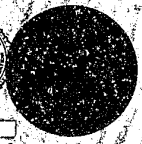
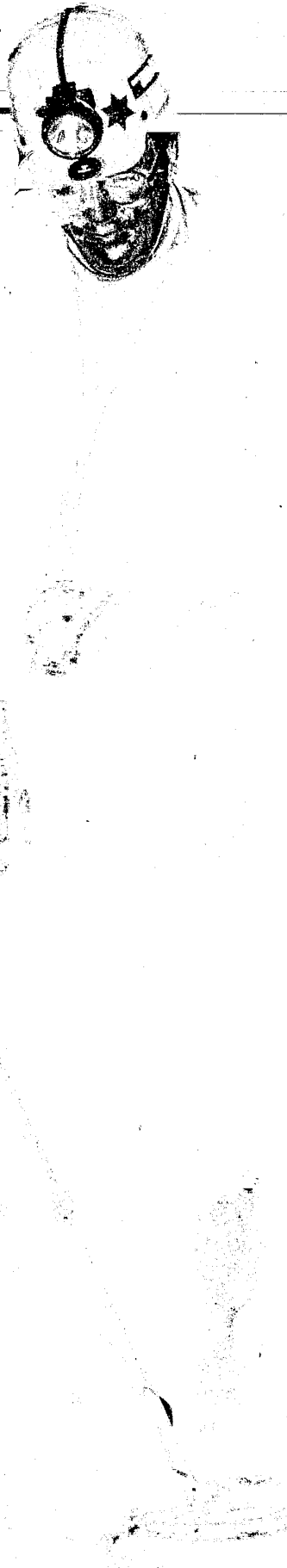


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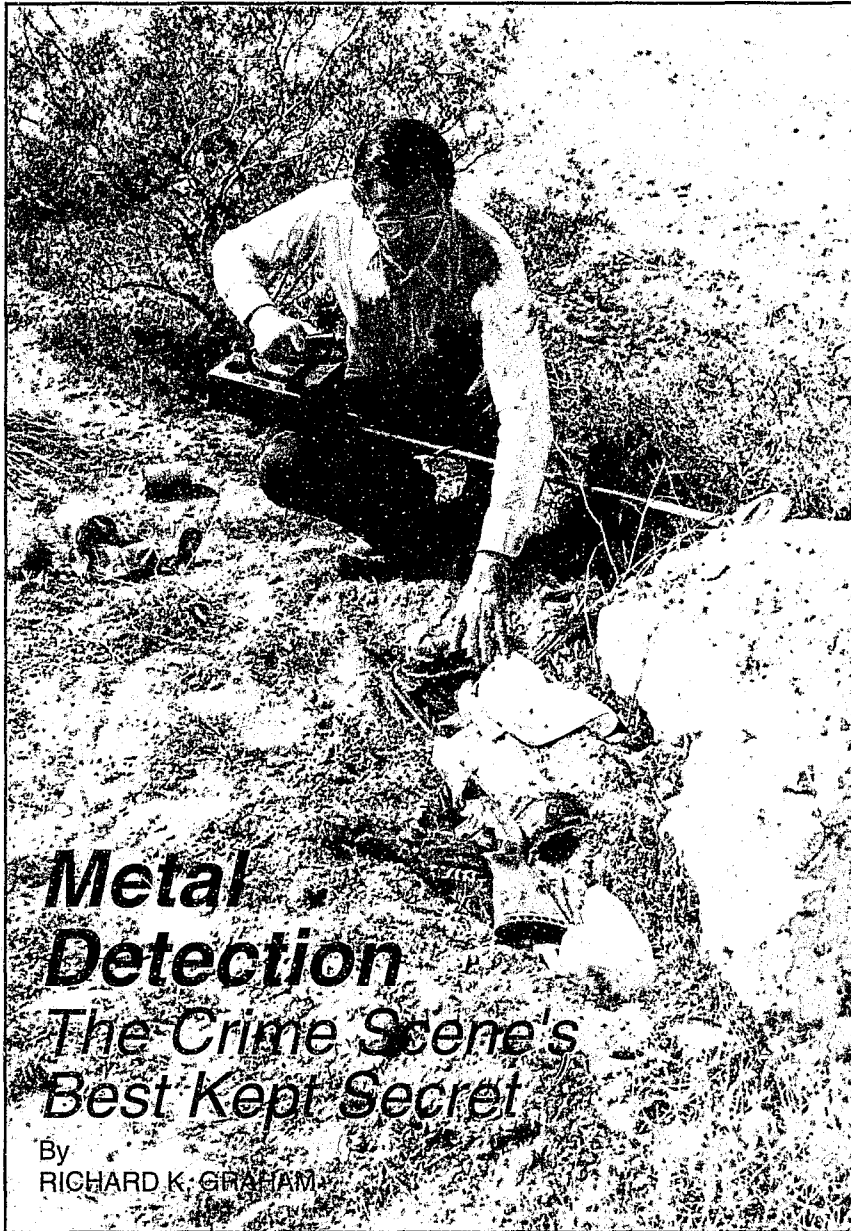
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## **Metal Detection** *The Crime Scene's Best Kept Secret*

By  
RICHARD K. GRAHAM

**I**t has been said that one person's trash is another's treasure. Nowhere is this adage more true than in the law enforcement setting.

Fragments of metal that most people would disregard can be, quite literally, crime scene treasures to investigators. These pieces of

evidence become forensic gems in the hands of skilled examiners and constitute a veritable bonanza for trained law enforcement officers who understand the value of physical evidence. In other words, small metallic fragments can be the "stuff" that makes convictions.

This article reaffirms the importance of the one investigative tool—a quality metal detector—that can locate hidden metallic crime scene treasures perhaps better than any other. In the hands of a skilled investigator, the metal detector represents an indispensable weapon in law enforcement's arsenal. Yet, all too often, metal detection seems to be the crime scene's best kept secret.

### **CASE STUDY**

A shootout between a police officer and a subject left the officer in serious condition with a gunshot wound to the abdomen. The officer had responded to a silent alarm and, finding the door of the business ajar, entered the building to initiate a search. He later reported that as he stepped out the back door of the building, he heard movement in the bushes to his left, but could not see anyone because it was a moonless evening and visibility was limited.

As the officer turned in the direction of the noise, he announced his identity. Instantly, two shots were fired in rapid succession from the subject's hiding place in the bushes; one projectile passed through the officer. According to the officer's account, he proceeded to move away from the building after being struck and, after four or five steps, fired twice into the bushes. He subsequently collapsed in a grassy area 30 feet from the door. Backup units responding to the scene took the subject into custody.

The subject's story completely contradicted that of the officer. The subject assured the arresting officers that he went to the building in question to speak with the owner. As he

approached the building, he heard someone exit the back door. He then took cover in the bushes at the rear of the building. Without warning, the person exiting the building turned and fired at least two rounds in his general direction. In an effort to preserve his own life, the subject returned fire and then observed the other person stumble and fall to the ground.

The officer's bullets struck the wooden frame of one of the building's windows, so the points of impact were readily apparent. Established trajectories placed the officer 15 feet from the door when he fired his shots, supporting his claim that he had fired only after moving four or five steps away from the building. This reconstruction helped to establish the veracity of the officer's statement. Yet, it did not totally disprove the subject's story or verify the sequence of the shots.

Only the bullet that had passed through the officer could establish who shot first. If that bullet was found close to the side of the building, it would support the officer's statement that he was fired upon as soon as he exited the building. On the other hand, the further away from the building the bullet was found, the more credible the subject's story that he had returned fire only as the officer moved away from the door.

The police department called a metal detection/crime scene specialist to the scene. Following a preliminary survey of the scene, tests determined the conductivity of the 9mm bullet being sought. The metal detector consistently gave the same reading (signature) each time the

searchcoil (antenna) passed over the test target. Additional tests indicated that the slug in question would remain intact and that the copper jacket would not separate from the lead core after passing through a human body.

Knowing the test bullet's signature, the crime scene specialist initiated a systematic and exhaustive search in an effort to verify or discredit the officer's statement. Metallic items unrelated to the shooting incident littered the search area. The operator ignored all metal signals until the detector located and reported a target item bearing the same characteristics as the test bullet.

The metal detector identified a single target with the same signature as the test bullet from among numerous other metallic targets in the search area. This fact alone was quite remarkable, but the metal detector provided even more critical information. The machine electronically pinpointed the target, placing

the bullet within a circle approximately the size of a U.S. half dollar very close to the side of the building. Next, the detector signaled that the target rested just below the ground's surface, less than an inch deep.

With this information, investigators carefully probed the area and found a mushroomed 9mm copper-jacketed projectile. They measured and photographed the bullet in place, then carefully recovered and maintained it as evidence. Subsequent forensic examination of the bullet located fibers consistent with the officer's shirt.

Knowing the location of the bullet that had passed through the officer enabled investigators to reconstruct the sequence of shots based on the subject's hiding place, the bullets' trajectories, and the officer's pattern of movement. The recovery of this vital piece of evidence gave proof positive that the officer had been fired upon almost immediately after leaving

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Mr. Graham, a retired FBI Agent, works as a private consultant in Springville, Utah.

the building. This one small item of physical evidence established the officer's credibility and debunked the subject's alibi. This case and others like it clearly demonstrate the capabilities of metal detectors in crime scene settings.

### **THE POWERS OF METAL DETECTION**

Technology has advanced to the point that a metal detection unit can report subtle differences in two similar metallic targets. For example, metal detectors can distinguish the individual characteristics of a .38-caliber, copper-jacketed slug from those of a lead bullet of the same size. Some detectors can alert the operator to whether a hidden

item is a knife, a handgun, or another weapon.

With very sophisticated detectors, operators can determine whether a particular concealed target is lead, iron, aluminum, gold, copper, or silver, based on the metal's conductivity. Detectors also can be programmed to search for a single, predetermined target, regardless of size, while disregarding all other metals. A detector's electromagnetic field penetrates air, water, earth, wood, stone, concrete, bone, skin, and tissue.

### **ECONOMY OF METAL DETECTION**

For many years, investigators have integrated innovative tools

and techniques into their fact-gathering procedures. Law enforcement agencies are becoming somewhat more aware of metal detection's important role in the crime scene process; however, many continue to regard it as a low-priority investigative tool.

Law enforcement agencies often lament a lack of funds to purchase equipment and to receive proper training in its use. Ironically, an agency that is unable to purchase a \$400-\$500 metal detector will spend thousands of dollars in labor and equipment to find one small item of physical evidence. Yet, the purchase of proper equipment, coupled with a small investment in training, can, quite literally, save an agency tens of thousands of dollars.

### **EFFICIENT USE OF TIME**

Most officers whose careers span 10 or more years have experienced the headache of searching for small items of evidence on their hands and knees. Clearly, this recovery method can locate evidence and, in fact, has produced results in the past. However, this type of search consumes a massive amount of time and requires a considerable investment of labor. In contrast, one officer with a metal detector can accomplish the same ends in a fraction of the time.

### **EXPERIENCED PERSONNEL**

Surprisingly, many law enforcement agencies depend on local treasure hunters to process crime scenes for hidden metallic evidence. Although treasure hunters may understand metal detection equipment,



**"...metal detectors can distinguish the individual characteristics of a .38-caliber, copper-jacketed slug from those of a lead bullet of the same size."**

they cannot be expected to possess expertise in conducting crime scene searches.

Trusting the crime scene to amateurs could compromise an entire investigation and create significant problems in the courtroom. It is important for law enforcement agencies to select crime scene experts who are skilled in metal detection.

## TRAINING

Learning to operate a metal detector is similar to learning the intricacies of a camera. The ability to take a picture does not make a person a crime scene photographer. Similarly, observing a hobbyist finding coins in a park does not teach the nuances of this specialized equipment or train an officer to conduct metal detection searches for evidence. While mastering the use of a metal detector is not difficult, considerable skill must be developed to obtain optimum results.

Law enforcement agencies need to ensure that officers assigned to use metal detection equipment receive training in crime scene applications. This course of study helps students to understand the operation of metal detectors, teaches them the skills required to process crime scenes for metallic evidence properly and effectively, and lays a proper foundation for the metal detection specialist. But, it is only the first step in learning to process a crime scene successfully with metal detection.

For metal detector operators to maintain and improve their proficiency, they must use the equipment in a self-paced program. Officers

trained in metal detection should be encouraged to use it regularly in an off-duty, hobby capacity.

An important truth about metal detection is simply this: If officers can find a dime in a park, they can locate a bullet in a crime scene. Without regular practice, though, metal detector operators can lose much of their ability to interpret signals and can forget desired detection settings. The time for officers to brush up on metal detection skills should not coincide with the time to process a crime scene.

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## LIMITATIONS

Like any piece of equipment, a metal detector does have limitations. Law enforcement administrators should have realistic expectations of the capabilities of detection equipment.

### Operator Skills

The principal limitation of a quality metal detector does not stem from manufacturing defects but from unskilled operators. The finest

detection unit cannot overcome operator deficiencies.

For example, skilled crime scene specialists recently searched the location of the shooting of a Federal officer. Evidence was collected, but bullets, shell casings, and other metallic evidence evaded the officers' detection. The crime scene supervisor understood the unique capabilities of metal detectors and obtained a number of detection units for the crime scene search. Then, veteran investigators scanned the scene using this specialized equipment. Although proper equipment had been introduced into the search, only limited success was realized.

Several months later, a metal detection/crime scene specialist entered the search and, in a fairly short time, recovered several critical items of evidence. The officers in the original search were experienced in investigative techniques but had no background or training in the use of metal detectors. Agency administrators learned an important lesson—the finest metal detectors cannot overcome the barrier of inexperienced operators.

### Metals Only

Metal detectors detect only metal and cannot be expected to locate other items of evidence. They also cannot detect one metal through another metal. For example, if a killer placed a murder weapon inside a tin box and buried it in the ground, the detector would report only the presence of tin. Additionally, if gold coins are buried in a cast iron pot, the metal detector would not “see” the gold but would alert the operator

only to the discovery of the pot's cast iron lid.

### **Depth**

The most frequently asked metal detection question is, "How deep will it go?" This seemingly simple question does not have a simple answer. Metal detectors search for metal mass and, therefore, will detect large metal targets at much greater depths than small items. For example, a safe can be detected at 3 feet or more, while a .38-caliber slug may be seen by the detector to depths of only 7 or 8 inches. To obtain optimum results from any metal detection search, the operator must understand the detector's depth limitations.

### **Scanning Width**

Metal detectors have limited scanning widths. The detector's searchcoil must, quite literally, pass directly over or in very close proximity to the desired target for detection to occur.

A shell casing hidden a short distance outside of a search area will be missed by a metal detector. Therefore, to ensure that all critical evidence is located, the searchcoil must pass over every inch of the area being processed. Because the scanning width can be no greater than the width of the searchcoil, strict attention must be given to a systematic and detailed search.

### **SELECTING A METAL DETECTOR**

To say that law enforcement agencies should purchase only quality detection equipment simply states the obvious. Use of poor

quality equipment rarely produces the desired results and could even be less effective than other search methods.

Because financial constraints regularly dictate the terms for acquiring new crime scene tools, departments often must settle for inferior equipment. Yet, quality metal detectors that will give years of trouble-free and dependable service to law enforcement agencies can be purchased at a reasonable price. Also, purchasing metal detection units on a low-bid basis or as part of a crime scene kit will almost certainly produce less than desirable results.

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***Numerous metal detection successes in the field give startling testimony to the effectiveness of this investigative tool.***

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Crime scene investigators should insist on detection units with proven track records and the latest technology. Some features to consider when purchasing detection units include simplicity of design and operation, automatic ground canceling, and ruggedness.

### **Simplicity of Design and Operation**

Simplicity of design and operation must be one of the principal

considerations in the selection of units for law enforcement, inasmuch as police departments generally do not have the luxury of assigning an officer exclusively to metal detection projects. Modern detectors are simply electromagnetic devices that detect the presence of conductive metals whenever these substances come within the detection zone of the searchcoil. The metal detector user should require that equipment be as simple as this definition.

Historically, some companies designing metal detectors followed the "more is better" rationale and prided themselves on the number of knobs and switches on their equipment. Users of these devices virtually require a degree in metal detectorology to operate them. Presently, however, quality metal detectors available to law enforcement feature one-touch operation—users simply press a touchpad and commence searching. This type of equipment appeals to the "keep it simple" logic of most crime scene investigators.

### **Automatic Ground Canceling**

The effectiveness of early metal detectors was somewhat limited due to their inability to cancel out undesirable conductive substances, such as wet salt and iron mineralization. Until recently, this troublesome interference could be eliminated only by manual tuning, referred to as ground canceling or ground elimination. However, today's quality metal detectors automatically ignore unwanted mineralization and tune themselves to the ground being searched. Automatic

ground canceling relieves the operator of making manual adjustments and simplifies the detector by removing one additional control.

### Ruggedness

Metal detectors are sensitive electronic devices and should be treated with care. However, the very nature of law enforcement investigations often dictates rough handling of crime scene tools. Numerous officers handle investigative equipment, each with a different method of maintaining and caring for departmental property. A metal detector selected for law enforcement application, therefore, should have performance records that verify its ability to withstand abuse while maintaining quality performance.

### Other Features

The crime scene manager also should be aware of a number of additional important points that have been integrated into industry-leading metal detectors. For example, metal detectors should be compact, well-balanced, and lightweight—less than 4 pounds. For crime scene applications, the detector must be sensitive to metals that are low in conductivity but often times important as physical evidence, such as lead and stainless steel.

Of course, a history of dependability is a must; the crime scene specialist can ill-afford detector failure during a critical search. The detection unit also must be versatile and capable of interchanging searchcoils to meet specialized crime scene requirements. Finally,

detection depth should be considered. Poor quality equipment will have difficulty locating items below the ground's surface. Although manufacturers often claim that their units will detect deeper than the competition's, most quality metal detectors provide excellent detection depth.

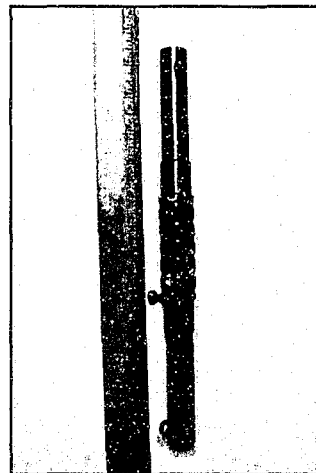
### CONCLUSION

Physical evidence reigns supreme over other investigative tools. Obviously, eyewitness accounts, as well as subject and victim statements, are important, but they can be influenced by external circumstances and even altered by outside pressures. Only physical evidence bears testimony that does not depend on memory and is unintimidated and unchanging. For this reason, no item of physical evidence, no matter how small, should be overlooked by the crime scene manager during an investigation. Often, fragments of physical evidence provide the only tangible strands that tie the perpetrator to the crime.

Metal detection has proven its worth repeatedly in crime scene investigations. Numerous metal detection successes in the field give startling testimony to the effectiveness of this investigative tool.

Recovery of a hidden murder weapon or location of a bullet concealed in a tree will preach a much more effective sermon on metal detection than published articles on the subject. Until crime scene managers avail themselves of this exceptional investigative tool, however, it will remain the crime scene's best kept secret. ♦

## Unusual Weapon



### Slender Shotgun

This easily concealable firearm was surrendered to officers of the Duluth, Minnesota, Police Department by the operator of a pawn shop who had received it from an unidentified male subject. The weapon's barrel appears to be commercially manufactured, and the other parts reflect considerable craftsmanship. The weapon measures just under 12 inches, fully assembled, and is chambered for 16-gauge shotgun shells. Due to its small size and high-quality construction, this weapon represent a significant threat to citizens and law enforcement officers. ♦