community members in order to address the growing crime problem.

Based on these forces, several commissions and agencies prompted the move to more cooperative approaches to addressing crime. The 1967 President's Commission on Law Enforcement and the Administration of Justice pointed to the inability of the police to solve the crime problem alone and suggested a number of activities, including greater emphasis on crime prevention. The Law Enforcement Assistance Administration, an outgrowth of the President's Commission, offered grants for many police initiatives, including the establishment of community crime prevention. The 1971 National Advisory Commission on Criminal Justice Standards and Goals promoted crime prevention as a cornerstone for criminal justice activity.

All of the above factors led to the establishment of formal crime prevention units in many police departments in the late 1960s and 1970s. These units were instrumental in developing programs such as block watch, citizen patrols, property marking, neighborhood crime prevention meetings, prevention newsletters, and neighborhood improvement projects. The crime prevention units also participated with other professionals in identifying problems and potential solutions, such as working with architects to be sure that building designs were conducive to safety issues.

Unfortunately, crime prevention units do not always enjoy a long life span. Many units are disbanded during times of tight budgets because they are still not viewed as essential to the police function. Although the units may disappear, the crime prevention activities are often assumed by other units, such as community relations or units tasked with addressing specific crime targets.

Since the late 1960s, there has been a growing movement toward bringing the citizenry back as active participants in policing, typically under the rubric of crime prevention. The police recognize that crime prevention must use the wide range of ideas and abilities found throughout society. Community planning, architecture, neighborhood action, juvenile advocacy, security planning, education, and technical training, among many other system and nonsystem activities, all have a potential impact on the levels of crime and fear of crime. Crime prevention units may come and go, but the role of crime prevention has become a staple in modern policing and has influenced the development of a number of policing theories and practices, such as community policing, problem-oriented policing, and attention to quality-of-life crime (i.e., Broken Windows).

Steven P. Lab

See also "Broken Windows" or Incivilities Thesis, Community Policing, Law Enforcement Assistance Administration, Problem-Oriented Policing, Theories of Policing

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CRIME SCENE INVESTIGATION

It would not be an exaggeration to assert that crime scene investigation ranks with the most intellectually challenging and difficult of human activities. It is also one of the most misunderstood. In practice, crime scene investigation is rarely carried out efficiently and effectively. Successful outcomes, when and where they occur, are often fortuitous rather than following from intelligently adaptive plans or designs.

There seems to be an inexplicable disconnect in the public's perceptions of the problem of crime scene investigation. In fictional portrayals dating from the Sherlock Holmes stories of Sir Arthur Conan Doyle to the present, the interpretation of physical clues at a crime scene is seen as the epitome of intellectual prowess. Judging from the allocation of expertise and

resources, this is a far cry from the importance accorded this activity in the real world today.

From a philosophical or theoretical viewpoint, the crime scene can be viewed as a recording device and a recording medium. To some degree, the scene provides a continuous and continuing record of events that transpire at the particular location. Events, including those that ultimately may be defined as crimes, involve human-initiated interactions that alter the environment as well as items within it in myriad ways. The alterations may be subtle or profound. It is the creation of these alterations that results in the production of the record. The interactions produce the alterations, and thus the record, according to physical laws. The resulting alterations to the scene and to some subset of the items within it form the physical evidence record. The record is, by its nature, incomplete and, to some extent, transitory. Postevent interactions can complicate the physical evidence record or even overwrite it. It is important to attempt to freeze the record soon after the event of interest, but this is not always possible. Although the concept of a pristine crime scene is a myth, it is important for investigators to act promptly to attempt to preserve the record that remains at the time that law enforcement personnel take control over the scene.

Because the interactions among items and surfaces at the crime scene follow physical laws in producing the physical evidence record, this makes the analysis of the scene itself a scientific problem—a point that is not widely appreciated. Certainly, it has long been recognized that individual items of physical evidence removed from crime scenes require a scientific analysis, but with notable exceptions, this realization has not been extended to crime scenes themselves. In most law enforcement jurisdictions in the United States, scientific expertise is absent from the initial crime scene investigation. This is true for many other parts of the world as well, and it is a situation that needs to be rectified. An argument can be made that scene investigations should be carried out exclusively by forensic scientists, but at the very least, experienced forensic scientists should form part of the crime scene investigation team.

The physical evidence record is produced in varying degrees of detail, but it is axiomatic that it is incomplete, and furthermore, that it is likely to be degraded to some degree following the event. A pristine crime scene is an unrealizable ideal. As noted earlier, it does not exist in the real world. Even in the most favorable circumstances, postevent factors will unavoidably alter the record left by the interactions taking place during the event of interest. The mere discovery of an event, and the steps leading to a conclusion that a crime has taken place and that the scene is worthy of attention, may destroy evidence. This is a reality that must be faced. If there is the possibility of saving the life of an injured person at the scene, the steps necessary to aid the victim take precedence over those directed at documenting and preserving physical evidence. The difficulties increase exponentially with large-scale events involving the injury and death of many people. Of course, this realization is not justification for a cavalier attitude toward scenes and physical evidence.

The term *crime scene processing* is commonly used as a synonym for *crime scene investigation.* This is unfortunate and betrays ignorance about the nature of crime scenes and what is necessary to extract relevant information from them. Crime scene investigation should not be perceived as a mechanical process, carried out in a rote fashion. Too commonly, this is the way it is viewed by law enforcement policymakers; administrators; supervisors; and, perhaps surprisingly, those who actually "process" the crime scene. Change is necessary.

No two cases are ever exactly alike. For this and other reasons, every crime scene is different. Items that are inconsequential in one scene may be of crucial importance in another, and of course, the reverse is also true. Scenes cannot and should not all be treated in the same way and approached in the same manner. We need to expect the unexpected if we are to do the investigation properly. The approach used must be both flexible and thorough. It must be developed de novo in an informed and systematic fashion. The scientific method provides an appropriately flexible and systematic approach. Crime scenes present very challenging and difficult scientific problems.

Crime scene investigation and laboratory analysis are not as effective where the investigators and scientists are operating in an information vacuum. Context is critical in framing questions.

Crime scene investigations are made more difficult by considerations of time. Some evidence can deteriorate with time and must be attended to as quickly as possible. This is especially true at outdoor scenes, where weather may be a factor. Some factors are beyond human control; others are not but can be even more adverse. The complex nature of many crime scenes clearly implies that an appropriate investigation will take a considerable amount of time. Unfortunately, in most jurisdictions, inadequate resource allocation may mean that there are more scenes to be examined than can be handled comfortably by the assigned personnel, and the time available at any given scene is commonly inadequate. Proper crime scene investigation may be seen as being expensive. However, it should be appreciated that improper crime scene investigation can be even more expensive in terms of the consequences that flow from it. There may be substantial monetary costs in terms of lost investigative time, unnecessary court time, and lawsuits, in addition to human costs. Doing it right the first time has many advantages, including economic considerations.

Once a crime scene has been secured, several interrelated stages in crime scene investigation and the handling of physical evidence at the crime scene can be identified. They are the *recognition, documentation, collection, preservation,* and *transportation* of physical evidence. The sequence given is typical and logical, but there is often extensive overlap, and departure from the strict sequence is often necessary. The stages of the crime scene investigation extend beyond the work at the scene. Once the evidence has been *analyzed* in the laboratory, the *scientific interpretation* of the laboratory results may lead to a *reconstruction* of the event.

RECOGNITION

Informed selection can only take place following *recognition* of the particular significance of given items to the event under investigation. Recognition of evidence is the key to successful crime scene investigation and reconstruction. It is the central component and is also the most challenging and difficult aspect. It is the process of defining the problem. There is a need to try to anticipate the kinds of questions that are likely to assume importance later. Furthermore, it requires a scientific approach and cannot take place efficiently outside the context of the crime scene.

A crime scene may contain literally thousands of items of potential evidence. Normally, only some small fraction of this large number of items has encoded information about the specific event that is the subject of the investigation and thus is of relevance. Clearly, all of the items at a scene cannot be collected and transported to the laboratory for analysis. Such an approach would overwhelm the laboratory and clog the system. Relatively little would be learned, even if resources were unlimited. Informed selection at the crime scene is necessary. Recognizing significant items among a much larger number that are ultimately irrelevant is a very challenging task. It takes time. Some of the first activities at a scene may be "hands in the pockets," or unhurried observation. There is no need to rush into action. Observation and thought should precede action.

Formal reconstruction will be discussed later in this entry, but it should be noted that an informal, often merely mental, reconstruction will help guide recognition of evidence. Such provisional reconstructions, used to guide recognition, are most useful where the scientific method is employed in developing them. The scientific method will be discussed in more detail in a subsequent section on reconstruction.

DOCUMENTATION

Proper and effective documentation of crime scenes and physical evidence is essential. Many different media or means of recording information are useful tools at crime scenes. The tools available include handwritten notes, sketches (which would normally include measurements), photography (silver halide emulsion and digital), audio and video recording, and casting. Technology that allows the automated

scanning and recording of the coordinates of three-dimensional features at a scene has become available recently and has been used to a limited extent in crime scene investigation. As it becomes more available, it should find wide use in both civil and criminal investigations.

Of the array of documentation tools available, it would not be expected that all would be used at every scene. The particular needs of a given scene must be evaluated on an ad hoc basis. Judgment on the part of the experienced investigator is necessary to decide what combination of tools to employ.

In addition to the choice of media, two general types of documentation are important to distinguish: passive or active. If one is recording the scene and the details of evidence within it, before significance of each such detail is known, the documentation is passive. This is all that may be expected early in an investigation. Passive documentation is often essential, but it is not sufficient. Qualitatively, the documentation must evolve beyond this passive stage during the course of the investigation into an *active documentation* phase. This requires that the significance of certain items of potential evidence be recognized. Thus, it must follow the recognition step. This allows informed selection as to what is thoroughly documented and ultimately collected and preserved for subsequent analysis and interpretation.

COLLECTION

Once evidence has been recognized and documented, it can be collected. Some items can be picked up and placed in an appropriate container. An important part of the collection process is the choice of the container, which affects the next topic, evidence preservation. If the entire item cannot be collected because of its large size or immobile nature, sampling is necessary. The sampling method chosen will depend on the nature of the evidence and how it will be analyzed in the laboratory. The sample may be cut from the larger object. Although property may be destroyed in the process, this may be the best means of collecting pattern evidence. For example, the best way to preserve the details of a critical patterned footwear outsole imprint might be to remove a section of flooring. Judgment is necessary. Stains or smears on surfaces may, at times, be collected this way, but more commonly, they are scraped or swabbed from the surface. The type of evidence and laboratory protocol may dictate the choice.

PRESERVATION

The details of evidence preservation are numerous and complex, and beyond the scope of this entry. For our purposes here, it must be understood that the means of preservation will depend on the nature of the evidence. Evidence that is volatile must be sealed in a suitable container to prevent loss due to evaporation. Biological evidence is subject to degradation from microbial activity. Evidence of this type that is kept in a wet or moist state at room temperature will support microbial growth and will degrade quite rapidly. Such degradation can render the evidence useless. In general, such evidence should be dried or kept at low temperatures, or both. The packaging should not trap moisture. For example, clothing with dried bloodstains should be placed in paper bags rather than plastic ones. The details of biological evidence preservation will depend on the exact nature of the evidence and the proximity of the scene to the laboratory. Fibers, hairs, and particulate trace evidence can often be preserved by placing them in paper folds, often known as “druggist” folds, before they are sealed in labeled envelopes.

TRANSPORTATION

The major issues with the transportation of physical evidence from the crime scene to the forensic science laboratory are the protection of the physical integrity of the evidence, time, and temperature. The latter two are especially critical with biological evidence, where the possible loss of value due to degradation must be considered and prevented. Where the scene and the laboratory are separated geographically, and where the drying of articles is not possible, practical, or desirable, refrigerated

vehicles may be employed for the transportation of the evidence to the laboratory. Particular designs allow for drying to take place at low temperature during transportation. Some evidence may be particularly fragile. Intelligent and informed attention to packaging concerns is usually sufficient to preserve the physical integrity of the evidence during transportation to the laboratory.

RECONSTRUCTION

Reconstruction is the culmination of the scientific work on the physical evidence in a case. It is at this stage where the information gleaned from the examination of all of the evidence is integrated and interpreted to yield an objective understanding of the event. In most jurisdictions, this activity is given insufficient scientific attention. As indicated above in the discussion of evidence recognition, the scientific method plays a central role in reconstruction.

Our modern understanding of nature dates from a paradigm shift during the Renaissance, when the concept of insisting on "reality checks" of propounded ideas emerged in the form of the requirement of hypothesis testing. The requirement of hypothesis testing replaced "received wisdom" and authority as the arbiters of scientific truth. Scientific advances would have been impossible without this shift.

The core of the scientific method is the rigorous testing of hypotheses. Hypotheses that endeavor to explain the event are put forward, and then an earnest attempt is made to disprove each. A hypothesis that fails this testing is discarded. A modified hypothesis or new alternate hypotheses are developed and tested in turn. Only a hypothesis that survives repeated vigorous testing develops into an explanatory theory of the event. The scientific method and hypothesis testing is a cyclical, iterative process. The key to the process is the vigorousness and rigorousness of the testing. There is a human tendency to identify with a hypothesis that one has developed and to subconsciously overlook observations or data that do not fit the hypothesis. This is antithetical to good science and must be avoided. Scientists must be involved in actively attempting to disprove their own hypotheses.

Advances in digital technology have provided useful tools for crime scene investigation. Some of these have been mentioned above. However, it is important to recognize that some new digital capabilities are not unalloyed blessings. Informed and judicious application is necessary. This is especially true of technologies grouped under the headings of "virtual reality" or computer animation. It is now possible to present what appear to be realistic visual representations of events on a video screen. These animations are distinctly different from computer simulations used in a range of disciplines in science and engineering. In simulations, each pixel in the image is generated from equations linked to physical reality. In animations, realistic-appearing images are generated without such constraints. The animation techniques allow for artistic expression such as that used in recent computer-animated feature films. Thus, legitimate animations in the context of crime scene reconstruction are only a means of illustrating what has been learned by scientific analysis. Unlike simulations, animations are not analytical tools. Despite the possible illusion of computer accuracy, animations may be no more grounded in reality than a hand-drawn cartoon. The least problematic animations for the depiction of the results of a crime scene reconstruction in court are those that illustrate the situation at a single moment in time, and where what is shown is based firmly on the physical evidence record. Legitimate examples include simulated camera pans and fly-bys to give the jury a better appreciation of the geometry at the particular moment in time for which the scientific data can provide a clear picture. Animations purporting to represent a series of crime scene events over time are, in the vast majority of cases, naïve or dishonest. The physical evidence record may allow objective conclusions to be drawn about an event taking place at a scene for a single moment in time, or perhaps even for a series of events at several moments in time. Normally, what it cannot do is provide a smooth, continuous record. With no foundation in fact, the animator must fill in the gaps in the physical evidence record to make a smooth-flowing animation. This is invention, and it is misleading and highly objectionable.

SUMMARY

Arriving at a crime scene and trying to make sense of the physical evidence record can be a decidedly daunting experience. Initially, it may be necessary to consider literally thousands of items as potential physical evidence. To some degree, the time available to deal with this awesome complexity will always be limited, which only compounds the problem.

Successful crime scene investigation depends on extracting information about the event under investigation from the physical evidence record. It is important to ask meaningful questions of the evidence. Evidence can be interrelated in complex ways, so prioritization may be required. This presents a very challenging problem. Scientific knowledge and a scientific approach are both necessary. Ideally, experienced scientists should be involved in the investigation from the outset.

As noted earlier, there are several interrelated stages in crime scene investigation and the handling of physical evidence. The list included the recognition, active documentation, passive documentation, collection, preservation, and transportation of physical evidence, followed by the analysis in the laboratory; the scientific interpretation of the laboratory results; and, if possible, a reconstruction of the event. The first two and the last two present the greatest scientific challenges. Those in the middle of the series—passive documentation, collection, preservation, and transportation—can be handled algorithmically. Rules, albeit often-complex ones, can be taught and followed to produce successful outcomes. The expertise of an experienced scientist is not necessarily needed for these. However, for recognition, active documentation, interpretation and reconstruction, such expertise is necessary.

Seamless integration of scientific activities with physical evidence from the crime scene, through the laboratory, and to the courtroom is necessary. There is a need for an enhanced role for scientists at each stage. Technicians, no matter how skilled, cannot be relied upon for all functions. A teamwork approach with scientists and technicians is very useful.

Resources allocated to crime scene investigation in most parts of the United States have long been inadequate. This has been true of the dollar amounts allocated and of the backgrounds of those assigned to crime scene investigation. The situation needs to be understood and addressed.

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☙ CRIME STATISTICS AND ANALYSIS

CRIME

To understand the meaning of crime statistics, one must first define crime. Crime is a very flexible concept, something like a woven carpet, that produces powerful associations from the public and agencies charged with its control. It varies cross-culturally, historically, and spatially, as well as by social morphology and cultural and social differentiation. Since Adolphe Quetelet first advocated that social order could be captured metaphorically by numbers, and the regularity and stability associated with large numbers, commensurability has been sought across measures and numbers have been used to represent social trends. Official crime data, like official statistics generally, are associated with the development of the nation-state and its need to tax and count its citizens. They appear to function differentially in Anglo-American societies and European states. They reflect a belief and trust in numbers and science in fragmented, individualistic, and horizontally differentiated societies, and are less central to policy making in more centralized and integrated societies. Furthermore, the bureaucratically driven capacity of nation-states to monitor, direct, refine, and analyze data is increasing.