WORKSHOP

FORENSIC SCIENCE SERVICES AND THE ADMINISTRATION OF JUSTICE

SUMMARY REPORT

United States Department of Justice
Law Enforcement Assistance Administration
National Institute of Law Enforcement
and Criminal Justice

FORENSIC SCIENCE SERVICES

AND THE

ADMINISTRATION OF JUSTICE

Summary Report

of a

Special National Workshop

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EXECUTIVE TRAINING PROGRAM

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TABLE OF CONTENTS

FOREWORD

Forensic science has yet to fulfill its promise as a tool of the law. While the number of crime laboratories has grown dramatically over the past decade, questions remain about the level of competence and the availability of services in many parts of the country. At the same time, there is a lack of understanding -- and appreciation -- of the potential of forensic science by those who are its intended users: police, prosecutors, judges, defense counsel.

As part of its efforts to explore ways in which forensic sciences can be upgraded and better utilized, the National Institute convened a Special National Workshop for representatives of the legal, scientific and law enforcement communities. The proceedings are presented in this volume. The discussions explore a number of key issues relating to the role of forensic science in criminal justice, and the National Institute believes this report will be of interest to users of the forensic sciences, to legislators and to administrators of public agencies.

Blair G. Ewing
Acting Director
National Institute of Law
Enforcement and Criminal Justice

I. EXECUTIVE SUMMARY

The Law Enforcement Assistance Administration's National Institute of Law Enforcement and Criminal Justice (NILECJ), in recognition of the untapped potential of the forensic sciences and the need for an interdisciplinary exchange of views among users and providers of forensic science services, sponsored a Special National Workshop on Forensic Science Services and the Administration of Justice. Thirty-two persons, representing the judiciary, police, prosecution, defense, Academe, and the forensic sciences, participated in this unique one-and-one-half-day workshop.

Six papers were commissioned, and detailed abstracts of these papers were distributed to all participants prior to the workshop. The papers, written from the perspectives of the police, prosecution, defense, judiciary, education, and forensic sciences, are being published in their entirety as part of these proceedings. Each paper serves as a complete review of the issues surrounding forensic science utilization as seen through the eyes of these professionals who represent the various fundamental units of the criminal justice system as well as the educational sector. In addition to these six papers, these proceedings also contain summaries of three presentations made at the conference that address problems and issues in the forensic science realm.

The workshop was built around general plenary sessions and small group discussions. At these small group meetings, key areas of concern were explored--problems, problem causes, and solutions and strategies. It was accepted at the outset that the role of forensic science is currently inadequate and that there is an urgent need to identify the principal causes of the inadequacies as seen by members of the professional disciplines represented at the workshop. Only then could potential solutions to clearly identified problems and strategies for achieving those solutions be discussed in practical terms. Reporters were designated to take notes at group sessions, to deliver periodic feedback reports to plenary sessions, and to summarize their notes at the end of the entire workshop for inclusion in this final report.

As outlined by the group reporters, the primary problems responsible for the current limited utilization of the forensic sciences included the following:

1. Communication - There was general consensus that one major problem is an absence of communication, and comprehension and appreciation of viewpoints and responsibilities among the legal, law enforcement, and scientific professionals involved in criminal justice.

2. Organizational Problems - Placement of the forensic laboratory in a police agency is often cited as an impediment to scientific growth and objectivity, particularly in dealings with the defense.

3. Fairness - Concerns for the maintenance of objectivity were expressed in terms of a perceived tendency for expert witnesses to identify either with the prosecution or defense, rather than to identify solely with the scientific validity of the evidence itself. There was also general acknowledgement that forensic scientists have been remiss in their efforts to serve the defense in the examination and interpretation of scientific evidence.

4. Personnel - Inadequacies in the education and training of both the scientist and user were outlined, with the absence of a "standard career field" for the forensic scientist noted as a most serious problem.

5. Resources - It was agreed that grossly inadequate resources, to provide reliable examinations and testimony in a timely manner when and where needed, characterize the status of forensic science services in this nation. Also, inequities exist from jurisdiction to jurisdiction and between opposing sides in criminal cases (usually weighted in favor of the prosecution).

6. Cost-Effectiveness - Skepticism exists in all segments of criminal justice and public budgeting about whether the costs of scientific services produce a convincing benefit. Problems in tracking cases and measuring benefits lead the list of why the effectiveness of the laboratory is still in question.

7. Physical Evidence Collection - The research literature is replete with proof of how little of available physical evidence is collected and examined.

Group discussions then centered on possible solutions to these and other problems. Candidate solutions included:

1. Communication - Workshops similar to this one should be repeated at the regional, state, and local levels of government to improve communications. State-of-the-art newsletters and manuals for attorneys and police officers would advise the nonscientist of the capabilities and limitations of the forensic sciences. Forensic science referral services to aid the user in finding appropriate and competent forensic assistance is also needed. At the practical case level, mandatory pre-trial conferences between scientists and lawyers would prevent misunderstandings and problems once the case is tried.

2. Conceptual Models - Flexible, conceptual models of laboratory systems are needed that take into account variations in space, equipment, personnel, and fiscal requirements. Solutions to organizational placement problems (placement in police agencies versus placement as an arm of the court) were thought to be related more to "turf" issues and politics than to strict problem analysis and solutions.

3. Fairness - Solutions to this problem must make funds available for scientists to be called by the defense, and means must be found for complete discovery of all scientific evidence with guidelines for mutual consultation between "opposing" forensic scientists.

4. Personnel - All groups agreed that a strong national policy along with adequate funding was essential. Only then could programs to address the basic competency, management, and career development needs of forensic scientists prosper. Among individual programs advocated by the workshop groups were peer certification boards.

5. Resources - Suggestions included looking to the private scientific sector for help, and greater regionalization of laboratory services and judicial activism in mandating that scientific inquiries be used under certain circumstances. Establishment of a central resource facility for all those needing information and assistance in forensic science was also proposed.

6. Cost-Effectiveness - The solutions to questions as to the worth of different forensic science resource alternatives are entirely contingent upon having adequately financed research and demonstration projects by LEAA. Ways of finding the cost-effectiveness of strategies, such as the widespread application of trace evidence analysis, and determining in which crimes such added investment of scientific effort would be most productive are also needed.

7. Evidence Collection - The crime scene search function should be placed under the direction of the crime laboratory. Having more and better-trained crime scene personnel is another potential solution.

The discussion groups next examined and debated a variety of strategies by which the proposed solutions could be implemented. Funding was not discussed as a primary issue because, even though the absence of funds ranked high as a barrier to improvement, it was assumed that NILECJ/LEAA would respond to the need at the national level and that many different governmental means would have to be used at state and local levels.

If there was a unifying theme throughout the discussion of strategies, it was the need for standards. Minimum standards for the field, which would transcend jurisdictional barriers and parochialism, would do much to upgrade the field and ensure a uniformly high level of scientific services throughout the entire country.

In addition to standards, other strategies focused on the following five areas:

1. Communication - Regular national, regional, and local meetings of scientists, judges, attorneys, and police officials were seen as excellent vehicles for discussing scientific services, problems, and new developments. Existing professional newsletters would also be an excellent means for disseminating forensic science information.

2. Constituency Building - Forensic scientists must build closer relationships with the judiciary so that judges will become activists in mandating the increased use of the sciences.

3. LEAA's Role - LEAA has a major role to play in bringing about the improved utilization of the forensic sciences. Forensic science must be recognized at the national level as a priority program area and should receive sufficient funds to sponsor research and training grants. According to the discussion groups, priorities include:

    - An Education/Training Task Force - To define necessary educational requirements for forensic scientists

- An Operations Research Task Force - To develop a model laboratory system and to establish such a system in an area of the country that has need of such service

- A Cost-Effectiveness Study - To measure the costs and benefits of a model laboratory system in which all available physical evidence is collected and examined

- Research and Development - LEAA must continue its financial support of basic and applied research in forensic sciences.

LEAA was also encouraged to support the standards-setting efforts and to continue support of the certification program.

4. Resource Enrichment - Forensic scientists were encouraged to step up public relations efforts to reach legislators and the general public. By using television programs, even fictionalized ones, such as "Quincy," and publications with wide circulation, such as the Reader's Digest the public can be made aware of the role and needs of forensic science just as much of the country has become sensitive to the plight of rape victims, the role of crisis intervention, and the availability of alcohol and drug rehabilitation programs through publicity. Private businesses and foundations should also be approached to enlist support for worthy forensic science projects.

5. Forensic Science Leadership - Scientists themselves must become much more active in the promotion of the forensic sciences. This activity could take the form of preparing position papers on issues affecting the profession, cultivating better relationships with key governmental leaders, acknowledging problems in the field, and having the courage to speak out for necessary reforms.

This workshop is only the beginning of an intensive national effort to establish dialogue and to exchange information between forensic scientists and forensic science users in the criminal justice community. Readers are challenged to peruse this report carefully, consider its recommendations, and see that the potential solutions and strategies proposed are seriously considered and, hopefully, acted upon in their respective agencies.

II. BACKGROUND

Forensic science is the study and application of science and scientific methods to the processes of law and involves the scientific examination and evaluation of evidence. The forensic sciences represent a bridge between the disciplines of science and the law. Because of its objective nature, scientific evidence can become an invaluable tool, aiding in the detection of crime or the corroboration of eyewitness testimony, or in resolving the guilt or innocence of an accused person in criminal proceedings.

However, despite the recommendations of numerous crime commissions and Supreme Court opinions urging a more extensive incorporation of the forensic sciences into criminal investigations, these services are still used in only a very small percentage of felony investigations in the United States today. Forensic science laboratories often occupy a remote position in law enforcement agencies, receiving less than 1 percent of a jurisdiction's funds that go toward law enforcement. For, police executives, judges, and other government decisionmakers at federal, state, and local levels have a tendency to allocate resources to highly visible activities, such as police patrol, at the expense of giving adequate support to the forensic science laboratory.

The workloads of these laboratories are sporadic and they are rarely supported except by the initial investigating agency. Counsel for the defendants in a criminal matter must usually shop from community to community in an attempt to find an expert qualified and equipped to conduct parallel or duplicate examinations on evidence. Although forensic science has the potential of supplying invaluable information to the detective, attorney, or judge, it is often prevented from doing so because of less than qualified scientific personnel, inadequate laboratory resources, and poor research data.

The users of the forensic sciences--the police, attorneys, judges, and private investigative agencies--are often uninformed concerning the capabilities of a laboratory and overlook, destroy, or misinterpret evidence without realizing it. This is attributable, in large part, to the absence of university-level, continuing education and training programs that are essential if the forensic sciences are to be used properly.

At a time when the level of crime has reached unacceptable proportions, and when the backlog of cases to be adjudicated in our courts threatens defendants' rights to a speedy trial, the need for the large-scale application of scientific methodology to the service of law is imperative.

In order to meet this mandate, steps must be taken to provide a uniformly high quality of forensic science services and to augment the participation of forensic scientists in the legal system by educating police, lawyers, and judges to understand and then to use these services properly. In addition, continuing education and re-certification programs must be developed to maintain and reinforce the necessary level of excellence in the forensic science field. The public, too, must be made aware of the benefits to be derived from the expanded use of the forensic sciences in our legal system as it is ultimately the people who carry the burden when justice is not served.

III. WORKSHOP OBJECTIVES, FORMAT, AND REPORT

Workshop Objectives

In recognition of the importance of the forensic sciences and their untapped potential, and also recognizing that an interdisciplinary exchange of views among users and providers of forensic science services can lead to identification of valuable new directions, the National Institute of Law Enforcement and Criminal Justice sponsored this Special National Workshop--Forensic Science Services and the Administration of Justice.

The workshop represented a unique attempt to integrate perspectives among and between police executives, prosecutors, judges, defenders, criminal justice educators, and forensic scientists. Invitations to participate in the conference were accepted by 32 individuals representing a mixture of these professionals.

The six position papers commissioned for the workshop are presented in the next section. The papers explore the use of forensic science from the six perspectives:

- Police
- Prosecution
- Defense
- Forensic Science
- Judicial
- Academic

Workshop Format

The workshop was constructed around general plenary sessions and small-group problem-identification and problem-solving meetings. At these small-group meetings, key areas of concern were explored--problems, problem causes, solutions, and strategies.

Following opening remarks and an overview of the workshop presented by Mr. Paul Estaver and Mr. John Sullivan of LEAA, and Dr. Joseph Peterson of the Forensic Sciences Foundation, the participants formed groups along occupational lines to begin to identify and list the problems associated with the use of forensic science in the administration of justice. Reports from these sessions were given at a plenary session by a reporter from each professional group.

Mixed groups were then assembled, with each group having one or more representatives from each of the major professional disciplines. Initially, these groups dealt with the problem of identifying the causes for the limited use of the forensic sciences. In particular, dialogue focused on why problems exist and their meaning in day-to-day agency operations.

The mixed groups formed the nucleus for much of the subsequent workshop dialogue. Each group had a pre-selected reporter and a neutral facilitator at its disposal. Reporters had the responsibility of taking notes at group sessions and preparing feedback reports for plenary sessions. In addition, reporters summarized their notes at the end of the entire workshop for inclusion in this report.

After identifying problems, the small groups next discussed solutions to problems identified in earlier sessions. The group facilitators were asked to assist the members in concentrating on "generic" solutions, that is, solutions that have general application to many localities and situations.

After the reporters briefed the plenary audience on the dialogue developed at the "solutions" meetings, the participants again broke into the small groups to discuss strategies available in implementing solutions. An attempt was made to identify both short- and long-range strategies.

A panel, with the six paper developers and Mr. George O'Connor, Commissioner of Public Safety in Troy, New York, closed the workshop and each panelist was given an opportunity to make observations regarding the day and one-half of deliberations.

Report Format

This report is divided into the following major sections:

- Conference Presentations - The following presentations were delivered at the workshop.

  LEAA's Forensic Science Research Program

  John O. Sullivan
  Manager, Forensic Sciences Programs
  National Institute of Law Enforcement and Criminal Justice
  Law Enforcement Assistance Administration

  Driving Spikes with Tack Hammers

  George W. O'Connor
  Commissioner of Public Safety
  Troy, New York

  The People vs. Hitch Case: Inadequacy in Communication in the Forensic Sciences

  Kurt M. Dubowski, Ph.D.
  Professor of Medicine
  University of Oklahoma

- Papers - The six position papers are presented in their entirety. They are:

The Police Perspective

E. Wilson Purdy
Director
Dade County Public Safety Department
Dade County, Florida

The Forensic Science Perspective

Joseph L. Peterson, D. Crim
Executive Director
Forensic Sciences Foundation, Inc.
and
Ms. Regina Kwan Peterson
Masters Candidate in Forensic Science
John Jay College of Criminal Justice

The Defense Perspective

Joseph F. Keefe, Esq.
Smith, Smith, Mettling and Keefe
Torrington, Connecticut

The Judicial Perspective

Oliver Schroeder, Jr.
Director
Law Medicine Center
Case Western Reserve University
Cleveland, Ohio

The Education Perspective

Richard H. Ward, D. Crim
Vice Chancellor for Administration
University of Illinois at Chicago Circle
Chicago, Illinois

The Prosecutor's Perspective

Robert Leonard
Prosecuting Attorney
Genesee County
Flint, Michigan

- Group Reports - This section contains a summary of the discussions and deliberations of three interdisciplinary groups convened at the workshop. The reporters for the groups were:

Bryan S. Finkle, Ph.D.
Center for Human Toxicology
Salt Lake City, Utah

Allen H. Andrews, Jr.
Superintendent of Police
Peoria, Illinois

Kenneth S. Field
FISA Corporation
Colorado Springs, Colorado

- Remarks of the Interdisciplinary Panel - At the close of the workshop an interdisciplinary panel presented brief, three-minute summaries of outstanding problems, solutions, and strategies formulated during the course of the one-and-one-half day workshop.

- Conclusions and Summary - This final report was prepared by workshop chairman, Dr. Joseph L. Peterson, and the staff of the Forensic Sciences Foundation. Concluding remarks are offered in this section.

- Appendix

  Participants

  Workshop Agenda

IV. CONFERENCE PRESENTATIONS

- LEAA's Forensic Science Research Program--John O. Sullivan
- "Driving Spikes with Tack Hammers" --George W. O'Connor
- People vs. Hitch: Communications Failure in the Forensic Sciences --Kurt M. Dubowski

LEAA's FORENSIC SCIENCE RESEARCH PROGRAM

John O. Sullivan
Manager, Forensic Science Programs
National Institute of Law Enforcement and Criminal Justice
Law Enforcement Assistance Administration

As the manager of the forensic sciences programs at the National Institute and on behalf of the Institute, I would like to say how delighted we are to have such a distinguished and well-balanced array of criminal justice professionals at this workshop on Forensic Science Services and the Administration of Justice.

I would like to begin by giving you a brief account of my organization and its programs in forensic science.

As most of you probably know, the National Institute is the research and evaluation arm of the Law Enforcement Assistance Administration. Since its inception, LEAA has been charged with the responsibility of reducing crime and improving the quality of justice. As a direct result of recent Supreme Court decisions, science and technology have begun to assume increasingly important roles in the criminal justice system. Accordingly, LEAA has taken the initiative in upgrading the nation's local, regional, and state crime laboratories.

Crime laboratories have been growing in numbers as well as in importance over the past decade. There were fewer than 100 such laboratories in 1967; today there are about 250. During that same 10-year period, the number of laboratory personnel has more than doubled, and laboratories are now, for the most part, much better equipped. Counting money allocated for equipment, facilities, personnel, and training, funding for crime laboratories has totalled more than $70 million over the past nine years. And it is clear that these crime laboratories are now vastly improved as a result of LEAA support.

As a complement to LEAA's block and discretionary grant programs, the National Institute has developed a well-defined forensic science research program. This research program, which has been created through close coordination with the leaders of the forensic science profession over the past four years, has had two goals: 1) to increase the quantity and quality of the forensic sciences available to the criminal justice system, and 2) to ensure high levels of performance in forensic sciences nationwide.

These goals are being pursued through a two-pronged approach. First, the Institute has sponsored research to provide practitioners with improved means for delivering their services. To this end, a number of studies have been funded to develop and refine techniques and instrumentation for examining physical evidence in crime laboratories. The recent test for detection of gunshot residues on a suspect's hands, developed under contract by Aerospace Corporation, is one example of the Institute's success in promoting technological advance. Also, the most advanced techniques in the nation and perhaps the world to analyze bloodstains have recently been developed by the National Institute.

A second approach to strengthening the forensic sciences has been a study of the current level of performance throughout the country. The National Institute has funded several projects aimed at improving the quality of professional services in forensic sciences. These efforts have sought to determine the needs of the profession. For instance, data have been gathered on educational requirements for forensic science professionals, on the most effective methods for delivering services, and on proficiency and deficiencies in performance. Findings have been used to develop programs for correcting deficiencies and improving effectiveness.

Over the past five years, the Institute has spent more than $5 million for these forensic science programs. Also, just recently, the Institute developed and implemented A National Program to Upgrade Crime Laboratories. (The program plan is available at the Institute.)

This conference was organized as the result of growing evidence that many prosecutors, defense lawyers, judges, and even criminal investigators do not understand and use the forensic sciences. The objectives of this conference are multifold:

- To convene a workshop of the nation's leading forensic scientists and representatives from the principal "users" of forensic science: police, prosecuting attorneys, defense attorneys, and judges

- To present topics that will stimulate efforts to improve the quality and increase the use of the forensic sciences in the criminal justice system

- To discuss alternative methods for increasing understanding and dialogue between scientists and law enforcement officials

- To develop long-range goals for the forensic science profession

- To produce conference proceedings that will serve as a permanent record of the papers and discussion groups.

We look forward to hearing your reactions and suggestions as to how the National Institute can foster the criminal justice system to increase its use of forensic sciences in the administration of justice.

"DRIVING SPIKES WITH TACK HAMMERS"

George W. O'Connor
Commissioner of Public Safety
Troy, New York

The American public would be shocked and disappointed to learn of this meeting. They have become so convinced by fiction that Quincy and Columbo are the reality that they would reject what we know to be the "real world" as make believe. Like the prisoners in Plato's cave, our publics confine themselves to their domestic caves and watch the images on the walls, convinced that the electronic shadows, lacking in substance, are, in fact, the truth. While unfortunate, the truth is that our clients act upon the basis of their beliefs and, having been taught of the flawless efficiency of our criminal justice system, they believe that we solve each case, find each fiber of evidence, and send each defendant away for an extended term.

As we look at the manner in which the forensic sciences are brought to bear upon the criminal justice process, we must conclude that in confronting crime, we are "driving spikes with tack hammers." If crime is the problem and the spike, the forensic science applications represent the tack hammer. We are applying insufficient, inadequate resources to the task of solving the crime problem.

Much of the reason for the inadequacy of the forensic sciences can be traced to the fact that the public considers the entire criminal justice system in the same manner as it thinks about prunes. As you contemplate why criminal justice and prunes are similar, consider the ways in which people think about prunes. For the most part, people think about prunes only when they are having some difficulty. At those times, they want only a rapid and effective solution to their problem. Beyond that, most people do not want to occupy themselves with thinking about prunes. After all, the subject is unpleasant. And so too, people only want to think about the criminal justice system when they are having a particular problem. Beyond that, they are not likely to devote much energy to considering unpleasant things like crime, police, courts, and forensic laboratories. In short, the forensic sciences, like the entire criminal justice system and like prunes, suffer from the fact that they are not terribly relevant to most people most of the time.

The issues about the appropriate and effective uses of the sciences seem to me to be one of the ways in which we demonstrate that mankind continues to be at war with itself--wanting to be civilized, for all that the term implies, but reverting so often to the behavior of the predator. In other words, the issue we confront in this workshop is a classic manifestation of the continuing clash between our intellects and our instincts or emotions. As an example of this point, I would point out to you that as recently as two days ago, the New York State Legislature passed a death penalty bill. That action I would characterize as attempting to "drive tacks with sledge hammers." The action by the legislature demonstrated that we are afraid, vengeful, and self-centered. It is all the more unfortunate that the legislators acted as they did because they have done almost nothing to balance the scales in the approach to criminal behavior. While seeking to bring swiftness and

sureness to the process of inflicting the sentence of death, they have failed to demand that similar degrees of swiftness and certainty be achieved in the process of determining guilt. As a group of office seekers, they have behaved in a manner almost identical to that of a group of city council candidates in a medium-sized northeastern city in 1975. Reacting to citizen fear generated by three unrelated--and solved--homicides, the council candidates publicly went on record as demanding "action not answers" to the so called crime wave. They, too, struck a blow for instinct and emotion but not for intellect or humanity.

As a nation, we are a people characterized by the polarity of our thinking. We tend to see things as:

- black or white
- right or wrong
- yes or no
- true or false
- good or bad
- and so on.

Such a mind set creates the need for simple, clear answers or solutions to so-called problems. We talk in terms of goals and objectives as though there were points in time at which we might expect to have "solved" any particular set of problems. Such expectations, whether thrust upon us by simplistic minds or developed and accepted by ourselves, pre-doom us to a frustrating existence. Problems may be approached, and from a wide variety of directions, but few are truly capable of being solved. Certainly mathematical problems have answers, and mechanical problems may be susceptible to solution. In the arena in which we work, however, the nature of the crime "problem" is such that it cannot be "solved." Whether we will be able to do more than we have done will depend upon what you do in this workshop. In addition, it will depend upon how well we overcome more fundamental conditions, such as public ignorance.

Before releasing you to attend to the workshop agenda, I would like to comment upon one other aspect of the difficulty of developing a more adequate use of the forensic sciences. That factor relates specifically to my own branch of this growth industry--the police. The nature of the police system in the United States is a major part of the problem. Most police agencies in this nation have fewer than 25 members. For the most part, the forensic sciences are a luxury beyond the reach of most police agencies. The few laboratories operating at the national and state levels do not have the resources to reach out to the many small agencies and they, in turn, cannot afford their own support services. If the forensic sciences are to be used, the police must understand, value, and actively seek out physical evidence. We must be willing to accept the fact that things as well as people possess the information essential to achieving not only clearance of cases but justice as well.

PEOPLE VS. HITCH: COMMUNICATIONS FAILURE IN THE FORENSIC SCIENCES

An Abstract of the Address by

Kurt M. Dubowski, Ph. D.
Professor of Medicine
University of Oklahoma Health Sciences Center
Oklahoma City, Oklahoma

Dr. Dubowski presented a review of significant judicial decisions concerning the retention, preservation, and re-analysis of Breathalyzer ampules and their contents. He noted that in placing reliance upon Brady vs. Maryland, 373 U.S. 83 S. Ct. (1963), the defense proposes that in the adjudication of alcohol-related traffic offenses, it be required that Breathalyzer ampules and their contents be preserved by the state and surrendered, upon timely demand, for re-analysis by the defense; or that, in the alternative, the charges be dismissed or the breath-alcohol test results be suppressed.

Dr. Dubowski went on to explain in the opinion in the People vs. Hitch (12 Cal. 3d. 641, Calif. Sup. Ct., 1974), the California Supreme Court accepted the defense contention that failure by the state to retain and provide, upon timely demand, the test ampule previously employed in a Breathalyzer test of the defendant, constituted denial of due process. In so holding, the Court ruled that "the test ampule, its contents and the reference ampule customarily used in the test constitute material evidence on the issue of the driver's guilt or innocence of the charge of driving a vehicle under the influence of intoxicating liquor." The court concluded that "...the investigative agency involved in the test has a duty to preserve and disclose such evidence."

In his own research, Dr. Dubowski found that he was unable to prevent unpredictable changes in the contents of used Breathalyzer ampules by any of various conditions of preservation or combinations thereof; and the changes in the contents of Breathalyzer ampules, evaluated statistically, did not correlate with time sufficiently well to permit scientifically valid and forensically acceptable conclusions regarding the validity of the original Breathalyzer test result.

Dr. Dubowski also provided an up-to-date listing of decisions in other trial, appellate, and supreme courts throughout the United States regarding this same issue. He cited the confusion and misinformation surrounding this case as a prime example of communications failure in the forensic sciences.

V. POSITION PAPERS ON FORENSIC SCIENCE SERVICES

- The Police Perspective - E. Wilson Purdy
- The Forensic Science Perspective - Joseph L. and Regina Kwan Peterson
- The Defense Perspective - Joseph F. Keefe
- The Judicial Perspective - Oliver Schroeder, Jr.
- Forensic Science in Higher Education - Richard H. Ward
- The Prosecutor's Perspective - Robert Leonard

56853

FORENSIC SCIENCE SERVICES:

THE POLICE PERSPECTIVE

E. Wilson Purdy, Director
Dade County Public Safety Department

Background

The use of forensic services by the law enforcement profession in the United States is a relatively recent phenomenon. A large contrast can be seen by comparing the rather modest facilities developed by Colonel Calvin Goddard in the Chicago Police Laboratory in 1929, to the ultra-modern laboratory available today to some elements of the criminal justice system. As one observes the historical trends in the development of forensic facilities, one sees that changes in the system were of an incremental nature. Rather than facilities being the result of a well-planned, integrated effort resulting from a "master strategy," they were formed by rapidly advancing technology and pressures from the"users" of forensic services. This phenomenon of incremental growth, along with a rapidly changing social environment, has resulted in a somewhat "fragmented" forensic science service delivery system.

Above all, we can focus on the drug-subculture phenomenon of the late 1960s and early 1970s as being the catalyst for the expansion of forensic facilities in the United States. To combat the increasing social unrest and drug usage, the federal government formed the Law Enforcement Assistance Administration. LEAA was to aid local law enforcement agencies in waging their war against crime, and a significant portion of the funds made available to the law enforcement community went toward the development of forensic facilities at both the state and local levels.

If we then consider that many of our forensic facilities are relatively young (born in the early 1970s), that they have been strained by rising workloads (particularly related to drugs), that technology has been expanding at an unprecedented rate, and that until very recently, no master plans have been available for intergrating forensic services, it should not be surprising to discover that the forensic science system is experiencing numerous dysfunctions. These dysfunctions are nothing more than normal perturbations expected when dealing with rapid change. It is a widely shared belief among professionals in the criminal justice system that the forensic sciences, although powerful in the fight against crime, have been classically under-used in the United States. Many theories have been postulated regarding the reasons for this condition and the following listing of causal factors represents those situations most often expressed:

Lack of Awareness and Understanding of the Forensic Sciences on the Part of Law Enforcement Executives

Because forensic scientists represent a "specialist" group who, on many occasions, express a myopic view of organizational activities, they are ignored

by some law enforcement executives. These executives may not be comfortable in communicating in the technical terms of forensic science and they may view the field as narrow in scope. The problem is further compounded by the fact that many law enforcement executives performed in an operational capacity in their field at a time when the forensic sciences were in their infancy, and therefore, much less efficient and effective than they are today.

Many of today's executives fail to appreciate the forensic sciences, especially since they originally learned to operate without forensic science services. Those law enforcement executives who have not kept abreast of current developments in the forensic sciences, and have not had an opportunity to re-educate themselves, are responsible in some instances for instilling negative feelings towards scientific personnel into today's modern law enforcement profession.

Inability of Scientists to Articulate and Communicate Their Needs to the Appropriate Elements of the Criminal Justice System

Due to the nature of their training, many scientists do not possess the ability to communicate their needs effectively in the bureaucratic system in which resources are allocated. If this situation prevails, and if the law enforcement executives who control the resources continue to lack understanding, then in a time of rapidly increasing technology, the forensic facilities will be outdated rapidly.

A forensic facility that does not implement the latest scientific techniques can not be expected to operate in an effective manner. Thus, a cycle begins in which losing respect for scientific services, in turn breeds underutilization of these services.

Failure of the Various Components of the Forensic Science Field to Coordinate Activities

The forensic science system is traditionally described as consisting of the following components: criminalistics, odontology, physical anthropology, pathology, psychiatry, questioned document examination, and toxicology.

In the United States, it is extremely rare to find all of these disciplines housed in one facility. Yet, coordination of these various components is essential if effective forensic services are to be provided. The coordination of these services (as the system now exists) is the joint responsibility of the forensic scientist, the law enforcement officer, and the prosecutor. However, before coordination can take place, it must be recognized that sophisticated services do exist, and they can play a major role in establishing a fact pattern in matters under consideration. Unfortunately, in many jurisdictions, the sophistication required for this recognition does not exist.

Lack of Forensic Science Facilities in Close Geographic Proximity to Agencies Requiring Services

Studies have repeatedly demonstrated that the effectiveness of a forensic science facility is greatest when it is in close geographic proximity to its

"user" agencies. A lack of geographic proximity hampers the progress of numerous jurisdictions in the United States by restricting them from having access to a full spectrum of forensic facilities for use on a routine basis.

Although this geographical problem has been somewhat mitigated by the establishment of regional forensic facilities, another problem associated with mailing or transporting physical evidence has been a major causative factor in the underutilization of forensic services.

Budgetary Restrictions Preventing the Development of Forensic Capabilities

The forensic science system, which is basically a low-profile system, sometimes loses out to the more visible entities in terms of resource allocation in the public sector. To date, in a large number of states, the main impetus for the development of forensic facilities has come from federal funding. Federal funding, however, has not been adequate in providing for the number of facilities that are required to satisfy the needs of law enforcement agencies. In many jurisdictions, executives have not kept the proper balance between "line" and "support" services.

Failure of the Judiciary to Demand Rigorous Scientific Testimony in the Adjudication Process

Partly because of pressing caseload demands, and partly due to an unawareness of the capabilities of the forensic science services, the judiciary has not demanded the introduction of scientific evidence in the trial process. All too often, questions arising during adjudication processes go unanswered because the judiciary is reluctant to demand scientific testimony. These phenomena can be attributed to our adversary system as well as to a lack of precedent.

Failure of the Prosecuting Agency to Demand Forensic Examinations in Case Development

The prosecuting agency's failure to demand scientific examinations can best be attributed to a general lack of understanding of forensic science capabilities on the part of a significant number of prosecutors. This lack of understanding is attributed, in part, to the fact that numerous forensic experts are unable to convey scientific information to lay personnel. Also, there is a general and fundamental deficiency in the training of attorneys.

Lack of Qualified Scientific Personnel Operating in Forensic Laboratory Facilities

As previously stated, the development of forensic facilities in the United States is a relatively recent phenomenon. Over half of the current forensic laboratories (crime laboratories) were put into operation after 1968.

This being the case, it follows logically that the majority of personnel employed in forensic facilities have relatively limited experience. This inexperience, coupled with the lack of widely available academic training that is pertinent to forensic subjects, leads to difficulties associated with ensuring employee proficiency.

Unacceptable Caseload to Examiner Ratios Necessitating a Superficial Treatment of Evidential Items

Taking into account the austerity programs recently established in most jurisdictions, together with the social unrest that has led to unprecedented rises in crime, it is apparent that severe demands have been placed on forensic facilities for physical evidence analysis. Unfortunately, funds to staff these facilities adequately have not been generally available. The resulting condition has been one of stretching personnel resources by handling more examinations than the optimum design would suggest.

Ineffective Coordination Between the Evidence Recovery and the Evidence Analysis Process

The essential step toward effective evidence use involves the evidence recovery process. Criticism has often focused on the use of inadequately trained and/or inadequately equipped personnel at the recovery stage. Those agencies using "sworn" personnel are most often criticized in this way, and the criticism is frequently made by the scientific personnel in the agency's own laboratory system.

On the other hand, agencies using "specialist" personnel to accomplish the evidence recovery process are often accused of not being responsive to the needs of investigative personnel. Whichever system is used, a coordinated effort must be maintained between the investigative process, the evidence recovery process, and the evidence analysis process.

Lack of Adequate Quality Control Programs in Many Forensic Science Facilities

Because of the highly technical nature of the forensic laboratory output, and because this output is rarely scrutinized or challenged in the adjudication process, it is essential that effective, internal quality control programs be instituted in forensic facilities. Although the need is apparent, there currently are forensic facilities that do not have effective quality control programs as part of their operational routines.

The above generalizations do not constitute an indictment of our forensic science system. The concerns expressed, however, are viable, although their appropriateness depends upon the specific jurisdiction in question. By and large, the dedicated men and women operating our forensic facilities perform in an outstanding manner and serve in the interest of justice. Those of us who are committed to improving the efficiency and effectiveness of the criminal justice system recognize that the system suffers from numerous imperfections. The forensic sciences field, being an integral part of that system, also possesses some dysfunctional characteristics. It is through the mutual exchange of ideas among professionals that these imperfections can be identified and eventually eliminated.

It is in this spirit, then, that the thoughts below are presented. Although there is no one "totally correct" solution to upgrading the use of the forensic sciences in the administration of justice, attention to the following areas would undoubtedly result in significant improvements.

Scope

Each jurisdiction must determine those elements of the forensic sciences which it will include in its unique forensic science system. Decisions must be made concerning the desirability of a combined medical examiner/crime laboratory operation. This will bring into focus those functions that tend to overlap such as toxicology. In a toxicological investigation, for example, certain procedures could be undertaken in the medical examiner's office, the crime laboratory or hospital. Indeed, a case could be made for a decentralized operation co-existing in all three locations.

Of a more fundamental nature, but of vital concern, is the question of centralized versus decentralized facilities, and of particular importance, is the relationship between state and local operations. It is also a basic concern to determine which agency of the justice system is ultimately responsible for forensic operations. Organizationally placing forensic facilities under the jurisdiction of either a prosecuting agency or the courts, the purpose of the justice system would perhaps be served more directly. Thus, the design of a viable forensic science system is different for every specific jurisdication and every forensic science system is unique and must be tempered to fit the existing resources in its jurisdiction. The administrator of the jurisdiction plays a key role in designing the system and must exercise discretion. (S)he can minimize the risks by adopting an enlightened outlook toward both the limitations and capabilities of the various forensic disciplines.

Budget

The degree of budgetary support necessary to fund a forensic science system should be maximally standardized. Attempts should be made to derive a formula value based on population served, volume of crimes, caseload, and other factors which are significant in deriving an equitable funding level. In those jurisdictions where both state and local agencies operate as administratively independent systems, innovative funding mechanisms should be developed to ensure that the budgetary burden is equitably distributed.

One mechanism for consideration should be legislation authorizing a percentage return to the local system from the state level. Also, as an adjunct to effective budgetary allocation, attention should be directed toward formulating performance indicators. Although this is a task of extreme difficulty, the development of performance indicators would enable administrators to allocate their resources more effectively.

Personnel

The heart of the forensic program, as with most programs, is its operating personnel. On the average, over 85 percent of the costs in operating a forensic facility are funds allocated to employee salaries and benefits. In view of this, it is paramount that every effort be made to develop the human resources in the forensic science system.

Of particular importance are programs directed toward the certification of individuals employed in the forensic sciences. Certainly, programs of this type should be encouraged to ensure minimum levels of proficiency. Once having established minimum levels of proficiency, programs related to continuous in-service training (seminars, workshops, professional meetings, etc.) should be encouraged so as to ensure continued proficiency in light of expanding technology.

To retain highly skilled employees in the forensic profession, administrators must see to it that equitable salaries and benefit programs are initiated for them. Also, the working environment must be conducive to forensic examinations, with particular emphasis upon the establishment of appropriate workload to analyst ratios.

Resource Development

In light of the vast number of disciplines encompassed in the forensics, programs should be developed to use the full resources of the community in the forensic sciences effort. For instance, special attention should be given to cultivating a relationship with expertise available in the university and other private sector environments.

Every effort should also be made to exploit technological innovation by fostering closer cooperation between major equipment manufacturers and the various elements of the forensic science system. In terms of technology, special attention should be given to ensuring that the forensic sciences benefit from both public and private technology transfer.

Another innovation not presently being exploited to its fullest is the use of consultants to increase effectiveness of forensic operations.

One final comment, critical in terms of the efficient operation of forensic facilities, involves the concept of increased use of centralized data banks to serve as resources for local forensic science systems.

Conclusion

In summary, the best interests of society can be served by increasing the use of forensic science services in the administration of justice. Empirical observations show that the full potential of the forensic sciences is unrealized. Causative factors responsible for the underutilization of the forensic sciences are multidimensional and vary with geographic and jurisdictional boundaries.

Remedies have been advanced, along with notions that simplistic solutions are inappropriate in terms of mitigating the underutilization phenomenon. The factor that holds the greatest promise, and that emerges as the "beacon" upon which all elements of the criminal justice system must focus, is communication . Meaningful dialogue between the forensic sciences and the "user" agencies represents the first step toward integrating more effectively the forensic sciences with the law enforcement process. This communication must not only be tempered with enlightened insight, but it must be pervaded with the spirit of cooperation.

The complexities of our present culture, the rapidly accelerating rate of change in our social environment, and unprecedented technological innovation all demand that every opportunity be exploited in attaining the goal of reestablishing social tranquility. In the attempt to implement strategies to compensate for the somewhat "fragmented" forensic science delivery system, a two-pronged approach is suggested: first, agencies using the services of the forensic sciences must be informed of the capabilities of the various disciplines which comprise the forensic sciences; secondly, through minimum standards (certification) and resource utilization, the forensic sciences must be brought up to their full potential.

From the historical perspective, it is clear that the forensic sciences occupy a position of extreme importance to the law enforcement effort; an obligation exists on the part of both scientists and administrators to ensure the continued contribution of the forensic sciences to the administration of justice.

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THE PROMISE AND PROBLEMS OF FORENSIC SCIENCE:

THE FORENSIC SCIENCE PERSPECTIVE

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Introduction

Historians have cited examples of the application of science to legal problems as far back as biblical times. The development of modern forensic science, however, is principally confined to the present century during which the term "physical evidence" has progressed from strictly legal parlance to an everyday idiom.

Whether the physical evidence be fingerprints, blood hair or human bones, each is involved in a quest ultimately to demonstrate individuality. Questions such as, "What is the probability that this hair came from this individual and no other?" and "Can you unequivocally state that this paint came from this automobile and no other?" are fundamental to understanding the fascination forensic science has held for scientific researchers. The dissection of a single type of physical evidence with the hopes that each layer will further individualize the evidence type has challenged many a scientific mind. In fact, it was in the pursuit of such challenges that many of the advancements in forensic science have been made. One might say that the origins of forensic science are found in the outside interests and hobbies of scientists of more traditional disciplines. Fifty years ago, no one trained strictly as a forensic scientist; forensic science as a discipline unto itself was nonexistent. With time and the increasing acceptability of physical evidence in the courtroom as well as the influence of such judicial decisions as Escobedo, Miranda and Schmerber,[1] the demand for forensic science expertise grew, and a profession was born to meet it.

Currently there are several thousand individuals in the United States who work as forensic scientists. These individuals have arrived from multiple directions, backgrounds and interests, and, as their number has grown, they have formed societies and organizations where forensic interest is the common thread. They are now of the consensus that any further movement or growth of the forensic science enterprise must be a controlled and united effort.

The forensic science profession has reached a point of critical self-examination and assessment of its position in our system of justice. Although such an undertaking is never an easy one, there are two "givens" that the profession must always work with. First of all, forensic science is a service to the criminal justice system and does not exist independently as a scientific discipline. Without crime and a system of justice to create a need for forensic science expertise, forensic science would indeed wither away. Secondly, the respective roles of user and provider puts the burden on the forensic science profession to demonstrate the desirability and promote the utilization of its service. Thus, the viability of the profession lies largely within its own hands, and the forensic scientist must certainly be his own champion.

In addition, there are several facets of the forensic science "condition" with which the profession must be concerned; they are:

Quality - higher quality forensic science enhances the desirability of the forensic science service, and a system by which such quality can be assured should be guaranteed.

Fairness - compared to other types of evidence, one of forensic science's greatest selling points has been that it offers a measure of objectivity and impartiality in a criminal investigation, whether the result be the exoneration of the innocent or the successful prosecution of the guilty.

Effectiveness and Increased Utilization - forensic science laboratories are not inexpensive operations, must compete for limited governmental resources and must demonstrate their cost-effectiveness in clearing crimes, prosecuting criminals and ensuring a high quality of justice.

Research - few funds are devoted to forensic science research at the national, state, or local level. Research is desperately needed to advance the state-of-the-art to a level commensurate with our current knowledge in allied scientific fields.

Education and Training - most forensic scientists were educated for careers in nonforensic professions. Core curricula must be developed, and career development problems must be addressed to attract top notch personnel into the field. Pre- and in-service training programs are needed to ensure high quality examinations and interpretations of results.

Communication- the forensic science profession must promote both understanding of its work and greater utilization of its service through open communication at all levels of the administration of justice.

Quality

The issue of quality control is being avidly discussed by the members of the forensic science community, and initial steps are being taken to institute appropriate quality control mechanisms within the various forensic science

disciplines. There are essentially two reasons why forensic scientists are concerned with the issue of quality. On the one hand, quality is integral in sustaining a sense of professional pride and integrity, and on the other, quality is necessary in establishing a good reputation for forensic science which, in the long run, will promote the use and enhance the desirability of the forensic science service.

Due to the erratic and sporadic growth of the forensic science profession, quality control has been extremely difficult to maintain, as the need for such control was temporarily masked. We have witnessed a doubling of forensic science resources in the last decade which has overtaxed and, in some cases, made obsolete existing quality control policies and procedures.

A problem which has been a source of embarrassment and frustration to the profession is a small number of "charlatans" who have embedded themselves within the profession. Although it is well-known that any profession in its infancy is unusually vulnerable to such infiltration, the forensic science community believes that it is no longer in its infancy and that incompetency must be dealt with strongly.

Certification is a major process which should promote competency and quality in the forensic sciences. This process, by which a member of a given forensic science specialty applies for recognition as having met certain minimum qualifications as established by a peer-review board, is based upon the candidate's personal and professional record of education and training, experience and achievement, as well as on the results of a formal examination. In this way, the certifying boards hope to establish minimum standards for individuals working in the field and to make available to the judicial system a practical and equitable means to readily identify those persons who profess to be specialists in the field of forensic science and possess the necessary qualifications and competence. A recertification provision will require that the individual who wishes to maintain his certification remain active in his chosen specialty, attend continuing education seminars and workshops, and demonstrate an acceptable level of professional activity in such other areas as research and teaching. Viable certification boards are presently operating in the forensic disciplines of pathology, toxicology, odontology, anthropology, psychiatry, and questioned document examination.[2]

The forensic specialty that has had the most difficulty with the certification issue is criminalistics. This is, in part, owing to the diverse composition of the group where there exists various subspecialties such as firearms examination, drug chemistry and serology.

At this writing though, a national criminalistics study committee is making substanti . headway in defining those areas where certifying procedures are possible and in establishing how a certification process might work. There is no question that the criminalistics discipline, as a whole, perceives a need for certification; the task at present is to devise a workable and equitable system.

One problem related indirectly to certification is the prevalence of civil service protection of the majority of forensic scientists working in local, state, and federal governmental laboratories. Those individuals who might be identified

as being unqualified cannot, in many cases, be removed as they are protected by their civil service tenure. This is regardless of any censure issued by peers or professional organizations. One tries not to juxtapose the power of the civil service with the authority of the professional societies and certification boards. Nonetheless, because the latter are not yet firmly established, civil service will continue to be a problem for the present. The best answer that can be given to the question, "Why certify if the incompetents cannot be removed?" is that with time and perseverance, certification will eventually be worked into the criteria for hiring and granting tenure.

Quality forensic science also depends greatly on the working facilities of the scientist, and the accreditation of crime laboratories is also currently being considered. The most complete inquiry into accreditation is being conducted by the American Society of Crime Laboratory Directors (ASCLD).[3] The favorably received draft report on accreditation submitted by the organization's Laboratory Evaluation and Standards Committee lists the following objectives of accreditation:

- To improve the quality of laboratory services provided to the criminal justice system
- To offer to the general public and to users of laboratory services a means of identifying those laboratory facilities throughout the nation which satisfy accreditation criteria
- To develop and maintain criteria that can be used by laboratories to assess their level of performance and strengthen their operation
- To provide an independent, impartial and objective system by which laboratory facilities can benefit from total organizational review.

The accreditation process would review such aspects as laboratory management and operation, equipment and procedures, personnel qualifications and physical plant and security. The recommendations of this report relate to the overall potential or capability of the laboratory to perform the scientific analyses and not to the end product of the analyses themselves. However, part of the accreditation process would be involved with ensuring accurate results by means of a proficiency testing program administered either internally, or, ideally, externally of the laboratory.

One of the most controversial and yet most successful quality assurance programs that was conceived was the proficiency testing of criminalistics laboratories.[4] There are approximately 240 crime laboratories in the country of which more than 90 percent voluntarily participated in the research project administered from 1974 to 1977. The proficiency testing project attempted to develop a procedure for measuring the proficiency levels of the crime laboratories in the examination and interpretation of various physical evidence types. The underlying purpose of that project, as well as that of the current fee-based private program, was to enable criminalistics laboratories to identify their areas of strength and weakness and allow them to compare their capabilities with those of other participating laboratories around the nation.

The proficiency testing results led to LEAA's adoption of a national program to upgrade crime laboratories, which included two more quality-related projects: training workshops for crime laboratory personnel and the criminalistics methods of analysis feasibility study. The training workshops, which will be supported by the Law Enforcement Assistance Administration (LEAA), are initially concerned with two areas of crime laboratory training: basic knowledge and applications of microscopy and applications of a recently developed multisystem approach to serological examinations.[5] Both of these training projects will have extensive evaluation components which should shed considerable light on the effectiveness of this form of training in upgrading laboratory competencies.

The data collected from the proficiency testing research project showed that crime laboratories were using a variety of analytical techniques which produced results ranging from superior to unacceptable. It is believed that the quality of techniques is directly related to the quality of results, i.e., poor techniques lead to poor results, and LEAA is now considering the support of a "methods of analysis feasibility study" as another step to upgrade the overall quality in forensic science. This study would complete a criminalistics methods literature search, determine those physical evidence examination categories that would be most amenable to the selection and adoption of acceptable methods of analysis, research and write the specifications for a methods testing procedure, pilot test the evaluation design, and publish the result of the testing procedure.

These are basic steps toward ensuring quality forensic science which, in time, will noticeably benefit our legal system.

Fairness

Fairness in the forensic science profession can be discussed in two different contexts. In one sense, fairness doubles for objectivity and impartiality. In other words, if forensic science testimony is objective and impartial, it is deemed "fair." The second context in which the term fairness is used pertains to the overall availability of forensic science to our adversary system of justice. Is forensic science equally available to both the prosecution and the defense? And if it is not, is this fair?

Forensic science should by its definition as a science be both objective and impartial. However, the unique relationship that forensic science has to the legal system is a continuous test of the scientist's ability to remain nonpartisan and completely objective. The majority of forensic science laboratories in the United States are supported by a law enforcement parent agency or other prosecutorial offices. The reason for the creation of the laboratories was to provide services to these agencies, primarily by analyzing physical evidence samples, the results of which would support criminal prosecutions. It is sometimes tempting for a forensic scientist to take on the mission of a criminal investigation personally, especially if he was once a police investigator himself. Often without realizing it, the scientist will begin to search solely for incriminating evidence and subconsciously neglect exonerating evidence.

For this reason, the placement of the crime laboratory within the police department or district attorney's office has been criticized as impeding fairness.

Perhaps the more ideal location for the laboratory would be under the jurisdiction of the court or under no legal jurisdiction at all (e.g., an independent civilian laboratory). If we could rebuild our justice system, indeed, these ideas would be incorporated into the blueprints; realistically, however, to change the jurisdiction of the laboratories at present would be both physically and fiscally unmanageable.

Thus, the problem of fairness must be dealt with given the existing conditions. Probably the most effective way to optimize fairness in terms of objectivity and impartiality is to require a formal scientific education of all practicing forensic scientists. Besides the basic scientific skills, such an education should instill an awareness of ethical responsibility and a commitment to scientific professionalism first and foremost. The scientist must be made aware that the power he has in the courtroom imparts these responsibilities and that only his acceptance of them will ensure that justice is meted out fairly.

As the weight of physical evidence testimony increases in the courtroom, defense attorneys are at an unfair disadvantage as the allocation of forensic science resources is most definitely skewed in favor of the prosecution. For the most part, defense attorneys are not welcome in their local police laboratories where the incriminating evidence against their clients is housed and analyzed. They must resort to the expertise of private, independent forensic scientists, whose fees are inevitably beyond reach. Some states set a maximum budget of $300 for an indigent defendant's scientific experts. Considering that most experts charge a minimum of $50/hour for services rendered, little can be purchased with such funds.

Although the forensic science budget for the defense remains a problem, if we return to the original purpose that forensic science serves in the justice system - scientific ascertainment of the truth - there is no good reason why excessive funds must be expended to obtain adequate services. To conserve both time and money, what is needed instead is objective and impartial physical analysis, the results of which are satisfactory to both the prosecution and the defense.

The forensic science laboratories must take the lead in improving communication between themselves and the defense not only in sharing information on actual cases but also in the form of continuing education. A better educated criminal defense lawyer will both reduce the badgering and irrelevant questioning which forensic scientists face in court and result in a more complete elucidation of the evidence and its significance in the courtroom. Common ground can then be established where the defense knows what tests are run and what their significance is. In the event that evidence is present which cannot routinely be handled by the local laboratory, it is then that an outside expert or specialist should be called in. Despite the natural tendency for the laboratory and the defense to take adversary positions, any history of enmity must be overcome. The adversary system of justice in the United States will not change within the foreseeable future, and if fairness and cost-effectiveness are seen as desirable goals by both "sides," cooperation and trust between the laboratory and the defense will be necessary.

Measures of Effectiveness

Since the passage of the Omnibus Crime Control and Safe Streets Act of 1968 and, with it, the establishment of the Law Enforcement Assistance Administration (LEAA), hundreds of millions of federal dollars have been directed toward the nation's "first comprehensive attack on crime." Congress was alarmed over the high incidence of crime that threatened the "peace, security and general welfare" of the nation and adopted a policy to assist state and local governments in strengthening and improving law enforcement at every level through national assistance.

Several million LEAA dollars have been used to expand and upgrade forensic science laboratories throughout the nation, with the net result being the doubling of forensic laboratory facilities and scientific personnel within the last decade. Unfortunately, however, the late 1960s and early 1970s also witnessed an overwhelming influx of street drugs and narcotics which, by law, mandated scientific analysis if the alleged offender was to be held and successfully prosecuted. Therefore, laboratories have been forced to channel a major share of their LEAA funds into the analysis of drugs, limiting their expansion and improvement in areas of evidence examination resulting from the major crime index categories.[6]

There is no question that forensic laboratory operations have improved in the last 10 years, but it is difficult to demonstrate that the added resources being devoted to forensic laboratories are paying off in terms most familiar to the criminal justice decisionmaker. That is, aside from showing that caseloads in various crime categories have risen, few crime laboratories maintain data which describe the role and significance of scientific evidence in the investigation, prosecution, and adjudication processes.

A fundamental problem with efforts to improve the justice machinery in general, and forensic science laboratories in particular, has been the absence of bona fide evaluation tools that can measure the effectiveness and/or contribution of alternative strategies in achieving specific goals and objectives. Within recent years it is very encouraging to report that the LEAA has placed strong emphasis on the development of evaluation measures for all funded projects; still, the adoption of such measures on a permanent basis by the various components of the justice system is a very complex and demanding requirement. LEAA's efforts to determine "what works and what doesn't work" in crime control research are beginning to yield substantial benefits. Research projects in such areas as criminal investigation[7] and alternative police patrol strategies[8] have challenged long held beliefs and suggested alternative procedures. The studies are beginning to provide the necessary data to make decisions concerning the use and application of diminishing financial resources at the state and local levels. As communities confront problems of a shrinking tax base and adopt zero-based budgeting systems, no criminal justice agency is immune from the requirement of demonstrating its contribution to meeting the goals of the justice system.

In terms of measuring its impact on the crime problem, the forensic laboratory is in a predicament. First of all, scientific evidence is grossly underutilized -- studies having shown that the laboratory is involved in two percent

or less of index crime investigations and prosecutions.[9] Secondly, forensic laboratories usually receive a very small percentage of the criminal justice system budget -- recent studies found that the crime laboratory receives less than one percent of the parent police agency budget in several jurisdictions.[10] This of course limits the quantity and quality of services the laboratory can offer. Thirdly, the laboratory has not been in the mainstream of the investigation process with the police, prosecutors, and courts feeling little or no obligation to supply feedback to the laboratory on cases in which it has been involved. It is not uncommon for crime laboratories to maintain a separate system of case record accounting which makes it extremely difficult to "track" cases through the system and to determine the role scientific evidence played in the disposition of the case.

The forensic science laboratory community itself, composed primarily of government crime laboratories and coroner/medical examiner laboratories, has had considerable difficulty in standardizing and adopting procedures for collecting and interpreting data. Historically, there has been no standardized procedure of reporting forensic case data, comparable to the Uniform Crime Reports or the National Crime Information Center (NCIC). There are promising efforts underway, a most notable one being the work of the Management Committee of ASCLD, which has developed a workload report form and is presently undertaking a nationwide survey to gather basic crime laboratory caseload data.[11] Still, this system will not yield a measure of laboratory effectiveness.

At the state and local level, forensic laboratories have tabulated number of cases processed, exhibits of evidence, examinations performed, etc., for many years and, within the steady increase in crime and the upsurge of drug and narcotic violations in local communities, have been able to capitalize on a steady rise in caseload to justify requests for additional space, equipment, and personnel. Nevertheless, measuring the volume of cases processed by a laboratory does not measure the degree to which these examinations are being used to help solve crimes, identify suspects, corroborate other case information, prosecute criminals, or perhaps exonerate individuals who are under suspicion yet are innocent.

Laboratory scientists are also frustrated by the fact that the ultimate use of their scientific analyses may be diminished or negated by a poorly prepared or trained police officer, attorney, or judge. Forensic scientists will point to the unmotivated detective or the inexperienced assistant district attorney who will not make the effort to capitalize upon the potentially valuable information developed in the crime laboratory. The net effect of this poor performance by such "users" is diminished impact of scientific evidence on cases.

In a recent study by the Institute for Law and Social Research (INSLAW) on police operations in the District of Columbia, it was determined that a minority of police officers make a majority of arrests that result in conviction; but even more important, the convictability of an arrest increases with the recovery of tangible evidence.[12] In most jurisdictions today, law enforcement personnel have considerably more incentive to make many arrests than to make fewer, good arrests. However, it is through the quality of the arrests and how physical evidence is collected, examined and used to corroborate eyewitness accounts and other circumstantial evidence, that the likelihood of successful case disposition is materially increased.

The INSLAW study suggests that the experimental reallocation of justice system resources to the collection, examination and interpretation of physical evidence may result in greater payoff to the system than when applied to standard modes of case investigation. Criminal justice practitioners and researchers should review the results of this study carefully and be encouraged to initiate similar projects in their own jurisdictions.

To date, the most exhaustive study in developing measures of forensic laboratory effectiveness was completed by the Calspan Corporation in 1974.[13] This LEAA-funded study set out to describe thoroughly the role of the crime laboratory in criminal justice systems and to develop and validate methods for measuring the effect of laboratory operations. The project determined that both the capacity and quality of forensic science (criminalistics) services were underutilized. Physical evidence was used primarily for corroboration when a suspect was in custody, and only rarely in cases where a suspect was not named or apprehended at the scene.

A survey of all investigative methods found high utilization of eyewitness and former evidence and infrequent reliance on physical evidence. While the role of physical evidence in adjudication remains primarily corroborative, it is interesting to note that physical evidence was significant in increasing the ratio of guily pleas as charged to guilty pleas at a reduced charge.

Research

Research in the forensic sciences can be divided under two broad subheadings: (1) technical research, which involves the pioneering or advancement of analytical techniques and new approaches to the examination of physical evidence, and (2) general (or evaluative) research, which involves the study or assessment of the profession's relationship to the justice system or systemic problems that are believed to exist within the profession (e.g., inadequate training of laboratory and criminal justice personnel).

Technical research is conducted at many levels ranging from a student's one-semester research project to a quarter-million-dollar federally funded research endeavor. And, as is the case in all types of research, only a small percentage succeeds in making significant breakthroughs that actually improve the state-of-the art.

A critical question facing forensic science at present is how to designate research priorities. Where should the money go? At the federal level the availability of research money to the forensic sciences is scant when compared to other types of scientific research. The LEAA National Institute's forensic science budget for FY 1979 is $250,000, which is down significantly from previous years.[14] Given the small budget, it is evident that priorities must be established to ensure that money is going where it is needed most.

The "Forensic Science Five-Year Research and Development Plan," which was commissioned by LEAA in 1975, outlines both technical and evaluative research priorities for all the forensic science disciplines.[15] Since that time there has been a shift in emphasis from technical to evaluative and training priorities,

the reason being that it has become apparent that the forensic science profession has basic problems regarding the quality of the work produced by the crime laboratories.

It should be mentioned here that much of what will be written on research, education, and training pertains to the criminalistics discipline or to crime laboratory personnel (which sometimes include toxicologists and questioned document examiners). This is not to slight the other disciplines but to acknowledge that the bulk of the most pressing problems in the field lie within the realm of the crime laboratory. It is reasonable to note that because scientists from crime laboratories present the majority of physical evidence testimony in court, forming the largest discipline in number, and because they are structurally organized into local or regional laboratories unlike the other forensic science disciplines, it is inevitable that they are susceptible to a greater number and variety of problems.

Some of the problems that have come to light were foreshadowed by the 1975 LEAA-funded "Assessment of the Forensic Science Profession," which noted the paucity of forensic science educational programs in the country and which suggested that on-the-job training was rarely adequate.[16] The simultaneously LEAA-sponsored "Analysis of Criminalistics Laboratory Operations" amply documented the need for operative and managerial improvement in the laboratory.[17] And finally the "Laboratory Proficiency Testing Research Program" (1974-1977) revealed that many of the laboratories are reporting unacceptable results due either to inadequately trained personnel or the use of inadequate testing methods.[18]

Justifiably then, greater attention has been given to the profession's internal housecleaning while technical advancement is presently secondary. LEAA is currently supporting a forensic science certification program and training workshops for crime laboratory personnel, as mentioned before. This is very much in line with the profession's current thrust to strengthen the effectiveness, efficiency and integrity of its professional services. Although it can be argued that these programs are not research projects in the classical sense, these are the programs that the profession needs and which are in need of federal support. When forensic science builds a firm foundation for itself, becoming both professionally and organizationally sound, it will then be ready to advance forward in other research areas.

The merits of a national forensic science center have been discussed widely over the past five years. The "Assessment of the Forensic Science Profession" envisioned this center to be a research information clearinghouse as a means to achieve coordination of research efforts. The authors reemphasize the need for a national forensic science research focus and urge LEAA to consider the development and support of such a center. It should be noted that the FBI is designing and planning the construction of a Forensic Science Research and Training Facility in Quantico, Virginia. This facility, which will be ready for use in 1981, will primarily perform technical research in the area of criminalistics and will not be equipped to serve as a national coordinating body for all the forensic science disciplines.

Education and Training

The importance of sound education and training in the forensic sciences has never been felt more strongly than at present. One could generally state that the development of educational programs ensures the future quality of forensic scientists while training is a more immediate vehicle to upgrade the quality of current forensic science personnel.

The education and training of crime laboratory personnel is perhaps the most crucial of all the forensic science disciplines. This can be attributed to the diverse functions performed in the laboratory and to the lack of traditional academic parent disciplines behind the criminalistics specialty. The other forensic science disciplines (e.g., physical anthropology, pathology, odontology, psychiatry, etc.) are offshoots of more traditional disciplines and have the benefit of a core course of study, developed over the years and conforming to general guidelines acceptable to the particular discipline.

What is drastically needed in criminalistics is the development of a core body of knowledge to be mastered by every future criminalist regardless of subspecialty. To date, various regions of the country do not conform in their emphasis of particular laboratory skills. One region, for example, might emphasize mastery of the microscope and its applications, while another might stress the mastery of instrumental analysis. This leads to the fostering of regional schools of thought regarding methodology and reduces the facility of interregional exchange of scientists. To overcome these difficulties, educators from around the country must convene to discuss and share their philosophies on forensic science education. Such interaction must be approached with earnest to the end that a core curriculum for forensic science education be developed and submitted for regional acceptance.

Informal dialogue has begun between educators at the annual meeting of the American Academy of Forensic Sciences. However, work products from this group have yet to be developed. Last year ASCLD invited educators from college and universities around the country to participate in discussions on education and training. This group considered the possibility of accreditation of forensic science programs in conjunction with the accreditation efforts of the Academy of Criminal Justice Sciences, which is currently responsible for the voluntary accreditation of forensic science programs. As a result, criteria for accreditation of forensic science programs were drafted that included curriculum guidelines for baccalaureate and graduate programs.[19]

Forensic science educators in all disciplines are concerned with the inherent quality of students entering the profession. The competition for top science students is stiff, and the low profile forensic science has maintained with the public has hindered it from attracting a substantial number of high caliber science students. To address this situation, members of the American Academy of Forensic Sciences began the "Junior Academy" program held in concert with the AAFS annual meetings. The junior academy serves to stimulate interest in and increase the understanding of the forensic sciences for high school and college students. In addition to this effort, more and more

forensic science practitioners and educators are volunteering to lecture before high school and college science classes and clubs on the principles of their field.

It was mentioned earlier that the purpose of forensic science training is to produce immediate improvement in professional practice and that LEAA is investing a portion of its resources to initiate training workshops addressing two areas of laboratory work (microscopy and serology). However, after the national attention has died down and the LEAA-sponsored workshops are completed, it will again be up to the crime laboratories themselves to permanently institute adequate training programs for their personnel. Formal, well-structured training courses can be organized on a regional basis in conjunction with local college and university programs or in the laboratory itself, utilizing senior personnel as training instructors. Whichever road a laboratory chooses, laboratory administrators must provide encouragement and support, both financially and morally.

Communication

After all the lamenting on what needs to be done in the forensic sciences and discoursing on the various alternatives open to us, perhaps the key to enacting any sort of change is a genuine effort to communicate better. This is, grant you, stated very gingerly as we all know that "communication" has become the highly touted panacea of our generation. The sad fact is that our communication attempts often fall short, ending in effortless paper shuffling and mindless head-nodding and lip service to no avail. If communication is to succeed in making our justice system more effective, there will be an expense: time and effort. And note, relatively few dollars are involved, which should make the proposition more appealing.

Although there is a need for communication at a national level, local interaction between scientists, police, attorneys, and judges is by far the most crucial. Judges and attorneys are rightfully complaining that their unfamiliarity with forensic science is hampering its proper utilization in the courtroom. They need to be educated, and it is the responsibility of the scientist to provide the education or educational materials. Short seminars and workshops can be offered to these criminal justice personnel on the capabilities and limitations of the use of physical evidence. Ideally, separate courses should be devised for the various justice personnel: judges, attorneys, police officials, and evidence technicians. This, of course, would depend greatly on the laboratory's resources to facilitate a range of programs. On a regional basis, however, several workshops of these types might be managed very well.

In addition to training workshops, and perhaps an even more useful tool, would be the publication of individual training manuals for judges, attorneys, and police, respectively. These would serve as reference material for criminal justice personnel and would be particularly useful in the event that workshops and seminars were not made available. The primary obstacle is in locating a

financial source for these handbooks, though it would seem reasonable that such an enterprise be given federal sponsorship as the production of the manuals would benefit the entire country.

Conclusion

In spite of our discussion of the numerous problems surrounding the utilization of forensic science in the justice system, there should be no question that forensic science still can provide badly needed information and guidance to legal decisionmakers. One must not confuse or equate the ups and downs associated with professional growing pains with professional potential. We witness the growth of the body but not of the potential within the mind; forensic science has, as always, much to offer to our society.

This is a critical time for our justice system to nurture and support forensic science. Only then will it be able to fulfill its promise of improving the quality of justice in our country.

End Notes

[1]Escobedo v. Illinois, 378 U.S. 478 (1964); Miranda v. Arizona, 384 U.S. 436 (1966); Schmerber v. California, 384 U.S. 757 (1966).

[2]For more information on the forensic science certification programs (sponsored under LEAA Grant #76NI-99-0101) please write the Forensic Sciences Foundation, 11400 Rockville Pike, Rockville, MD 20852.

[3]American Society of Crime Laboratory Directors, Report of the Committee on Laboratory Standards and Evaluation, August 1977, unpublished.

[4]Peterson, Joseph L.; Fabricant, Ellen L. and Field, Kenneth S. Laboratory Proficiency Testing Research Program, Final Report on LEAA Grants #74NI-99-0048 and #76NI-99-0091, Forensic Sciences Foundation, June 1977.

[5]"Forensic Microscopy Workshops," LEAA Grant #78NI-AX-0066 was awarded to the Forensic Sciences Foundation on June 7, 1978. The project will train up to 300 forensic microscopists in the nation in basic and advanced microscopical techniques.

The "Forensic Serology Workshops" proposal is pending at the time of this writing. It will train 100 forensic serologists in the latest multisystem techniques for analyzing bloodstains.

[6]As defined in the Federal Bureau of Investigation's Uniform Crime Reports, the crime index offenses are defined as murder, forcible rape, robbery, aggravated assault, burglary, larceny-theft and motor-vehicle theft.

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[18]Peterson, Joseph L. Utilization of Criminalistics Services.

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56855

FORENSIC SCIENCE SERVICES:

THE DEFENSE PERSPECTIVE

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Introduction

This paper is addressed to the troublesome issues found in the use, or more accurately the non-use of forensic science in criminal prosecutions, and particularly in the defense of criminal cases. A great deal of the following material is also applicable to civil proceedings The main distinction between criminal and civil cases is that forensic science services are more often used in civil cases due to the monetary issues that initiate and permeate civil litigation. In the course of this discussion, there will be a differentiation of the four types of economic situations that defense counsel frequently encounter. There are also distinct differences between the public defender system and the private criminal practitioner that will be noted where appropriate.

The public defender may be on a full-time basis with staff, office, library, adequate funding, and access to forensic experts. On the other hand, he may be a part-time public defender or a special public defender, called on a case-by-base basis, with resources limited to his own imagination and law office. In the latter situation, the monetary rewards are unusually dismal -- for example, in Connecticut a special public defender is paid $12.50 an hour, with a maximum of $75.00 per trial day. The average, skilled, criminal practitioner in private practice bills $60 to $100 per hour, and $350 to $750 per trial day, or an average of $400 to $500 per trial day.

The private practitioner finds himself defending someone who falls into one of two categories. One is the criminal client with good or great financial resources who can and will finance the location of experts, the experts' preparation, work, and testimony, and whatever else is needed. This is the ideal situation and an illustration is appropriate.

A wealthy gentleman was indicted for committing a federal felony, to wit: interstate extortion resulting from abusive and threatening telephone calls to the victim. The defense involved insanity and involuntary intoxication; both defenses resulted from the defendant having ingested large amounts of both alcohol and placidyl for a long period of time.

The first step was to locate, investigate, and interview both experts and lay witnesses to buttress the defendant's claims. Medical treatment was not a

problem and one of the state's best forensic psychiatrists became the treating physician. When the matter was reached for trial, the following experts were called: the physicians who prescribed the drug and treated the patient during periods of withdrawal; the forensic psychiatrist; a pharmacologist; and a neurosurgeon (to confirm the psychiatrists' diagnosis). These experts confirmed the diagnosis of an organic brain syndrome establishing the insanity defense. The defendant was found not guilty on the basis of the experts' testimony, all of which involved the use of forensic sciences and expertise in identifying, preparing, and successfully proving the insanity/involuntary intoxication defense.

The second situation is the middle- or low-income client who can barely pay counsel adequately and, therefore, must depend on his counsel's knowledge of forensic evidence. In reality, the defendant must rely on the prosecution's crime laboratory and hope for the best. He will be very fortunate if his counsel knows enough about the forensic sciences to be anything other than "awed" by the state's evidence. Oftentimes defense counsel becomes convinced of his client's guilt because of the state's "forensic evidence," when the evidence may be completely unacceptable after a knowledgeable examination.

This is illustrated by a driving under the influence case where after counsel was paid all available funds were exhausted. The state had a blood analysis showing a .022 weight of alcohol in the blood. Any alcohol blood level over .010 raises a presumption that an automobile operator is driving under the influence of alcohol. Thus, the defendant had to rely on counsel's ability to create a reasonable doubt through inconsistencies in the state's case. At trial, the police officer's testimony did not paint the driver as all that drunk, and the defendant's friends testified that he was sober. The defendant claimed to have been sober and gave a good explanation for what happened on the highway. The emergency room nurse testified to the taking of the blood sample and the voluntary consent of the driver without a mention of drunken conduct or extreme symptoms of alcohol. Lastly, the police released the defendant within a matter of hours after his arrest.

The state's toxicologist testified on cross-examination as to the effect of a .022 finding and, with the help of defense counsel, made the defendant very drunk and obviously showing the effects of alcohol. The defense showed that the testing procedures consisted of merely placing the blood sample in a complex machine, followed by a "magic print-out" being flashed on a screen for the toxicologist to report to the police.

The final argument focused on the defendant and his friends' testimony emphasizing the inconsistency between the trooper's and nurse's testimony as to the defendant's condition versus the toxicologist's testimony of extreme drunkenness. It was then argued that scientists never admit that they are wrong or that their laboratory is imperfect. However, it is obvious in this case that something went wrong at the laboratory. Thus, there is a reasonable doubt in this case based upon the testimony of the other witnesses who were there and saw the defendant firsthand. The jury acquitted. It should be borne in mind that this sort of approach seldom works, and most attorneys do not have enough knowledge to ask the proper questions of the expert witnesses to create the necessary doubt needed for an acquittal.

The Problems

The major problems are inter-related in that a common thread runs through them. The thread is the general lack of education, training, and awareness of what the forensic sciences can do in incriminating or exculpating the criminal accused. This has resulted in a loss of credibility for the accuracy and integrity of many police investigations. Further, police mishandling of investigations and prosecutions, based on erroneous theories of what transpired, as well as embarrassing courtroom outcomes, have enlightened the public to police deficiencies in criminal investigations.

The crime scene is often not properly searched and evaluated. The significance and meaning of blood splatters and patterns are not considered or photographed. All the relevant physical evidence is not retrieved, and the proper experts are not consulted. Finally, the numerous theories suggested by the physical evidence are not explored. For instance, a cigarette butt left at a scene, if properly analyzed, might exclude a number of suspects and form a circumstantial link of evidence as to a particular suspect. Yet, this type of evidence is often overlooked, seldom analyzed, and usually not even considered.

Such problems are exacerbated by the prevalent police philosophy of obtaining a confession at all costs. This leaves the prosecutor to determine how to enter the confession or admission into evidence. Thus police efforts are expended on duress deception, fraud, and trickery to get a confession that may or may not be admissible in a subsequent trial. The foregoing activities are often coupled with extensive subterfuges and fictions to avoid constitutional and statutory safeguards. These actions are performed by the police in order to accomplish the intended result--a confession at any cost. Once the confession or admission is obtained, the investigation either ceases entirely or focuses in on <u>one</u> suspect to the exclusion of all other suspects and evidence. The effect of this approach is to ignore or relegate as insignificant any evidence that is not consistent with the police theory of a particular suspect's involvement in the crime under investigation.

An abbreviated discussion of a recent Connecticut murder case provides an apt illustration. However, in this case, defense counsel was not "awed" by the state. He had adequate financial resources, imagination, and the ability to devote substantial effort to an independent investigation and analysis of the physical evidence. His efforts enabled him to disprove the state's case.

The case involved the body of a 14-year-old female that was found in a cellar excavation at about midnight. The victim had died from extensive head injuries caused by a massive crushing of her skull with a large blood-encrusted rock. An autopsy revealed that death was caused by exsanguination as a result of blood flowing from the smashed and exposed skull area into the earthen floor of the cellar.

The state police had a flimsy, circumstantial case against one suspect, and the time of death became a critical factor. In order to make their suspect eligible, the time of death had to be between 4:00 and 5:00 p.m. The suspect was able to establish his whereabouts with other people at all other times on the afternoon and evening in question.

The state police posted a guard in the cellar hold and barred everyone from entering. This included a semi-retired physician in his 70s who happened to be the medical examiner. When he attempted to enter the excavation he was barred, even after his protest that he was the medical examiner and had to examine the body as part of his official duties. The medical examiner also indicated that he could not conduct such an examination long distance, but to no avail. Therefore, while the body was illuminated by floodlights the state police had positioned, the medical examiner yelled directions to the trooper below: "Feel the body. How does it feel?" The trooper responded, "Cold." The medical examiner continued: "Move her arm. How does it feel?" He watched the trooper move the arm and heard the trooper characterize it as "stiff." Whereupon, after conversing with the investigating troopers, he set the time of death at 5:00 p.m., give or take half an hour.

The time of death as set forth in an autopsy protocol was placed between 4:00 and 5:00 p.m. The autopsy itself was performed by a capable forensic pathologist, but he relied in large part on the information given to him by the state police and his medical examiner. This, of course, influenced his conclusions and the findings in his medical/legal report. Consequently, many other factors in determining time of death were not considered. (See generally, Moenssens, Moses, Imbau, Scientific Evidence in Criminal Cases, §5.07, "Time of Death," Foundation Press, 1972, pp. 191-104.) Additionally, a thorough investigation as to whether or not the body was moved after the homicide took place was not pursued. The initial exsanguination theory was accepted without further inquiry or investigation. Yet, the effect of exsanguination on the body and the lack of lividity do not explain away one another. Here, there was no lividity consistent with the victim lying on her face from 4:00 p.m. to midnight, or a period of some eight hours. The state police theorized that all of the victim's blood had drained from the body. It was an absurd theory, but it made sense in a simplistic fashion. Additionally, the victim's stomach contents and a history of the victim's known food intake on the day in question were not thoroughly evaluated. In other words, anything that was inconsistent with the 4:00 to 5:00 p.m. time of death was not pursued by the state police.

The defense, on the other hand, went over all of the physical evidence with a qualified pathologist and a criminologist. They established that the original method used in setting the time of death was meaningless. Furthermore, the lack of lividity was consistent with a much later time of death as was the quantity of stomach contents. Blood would have settled in the soft body tissues in the front of the victim, and it would not have been part of the exsanguination process. Thus, it would have produced a lividity consistent with an eight hour death period, and since there was no lividity, death must have occurred much later. This theory was consistent with the defense theory that death occurred much later than 4:00 or 5:00 p.m.

The final chapter resulted in acquittal, but there is more The state police arrived with their mobile crime lab trailers (complete with official state police insignia), floodlights, and personnel attired in lab coats. They blocked off areas, took complete control, and gathered, bagged, and tagged everything in sight, including the murder weapon. Some months later as the defense counsel and defense criminologist were examining the massive collection of physical evidence piece by piece, they proceeded to examine the murder weapon. This decision led to a very significant find. As the state police watched with great interest, the

defense criminologist examined the rock with his "jeweler's eye" and under proper illumination. As he turned the item he came upon the blood-encrusted area that probably had come into contact with the victim's head. There, embedded in the blood, gore, and tissue, was another fiber, separate and distinct from anything of the victim's or the defendant's. In the many months that the murder weapon was in police custody and physically in the forensic lab, no one had carefully examined it and found the clearly exculpatory evidence. It was particularly critical because the state's case against the defendant rested in large part on a thread found on the victim that allegedly was similar to a thread from the defendant's sweater.

The state's expert testified to the similarity of the defendant's sweater and the thread found on the victim. However, the expert finally concluded, after much cross-examination, that the thread contained many dissimilarities as well. This was a far cry from the expert's testimony that focused on the similarities between the thread found on the victim and the defendant's sweater. The ultimate testimony was largely attributable to the preparation by defense counsel, after consultation with his independent expert. When this new information was coupled with the separate and distinct thread found on the murder weapon, the state's case was considerably weakened.

The foregoing description of a police investigation emphasizes two of the forensic difficulties encountered in serious felony cases. First is the typical police investigation that either ignores physical evidence or misuses said evidence by employing police-oriented experts to fit their theory to a particular case. A police theory is usually developed very early in the investigation, and the rest of the police effort is spent in pursuing one candidate, excluding all other suspects and ignoring inconsistent physical evidence. Second, many criminal defense attorneys take the state's beautifully written forensic reports and sigh, "What do we do now?" The answer is obvious--defense counsel must employ his own independent expert and investigate with an independent and distinct theory of defense. In order to do this, he must develop expertise and knowledge in the forensic areas that touch upon his case. A theory of defense is a necessity in order to allow counsel to develop a theme, locate the necessary experts, and to understand the significance of the physical evidence.

When a well-prepared and able defense counselor finds a situation such as the one described above, and effectively explores an inadequate and biased police investigation, police may then lose credibility in the eyes of a jury. Generally, this is the type of courtroom development that makes good news copy and can result in an acquittal. But, this type of publicity results in the entire criminal justice system losing the respect and confidence of the general public. This situation must be remedied in order to restore confidence in the administration of criminal justice.

It should be understood that the use of forensic sciences should not be limited to homicide or rape cases. By way of illustration, recent developments in serology can be very effective in paternity cases. The use of a polygraph can be of great assistance in pretrial investigations as well as in the plea bargaining process. Forensic services may also be useful in solving problems created by wiretaps, body recordings, and other recording devices. Such evidence can be more effectively handled if the attorneys have a knowledge of the

forensic expertise involved as well as the relevant case law. There are often problems of "inadmissibility" that necessitate the "screening" and the "cleaning up" of recordings. Then too, there are difficulties with the use of transcripts and their accuracy. Thus, defense counsel should know that he has a right to an "audibility hearing" before a recording is admissible. The proper procedure is to offer the defense's own transcript of what is allegedly on the tape as an aid to the jury. (See generally, United States v. Chiarizio, 388 F. Sup. 858 (D.Conn. 1974), aff'd, 525 F. 2d 289 (2d Cir. 1975).)

Defense counsel should also be aware of the limited number of experts that work with tapes and wire recordings and how best to use their services. Additionally, some practical hints can be helpful--for example, blind people are better at deciphering what is on a recording and are more reliable than clerical workers in listening and typing what they think they hear. In reality, the average hit-or-miss transcripts are reviewed by the person in charge of an investigation. He determines what the ambiguous or missing words and phrases were in the context of the particular conversation. Although seldom done, this is a fertile area for defense lawyers to employ forensic expertise.

A related problem involves a courtroom in which the judge, prosecutor, and public defender are all employed and paid by one employer--the federal or state government. The common employer situation is further exacerbated where the prosecutor and public defender are appointed by the judiciary and are paid from funds appropriated to the judicial system. No wonder the indigent defendent says, "I don't want a public defender, I want a lawyer."

The incredible caseloads to which public defenders are assigned further limit what effectiveness remains. However, the final blow to the public defender system is the almost limitless funding and resources available for criminal prosecutions. This is particularly significant as a majority of those prosecutions are defended by that "step-child" of the justice system--the public defender.

Lest there be a false impression created by the foregoing, the entire fault does not lie with the criminal justice system itself. Forensic experts also contribute to the crises of forensic science in the justice system. Claiming to be "scientists," they believe their conclusions and opinions are infallible. This scientific infallibility is then used to justify their abhorrence of cross-examination, which is often considered an affront to their dignity. For instance, at a recent Practicing Law Institute Program, one of the country's leading forensic experts refused to participate in the program if he had to submit to cross-examination. Obviously, scientists must recognize that they make mistakes and that there are legitimate areas of inquiry as well as legitimate differences of opinion. In other words, if they want to set forth their opinions they must be subjected to the process of cross-examination in order to arrive at basic truths. This process of cross-examination is not only necessary, it is fundamental to the participation of forensic experts in the adversary process," which is part and parcel of a criminal trial.

Proposals

The solutions to the above problems are not straightforward or simple. The two factors involved are the funding for and the education of persons involved

in the Criminal Justice System--the judiciary, the prosecutors and defense counsel (public and private), and the police authorities. The mechanics of accomplishing the above are federal funding, experimental programs, and an educational process for all concerned. A few generalizations are appropriate here.

First, there must be separate funding for the judiciary, the prosecuting authority, and the public defender's office. The legislature should separate these three distinct functions and fund them separately. Furthermore, the prosecutors and public defenders should be supervised and overseen by separate commissions appointed by the legislature and not the judiciary. Appointments to either the prosecution staff or defense staff should be made on the basis of merit and not political patronage. The respective commissions should perform a watchdog function removing the 'lay down" public defenders while encouraging aggressive defenses.

Public defenders, prosecutors, and judges should not share offices in the same courthouse. When they do, all three become part of a team, wearing different hats, to expedite criminal cases under modern pressures of computerized case dockets. In other words, they view themselves as part of the same system working together to expedite business. Finally, the legislature and the judiciary should actively discourage needless and costly multiple prosecutions of the same offenders. The prosecutions are often unnecessary other than to make a police department happy or to satisfy a prosecutor's ego.

Second, there should be continuing legal education programs in the areas of forensic evidence in criminal cases for judges, prosecutors, public defenders, and the private defense bar. These programs can be conducted by associations of trial lawyers, defense counsel, prosecutors, judges, and private foundations. The programs should be mandatory in terms of required hours of forensic science or evidence for trial practice. The necessary expertise is presently available to accomplish this on a regional or statewide basis. There should also be a forensic science course or seminar in every law school that would be a requirement for graduation. The law school program should be an exposure or overview in order to apprise the prospective practitioner of the resources and information available to him in the forensic sciences.

Third, police investigative squads should be educated in the forensic sciences at regular intervals and on a continuing basis. They should also be encouraged to objectively investigate with open minds regarding suspects and theories of what may or may not have transpired in each case.

Fourth, the present police system with "on-the-job" training procedures and self-taught investigators claiming to be experts, should be discouraged if not totally eliminated. Training and investigations should be buttressed by frequent consultations with qualified experts in the forensic area. This is of primary importance in cases such as homicides and other serious felonies.

Fifth, the forensic scientists should be made aware of the fact that they are going to be subjected to cross-examination; that they are fallible; and that reasonable people can differ on the conclusions drawn from complex and contradictory physical evidence found at a crime scene.

Sixth, in order to obtain qualified personnel with proper equipment, there must be an increase in financial resources for both state and local government crime laboratories. If there is adequate funding, salaries can be raised to attract sufficient numbers of qualified candidates. Additionally, they can perform a sufficient number of sophisticated tests to achieve highly accurate findings with reference to the subject material, for example, they can perform five distinctive and separate tests where indicated and no longer rely on one or two tests. The higher quality and greater capability of crime laboratories may encourage prosecutors to use the facilities more frequently. It will also decrease the prolonged waiting period that now exists between delivering the subject material to the laboratory and the receipt of a report of the examination.

Seventh, the forensic sciences must delineate criteria, standards, and certification procedures for the various forensic disciplines. This must be accomplished in order to weed out the "self-proclaimed experts," "charlatans," "opportunists," "phonies," and "incompetents." The courts are not in a position to eliminate the non-legitimate expert, because the courts lack the necessary expertise to determine who is, in actuality, a qualified expert and who is not. Thus, the task must be left to the forensic scientists to specify particular criteria for each discipline in order that the courts may then implement them on a case-by-case basis.

The Defense Function

In equiping the defense bar to effectively use the forensic sciences in the defense of criminal cases, there must be funding for separate and independent crime laboratories. These laboratories can be operated by state or private universities or the state government itself. In appropriate situations they would bill on a reduced basis for their services. The key is that they not be manned or controlled by police agencies. In other words, they must be separate and distinct from police and prosecutorial influences.

Such laboratories are ideal; practically speaking, funds must be made available for public defenders to acquire forensic expertise in the investigation, preparation, and defense of their cases. The need is for realistic funding and not minimum allocations to make a budget look good on paper. Additionally, there should be a court-controlled fund to aid middle-income defendents who have private counsel but lack the financial resources for the forensic expertise that may be required Once again, this fund should be realistic and reasonably dispensed to those who qualify. There is, of course, a correlative responsibility on the part of the defense bar to forego frivolous inquiries. In short, the courts should, under their inherent powers, order forensic science services for the defense and require the funding of these services. It is not an insurmountable problem, as the prosecutorial authorities have funding for adequate access to the forensic sciences. A solution may be for the courts to hire "defense forensic consultants," with a duty of confidentiality, to assist defense attorneys regarding areas of expertise and the location of experts.

Finally, the courts should carefully review the quality of forensic experts and no longer relegate all objections to the weight of their testimony. In summary, courts should make detailed inquiries into the qualifications of forensic

experts, recognizing their particular specialty relative to specific instances. Then, and only then, should the trial court make a determination as to the admissibility of an expert's testimony.

The experts themselves, separate and distinct from the courts, raise problems for the criminal justice system. The principal problems are threefold. First, there is a desperate need for a descriptive and extensive directory of forensic experts as well as the various fields of forensic expertise. Presently, there are at least two organizations capable of producing such a directory. They are the American Academy of Forensic Sciences and The Forensic Sciences Foundation, Inc. All that is lacking is appropriate government funding.

Second, an educational program for forensic scientists should be undertaken as regards fee structures in criminal cases involving indigents and middle-income defendents. The experts' fees often make their services prohibitive. Therefore, an awareness of the problem and the suggestion of a duty to better the entire system might have a salutary effect. The appropriate vehicle is probably the numerous forensic science programs that are conducted around the country. Once again, with appropriate funding, the American Academy of Forensic Sciences and The Forensic Sciences Foundation, Inc. could provide the necessary speakers.

The third aspect is troublesome and more difficult to resolve. It is the hostile attitude of former police experts toward the defense and their hesitancy to work with the defense. It is a "them" and "us" view that permeates their whole attitude. Thus, many retired police experts are often unavailable to the defense for a separate and independent inquiry into criminal evidence in a given case. This is complicated by a lack of undivided loyalty and confidentiality once they join the defense team. They often engage in unauthorized disclosures to police and prosecutorial friends regarding their "doings and findings" for the defense. The solution would entail long-term education on the part of forensic scientists in the criminal justice system. It would be beneficial to hold more interdisciplinary conferences with full communication and exchange of ideas between the disciplines. Whatever the ultimate solution, it is a very real and significant problem and should receive immediate attention.

A classic illustration of the problem is the prevalent attitude that an expert is more reliable and trustworthy if he has either had a police affiliation in his past or does independent police consultation. What the existence or lack of a police affiliation has to do with the particular qualifications of an expert is a complete mystery. It is obviously an absurd criterion on which to judge an expert. Nevertheless, it exists and should be eradicated by extensive judicial screening of forensic experts.

Conclusion

It is shocking that physical evidence is so often sadly overlooked in this age of modern technological developments. This dilemma is particularly sad in light of the United States Supreme Court's recognition of the inherent unreliability of eyewitness identifications and other eyewitness evidence. (See generally, United States v. Wade, 388 U.S. 218 (1967); Gilbert v. California, 388 U.S. 263 (1967); and Stovall v. Denno, 388 U.S. 293 (1967) and their progeny.)

This recognition was coupled with an expressed desire for greater dependence on physical evidence and a recognition of its reliability. (See generally, Schmerber v. California, 384 U.S. 757 (1966) and Gilbert v. California, supra.)

The United States Supreme Court's teachings in Brady v. Maryland, 373 U.S. 84 (1963), and Giles v. Maryland, 386 U.S. 66 (1967) and their progeny, may mandate some type of effective prosecutorial and defense access to forensic experts and laboratories. This may be required to ensure that the defendant's constitutional right to exculpatory evidence is honored. In other words, if there is a prosecutorial duty to disclose exculpatory evidence that is favorable to an accused upon the issue of guilt or punishment, then in order to accomplish this, the forensic sciences must be used to explain, clarify, and illustrate the significance of physical evidence. This is evident when physical evidence would be otherwise meaningless without the aid of the forensic scientist to establish its exculpatory nature.

Consequently, an expanded use of the forensic sciences to meet the mandates of decisions such as those cited above may be constitutionally required in the not too distant future. This is an avenue that should be explored by defense counsel. It is an area of law that prosecutors and the judiciary should be acutely aware of, and an area, which in years to come, will experience significant developments. Therefore, we should begin now to restructure the criminal justice system and get ready to meet the evolving decisional law that has just begun to recognize the significance of the forensic sciences in criminal prosecution.

56856

FORENSIC SCIENCE SERVICES:

THE JUDICIAL PERSPECTIVE

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The judiciary decides what science is to become forensic--that is, acceptable for admission into evidence at a criminal trial to aid in the determination of guilt or innocence. Since this criminal justice decision can involve a person's life, liberty, and property, the judicial decision is not lightly taken nor recklessly made.

The judiciary in making its decision of when a science is to become forensic must balance several factors: (1) precedent, or what prior courts have decided; (2) fairness, or what secures constitutional protections for the accused; (3) harmonization, or how to mesh the constantly advancing scientific knowledge used by society with the legal procedures required for criminal justice.

When the judiciary uses precedent for decisionmaking, it acknowledges the wisdom of stability in the law. People can "know" what the law is, so individuals can conform to the law. Precedent also facilitates the decisionmaking process for judges. Courts can copy what has been previously established as a rule, or can make a reasonable analogy to the prior decision. The immediate issue can thereby be more easily resolved. The precedent process in judicial decisionmaking under the Anglo-American common law system of justice is very ancient. Its roots are found in the land law of the English feudal system nearly 1,000 years ago. Precedent evolved in the "pre-scientific" era of man. In the modern world where science has been doing unprecedented things, this ancient judicial process of common law precedent has trouble. It can still be a valuable tool for justice, provided it does not become so rigid that new ideas of science are not permitted to flower in the law.

Because of science, the judicial process of fairness in decisionmaking has evolved vigorously. When science exposes old myths and reveals new truths, the doctrine of judicial fairness demands changes. For example, over a century ago medicine discovered that an insane person did not know what he was doing as an individual and could not comprehend his acts. Law responded by acknowledging that the malice or mens rea, required to make a person a criminal, could not exist in an insane person's mind. In fairness, the judiciary had to change the law and accept a new type of defense plea--not guilty by reason of insanity. A scientific expert, the psychiatrist, became an integral part of the criminal law administration and continues as such today.

The acceptance of the fairness doctrine by the judiciary has not been smooth nor without controversy. In the science of serology, for example, the ability to exclude a male by scientific test as the natural father of an infant became a scientific truth in the late 1920s and early 1930s. The judiciary required nearly three decades, however, to accept fully this scientific fact that could protect a male defendant from liability in paternity cases.

An even more extreme example of extended delay in judicial acceptance of a scientific procedure can be found in evidence from a polygraph. Over half a century ago in United States v. Frye, 293 F.1013 (1923), a federal appellate court denied the admission into evidence of polygraph results in a criminal trial. The court explained:

> Just when a scientific principle or discovery crosses the line between the experimental and demonstrable states is difficult to define. Somewhere in this twilight zone the evidential force of the principle must be recognized, and while courts will go a long way in admitting expert testimony deduced from a well-recognized scientific principle or discovery, the thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs.

Since 1923, the judiciary has relied on the precedent of Frye to deny the science of polygraph. As the improvement of polygraph capabilities became more and more recognized, the pressure of fairness to persons within the judicial process and the need to harmonize law with science knowledge compelled a change. Within the past several years, lower courts throughout the land have been edging toward acceptance of this new science into the old law, thereby establishing new precedent. It remained for the Ohio Supreme Court of February 22, 1978, to pronounce the ultimate decision in State v. Souel, 53 Oh.St. 2d 123: "The results of a polygraph examination are admissible in evidence in a criminal trial for purposes of corroboration or impeachment...." The precedent of Frye succumbed to the fairness provided by polygraph evidence. Harmonization of a new science with criminal law was achieved.

To ensure proper use of this newly accepted science, the Ohio Supreme Court established rules for admission of polygraph evidence:

> (1) The prosecuting attorney, defendant and his counsel must sign a written stipulation providing for defendant's submission to the test and for the subsequent admission at trial of the graphs and the examiner's opinion thereon on behalf of either defendant or the state.
> (2) Notwithstanding the stipulation, the admissibility of the test results is subject to the discretion of the trial judge, and if the trial judge is not convinced that the examiner is qualified or that the test was conducted under proper condition, he may refuse to accept such evidence.

(3) If the graphs and examiner's opinion are offered in evidence the opposing party shall have the right to cross-examine the examiner respecting:
(a) the examiner's qualifications and training;
(b) the conditions under which the test was administered;
(c) the limitations of and possibilities for error in the technique of polygraphic interrogation; and,
(d) at the discretion of the trial judge, any other matter deemed pertinent to the inquiry.

To secure ultimate fairness and proper harmonization in the use of this new science in the old criminal law procedures, the Ohio Supreme Court placed final control with the trial judge:

> If such evidence is admitted the trial judge should instruct the jury to the effect that the examiner's testimony does not tend to prove or disprove any element of the crime with which a defendant is charged, and that it is for the jurors to determine what weight and effect such testimony should be given.

With judicial acceptance of polygraph evidence, America's lawyers must now understand the polygraph science. Recognition of this fact is demonstrated by the American Bar Association through its Consortium for Professional Education. Recently, it announced a new program:

> SUBJECT: VIDEOTAPED PROGRAM ON SCIENTIFIC EVIDENCE: POLYGRAPH TESTS--DEMONSTRATION AND DISCUSSION
>
> - What is a polygraph (lie detector) test?
> - How does it work?
> - How reliable is it?
> - Can a person cheat when being examined?
> - What about admissibility of test results?
>
> These and other questions dealing with the nature, purpose, capabilities, and limitations of polygraph testing are answered in the Consortium's first program in a series on scientific evidence.
>
> Polygraph examinations are now used routinely by law enforcement agencies and by companies and institutions for pre-employment screening and investigation. The admissibility of polygraph tests is often questioned in terms of accuracy and reliability. Attorneys working on criminal or employment cases need to know how the test is conducted and how the results are interpreted.

The final chapter for acceptance of a science into the judicial process may well be in case preparation by trial counsel. If scientific evidence ensures a close approach to truth, fairness to both prosecution and accused in a criminal trial demands the right to obtain such evidence. Under our

constitutional system, government must secure the rights of the accused. One specific right guaranteed to each accused by the Sixth Amendment VI is:

> In all criminal prosecutions the accused shall... have compulsory process for obtaining witnesses in his favor.

Does the accused have the constitutional right to demand a polygraph test by a scientific expert just as he has the right to counsel and an impartial jury? Yes, responded an Ohio trial judge in a landmark case that elevates to a constitutional right the accused's request for a polygraph examination a fortiori all scientific evidence, and to submit its scientific results as evidence in a criminal trial. In State v. Sims, 52 Ohio Mis.31 (Cuyahoga County Common Pleas, 1977), Judge J. Gareth Hitchcock of Paulding County, sitting by assignment, asserted:

> This Frye case, tried well over a half century ago, was a pioneer effort to use only a systolic blood pressure test, a crude forerunner of the modern polygraph test, as corroboration of Frye's testimony that he was innocent. The evidence was excluded, and similar evidence has continued to be excluded by many courts to this day. More remarkable to this court is the fact that the courts citing this case as a precedent for excluding polygraph evidence have not apparently: (1) mentioned the fact that Frye, without the benefit of the only witness who could intelligently lend corroboration to this testimony, was in fact convicted of a murder he was found not to have committed after serving 3 years in prison, when his innocence was demonstrated by the confession of a third person, See N.Y. Judicial Council, Fourteenth Annual Report 265 (1948) or (2) considered the actual development of the modern polygraph device which has been an extremely effective device, in the hands of competent operators, for at least the past quarter century... .
>
> This court's own experience and inquiry prior to receipt of its instant task has lead it to the conclusion that there is a wealth of proof existing among all the more than 1,500 members of The American Polygraph Association, which is addressed P.O. Box 74, Linthicum Heights, MD 21090, and near unaniminity among all the lawyers who have made deep study of the technique for at least two decades now, that it is highly effective. Further, the general trustworthiness of the results of modern polygraph examinations, when conducted by competent operators of intelligence, experience, and umblemished reputation for truth and veracity, is higher than that reached by any other method for judging human deception or lack of it in respect to persons who have, or have not, participated in past events. Particularly, this is true of those facts which can only be proven by the present knowledge of persons whose personal interest may be intense. The court has no knowledge of a single intelligent person, who has seriously investigated the polygraph technique, who has not concluded that a qualified

> examiner's opinion, after examination, that a certain individual did or did not rob a bank is many times more credible in determining such fact than much eye-witness testimony to the contrary given in court or elsewhere.

The proper interplay of precedent, fairness, and harmonization required for a living law as it relates to modern science is demonstrated in this trial judge's consideration of the polygraph science in contemporary criminal justice.

With this historical understanding, judicial procedures for admitting a science into law must be examined. The judiciary has formulated several processes by which scientific evidence can become legal evidence: (1) stipulation or agreement by both parties that the scientific evidence is admissible; (2) judicial notice or acceptance of widely known scientific facts capable of being catalogued for public use (e.g. precise times of sunrises, sunsets, and full moons; heights of high or low tides at specific locations; longitudes and latitudes at precise points on earth); (3) expert witness or the testifying scientist who provides scientific facts and opinions as direct evidence (e.g. a medical examiner who testifies on time, cause, and manner of an individual's death; criminalist who testifies on identification of rifle bullet; odontologist who testifies on the identification of the murder victim through teeth comparison).

It is the third category, the expert scientific witness, that causes major problems. The judiciary must determine who is a scientist and what is a science before evidence can be legally admissible.

"Who is a scientist" is determined by the witness' education and training, experience, research and writing, licensure and certification, and memberships in scientific societies.

"What is a science" is determined by (1) whether the scientific test performed by the scientist has been generally accepted by recognized experts in that scientific field or (2) whether the scientific test performed by the scientist has manifested prior reliability through general and common use.

The judiciary, in exercising its function to admit or deny a scientific test as legal evidence, may recognize quickly new scientific procedures which can qualify as legal evidence. The current development in "bite marks" is a prime example of rapid judicial recognition of a new scientific procedure. But such judicial recognition is not solely the trial judge's effort. The judicial acceptance of forensic sciences rests on the trial lawyers' ability to present properly the scientific facts and opinions for admission as evidence. Under the common law adversary procedure, the judge awaits the proper presentation by the prosecution and defense. Only then can the judge determine the admissibility of scientific evidence. The judge does not act to present evidence. The judge reacts to evidence offered by trial counsel. It is the quality of legal advocacy which basically determines whether a witness is a scientist and whether his evidence is based on a science worthy of being admitted into the judicial process.

> The question of bite mark identification is a matter of first impression before this court and we are compelled to comment that the record in this case reflects the utmost diligence and care in preparation by the investigating police, the State's Attorney, and counsel for the defendant. It must be

> realized that our synopsis of the dental testimony hardly does justice to the 1300 pages of intense examination which took place at trial, and, without the painstaking care exercised in preserving evidence, none of the dental testimony would have been available. Had the quality of the scientific or legal preparation been less thorough, we might have given less credence to this entire area of inquiry. People v. Milone, 43 Illinois Appellate Reports (3d Series) 385 (1976).

From the judicial perspective, what is needed to improve the capacity of the judiciary to use the forensic sciences better?

- Prosecutors and defense counsel must know how to qualify scientists as expert witnesses for the law and how to introduce scientific facts and opinions as evidence at the trial.

- Licensure through public legislation and certification by scientific peers of the scientific experts witness can authenticate the general acceptance of a science and the special qualities of a scientist.

- Public legislation qualifying certain scientific facts and opinions as legally admissible without direct testimony of the scientific expert in person would expedite trials and ensure the admission of unquestionable scientific evidence, e.g. blood alcohol tests.

From the judicial perspective, why are the forensic sciences of increasing value in the administration of criminal justice? Reasons include:

- More truthful than eye-witness testimony

- More probable that guilty pleas can be obtained, telescoping dramatically the time required to dispose of criminal cases

- Easier to obtain, for compulsion can be constitutionally imposed on the suspect to obtain the raw data for scientific analysis, unlike interrogation of the suspect, which is heavily encumbered by the constitutional rules and limitations

- Easier to ensure to the accused the truthfulness of his account of the alleged criminal act through the constitutional right to have compulsory process for obtaining witnesses in his favor

- More easily accepted by lay jurors whose daily experiences have revealed the greater value of modern science in the pursuit of truth as compared to the layperson who is an eye-witness.

In the current environment of criminal justice, the demand for skilled trial counsel rates high. The Chief Justice of the United States stated in a recent letter:

> Some lawyers have been disturbed by my statement that society as a whole has been more careful about examining the qualifications of electricians and plumbers before certifying them than

> we have with respect to those lawyers who try cases in the courts. This is one of those cases where the truth is so obvious and the consequences so grave that it is difficult for some people to accept. New Orleans Times Picayune, March 22, 1978.

The Chief Justice was writing to Chief Judge David N. Edelstein of the U.S. District Court for the Southern District of New York who had announced a unique training program for law students and lawyers in trial practice to upgrade the advocacy skills of the practitioners. The highest priority in such a program should be how to use the forensic sciences in the judicial process as a source for truthful scientific facts and responsible scientific opinions. The judicial perspective of the forensic sciences in the administration of justice is inevitably limited only by the wisdom and skill of the trial counsel. Trial lawyers must authenticate that a science is worthy of becoming evidence in the trial and that a scientist is worthy of becoming an expert witness in the courtroom. The process of qualifying the expert witness and introducing the scientific evidence is an ancient procedure. The current use of that process is a contemporary challenge if justice through law and science is to be our blessing.

In addition to trial counsel skilled in the art of advocacy, including how to use the forensic sciences as sources of evidence, contemporary criminal justice administration requires trial judges who can recognize: (1) when scientific knowledge is worthy of becoming legal evidence, (2) how to judge when an expert witness has the scientific qualifications to testify, and (3) why the accused's right to have compulsory process obtaining witnesses in his favor must include the right to obtain his own expert scientific witness to present the evidence of science which is favorable to the accused.

Truly, the judicial perspective of the forensic sciences is founded on the trial counsel's skill and energized by the trial judge's wisdom. The remaining decades of this century, as science intensifies its challenges to law, require the highest education of judges and lawyers in the unbounded opportunities for science to serve the administration of criminal justice.

56857

FORENSIC SCIENCE IN HIGHER EDUCATION

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Despite increasing emphasis on criminal justice as a discipline in the higher education curriculum, relatively little attention has been given to the subject of forensic science,* except in institutions with a specific program in this area. Even in those criminal justice programs which offer a forensic science major, it is common for a student not enrolled in the major to complete a course of study without having attended even one course in forensic science. Given the increased emphasis on forensic science in our legal system, one might reasonably ask why it is omitted in the criminal justice education system, particularly when that system purports to provide breadth of knowledge. Professor James W. Osterburg of the University of Illinois at Chicago Circle has described forensic science as a fringe area of criminal justice education, pointing out in a recent paper that few individuals seeking faculty positions in criminal justice display even one course in forensic science on their transcripts. (Osterburg, 1978) Despite the vast increase in criminal justice programs over the past decade, fewer than 25 offered degrees in forensic science. (Peterson, 1975, pages 301-365) This lack of recognition of forensic science should be cause for concern to both practitioners and academics.

Neglect of forensic science in Academe results in much confusion and a misunderstanding of its role in the investigation of crime and in the legal system. This neglect has several causes including an absence of qualified faculty, the lack of a strong literature base, and the relatively sparse research on forensic science applications in the criminal system.

Over the past decade there has been increasing support for forensic science in operating agencies, accompanied by growth both in the number of laboratories and in personnel assigned to them. Despite this growth, numerous problems remain on the operational level; not the least of these is a misperception of the laboratory's role. Undoubtedly, the crime laboratory is used in homicide and other serious cases, but experience indicates that the laboratory could play a much greater role in what might be termed the "garden variety" crime, which makes up such a large portion of the average crime picture.

The problem is compounded by what might be termed an optimistic view of the potential of forensic science by the legal system and frequently by the public at large. Media coverage of forensic science frequently plays up the more spectacular cases and few people are aware of the many components that go into the making of a case through the use of physical evidence.

Given the above, it is probably not surprising that most of the academic world in criminal justice has tended to shy away from offerings in this area. Where courses are offered, they usually relate to the area of criminalistics, are generally not laboratory-related courses, and focus on crime scene search

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* Forensic science is defined as the application of science to law.

efforts and the recognition of physical evidence. These courses give little or no consideration to what might be thought of as a broad-based approach to physical evidence. In other words, those who are exposed to criminalistic courses may be aware of how to search a crime scene and what to look for, but have no concept of the types of tests that may be run, what information they may provide, and what use they might be in terms of personal identification. Further, because the literature in forensic science ranges from extremely poor to highly technical, with relatively little in the middle, it is viewed by many faculty as a difficult subject to teach. Also, because most of the research efforts in the field are related to specific evidentiary applications, we know very little about the best approaches to the utilization of physical evidence in criminal investigation.

Investigators generally tend to focus efforts at a crime scene on the discovery of latent prints and view any other form of physical evidence as being somewhat esoteric. Each year we turn out large numbers of criminal justice majors, many of whom are in-service personnel, who lack even a rudimentary understanding of forensic science application.

Prior to any discussion of the need for course offerings in forensic science within the criminal justice curriculum, one must be familiar with the nature of academic planning and the way in which courses are both developed and supported by the institution. Generally, the implementation of the course on a college campus entails a circuitory route through a series of departmental and college committees; the course description must include items such as justification, bibliography, and the credentials of the faculty member qualified to teach the course. Because few criminal justice faculty are qualified in this area, they are probably somewhat reluctant to put forth a course with which they are not familiar. Further, in today's competition for students, emphasis is frequently placed on courses that will produce high enrollment, and some argue that courses in forensic science will not draw students readily because they are frequently viewed as difficult. When a course is finally introduced into the curriculum, it must compete for faculty resources. Most college catalogs list any number of courses which are offered infrequently, and this is often the case with respect to forensic science courses.

Analysis of the undergraduate criminal justice curricula in college catalogs indicates that most programs offer one or two courses in what might be termed basic forensic science. However, a review of course descriptions indicates that few courses are devoted to laboratory approaches.

Assuming agreement among criminal justice educators that forensic science should be offered in more depth, and I hasten to add that this is probably not the case, several things must occur before we can develop programs that will have direct benefit to the practitioner. These include:

- Definition of forensic science at the academic level
- Preparation of faculty
- Recognition of the need for sponsored research
- Improvement of the literature
- Curriculum design
- Development of a plan for the future of forensic science in higher education.

Given these approaches, it may be possible to alert both faculty and students to the need for forensic sciences in the criminal justice curriculum.

Definition of Forensic Science on the Academic Level

The broad field of forensic science includes the following disciplines that encompass a wide spectrum and require different levels of preparation:

- Criminalistics
- Jurisprudence
- Odontology
- Pathology and Biology
- Physical Anthropology
- Psychiatry
- Questioned Documents
- Toxicology.

For the most part, programs located in criminal justice departments in colleges throughout the United States focus primary efforts in the area of criminalistics, which is defined as the analysis, identification, and interpretation of physical evidence. "The primary aim of the criminalist is to provide an objective application of the natural and physical sciences to physical evidence in the reconstruction of events to prove a crime, and to connect or eliminate a suspect with the crime." (Bulletin of the Forensic Sciences Foundation, Inc., p. 4.) The preparation of specialists in the majority of other areas in forensic science, such as jurisprudence, odontology, pathology, psychiatry, and toxicology, requires varying levels of academic preparation, often including completion of a medical degree. Thus, in analyzing the development of forensic science in higher education, one must recognize that in the criminal justice rubric, the major emphasis is on criminalistics. As Peterson and DeForest point out:

While criminalistics is only one of the many disciplines which make up the forensic sciences, several university level programs, although focusing on criminalistics, employ the generic term forensic science to describe their curricula.

Although still small, the number of forensic science programs in the United States has increased markedly since 1968, largely as a result of the availability of federal funding through the Omnibus Crime Control Act. Table 1 indicates the number of forensic science degree programs in the United States through the middle 1970s, as well as their university affiliations.

A survey of educational offerings in the forensic sciences conducted by the Forensic Sciences Foundation found that 231 separate institutions or agencies offer instruction that is in some way related to the forensic sciences. (Field, Lipskin and Reich) This study found a high correlation between the number of forensic offerings and the presence of statewide criminalistic laboratory satellite systems. In other words, the higher the probability of a satellite laboratory system, the more likely that a forensic science offering is included in academic programs in the state.

The majority of courses offered relates to the area of criminal investigation, criminalistics, or physical or forensic anthropology. It is not surprising to find that courses in forensic pathology, analytical toxicology, and forensic medicine are found more often in medical schools, and an increasing number of forensic science courses are being offered in law school. For the most part, these courses are not part of a "major" related to forensic science, but are designed to familiarize the student with a specific aspect of the field. The problem of definition within the academic program is a real one that needs to be addressed further by members of the forensic science profession. Within the forensic science field there is frequently heated debate relative to the individual disciplines, and this is likely to have a stifling effect on the development of the profession unless the forensic scientists themselves can agree on a common framework. It is perhaps relevant to note that the only degree-level programs offering a baccalaureate, masters, or doctorate in forensic science are those commonly thought of as being criminal justice related. Yet the majority of those individuals within the discipline, who call themselves forensic scientists, usually have completed their academic preparation in another "major," such as medicine, law, dentistry, chemistry, or biology.

One must also note that the total number of degrees conferred in forensic science since the inception of the first program in 1947 is minimal. Indeed, only 11 doctorates have been conferred in the field, all of these from the University of California at Berkeley. See Table 2.

Given the relatively low completion rate of degrees in the field, it is unlikely that these graduates will be a major force for change in Academe.

Despite these problems, there is no indication that forensic science degree programs are likely to diminish in the near future and, in fact, there is likely to be some slight growth.

TABLE 1--Forensic Science Degree Programs

Institution	Year Program Established	Degrees Offered
Michigan State University	1974	B.S., M.S.
University of California (Berkeley)	1950	B.S., M.S., D.Crim.
California State University (Los Angeles)	1957	M.S.
Northern Arizona University	1959	B.S., M.S.
The George Washington University	1968	M.S., M.F.S.
John Jay College of Criminal Justice	1968	B.S., M.S.
University of Pittsburgh	1969	M.S.
State University College of Buffalo	1971	B.S.
Georgetown University	1972	Certificate
University of Illinois at Chicago Circle	1972	B.S., M.S.
University of New Haven	1972	B.S.
East Texas State University	1973	B.S., M.S.
California State University (Sacramento)	1973*	B.S.
Indiana State University	1974	B.S.
Florida Technological University	1974	B.S.
Jacksonville State University	1974	B.S., M.S.
Metropolitan State College	1974	B.S.
University of Mississippi	1974	B.S.
Eastern Kentucky University	1975	B.S.
Northeastern University	1975	M.S., Ph.D.
Sam Houston State University	Not available	B.S., M.S.
Southeast Missouri State University	Not available	B.S.

* B.A. in Criminal Justice with concentration in forensic science established in 1969.

Source: The Status of Forensic Science Degree Programs in the United States, by Peterson, J.L., and DeForest, P.R., Journal of Forensic Science, Vol. 22, No. 1.

TABLE 2--Total Number of Degrees Awarded Since Program's Inception

Institution	B.S.	M.S.	Doctorate
Michigan State University	36	5	NA
University of California (Berkeley)	150	12	11
California State University (Los Angeles)	NA	25	NA
Northern Arizona University	15	0	NA
The George Washington University	NA	150	NA
John Jay College of Criminal Justice	40	7	NA
State University College of Buffalo	1	NA	NA
University of Pittsburgh	NA	49	NA
Georgetown University	(21)*	--	--
University of Illinois at Chicago Circle	16	1	NA
University of New Haven	5	NA	NA
East Texas State University	2	0	NA
California State University (Sacramento)	10	NA	NA
Indiana State University	0	NA	NA
Florida Technological University	0	NA	NA
Jacksonville State University	0	0	NA
Metropolitan State College	0	NA	NA
University of Mississippi	0	NA	NA
Eastern Kentucky University	0	NA	NA
Northeastern University	NA	0	0
TOTAL	275	249	11

* Special Certificate Program at Georgetown University.

Source: The Status of Forensic Science Degree Programs in the United States, by Peterson, J.L., and DeForest, P.R., Journal of Forensic Sciences, Vol. 22, No. 1.

Preparation of Faculty

Faculty who are currently teaching in forensic science programs are generally drawn from crime laboratories, many of them embarking on a second career in higher education. This phenomenon, which is also prevalent in criminal justice higher education, has some drawbacks, not the least of which is the lack of individuals with a research background and/or doctorate degrees. This is compounded by a general lack of expertise in the area of forensic science among other faculty in criminal justice. Furthermore, few individuals in other areas of forensic science, such as pathology, toxicology, and psychiatry, are teaching full time in forensic science degree programs.

One cannot rule out the importance of experienced faculty in the preparation of forensic science degree students. However, as the field develops, there is a need to bring in faculty with strong academic preparation as well as experience.

The problem of drawing faculty from crime laboratories may further be compounded by a lack of training at the crime laboratory level. As Sullivan notes:

> A pressing need exists to upgrade the quality of physical evidence examinations being performed in the 250 crime laboratories within the United States. The recently completed laboratory proficiency testing research program has documented a wide range of proficiency levels among the nation's crime laboratories.

Since most laboratory personnel must depend upon advanced courses and training to upgrade their skills, the relative lack of these developmental activities in the field could prove detrimental to the recruitment of qualified faculty.

The success of any forensic science educational program will depend, in large measure, on the expertise and ability of the faculty. As these programs continue to grow, and as the "first generation" of forensic science faculty begin to retire, there will be a need to recruit individuals who have kept the pace with the development of the field over the past decade. This area should be a source of concern to program administrators and to the field, for its complexity increases daily.

Recognizing the Need for Sponsored Research

Since 1975, the Law Enforcement Assistance Administration has devoted approximately $5 million to the forensic sciences area. However, there has been a decline in the level of funding each year since 1975, which should raise serious concerns among those in the profession. Several recent studies have pointed up some of the deficiencies in the field, not the least of which is a lack of data relative to forensic science as a broad-based discipline.

In addition to the need for studies to provide base-line data for the development of academic programs and the field in general, there is a significant lack of sponsored research relative to the utilization of forensic science and to the development of improved methods and procedures for the analysis of evidence. As Kirk so aptly pointed out in 1963:

> Research, so essential to an active science, cannot remain undefined in its objectives, nor limited to technical progress alone. The most important objective of all is still receiving the least attention, viz., the interpretative. The physical properties which serve for identification and for individualization are not all equivalent in kind or in value, nor uniformly effective under varying circumstances. Applications of theories of probability to evidence interpretation remains inadequate for the need. Related statistical studies have been limited and unsatisfactory for the most part. . . .

Little has changed since Kirk's pronouncement, and the area of interpretative and developmental research still leaves much to be desired.

The increasing number of graduate students in forensic science represents an untapped resource that might be used more effectively and efficiently to address relevant research areas in the field. However, the lack of funding for fellowships and internships for the purpose of conducting research in specific areas has hampered the development of a coordinated research effort. The infusion of research dollars into graduate programs combined with a national effort to identify the most pressing needs, could result in significant forward strides.

Improvement of the Literature

Despite a significant growth in the literature of criminal justice, the field of forensic science continues to lag. No doubt, one of the major problems is the unwillingness of major publishers to undertake texts with limited market appeal. However, as the number of students in forensic science continues to increase, and as the various laboratories begin to recognize the need for an adequate library, it is likely that publishers will be more receptive to this area.

Unfortunately, the number of individuals conducting research and writing in the field is relatively limited. There is a need to encourage authors, for the success of any discipline rests in large measure with its literature. Osterburg rightly points out that one explanation of why so little forensic science is taught in criminal justice academic programs is the limited number of textbooks. A recent literature review conducted by Tony Simpson indicates that since 1976, approximately 21 books have been published in the area of criminal investigation or forensic science. (Simpson, 1978) Of these, seven were what might be termed basic criminal investigation texts, and two related to traffic investigation. The number of articles and research reports appearing in journals and other periodicals has increased dramatically since the early 1970s and this is certainly a positive sign. Still, it is probably safe to say that most crime laboratories have inadequate libraries, a problem which contributes to a lack of professional development. As Cadman notes:

> A good library is a must for a good crime laboratory. Appropriate forensic science and related scientific journals in books represent an invaluable resource when catalogued and maintained. Laboratory and other department personnel should be encouraged to use it to increase their capabilities and backgrounds in relevant areas in order to get the best from the crime laboratory.

The lack of an adequate literature base stifles the development of the profession, and contributes to mediocrity. The need for improving the literature in the field is coterminous with improvements in academic programs.

Curriculum Design

Even within the forensic science/criminalistics programs there is a wide disparity among the courses offered. See Table 3. Thus, there is even a lack of agreement as to what a forensic science program should offer, and individuals with degrees in the field will exhibit different levels of preparation.

It is probably safe to say that the orientation of a particular program will largely follow the interest or expertise of the faculty. Although this is not unusual, there is probably a need in the field to develop a core curriculum in which students receive the basics in specific areas. Further, since the majority of those students graduating from forensic science programs will be employed in crime laboratories, there is probably a need to assess the basic needs of the laboratory. It is not uncommon to hear a laboratory director state that he would rather have an individual with a degree in the natural sciences than in forensic science, so that the student can be trained in a way which is consistent with that laboratory's procedures. The communication between laboratories and academic programs appears to be a problem of some concern.

Most curricula in forensic science programs have developed over time, and generally do not represent a comprehensive or cohesive approach to the discipline. Courses are usually added over time, few if any are deleted, and the end result is an array of courses that have been created to meet the particular needs of individual faculty members. This approach is likely to create poor overall design and a lack of adequate training in providing the most meaningful education in the field.

Needless to say, the curriculum of a program represents the definition of what it should entail. The curriculum then becomes the framework upon which a program is developed. In some measure, one comes full circle to the definition problem as stated earlier and is faced with the problem of what is forensic science.

The Future of Forensic Science in Higher Education

From the viewpoint of the administrator in higher education, it is likely that forensic science, despite its costs, is here to stay as an academic discpline. As noted earlier, forensic science within this context largely relates to the development of a criminalistics major, and it is unlikely that this will change drastically in the immediate future. The need for career development of forensic sciences at all levels, in both education and training, is generally well recognized. There is no question that college courses will continue to be supplemented by individual workshops, training programs, and seminars.

As graduates of forensic science programs become more integrated in the system, particularly in crime laboratories, it is likely that they will gain more acceptance. Over the next decade, more and more of these individuals will rise to management positions in laboratories, and this will further serve to establish university-level programs. It is probably safe to say that it takes an estimated 20 years for a new field to establish itself. One need only look at the

TABLE 3--Number Graduate and Undergraduate Course Offerings in Forensic Science (h = 16)

Institution	Forensic Medicine/ Pathology	Scientific Photography	Forensic Science Seminar	Microscopy	Crime Scene Investigation	Legal Aspects of Forensic Science
University of California, Berkeley*	1	-	1	2	-	-
California State, Los Angeles**	1	-	1	-	-	-
Northern Arizona University*	-	-	-	-	-	-
John Jay College*	-	-	2	-	-	-
University of Pittsburgh**	-	-	-	-	-	1
State University College, Buffalo***	-	-	-	-	-	-
University of New Haven***	2	1	-	-	-	-
East Texas State University*	-	-	-	-	-	-
California State, Sacramento***	-	-	-	-	1	2
Indiana State University***	-	-	-	-	-	-
Florida Technological University***	-	-	-	-	-	-
Jacksonville State University*	2	1	1	-	-	1
Metropolitan State***	-	-	1	-	-	-
University of Mississippi***	-	1	-	1	-	1
Eastern Kentucky University***	-	1	1	1	-	-
Northeastern University**	-	-	1	-	1	1

* Both graduate and undergraduate courses.
** Graduate courses only.
*** Undergraduate courses only.

Source: The Status of Forensic Science Degree Programs in the United States, by Peterson, J.L., and DeForest, P.R., Journal of Forensic Sciences, Vol. 22, No. 1.

TABLE 3 (continued)

Institution	Questioned Documents	Arson/ Explosives	Soil Analysis	Firearms/ Toolmarks	Internship	Other	Total
University of California, Berkeley*	-	-	-	-	1	2	15
California State, Los Angeles**	1	-	-	-	-	1	8
Northern Arizona University*	-	-	-	-	1	-	4
John Jay College*	-	-	-	-	1	-	14
University of Pittsburgh**	-	1	-	-	1	1	11
State University College, Buffalo***	-	-	-	-	1	-	2
University of New Haven***	-	-	-	-	1	1	11
East Texas State University*	-	-	-	-	1	-	3
California State, Sacramento***	-	-	-	-	1	1	9
Indiana State University***	-	-	-	-	-	-	3
Florida Technological University***	-	-	-	-	1	1	7
Jacksonville State University*	1	-	1	1	1	1	22
Metropolitan State***	-	-	-	-	1	1	4
University of Mississippi***	-	-	1	-	1	1	13
Eastern Kentucky University***	1	-	-	-	1	1	10
Northeastern University**	-	1	-	-	1	1	14

* Both graduate and undergraduate courses.
** Graduate courses only.
*** Undergraduate courses only.

TABLE 3 (continued)

Institution	Introduction to Forensic Science	Criminalistics/ Microanalysis	Instrumental Analysis	Serology/ Immunology	Toxicology	Drug Analysis
University of California, Berkeley**	1	2	1	3	1	-
California State, Los Angeles**	-	3	-	-	-	1
Northern Arizona University*	-	1	2	-	-	-
John Jay College*	1	4	4	1	1	-
University of Pittsburgh**	1	2	-	2	-	2
State University College, Buffalo***	-	1	-	-	-	-
University of New Haven***	1	2	1	1	1	-
East Texas State University*	-	-	2	-	-	-
California State, Sacramento***	1	2	1	-	-	-
Indiana State University***	-	1	1	1	-	-
Florida Technological University***	-	2	1	2	-	-
Jacksonville State University*	1	4	1	1	3	2
Metropolitan State***	-	1	-	-	-	-
University of Mississippi***	1	2	1	1	1	1
Eastern Kentucky University***	-	-	2	1	1	-
Northeastern University**	-	2	2	-	1	3

* Both graduate and undergraduate courses.
** Graduate courses only.
*** Undergraduate courses only.

area of criminal justice in general, particularly law enforcement, where more and more college gradutes are moving into high-level positions, and are generally more likely to support higher education in criminal justice than their predecessors, many of whom did not have degrees, or who completed degrees in other disciplines.

In viewing the field of forensic science, we must recognize that there continues to be much disagreement within the field as to what constitutes proper preparation for entry into the field. This debate is not likely to diminish in the near future and is probably healthy.

Those programs that have been adopted at the university and college level continue to strive toward higher quality. Indeed, one might hypothesize that the relatively low number of students graduated from forensic science programs is an indication of the emphasis on preparing qualified students. The attrition rate from forensic science programs is generally higher than for most programs on a campus.

One of the major problems in criminal justice and, to some degree, in forensic science, is the notion that a faculty member can teach virtually any course. This has resulted in faculty members teaching courses in which they may not be qualified. Even in the better staffed programs, it is unlikely that there are faculty available to teach all of the necessary courses in forensic science.

The development of forensic science programs is also hampered by the lack of literature in the field, a sparsity of research, and poor articulation with practitioners. To some degree, there is a lack of confidence in graduates by laboratory managers, and the result has frequently been the adoption of an "ivory tower syndrome" in which the faculty fails to develop strong lines of communication with those actually working in the field. The opposite of the "ivory tower," and often as problematic, are those programs developed to provide centers for individuals seeking a second career.

Perhaps it is time to pause, take stock of where we are, and where we are going in the field of forensic science. We should not be too quick to accept old models and old concepts. Rather than ask how do we improve the forensic sciences, we might ask, "What do we want from the forensic sciences?" Research currently indicates that forensic science is not being used anywhere near its potential within the justice system. We do not know how cost-effective forensic science is or can be. We recognize that there are deficiencies in our laboratories, a lack of awareness by users and the public as to capabilities and deficiencies, and wide variations in the quality of services.

Ultimately, the education of forensic scientists will be determined by the field itself. The educator has an important role to play in this development, as does the practitioner. An immediate goal should be to bring these two groups together in an effort to charter a course for the future.

56858

FORENSIC SCIENCE SERVICES:

THE PROSECUTOR'S PERSPECTIVE

Robert Leonard
Prosecuting Attorney
Genesee County
Flint, Michigan

The development of the atomic bomb during World War II was the greatest example up to that time of the use of science to obtain national goals. Then the space race, beginning in 1957, caused an unprecedented explosion of scientific knowledge, training unequalled in intensity, and, ultimately, vast additions to the storehouse of man's knowledge. That, too, was a national goal. In another area, we have a very unsatisfied national goal--to reduce crime. It is obtainable in part by prosecuting those believed to have committed crimes.

It is estimated that over 90 percent of all the people who have ever been scientists are alive today. Through science, man has learned more about his world, both his inner being and his outer environment, since the turn of the century than in all the years from the first step out of the primordial ooze to 1900.

Today, as man seeks a more crime-free society, he has to attempt to take this mass of scientific knowledge, apply the relevant portions of it to carefully collected and preserved objects, test and examine those objects, and then inform others persuasively of the results of the tests. This society's increasing application of technology to the problems of everyday life creates a potential for law and science to work together more closely in an effort to operate the criminal justice system more effectively. The effective use of forensic evidence in areas of criminal law is already familiar to us, and the application of advancing technology to new problems in law enforcement should result in a better and more comprehensive base upon which an individual's innocence or guilt is determined.

Because the forensic sciences as a whole have generally had a very low profile, their potential as well as problems and needs have largely been unattended, unnoticed, or unrealized by the public, law enforcement agencies, the courts, and the defense bar.

From the point of view of many prosecutors, the forensic science field appears very complex and technical, and the persons in it often speak in an unfamiliar language. For the most part, attorneys, whether working for the prosecution or defense, don't know where to go or whom to contact in order to obtain expert advice. This highlights the need for a manual, a center, or a clearinghouse where such information would be available.

This paper presents a brief analysis of the apparent and often crucial conflicts between police, prosecutors, defense attorneys, and judges, on the one hand, and forensic scientists on the other. The scientist seeks to prove certain facts or theories within a framework of confidence limits and tests so that he or she can say that a certain fact is scientifically true, using the esoteric language specific to his or her specialty.

Attorneys and judges also seek truth, but in another form. Truth is what a jury of twelve lay persons says is the fact. They do not use the scientific method in their deliberations, nor do they have particular confidence limits other than "reasonable doubt," but through the collective sifting and weighting of what witnesses, including scientists, claim is the fact, they reach for a decision.

Attorneys must bridge the gap between the erudite expert who claims a certain fact exists and the lay jurors who ultimately decide whether it does. The universal method used in the courtroom is the reduction of scientific language to lay terms. The expert testimony often concerns physical evidence, which can be the most compelling evidence that a jury receives in a criminal trial. Very often, the physical evidence offered at trial and the scientific testimony associated with it, are the determining factors in the jury's ultimate conclusion about whether or not a defendant is guilty.

Police are concerned with the collection of evidence, in the form of witness testimony and physical things that often are subjected to forensic examination. In fact, the recognition and proper care of such physical things is the first crucial step in the development of forensic evidence in any particular case. But often the police are concerned more with "closing the case" and making an arrest than in seeing the case through to completion.

Let us look at physical evidence and what happens to it on its often tortuous route from the scene of a crime to the jury room.

First, the evidence must be discovered. A trained eye will see what physical items at a crime scene are obviously useful as evidence. A very well trained eye will discover things that might easily be passed over at a cursory first examination but that are nevertheless crucial to the development of the case.

Second, the evidence must be collected and preserved in such a way that the expert who will later examine it will receive it in an unaltered and pristine form. As an obvious example, burglar tools dropped on their edges on the sidewalk on their way to the police car are <u>not</u> well preserved. While the police technician is normally trained in collection and preservation techniques, continual retraining in improved methods of evidence discovery, gathering, and security would undoubtedly be useful.

After being discovered and properly secured, evidence will be taken either to a morgue for postmortem examination, directly to a laboratory for analysis, or to the police property room for an indeterminate stay that may later include a delayed trip to a laboratory.

The collection, transport, and storage of physical evidence involves a so-called "chain." Under current law, all those who have anything to do with an item of physical evidence are subject to being called to testify as to their receipt of evidence, their care of it while it was in their custody, and its condition upon delivery to the next person in the chain. At the end of this paper is an affidavit that points out the types of problems that may result from improper safekeeping of crucial evidence. (Names have been changed to protect the parties involved.) While it must be borne in mind that the allegations contained in the affidavit have not as yet been proven and the physical evidence referred to has not as yet been suppressed, proper techniques relating to the operation of a laboratory will prevent this issue from arising.

The concept of regional forensic science centers I propose will add to the geographic length of the chain of evidence, but I am certain that procedures can be developed to keep the number of chain witnesses to a minimum. It has often been my experience that the defense will stipulate to the chain of evidence where, based upon the reputation of the police agency and laboratory for the proper treatment of physical evidence, no issue beneficial to the defense may properly be raised. So the mere fact that such regional centers may be somewhat removed from the trial site is not a valid argument against the concept of the center.

Returning to the evidence, finally, it arrives at a laboratory where it may be subjected to numerous scientific tests, perhaps by several different experts. This is the heart of the discovery process. The scientific expert must know what to look for and how to look for it. He must be educated and trained in such a way that his testimony at trial is not subject to attack based upon his qualifications. Most importantly, he must know not only what he testifies about, but how he testifies. The tremendous intellectual impact of the value of expert testimony concerning physical evidence may easily be lost if the expert cannot communicate effectively. First and foremost, the expert and the attorney who will elicit his testimony must be able to communicate with each other, in advance of trial, along a common plane of understanding. The attorney must learn enough of the expert's field to assure himself of the meaning and quality of the expert's testimonial evidence. The expert, on the other hand, must learn the value of his testimony and its place in the trial of a case, not only from the scientific point of view, but also from the aspect of how the testimony he has to offer may be most effectively and impressively laid before the jury so that they may best understand and weigh its value in the case. Open communication between scientists and lawyers, initiated long before the scientist enters the courtroom door, is imperative. The communication must flow both ways, and must be cooperative, not antagonistic, in nature. Only when the out-of-court dialogue results in effective in-court communication between the scientist, witnesses, and the jury may we say that law and science have truly come together.

However, conflicts often arise because forensic science is science and law is an art. Conflicts may arise because of different terminology, for example, the use of insanity versus mental illness, assault versus circular entrance wound. Conflicts may also arise from the apparently different perspectives concerning proof: scientifically acceptable versus beyond a reasonable doubt.

Law and science are two rigorous disciplines that must on occasion touch each other. On those occasions, the differences between them become evident; the lawyer is confused by the scientist's unfamiliar jargon and methodology, and the scientist is confused by the lawyer's lack of appreciation of the intellectual beauty of the scientist's specialty. Both are often confused and upset by a jury's reaction to scientific evidence, even after it has been carefully expressed in lay terms. Furthermore, the areas, specialties, and accomplishments of the forensic sciences are unknown to many prosecutors. I dare say that most prosecutors, out of ignorance, do not use forensic scientists. Clearly, it behooves forensic scientists to make their capabilities and resources known to prosecutors so that prosecutors can bring their problems to the forensic scientist.

Forensic science is not a panacea, however, especially at present. Training, education, and certification are sorely lacking in the field. Not only do forensic scientists themselves often lack adequate training, but training and education of persons in the disciplines that use forensic science is essentially non-existent. One cannot, for instance, in a three-hour course at a five-day trial tactics conference, expect to educate a trial assistant on the uses and the benefits of calling in a forensic scientist. Perhaps forensic scientists themselves should have an institute or academy at which they could not only train and discuss matters among themselves but could offer training sessions for prosecutors, police, judges, and defense lawyers concerning advancements and techniques in various fields.

The first step in improving forensic science services and use is to standardize forensic science technology nationwide. One methodology, employed by all laboratories and used by the criminal justice system, is essential to guarantee the integrity of results and fairness to the defendant and the judicial system.

John O. Sullivan has persuasively argued in his paper, "National Program to Upgrade Crime Laboratories," that unacceptable results are reported in many cases by crime laboratories and that large numbers of crime laboratory technical and professional personnel are not qualified for the work they are expected to do. These threshold problems obviously need to be resolved before effective use of services by criminal justice professionals can occur. Yet, optimally, the development of greater reliability can take place as part of the overall improvement in communication between disciplines and the esatablishment of "national methodology" for forensic science and its application.

I propose that police, lawyers--both prosecutors and defense counsel--judges, and scientists form a center for the study and dissemination of forensic science data. In my view, such a center would encourage effective communication between lawyers and scientists. Lawyers need to be aware of what scientific techniques and methods are available to assist them and how these techniques and the results of scientific examinations performed with such techniques may be most persuasively presented to a jury. Police officers need to know what methods of initial evidence recognition, collection, and safeguarding are required to maintain the integrity of the scientific process. Scientists need to know what forensic evidence lawyers require, why and how such evidence assists in proving facts about an issue and how such evidence may be most persuasively presented.

The proposed center could also serve as a forensic science clearinghouse. It would receive information from a variety of sources, including local forensic laboratories, prosecutors and defense attorneys, law enforcement agencies, judicial authorities, professional organizations and the scientific academic community, and then would regularly publish and distribute pertinent information. In addition, I perceive the center as a research facility for the study and development of judicially admissible scientific techniques and methodology. For example, the Michigan Supreme Court has recently held that a trial judge has discretion to consider the results of polygraph examinations in deciding whether to grant a motion for a new trial on the basis of newly discovered evidence, even though such test results still are not admissible at trial. The center also should have as one of its tasks the development of standards of research and examination for the scientific community that will also meet the standards necessary for judicial admissibility of forensic evidence in the truth-seeking process.

Additionally, I see the center as a facility for qualifying scientists as expert witnesses in their respective specialties. Professional associations representing polygraphers, psychiatrists, psychologists, breathalyzer operators, chemists, pathologists, psychopharmacologists, graphologists, document examiners, and the like, should be invited to participate in developing criteria and setting standards of qualification for their constituent groups. The center might also develop standards for local forensic laboratories with respect to equipment, integrity procedures, technical library, and operating personnel qualifications.

Should such a center be established, I foresee the possibility that administration of local forensic laboratories could reside in the hands of the courts eventually, with both prosecution and defense having equal access to both impartial forensic scientists and the findings of forensic examinations.

Consider, for example, rule 706 of the Federal Rules of Evidence:

> (a) Appointment. The court may on its own motion or on the motion of any party enter an order to show cause why expert witnesses should not be appointed, and may request the parties to submit nominations. The court may appoint any expert witnesses agreed upon by the parties, and may appoint expert witnesses of its own selection. An expert witness shall not be appointed by the court unless he consents to act. A witness so appointed shall be informed of his duties by the court in writing, a copy of which shall be filed with the clerk, or at a conference in which the parties shall have opportunity to participate. A witness so appointed shall advise the parties of his findings, if any; his deposition may be taken by any party; and he may be called to testify by the court or any party. He shall be subject to cross-examination by each party, including a party calling him as a witness.
>
> (b) Compensation. Expert witnesses so appointed are entitled to reasonable compensation in whatever sum the court may allow. The compensation thus fixed is payable from funds which may be provided by law in criminal cases and civil actions and proceedings involving just compensation under

the Fifth Amendment. In other civil actions and proceedings the compensation shall be paid by the parties in such proportion and at such time as the court directs, and thereafter charged in like manner as other costs.

(c) Disclosure of appointment. In the exercise of its discretion, the court may authorize disclosure to the jury of the fact that the court appointed the expert witness.

(d) Parties' experts of own selection. Nothing in this rule limits the parties in calling expert witnesses of their own selection.

States that have codified rules of evidence based on the federal rules have similar, if not identical provisions. The development of regional forensic science centers may well permit forensic science witnesses to be the court's witnesses. Such an eventuality, were it to become commonplace, would constitute fair judicial recognition of the character of scientific evidence and the inherent reliability and accuracy of testimony originating from such centers.

Prosecutors long have had full access to crime laboratories. Defense lawyers have not. Impartial experts or equal access to forensic scientists should be available to the poorest defendant, as a matter of due process.

As the relationship between forensic scientists and the police and prosecutors is perfected, it is important for all to realize that central control at the scientific, not the legal, level and an integrated laboratory system are essential, as Dr. Edgar W. Kivela, chief of the Forensic Services Division of the Michigan Department of State Police, has pointed out. The practical need for such central control is that it would eliminate second guessing as to results obtained by local laboratories. More importantly such scientific control would provide for the integrity of results and thereby ensure fairness both to the defendant and to the justice system.

Forensic science plays a significant role in the criminal justice process and, as society becomes even more technologically oriented, this discipline will probably have even greater impact. Dialogue, such as that at this conference, holds forth the greatest promise for law and science to work more closely together. How, or whether this eventually may affect the traditional concept of burden of proof should also be a subject for study.

STATE OF MICHIGAN

IN THE CIRCUIT COURT FOR THE COUNTY OF GENESEE

PEOPLE OF THE STATE OF MICHIGAN,
Plaintiff,

Case No. 77-27712-FY

VS.

Judge:_____

Defendant,

AFFIDAVIT

NOW COMES JOHN DOE who being first duly sworn, deposes and says:

1. That he is a former employee of the Michigan State Police Crime Laboratory.

2. That his former job function was as a scientist analyzing narcotics and dangerous drugs.

3. That he was asked by the Law Firm of Smith, Jones, and Brown to provide certain information regarding the security of evidence submitted to the East Town Crime Laboratory relating to one Mr. George Washington, Defendant herein, who is charged with the Crime of Possession of Heroin with Intent to Deliver.

4. That on or about April 13, 1976 he became aware of the fact that a secretary had the unauthorized possession of a key to the narcotics evidence room.

5. That some time later he received a copy of a letter for the East Town Lab director, Lt. Frank Johnson, to the director of all state police crime laboratories, Capt. James Hook.

6. That in said letter, dated June 11, 1976, Lt. Johnson stated: "On April 19, 1976, I obtained from the Quartermaster, a copy of the journal listing all persons and dates keys 35 and 37 were issued. . ."

7. That key #35 was the key to the laboratory and key #37 was the key to the evidence room inside the laboratory.

8. That said letter from Lt. Johnson further stated that ten (10) employees had left the lab with #35 and twelve (12) employees had left the lab with key #37. That by the end of May, 1976 these keys had been. . .turned in or accounted for to the Quartermaster. . ."

9. Lt. Johnson further stated in his letter that two (2) #37 evidence room keys were unaccounted for and that ". . .I do not know the whereabouts of the remaining two keys."

CONTINUED

1 OF 2

10. That the evidence room was not re-keyed until on or about April 20, 1977, one year and seven days later.

11. That the evidence room had not been re-keyed at the time that the evidence against defendant George Washington was received at the crime lab.

12. That at least three (3) pieces of evidence submitted on different dates were left out overnight on the analyst's workbench.

13. That one of the pieces of evidence, submitted on February 23, 1977, was left out open from March 1, 1977 to March 4, 1977.

14. That the analyst above mentioned, who left out all of this evidence, is Dr. Ferdinand Hamilton.

15. That during this period of time, several members of the laboratory were teaching at East Town Community College and were bringing their students into the lab at night on "tours."

16. That the evidence left on the workbench by Dr. Ferdinand Hamilton was accessible to these visitors. Further, that anyone at all who passes Dr. Hamilton's workbench during the day had access to this evidence.

17. That he does not suggest that anyone has tampered with evidence submitted against Defendant George Washington or any other Defendant, however, the possibility of such occurring is less than remote.

17. That "The people are obligated affirmatively to make known all the evidence of which they have knowledge bearing upon the charged offense, whether it be favorable or unfavorable to the prosecutor."

People vs. Miller, (1973) 51 Mich App 117, 119.

FURTHER DEPONENT SAYETH NOT.

_____
John Doe

On this 16th day of May, A.D., 1978, before me personally appeared the above-named John Doe and made oath that he has read the foregoing affidavit by him subscribed and knows the contents thereof, and that the same is true of his own knowledge, except as to the matters which are therein stated to be on his information and belief, and as to those matters he believes them to be true.

_____
Casey McLain
Notary Public, Genesee County, Michigan
My Commission Expires: August 4, 1981

VI. GROUP REPORTS

This report summarizes the discussions and deliberations of the three interdisciplinary groups convened at the workshop. The reporters for each group were:

Group I

Bryan S. Finkle
Director
Center for Human Toxicology
University of Utah
Salt Lake City, Utah

Group II

Allen H. Andrews, Jr.
Superintendent of Police
Peoria Police Department
Peoria, Illinois

Group III

Kenneth S. Field
Vice President
FISA Corporation
Colorado Springs, Colorado

The assistance of the three reporters is gratefully acknowledged and appreciated. The Forensic Sciences Foundation's responsibility was to review each of the reporters' notes, synthesize these reports into a single, cohesive summary, and to present the information in a unified format. We trust we have done justice to each of the reporter's submissions and apologize for any errors in interpretation or omissions that were inadvertently committed.

Members of the groups included forensic scientists, lawyers, judges, police officers, and educators. The groups met on three separate occasions to discuss a series of issues concerned with the application and effectiveness of science in the criminal justice system. It was accepted at the outset that the role of forensic science is currently inadequate, and that there is an urgent need to identify the principal causes of the inadequacies as seen by members of each of the professional disciplines represented in the groups. Only then could potential solutions be discussed in practical terms. The three meetings were therefore designed so that definition of problems, identification of solutions, and possible approaches to achieve the solutions were treated separately.

A conscientious effort was made throughout to integrate the often diverse perspectives and priorities of the judge, lawyer, police officer, scientist, and educator. There was unanimous agreement that interdisciplinary meetings were essential if a proper appreciation and application of science to legal problems and to criminal justice are ever to be achieved These meetings must be strongly encouraged at local, county, and state levels as well as nationally, and they should be held under the aegis of the National Institute of Law Enforcement and Criminal Justice, Law Enforcement Assistance Administration, United States Department of Justice.

The Role and Promise of Forensic Sciences

Forensic science services have been influenced significantly by the multi-component nature of the criminal justice "system." The very same functional, governmental, jurisdictional and philosophical fragmentation and insularism so readily identifiable as prominent bases for criminal justice deficiencies in the United States are also the source of the difficulties that confront the forensic sciences as they attempt to serve the criminal justice system.

Communication

It was acknowledged, virtually without debate, that a lack of communication, comprehension, and appreciation of others' viewpoints and responsibilities among the legal, law enforcement, and scientific professionals involved in criminal justice was a major problem, and that this was a substantial cause of the forensic scientist's lack of credibility in the system. In general, there is no interdisciplinary dialogue.

The major cause of problems related to the utilization of the forensic sciences was also deemed to be a lack of communication, especially between the forensic scientist and the principals in the adjudicative process.

Foremost, was the lack of sharing of general knowledge. Scientists do not keep the judges and the trial lawyers informed of the current state of the art in their various disciplines. As a result, the scientist is underused since, at trial, the onus is on the judge and the lawyers to introduce scientific evidence into a case. It was also noted that trial lawyers do not share their knowledge of pertinent court procedures with forensic personnel. (A general exception is the case where the defense hires a scientist to introduce evidence or to serve as a rebuttal witness. Such witnesses are usually carefully schooled in court procedure.)

A language barrier was cited as a second cause of the underuse of the forensic sciences. This aspect was summed up rather nicely in the statement: "Not only do I not know the facts, I don't understand them when you advise me of them."

The third cause for communication failures pertained to the professional relationship between the defense attorney and the forensic science profession. Defense attorneys, especially public defenders, are unable to locate scientists to support their cause. They, the defenders, do not know who is available nationally or locally. Compounded with this problem is the fact that most forensic scientists have priced themselves above the legal fee limits imposed on defender offices. As a result, the scientific profession has done little to aid the defense.

The last cause for the failure in communications rests with the attorneys. They seldom explain what they want from the scientific profession.

Thus, it was agreed that provision of forensic science support was disproportionately in favor of the prosecution, and that this lack of parity constituted a problem requiring high priority attention. The present state of affairs is caused by the previously noted historical development of forensic science laboratories as an adjunct, investigative arm of the police. Although this need is still valid, the many changes in legal practice and organization of criminal justice make it imperative for forensic science to operate as a non-aligned professional service to the criminal justice system.

Organizational Problems

The current availability and location of forensic science services in police agencies and in the private sector are the result of several situations, such as, the desire of the police to improve their criminal investigation procedures, individual scientists who may be regarded as "police buffs," and also retiring, government forensic scientists who take on second careers as private examiners. Proposals for change in the organizational location of government forensic laboratories stem from a number of factors, not the least of which are the increasing cost and complexity of analytical instrumentation, facilities, and personnel.

Other considerations include a growing concern for professional qualifications and standards and the issues of parity and objectivity. The constricting finances of local government also are causing increased interest in regionalization or the consolidation of services at the state level. This is fueled by the growing realization that the present limited impact of forensic science (except in drug- and alcohol-related cases) in crime clearance, prosecution, and adjudication, when weighed against the increasing costs of maintaining up-to-date laboratory services, argues strongly for the centralized provision of many analytical services.

Although a great variety of alternative organizational units for forensic services exists when a region or state engages in the consolidation of services, the pressing issue continues to be the placement of forensic services within the law enforcement structure. Those in law enforcement present a strong argument for a close, inhouse relationship--the need for team effort with the police officers who investigate crime scenes and who decide whether to collect physical evidence in individual cases. Furthermore, many of the older, more established crime laboratories use police officers as laboratory scientists and examiners and rely upon their sworn ranks as the primary source for new laboratory personnel. Police administrators also have been in the forefront of campaigns for increased forensic science resources and, in general, seem to show more interest in aiding the forensic science "cause" in comparison to prosecutors and judicial officials.

In contrast, members of the judiciary, defense attorneys, and forensic scientists themselves are raising issues concerning fairness, objectivity and availability of services as arguments for alternative sponsorship and location of the forensic science service.

Fairness

Issues of parity include a number of procedural matters that have not received much attention from police, prosecutorial officials, and administrators of forensic laboratories. Among the concerns are:

- General reluctance of courts to fund expert witnesses for indigents who are confronted with scientific evidence
- Usual unavailability of physical evidence in original, unaltered condition for examination by defense experts
- Defense attorney distrust of police organization experts
- Inability of too many defense attorneys to assess properly the importance of scientific evidence and competency of techniques and expert witnesses.

Concerns for the maintenance of objectivity were expressed in terms of a perceived tendency for expert witnesses to identify with either the prosecution or defense rather than to identify solely with the scientific validity of the evidence itself. Whether this is real or only a perceived lack of objectivity was the subject of considerable concern. Many participants felt that an attorney's direct examination and cross-examination skills are significant in affecting both the appearance and the actual objectivity of the expert witness's testimony. Furthermore, the attorney's knowledge of law and science and his tactical skills in the courtroom can largely enhance or attenuate the ability of a scientist to get his message across to the court. The police participants were strongly of the opinion that objectivity is a function of the personality, integrity, professionalism and competence of the witness and not of the organization for which he works.

Several other aspects of the role of forensic science were considered significant. Science is seen as having left behind police, prosecutors, and judges in terms of their knowledge of its capabilities; consequently, police fail to recognize at a crime scene what may be potentially useful as evidence, and prosecutors fail to use effectively that which is available to them. Court acceptance of evidence has many complexities and uncertainties and is obviously affected by a lack of comprehensive research and agreement within the forensic science community regarding the validity and reliability of various techniques, and by poorly prepared attorneys who do not know how to qualify expert witnesses or to introduce evidence into trial.

One of the main problems that inhibits the development and full use of forensic science is the lack of an organized central resource to provide a focus for all those involved in the criminal justice system, act as a clearinghouse for information, and facilitate research. Despite efforts by the Forensic Sciences Foundation, the Federal Bureau of Investigation, regional forensic science groups and others, dissemination of knowledge has remained in the immediate family of scientists and has generally excluded police, lawyers, judges, and educators. This is a very serious problem.

Personnel

This area is somewhat more nebulous than the others discussed. As stated by one workshop participant: "The essence of the argument is that current personnel policies in the forensic science field mitigate against optimal utilization of the current population of scientists."

The primary culprit was stated to be antiquated or nonexistent personnel management policies. The absence of sound operational management was also cited: "Bankers don't wash windows, but scientists wash bottles."

Also cited were the inadequacies of today's education and training programs. This applied both to the scientist and to the user. The lack of a standard career field was recognized as the prime cause for inbreeding in specific laboratories. Without standard career fields, there can be no lateral transfer from one laboratory to another. Additionally, lack of such standards renders the scientist immobile, with the result that the profession cannot respond to geographic shifts in labor demands.

This problem is exacerbated by deficiencies in the formal education and professional training requirements of laboratory forensic scientists. There are no specifications of the demands and requirements for forensic scientists, no minimum standards for employment and promotion, no accepted standards of laboratory practice and, perhaps most seriously, no core curriculum and almost no teachers who are experienced forensic scientists with a broad understanding of the various sub-specialties of the discipline. Until this multiple problem of competency, credibility, and communication between law and science has been solved, the role of the forensic scientist will continue to flounder for want of definition, an identified place in the justice system and personal professionalism.

Deficiencies in knowledge and competency are seen as characteristic of personnel in all segments of the criminal justice system, including the forensic science laboratories. The education of criminal justice personnel is deficient in basic science and the forensic sciences, and the training is deficient both at the outset of careers and during inservice training programs. Further, most criminal justice personnel have no practical means for keeping abreast of advancements in forensic science due to the specialized nature and limited reach of professional journals and the isolation and resource limitations of the thousands of criminal justice agencies that need to be reached.

Of most immediate concern are the deficiencies found by the Forensic Sciences Foundation, Inc., in the recently completed, LEAA-funded proficiency testing project to determine the accuracy and reliability of crime laboratory examinations.

Resources

Resources are defined for purposes of this discussion in terms of the quality and quantity of forensic science services available.

The scientific profession is described as having an abnormal level of inconsistency in the quality of service provided throughout the nation. This inconsistency ranges from variations in quality by a specific analyst to even wider inconsistencies in a specific forensic agency. An attorney will not be "burned twice" by poor quality work; for instance, if the attorney believes that a case is lost due to poor lab work, he will have a tendency to build future cases on other types of information.

The second facet of the resource problem relates to the "spotty" availability of scientific support. Judges and trial lawyers contend that too much of the scientific support is going to the investigative function of the police force. On the other hand, the police say that they have to place restrictions on the cases to be processed by the forensic scientists because of limited laboratory resources. All agreed that the defense counsel was the hardest hit.

Thus, it boils down to a massive contradiction: on the one hand, the users complain that they don't know what the forensic science capabilities are, they don't know where to locate specific talent, and when they do approach the laboratory with a particular evidentiary problem, the talent is unavailable; on the other hand, the scientific profession purports to be underused while being seriously backlogged with cases demanding attention.

It is clear that forensic science operations reflect local leadership, political strength and often arbitrary budget management and, therefore, appear in all guises from the "independent lab," to the police or DA's lab, to the state attorney general's forensic science service, which only serves the prosecution. Contributing to the problem is th, diversity of local, political, and legal systems together with an often obdurate resistance by the forensic scientist to change laboratory practices. This is an untenable situation and will not be rectified until there are carefully organized conceptual models available for the operational design, establishment, and management of forensic science laboratories, including appropriate mechanisms for budget.

All forensic science services are confronted with grossly inadequate resources to provide reliable analyses and testimony in a timely manner when and where needed, if only to the level of using techniques presently acknowledged to be reliable, useful, and necessary. LEAA funds have been used by many states to expand scientific facilities (and have thereby created a nationwide shortage of competent, educated scientists and technicians), and LEAA itself has initiated several research projects. But there seems to be little argument that the resources allocated in both areas (operations and research) are still inadequate. This is particularly acute in the areas of training, education and continuing education of new and existing scientists and technicians. The present shortage of such programs may prove to be the intractable obstacle to resolving other resource issues.

The current situation in the United States contrasts sharply with those of European nations in the use of university and private sector scientific resources and talent, particularly in the employment of university resources. Universities have abundant talent yet have seldom appeared interested or organized in addressing the application of science to legal problems although colleges and universities have eagerly participated in establishing thousands of criminal and social justice courses, curricula, schools and even institutions. Much LEAA funding has supported these programs, without apparent emphasis on science and justice. Many communities

that lack significant scientific resources in a local college or university do have local industry with highly sophisticated analytical capabilities that could be applied to law enforcement problems. Nevertheless, seldom have criminal justice agencies turned to these resources, and no effort exists to organize systematically a program where industrial scientists can assist the justice system. In many cases these resources are more sophisticated, reliable and cost-effective than those the government could deliver, if it were willing to invest in the facilities.

Cost-Effectiveness

The value of forensic science services to the public and the criminal justice system has not been unequivocally shown. There is widespread skepticism in all segments of criminal justice and public budgeting whether the great (and rapidly increasing) costs of scientific services generally produce a convincing benefit. Although physical evidence is used infrequently, prosecutors point to the valuable influence of physical evidence in resolving cases through plea bargaining, which presently dominates the justice process. Science is not only of significant benefit to the justice process by confirming the guilt of a suspect after he has been identified and arrested, but also holds great promise in discovering the identity of a suspect where eyewitnesses or other forms of evidence are absent. Many current research studies, including the Rand study, have concluded that latent fingerprints and other forms of evidence represent significant opportunities for improving the clearance, prosecution, and control of crime.

Scandinavian experience indicates that the extensive analysis of physical evidence at the scenes of "ordinary" crimes is beneficial if, of course, scientific resources are available. Preliminary studies in the United States suggest that cases where physical evidence is used are generally disposed of more quickly, usually through the plea bargaining process. This increased efficiency would immediately benefit our system which, at present, is characterized by excessive caseloads and delays, and thus defeats our goals of public safety, and swift and equal justice. The Institute for Law and Social Research study indicates a much higher conviction rate in cases having useful physical evidence than in those involving no tangible evidence. Preliminary results of a Peoria, Illinois, study indicate that when the number of dwelling burglary crime scenes examined for fingerprints was increased from 31 percent to 62 percent (or doubled), the rate of recovery of prints remained constant. In other words, the rate of recovery of physical evidence from crime scenes is only limited by the resources that law enforcement agencies direct to the crime scene investigation function. The goal of the Peoria program, says Chief Allen Andrews, is to reach more than 90 percent of dwelling burglary scenes to search for latent prints.

In summary, there is accumulating evidence to support the theory that major expansion of forensic science services would not only return benefits comparable to the investment, but might result in a reduction of costs in other areas of the criminal justice system.

Forensic science administrators have little control over priorities for the use of their resources and have suffered from the diversion of talent and time from the examination of evidence from Part I crimes to drug and alcohol analysis

which together typically represent 50 percent or more of the analyses performed. To the extent that this large caseload has not been alleviated by automated analytical methods employing technicians rather than scientists, there has obviously been a serious decline in service, a waste of resources, or both.

The forensic science administrator suffers from the same basic difficulty in determining cost-effectiveness as do other criminal justice administrators, namely, the absence of a uniform data management supporting system. Without such a system one lacks the ability to track cases economically through a variety of agencies employing different methods and resources, and this prevents the comparison of data from various jurisdictions employing differing practices and resources. The LEAA-sponsored Uniform Data Reporting System for Crime Laboratories may be a significant step in this direction. The work of the American Society of Crime Laboratory Directors in management reporting also points in the direction of standardized case reporting and outcome measurements.

Physical Evidence Collection

The last cause for underuse of the available services of the forensic sciences relates to the perplexing problem of physical evidence collection. The research literature is replete with proof of how little of the available physical evidence is collected and, of that which may be collected, how little is actually delivered to the forensic sciences agency for analysis.

In defense of the collection effort, those who turn in evidence cite case after case of what little value it is to do so. Either the evidence is not processed, and is only examined after great delay, or the forensic laboratory cannot provide the answers to questions the investigator asks, for instance, did this evidence originate from a particular suspect?

In part, this is a classical case arguing for a comprehensive systems analysis--as opposed to traditional components studies that focus on the laboratory, the police, the prosecutor's office, or the courts individually and not as a total system.

PROBLEM SOLUTIONS

There will be no solution to the forensic scientist competency problem until formal educational requirements and standards for employment and professional practice are promulgated and recognized in both the academic and justice communities. The solution rests in the establishment of criteria for academic core curricula and requirements for professional certification of forensic scientists. Continuing education and proficiency testing must also be considered. Approved laboratory methods and techniques must be documented, and guidelines for employment, career growth, and retention established. In addition, the appropriate use of expensive, sophisticated laboratory equipment should be defined as part of the solution. Efforts must be made to attract experienced, practicing forensic scientists into academia to teach the theory and skills required; any scientist-educator is not adequate.

Competency of lawyers and others who interact with the forensic scientist can be solved by addressing the problem of communication and interdisciplinary debate concerning the application of science to criminal justice. Forums conducted at local, state and national levels to facilitate regular working sessions with judges, prosecutors, defense attorneys, law enforcement officers and scientists as participants are essential. The frank sharing of knowledge, opinions and practical problems in these forums would be an eloquent answer to the current mute situation. This activity should include dissemination of pertinent legal and scientific decisions, advances and other technical information relevant to both lawyers and scientists.

Communications

There exists an immediate need for a "formal media" program to explain the state of the art in forensic science to users and the public. Newsletters, prepared in an informal, easily readable format, are needed. Less technical reference texts, which would advise the reader of information on what the forensic scientist can do, rather than on how his methods perform, would be welcomed by police, attorneys, and judges.

There also exists a need for greater communication among forensic science degree programs and institutions of higher learning in law and criminal justice. Core curricula introducing each other's professions must be developed and adopted. At the more practical level, law enforcement training academies require a "core forensic science curriculum" to satisfy entry-level needs of new recruits.

At the continuing education and training level, the following types of programs are desirable:

1. Annual Conferences - to bring the latest information on forensic science to law enforcement and legal practitioners.

2. Speakers Bureau - forensic scientists to speak before various interested organizations.

3. Audio-Viscual Library - a lending library of tapes to describe procedures for the collection, examination, and presentation of scientific evidence.

4. Roll-Call Material - short (five minute) presentations to be given to police officers during roll call.

Professional societies should strive to develop cross-membership procedures which would yield an automatic privilege to professionals who belong to either a scientific or legal/law enforcement organization to attend the other's conferences.

The forensic science profession must also examine efforts made by other scientifically based industries to communicate highly technical problems and solutions to nonscientists. The defense industry was cited as one primary example. The current "science court" experiment by the Department of Commerce, which is intended to resolve scientific dilemmas prior to their consideration by policy makers, should also be reviewed as a mechanism to address and communicate to users the advantages and disadvantages of scientific tests.

The language barrier can be removed if scientists will strive to speak in terms that are understandable and meaningful to nonscientists. To insist upon using scientific or medical language only will only result in the frustration of both parties. Likewise, the attorney must consciously make an effort to instruct the scientist in the points of law related to the scientific evidence to be presented. Frank discussions and an added measure of honesty on both sides will improve the relationship considerably.

There are a variety of additional steps that can be taken to improve communications:

1. Forensic Science Reference Services - at the national, state, and local levels, these services can aid the user in finding appropriate, competent forensic assistance.

2. Distribution of Professional Society Rosters - these registries can often provide quick and convenient aid to the practitioner in need of a forensic scientist.

3. Regular Scientists/User Meetings - such conferences can be significant in reducing language and philosophical barriers and serve as a practical procedure for communicating needs and results.

4. Formal Feedback Techniques - the conferences and other written feedback provisions must be formalized, to the extent that police and attorneys are required to provide feedback to the laboratory on all cases nvolving scientific evidence, not just on those where service was exceptionally good or bad.

5. Mandatory, Pre-trial Conferences - if there is one complaint that forensic scientists voice most often, it is the failure of the attorney to meet with the scientist in advance of the trial date. Such meetings are needed to eliminate any misunderstandings or false expectations regarding the scientific evidence to be presented and how the expert is prepared to testify.

Conceptual Models

Careful study resulting in the provision of flexible, conceptual models for the development and subsequent operation of forensic science systems is one solution to the present haphazard structure of forensic science laboratories and their ill-defined role. Although, ideally, one comprehensive model could suffice, several models may be needed to satisfy the wide diversity of local governments and their law enforcement practices. To be successful, the models must account for space, equipment, personnel, operations, and fiscal management, and the functional relationships between the laboratory, police, courts, prosecution, and defense and other local agencies. They must include a means for evaluating effectiveness and maintaining acceptable standards satisfactory to both the scientist's peers and the legal professionals who use the service.

Role and Expectations

The acceptance and ultimate understanding of the role forensic science has to play in the justice process depends upon the components of the criminal justice system functioning as effective, interrelating parts of a total system. This will require a common understanding of agency goals, objectives, and philosophical and constitutional constraints; all components of the system must have mutual regard for each agency's priorities, resources, and practices.

Organizational Location

The solution to the problem of location may be related more to "turf" issues and politics than to strict problem analysis and solutions. It would appear that an evolutionary approach may be the "solution." As resources, professionalism, parity, objectivity, standards, quality control, and demonstrated cost-effectiveness develop and produce their desired effects upon forensic services, the need for change in organizational relationships may become obvious and evolve by consensus. Location in independent state or federal facilities, in the courts, universities, or other institutions, are some of the possibilities being discussed. Each of these alternatives carries with it the potential for both advancement and serious controversy. Forensic science at this stage of its development may benefit more from harmony and consensus among criminal justice component agencies and receive greater immediate and lasting benefit from such relationships than from "confrontation" politics. Controversy and power struggles which could easily be provoked in an effort to change the existing organizational locations of forensic services in each state may be counterproductive.

Parity

The problem of providing equal forensic science service to both prosecution and defense has no easy answer, especially in the present organization of the justice system in which, almost invariably, the laboratory is administratively controlled by the prosecution. Consequently the laboratory is difficult for public defenders to use and virtually impossible by trial attorneys in private practice. A solution must be found, however, and restructuring the function of the laboratory must be considered as one possibility. Another possible solution is to develop a

separate forensic science service for the defense; but perhaps a better alternative is to relegate the service directly to the courts both for use by them and attorneys. The solution must provide funds for scientists called by the defense, the means for complete discovery of all scientific evidence, and guidelines for mutual consultation between "opposing" forensic scientists.

Other solutions to the parity problems are:

- Increased resources for laboratories
- Court ordered funding for adequate defense expertise
- A professional standards practice established by laboratories and forensic scientists to preserve, unaltered, an adequate portion of physical evidence for possible use by defense forensic experts, whenever the quantity of the evidence and the nature of the essential analysis permit.

Personnel

Competency of Personnel

An increase in the knowledge and competency of criminal justice and forensic science personnel may be accomplished by many of the same measures used in any other environment or discipline. However, certain measures appear preferable given the criminal justice framework within which forensic science must serve. The solutions briefly described below have one thing in common: the need for a "moving spirit" together with adequate resources. It appears that most of these suggestions would be best implemented at the federal level as a matter of national criminal justice policy, but not necessarily through a federal agency. Generous federal financial support of a strong professional organization to provide a widespread and comprehensive program of training, communication, consensus building, standards formulation, and enforcement through professional licensing would, over time, be a stronger and superior alternative to a federal agency program.

Solutions felt to be of immediate and obvious benefit are:

1. Publication and widespread circulation of state of the art manuals, quick references, technical and analytical procedure references tailored to the differing interests and concerns of the various criminal justice audiences
2. Wide distribution of checklists, evidence kits, and protocols oriented to individual crimes or classes of crimes with similar physical evidence recognition, collection and preservation characteristics
3. Self-administered teaching and testing aids using video and other audiovisual techniques and tailored to the differing criminal justice audiences

4. Distribution of appropriate information to all journals, newsletters, magazines and training organizations of the police, prosecution, defense, court agencies and professional societies so that they may easily insert accurate and reliable information on forensic science developments into their communication and training networks

5. LEAA and state sponsorship of interdisciplinary training and problem-solving and consensus-building conferences for operation and management personnel at the local and state criminal justice level--this would be aimed at building support for research, quality assurance programs, and increased use of forensic science services

6. Development of specific training programs on analytical techniques and protocols for forensic science personnel in those jurisdictions with less crime and less scientific sophistication

7. Increased LEAA sponsorship of research to refine existing techniques and develop new applications of science to the needs of the justice system (The presently small LEAA forensic science research program is just enough to tantalizingly create visions of what a large scale, comprehensive program might accomplish.)

8. Development of standards for forensic scientists and technicians that can be used for certification or organizational training and quality control purposes.

Personnel Management

Organizations such as the American Society of Crime Laboratory Directors and American Academy of Forensic Sciences, must take a strong interest in personnel management problems. A national school for managers, such as the FBI training program for managers, should be encouraged. Free of charge, the AAFS or FSF could gather literature on such topics and disseminate it to its members and constituent agencies.

Career Development

In response to an earlier defined problem of inadequate career development programs within forensic science laboratories, the following suggestions were offered:

- Creation of Forensic Science Personnel Standards Boards - These boards would be similar to the state police professional advancement entities which formulate career advancement guidelines for law enforcement officers.

- Implementation of Voluntary Personnel Policy Standards - Such measures would include provisions for lateral transfer and would be taken by individual laboratories throughout the United States.

Essential Human and Physical Resources

Solutions to the presently inadequate level of funding for forensic science services appear to be:

1. Improve the effectiveness of forensic science administrators, many of whom appear to be scientists or technicians promoted out of their level of professional competence into a level of administrative incompetence, at least with respect to their entrepreneurial abilities. No outside forces can (or are likely to try to) substitute for the inherent responsibility and obligation of the forensic science administrator to establish the necessary support for and belief in his laboratory's services.

2. Encourage and make it professionally stylish and progressive to develop and use local and regional facilities and expertise in industries and universities, before attempting to finance procurement of expensive resources through taxes. Routine purchase of services from these sectors has been completely neglected as a means of securing significant, continuing assistance and used only occasionally in unusual and rare cases.

3. Determine whether the forensic science services being used in court proceedings are reliable and adequately available to serve the needs of justice and the courts' concern for finding the truth. The judiciary should order provision of such services in individual cases, thus putting continuing pressure upon forensic science administrators, legislators, and law enforcement officials to cooperate in securing the necessary quantity and quality of services.

4. Draft legislation that would require that only proven physical evidence techniques are used and that the scenes of certain mandated crimes are examined for evidence and the evidence analyzed. There are all too many cases tried in this wealthy nation where guilt remains in doubt because basic physical evidence investigations have either not been conducted at all or have been conducted unsatisfactorily with respect to existing police and scientific standards. This should be remedied in the interest of enhancing the quality of justice throughout the nation.

5. Formulate economic and scientific standards to determine the costs and types of forensic services required in various local, regional and state jurisdictions. Wide dissemination of these standards plus a strong rationale supporting them might convince the public and government officials of what needs to be done and how it should be organized. LEAA, the State Planning Agencies administering LEAA block funds, legislative and congressional bodies, and the executives at various levels of government could then develop a sense of their responsibilities and a factual rationale for them.

6. Reallocate existing manpower resources so that scientists are available for more sophisticated problem solving. Two suggestions are: a) the automation of routine identification problems, and b) the use of technicians for routine work.

7. Experiment with alternative procedures to cut court time and delays, including closed circuit video presentations of testimony and greater use of written depositions. Greater effort at the legislative level would establish the acceptance of properly documented, proven methods of analysis, as in current "driving while intoxicated" situations.

8. Establish a central resource facility for all those needing information and assistance in forensic science. This facility could conduct essential basic and applied scientific research and provide reference materials for the benefit of all forensic scientists. This is perhaps the only reasonable solution to the currently woeful lack of intelligence stressed by all group members regarding the need for improved interdisciplinary appreciation of the scope of forensic science. The facility should encompass a professional registry for each discipline in forensic science; identify lawyers, educators, and law enforcement personnel with special involvement in forensic science, collect and disseminate reference data; and publish position papers on topics relevant to all professionals in the field. LEAA support of such an enterprise appears to be essential.

9. Distribute public information material and programs designed to increase citizen awareness of the realities and needs of forensic science services.

Other steps to improve resources are:

- Encourage the courts to mandate the use of forensic science services
- Assign the forensic science function to the courts
- Provide the courts and public defender offices with a forensic science audit capability.

Quality of Service

Certification Procedures - All groups expressed their wholehearted support of present efforts to establish certification boards in all the forensic science disciplines. Participants wanted it to be on record that LEAA financial support must continue until the certification boards are all clearly self-sufficient. Other certification efforts have failed because financial resources were withdrawn too soon.

Accreditation - The accreditation of laboratory facilities, currently being addressed by a committee of ASCLD, must also be given priority funding by LEAA and full support of the profession.

Curriculum Standards - There is an urgent need for curriculum standards to correct problems resulting from the great variety of forensic science degree programs in existence throughout the United States.

Proficiency Testing - The past LEAA-funded studies have documented the value of such quality control procedures. All forensic science services must develop their own inhouse quality control programs and preferably participate in external, nationwide testing programs.

Cost-Effectiveness/Value

The solution to questions as to the worth and preference of different resource alternatives can lie only in adequately financed research and demonstration projects by LEAA. The most immediate concerns should be:

1. Discovering the optimal operating procedures and communicating the means for achieving them to officials throughout the United States. An example is the effort by the Police Executive Research Forum in the use of decision models for burglary investigation decisions and identifying in its preliminary results, wide variations in investigative methods used and outcomes achieved.

2. Finding what the cost-effectiveness of more "esoteric" techniques might be, such as widespread application of trace evidence analysis, and determining in which crimes this added investment of scientific effort would be most productive.

3. Evaluating the use of physical evidence in terms of increased clearance rates for crimes having the greatest impact upon public safety, public confidence in the criminal justice system, and the ability of government to protect citizens from crime.

4. Instituting and improving, as needed, a uniform data system for forensic science laboratories and management analysts.

5. Exploring whether certain forensic science laboratories, functions, and techniques need a "zero base" study of their basic usefulness and validity.

6. Developing and disseminating standards for the use of acceptable and valid methods of analysis and appropriate crime scene activity so that administrators and legislators may judge the quality (in the sense of adherence to standards) of police and laboratory organizations.

7. Researching and identifying analytical techniques in the various sciences that might have "high payoff" potential if suitably employed; these results must then be disseminated to the criminal justice and forensic science communities.

Recognition and Collection of Physical Evidence

Solutions to the current situation in which only a small percentage of crime scenes are adequately investigated for physical evidence are:

1. Increasing attention to introductory and continuing education programs for law enforcement personnel in crime scene search and evidence collection.

2. Relocating the crime scene function to the crime laboratory so that the crime lab director might have greater control over evidence being collected and submitted for analysis.

3. Simply increasing resources in the crime scene search area so that a greater percentage of crimes receive a competent investigation. Studies have documented the presence of physical evidence at most crime scenes, but this will not benefit our system of justice unless it is recognized, collected, and preserved.

Justification of Forensic Sciences

- Perform studies to prove factually the value of the profession in all facets of the criminal justice process

- Establish procedures whereby "users" document their unfulfilled needs for forensic science work

- Generate empirical data on the contribution made by the profession

- Create public interest through such devices as high visibility for crime scene technicians

- Establish meaningful dialogues on a regular basis with budget decisionmakers, legislators, and administrators.

STRATEGIES

Procedures, techniques, and a variety of approaches by which the proposed solutions could be achieved were carefully examined and debated by the groups. The following is a synopsis of ideas but by no means a total report of all the suggestions made. Funding for the proposals was not discussed as the primary issue, partly because it seemed to put the cart before the horse, and partly because it was assumed that LEAA/NILECJ would be responsible at the national level and that many different governmental means would be used locally.

The discussions constantly returned to the need for standards. The direct and indirect benefits to be expected from well-financed research on standards, as well as a development and implementation program were raised whether the discussion centered upon problems, solutions, or strategies.

It appears that the development of interdisciplinary standards can be regarded as something of a broad "universal" strategy, in that such standards can be the basis for a wide variety of more specific and narrowly targeted strategies. Therefore, standard setting and implementation appear as the first item for each problem area. Several substrategies are involved:

- The Forensic Sciences Foundation should be funded by LEAA to conduct the research leading to an interdisciplinary standards-setting process, including effective voices from various components of the criminal justice system.

- Legislatures should mandate adherence to the FSF standards, suitably modified to meet the great diversity among the states.

- LEAA should mandate block funding support by the states to implement the state-modified FSF standards.

Communication and Coordination

The best strategy for promoting general competency and understanding by all disciplines, particularly the legal profession, is for laboratory directors, judges, district attorneys, public defenders, and police chiefs to take the lead (actively encouraged by NILECJ) in developing regular local meetings to discuss forensic science services, both new developments and problems. This should become routine. This very practical approach should be supplemented by state and special national workshops; this would then logically lead to solving the problem of a central resource facility. As previously stated, the facility could provide for distribution of information to the profession. The Forensic Sciences Foundation, working in coordination with the National Trial Attorneys and Judges Association and the International Association of Chiefs of Police, would seem to be the obvious choice. They could provide indexed "newsletters," concise authoritative bulletins, an abstract service, and even a forensic science wire-service through the National Criminal Justice Reference Service. As a beginning, existing

professional newsletters could be supplemented with forensic science information. Additional and helpful, but more ambitious strategies could include cross-membership in appropriate professional societies and the creation of a position for a forensic science liaison officer to the courts. If these proposals were followed, then in a short time and for relatively little costs, education of forensic scientists could be dramatically improved and the competency of all professionals involved would be enhanced.

Constituency Building and Political Tactics

The forensic sciences must woo, win over, and constantly nurture constituents. The effort should be limited but intense. Of primary importance is the need to cultivate a close association with the judiciary. An entity such as the Forensic Sciences Foundation could initiate an association by offering orientation courses and state-of-the-art seminars that could be held at meetings of the many legal associations. These courses must become regularly scheduled affairs. It is suggested that this will be the only way that the forensic sciences will convince the courts to become activists in mandating the increased use of the sciences. This effort must be carried on nationwide.

Of equal importance is the need to develop a strong tie with law enforcement agencies. The same orientation procedure could be followed as with the courts but, in addition, law enforcement officials should be briefed regularly on all forensic science services available in their area and on those that could be made available.

Other constituents to be approached--on a lower priority--include district attorneys (local level), defense counsel (especially by offering service at a reasonable price), government administrators, and victim organizations.

The forensic sciences should take public positions on current issues through professional associations. As an example, if capital punishment is widely restored, much greater reliance should be placed on the establishment of scientific fact and on the use of expert opinion, even to the extent that some tests be made mandatory.

Parity Development

The procedure by which parity of services can be provided to both sides in the adversary court system can only be implemented at the state or county level. It cannot be ordered effectively from Washington; it must evolve from a resolution by law enforcement chiefs, lawyers, and the local judiciary. Using state and county funds, such a group must study the problem and establish a mechanism for creating parity. Certainly the federal government could undertake a survey of current practices to confirm this need and identify those areas in which a uniform approach might be feasible. Separate "defense labs" would be wasteful and uneconomical, but establishing laboratories (approved through the Attorney General's orders), administratively independent of either arm of the law and serving the courts directly is possible, in which case the local steering group would be charged with defining operational guidelines for the laboratories.

LEAA's Role

The leadership of the forensic science community should conduct regular briefings for a wide selection of LEAA officials. The topics should be within the framework of LEAA's responsibility in this area: establishment of the forensic sciences in one of the priority programs; special support for research and development; education and training requirements; allocation of specific sums from discretionary funds; evaluation and review grants, etc.

Currently, it is felt that briefings should stress the need for continued support of certification, original support of accreditation, and continuing education of the professionals in the field.

The profession's voice must be unified and persuasive. It is noted that forensic scientists do not appear to believe the old adage about the squeaky wheel getting the grease. That is the ONLY way Washington agencies work!

- Education and Training Task Force

A task force should be established through LEAA and the Forensic Sciences Foundation consisting of scientists drawn from the American Academy of Forensic Sciences, who have primary academic positions and forensic science laboratory experience, for the purpose of defining the necessary educational requirements for forensic scientists, particularly for criminalists and toxicologists. Some specialties such as forensic pathology and jurisprudence are already defined. The task force would also serve as an advisory council for colleges and universities wishing to prepare students for careers in forensic sciences. As a beginning, those universities that already have scientific degree programs with potential core curricula would be identified. Similarly, a program to identify students suitable for forensic science training could be started. First and foremost, the students would graduate as educated scientists. Following university graduation, they would undertake a residency in one or more forensic science specialties culminating in certification through Board examination. Continuing education requirements, proficiency testing, and re-certification would also be considered by the task force. Accreditation of laboratories would ultimately be important and should be considered through the same mechanism with the American Academy of Forensic Sciences and FSF playing a major role.

- Operations Research Task Force

The development of conceptual models for the forensic sciences is essential as a means of ensuring rational, responsible operations in the justice system. It can only be achieved by an operations research task force. LEAA could contract with a research corporation which would engage the services of senior forensic scientists and other professionals concerned with criminal justice to accomplish the task. The models would include everything from laboratory design to service demands to requirements and evaluation procedures, but would remain sufficiently flexible to be adapted for application by small, neophyte laboratories and by large, urban full-service operations. This approach would eventually bring uniformity to professional practice without mandating physical structures and operational designs too rigid to allow for local needs and different emphases.

A start could be made by building on existing models and applying principles used in highly respected and successful laboratories to newly developing operations. LEAA might consider establishing a model laboratory system in an area that demonstrates a need for a service but which does not currently have one. This would require careful identification of local political factors that influence forensic science operations so that the conceptual models would allow easy translation into practice.

- Research and Development

LEAA must continue its financial support of basic and applied research projects to further characterize physical evidence. This research must continue so that forensic laboratories have the techniques necessary to examine evidence and to develop the information needed by police and judicial decisionmakers.

- Forensic Science Clearinghouse

LEAA should look into the possibility of establishing a clearinghouse for all those needing forensic science information and assistance.

- Cost-Effectiveness

LEAA should fund research to define the costs and benefits of the various routine functions of forensic science services.

- Knowledge and Competency Summary

1) The research, development and implementation of standards for the profession must be initiated and supported.

2) Professional forensic science groups should develop a self-assessment mechanism tied to continuing education programs.

3) LEAA should continue to fund the FSF for five years and institutionalize a certification/recertification program with effective complaint and review mechanisms.

Summary of Strategies to Address the Problem of Inadequate Resources

1) Technically assist forensic administrators in public relations constituency building and budgeting skills through executive development training.

2) Distribute an executive summary of this conference to the legislative and executive officials of the various levels of government and accompany it with material factually describing the most urgent needs and benefits.

3) Publish (in widely circulated media such as Parade, or Reader's Digest) articles on the actual state of forensic sciences to educate the public. This tactic has had demonstrable influence in sensitizing the public to other issues such as rape, equal opportunity, crisis

intervention techniques, alcoholism and drug support programs.

4) Arrange for the "Quincy" television program and the various other police television programs to present realistically forensic science services in the United States.

5) Develop local interagency, interdisciplinary forensic science meetings and councils, on a continuing basis, to facilitate local problem solving and develop consensual support for state and national efforts.

6) Seek monetary support from private foundations for the development of training materials. Many foundations will support one-time efforts of this nature if shown the need and potential benefits.

7) LEAA should enlist the support of other relevant federal agencies such as Health, Education and Welfare to encourage interest among their program beneficiaries and constituents in making their scientific resources widely available.

8) LEAA should sponsor additional workshops and conferences of an interdisciplinary nature to continue the work of this conference and to develop strong consensus and support networks between criminal justice, legislative, and budgeting officials.

9) Compile a directory that lists the analytical capabilities and experts available for consultation. This could probably be developed with enthusiastic leadership and support from industrial and trade associations if they were suitably approached.

Forensic Science Leadership

The profession must govern its own destiny. It will not be properly steered by local hierarchical heads or by well-meaning but remote administrators.

Forensic scientists can begin asserting this leadership by preparing position papers on issues that directly affect the profession. These papers would be the "talking" papers in all contacts with legislators and other officials.

The leadership must actively support its representative(s) in LEAA by providing substantive material in a timely manner.

The leadership must take the initiative in designing alternative ways to deliver forensic science services. As an example, the MITRE study on criminalistics should be reviewed again and revised as necessary by knowledgeable forensic scientists.

The leadership must face up to its unacceptable record concerning the support of forensic science services for the defense. Such support--at a reasonable cost--must include advisory and analytical services. (Because the authorized fees allowed for professional services are so low, the leadership

must concurrently back the efforts made by others for budget increases in this area.)

The forensic science profession must be ever vigilant of its placement in and relationship to the criminal justice system. It must set the course for its own future, for if it becomes indifferent or incapable of acting, someone else will take the leadership role.

VII. PANELISTS' CLOSING REMARKS

Panelists: E. Wilson Purdy
Joseph L. Peterson
Joseph S. Keefe
Oliver Schroeder, Jr.
Richard H. Ward
E.J. Salcines

Mr. Purdy: Most of the issues have been discussed thoroughly and I would like to state how much I have enjoyed this conference. Forensic science is underutilized. There is a general lack of understanding among police executives as to what forensic science can do for them. On the other side of the coin, the forensic scientist must also try to "sell his product." There is a responsibility on the part of the scientific community to encourage the police executives to use the facilities available to them. There are several notable failures in the justice system: 1) totally inadequate laboratory, budgetary support; 2) a judiciary that has failed to mandate the use of science; and 3) failure on the part of the prosecutor to utilize forensic assistance. Additionally, there are deficiencies in the areas of qualified scientific personnel and quality control programs.

The so-called police laboratory is not a forensic laboratory as it should be. The scientific approach to crime solution is grossly lacking and, as a result, the typical crime investigation report is also sadly lacking. Obtaining an adequate budget is a problem which must receive careful attention if improvements are to be made.

In-service training programs are needed for all law enforcement personnel. There is also ineffective use of nonsworn, civilian personnel in forensic laboratories. Often times, salaries are so poor that it is not possible to attract qualified civilian personnel to the laboratory. Consequently, police personnel end up doing the work, at a much higher total cost to the police agency.

Dr. Peterson: I have six points which I would like to make:

(1) Quality of the examinations performed in the laboratory must be improved and monitored through ongoing proficiency testing programs.

(2) Fairness. Forensic science services must be available equally to all parties in a criminal case.

(3) Effectiveness. Appropriate reporting procedures and measurements must be available to determine the value and contribution of forensic science to the administration of justice.

(4) Increased Utilization. Forensic science services should be used more, with the result being the expanded contribution of science to the justice system.

(5) Research and Evaluation. The forensic scientist will only be able to provide the system with clearer and more definitive answers if better methods and analysis procedures are developed.

(6) Communication. We must try to communicate information not only to fellow forensic scientists but also to the entire criminal justice community.

Mr. Keefe: I found the workshop to be enjoyable and extremely beneficial. I was overwhelmed by the agreement among the interdisciplinary discussion groups in their definition of problems, solutions, and strategies. One of the most significant areas of universal agreement was in the area of funding and the need to establish improved financial support of forensic science services. Again, I would like to underscore the fact that there existed virtually total agreement among participants as to what needs to be done to upgrade the forensic sciences and improve their service to the justice process.

Professor Schroeder: Our goal is greater and better use of forensic science. That is why we are here. The judge is the key to the achievement of that goal. He opens doors. He determines whether or not an opinion is overruled or sustained. That is a very crucial decision. The judge has the responsibility to administer justice. He has accepted the reformation of our whole judicial system.

What should judges do? Judges should use the Sixth Amendment for the forensic sciences. The judge can order that the defendant be given the services of a forensic scientist. This is a tool that the judge can and should use.

How does a judge do it? By ordering examinations. Why should the judge do it? The judges are up to their necks in criminal cases and this is a way they can move cases more quickly and efficiently.

When should it be done? Is there any better time than now?

Dr. Ward: I have some very brief comments.

There are a limited number of educational programs in the forensic sciences. The curriculum is poorly defined and is sadly lacking. There is a poor literature base and I also think there is a lack of confidence in the graduates of the few existing programs. The British educational approach seems to be working very nicely and I think it would be to our benefit to investigate its applicability to our special problems.

Communication is a severe problem and the need for professionalism is great. I might add that there is sometimes a tendency to blame LEAA for all the inadequacies in our system but, of course, that is grossly unfair. LEAA will be a key in the improvement of the forensic sciences, though, for if we want to improve this area of study we shall need more funding and we will have to turn to LEAA for assistance.

Mr. Salcines: First, I would like to make a few comments in behalf of Bob Leonard who is preparing the prosecutor's perspective paper for inclusion in the workshop report. Bob correctly recognizes, as all of us should, that the best forensic laboratories can never operate successfully unless the people

in these laboratories are the very best. He goes on to state that he would like to see a center for scientific laboratories so that lawyers, judges, and police could use such a resource as a clearinghouse for information on the forensic sciences.

My observation as a prosecutor is that the average caseload is very heavy. The constant chronic problem is that prosecutors do not have the training to utilize crime laboratories adequately. The following categories are being used minimally, but not to their fullest: firearms and ballistics, drugs, handwriting examinations, fingerprints and palmprints, semen, hair, pathology, and psychiatry.

Another problem we see as prosecutors is poor politicking on the part of forensic scientists, resulting in their failure to secure adequate budgets and administrative support. They need an education in how to get more revenues and funding for their laboratories. I am very pleased to see LEAA taking a stand in the funding of the forensic sciences.

Dr. Peterson: This concludes our workshop on forensic science services and the administration of justice. This was a landmark workshop and one which has proven to be very rewarding. I would like to thank the Law Enforcement Assistance Administration for sponsoring it and to thank all of the participants for their support and contributions.

VIII. CONCLUSIONS AND SUMMARY

Forensic scientists recognize that their examinations and findings are only as valuable as the degree to which they can be used by other decision makers. The scientist is part of a process which most often begins with the commission of a crime and its report to the police. Immediately, the recognition and preservation of the evidence must be capably performed if the scientist is to offer any assistance whatsoever.

Upon completion of the laboratory examination, information, explanations, and opinions will be offered to police investigators, prosecutors, defense attorneys, judges, and juries in order to assist them in making decisions:

- Was a crime committed?
- Should a suspect be arrested?
- Should a suspect be released?
- Shall we prosecute?
- Shall we plea bargain?
- Is the defendant guilty or innocent?

The scientist is dedicated to providing the most complete and objective information within his capabilities so that decisions can be made quickly and fairly, minimizing the chance for error in the justice process.

The forensic sciences are maturing rapidly--the scientific community is confronting problems of quality and competency of its members in a far more rigorous fashion than previously. We are on the brink of a new and exciting period in the forensic sciences in which we will be able to offer the legal system more accurate and complete information than ever before.

But what we can do <u>within</u> our field is only half the task; the other half is dependent upon the competencies of legal practitioners in using scientific information.

Forensic scientists have chosen careers that they recognize involve special skills and added responsibilities. They are bound by the procedures and ethics of both science and the law. Forensic scientists believe in their profession because of their ability to make a unique contribution to the justice process. Scientists may at times seem befuddled with the system of justice because they know that with better resources they could be making an even greater contribution and making the tasks of police officers and courts less frustrating and more streamlined.

The evaluations submitted by participants in the Special National Workshop confirmed that it was an unqualified success. Still, the workshop itself is only

the beginning of an intensive national effort to establish dialogue and to exchange information between forensic scientists and legal practitioners. Judges, attorneys, police officers, and forensic scientists alike must all share the responsibility of seeing that the potential solutions and strategies described in this report are acted upon by their respective agencies. Only in this fashion can we hope that the justice process takes maximum advantage of the knowledge and procedures of the forensic scientist.

APPENDIX

- Listing of Participants
- Workshop Agenda

Special National Workshop
on
Forensic Science Services and the Administration of Justice

Kenner, Louisiana
March 22-23, 1978

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Forensic Science Services-2
Kenner, Louisiana
March 22-23, 1978
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Kenner, Louisiana
March 22-23, 1978
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Ethel Foster, Secretary
Special National Workshops

Jake Roberts, Director
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Ty Hodanish, Manager
Special National Workshops

AGENDA

Special National Workshop
on
Forensic Science Services and the Administration of Justice

Kenner, Louisiana
March 22-23, 1978

TUESDAY EVENING, MARCH 21

8:00 - 10:00 p.m.	REGISTRATION AND RECEPTION (North Room)

WEDNESDAY, MARCH 22

8:15 a.m.	MORNING REGISTRATION (North Central Room)
8:45 a.m.	WELCOMING REMARKS Paul Estaver National Institute of Law Enforcement and Criminal Justice, LEAA
	WORKSHOP OVERVIEW Dr. Joseph Peterson (Workshop Chairperson) Executive Director The Forensic Science Foundation Washington, D.C.
	John Sullivan National Institute of Law Enforcement and Criminal Justice, LEAA
9:30 a.m.	OCCUPATIONAL GROUP MEETINGS "Problem Identification"
10:30 a.m.	COFFEE BREAK
10:45 a.m.	PLENARY SESSION Group Reports and Synthesis of Problem Identification
11:30 a.m.	INTERDISCIPLINARY GROUP MEETINGS "Problem Causes and Priorities"

WEDNESDAY, MARCH 22 (cont.)

12:30 p.m. — LUNCH

Luncheon Presentation
"The People vs. Hitch Case: Inadequacy in Communication in The Forensic Sciences"
Dr. Kurt M. Dubowski
Professor of Medicine
University of Oklahoma
College of Medicine
Oklahoma City, Oklahoma

1:30 p.m. — PLENARY SESSION

Group Reports by Workshop Reporters
Reporters:

Group I
Bryan S. Finkle
Director
Center for Human Toxicology
University of Utah
Salt Lake City, Utah

Group II
Allen H. Andrews, Jr.
Superintendent of Police
Peoria Police Department
Peoria, Illinois

Group III
Kenneth S. Field
Vice President
FISA Corporation
Colorado Springs, Colorado

1:45 p.m. — KEYNOTE ADDRESS

"Driving Spikes with Tack Hammers"
George O'Connor
Commissioner of Public Safety
Troy, New York

1:00 p.m. — QUESTIONS AND ANSWERS

George O'Connor
Bryan S. Finkle
Allen H. Andrews, Jr.
Kenneth S. Field

2:30 p.m. — INTERDISCIPLINARY GROUP MEETINGS

"Solutions"

4:30 p.m. — ADJOURNMENT

THURSDAY, MARCH 23

8:45 a.m.	PLENARY SESSION Group Reports by Workshop Reporters
9:15 a.m.	INTERDISCIPLINARY GROUP MEETINGS "Strategies"
11:00 a.m.	PLENARY SESSION Group Reports by Workshop Reporters
11:15 a.m.	INTERDISCIPLINARY PANEL DISCUSSION

E. Wilson Purdy (The Police Perspective)
Director
Dade County Public Safety Department
Dade County, Florida

Dr. Joseph Peterson (The Forensic Science Perspective)
Executive Director
Forensic Science Foundation
Washington, D.C.

Joseph S. Keefe, J.D. (The Defense Perspective)
Smith, Smith, Mettling & Keefe
Torrington, Connecticut

Oliver Schroeder, Jr. (The Judicial Perspective)
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University of Illinois at Chicago Circle
Chicago, Illinois

Robert Leonard (The Prosecutor Perspective)
Prosecuting Attorney
Genesee County
Flint, Michigan

George O'Connor
Commissioner of Public Safety
Troy, New York

11:45 a.m.	QUESTIONS AND ANSWERS
12:30 p.m.	WRAP-UP AND ADJOURNMENT

END