the president's limousine. One bullet hit the president in the back, exited from his throat, and then went on to strike Governor Connally, who was sitting in a jump seat in front of the president. The bullet hit Connally first in his back, then exited from his chest, struck his right wrist, and then temporarily lodged in his left thigh. This bullet was later found in the governor's stretcher at the hospital. A second bullet in the skull fatally wounded the president.

In a room at the Texas School Book Depository, a 6.5-mm Mannlicher-Carcano military rifle was found with Oswald's palm print on it. Also found were three spent 6.5-mm Western Cartridge Co./ Mannlicher-Carcano (WCC/MC) cartridge cases. Oswald, an employee of the Book Depository, had been seen there that morning and also a few minutes after the assassination, disappearing soon thereafter. He was apprehended a few miles away from the Depository nearly two hours after the shooting.

Critics of the Warren Commission have long argued that evidence exists for proving Oswald did not act alone. Eyewitness accounts and acoustical data interpreted by some experts have been used to advocate the contention that someone else fired at the president from a region in front of the limousine (the so-called grassy knoll). Furthermore, it is argued that the Warren Commission's reconstruction of the crime relied on the assumption that only one bullet caused both the president's throat wound and Connally's back wound. Critics contend that such damage would have deformed and mutilated a bullet. Instead, the recovered bullet showed some flattening, no deformity, and only about 1 percent weight loss.

In 1977, at the request of the U.S. House of Representatives Select Committee on Assassinations, the bullet taken from Connally's stretcher along with bullet fragments recovered from the car and various wound areas were examined for trace element levels.

Lead alloys used for the manufacture of bullets contain an assortment of trace elements. For example, antimony is often added to lead as a hardening agent; copper, bismuth, and silver are other trace elements commonly found in bullet lead. In this case, the bullet and bullet fragments were compared for their antimony and silver content. Previous studies had amply demonstrated that the levels of these two elements are particularly important for characterizing WCC/MC bullets. Bullet lead from this type of ammunition ranges in antimony concentration from 20 to 1200 parts per million (ppm) and 5 to 15 ppm in silver content.

As can be seen in Table 6–3, the samples designated Q1 and Q9 (the Connally stretcher bullet and fragments from Connally's wrist, respectively) are indistinguishable from one another in antimony and silver content. The samples Q2, Q4, 5, and Q14 (Q4, 5 being fragments from Kennedy's brain, and Q2 and Q14 being fragments recovered from two different areas in the car) also are indistinguishable in antimony and silver content but are different from Q1 and Q9.

The conclusions derived from studying these results are:

1. There is evidence of only two bullets—one of a composition of 815 ppm antimony and 9.3 ppm silver, the other of a composition of 622 ppm antimony and 8.1 ppm silver.

TABLE 6–3.

ANTIMONY AND SILVER CONCENTRATIONS IN THE KENNEDY ASSASSINATION BULLETS

Sample	*Silver (parts per million)*[a]	*Antimony (parts per million)*	*Sample Description*
Q1	8.8 ± 0.5	833 ± 9	Connally stretcher bullet
Q9	9.8 ± 0.5	797 ± 7	Fragments from Connally's wrist
Q2	8.1 ± 0.6	602 ± 4	Large fragment from car
Q4, 5	7.9 ± 0.3	621 ± 4	Fragments from Kennedy's brain
Q14	8.2 ± 0.4	642 ± 6	Small fragments found in car

[a]One part per million equals 0.0001%.

Source: Reprinted with permission from V. P. Guinn, "JFK Assassination: Bullet Analyses," *Analytical Chemistry*, 51 (1979), 484A. Copyright 1979, American Chemical Society.

INCONCLUSIVE !!

2. Both bullets have a composition highly consistent with WCC/MC bullet lead, although other sources cannot entirely be ruled out.
3. The bullet found in the Connally stretcher also damaged Connally's wrist. The absence of bullet fragments from the back wounds of Kennedy and Connally prevented any effort at linking these wounds to the stretcher bullet.

None of these conclusions can totally verify the Warren Commission's reconstruction of the assassination, but the results are at least consistent with the Commission's findings.

The analyses on the Kennedy assassination bullets were performed by the technique of neutron activation analysis. The remainder of this chapter will be devoted to describing this and other techniques currently used for the examination of inorganic physical evidence.

THE EMISSION SPECTRUM OF ELEMENTS

We have already observed that organic molecules can readily be characterized by their selective absorption of ultraviolet, visible, or infrared radiations. Equally significant to the analytical chemist is the knowledge that the elements will also selectively absorb and emit light. These observations form the basis of two important analytical techniques designed to determine the elemental composition of materials—**emission spectroscopy** and **atomic absorption spectrophotometry.**

The statement that elements emit light should not come as a total surprise, for one need only observe the common tungsten incandescent lightbulb or the glow of a neon light to confirm this observation. When the light emitted from a bulb or from any other light source is passed through a prism, it is separated into its component colors or frequencies. The resulting display of colors is called an **emission spectrum.**

When sunlight or the light from an incandescent bulb is passed through a prism, we have already observed that a range of rainbow colors is produced. This emission spectrum is called a **continuous spectrum** because all the colors merge or blend into one another to form a continuous band. However, not all light sources produce such a spectrum. For example, if the light from a sodium lamp or a mercury arc lamp or a neon light was passed through a prism, the resultant spectrum would consist not of a continuous band but of several individual colored lines separated by dark spaces. Here, each line represents a definite wavelength or frequency of light that is separate and distinct from all others present in the spectrum. This type of spectrum is called a **line spectrum.** Figure 6–1 shows the line spectra of three elements.