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Forensic Science and the Reduction of Crime

Elementary and very crude "scientific" techniques have been utilized for centuries in judging cause of death, determining the truthfulness of an individual's statements, and assaying the purity of valuable materials. It was not until the nineteenth century, however, that the scientific disciplines of chemistry, toxicology, and medicine were sufficiently advanced for them to be utilized meaningfully in resolving legal issues. The legal and scientific professions both attained higher levels of theoretical and practical development at this time, and became more receptive to rational modes of proof and evidence to replace those based primarily upon magicoreligious or political foundations [*1*]. The recognition and admission of scientific procedures by the criminal courts proceeded at a slow pace, though, due largely to the presence of pseudo and biased experts who delivered unreliable findings [*2*].

The most significant contact between scientists and jurists occurred where, because of the increase in population and disease, centers of medical practice, education, and research had developed. The medical researcher's knowledge of body fluids and the toxicologist's familiarity with poisons proved to be "natural" aids to the investigator, who was often subjected to intense social and political pressure in solving homicides. At this time science became largely the tool of the police magistrate or investigator and was employed to locate suspects and confirm their connection with a victim or crime scene. Even in cases where scientific tests were ruled inadmissible by the courts, police utilized the findings to elicit confessions during the interrogation of suspected offenders [*3*].

The growth of forensic science in Europe and in the United States was closely correlated with increasing urbanization, the growing incidence of crime, and the creation of full-time police forces. Police officials were very reluctant to adopt scientific investigative methods—usually only after a particular technique was successful in solving a case or convicting a criminal. Though not rigorously scientific, fingerprinting is a prime example of a method of identification which required decades of usage before being acknowledged as a valuable method of connecting persons to physical environments [*4*]. Only because of the persistence of a few dedicated scientists, including Locard, Spillsbury, and Landsteiner, and magistrates like Hans Gross, were scientific techniques used at all [*5*].

The institution of scientific laboratories within police agencies may be attributed to several factors: inconsistency and unreliability of individual scientists hired on a case-by-case basis, use of unethical and third-degree interrogation practices by police, publicity describing the neglect or destruction of important physical evidence, and, perhaps most

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of all, the commission of heinous crimes which the police were unable to solve. Forty years ago, the Wickersham Commission predicted that the newly formed crime laboratory at Northwestern University would instill a more scientific attitude in the minds of police investigators [6]. Fong [7] has concluded:

> In virtually every instance, the genesis of a criminalistics function, whether local or state, has been either the outgrowth of a need laid bare by a major crime of violence, or a series of such crimes occurring at a particular locale. The notoriety which attends such cases, and the ensuing public outcry against the apparent deficiencies of the investigative effort, focused attention on possible avenues of improvement.

These historical observations contribute to an understanding of contemporary scientific utilization patterns. Unquestionably the primary motivating force behind the introduction of scientific techniques into the criminal investigation and adjudication processes was the pragmatic value of a laboratory in identifying and convicting offenders. A secondary reason which cannot be completely removed from the first concerns the superiority of scientific evidence in establishing truth, guilt, or innocence. It is often argued that investigations should make greater use of scientific techniques due to the belief that physical evidence is inherently more objective and reliable than eyewitnesses, and that the analyst possesses a level of expertise and impartiality not to be found in other witnesses. Forensic science therefore not only can aid in the practical requirements of a criminal investigation, but employs methods which assure a higher quality of justice.

Supreme Court decisions which have affirmed and in several cases broadened the rights of the accused during criminal proceedings, have also been interpreted as a mandate for increased utilization of physical evidence and scientific analysis (*Miranda* and *Escobedo*). Such judicial interpretations are consistent with prevailing societal attitudes which look toward science and technology as means for alleviating and eventually solving social problems. Stimulated by the conclusions and recommendations of the President's 1967 Task Force Report on Science and Technology [8], all units of the criminal justice system, and in particular the police, have adopted more scientific perspectives and a greater willingness to employ technological innovations.

Reduction of Crime

Virtually all component agencies of the criminal justice system are being subjected to intensive evaluation programs in which the costs and benefits of specified operations are being defined and measured. Limited resources and the rising incidence of crime have forced criminal justice planners to scrutinize budgets and divert the flow of funds from agencies where payoff is minimal. Where do forensic science laboratories stand with respect to other agencies in this area of crime cost/benefit analysis? May the criminalistics profession be evaluated or defined with reference to a goal such as the reduction of crime? Perhaps an even more fundamental question is *should* the laboratory be expected to justify its existence in such terms?

The laboratory strives to satisfy dual objectives: assisting the police in the detection, identification, and apprehension functions, and guaranteeing an objective and impartial determination of facts at the adjudication stage. The criminalistics profession is still at a "crossroads" [9], and the issues of meaningful evaluative and performance measurement systems are crucial to the success of future forensic science operations and research. The remaining two sections of the paper will examine the relationships among the present status of criminalistics, the research program plans of the major Federal law enforcement agency focusing on crime reduction strategies, and ways in which scientific laboratory

service can be more effective. Both immediate programs which can be tested by laboratories for playing a greater role in solving crimes, and long-range considerations of the service criminalistics should provide in the future will be discussed.

Due to the neglect the criminal justice system suffered from its inception, Federal funds which became available in the mid-1960's were primarily directed to "system improvement." Striving to create a minimum level of competence and effectiveness in the police, courts, and corrections fields, characteristic strategies sought to improve manpower, operations, physical facilities, and equipment. For example, in the area of policing, this resulted in concentration upon recruiting better qualified personnel and exposing them to better training programs; instituting more rational management and command-control procedures; and procuring specially designed weaponry, communications equipment, and vehicles. In several instances this also resulted in the construction of a crime laboratory and the acquisition of badly needed instrumentation, supplies, and personnel.

The Law Enforcement Assistance Administration (LEAA) has adopted a Planning by Objective approach, which is not as restrictive and should result in a more integrated, functionally based program whose priorities are structured to the needs inherent in the crime problem. A "crime-specific" model has been adopted by LEAA which will serve as the basis for the allocation of both action and research funds. The model is designed to contribute to the reduction of crime by diminishing the causes of crime while controlling its incidence. Due to the importance of this model to all criminal justice professionals, the approach will be explained in more detail.

The causes of crime may be reduced by alleviating the conditions which promote crime and by reintegrating offenders back into society. The National Institute of Law Enforcement and Criminal Justice, the research arm of LEAA, is funding research to address the economic, social, and psychological conditions which promote crime and to determine how community support for crime prevention and control activities can be strengthened. The Institute's program in reintegrating offenders into society strives to improve methods for classification of offenders and appropriate intervention points in individual criminal careers.

The second half of the crime-specific model is directed toward the control of crime by reducing opportunities for crime and by increasing the risk associated with the commission of criminal acts. Strategies for reducing the vulnerability of victims and the accessibility of targets and areas of crime is an attempt to stop crime before it occurs. The incidence of crime may also be controlled by improving the detection, identification, and apprehension functions of police and assuring that there is swift and fair adjudication of offenders who are arrested and charged. The hypothesis that increasing the likelihood of arrest has both a short-term utility in bringing offenders to trial with the threat of incarceration, and also a long-term deterrence effect is the foundation for this crime control approach.

In accordance with the crime-specific model, the crimes of burglary and stranger-to-stranger assaults have been designated as priority areas. These crime categories have been selected for intense investigation due to their high incidence rates, low levels of clearance by arrest, and their great cost to society [*10*]. Over 2.3 million burglaries were committed in 1971 (composing 40 percent of all Crime Index offenses), of which only 19 percent were cleared by arrest. Homicides, in contrast, although of grave concern to society, are neither as preventable or controllable and already have high clearance rates (84 percent in 1971). How the criminalistics laboratory may play a more integral role in the solution of property and assaultive crimes, and how its contribution may be better measured, will be addressed in greater detail.

A discussion of crime laboratory involvement in Part I crimes must necessarily be prefaced by remarks describing the heavy drug and narcotic identification requirements. A 1970 study in California indicated that selected county laboratories reported more than 1000-percent increases in drug cases from 1964 to 1968 [*11*]. A recently published report [*12*] by Stanford Research Institute has described in detail just how deeply crime laboratories have become involved in the identification of drugs. The report concluded: "The singularly most impressive finding of this analysis was that criminalistics is disproportionally utilized in cases of suspected possession and/or use of drug compounds."

Furthermore, the overloaded conditions and resultant delays in testing have served to deter police officers from utilizing the laboratory in other types of crime [*13*]. The same SRI report demonstrated that while laboratory casework in drugs has increased significantly in the past ten years, casework in the major crime categories has been almost constant and, in fact, decreased in some categories [*12*]. In Ward's study of criminal investigation units in the United States in 1971, the number of examinations decreased in New York City from 1968 to 1969 in the categories of burglary and robbery, while narcotic analyses rose over 60 percent [*4*].

Presently, the involvement of forensic science laboratories in the investigation of commercial and residential burglaries is minimal. A study conducted by Cornell Aeronautical Laboratories in 1968 found that evidence was collected and submitted to laboratories in a New York State tricounty area in only 1.6 percent of all burglaries reported to the police [*14*]. Data presented in the Stanford Research Institute Report, "The Role of Criminalistics in the World of the Future," illustrated that less than one percent of burglary reports in Santa Clara County, Calif. in 1970 resulted in an actual laboratory case report. Latent fingerprints are the only form of physical evidence which is regularly searched for at the scenes of burglaries.

If physical evidence is not regularly utilized in burglary investigations, then how are these crimes usually cleared? Initially it must be remembered that few burglaries are ever cleared by arrest—approximately 19 percent as reported in the 1971 Uniform Crime Reports. A study by the New York City Rand Institute in 1970 concluded that the "solution of any particular property crime is a chance event, insensitive to the amount of investigation conducted" [*15*]. The naming of a suspect in the initial crime report taken by a patrol officer appears to be the most significant factor affecting clearance rates. Detectives concentrate their resources on crimes where a suspect has been named and only give perfunctory attention to those offenses where a probable offender is not identified [*8*].

In Scarr's study the results of interviews with investigators indicated that the police themselves feel that "informants are the most important element in the effort to solve burglaries" [*16*]. Although stolen property and *modus operandi* are two sources of information traditionally cited by investigators as important methods for connecting suspects with unsolved burglaries, physical evidence is infrequently employed as an element in building a comprehensive *modus operandi* system. With the heavy emphasis on high clearance rates, it is common for investigators to "clear" a case even if it only *appears* that a particular crime was committed by an arrested suspect, but without the benefit of a scientific analysis and interpretation of the physical evidence [*4*].

In contrast with the present low levels of evidence utilization are data which strongly suggest that physical evidence is, in fact, present at crime scenes yet goes uncollected. A study by Parker and Peterson in 1970 found that 88 percent of the crime scene environments studied possessed physical evidence meriting laboratory examination, but only four of the more than 3300 Part I offenses committed during the study period resulted in an

actual crime laboratory analysis (excluding latent fingerprints). These data indicate that significant quantities of potentially meaningful physical evidence go unrecognized, undeveloped, and uncollected [*17*].

Many of the evidence recognition and retrieval problems in burglaries can be attributed to the training, attitudes, and investigative routines employed by crime scene evidence technicians. In Peterson's study of evidence technician units in five metropolitan police agencies in 1970–71, it was determined that most investigations of burglary scenes are conducted by these specialists. Data compiled by a medium-sized criminalistics laboratory in a western city indicate the proportion of burglary scenes responded to by a technician plus the ratio of cases where evidence was actually retrieved. Approximately 18 percent of commercial burglary scenes and nine percent of residential scenes were investigated, and evidence was recovered in about half of the scenes visited [*18*].

The important findings of the above study may be summarized: most searches for evidence at burglary scenes are cursory and restricted to dusting for latent fingerprints, the search for evidence is most superficial when there is no named or arrested suspect, evidence is frequently collected yet never submitted to the laboratory for analysis, technicians often adopt a "public relations" approach toward such investigations and primarily function to create a favorable public image, and, finally, interaction among technicians and laboratory scientists is minimal and feedback to field evidence technicians is sometimes nonexistent.

New strategies need to be adopted by criminalistics laboratories in order for them to make a more appreciable impact on crime investigation efforts. Beginning with the basic capabilities of the laboratory—establishing the elements of a crime, aiding in the reconstruction of the crime, developing and identifying possible offenders, and confirming the involvement of particular individuals in a criminal act—the third area concerning development of suspects appears to be one area where more effective tactics could yield the maximum payoff.

It is most logical to conceptualize the physical evidence utilization process from an information processing perspective. The crime scene can be viewed as a type of "signal generator" emitting messages of varying types and intensities. Physical evidence has informational content when it enables the criminalist or detective to reduce the uncertainties surrounding a criminal act [*19*]. At least one method for measuring the informational content of evidence at a crime scene is by approximating the number of potential suspects in a given case which were removed from consideration based upon the examination of particular evidence. Maximum information would be that which eliminates all suspects except the one(s) actually responsible for the crime.

The evidence technician, detective, and criminalist have the task of evaluating physical environments and screening out material which may be labelled "noise"—material which could be perceived as being relevant to a criminal act yet in fact having absolutely no casual relationship with the offense. When this noise reaches such a level that less is known about a situation after receipt and evaluation of a signal than before, "negative" information has resulted. For example, the discovery and misidentification of a latent print at a crime scene belonging to an individual responsible for the crime, yet labelled otherwise, results in output which is a distortion of the input. This problem is compounded by the fact that the investigator and criminalist have no way of positively knowing the precise state of the crime scene before the commission of the criminal act. Also, many of the alterations in the physical environment caused by the offender are not easily seen with the naked eye and therefore go unrecognized.

Studies have shown that burglars have the highest rates of recidivism in repeating the same type of crime [*10*]. The fact that burglars are known to use similar methods of operation from one crime to the next, that they frequently use the same tools and wear the same clothing, and that they often dispose of stolen goods in a similar manner suggests the importance of building and maintaining an information storage and comparison capability. If the criminalistics operation is to make a significant impact on the burglary solution rate, laboratory operations must develop means for effectively retrieving, categorizing, storing, and comparing evidence from scenes of crimes and from offenders, and measuring the information capacities of the various evidence types.

One possible evidence/information system is described below. Depending upon the resources available to conduct crime scene investigations, a portion of all burglary scenes would receive thorough investigations for physical evidence. This approach would be preferable to one which attempted to spread existing investigative resources over *all* burglaries. All evidence retrieved would receive at least a cursory initial review by a criminalist. Regardless of the likelihood that an individual case would be solved, the evidence collected would be analyzed and, if possible, quantitated in order to facilitate the storage and retrieval processes.

A similar approach would be taken with suspects and offenders as they are detained or arrested on suspicion of burglary. Their personal possessions, clothing, and tools, for example, would be examined and searched for possible physical clues. The resulting evidence would then be analyzed, interpreted, and stored. On a routine basis thereafter, the information derived from the evidence collected from the scenes of burglaries would be compared with the evidence gleaned from suspects and actual offenders.

The immediate practical value of such a procedure should manifest itself in the solution of crimes and the clearing of multiple offenses committed by the same offender. In addition, the actual value and informational content of all forms of physical evidence found at scenes of burglaries would be established. Evidence types could be weighted based upon their frequency of occurrence at scenes of crimes and their practical value in the investigation of crimes. Such "information ratings" would assist future investigative efforts by evidence technicians in selecting that evidence which had demonstrated the highest probability for a positive payoff. In a similar way, it would be possible to determine those points in an investigation when physical evidence would be of greatest assistance, as well as the stages at which evidence analysis would be unlikely to offer any meaningful support to a case.

The evidence/information model described here is, of course, quite similar to the ones employed for the storage and comparison of latent fingerprints. Due to the high informational content of fingerprints and the frequency with which they appear at crime scenes, greater interest has been shown in developing classification, storage, retrieval, and comparison systems for latent prints than in other evidence areas. The study by Kingston and Madrazo predicted the increased proportion of offenders which could be identified if an effective latent print processing system was implemented [*20*]. Research continues in the area of developing semiautomated techniques for the rapid comparison of latent fingerprints.

These suggestions for improving the effectiveness of criminalistics operations would have to be evaluated before they could be instituted on a broad basis. Such a requirement points to the immediate need for better evaluative and performance measures within laboratory operations. Unfortunately, few laboratories in the United States maintain record systems which record and define particular output measures in a similar way. For example, there exist no standardized definitions for "examinations," "cases," or "tests,"

all of which are commonly utilized "measures" of output or performance. These diverse record and data systems make the task of collecting information on a national scale practically impossible. More important, perhaps, is the inability of local laboratories to evaluate their own operations and adequately detail their contributions to the investigative, prosecutorial, and adjudicative functions of the criminal justice system.

A battery of performance measures are needed which thoroughly delineate the role of the criminalistics laboratory within the system of criminal justice. Due to the interrelationships of the laboratory with the police and judiciary elements, these measures must reflect their particular needs and expectations. Once the measures have been defined, a record keeping system capable of storing the desired information required for making these measurements must be designed. Such a system would require preliminary test and evaluation on a pilot basis before it should be incorporated into an existing system. Keeping in mind the growth of police and court management information systems, the fundamental design of the criminalistics model must be compatible with these.

The Quality of Justice

In view of the current emphasis on the reduction of crime, the forensic science profession must evaluate and increase its own capacity to contribute to that worthwhile goal. However, both forensic scientists and criminal justice administrators should consider other important goals which are equally important and in need of immediate attention. A very broad and more nebulous goal is that of maintaining a high quality of justice and of continually improving that quality.

The quality of justice, or perhaps more appropriate for our purposes, the quality of the criminal justice system, is a concept that will probably take on as many nuances as there are individuals who may attempt to define it. Therefore we will not define it, but will rather point out several specific areas which we feel are important in evaluating the quality of the criminal justice system and the role that forensic science can be expected to play.

1. What conduct is defined as crime by the criminal justice system is important in evaluating quality. Defining what will be considered a crime is primarily a legislative function[3] which hopefully represents the attitudes of the elected legislators' constituencies. When the community and legislative bodies function to generate or alter criminal laws or procedures, then they should be considered as part of the criminal justice system. In fact, the recognition that the community is an important, though informal, component of the criminal justice system is a requirement for any successful program to reduce crime.

One role forensic science may assume is in applying scientific knowledge and methods to the process of defining what constitutes a criminal act. A primary contribution will be in developing objective statements about the elements of a crime when such elements must be determined by forensic examination or evaluation. For instance, the term "under the influence of," which is found in several laws and codes in reference to alcohol or drugs, is not always clear. An objective definition with reference to alcohol consumption has been developed in terms of the blood alcohol levels as a result of forensically oriented studies, and this has had its influence on revisions of the appropriate laws or codes. Forensic psychiatrists have provided input in formulating the definition of legal insanity by judicial precedent.

[3] We of course cannot ignore the important administrative and judicial forces that define or refine the definition of those acts that are considered criminal, and the discretion exercised by law enforcement agencies and prosecutors in determining which acts will be responded to with an arrest and prosecution.

2. The ability to bring people into the criminal justice system who should be in (that is, criminal offenders), and to keep people out of the system who should be out, is a mark of the quality of the system. The ability to bring a high percentage of criminal offenders into the system is a factor that is also important to the reduction of crime as previously discussed. However, while maximizing that ability, the risk of processing and possibly convicting innocent persons must be minimized. The role of forensic science here is clearly of great importance whenever physical evidence is involved. The forensic scientist must have the capability, tools, and techniques to accurately analyze and evaluate all physical evidence presented to him. In addition, the forensic scientist should have the capability of obtaining all physical evidence that should be processed.

3. The ability to process cases in a timely manner is a mark of quality. This of course includes the timely analysis and interpretation of physical evidence without any sacrifice of accuracy. Procedures must be developed, if they do not already exist, to effectively handle large influxes of evidence, which should not be allowed to choke a forensic science operation to the point where other physical evidence is not properly collected and processed.

4. The perception of the formal criminal justice system by the public, by victims, and by offenders, is an important factor in evaluating the quality of the system. We have already discussed the hypothesis that the higher the perceived risk of detection, prosecution, and incarceration is to a potential offender, the more deterrence value the criminal justice system has. The victim of a burglary is intensely interested in having the perpetrator apprehended and in having his property returned. His perception of how interested and effective the formal criminal justice system is in these matters is just as important as is actual interest and effectiveness on the part of the system. An investigating officer or someone else may send out a fingerprint technician to dust for prints simply to develop a favorable perception on the part of the victim. The role of forensic science should be to further develop the effectiveness of such procedures (such as might be done with better methods of processing latent fingerprints in the above example). We should consider what contributions to the perception of the criminal justice system by nonoffenders are made by effective, impartial, and visible forensic science operations.

5. In this last grouping we include the many factors that simply constitute good administrative practice. This would include the selection of qualified personnel, providing adequate working facilities, paying reasonable salaries, and so on. Any system that strives for "high quality" must give careful consideration to and take appropriate action on such matters.

The maximum contribution by a crime laboratory to the reduction of crime and to the quality of the criminal justice system can only be achieved when the laboratory is organized and administered to assume its proper role within the system. This was one of the primary areas of emphasis in the standards relative to the crime laboratory that were written by the Police Task Force of the National Advisory Commission on Criminal Justice Standards and Goals [*21*]. After a brief note on the background of the Commission and its task forces, we will conclude this section by discussing some of those standards and their implications.

The Commission was formed in September of 1971 with the charge to develop national goals and standards for reducing crime in our country and for upgrading police, courts, corrections, and other systems related to reducing crime. Twelve task forces were formed, four of which—the police, courts, corrections, and community crime prevention task forces—were designated as "operational" and had staffs to prepare reports. Portions of those reports were made public and reviewed by approximately 1500 persons attending

the National Conference on Criminal Justice held in Washington, D.C. in January of 1973. The reports containing the standards and recommendations should be considered as good starting points for more thorough study, evaluation, and possible modification by the various interested agencies, groups, and individuals in each state. It is therefore in the interests of members of the American Academy of Forensic Sciences to review those standards relating to the crime laboratory and submit any suggested modifications, additions, or deletions, together with supporting reasons, through the appropriate channels in each member's state prior to a possible formal review and revision of the standards around 1976. All crime laboratory standards discussed below are contained in Standard 12.2 in the Police Task Force report. (Standard 12.1 on evidence technicians was not released at the conference.)

Standard 12.2.2 states that "Every crime laboratory within a police agency should be a part of the organizational entity which includes other support services, and should be directed by an individual who reports only to the agency's chief executive or to a staff authority who reports directly to the chief executive." This particular standard is especially important if many of the other standards are going to be met. For instance, Standard 12.2.3h calls for a salary structure that is at least equivalent to that in non-law-enforcement laboratories employing similarly qualified personnel. This would be difficult to realize if the director of the laboratory were buried in the hierarchal chain of command, perhaps reporting to an identification sergeant. Standard 12.2.5 requires that "every laboratory director should be able to assess and control the amount, type, and quality of evidence received by the laboratory." This requires direct staff input into the policy making machinery of the agency by someone who has firsthand knowledge of the problems involved.

Aside from the standards, we have seen a relatively recent emphasis on the broad application of science and technology in the criminal justice system, and in law enforcement agencies in particular. The director of the crime laboratory, or of a law enforcement agency's scientific services (who should be a qualified scientist as well as an administrator), is actually the agency's primary scientific personnel resource. Most agencies have not made full use of this resource, nor have most laboratory directors seen themselves in this role. We feel that crime laboratory personnel could make significant contributions to the effectiveness of law enforcement agencies and the criminal justice system in general if they took a more active role in bringing scientific and technological innovation into law enforcement operations.

An obvious deterrent to playing a more active role is the absence of sufficient time, due in part to the heavy case loads in most laboratories. This is addressed by Standard 12.2.3f, which states that "The working staff (should) be sufficient to meet the demands of the laboratory caseload." Though such a state is unquestionably desirable, it is not likely to be realized unless personnel positions and salary funds are made available to accomplish that goal. Standards like this are mainly useful in helping support the laboratory director's requests for necessary positions.

Standard 12.2.4 states that "Every laboratory which employs more than 10 nonclerical personnel should also establish at least one research position for solving specific laboratory problems and developing new laboratory techniques." These positions can provide some of the manpower required to pursue the active role referred to above. Having several such positions around the country could be advantageous in a number of ways. For instance, a number of "systems analysts" have issued reports on forensic science operations. Unfortunately, many of these analysts and corresponding organizations have had little or no background in forensic science. It might be advisable to create research units, for limited periods of time, composed of laboratory researchers, as well as individuals with

systems and management science backgrounds. The final results are likely to be far more insightful and practical than would otherwise be possible.

The last standard to be discussed in this paper is concerned with providing a data base that can be used to evaluate and improve the performance of forensic science operations within the criminal justice system. This is Standard 12.2.7, which calls for a reporting system that provides data relative to the laboratory's involvement in the various phases of crime investigation through to the final disposition in the courts. Such a reporting system cannot be constructed by the laboratory alone since it requires data from investigators, prosecutors, and the courts. Thus, the phrase in the standard that reads "Every crime laboratory director should, by 1974, design and implement a reporting system . . ." can be interpreted to mean that the laboratory directors should be instrumental in causing such a system to be designed and implemented. It was mentioned earlier that one of the areas of interest in the National Institute of Law Enforcement and Criminal Justice was the development of performance measures and record keeping systems relative to forensic science operations. In the very near future, steps will be taken to reach the goal of this standard.

Conclusion

The above discussion has presented some highlights of the policies and guidelines that will play a part in the future development of forensic science (our emphasis here being on criminalistics). What has been reported is only a framework that must be added to and filled in by individuals with expertise in the forensic sciences, such as members of the American Academy of Forensic Sciences. Consistent with the emphasis on reducing crime, a specific question has been posed: To what extent can the criminalistics operation contribute to the increased solution of burglaries and stranger-to-stranger assaults? Relevant to the goal of improving the quality of the criminal justice system, we would like to pose this question: Should forensic scientists take a more active role in determining their own functions, and in introducing and developing scientific and technological advances in the criminal justice system? The initiative must rest with the reader to answer and act upon these questions.

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