CRIME LAB REPORT
Media and public policy analysis for the forensic science community

VOICES OF HISTORY - A SPECIAL EDUCATIONAL SERIES BY CRIME LAB REPORT

The father of firearm identification speaks - an interview with Dr. Calvin Goddard

April 15, 2009 by Crime Lab Report

About *Voices of History*

Forensic science is both young and old. As an organized profession shaped by strict quality management standards and higher educational requirements, forensic science is very young – less than 30 years old. But many of the most commonly practiced techniques have a long history of development and research that is often forgotten even by forensic science practitioners themselves.

In our *Voices of History* series, *Crime Lab Report* resurrects pioneers and thinkers who were critical to the development of today's forensic sciences. In their own words, we learn of their contributions, their setbacks, and their perspective on contemporary issues facing the profession.

What follows are the actual comments of one such pioneer set within an imaginary interview conducted by *Crime Lab Report's* managing editors. In some instances, actual quotes have been used. In other instances, *Crime Lab Report* has exercised editorial liberty by either carefully paraphrasing the individual or providing answers that are most consistent with comments appearing in various literature sources. Every effort has been made to preserve both the meaning and context of such comments.

If you have an idea for a *Voices of History* interview or would be willing to assist us in researching the literature, please contact our editors at editors@crimelabreport.com or call us toll free at 866-674-9194.

An Interview with Dr. Calvin Goddard – The Father of Firearm Identification

CRIME LAB REPORT: Dr. Goddard, we are thrilled to be able to speak with you today. You're probably aware of the recent National Academies report on forensic science. Are the identification disciplines as lacking in foundational research as so many modern-day critics seem to think?

GODDARD: I'm not sure how to answer that. I can only speak to the firearm-identification research that was performed in the early days when the discipline was in its infancy.

CLR: In that case, can you talk a bit about the foundational research in firearm & toolmark identification? What was your role in determining whether or not this particular discipline was valid?

Dr. Calvin Goddard adjusts his comparison microscope, circa 1930.

GODDARD: Following my work on the St. Valentine's Day Massacre in Chicago in 1929, I was invited to move my laboratory to the campus of Northwestern University, where it was envisioned that a complete forensic science laboratory would be located. It was supposed to be patterned after the best medico-legal institutes and police laboratories overseas. I spent three months in some thirteen countries and realized that the large majority of research and literature on the subject appeared almost exclusively in foreign journals.

CLR: What do you think was the reason for this?

GODDARD: Unfortunately, most of our American police investigators had no scientific background or interest and remained in complete ignorance of the work of our foreign colleagues. But as time progressed, it wasn't long before students of the science in this country began making their own additions to the literature.

CLR: Are the intense criticisms that we are seeing today a new phenomenon or is this something you had to deal with also?

GODDARD: Although it's frustrating, it's not a new phenomenon. In my day, it was the criminal lawyers, as you would expect, who were the most outspoken in trying to discredit the comparison microscope. This is just my opinion, but I think they saw it as a threat to their ability to manipulate testimony in cases involving firearms.

CLR: With all due respect, that's a rather harsh statement to make. What do you base it on?

GODDARD: I remember two suspected killers named Sacco and Vanzetti who were on trial for capital murder. They had many supporters who were openly opposed to capital punishment and cursed the comparison microscope, and everyone using it, after it was used to reveal without question that the fatal bullet removed from the body of one of the victims had been fired from the barrel of Sacco's automatic pistol. Also, at least one of the empty cartridge cases found at the scene of the crime bore the impressions of the weapon's breech face.

CLR: It seems that many of the classical forensic disciplines, such as firearm identification, are victims of their own age. They preceded the era of mass media and fast information that we enjoy today. Do you agree?

GODDARD: I do, especially with regards to the argument of art versus science, which fascinates me. The origins of both the art and science of firearm identification is, like that of any

other branches of human endeavor, shrouded in obscurity. Unfortunately, we simply can never know with any certainty when the first man discharged a firearm, recovered the fired bullet and observed similar patterns of striae inside a certain number of grooves, inclined in the same direction, all of the same width, sloping at the same angle, and spaced equally about its circumference, and that every other bullet fired through the same weapon showed similar markings. This historical obscurity, however, does not detract from the validity of the science.

CLR: Maybe so, but do you have any idea when the field became established here in the United States? After all, you are considered the father of the science.

GODDARD: Yes, but I'm not sure that I deserve the title. In the United States, the first investigator to bring the field forcefully to the attention of the world was Dr. Albert Llewellyn Hall who authored an article that appeared in the Buffalo Medical Journal in June, 1900. In his article, he clarified and summarized the basic problem of bullet identification, and I would say that his perspective on the discipline remain unsurpassed until the actual development of the comparison microscope.

CLR: Did you ever meet Dr. Hall?

GODDARD: Yes I did - in the summer of 1931 and he confessed to me with some regret that following the publication of his article he made no further effort advance the science of firearm identification. In spite of this, he probably deserves the title of the father of firearm identification in America.

CLR: We appreciate your modesty, but can you tell us a bit about your own educational background?

GODDARD: I grew up in Baltimore, and attended Johns Hopkins University. After completing my undergraduate degree, I went to medical school at Johns Hopkins and received my medical degree in 1915. I remained at Johns Hopkins for a short time, specializing in cardiology. As many of us did back then, I entered the Army in 1916 as a major in the Medical Corps and served in France, Belgium, Germany and Poland. I returned home in 1920, as a part of the Army Ordnance Department, since I have always had an interest in firearms. I returned to Johns Hopkins and eventually became Deputy Director of the University Hospital.

CLR: You mentioned the research and literature that was predominantly established overseas. Can you expand on this for our readers?

GODDARD: Certainly. Around 1912, a French professor of forensic medicine at the Sorbonne in Paris by the name of Victor Balthazard began taking photographs of fatal bullets in an effort to capture any markings that might allow him to identify the bullets to the actual weapons from which they were fired. He compared the photographs with those of the test bullets fired from the suspected weapons and determined that the cutter used to create the rifling of a firearm never leaves quite the same markings in its successive passes through a barrel. As a result, he confirmed the existence of a pattern of striations that can serve to identify a particular weapon.

Balthazard also called attention to the markings imparted to cartridge cases fired in automatic pistols by the firing mechanism, breech face, extractor, and ejector. In fairness, we can credit Balthazard with having been the first to establish the practical applications of cartridge case identification.

CLR: At what point however, did the practical applications of firearm identification take root in the United States?

GODDARD: I'm glad you asked this because people may be surprised to know that the history of firearm identification has deep roots in overturning wrongful convictions, a subject that has so much media attention right now. Can I tell you about one case in particular?

CLR: Yes, please.

GODDARD: Around 1917, an investigator named Charles Waite, who worked in the New York State Prosecutor's Office, was asked by Governor Whitman to conduct an investigation into the case of a man named Charles Stielow. Stielow was convicted of a double murder in 1915. There were some serious questions about whether Stielow had actually committed the crime, especially after reports that two other men had confessed to the murder. The principal evidence against Stielow was two .22 caliber bullets removed from the bodies of the victims. Coincidentally, Charles Stielow owned a 22 caliber revolver.

CLR: False confessions are still a big problem today, but a caliber-match doesn't seem like very strong evidence.

GODDARD: Yes, but Waite determined that firearm-related testimony given at Stielow's trial by a man named Albert Hamilton was misleading at best and incompetent at worst. So he accumulated statistical information regarding the manufacture of all makes and types of firearms and ammunition so he could deduce some sort of a method whereby a firearm could be linked to a particular homicide. He visited the principal makers of arms and ammunition in the U.S. and abroad and was able to secure vast amounts of technical data. At the same time he collected samples of unfired bullets, empty primed shells, loaded cartridges and specimen firearms, in every possible make, type, caliber and variety….

CLR: It's one thing to have the information, but it's another to be able to do something with it.

GODDARD: True. Eventually he began to realize his lack of technical knowledge and began to search for people to help him. First he found John Fisher, a physicist, formerly on the staff of the United States Bureau of Standards, who was an expert mechanical engineer and had special expertise in instrument design and precision measurement. Then he located Philip Gravelle, a chemist from Columbia University who was also an accomplished photographer and microscopist. Eventually, I joined the group in 1925, and the Bureau of Forensic Ballistics was established, the first institute of its kind anywhere.

CLR: You were saying that the birth of the Bureau of Forensic Ballistics actually resulted from the wrongful conviction of Charles Stielow and the search for the means to use firearms evidence to overturn his conviction. Can you explain that a bit more?

GODDARD: Yes. Waite was able to show that the grooves in Stielow's revolver were regularly spaced and normal, but the murder bullets bore the imprint of an abnormally wide land, which meant that the murder weapon had, in fact, a manufacturing abnormality. After serving three years in Sing Sing Prison, Stielow was pardoned by Governor Whitman. At one point, Stielow was actually strapped into the electric chair before a last minute reprieve was delivered.

CLR: This is fascinating. Charles Waite is not a name we commonly hear associated with firearm identification. But clearly his passion was critical to the development of the science. Did you enjoy working with him?

GODDARD: Let me put it this way. While his ability as an investigator was well-established, his qualifications and skills as a promoter were even better. He had a very ingratiating personality and a rare and unusual ability to sell himself and his projects. Gravelle, Fisher and I all succumbed to his "passion," as you said. In fact, Gravelle and Fisher did a tremendous amount of work for Waite over a period of two or three years all on the promise of recompense "when the ship came in." As for myself, I actually paid him $7500 for a half partnership in his work prior to the development of the comparison microscope by Gravelle.

CLR: It sounds like all three of you were immensely impressed with Waite.

GODDARD: Indeed. But I was even more impressed by the importance of the statistical data about arms and ammunition that he had accumulated – not to mention his rosy vision of the development of a sound method of firearms identification.

CLR: Because this was such a new and developing science, there must have been some tension among you. True?

GODDARD: There was. In fact, it seemed like I was in constant conflict with Waite over the amount of information to be released to the public with regards to instruments and methods we were developing. He was all for publicity – the kind that would bring in business, but violently opposed to the dissemination of any data which might enable competitors to duplicate our work. He disapproved vigorously of my contributions to scientific journals on the subject of our studies, and would agree to their publication only if and when I would incorporate sufficient commendatory remarks concerning him personally.

CLR: Do you think it was unfair for Waite to be concerned with the strength of your young scientific organization? It seems reasonable to exercise some control over the disclosure of proprietary information.

GODDARD: I don't disagree with that, but in conversations with clients, Waite often gave the impression that he *was* the organization, and that Gravelle, Fisher, and myself were junior office

boys. I'm certain that he never once examined an evidence bullet or cartridge case from the time of my joining him in the Spring of 1925 until his death in November 1926. He relied on me for this part of the work. So, to answer your question, Waite did furnish the idea and had good reason to be concerned about the disclosure of information. Without his promotional ability to inflame my enthusiasm, I would never have resigned my lucrative position as I did to join him, or paid him the sum I did for half interest. Neither would Gravelle or Fisher have made their fundamental contributions to the science of firearms identification. Instead, it would have relied upon others, at some later time and place, to adapt the comparison microscope to bullet and shell studies, and remove these from their status of guess work and uncertainty, to the clear cut science under which they are now conducted.

CLR: You have made several mentions about the development of the comparison microscope. Can you explain more about how this instrument was actually developed?

GODDARD: Waite had consulted with a man named Max Poser at the Bausch & Lomb Company while he was working on the Stielow case. He convinced Poser to design a microscope that made it possible to measure the width of lands and grooves engraved on a bullet's surface and the angles these grooves made with its long axis. Again, Waite's ability as a promoter was astonishing so it's no wonder that he motivated Poser to develop a first rate microscope with bullet holders and measurement scales.

CLR: When was the comparison microscope first subjected to any kind of validation study?

GODDARD: Gravelle used the microscope as a way to take pictures of the bullet surfaces, which is when he discovered that the bullets had certain distinctive characteristics. Basically he believed he had found the fingerprint of every individual weapon. While the use of this method of using photographic prints to compare these markings was certainly shown to be very accurate, the time and expense involved in its application rendered it impracticable. Imagine the number of hours consumed comparing a fatal bullet with test specimens from half a dozen suspected weapons.

CLR: How much do you think Gravelle modified Waite's original concept for the comparison microscope?

GODDARD: Good question. Gravelle's original instrument was a cocktail of a lot of different components. As I recall, he used a Zeiss comparison bridge, Spencer tubes, Leitz eyepieces, Bausch & Lomb objectives, and customized bullet mounts he ordered from the Remington Arms Company. The idea of such an instrument was not a new one. One had been used for years for the analysis of questioned documents by Albert S. Osborn of New York. But it was entirely Mr. Gravelle's ingenuity that allowed it to be used effectively for firearm identification.

CLR: You mentioned that you had some disagreements with Waite concerning the release of your findings, so when did you first publish an article about this new technique?

GODDARD: I published my first article on the comparison microscope and its uses in bullet and cartridge case identification in the November-December 1925 issue of *Army Ordnance*. The article was entitled "Forensic Ballistics" and for that phrase I take full credit and blame.

CLR: What do you mean by blame?

GODDARD: Unfortunately, the public took up the expression rather quickly and found that the phrase was a bit awkward, so the practice eventually became known simply as ballistics, which I didn't like. So I coined the term firearms identification because I felt it was more accurate.

CLR: What kind of response did you get once the article was published?

GODDARD: Right away, inquiries began to come in from interested parties, such as Dr. J. Howard Matthews who was the Professor of Chemistry at the University of Wisconsin. I was also contacted by an optical company in St. Louis.

CLR: What did they want?

GODDARD: The inquiries dealt with how the comparison microscope was constructed, what were the magnifications of the oculars and objectives, where could bullet mounts be secured, what cameras and lenses were used in photography, what type and intensity of illumination, and so on. Technical information, basically.

CLR: How did Waite feel about this in light of the fact that he was so intent on keeping your work private?

GODDARD: Waite was furious with a letter that I wrote to Dr. Matthews and the amount of detail that it included. In fact, Waite, insisted upon destroying the letter and substituting for it one with vague generalities which conveyed absolutely no useful information. The same held true for the St. Louis inquiry. Fortunately, Dr. Matthews was not discouraged and proceeded to build himself a microscope and camera equipment that he used with great success.

Another inquiry came from Charles Gunther, a Professor of Mathematics at Stevens Institute of Technology in New Jersey, who also went on to become a pioneer in the field. I accommodated anyone with a scientific background and ordnance affiliations. Gunther soon became such a constant visitor at my office and apartment that I provided him a key and he came and went as he pleased at all hours of the day - whether I was there or not. I supplied him samples of every type of ammunition, duplicated prints of matched bullets and cartridge cases, and so on. Finally, in order to help him afford the money to buy his own microscope, I took him with me as an associate expert on a murder case.

CLR: Can you quickly tell us about anyone else who was interested in your work?

GODDARD: Edward C. Crossman of California. He arranged to collaborate with Waite as our Western associate, and was one of the first to purchase and operate his own comparison

microscope. I visited with him in the summer of 1926 and compared notes with him. After Waite died, our association more or less dissolved, although we remained friends. If I had ever been falsely accused of a crime committed with a firearm, I think Ed Crossman would be the first person that I would have called to help prove my innocence.

Another scientist who visited my laboratory during the early years was Dr. Wilmer Souder, Principal Physicist of the U.S. Bureau of Standards. He had already been interested for some time in federal cases involving document examination. He felt that his bureau was likely to have firearm identification cases referred to it as the science developed so he familiarized himself with the latest methods and had numerous conversations and exchanges of correspondence with me on the subject. These led to the purchase by his bureau of a comparison microscope and camera outfit, which launched him into this work. Souder was a scientist of the highest order and he has since contributed largely to the advancement of the discipline.

CLR: This is interesting. I think today's critics simply don't realize that people with Dr. Souder's credentials were deeply involved in the development of this science.

GODDARD: Souder was certainly an important contributor. At the time of his first visit with me, there was a case of a felonious shooting in Washington, D.C. A Lieutenant John Fowler from the Metropolitan Police department was encouraged by the comparison microscope as a solution for these identification problems, and was soon working with Dr. Souder at the Bureau of Standards.

CLR: At this stage, it seems that the majority of the interest in firearms identification was more academic in nature, rather than from the standpoint of a law enforcement tool. When did police agencies and crime labs begin to embrace this new technique?

GODDARD: The inquiry from the optical company in St. Louis was actually on behalf of the St. Louis Police Department Laboratory, which was managed by Mr. Thomas Lewis. They developed their own equipment with some interesting refinements. On my way back east following my visit to Crossman, I stopped to demonstrate my comparison microscope to the heads of the police identification bureaus in several cities, including, as I recall, El Paso, Houston, Beaumont, and New Orleans.

CLR: What was their impression?

GODDARD: The more advanced police officers were quick to recognize the possibilities of the comparison microscope. In fact, Waite was invited to address the International Association for Identification (IAI) in 1925, which at the time was probably the most scientific of American law enforcement bodies. Within a year or two after our work was launched, the IAI, comprised almost entirely of fingerprint men, approved the acceptance of firearms examiners as members.

CLR: When did the FBI eventually become interested in the comparison microscope as an instrument for comparing bullets and cartridge cases?

GODDARD: Well, by 1927 or 1928 the comparison microscope was being used by numerous police departments. I tried to get J. Edgar Hoover to give me his thoughts on it one way or another but he was unwilling to do so. It wasn't until 1932 when the instrument had long been standard equipment in the majority of our metropolitan police departments that the FBI installed a comparison microscope in its identification laboratory.

CLR: Whatever became of Gravelle and Fisher? I think it's safe to say that most modern-day firearms examiners aren't familiar with them.

GODDARD: That doesn't surprise me. When Waite died, Gravelle and Fisher more or less realized that the launching of this new science was not the financial bonanza that Waite predicted. They eventually lost interest in the work but stayed friends.

CLR: Did they ever receive the financial rewards that Waite had promised? Did the "train" ever come in?

GODDARD: Yes and no. Waite kept the books and handled the finances of the organization but he failed to pay either of these men a penny for their services. At the time, I was obviously unable to compensate them, but managed to do so over a period of years ending in 1930. But also keep in mind that neither Gravelle nor Fisher had ever really devoted more than their spare hours to our bureau. Gravelle had a full-time position in the design department of a large textile organization and Fisher, who was independently wealthy, merely worked with us when he felt like it. They didn't have the passion that I had for the science.

CLR: What would you say to those critics today who claim that the field of firearms identification is not sufficiently grounded in science and that proper studies have not been conducted to fully understand the reliability of the methodology?

GODDARD: I don't think I would say anything to them. If they don't think the work is reliable, then scientific protocol would require them to do their own research and conclusively demonstrate that it isn't reliable.

CLR: That make sense, but these critics do not seem to be interested in science. They rely almost entirely on rhetoric.

GODDARD: I faced the same problem in my day so I am sympathetic. In my day the whole-hearted acceptance of the firearm identification science by people who might have been prone to reject it was sufficient to compensate for the disappointments produced by blind reactionism – or rhetoric, as you called it. John Henry Wigmore, Dean of the Northwestern University Law School, whose "Rules of Evidence" were the standard for many years, was quick to appreciate the importance of the comparison microscope and even more quick to encourage me in my efforts to break down prejudices against it. Without his help I might have abandoned the struggle, and I feel he should be given a lot of credit for the universal scientific acceptance that exists today.

CLR: So what is the final piece of advice you have for the forensic sciences?

GODDARD: Never stop building upon the existing research and never be satisfied with the state of the art. Continue to develop the science of firearm identification despite what the detractors have to say. The truth will win in the end. *****