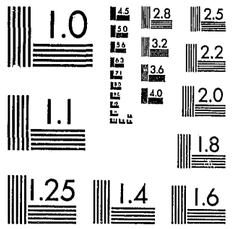

MFI

Calspan

Technical Report

Calspan Corporation
Buffalo, New York 14221

Formerly Cornell Aeronautical Laboratory, Inc.

Calspan

ANALYSIS OF CRIMINALISTICS LABORATORY EFFECTIVENESS IN CRIMINAL JUSTICE SYSTEMS

VOLUME I
THE USE OF PHYSICAL EVIDENCE EXAMINATION IN INVESTIGATION OF CRIMES

August 1974

Calspan Report No. DC 5414-X-1

by

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Computer Systems Department

On November 17, 1972 Cornell Aeronautical Laboratory (CAL) changed its name to Calspan Corporation and converted to for-profit operations. Calspan is dedicated to carrying on CAL's long-standing tradition of advanced research and development from an independent viewpoint. All of CAL's diverse scientific and engineering programs for government and industry are being continued in the aerosciences, electronics and avionics, computer sciences, transportation and vehicle research, and the environmental sciences. Calspan is composed of the same staff, management, and facilities as CAL, which operated since 1946 under federal income tax exemption.

Calspan Corporation
Buffalo, New York 14221

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PREFACE

The research on which this report is based has been performed as part of the National Institute for Law Enforcement and Criminal Justice program of addressing problems of resource allocation within forensic laboratories, performance and effectiveness measurement. The MITRE Corporation, as prime contractor for the program, has been assisted by two subcontractors: The PRC Systems Science Company has developed internal measures of criminalistics laboratory performance and the Calspan Corporation has been responsible for developing external measures of their impact on criminal justice systems. Both subcontractors collected data on on-going operations at three sites: Contra Costa County, California; Dade County, Florida; and Columbus, Ohio.

The study by the Calspan Corporation has been conducted during the period 1 October 1973 to 30 September 1974. Data were collected by resident observers at the three sites from November 1973 to July 1974. Results are reported as "Analysis of Criminalistics Laboratory Effectiveness in Criminal Justice Systems", in four volumes:

I - The Use of Physical Evidence Examination in Investigation of Crimes

II - The Use of Physical Evidence Examination in Adjudication of Crimes

III - Measures of Effectiveness of Criminalistics Laboratories

IV - Summary and Recommendations

The success of the study was predicated on full cooperation and support by the criminalistics, investigative and adjudicative agencies at the three sites. The cooperation and assistance of the following officials, their staff and colleagues, is gratefully acknowledged.

CONTRA COSTA COUNTY

Harry D. Ramsey, Acting Sheriff - Coroner

Cpt. Harry Deram, Chief, Investigation Division

Duayne J. Dillon, Chief, Criminalistics Laboratory

Gerald T. Mitosinka, Supervising Criminalist

Lourne G. Phelps, Chief, Richmond Police Department

Cpt. Robert W. Wood, Richmond Police Department

Cpt. John Huddleston, Concord Police Department

Lt. Bud Savage, Concord Police Department

Wm. A. O'Malley, District Attorney

Hon. Wm. R. Channel, Presiding Judge, Supreme Court

Wm. R. Higham, Public Defender

COLUMBUS

Earl Burden, Chief of Police

Maj. Lloyd V. Forbus, Chief, Investigative Subdivision

Richard O. Pfau, Supervisor, Crime Laboratory

Hon. Frederick T. Williams, Administrative Judge, Court of Common Pleas

Hon. G. W. Fais, Chief Judge, Municipal Court

George Smith, County Prosecutor

Daniel Johnson, City Prosecutor

Roy F. Martin, Director, Legal Aid and Defender Society

DADE COUNTY

E. Wilson Purdy, Director, Public Safety Department

Charles Black, Chief, Central Services Division, P.S.D.

Edward Whittaker, Supervisor, Crime Laboratory

Richard Gerstein, State Attorney

Hon. Gene Williams, Administrative Judge, Circuit Court

Phillip A. Hubbart, Public Defender

In addition, the leadership, guidance and assistance by the staff of the MITRE Corporation under Fernando Biagi, Group Leader, Forensic Laboratory Analysis Program, is gratefully acknowledged.

At Calspan, the project was under management supervision by Miles W. Hall, Head, Computer Systems Department. Paul Rosenthal was project manager and Dr. D. A. Travnicek, associate project manager. They were assisted by Dr. R. C. Sugarman, psychologist, and Barbara Frida, computer. The following served as part-time resident field observers: Grady L. Goldman, Keith E. Inman and Enrico N. Togneri, Contra Costa; Wm. F. Jankun, Michael Hohn, John W. Garland, Richard Kettler and John Czeciuk, Columbus; Robert C. Gross, Salli A. Gross, Mark Kaplan, Mark A. Siegel and Edward R. Young, Dade County.

The study was supported by three consultants: Professor Joseph D. Nicol, Criminal Justice Department, University of Illinois, actively participated in all phases of the program. The Hon. Charles Desmond, Chief Judge, New York Court of Appeals (retired) advised on court-related problems and D. M. Lucas, Director, Centre of Forensic Science, Toronto, Canda, provided helpful comment on the program plan during its formative stage.

Section 1

BACKGROUND

The goal of the study reported in these volumes is to develop means to improve the utilization of physical evidence in the investigation and adjudication of felony crimes. Several problems have prompted initiation of the study:

a. Scientific examination of physical evidence plays a role in only a small percentage of reported crimes. In 1963 it was found that abroad and in the United States, such examination is conducted in less than 2% of reported criminal violations[1]*. Of the evidence available at the crime scene only a small fraction is collected and submitted for laboratory examination[6]. In the last decade the number of criminalistics** laboratories in the United States has increased substantially. The proportion of physical evidence examination in major crimes has not been resurveyed but is believed to have remained low. Further, while it has not been established what the percentage ought to be, it is generally acknowledged that it ought to be increased[2]. For instance the United States Supreme Court in pursuance of its goal that no injustice is done has declared a preference to fact finding based on physical evidence examination over fact finding based solely on eyewitnesses or confession.

* References are cited in Section 13.

** See the Glossary, Section 14, for definition of terms.

b. An increasing proportion of criminalistics laboratory activity is spent on dangerous drug and sobriety-related analyses. This trend is caused by the increasing number of arrests for drug abuse and alcohol-related traffic offenses and by the need to establish prima facie evidence of these offenses through analysis. The particular concern here is that this trend has diverted criminalistic activity away from the investigation of other offenses.

c. Although crime laboratories have grown in number, it is not evident that the quality and scope of output in terms of the investigator's needs has kept pace with the state-of-the-art or adjudicatorial expectations. Thus, neither the investigator nor his supervisor are motivated toward a greater use of criminalistics.

d. The use and the effectiveness of criminalistics in criminal justice operations has not been investigated systematically.

   For instance, the various uses of criminalistics in criminal justice operations have not been investigated quantitatively and on a crime-specific basis, and such information is needed to assess the need for changes, if any. Measures of effectiveness are needed in order to assess the result of such changes.

In recognition of the above problems the following three study objectives were formulated:

1. Describe the role of criminalistics operations in criminal justice systems.

2. Develop and apply methods for measuring the effectiveness of criminalistics operations.

3. Recommend steps to improve their utilization.

To meet these objectives, detailed information on ongoing criminal justice operations had to be obtained. A major part of the study effort was therefore devoted to data collection and observation of criminal justice operations in three locations, a California county, a Florida county and a city in Ohio.

The study was designed to concentrate on actual use and on the user's view of criminalistics operations. A concurrent, independently conducted, study addressed activities within the criminalistics laboratory at the same three sites. Its results are reported elsewhere[3].

The use of the term "criminalistics operations" in the statement of the above objectives follows a distinction made by Kirk and Bradford[4] and is broader than the term "criminalistics laboratory". The latter denotes a facility. As used here, the former encompasses all scientific support of the criminal justice system involving physical evidence, excluding forensic pathology. For instance, lifting, processing and evaluating latent fingerprints, as well as comparing them with fingerprints on file are considered criminalistics operations, though they may or may not be performed by criminalistics laboratory personnel or in a criminalistics laboratory.

The meaning of "criminal justice system" depends of course on the context in which the term is used. In the context of the study objectives it must encompass all actual and potential users of criminalistics. Functions unrelated to criminalistics, e.g., detention or parole, need not be included. It is depicted as the largest block in Figure 1 and includes crime scene search, investigation and adjudication. The arrows in the Figure indicate the information flow in the system. The crime scene is searched for physical evidence by criminalistics laboratory or other personnel. Physical evidence (containing information) is brought to the criminalistics laboratory with a request for examination. The criminalistics laboratory reports its findings to the investigator and a dialog with the investigator may ensue. Information on the findings of the criminalistics operation may be used in the adjudicatory process. Typical outputs from the investigation subsystem are information leading to arrest, dismissal, prosecution of a suspect; the adjudicatory process typically results in

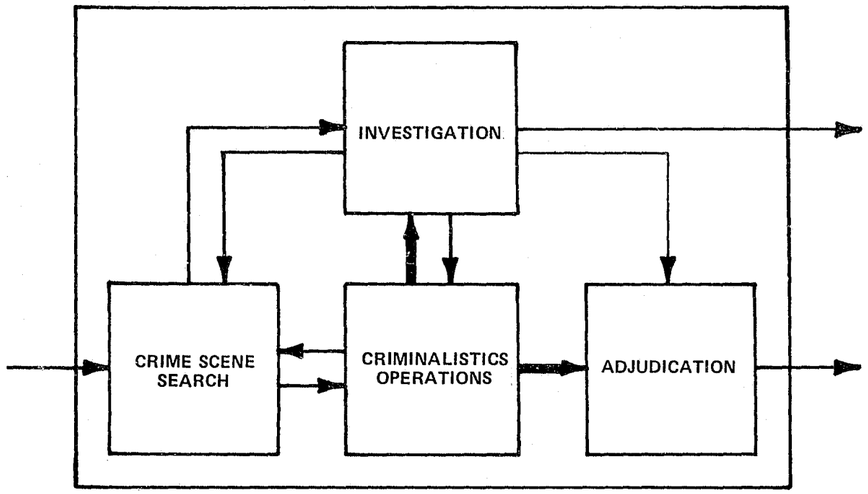

Figure 1 THE CRIMINAL JUSTICE SYSTEM

a guilty plea, verdict, appeal, etc. The two information links shown by heavy lines are the outputs of the criminalistics operation whose effectiveness is to be measured. The flow of information from crime scene to the criminalistics operation is recognized a priori as a strong influence on effectiveness.

Each of the blocks in Figure 1 represents a complex activity; further there are many information links to these activities that must be considered even if they are not expected to be changed as a result of this study. To that end Figure 2 expands on the activities represented by each of these blocks and indicates some of the key physical evidence related activities.

We may note first that the criminalistics operation remains a single "black box" in this presentation. However, its scope of activity, its available analytical methods, the process time, and its capacity are relevant here.

Participants in crime scene search for physical evidence are shown on the upper left of Figure 2. The police patrol unit responding to a reported crime is usually the first investigator on the scene. The police patrol may proceed to investigate or it may secure the crime scene and call for a detective or evidence-squad investigation. The latter may proceed to the crime scene with or without a mobile evidence unit. The detective or the evidence squad may call for assistance from crime lab personnel, if needed and if an appropriate procedure has been established. The crime laboratory personnel may, in turn, find that a yet higher level and specialization of skill is required and may call for a consulting criminalist. The prosecutor is, or expects to be, called to the scene of serious crimes and may call for a medical examiner, or the latter is called by the detective.

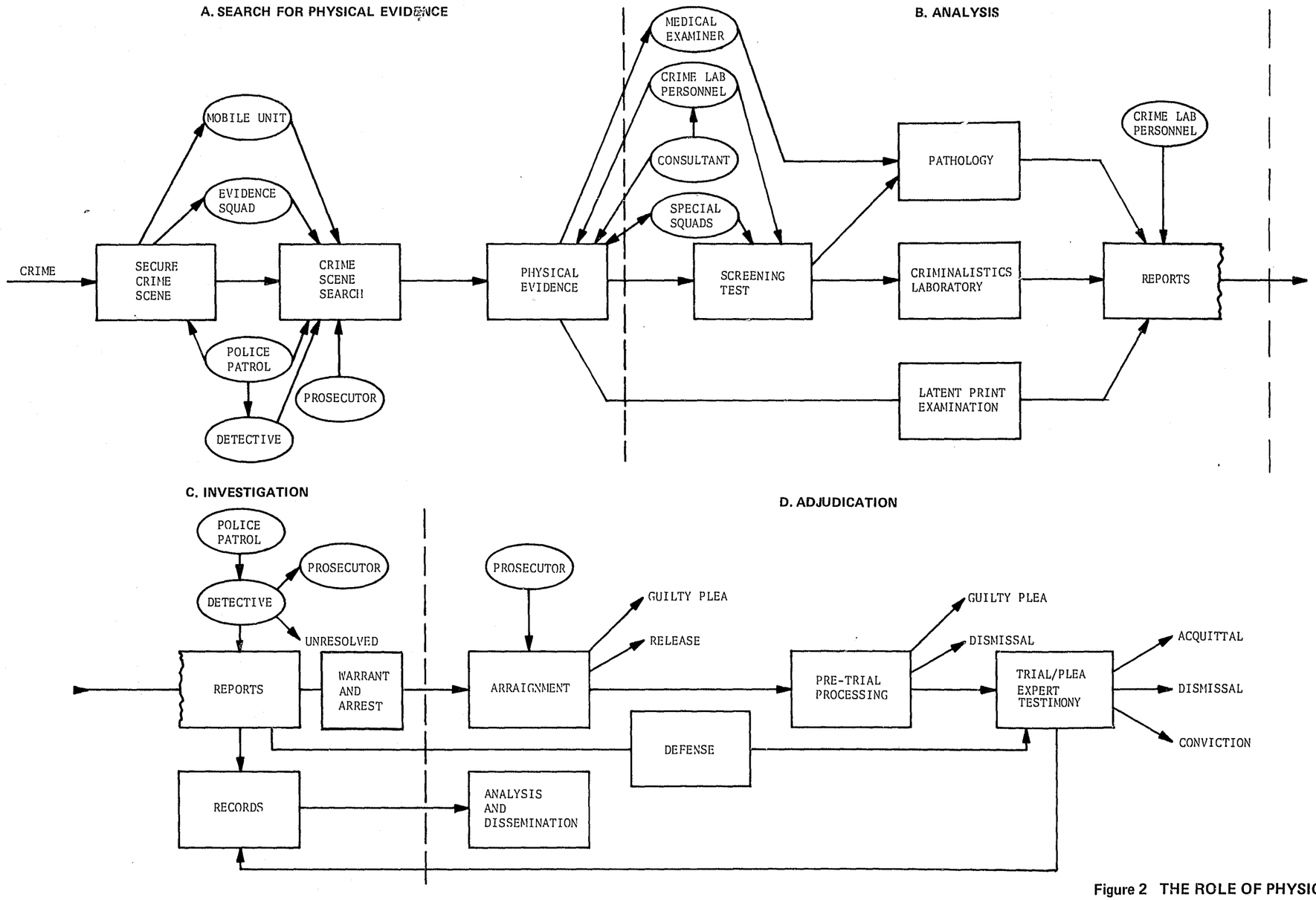

Figure 2 THE ROLE OF PHYSICAL EVIDENCE

Which of the officers shown in Figure 2 participates in the crime scene search depends on the nature of the crime and on other circumstances such as the availability of personnel, and who is notified of the crime. Further, organizational relations differ from site to site; for instance, mobile unit and evidence squad have the same function; the mobile unit may be attached to the criminalistics laboratory rather than to the detective division. Further, more than one police jurisdiction may be involved in crime scene search; in the city, the city police department is responsible, whereas in the suburbs the county sheriff or a town police department may assume responsibility; further, depending on the nature of the offense, state or federal police may become involved at the crime scene.

Analysis of physical evidence discovered in crime scene search is shown performed in Figure 2 by several operations, only one of which is the "criminalistics laboratory". We note particularly that evidence may come to the criminalistics laboratory directly from the crime scene or after a screening test (e.g. colorimetric indication of certain dangerous drugs) which may or may not be administered under the control of the criminalistics laboratory.

The upper main line in Figure 2 represents the flow of physical evidence through two stages, Search (A) and Analysis (B). The main line is continued in the lower part of the figure through Investigation (C) and Adjudication (D).

*In some instances these mobile evidence units are called mobile "laboratory" units; however, they do not perform analyses of evidence.

It is seen that some of the participants in Stage A, also are involved in Stage C, e.g., the detective and prosecutor. They receive laboratory reports and (sometimes) engage in dialog with the laboratory which may lead to additional laboratory analysis. The prosecutor also participates in adjudication from arrest and arraignment through pre-trial proceedings and trial. Each of these stages is of a complex nature and has a number of possible outputs, such as a guilty plea or dismissal; the effect of physical evidence analysis on these outputs have been a study objective.

In keeping with these concepts the study had to be structured to gather data from the police department, the laboratory, the prosecutor, defense attorneys and courts, since they are all potential users or processors of physical evidence.

The primary purpose of the data gathering effort was to learn how criminalistics effort and its results are currently used, so that measures of criminalistics operations effectiveness could be developed and their validity tested. A further purpose was to describe this use, its frequency, timing and any other important attributes for the guidance of the criminalistics users at any location - and that has been done in this volume of the report. It was not the purpose of the information and data gathering effort to evaluate any one person or agency or the handling of any one case.

The effectiveness of criminalistics operations is related with two major aspects of their results, frequency of use and value. Any variable of a criminalistics operation is a candidate measure of effectiveness if it can be shown to be highly correlated with frequency of use and value. Further, candidate measures of effectiveness must be tested for validity, the data necessary for their application must be obtainable and they must be "practical". Since it was not known at the outset how many measures of effectiveness would survive the above tests, the study was structured to search initially for data for a large number of candidate measures of effectiveness so as to assure an adequate number of acceptable measures at the end.

The final study objective, recommendations leading to improved utilization of physical evidence examination, could be attained through three approaches: Application of the measure of effectiveness to the sites, comparison between sites and observations at the site.

The results of the study are reported in four volumes:

1. The use of physical evidence examination in crime investigation.
2. The use of physical evidence examination in crime adjudication.
3. Measures of effectiveness of criminalistics operations.
4. Summary and recommendations.

Section 2

THE STUDY SITES

The study sites had been selected before the project began. Selection criteria included the willingness of the affected agencies to cooperate with the project staff; their interest in the study and in possible follow-on demonstration projects; "representative" population and laboratory capability; and manageable sample size.

As much as possible the results of the study are reported without reference to a particular site. The reader should bear in mind the limited generality of the findings that is imposed by the small number and limited variety of sites. For instance, areas served by strong central laboratories, areas with much larger distances between criminalistics laboratory and crime scenes, areas served by criminalistic laboratories not operated by law enforcement agencies, or sites with much smaller or much larger populations, may have characteristics that may limit the applicability of these reports.

The study sites were Contra Costa County, California, the City of Columbus, Ohio and Dade County, Florida. The characteristics of these sites are tabulated in Figure 3.

Figure 3 SITE CHARACTERISTICS

	TOTAL POPULATION x 1000	RECTANGULAR SIZE miles		STUDY AGENCIES	STUDY POPULATION x 1000
CONTRA COSTA COUNTY	560	32 x 72	16 MUNICIPALITIES INCL. 1 "SUBURB", 93,000 POP. 1 INDUSTRIAL CITY, 81,000 POP. LARGE SUBURBAN, RURAL AND UNINHABITATED AREAS	SHERIFF'S DEPT. CONCORD RICHMOND	172 93 81 } 346
COLUMBUS	533	10 x 12	LARGEST CITY IN FRANKLIN COUNTY, 11 OTHER POLICE AGENCIES	COLUMBUS	533
DADE COUNTY	1268	55 x 49	26 MUNICIPALITIES INCLUDING MIAMI (335,000)	COUNTY PUBLIC SAFETY DEPT.	557

Contra Costa County, California, extends eastward from the northeast portion of San Francisco Bay and covers an area exceeding 2000 square miles. To the southeast it is part of a continuous urban area extending from the cities of Haywood, Oakland and Berkeley in Alameda County to Richmond, Contra Costa County. The total population of 560,000 (1970 Census) is composed of 15 municipalities, the largest of which is Richmond with a population of less than 100,000. Richmond is an industrial city with a large, poor, black population. The next largest city, Concord in the southeastern part of the county might be called a "bedroom community" having a large part of its white population commute to the large bay area cities outside the county.

The County has 14 separate police agencies; two municipalities contract with the Sheriff's Department for their police service. The Sheriff's Department polices the unincorporated areas of the county which include a number of large sparsely populated areas as well as densely populated areas adjacent to or surrounded by the cities. The population policed by the Sheriff's Department is 172,000, just under 31% of the county population.

In order to contain the study at a readily manageable level only offenses reported in three agencies were included: Concord, Richmond and the Sheriff's Department. Together they comprise a population of 346,000, 62% of the county.

The Superior Court, which handles all felony trials, is located in Martinez, the county seat, population 16,000, located in the north central part of the county. Arraignments and misdemeanors are under jurisdiction of five municipal courts, one of which is also located in Martinez.

The Criminalists Laboratory is a part of the Sheriff's Department. Its director reports directly to the undersheriff and sheriff. As tabulated in Figure 4, the Sheriff's Laboratory has 8 criminalists, one crime scene technician and one fingerprint examiner. The Richmond Police Department has 9 crime scene and 2 fingerprint technicians; the Concord Police Department has 5 and 1, respectively. On request, the Criminalistics Laboratory provides crime scene service in the Sheriff's Department jurisdiction and crime scene consulting services to the 15 municipalities in excentional, major cases. Laboratory services include firearms, chemistry and document examination*. The county is also served by the State's Criminalistics Laboratory in Sacramento, about 60 miles northeast of Martinez. The Concord Police Department currently has all its document and latent print identification work done in Sacramento. In addition, all three agencies have sobriety testing and toxicological analyses performed by commercial laboratories. Forensic pathology is the responsibility of the County's coroner and services are provided by commerical laboratories at the direction of the pathologist. Finally, Contra Costa County is the only one of the study sties in which the Public Defender makes regular use of a commercial laboratory for criminalistics.

* Details on the organization and capabilities of the criminalistics laboratories at the study sites will be found in reference 3.

	CRIMINALISTICS LABORATORY	CRIME SCENE TECHNICIANS	FINGERPRINT IDENTIFICATION
CONTRA COSTA	8	1 SHERIFF 9 RICHMOND 5 CONCORD	1 2 1
COLUMBUS	6	8	2
DADE	16	21	4

Figure 4 - PHYSICAL EVIDENCE EXAMINERS

The City of Columbus, Ohio, population 533,000, is located in Franklin County, population 833,000. The entire county contains 26 villages and municipalities, and 12 police departments. The study was confined to the City of Columbus which is the State Capital and County Seat.

Franklin County also has a two-court system for criminal procedures. The Common Pleas Court is the upper court and handles all felony trials. Arraignments and misdemeanors are under jurisdiction of the Municipal Court.

The Criminalistics Laboratory with a staff of 8 (Fig. 4) is a part of the Police Department's Investigative Subdivision. Crime scene technicians are organized in a "Mobile Crime Laboratory" unit which is also part of the Investigative Subdivision though operated independent of the Criminalistics Laboratory. Fingerprint identification operations are conducted by a section attached to the Service Subdivision of the Police Department. Criminalistics Laboratory services are provided for firearms, chemistry (including dangerous drug and sobriety testing) and document examination. Forensic pathology services are provided under contract to the medical examiner by Ohio State University.

Dade County, Florida, with a population of 1,268,000* has an area comparable to Contra Costa County. This population is made up in part by the central cities of Miami, population 335,000; Hialeah, 102,000; Coral Gables, 87,000; Miami Beach, 87,000; North Miami, 35,000; and North Miami Beach, 31,000; each of these have their own police department. The Metropolitan Dade County Public Safety Department has jurisdiction over the unincorporated area of the County, population 557,000. The unincorporated area consists of densely populated areas that are contiguous to the cities, and large practically uninhabitated areas, including a part of the Everglades National Park. The study has been restricted to the offenses originating in the jurisdiction of the Public Safety Department.

The Crime Laboratory Bureau is located in the main building of the Public Safety Department and is a part of its Central Services Division. As of November 1973, it numbers 16 criminalists and provides services in chemical analysis (including dangerous drugs and blood alcohol), firearms, toolmark comparison and document examination. Sobriety testing is provided by a separate section of the laboratory with branch locations at district stations of the Public Safety Department.

A large Crime Scene Section (see Figure 4) is a part of the laboratory. It provides services to the Police Division of the Department in most "major"** crimes and on special request, mostly in homicide investigations, to other police agencies of the County. Fingerprint identification service is provided by a section in the Records and Identification Bureau which, as the laboratory, is a part of the Central Services Division. The Dade County cities do not have laboratory operations, with the exception of fingerprint identification service in the City of Miami.

* 1970 U.S. Census

** Crime categories are discussed and defined in Section 4 below.

As the other two sites, Dade County has a two-tier felony court system. The Criminal Division of the Circuit Court handles all felony adjudication while misdemeanors and arraignments are the responsibility of the County Court's Magistrate Division.

The staffing of the laboratory, investigative, and adjudication operations in the three study sites are summarized in Figure 5. The offenses reported in State and FBI reports for the sites are listed in Figure 6.

Data were collected at the three sites on extensive questionnaires which were filled out by the project's field observers in the period from November 1973 to July 1974. These observers obtained information through available case records and interview of criminalist, investigative and adjudicatory agency staff, as well as defense attorneys, judges and (by court permission) jury foremen. The information recorded on the questionnaires was supplemented by informal case-by-case information. Following data collection, broader questions raised by analysis of the data, were reviewed with appropriate agency personnel at the sites.

The data collected in the above manner are incomplete and, to some extent, inaccurate, because they reflect the incomplete, fragmented and inaccurate state of record-keeping at the sites in general and particularly as regards physical evidence use. This unsatisfactory state of record-keeping has by itself become a major finding of the study. To the extent that data were obtained through interviews that were conducted from one week to 3 months after the event, they also reflect the state of recollection of the participants. This inaccuracy is particularly great in cases receiving relatively little investigation.

SITE	STUDY AGENCY	POPULATION X1000	PHYSICAL EVIDENCE EXAMINERS[1]	UNIFORMED PATROL	DETECTIVES	PROSECUTORS[2]	JUDGES[3]
CONTRA COSTA COUNTY	SHERIFF'S DEPT. CONCORD RICHMOND	172 93 81	10 6 11	151 50 77[4]	46 10 26	25	10
COLUMBUS	COLUMBUS	533	16	625	103	25	10
DADE COUNTY	PUBLIC SAFETY DEPT.	537	41	782	76	35	8

[1]CONDENSED FROM FIGURE 4.
[2]ASSIGNED TO FELONY PROSECUTION.
[3]ASSIGNED TO CRIMINAL DIVISION.
[4]NOT INCLUDING 11 UNIFORMED EVIDENCE TECHNICIANS.

Figure 5 - STAFFING SUMMARY

	SOURCE	POP. x 1000	M & NN HOMICIDE	FORCIBLE RAPE	ROBBERY	AGGR. ASSAULT	BURGLARY	LARCENY
SHERIFF'S OFFICE RICHMOND CONCORD	CA	346	43	144	596	874	7266	10,151
COLUMBUS CITY	FBI	533	72	362	1570	890	10,941	8,574
DADE COUNTY UNINCORPORATED AREAS	FA	568	96	112	2027	3154	11,110	17,580

Figure 6: REPORTED OFFENSES - 1973

Section 3

PURPOSE AND SCOPE OF VOLUME I

Together, four volumes will report the results of the entire project and readers interested in applying measures of effectiveness of criminalistics operations as a formal management and planning tool will want to read all four volumes. This volume has been written to serve as a self-contained, qualitative guide for the user of criminalistics operations. It systematically treats the interrelations between laboratory capabilities and the elements of the investigative process. Quantitative findings from data obtained at the three study sites illustrate and support conclusions on actual use of criminalistics in investigation, its strength and weaknesses. In Volume III, the data obtained at the sites are examined for their relation with the effectiveness of criminalistics services and their practicality as measures of effectiveness.

While every detective or criminalist reading this volume will be thoroughly familiar with some of the criminalistics operations and their use that are reported here, they may find the systems point of view from which this report is written useful. This volume may also be helpful in the formulation of criminal justice curricula.

While a systematic treatment of criminalistics operations has been attempted, no claim for comprehensive treatment is made. Thus, this and the other volumes concentrate on criminalistics operations involving certain crimes Other offenses, as well as physical evidence examination in public safety or civil investigation, are not included.

The offense categories treated are:

1. Homicide and Non-Negligent Manslaughter
2. Rape
3. Robbery
4. Aggravated Assault
5. Burglary
6. Larceny
7. Arson
8. Bombing and Explosives
9. Hit and Run
10. Forgery
11. Narcotics and Dangerous Drugs
12. Driving under Influence of Alcohol

The first 6 of these offense categories will be recognized as Type I crimes of the Uniform Crime Reports, UCR (5). They have received primary emphasis in our data collection because they are the crimes on which government and public attention is focussed (if only through the UCR). They are major evidence generators and, together, they constitute a very large part of the routine criminalistics operations. Several other offenses, arson, bombing and explosives, and hit and run, were included, though not reported in the

UCR, because they are major crimes whose investigation often requires substantial physical evidence evaluation. Forgery has been included because its investigation through document examination involves a high-volume, high-skill, criminalistics specialty. Finally, narcotics and dangerous drugs, and driving under influence of alcohol have been included though - as forgery - only to establish their relative volume at the three sites, because they constitute high-volume, routine criminalistics operations.

Figures 7 a, b and c list for each site an estimated physical evidence utilization factor expressed as the percentage of laboratory service requests per reported offenses. Also listed are the number of cases involving physical evidence on which data were collected during the study.

In prior research, attempts have been made to assess the criminalist's task in terms of the many physical evidence materials brought for examination (Refs. 6 and 12). In this report an 8-item problem-oriented physical evidence classification has been found useful because by collecting information on fewer categories their relation to offense categories could be shown better for comparatively small offense numbers. The evidence classification is listed below and an evidence-offense matrix will be found in Figure 23, Section 12.

OFFENSE CATEGORY	LAB SERVICE REQUESTS / REPORTED OFFENSES %	NO. OF CASES OBSERVED	
		OFFENSE REPORT, SEARCH LAB. EXAMINATION	INVESTIGATION
1. HOMICIDE NN MANSLAUGHTER	84	21*	15*
2. RAPE	25	21	21
3. ROBBERY	3	12	14
4. AGGR. ASSAULT	6	28	33
5. BURGLARY	0.5	25	38
6. LARCENY	0.3	2	3
7. ARSON	NA	10	10
8. BOMBING & EXPLOSIVES	NA	2	2
9. HIT AND RUN	NA	2	2
10. FORGERY	0.9	215	
11. NARCOTICS AND DANGEROUS DRUGS	1	985	
12. DRIVING UNDER INFLUENCE OF ALCOHOL	1	2300**	

* INCLUDES SUICIDE INVESTIGATION
** SUBJECTS TESTED BY COMMERCIAL LABORATORY; EXTRAPOLATED FROM 3-MONTH COUNT.

Figure 7 CRIMINALISTICS LABORATORY SERVICE
(a) CONTRA COSTA CTY., 3 AGENCIES, NOV. 73 - MAY 74

OFFENSE CATEGORY	LAB SERVICE REQUESTS / REPORTED OFFENSES %	NO. OF CASES OBSERVED	
		OFFENSE REPORT, SEARCH, LAB. EXAMINATION	INVESTIGATION
1. HOMICIDE NN MANSLAUGHTER	80	24*	19*
2. RAPE	64	96	51
3. ROBBERY	1	9	6
4. AGGR. ASSAULT	8	29	17
5. BURGLARY	1	50	26
6. LARCENY	0	1	0
7. ARSON	NA	1	0
8. BOMBING & EXPLOSIVES	NA	1	0
9. HIT AND RUN	NA	19	9
10. FORGERY	0.9	396	
11. NARCOTICS AND DANGEROUS DRUGS	1	800	
12. DRIVING UNDER INFLUENCE OF ALCOHOL	1	1110	

*INCLUDES SUICIDE INVESTIGATION

Figure 7 CRIMINALISTICS LABORATORY SERVICE
(b) COLUMBUS PD, DEC. 73 - APR. 74

OFFENSE CATEGORY	LAB SERVICE REQUESTS / REPORTED OFFENSES %	NO. OF CASES OBSERVED	
		OFFENSE REPORT, SEARCH LAB. EXAMINATION	INVESTIGATION
1. HOMICIDE NN MANSLAUGHTER	80	51*	44*
2. RAPE	25	31	23
3. ROBBERY	4	40	38
4. AGGR. ASSAULT	6	117	115
5. BURGLARY	1	59	53
6. LARCENY	0	3	4
7. ARSON	NA	2	2
8. BOMBING & EXPLOSIVES	NA	1	1
9. HIT AND RUN	NA	1	0
10. FORGERY	0.9	106	
11. NARCOTICS AND DANGEROUS DRUGS	1	1125	
12. DRIVING UNDER INFLUENCE OF ALCOHOL	1	1414	

* INCLUDES SUICIDE INVESTIGATIONS

Figure 7 CRIMINALISTICS LABORATORY SERVICE
(c) DADE COUNTY PSD, NOV. 73 - MAR. 74

PHYSICAL EVIDENCE CLASSIFICATION

1. Finger, Palm and Footprints
2. Physiological Material (Tissue, Blood, Semen, Hair, Saliva, Perspiration, Fecal Matter)
3. Physical Match Problems (Tools, Tool Marks, Shoe Impressions, Tire Impressions, Broken Glass, Fabrics, Fracture, Cut and Tear Patterns)
4. Weapons (Firearms, Ammunition and Components, Gunshot Residue, including Clothing, Stabbing, Cutting or Blunt Instruments)
5. Structural Materials (Safe Insulation, Glass, Wood, Paint)
6. Transfer Materials (Dust, Soil, Plants, Fibers, Grease)
7. Document Materials (Documents, Execplars, Ink, Paper)
8. Chemical Problems (Drugs, Alcohol, Toxic Materials, Petroleum)

Section 4

ORGANIZATION OF THIS VOLUME

Our purpose in this volume is to describe the use of criminalistics operations in criminal investigation. This description will be guided through a diagram depicting a series of steps in crime investigations on one side and criminalistics resources and activities on the other; the two are linked by eight potential aids that can be provided by the criminalist to the criminal investigator (Figure 8).

Crime investigation starts when an incident, which may or may not be an actual crime, is reported; a response is made, typically through dispatch of a police patrol to the scene of the incident; the police patrol takes certain action, e.g. securing the scene and/or questioning witnesses at the scene, and makes a report; if the report indicates that a criminal offense may have been committed, there follows a preliminary investigation, typically by a detective; further investigation is conducted if sufficient leads are developed to warrant it or in all cases of certain serious crimes, e.g., homicide. The final step is disposition of the investigation through arrest of the alleged perpetrator, or the investigation may be discontinued as "unresolved".

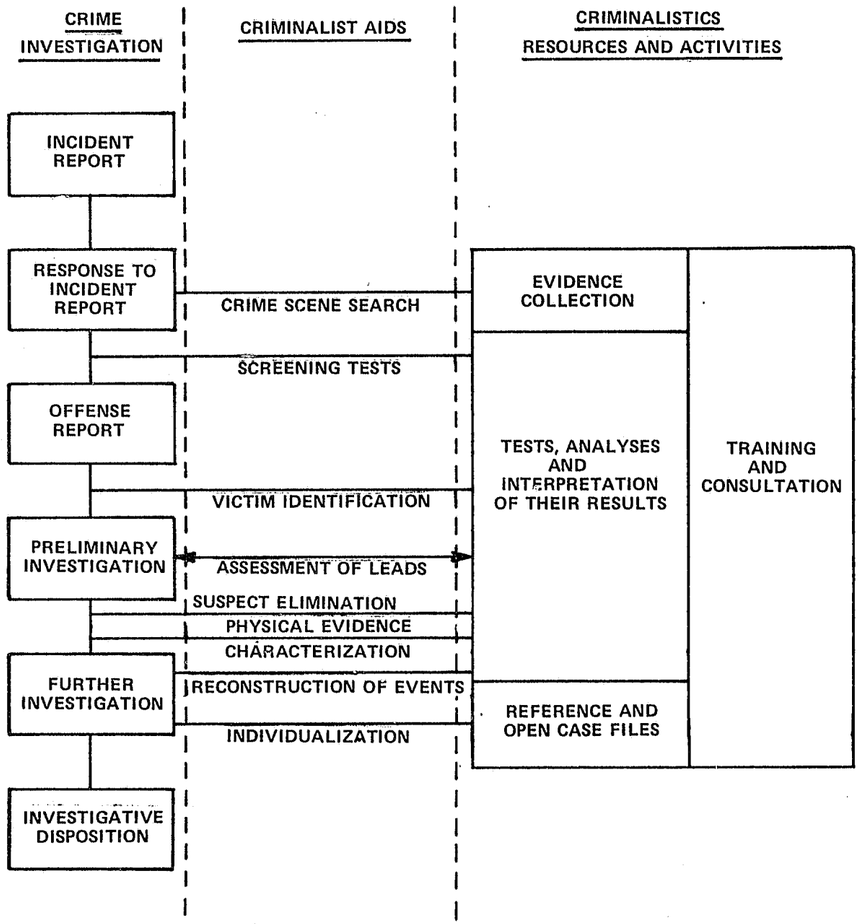

Figure 8 THE POTENTIAL ROLE OF CRIMINALISTICS IN CRIME INVESTIGATION

Criminalistics resources and activities are shown in four groups. (a) Evidence collection is not necessarily done by a criminalist; for instance, it may be done by the police patrol or detective. Evidence collection includes recognition of possible evidence, its appropriate treatment at the scene, e.g. recording its position when found; and its transport to a secured storage area. The next group (b), tests and analyses of physical evidence and interpretation of the results of these tests and analyses may be considered to be the core activity of criminalistics. Reference and open case files (c) are a resource of the criminalist which may include fingerprint files, toolmarks, and firearms or ammunition. The fourth group of criminalistics resources and activities (d) is training and consultation; training is, or should be, a continuing educational activity available to all users of information from criminalistics operations. Consultation is a case-specific activity.

It should be noted that these four groups of criminalistics resources and activities circumscribe the role of criminalistics in crime investigation. They do not include all criminalistics laboratory functions; for instance, research and management functions are omitted.

The eight potential aids shown in Figure 8 as provided by criminalists to crime scene investigation are:

Crime Scene Search

Identification of Victims

Screening Tests

Assessment of Leads

Elimination of Suspects

Physical Evidence Characterization

Reconstruction of Events

Linking of Suspects to Scene, Victim or Offense

These terms will be defined and elaborated on in the following section. It should be noted here that in the figure each of these aids is shown applied at one definite step in the crime investigation sequence. Actually, there is considerable variation; some aids may not be used at all; others may occur in different order in the investigation sequence.

Figure 8 can serve as a model because it is general enough to fit the three study sites and all offense categories. In subsequent sections the nature of criminalistics involvement, organizational peculiarities, and crime-specific aspects of these relations will be discussed. Further, these subsequent sections bring data on the frequency of use of the criminalist aids, their timing, and qualitative observations.

Section 5

INVESTIGATION OF A CRIME

Investigation of a crime begins with a response to an incident report which may come from the victim, any private citizen or a police officer. These reports come to the police, and are acted upon, through a variety of channels of communication that have not been a part of the study.

Response to an incident report is a contact with the victim and often, though not always, a visit to the crime scene and a search of the scene. As pointed out in the discussion of Figure 2 in Section 1, this response may be made by a patrol officer, a detective and others. In some cases, the patrol officer is the only responding officer and he, in effect, conducts the entire investigation. For instance, he may arrest the offender at the scene; he writes the Offense Report and the detective only has to record the information, including the disposition of the investigation.

In Figure 8, the more general case in which a detective conducts the investigation is depicted at the left side. The criminalistics resources and activities that are available to the investigator are shown on the right and the criminalist aids, as they apply to distinct stages of the investigation are in the center.

The sequence of steps in crime investigation in Figure 8 is a highly condensed version of Standard Operating Procedures, SOP, for burglary investigation issued by the Detective Bureau in one of the study sites. Omitted are numerous steps that have to do with interview of witnesses and suspects, etc. According to these Procedures, an investigator is assigned by a supervisor in the General Investigative Unit for preliminary investigation of all "major" crimes (burglary, larceny, assault, forgery, fraud, sex offenses, embezzlement, bomb threats, and miscellaneous other offenses). "Further investigation" is mandated if "identifiable leads" are developed in the preliminary investigation. Our observations indicate that in practice the distinction between preliminary and further investigation is not distinct at all three sites; in particular, the detective supervisor is not involved in the decision. The supervisor's role is more evident in case assignment and review of reports; in particular, disposition of a case requires the signature of a supervisor. In one of the General Investigative Units the detective has to make a written interim report within 10 days after assignment; on another site after 30 days; in the third site, no formal time limit is imposed.

The aforementioned SOP includes the following reference to physical evidence examination in its Investigative Procedures for burglary: "Ascertain physical evidence gathered by the crime laboratory and request evaluation [and] analysis and submit name(s) of suspect(s) or active burglars in the area to I.D. Section in cases which have latents of value." This instruction implies that the crime scene has been searched by the laboratory and that a report on crime scene search, including information on lifting of latent prints, has become available to the detective. It is cited here because it is the only specific reference to criminalistics in the Investigative Procedures for burglary at that site. The instruction is not specific as to how the detective is to make his request for evaluation and analysis to the criminalist. Apparently, in practice, this communication is sparse, verbal, and unrecorded. In such lack of written record lies a shortcoming and impediment to effective supervision and management, as well as to the data gathering effort under this study, that will be noted in many instances throughout the four volumes of this report.

Indicating for this offense category a higher concern with criminalistics support, the Homicide Section of the same SOP has the following physical-evidence related provisions: ...(2) Request Mobile Laboratory Unit, Medical Examiner and District Attorney to scene..." "(7) Hold brief conference with laboratory technician...and discuss what needs to be accomplished by Mobile Unit at scene..." "(14) Supply laboratory technician with any additional information that may come as a result of witness interviews" and ...(2) Hold conference with laboratory personnel and review all evidence." This Procedure is very explicit in requesting communication and collaboration between the criminal investigator and the criminalist and our on-site observations confirm that in homicide investigation these contacts are made frequently, though not always. However, here also, the written record of these contacts is practically nonexistent and review is therefore made difficult.

The preceding paragraphs have given an indication of the relative importance of physical evidence examination in burglary and homicide investigation according to SOP and also observed practice. In Figure 9, our detailed and general observations have been drawn on to characterize criminalistics involvement in investigation for each of the 12 offenses of the study. The first column lists the offenses, the second the criminalistic characteristics, particularly the evidence likely to be used; the relative priority of criminalistics involvement from the point of view of the investigator, is stated in the third column. In that column, "necessary" is meant to convey that physical evidence information is necessary in adjudication.

Further indication of crime-specific frequency of use of criminalistics in investigation was obtained at the beginning of the study through 10% samples of all investigation reports, in one Department of one site during the first six months of 1972 (Figures 10a and 10b) and in another site for the last three months of 1972 (Figure 10c).

The first survey was made for all offenses of the study except hit-and-run. Laboratory service requests were divided into those for latent print evaluation and matching only (the "FP" column) and "other" requests. Investigative dispositions are listed at the bottom of Figure 10a. The greater ratio of unresolved burglary investigations may be noted. A peculiar result of the survey is highlighted in Figure 10b where disposition is shown for all cases in 5 offense categories in which laboratory examination requests other than fingerprints were made. The incidence of unresolved burglary cases with laboratory examination tends to indicate that, with the techniques and practices in use

OFFENSE CATEGORY	CHARACTERISTICS	PRIORITY
HOMICIDE	MOST INTENSIVE USE; PARTICIPATION IN SCENE SEARCH, CONFERENCES WITH INVESTIGATORS	TOP
AG. ASSAULT	PROBLEMS SIMILAR TO HOMICIDE, BECOMES HOMICIDE IF VICTIM DIES	HIGH
RAPE	EVIDENCE OF IMPREGNATION EVIDENCE OF FORCE INDIVIDUALIZATION	HIGH
ROBBERY	FINGER PRINTS, FIREARMS IDENTIFICATION, CLOTHING	MEDIUM
BURGLARY	FINGERPRINTS MOSTLY; TRACE EVIDENCE, TOOLMARKS	LOW
LARCENY	FINGERPRINTS; TRACE EVID. TOOLMARKS (SIMILAR TO BURGLARY, BUT P.E. EXAMINATION NOT AS FREQUENT)	LOW
BOMBING & EXPL.	CHEMICAL ANALYSIS, TOOLMARKS	HIGH
ARSON	EVIDENCE OF ACCELERANTS, PROBLEM TO LINK TO SUSPECTS, INITIATION	NECESSARY
HIT & RUN	PROBABLE MATERIAL TRANSFER	HIGH
FORGERY	A CRIMINALISTICS SUBSPECIALTY	NECESSARY
NARCOTICS & DD	NO CRIME SCENE SEARCH; MOSTLY ROUTINE ANALYSIS; HIGH VOLUME; PROMPT SERVICE REQUIRED	NECESSARY
DRIVING UNDER INFL.	NO SEARCH; ROUTINE ANALYSIS; ARRESTEE HAS OPTION ON METHOD	NECESSARY

Figure 9 CHARACTERISTICS OF CRIMINALISTICS INVOLVEMENT IN INVESTIGATION

OFFENSE CATEGORY	REPORTED		LAB SERVICE REQUESTS			INVESTIGATION DISPOSITION						SEARCHES / OFFENSES	LAB REQU. / OFFENSE	LAB REQU. / SEARCH	"OTHER" LAB REQU / SEARCH	"OTHER" LAB REQU / OFFENSE
	OFFENSES	SEARCHES	FP	OTHER	ALL	1	2	3	4	5	6					
HOMICIDE	1	1	–	1	1	–	–	–	–	1	–	1	1	1	1	1
RAPE	4	2	–	1	1	–	1	2	–	1	–	.5	.25	.5	.5	.25
ROBBERY	7	1	1	–	1	–	3	–	–	2	2	.14	.14	1	0	0
ASSAULT	46	3	1	2	3	3	4	9	–	23	7	.07	.07	1	.7	.04
BURGLARY	204	162	66	7	73	3	166	5	–	25	5	.8	.36	.45	.04	.03
LARCENY	17	10	–	1	1	2	14	1	–	–	–	.59	.06	.1	.1	.06
AUTO THEFT	1	–	–	–	–	–	–	1	–	–	–	0	0	0	0	0
ARSON	3	1	0	0	0	–	3	–	–	–	–	–	.15	–	.15	.15
FORGERY	26	0	0	4	4	5	–	12	1	6	2					
DANG. DRUGS	10	–	–	5	5	–	–	–	–	7	3					
DRIV. U. INFL	4	–	–	4	4	–	–	–	–	4	–					
TOTALS	323	180	68	25	93	13	191	30	1	69	19					

DISPOSITION OF INVESTIGATION

1 UNFOUNDED
2 UNRESOLVED
3 S IDENTIFIED NOT CHARGED
4 S APPREHENDED AND RELEASED
5 S APPREHENDED AND CHARGED
6 UNKNOWN

Figure 10a - INVESTIGATIVE FILE SURVEY, 10%, JAN. - JULY 1972
COUNTY SHERIFF'S DEPARTMENT
SOURCE: CONTRA COSTA

OFFENSE CATEGORY	LAB EXAMINATION REQUESTS	DISPOSITION	
		2	5
		UNRESOLVED	SUSPECT CHARGED
HOMICIDE	1		1
RAPE	1		1
LARCENY	1	1	
ASSAULT	1		2
BURGLARY	1	5	2
TOTAL	12	6	6

Figure 10b - INVESTIGATIVE FILE SURVEY 1972
CONTRA COSTA

OFFENSE CATEGORY	REPORTED		LABORATORY SERVICE REQUESTS			INVESTIGATION DISPOSITION						SEARCHES OFFENSE	LAB REQUESTS OFFENSE	LAB REQUESTS SEARCH	"OTHER" LAB REQ. SEARCH	"OTHER" LAB REQ. OFFENSE
	OFFENSES	SEARCHES	FP	OTHER	ALL	1	2	3	4	5	6					
HOMICIDE	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
RAPE & ASSAULT TO RAPE	6	–	–	2	2	–	–	1	–	5	–	0	.33	0	0	.33
ROBBERY ARMED UNARMED ASSAULT TO ROB	29	10	–	–	–	1	17	9	–	2	–	.34	0	0	0	0
AGGRAVATED ASSAULT	15	1	–	–	–	–	5	7	–	3	–	.07	0	0	0	0
BURGLARY, B.E.	166	80	9	8	17	1	85	51	–	25	4	.48	.10	.21	.10	.05
GRAND LARCENY	102	17	1	–	1	2	70	18	–	5	7	.17	.01	.06	0	0
TOTALS	318	108	10	10	20	4		86	–	40	11					

DISPOSITION OF INVESTIGATION

1. UNFOUNDED
2. UNRESOLVED
3. SUSPECT IDENTIFIED, NOT CHARGED
4. SUSPECT APPREHENDED & RELEASED
5. SUSPECT APPREHENDED & CHARGED
6. UNKNOWN

Figure 10c - INVESTIGATIVE FILE SURVEY, 10%, OCT - DEC 1972
SOURCE: COLUMBUS POLICE DEPARTMENT

in such offenses, the criminalistics laboratory examination of evidence other than fingerprints tends not to be very productive. The total sample from which this observation is derived is of course too small to be statistically significant. The observation is made because it is in keeping with a much larger set of observations made in the same area several years ago (7).

The right side of Figure 10a contains normalized data on the relative frequency of searches and laboratory service requests. The value of one for homicide is, of course, due to the fact that only one homicide investigation was sampled. For a larger sample, a number between 0.8 and 1.0 would be expected. Of significance is that laboratory service requests other than for fingerprint examination were made in 3% of the burglary investigations, a figure exceeding the value observed in the current survey which is also the national average, 0.5%.

The survey taken at the other site (Figure 10c) was made over a shorter period because data collection was more time consuming. Consequently, its sampling error is higher. Thus, the 10% sample for the 3-month survey period contained no homicides, although the Police Department Annual Report lists 83 "actual" reported offenses in this category and therefore two would be the expected value for the survey. Nevertheless, the survey reveals that at the second site the relative number of searches for all offenses except robbery was lower than at the first. The number of "other" laboratory requests, i.e., other than for latent print examination, is lower for all offenses except rape. (The higher laboratory involvement at that site in rape cases will be further noted in this volume.)

Figures 10 indicate that physical evidence examination, particularly other than fingerprints, was used in investigation of only a small fraction of the Type I offenses.

Investigative Methods Survey

While the major concern of the study has been with the frequency, timing, nature and utility of physical evidence examination, some information was also obtained on the methods used in investigation of offenses when physical evidence was not examined. To that end a survey was conducted in each of the three sites, of methods used in investigation of burglary, robbery, and aggravated assault. The objective was to determine the single method, or combination of methods, which was used predominantly in each case.

The survey is based on investigative file or log book entries for one month. Where the entries for the month exceeded 60, a random sample was used. In Contra Costa County two of the three participating police agencies were surveyed; in Columbus the city-wide Police Department log books were used; and in Dade County a densely populated, poor district and a low-density, more affluent, district was surveyed.

Survey rules were that investigations still pending after 30 days were checked as "unresolved" in answering the disposition question (Figure 11) and this 30-day period was also used to complete the duration of investigation in such cases. Such a time limit, not necessarily 30 days, was needed in order not to make the survey period too long. It is realized, however, that in some instances cases are resolved after much longer periods, particularly by exceptional clearance after solving chain-burglaries or robberies. Because the rule was applied uniformly in all five agencies and for the three offenses, our findings as to trends in method use should not be affected.

Another survey rule was to ask each detective that handled a surveyed case only about the methods used predominantly in investigating the case. All other information was to be taken from the record, if available. It was however necessary due to time limitations to have the methods question completed by the detectives in one of the sites (Columbus).

Offense Report No. _____ Offense Category _____

Detective: _____ Offense Severity: Light Average Severe

Date Investigation Started _____ Ended _____

Hours Spent on Investigation: _____

Was crime scene searched? Yes _____ No _____

Were latent prints lifted? Yes _____ No _____

Was other evidence collected? Yes _____ No _____

Disposition of Investigation:

Unfounded	1
Unresolved (suspended, pending)	2
S identified, not charged	3
S apprehended, released	4
S apprehended, charged	5
S not apprehended, charged	6
Exceptionally cleared	7

Check those investigative methods which were used predominantly in working on this case:

1 Insufficient information to conduct investigation
2 Suspect caught in act
3 Eyewitnesses to crime
4 Modus operandi of suspect
5 Informers
6 Surveillance of evidence locations (e.g., pawn shops, junkyards, etc.)
7 Confession
8 Polygraph
9 Latent print identification
10 Crime laboratory examination of physical evidence

Figure 11 SURVEY OF METHODS IN INVESTIGATION OF BURGLARY, ROBBERY AND AGGRAVATED ASSAULT

A few other peculiarities prompt a caveat not to read more than trends into the combination of numerical results from the three sites and five agencies: Local definitions of offense severity (Figure 11) were adopted; for instance, one Dade County district considers a burglary "average" when the value of the stolen goods is $1000-5000, while the other (poorer) surveyed district uses a range from $100-500. Further, a definitional problem was noted in the methods questions; detectives had a preference for a "general investigation" which was not a survey category; there was no independent means to ascertain whether predominantly used methods or all used methods were checked; "latent print identification" was apparently not consistently interpreted as including attempted identification.

An editorial rule adopted after the completed questionnaires were returned from the field was to eliminate a check on"insufficient information to conduct investigation"if any other method was checked for the same case.

The large proportion of cases in which information was not sufficient to conduct investigation is the most obvious result (Figure 12). The disposition of most of these cases was unresolved; though a few were "exceptionally cleared". These insufficient information cases, which are cases ending upon preliminary investigation (Figure 8), were separated from the other cases and data analysis was based on "investigated cases"; i.e. those in which one or more of the method questions 2-10 (Figure 11) were checked.

The seven Investigative Dispositions are collapsed in Figure 12a onto four categories as follows:

1. Unresolved, including suspect apprehended and released
2. Unfounded
3. Suspect identified and not charged, including exceptionally cleared
4. Suspect charged, including apprehend and not apprehended

Thus categorized the dispositions as listed in Figure 12a indicate clearly the large proportion of unresolved cases, which is highest for burglaries and lowest for assaults at two of three sites. An exception is Columbus, where the returned questionnaires indicated two cases in which confessions to a large number of burglaries were obtained which led to a number of exceptional clearances.

The investigative dispositions were further collapsed into two categories, resolved and unresolved, in order to make possible a clear comparison with investigated cases (bottom of Figure 12a). Here "resolved" includes unfounded, suspect identified without charge, and suspect charged; "investigated", as used here, denotes those cases in the survey in which any of the listed investigative methods were used. The figure lists for each agency resolved/investigated cases; the fraction is not shown as a single number so that the number of cases involved can be displayed. The number of cases with the less frequently used methods is seen to be quite small.

	CONTRA COSTS PSD						COLUMBUS			DADE COUNTY PSD					
	SHERIFF'S DEPT.			CONCORD						CENTRAL DISTRICT			WEST DISTRICT		
	BURGLARY	ROBBERY	ASSAULT	BURGLARY	ROBBERY	ASSAULT	BURGLARY	ROBBERY	ASSAULT	BURGLARY	ROBBERY	ASSAULT	BURGLARY	ROBBERY	ASSAULT
NO. OF CASES LOGGED BY INVESTIGATORS	270	8	19	120	6	0[X]	910	130	67	240	120	180	150	0[XX]	80
NO. OF CASES SURVEYED	68	8	19	52	6		61	80	40	29	60	38	48		24
SEVERITY, % OF CASES LIGHT	68	0	16	46	0		42	32	56	35	30	32	73		42
AVERAGE	25	50	42	40	50		42	53	44	45	50	42	21		12
SEVERE	16	13	16	14	17		16	15	0	20	20	26	6		46
INVESTIGATIVE PERIOD, DAYS, MEAN	16	NA	8	9.6	NA		14	11	3	28	20	13	27		1.3
RANGE	1-30		1-30	1-30			1-30	1-30	1-17	4-30	1-30	1-30	1-30		1-10
INVESTIGATIVE EFFORT, HOURS, MEAN	2.5	8.0	7.0	2.3	4.7		9.2	5.3	1.2	NA	NA	1.9	NA		NA
RANGE	1-40	3-20	2-20	0-30	1-20		1-150	1-100	1-4						
SCENES SEARCHED % SURVEYED CASES	92	25	52	98	50		71	74	3	45	32	0	62		0
LATENTS LIFTED	22	0	5	38	0		8	6	0	35	25	0	42		0
OTHER PHYS. EVIDENCE COLLECTED	10	0	21	35	17		13	13	0	3	9	1	9		0
DISPOSITION, % OF CASES UNRESOLVED	77	50	16	76	67		51	63	3	94	59	39	77		9
UNFOUNDED	4	0	5	0	17		7	4	5	3	5	3	0		4
SUSPECT IDENTIFIED, NOT CHARGED	13	0	37	15	17		25	23	53	0	18	26	17		46
SUSPECT CHARGED	5	38	42	19	0		16	10	40	3	18	32	6		42
INVESTIGATIVE METHODS INSUFFICIENT INFORMATION TO INVESTIGATE CASES	51	2	2	37	6		22	20	1	13	19	9	16		2
% OF SURVEYED CASES	75	25	11	71	50		36	25	3	45	32	24	33		8
RESOLVED CASES/INVESTIGATED CASES															
2. SUSPECT CAUGHT IN ACT	1/1	2/2	2/2	1/1	0		1/1	4/4	2/2	0	3/3	7/7	3/3		4/4
3. EYEWITNESS TO CRIME	6/8	3/5	14/16	5/7	2/3		7/15	19/55	37/38	1/3	21/31	15/22	3/11		18/18
4. MODUS OPERANDI OF SUSPECT	0/1	0	1/1	1/1	0		7/14	8/14	0	1/4	0	0	0		0
5. INFORMERS	1/4	0/1	1/2	5/8	0		3/7	1/4	1/1	0	0	0	0		1/1
6. SURVEILLANCE OF EVID. LOCATIONS	0/2	0/1	0	1/1	0		0/3	1/4	0	0	4/6	0	0		0
7. CONFESSION	3/3	1/1	1/1	5/5	0		17/17	6/6	2/2	1/1	5/5	5/5	7/7		0
8. POLYGRAPH	0/3	1/1	1/1	5/5	0		0	1/2	0	0	0	0	0		0
9. LATENT PRINT IDENTIFICATION	0/2	0	0	1/2	0		1/1	0/1	0	1/10	3/15	0	1/17		0
10. CRIMINALISTICS LABORATORY	1/1	0	1/1	0	0		1/1	0/1	0	1/1	1/1	0/1	0		0

[X] NO ASSAULTS LOGGED DURING SURVEY MONTHS

[XX] ALL ROBBERIES INVESTIGATED BY CENTRAL DISTRICT

Figure 12 INVESTIGATIVE METHODS SURVEY
(a) AGENCY AND SITE SUMMARY

In Figure 12b the same resolved/investigated characteristic is shown on a crime-specific basis,combining the data from the five agencies. Here most of the numbers are large enough to warrant computing the percentage for each method. The dominance of eyewitnesses in assault investigation becomes very obvious here. The use of criminalistics laboratory with an apparent high success rate of 71% must still be interpreted with caution: (1) the number of so investigated cases in the entire sample of 535 surveyed cases was only 7; and (2) the summary does not display the fact that in this method category, as in many others, several methods were used (and checked) for one case. In fact, in each of the five cases resolved with aid of the criminalistic laboratory other investigative methods are also used. The same note applies to each of the methods. For instance, the 100% success of confession also was achieved with other methods.

The frequency relative to the 327 investigated cases with which each of the investigative methods was used is shown in Figure 12c. With the exception of eyewitnesses, none of the methods were used in more than 15% of the cases.

	ALL AGENCIES SURVEYED				
	BURGLARY	ROBBERY	ASSAULT	3 CRIMES	
NO. OF CASES LOGGED BY DETECTIVES	1700	264	346	2310	
NO. OF CASES SURVEYED	254	154	127	535	
INVESTIGATED CASES	115	107	105	327	
INSUFFICIENT EVIDENCE TO INVESTIGATE CASES	139	47	20	206	
INSUFFICIENT EVIDENCE TO INVESTIGATE % OF SURVEYED CASES	55	30	16	39	
RESOLVED CASES/INVESTIGATED CASES	NUMBER OF CASES				%
2. SUSPECT CAUGHT IN ACT	6/6	9/9	15/15	30/30	100
3. EYEWITNESS TO CRIME	22/44	42/94	84/94	148/232	64
4. MODUS OPERANDI OF SUSPECT	9/20	8/14	1/1	18/35	51
5. INFORMERS	10/20	1/5	3/4	14/29	48
6. SURVEILLANCE OF EVID. LOCATIONS	1/6	5/13	0	6/19	32
7. CONFESSION	30/30	12/12	8/8	50/50	100
8. POLYGRAPH	0/3	1/2	0	1/5	20
9. LATENT PRINT IDENTIFICATION	4/32	3/16	0	7/48	15
10. CRIMINALISTICS LABORATORY	3/3	1/2	1/2	5/7	71

Figure 12 INVESTIGATIVE METHODS SURVEY

(b) CRIME-SPECIFIC COMPARISON OF RESOLVED INVESTIGATIONS

NUMBER OF CASES SURVEYED	535
NUMBER OF CASES INSUFFICIENT INFORMATION	206
NUMBER OF CASES INVESTIGATED	327
NUMBER OF METHOD USES/CASES INVESTIGATED	
2. SUSPECT CAUGHT IN ACT	9%
3. EYEWITNESS TO CRIME	71
4. MODUS OPERANDI OF SUSPECT	11
5. INFORMERS	9
6. SURVEILLANCE OF EVIDENCE LOCATIONS	3
7. CONFESSION	15
8. POLYGRAPH	2
9. LATENT PRINT IDENTIFICATION	15
10. CRIMINALISTICS LABORATORY	2

Figure 12 INVESTIGATIVE METHODS SURVEY
(c) FREQUENCY OF INVESTIGATIVE METHODS USE
(3 SITES, 3 CRIMES)

Before examining in detail in the following sections, how criminalistic operations are used in crime investigation, the eight aids linking criminalistics resources and activities with crime investigation in Figure 8 must be discussed. Kingston (8) lists only 4 such aids, discovery of clues, reconstruction of events, development of suspects and individualization. Our larger list includes operations not necessarily conducted in the criminalistics laboratory. It is hoped that a more detailed classification may more effectively highlight and encourage the use of these aids.

1. Crime scene search, as used here, denotes search directed at recognition of possible physical evidence. As indicated earlier this search may be conducted by uniformed patrol, detectives, evidence technicians* or criminalists. It is a criminalistics operation to the extent that it reflects the searcher's knowledge and consideration of subsequent examination requirements. e.g., analytical requirements as to sample size and preservation, investigator needs and court requirements.

2. Identification of victim becomes a needed criminalist aid when a victim cannot communicate and there are no certain identifiers not requiring scientific examination.

*No particular distinction is made between evidence technicians and mobile crime laboratory personnel; see also footnote, p.8.

3. Screening Tests may be used by an investigator to determine whether he should hold a suspect or investigate further; they are characterized by a need for rapid response and by the absence of need for the analysis to be admissible in a court of law. Examples are the color indicating drug test kits; or say, the determination whether a red stain on a suspect's shirt is food or blood. (It should be noted here, that very few instances of such tests were found during the study.)

4. Assessment of leads: Pieces of paper, cigarette butts, matchbooks, fibers, are frequently picked up at crime scenes. They may or may not contain information of value to the investigator. That a firearm found at the crime scene has possible investigative or evidential value is more obvious. In all these cases, the investigator must determine what leads the information conveyed by these items represents. This determination may be made by the investigator, or by the criminalist, or it may be a joint determination. In Figure 8, an arrowhead at both ends of the connecting line denotes these possibilities.

5. Elimination of suspects: This is an important criminalist aid represented, for instance, by the determination that a suspect's fingerprints do not match those found at the scene, or that blood stains on the suspect's clothing are of animal origin. This aid is listed separately so that its value to the investigator, the suspect and society of such "negative" findings is not overlooked.

6. Physical Evidence Characterization is represented by the finding that a trace material is window glass, or by noting the caliber or rifling of a gun, or composition of a building material. The detail at which this information is provided determines its cost and the time required to make the determination. Therefore the service requires communication between criminalist and investigator, unless the problem is routine.

7. Reconstruction of events. This criminalist aid may involve aspects of the offense, such as determining the point of entry of a burglar, or whether a window was penetrated by a bullet from the inside or the outside of a room. It may also encompass an entire train of events, and may be of use in investigation and in court. For instance, it may help answer the question whether a crime has or has not been committed.

8. Linking of suspect to crime scene, victim or crime, often called individualization (8), means ideally the finding that a piece of physical evidence can only be associated with the suspect. The best example is the fingerprint match. Many others are less unique but equally valuable to the investigator, for instance blood typing according to enzyme groups.

Detailed observations on the use of criminalistics aids in crime investigation will follow. Two general observations may be reported here. (1) It has been found at all three sites that - with the possible exception of homicides - crimes in which a suspect has been seen, or named at the outset, receive more intensive investigation, including more frequent criminalistics involvement*. (2) The role of defense counsel in examination of physical evidence is minimal. The official report from one of the site counties lists one defense request for examination from the county criminalistics laboratory for the fiscal year 1972-73. During the study period, no such requests were found on record at any of the sites and, at public defender request, 10 examinations were made at one of the sites by an independent (commercial) forensic laboratory. The entire role of defense in physical evidence utilization is discussed in Section 6, Volume II.

*This observation is consistent with a Los Angeles study (Reference 14) which found that felony investigations in which the suspect was unknown to the victim constituted the vast majority of the unresolved cases.

Section 6

RESPONSE TO INCIDENT REPORTS

As far as the potential for solving a crime is concerned one may consider as essential the incident report itself, its routing, its timing and the accuracy with which the time of the alleged offense can be fixed. (9) In this study the first parameter that was considered relevant was the time between the occurrence of the crime and the arrival of the first law enforcement officer at the scene.

Our observers determined from review of investigative records and through case-by-case questioning of observers who (i.e., patrol, detective, evidence technician, etc.) responded to the incident; (a) when, and for how long. Further determined were (b) the purpose of the search, (c) what other scenes were searched, (d) whether the scene was found distrubed or not, (e) what was searched and collected, including standards for comparison and latent prints, (f) what services were requested, and (g) details of scene processing in major crimes of bodily violence.

Important differences in incident response were found among agencies and sites. The Sheriff's Department patrols of one site responded to reported offenses, except homicide, with only occasional early involvement of the evidence technician attached to its criminalistics laboratory. The two cities at that site employed evidence technicians who had other duties only when not on crime scene call. In the second site, uniformed patrol was first on the scene, often immediately followed by the evidence technician unit which was in such cases centrally dispatched to the scene, i.e. without specific request from the responding patrol; detective assignment at that site is usually made only upon receipt of the written offense report from the patrol. Collected evidence is usually delivered to the Property Room and only on request from the detective from the Property Room to the Criminalistics Laboratory. Frequent departures from this procedure were observed in that evidence was delivered directly to the laboratory by the patrol officer. In such instances, the evidence would still be logged by the Property Room, the significant departure being that evidence examination by the criminalist may be requested before a detective begins his investigation. At the third site, the crime scene unit is attached to the criminalistics laboratory and is, numerically and in relation to reported crimes, the largest of the three sites. Again, the investigating detective is assigned to the case usually after patrol and crime scene unit have made their report.

In Volume III of this report the data obtained from the three sites are analyzed for indications whether postulated measures of effectiveness will detect significant differences in outcomes that can be ascribed to the search procedures at the three sites. At this point some qualitative observations are in order.

"Regular" patrol officers, i.e. officers not on full-time or top-priority assignment to crime investigation, are in most cases the first and sometimes the only investigators at a crime scene. Their actions or lack of actions may be crucial and irreversible as far as possible physical evidence is concerned. Even though the first officer at the scene does not require the skills of the detective, he must know of their requirements. Therefore, some training in criminalistics operations of all potential first officers at the crime scene is needed. For instance, if victims or articles are moved or touched without compelling reasons it may not be possible to reconstruct events for the benefit of investigators, criminalists or courts. His definition or description of the scene is crucial. In one observed instance, a request for analysis by a criminalist firearms expert, contained as information only that shots were fired at the occupant of a car and a brief description of the wounds. The only physical evidence was the weapon and a shell. Preservation of the vehicle in the position found at the scene might have enabled the criminalist to determine the direction in which the shots were fired, whether from within the vehicle or from the outside, etc.

Figure 13 presents crime scene chronology during the survey period combined for the three sites for the nine offenses of interest. The upper number in each cell of the Figure is average hours. The lower number is standard deviation also in hours. The first three major rows represent the time elapsed between the stages of the search: crime, Offense Report and beginning of search. The other three major rows show time between crime and arrival at scene and time at scene for patrol evidence units and detectives.

From 622 search questionnaires, the time from crime to Offense Report was recorded in 494 cases as shown in the police Offense Report. If possible the time of crime was estimated when not entered in the Offense Report. It should be noted here that the study did not explore the time elapsed between the telephone, radio or other report of the crime to the police, the time to dispatch and similar elements. Rather, our interest centered on reference to the time of crime, because the age of the crime scene may be an element in measuring how effective search and subsequent physical evidence examination can be. (However, one case, in which an assult victim died two weeks after the attack and the crime scene was searched then, was removed from the data base so as not to bias the average too drastically.)

Personnel arrival times were recorded for 206 patrols, 250 evidence units and 33 detectives. In some cases both patrol and evidence units searched the scene. Time at the scene is recorded in the Figure for 111 patrols, 20 detectives and 269 evidence units. The shrinkage in the data from 622 questionnaires is due to lack of available record. However enough data were collected to discern interesting trends. The Figure denotes the few data points that are based on 5 or less cases by a superscript 0. The standard deviation is zero where only one data point was available.

		HOMICIDE	RAPE	ROBBERY	AGG. ASSAULT	BURGLARY	LARCENY	ARSON	BOMBING & EXPLOSIV.	HIT & RUN
CRIME → OFFENSE REPORT	1	2.00	4.23	2.60	1.34	3.88	2.45	8.30	0.34^{o}	2.49
	2	5.10	7.58	6.90	4.82	11.57	5.82	19.13	0.43^{o}	5.45
OFFENSE REPORT → SEARCH		1.09	0.88	5.20	1.93	3.26	1.62	0.25	1.42^{o}	0.57
		2.40	2.43	20.60	12.19	8.98	3.63	0.75	1.89	0.84
CRIME → SEARCH		3.63	7.50	6.82	3.69	7.75	4.49	7.29	1.88^{o}	0.31
		6.37	21.60	20.10	13.00	16.90	6.53	19.88	1.35	0.14
PATROL, CRIME → ARRIVAL		2.39	3.18	2.89	0.77	4.01	4.78^{o}	10.50	0.58^{o}	0.09^{o}
		6.56	5.16	8.16	2.52	7.92	8.27	24.50	0.71	0.11
TIME AT SCENE		1.01	0.81	1.20	0.96	1.17	0.67	0	0	0.75
		1.31	0.63	0.90	0.81	1.38	0			0
EVIDENCE UNIT, CRIME → ARRIVAL		2.76	8.50	3.19	2.24	6.60	6.27	0.96^{o}	0.92	0.55
		5.03	16.10	6.06	4.21	14.20	8.09	0.30	0	0.26
TIME AT SCENE		3.12	2.51	1.50	1.44	0.99	1.13	1.92	0.83	1.39
		2.09	1.62	1.41	0.75	0.61	1.24	0.59	0	0.53
DETECTIVE, CRIME → ARRIVAL		3.56	8.13	0.96	10.0	0	0	0	0	0
		8.58	6.62	0.18	28.2					
TIME AT SCENE		1.24	2.10	0.17	1.74	1.23	0	0	0	0.28
		0.96	2.72	0	1.14	0				0

1 AVERAGE HOURS
2 STANDARD DEVIATION, HOURS

^{o}LESS THAN 5 OBSERVATIONS

Figure 13 CRIME SCENE CHRONOLOGY

Patrol time at the scene is seen to be remarkably constant with an average of one hour for most offenses. The search times of the evidence units follow the severity of the crime category with murder getting the highest attention (3.12 hours average). Detectives do not usually participate in the initial crime scene search and when they do, they arrive later than the evidence unit. (Their visits to crime scenes for follow-up investigation are not part of these data).

Our qualitative observation is that the need to make first-arriving patrol officers aware of criminalistics operations should receive as much attention as the training of crime-scene technicians as first line criminalist operators. The practicality of using team make-up and chronology of law enforcement officers at crime scenes, as well as of other crime scene parameters, in measures of effectiveness is examined in Volume III. This practicality depends on the availability of the information and on the possibility of meaningfully relating the data to outcome of investigation. Here, it suffices to note that in addition to the critical role of the first contact, we must also be aware of the obvious - that without the recognition, preservation and collection of possible physical evidence, the criminalist cannot function. In Figure 14, the number of cases in which physical evidence was collected, the collection of evidence standards and the subsequent requests for analysis of these items is summarized for the crime scene searches included in the study on a crime and evidence-specific basis. In the Figure, evidence category (1), latent prints, does -- with few exceptions -- not include cases in which latents were the only evidence collected. The large number of cases with evidence category (4), weapons may also be noted. That number is particularly large in assault cases, Figure 7c, In most of these assault cases, the laboratory was, however, only requested to determine whether or not a firearm was operable. In Figure 15, physical evidence collection, analysis requests and performed analyses are listed for each site on a crime-specific basis. The data on the ratio of laboratory service requests/evidence collected reflect a number of considerations that were not a subject of our investigation including indiscriminate or public-relations-motivated evidence collection (13). The extent to which this ratio is less than one indicates the discretion exercised by the detectives in deciding which evidence to have examined.

OFFENSE CATEGORY		EVIDENCE CATEGORY								STANDARDS		
		FINGER AND PALM PRINTS	PHYSIOLOGICAL MATERIAL	PHYSICAL MATCH PROBLEMS	WEAPONS	STRUCTURAL MATERIALS	TRANSFER MATERIALS	DOCUMENT MATERIALS	CHEMICAL PROBLEMS	PRINTS	PHYSIOLOGICAL MATERIALS	OTHERS
		1	2	3	4	5	6	7	8			
HOMICIDE												
NO OF CASES*	A	2	10	6	15	4	3	0	1	11	8	5
NO OF ITEMS	B	3	11	7	16	8	5	0	6	11	8	5
ITEMS/CASE	C	1.5	1.1	1.6	1.1	2.0	1.6	0	6.0			
RAPE												
	A	3	8	1	11	3	0	0	0	3	7	5
	B	4	9	3	13	9	0	0	0	4	7	5
	C	1.3	1.1	3.0	1.2	3.0						
ROBBERY												
	A	8	0	3	4	3	0	0	0	1	0	1
	B	11	0	5	5	6	0	0	0	1	0	1
	C	1.4	0	1.6	1.2	2.0						
AGG. ASSAULT												
	A	2	9	7	21	3	2	2	1	3	3	6
	B	3	10	8	25	4	4	9	2	3	3	6
	C	1.5	1.1	1.1	1.2	1.3	2.0	4.5	2.0			
BURGLARY												
	A	13	3	8	4	10	4	5	0	1	1	12
	B	14	4	9	6	11	6	6	0	1	1	12
	C	1.2	1.3	1.1	1.5	1.1	1.5	1.2				
LARCENY												
	A	1	0	0	2	2	0	0	0	0	0	1
	B	3	0	0	6	11	0	0	0	0	0	1
	C	3.0			3.0	5.5						
ARSON												
	A	1	1	1	2	5	1	0	0	0	0	0
	B	3	2	3	3	6	6	0	0	0	0	0
	C	3.0	2.0	3.0	1.5	1.2	6.0					
BOMBING & EXPLOSIVES												
	A	1	0	1	1	1	0	0	0	0	0	1
	B	2	0	3	3	4	0	0	0	0	0	1
	C	2.0		3.0	3.0	4.0						
HIT & RUN												
	A	0	2	2	1	1	1	0	0	1	1	1
	B	0	3	4	2	2	2	0	0	1	1	1
	C		1.5	2.0	2.0	2.0	2.0					

*I.E. NUMBER OF REPORTED OFFENSES FOR WHICH ONE OR MORE CRIME SCENE SEARCH WAS CONDUCTED.

Figure 14a PHYSICAL EVIDENCE COLLECTION

SITE: CONTRA COSTA

OFFENSE CATEGORY		EVIDENCE CATEGORY								STANDARDS		
		FINGER AND PALM PRINTS	PHYSIOLOGICAL MATERIAL	PHYSICAL MATCH PROBLEMS	WEAPONS	STRUCTURAL MATERIALS	TRANSFER MATERIALS	DOCUMENT MATERIALS	CHEMICAL PROBLEMS	PRINTS	PHYSIOLOGICAL MATERIALS	OTHERS
		1	2	3	4	5	6	7	8			
HOMICIDE												
NO OF CASES*	A	5	6	6	21	2	1	3	0	2	3	2
NO OF ITEMS	B	6	7	7	23	3	2	4	0	2	3	2
ITEMS/CASE	C	1.2	1.2	1.2	1.1	1.5	2.0	1.3				
RAPE												
	A	1	10	7	2	2	0	1	0	0	0	3
	B	9	12	8	6	4	0	3	0	0	0	3
	C	9.0	1.2	1.1	3.0	2.0		3.0				
ROBBERY												
	A	0	0	0	0	0	0	0	1	0	0	1
	B	0	0	0	0	0	0	0	5	0	0	1
	C								5.0			
AGG. ASSAULT												
	A	3	6	3	12	0	1	1	0	0	0	0
	B	4	7	4	13	0	3	2	0	0	0	0
	C	1.3	1.2	1.3	1.1		3.0	2.0				
BURGLARY												
	A	5	1	20	4	12	8	3	1	0	3	24
	B	6	3	21	5	13	9	4	2	0	3	28
	C	1.2	3.0	1.1	1.1	1.1	1.1	1.3	2.0			1.2
LARCENY												
	A	0	0	0	1	0	0	0	0	0	0	0
	B	0	0	0	2	0	0	0	0	0	0	0
	C				2.0							
ARSON												
	A	0	0	0	0	0	0	0	0	0	0	0
	B	0	0	0	0	0	0	0	0	0	0	0
	C											
BOMBING & EXPLOSIVES												
	A	0	0	0	0	0	0	0	0	0	0	0
	B	0	0	0	0	0	0	0	0	0	0	0
	C											
HIT & RUN												
	A	0	0	3	0	1	2	0	0	0	0	3
	B	0	0	4	0	2	3	0	0	0	0	3
	C			1.3		2.0	1.5					

*I.E. NUMBER OF REPORTED OFFENSES FOR WHICH ONE OR MORE CRIME SCENE SEARCH WAS CONDUCTED.

Figure 14b PHYSICAL EVIDENCE COLLECTION

SITE: COLUMBUS

OFFENSE CATEGORY		EVIDENCE CATEGORY								STANDARDS		
		FINGER AND PALM PRINTS	PHYSIOLOGICAL MATERIAL	PHYSICAL MATCH PROBLEMS	WEAPONS	STRUCTURAL MATERIALS	TRANSFER MATERIALS	DOCUMENT MATERIALS	CHEMICAL PROBLEMS	PRINTS	PHYSIOLOGICAL MATERIALS	OTHERS
		1	2	3	4	5	6	7	8			
HOMICIDE												
NO OF CASES*		17	16	15	41	9	5	5	4	2	1	0
NO OF ITEMS	B	18	21	18	43	10	6	6	6	3	1	0
ITEMS/CASE	C	1.1	1.3	1.2	1.0	1.1	1.2	1.2	1.5			
RAPE												
	A	17	11	11	13	2	1	6	7	1	1	3
	B	20	12	16	17	3	4	7	8	2	1	4
	C	1.2	1.1	1.4	1.3	1.5	4.0	1.2	1.1			
ROBBERY												
	A	21	4	8	29	5	5	1	0	1	0	2
	B	24	5	12	30	6	6	2	0	1	0	3
	C	1.1	1.2	1.5	1.0	1.2	1.2	2.0				
AGG. ASSAULT												
	A	10	6	13	107	3	3	1	5	1	0	1
	B	11	7	14	110	4	4	2	6	1	0	1
	C	1.1	1.2	1.1	1.0	1.3	1.3	1.5	1.2			
BURGLARY												
	A	38	9	22	11	12	2	0	1	2	1	4
	B	39	10	27	12	13	4	0	2	2	1	4
	C	1.0	1.1	1.2	1.1	1.1	2.0		2.0			
LARCENY												
	A	0	0	1	1	0	0	0	1	0	0	0
	B	0	0	2	4	0	0	0	2	0	0	0
	C			2.0	4.0				2.0			
ARSON												
	A	0	0	2	0	0	0	0	1	0	0	0
	B	0	0	4	0	0	0	0	2	0	0	0
	C			2.0					2.0			
BOMBING & EXPLOSIVES												
	A	0	1	1	1	0	0	0	0	0	0	0
	B	0	2	2	2	0	0	0	0	0	0	0
	C		2.0	2.0	2.0							
HIT & RUN												
	A	0	0	1	0	0	1	0	0	0	0	0
	B	0	0	3	0	0	2	0	0	0	0	0
	C			3.0			2.0					

*I.E. NUMBER OF REPORTED OFFENSES FOR WHICH ONE OR MORE CRIME SCENE SEARCH WAS CONDUCTED.

Figure 14c PHYSICAL EVIDENCE COLLECTION

SITE: DADE COUNTY

OFFENSE	EVIDENCE				
	NUMBER OF ITEMS			REQUESTS / COLLECTED	ANALYZED / REQUESTED
	COLLECTED	ANALYSIS REQUESTED	ANALYZED		
HOMICIDE	72	37	32	.51	.85
RAPE	49	28	22	.57	.80
ROBBERY	16	10	9	.63	.90
AGG. ASSAULT	55	35	31	.64	.89
BURGLARY	49	35	26	.71	.74
LARCENY	2	2	2	1	1
ARSON	14	11	10	.79	.91
BOMBING & EXPL.	4	1	1	.25	1
HIT & RUN	1	1	1	1	1
9 OFFENSES	262	160	134	.61	.84

Figure 15a PHYSICAL EVIDENCE EXAMINATION REQUESTS

SITE: CONTRA COSTA

OFFENSE	EVIDENCE				
	NUMBER OF ITEMS			REQUESTS / COLLECTED	ANALYZED / REQUESTED
	COLLECTED	ANALYSIS REQUESTED	ANALYZED		
HOMICIDE	55	34	30	.62	.88
RAPE	158	93	91	.60	.97
ROBBERY	9	7	2	.77	.30
AGG. ASSAULT	27	25	24	.93	.95
BURGLARY	97	65	61	.69	.94
LARCENY	1	1	1	1	1
ARSON	0	0	0	–	–
BOMBING & EXPL.	4	1	1	.25	1
HIT & RUN	11	7	7	.63	1
9 OFFENSES	362	233	217	.64	.93

Figure 15b PHYSICAL EVIDENCE EXAMINATION REQUESTS
SITE: COLUMBUS

OFFENSE	EVIDENCE				
	NUMBER OF ITEMS			REQUESTS / COLLECTED	ANALYZED / REQUESTED
	COLLECTED	ANALYSIS REQUESTED	ANALYZED		
HOMICIDE	174	76	67	.44	.88
RAPE	89	53	44	.59	.94
ROBBERY	81	60	53	.75	.88
AGG. ASSAULT	240	131	124	.55	.95
BURGLARY	118	79	71	.66	.90
LARCENY	4	2	2	.50	1
ARSON	6	3	3	.50	1
BOMBING & EXPL.	3	3	3	1	1
HIT & RUN	2	0	0	–	–
9 OFFENSES	717	407	367	.57	.90

Figure 15c PHYSICAL EVIDENCE EXAMINATION REQUESTS
SITE: DADE COUNTY

Section 7

THE OFFENSE REPORT

The importance of the Offense Report in crime investigation resides in the fact that it is the first documentation of an alleged offense. It may contain facts on suspects, victims, crime scene, stolen property (if applicable) and possible physical evidence. The report is usually prepared by the patrol officer sent to the scene (or receiving the complaint if the scene is not visited). Particularly in cases where crime scene technicians do not go to the scene at all or considerably later, the Offense Report is the major source of information or possible physical evidence available for subsequent investigation.

Offense Reports, at the study sites and generally elsewhere, require a mixture of narrative, specific answers (e.g. place of occurrence), and check answers (e.g. vehicle impounded or returned to owner). The specific and check answers require varying detail such as names and characteristics of victim, suspect, modus operandi, weapons, property recovered and vehicle. In none of the Offense Report forms reviewed was there any space specifically reserved for physical evidence information. Such information can and does in practice appear in the narrative. However, many Offense Reports reviewed did not contain any physical evidence information. We recommended that check list type of questions on physical evidence be incorporated in Offense Reports. This recommendation is made notwithstanding the fact that crime scene procedure charts and also (detective) supplementary offense reports do require such information because the Offense Report may be the only document on the offense or at least on the initial condition of the crime scene. Check-type questions are preferable to instruction to include physical evidence information in the narrative, because they are more specific reminders and also lend themselves better to computerized management monitoring of procedures.

Figure 8 has screening tests occurring before the offense report is issued and, hence, while the first officer at the scene may still be the sole investigator. Such tests would more likely be applied or called by a crime scene technician or a detective. Screening tests might also be applied during preliminary investigation. As has already been noted, few screening tests were on record or observed throughout the study. We believe that as a means to come to important decisions, such as whether or not to take a suspect into custody or whether to release a suspect, they are of categoric value and that consequently their use should be encouraged.

Following the Offense Report the Figure indicates Identification of Victim as a criminalst aid. Again, the timing relative to the investigation sequence may vary. Such criminalist services, e.g. to fingerprint an unidentified victim, are more likely to be called for as needed by investigators than the screening tests above. Few cases involving victim identification were found in our study and we would ascribe this only to the relative rarity of the need. Nevertheless, the service may constitute an important criminalist contribution when it occurs.

Section 8

PRELIMINARY INVESTIGATION

Although "preliminary investigation" (of alleged crimes) is a self-explanatory and useful concept, we found that in practice boundaries are not rigorously drawn. As was mentioned earlier, the transition between preliminary and further investigation often is gradual, rather than abrupt, deliberate, and formal. The beginning of preliminary investigation also is not uniform. In some cases the detective investigator takes part in the first crime scene search; sometimes one detective goes to the crime scene and preliminary investigation is assigned to another; and sometimes preliminary investigation starts when the detective receives offense and laboratory reports.

The entire criminal investigation process, including its command and control structure and its non-physical evidence-related operations are the subject of another NILEJC study (10). The present study is only concerned with the use of physical evidence in criminal investigation. In Figure 16, preliminary investigation is depicted in its relation to physical evidence examination only.

Patrol (1), evidence technicians (2) and detectives (3) are shown as possibly converging on the crime scene. Other possible participants, e.g., the prosecutor or medical examiner are not shown so as to retain clarity.

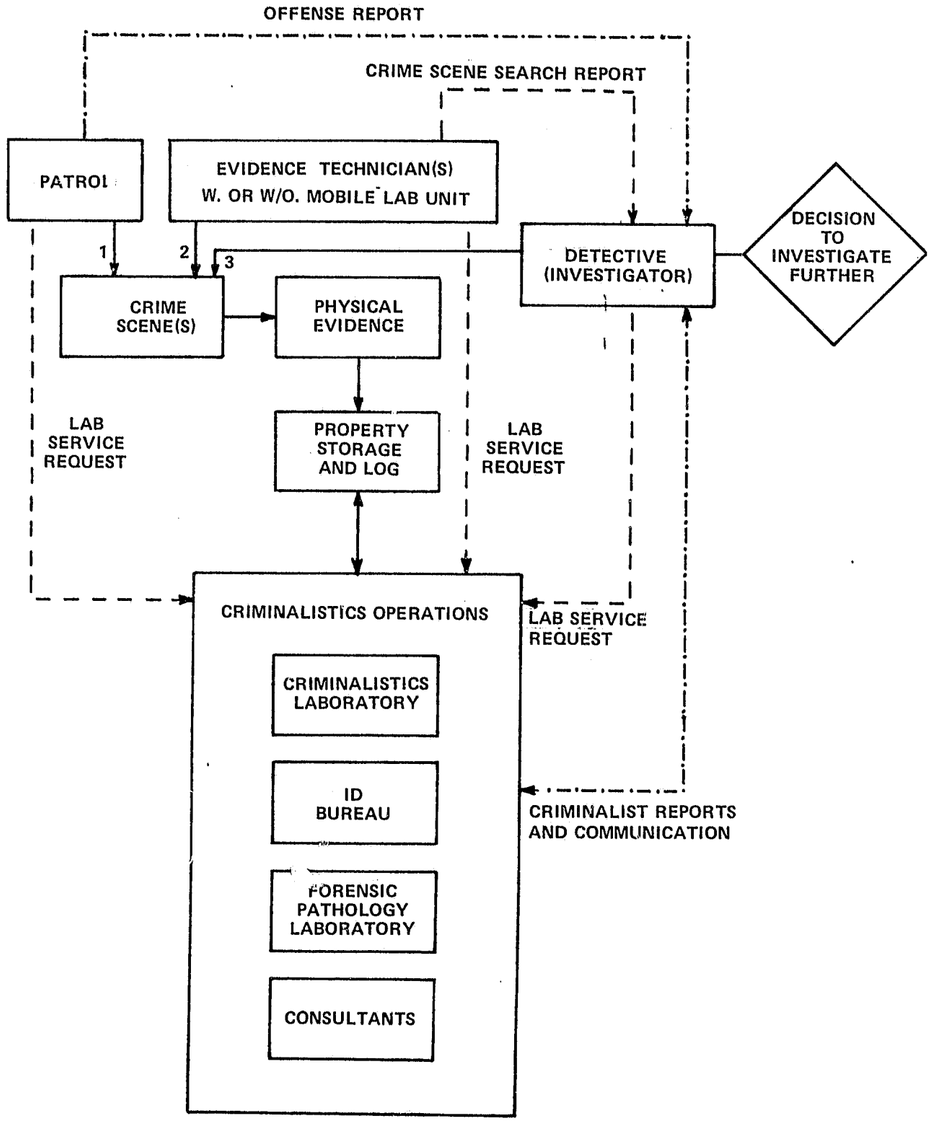

Figure 16 PRELIMINARY INVESTIGATION

The solid, dashed, and dash-dotted lines denote different relations. Physical evidence is shown by solid lines and arrows as coming from the crime scene entering property storage and log, going to a criminalistics operation and returning to property storage. Dashed lines indicate requests for laboratory service which may originate from the patrol, from the evidence technicians or the detective. The decision on the part of patrol or evidence technician to make a request for examination rather than leave this decision to the detective investigator, appears to be entirely informal and based on the judgment of the nature and importance of the case. For instance latent prints when lifted will be evaluated by ID personnel without detective participation, although the detective would make the decision to request a comparison file search.

CONTINUED

1 OF 2

Dash-dotted lines denote the criminalist's report to the detective and communication between detective and criminalist. From this report and communication and from his other information sources must come the investigator's assessment of his leads for solution of the case and the decision whether to investigate further or not. As noted earlier, the written record on such communication other than the formal criminalist report was found to be almost non-existent. We know that in certain crime categories (homicide) there is such communication. In other cases the communication may take place but it is not a controlled, supervised or managed activity. Our field observers asked detectives explicitly whether laboratory evidence was used to decide whether to conduct investigation or not* and the results are summarized in Figure 17. In most cases laboratory evidence did not play a role in this decision. The three crimes in which the decision was influenced (positively or negatively) in more than 10% of the cases are: rape 16%, arson 25% and hit-run 36%. While the highest of these percentages is based on a rather small sample (11 cases), the higher rate for these three crime categories is a plausible result, since in each of these categories physical evidence is usually necessary in court; in the other crime categories, physical evidence has more often only a supporting role.

Another site observation is that in some cases further investigation does not proceed because the investigator has not received the record of physical evidence examination, although examination was made and the record exists.

*The question was suggested by Mr. Lowell Bradford, PRC.

OFFENSE	CASES, LABORATORY EVIDENCE USED			
	NOT KNOWN	YES	NO	YES / YES + NO
HOMICIDE	3	1	76	.01
RAPE	6	14	71	.16
ROBBERY	9	4	42	.10
AGG. ASSAULT	16	5	138	.03
BURGLARY	31	5	78	.06
LARCENY	1	0	7	0
ARSON	3	2	6	.25
BOMBING & EXPLOSIVES	1	0	2	0
HIT AND RUN	0	4	7	.36
9 OFFENSES	70	35	427	.08

Figure 17 CONTRIBUTION OF LABORATORY EVIDENCE TO DECISION TO CONDUCT DETECTIVE INVESTIGATION – 3 SITES

Our preceding discussion of Figure 16 has not dealt with differences in procedure among the three sites. A few remarks on these differences are in order. The Laboratory Service requests have differences in form, content and manner of communication that tend to make a difference in the resulting role of the criminalist. Is he asked to perform a certain test, analyze a substance for composition, determine whether a gun is operable, or is he asked to participate in solving an alleged crime? The more information that is provided on the service request, the better is the opportunity for the criminalist to become involved in the entire process of solution. In all three sites service requests are made in person. The reason for this procedure is that it facilitates maintaining the chain-of-evidence and, in the three sites, the distances involved permit this arrangement. Two of the three criminalistics laboratories as a rule have a criminalist or technician interview the transmitting officer who may, however, only be a "transportation" officer without knowledge of the case. One laboratory has established a "laboratory memorandum" requiring detailed information for cases in which there is no detailed crime scene search report.

Section 9

FURTHER INVESTIGATION

A general impression gained from the observations made during the study is that the most frequent use made of criminalistics in investigation is to corroborate findings rather than to develop the investigation.

Some difficulty exists in documenting this impression because (a) the record is sparse and (b) to obtain in-depth case-by-case information on the laboratory contribution would be extremely time-consuming. Though annotated in more detail on the case questionnaires, the information on the results of laboratory analysis tabulated in Figure 18, is whether or not an "identification" was made. This is a rather coarse-screen filter and the results must be interpreted with caution. For instance, an "identification" was recorded when a specimen was determined to be human blood, whether or not the specimen was related to victim or suspect. Nevertheless, the data summarized for three sites provide a first overview of laboratory analysis results on a crime and evidence-specific basis. The data for laboratory analysis in this figure continue the trend found in Figure 14, namely the large number of laboratory requests involving assault cases and weapons. The numerically next largest incidence of physical evidence (submitted, analyzed and identified) is physiological material in rape cases. The major contributor to the high number is one site (Columbus) where as a regular practice vaginal swabs and slides are sent to the crime laboratory, even though they may have been examined previously in a hospital: no other physical evidence is usually examined.

		EVIDENCE CATEGORY (NUMBER OF ITEMS)							
		FINGER AND PALM PRINTS 1	PHYSIO — LOGICAL MATERIAL 2	PHYSICAL MATCH PROBLEMS 3	WEAPONS 4	STRUCTURAL MATERIAL 5	TRANSFER MATERIAL 6	DOCUMENT MATERIALS 7	CHEMICAL PROBLEMS 8
HOMICIDE SUBMITTED	S	20	29	18	69	3	5	1	3
ANALYZED	A	18	22	13	66	2	5	1	3
IDENTIFIED*	I	7	19	7	46	1	3	1	3
RAPE	S	17	94	20	27	3	1	7	5
	A	16	89	15	23	3	1	5	5
	I	7	65	9	17	2	1	0	5
ROBBERY	S	29	3	9	23	4	1	1	1
	A	26	2	6	23	3	1	1	1
	I	15	2	1	15	3	0	0	1
AGG. ASSAULT	S	13	13	13	135	6	3	1	5
	A	13	11	12	129	6	1	1	4
	I	4	10	7	115	5	1	0	4
BURGLARY	S	39	8	59	22	32	12	3	3
	A	35	7	52	18	30	9	3	3
	I	10	4	31	11	18	2	3	2
LARCENY	S	0	0	0	3	1	0	0	1
	A				3	1			1
	I				2	1			1
ARSON	S	2	0	2	3	4	1	0	2
	A	2		2	3	3	1		2
	I	2		2	2	2	1		2
BOMBING & EXPLOSIVES	S	0	0	2	1	1	0	0	1
	A			2	1	1			1
	I			0	1	1			0
HIT & RUN	S	0	0	3	0	2	3	0	0
	A			3		2	3		
	I			3		1	2		

* SEE PAGE FOR DISCUSSION OF "ITEMS IDENTIFIED"

Figure 18 PHYSICAL EVIDENCE EXAMINATION
3 SITES

Figure 19 provides a first cut at the reasons why evidence submitted to the laboratory, or delivered to the property room, was not analyzed. The relatively small number of data, compared to the total number not analyzed, reflects the sparsity of available information. "Insufficient time" and "by direction of investigator or prosecutor" are the dominant reason for not analyzing submitted evidence. Very little information was obtainable on questions of adequate speciman size and fitness for analysis, because such information is not usually recorded in writing.

Criminalistics Aids

The contribution of laboratory analysis to investigation can also be approached from point of view of the kind of aid rendered. In Figure 8, the following four criminalistics aids are shown available in further investigation or the transition between preliminary and further investigation:

- Elimination of suspects
- Physical evidence characterization
- Reconstruction of events
- Individualization

EXPLANATION	HOMICIDE	RAPE	ROBBERY	ASSAULT	BURGLARY
1. INSUFFICIENT TIME	16	2	6	14	10
2. NOT RELEVANT	0	7	0	4	1
3. BY DIRECTION OF INVESTI-GATOR OR PROSECUTOR	18	14	5	3	7
4. EQUIPMENT LIMITATION	2	0	0	0	0
5. TRAINING LIMITATION	0	0	0	0	0
6. OTHER (e.g. SENT TO ANOTHER LAB)	2	4	0	0	6

Figure 19 PHYSICAL EVIDENCE SUBMITTED AND NOT ANALYZED 3 SITES

As pointed out in Section 5, aid in elimination of suspects is an important criminalist contribution that should not be overlooked, even if the investigation itself may remain "unresolved" on police department records. Some of the analyses required for such aids may be routine, such as fingerprint matching, blood stain analysis or determining the size of projectiles; others may require more communication between criminalist and detective, or more creative criminalist contribution. For instance, in one of the sites, a widely publicized rape and homicide involving several crime scenes, several perpetrators and fugitives, occurred during the survey period. Numerous service requests were made to the evidence technician unit, the crime laboratory and the (fingerprint) identification unit. Service was rendered rapidly and numerous conferences between detectives and laboratory personnel took place. The results of the physical evidence information were decisive in successfully closing the investigation in a short time.

The ultimate such criminalist contribution would be "prevention of miscarriage of justice" and would apply to a case in which a suspect has been formally charged at the time he is eliminated as a suspect through criminalist aid; no such case came to our attention during the observation period.

Examples of "physical evidence characterization" were given in Section 5. It is listed as a separate criminalistics aid category because, though it contributes to reconstruction of events, the investigator (and consequently the adjudicator) sometimes only require physical evidence information to complement or corroborate other evidence. Often the contribution of the criminalist need only be one of characterization, e.g. in dangerous drug cases or sobriety tests.

Reconstruction of events involves the gamut of aids such as answering a specific question by an investigator. Was the shot fired at a distance exceeding an arm's length from the victim? The answer might determine whether the wound could have been self-inflicted or not. Another partial reconstruction is the point of entry of an intruder, how entry was gained, what tools were used, i.e. information enabling the investigator to establish or compare the perpetrator's modus operandi.

"Individualization" of physical evidence is, of course, the ultimate aid that the criminalist can provide. Matching of fingerprints, footprints, tool marks, bullet striations are but a few examples.

In our study, information on this last aid has been more definitive than the replies to our questions on other criminalists aids. Figure 20 summarizes the answers obtained to our questions to detectives concerning their use of the criminalistics laboratory through:

OFFENSE	TOTAL CASES	AIDS					NEW INPUT		
		CLUES	RECONSTRUCT EVENTS	DEVELOP SUSPECTS	INDIVIDU-ALIZATION	OTHERS	SUPPORT OR REFUTE HYPOTHESIS	NEW HYPOTHESIS	NEW CLUES
HOMICIDE	79	14	21	8	26	13	1	0	0
RAPE	81	2	17	3	14	45	4	0	0
ROBBERY	52	3	3	14	23	9	2	1	0
AGG. ASSAULT	152	11	33	10	41	56	2	1	0
BURGLARY	105	8	19	23	51	14	8	0	0
LARCENY	7	0	3	0	1	3	0	0	0
ARSON	8	4	2	2	0	0	0	0	0
BOMB.& EXPL.	2	1	1	0	0	0	0	0	0
HIT & RUN	11	2	6	5	2	0	1	1	0
9 OFFENSES	497	45	105	55	158	140	18	3	0

Figure 20 CRIMINALIST AID TO INVESTIGATION

Development of clues

Reconstructing events

Developing suspects

Individualization of physical evidence

Support or refutation of the investigator's hypothesis

New hypothesis

New clues

The low utilization of laboratory aids in substantiating clues and developing suspects will be noted from the figure. Even lower was any record on new input by, or as a consequence of, laboratory examination. We interpret these results to indicate, in addition to lack of use of such laboratory aids, inability to perceive the value of some laboratory results. We conclude further, that they also indicate a general lack of sensitivity to the breadth and depth of services that can be provided by the laboratory. Again some of these aids such as development of hypotheses on the probable offender or his modus operandi, would require more dialogue between detectives and criminalistics than was evident at the sites.

For the purposes of this study the available criminalistics operations have been treated as equivalent, although some references to differences in practices have been made which affect the extent to which criminalist aids can be used. The companion project (3) investigated laboratory operations and developed such information. One area not fully covered by that study should be mentioned here, because, though a criminalistics operation, it is not in all three sites performed in the criminalistics laboratory; that is latent print identification. In all three sites, latent print matching capability

exists and is used if the 10-finger comparison print is available. However, large differences prevail in "cold" search capability and results. The Contra Costa Sheriff's Department has a suspect file of approximately 20,000 prints. However, due to lack of staff, the file is not used for cold search. In Richmond, several categories of active suspects files are maintained by area, race, and offense category; their size varies from 25 to 900. In 1971 the lone fingerprint technician there made 289 suspect identifications of which 66 were "cold". The Richmond file is also used to check prints of suspects charged with a recent crime confessing to old offenses for which they are not charged. Further, the Department takes palm print on the back of its 10-finger cards.

In Concord, known suspect prints are checked in the State Capital, Sacramento, a one-way distance of 60 miles from Concord. The entire evidence technician unit is newly reorganized and no suspect file is kept at this time in Concord.

In Columbus the Police Department 10-fingerprint file is large; no cold searches are conducted.

In the Dade County Public Safety Department "strip files" are maintained by detective district and broken down according to an 8-point single finger classification system used by the Atlanta Police Department. Each of four fingerprint technicians specializes in a district. The files number about 1,000 per district and are purged gradually. In addition, an 18,000-card palmprint file is kept

in alphabetical order. In 1972 there were 22 cold search hits and 8 in 1973. In addition, the Dade County department daily receives prints from jail bookings and with the aid of this information a substantial number of unknown subjects are identified. Observations on latent print lifts, identifications and subsequent investigation dispositions follow in the next section.

Section 10
DISPOSITION

Six investigative disposition categories are of interest from the point of view of assessing the contribution of physical evidence to criminal investigation:

1. Unfounded
2. Unresolved
3. Suspect identified, not charged
4. Suspect apprehended, and released
5. Suspect apprehended and charged
6. Suspect charged, not apprehended

The first category includes investigated incidences that are found not to be a chargeable offense e.g. natural death, suicide and self-defense in cases of manslaughter or assault.

"Unresolved" includes "suspended" and "pending" in police investigative files. For the purposes of this study the arbitrary rule was adopted that burglaries, robberies and assaults would be called unresolved after 30 days of investigation. If they were still pending, homicides and rapes were so called at the end of the observation period if they were more than 30 days in investigation and still unsolved.

"Suspect identified and not charged" includes cases in which the victim refuses to prosecute after investigation and several other examples of "exceptional clearance" recognized by the UCR Reporting Handbook (11), e.g. extradition of offender denied by another jurisdiction, or offender dead. Our category also includes "the exceptionally cleared" definition used in two of the sites which includes offenses, typically a series of burglaries, confessed to but not charged against suspects after they are charged for one burglary. The study has been particularly interested in the physical evidence role in this latter category and we asked in each case: "If other crimes were cleared by this investigation, did physical evidence play a role?" Very few positive answers were obtained. We noted earlier the practice observed in one of the sites of trying to verify from latent print records in such cases, a practice which incidentally also helps to keep the files cleared of solved cases.

The last three disposition terms on the preceding page are self-explanatory. In all six disposition categories the study was interested in determining what circumstances contributed to the investigation and a question to this effect was asked in each case whose record was included. For purposes of evaluation a collapse of these categories onto "resolved" and "unresolved" is of interest. (This procedure has been used in the Investigative Methods Survey, Section 5.)

In Figure 21 a-j investigative dispositions and the role of physical evidence in 417 cases are shown on a crime-specific basis. The data summarizes cases in which physical evidence was examined in a criminalistics laboratory at each site during the 8-month observation period of the study. The assessment of physical evidence contribution is that of the detective investigator or that of the study's field observer. Regardless of disposition, the role of physical evidence was adjudged minor or mil in the majority of cases in each of the nine offense categories. These data are presented here because they give a first overview as to how the results of physical evidence examination are used in investigation and what the associated investigation outcomes were. The development of measures of effectiveness in Volume III includes critical consideration of these and other data.

The survey of 1972 investigations, Figures 10, indicated that in a large fraction of crime investigations in which there is a scene search latent prints are the only physical evidence collected. This pattern was found also during the observation period of this study. Figure 22 summarizes the results of investigations involving latent prints during part of the total observation period, 1.5-3.0 months, at each site.

In the figure latents lifted, latents of value, and elimination prints, are counted as 1 for each case, regardless of the number of lifts, etc. per case. The number of unknown suspects identified is taken from records of the identification bureaus. All other data are from departmental investigative files.

	UTILIZATION	DISPOSITION: UNFOUNDED	UNRESOLVED	S IDENTIFIED, NOT CHARGED	S APPREHENDED RELEASED	S APPREHENDED CHARGED
(a) 9 OFFENSES	DECISIVE	3	4	3	0	34
	SIGNIFICANT	6	7	4	0	48
	MINOR	5	15	9	0	65
	NONE	15	50	32	3	114
(b) HOMICIDE	DECISIVE	1	0	0	0	5
	SIGNIFICANT	2	0	1	0	6
	MINOR	2	2	2	0	0
	NONE	7	5	0	1	22
(c) RAPE	DECISIVE	1	0	1	0	12
	SIGNIFICANT	2	6	3	0	7
	MINOR	2	7	4	0	12
	NONE	5	11	6	0	6
(d) ROBBERY	DECISIVE	0	0	0	0	2
	SIGNIFICANT	0	0	0	0	6
	MINOR	0	0	0	0	5
	NONE	1	9	1	0	11
(e) AGG. ASSAULT	DECISIVE	0	2	0	0	4
	SIGNIFICANT	1	0	1	0	12
	MINOR	1	2	2	0	25
	NONE	3	6	10	2	51
(f) BURGLARY	DECISIVE	0	0	1	0	10
	SIGNIFICANT	0	0	0	0	11
	MINOR	0	1	1	0	12
	NONE	0	15	13	0	21
(g) LARCENY	DECISIVE	0	0	0	0	1
	SIGNIFICANT	0	0	0	0	2
	MINOR	0	0	0	0	1
	NONE	0	1	0	0	2
(h) ARSON	DECISIVE	0	0	0	0	0
	SIGNIFICANT	0	0	0	0	1
	MINOR	0	3	0	0	0
	NONE	0	3	1	0	1
(i) BOMBING & EXPLOSIVES	DECISIVE	0	0	0	0	0
	SIGNIFICANT	0	0	0	0	0
	MINOR	0	0	0	0	0
	NONE	0	0	0	0	0
(j) HIT & RUN	DECISIVE	1	2	1	0	0
	SIGNIFICANT	1	1	0	0	3
	MINOR	0	0	0	0	0
	NONE	0	0	1	0	0

Figure 21 INVESTIGATIVE DISPOSITION vs PHYSICAL EVIDENCE UTILIZATION 3 SITES

	CONTRA COSTA COUNTY: CONTRA COSTA SHERIFF'S DEPT.	CONTRA COSTA COUNTY: RICHMOND P.D.	CONTRA COSTA COUNTY: CONCORD P.D.	DADE COUNTY P.S.D. (2 DISTRICTS)	COLUMBUS P.D.
TIME PERIOD (MONTHS)	1.5	1.5	2	2	3
NUMBER OF SCENES SEARCHED (CASES)	199	247	NA	530	430
PHOTOS	20	247	NA	NA	197
LATENTS LIFTED	165	247	27	469	157
LATENTS OF VALUE	150	183	NA	234	109
ELIMINATION PRINTS	0	6*	0	99	17*
NAMED SUSPECTS IDENTIFIED	9	27	15	27***	11
"COLD" IDENTIFICATIONS	0	6	0	3	0
NO SUSPECTS (CASES)	15	125**	NA	NA	NA
OTHER PHYSICAL EVIDENCE COLLECTED	14	41	NA	58	131
INVESTIGATIVE DISPOSITIONS			NA		NA
a) IDENTIFICATION MADE					
UNRESOLVED	1	5		4	
SUSPECT IDENTIFIED NOT CHARGED	1	4		6	
SUSPECT APPREHENDED, CHARGED	7	24		17	
b) NO IDENTIFICATION					
UNFOUNDED	2	1		3	
UNRESOLVED	169	54		333	
SUSPECT IDENTIFIED NOT CHARGED	3	12		50	
SUSPECT RELEASED	–	1		3	
SUSPECT APPREHENDED, CHARGED	16	22		18	
UNRESOLVED INVESTIGATIONS ALL INVESTIGATIONS (NO IDENTIFICATION)	0.9	0.6	NA	0.8	NA
UNRESOLVED INVESTIGATIONS ALL INVESTIGATIONS (IDENTIFICATION MADE)	0.1	0.2	NA	0.1	NA
FRACTION OF SEARCHES WITH LATENTS LIFTED	0.8	1.0	NA	0.9	0.4
IDENTIFICATIONS/LATENTS OF VALUE (CASES)	0.06	0.18	NA	0.12	0.07

* VICTIM IDENTIFIED
** NO SUSPECT NAMED OR NO COMPARISON ATTEMPTED DUE TO LACK OF ID PERSONNEL TIME
*** INCLUDES REGULAR COMPARISON WITH NEW JAIL BOOKINGS

Figure 22 LATENT PRINT UTILIZATION

The normalized data in the last four rows of Figure 21 indicate that the fraction of unresolved investigations is much higher in the absence of fingerprint identification. The number of identifications for cases in which latents of value were found is low and varies by a factor of 3 (from 0.06 to 0.18) among the sites. The variation reflects a number of conditions, e.g., "cold" search capability, how many suspects with prints on records are known to the investigators and how active the investigators are. The number of "cold" search identifications itself reflects local capabilities described in the preceding section.

The number of searches in which physical evidence other than latents was also collected is not directly comparable among the agencies and sites as tabulated. The number is high at a site in which the evidence technician unit is administered independently of the criminalistics laboratory, where only a fraction of the items collected are sent to the laboratory for examination. By contrast at the site in which the evidence unit is an integral part of the laboratory, each of the smaller number of the evidence items collected was examined by the laboratory.

Two critical findings resulting from review of the data and on-site observations are: (1) the utilization and contribution to outcome (by clearing the innocent or identifying the suspect) of fingerprints is much higher than that of other physical evidence. Yet, firearms and ammunition comparison, tool mark comparison and any transfer evidence analysis carry in principle similar investigative opportunities but are much less often used. 2) The potential for unknown suspect identification through latent fingerprint examination is not used at all at some agencies and is not fully utilized at all study agencies.

Section 11

USER CHARACTERISTICS

In keeping with the goal of the study, to develop means to improve the utilization of physical evidence, it is appropriate to inquire as to the influence of the users' personal characteristics on this utilization. For instance, it might be that the frequent users of physical evidence information tend to be men with long years of investigative experience and the infrequent users might be the less experienced, or vice versa. Or, the frequent users might have had longer or more recent exposure to information on criminalistics laboratory methods. Our formal questionnaires did not address such hypotheses directly. Other influential factors that may mask effects of the aforementioned individual traits did become evident.

A general finding is that investigators are not familiar enough with their criminalistics laboratories to enable them to take full advantage of their capabilities. Much of the information supporting this qualitative finding, and others in the following paragraphs, was developed by the resident field observers during the course of the study. The information was obtained during the observers' frequent informal discussions with investigators, through periodic workshop sessions held by field observers and project staff, through detailed review of some case histories, and through observer summaries at the end of their collection period. These findings are not inconsistent with the information recorded on the case questionnaires.

The overriding factor determining investigator utilization of physical evidence information is his assignment to crimes against persons or to property crimes. In the former assignment, particularly on homicide investigation, utilization is high because the custom to have more extensive investigation and to use the laboratory is well established. As can be seen from Figures 7a, b and c, in all three sites the other major crimes against persons (rape, robbery and assault) have much lower physical evidence utilization factors. However, these factors are again sifnificantly lower in property crimes. In discussions with burglary investigators there was noted a widespread lack of confidence in the ability of the laboratory to help. This use disparity is reinforced, by the expected, and actual, longer time span between request for laboratory examination and report on results in the case of property crimes, which does indeed make these results less useful. Further, in general the time span between offense report and crime scene search, as well as that between offense report and detective assignment, is longer in the case of property crimes with a consequent tendency for a "cooling of the trail".

Another important influence on frequency and extent of laboratory utilization is the quality of the patrol and evidence technician effort that precedes the detective's assignment. While this result cannot be generalized, our observation at the five agencies in the three study sites is that agencies in which the patrol does not also function as the evidence unit prepare the case better for subsequent investigation and laboratory utilization. Such quality differences were even noted in the scope, content and legibility of the patrols' offense reports.

From virtually all casual and introductory conversations with investigators, the impression might be gained that the criminalistics laboratory is considered an indispensable investigative resource. On the other hand, case-by-case observation reveals that, even in most homicide investigations, the laboratory is used largely to corroborate information for presentation in court, rather than to help solve the case through development of leads, and the other investigative aids of Figure 8. Exceptions to this statement, represented by a few cases in which there was close and successful cooperation between investigator and criminalist, were found at each of the sites, but they stood out as exceptions. For instance, a case in which criminalist and investigator met at a homicide scene and jointly mapped out their plan for the eventual solution of the case, was pointed out as such an exception by one of the investigators.

A state of stable equalibrium was perceived at each of the sites, in the sense that whatever service was cutomarily provided by the laboratory, both in scope and delivery time, appeared to be accepted at the level of the investigator. By contrast, these were indications of management awareness of the need for more and better utilization of physical evidence utilization.

Section 12

SUMMARY OF FINDINGS

Our purpose, in this volume, nas been to describe the use of criminalistics operations in criminal investigation. Most of the findings below draw directly on the qualitative and quantitative observations that are discussed in the preceding sections, though some new summary material is included. Mainly, this concluding section highlights the system's strengths and weaknesses which affect the utilization of criminalistics operations.

Figure 23 summarizes physical evidence utilization in the 9 offense categories surveyed in detail. The top number in each cell denotes the number of cases in which the physical evidence category of the cells column was analyzed. The sum in each row of these numbers is the base of the decimal fraction, the middle number in each cell, denoting the relative number of physical evidence utilizations for its offense category. The bottom number in each cell is the decimal fraction of physical evidence utilizations relative to all utilizations in the evidence category. The most and the next-to-most frequently used evidence categories for five major crimes are excerpted below with their relative frequency (middle number of Figure 23):

Homicide: Weapons .51, Physiological Materia1 .17

Rape: Physiological Material .57, Weapons .15

Robbery: Latent Prints .41, Weapons .36

Assault: Weapons .73, Latent Prints .07

Burglary: Physical Match Problem .33, Latent Prints .22

	CASES	FINGER AND PALM PRINTS 1	PHYSIOLOGICAL MATERIAL 2	PHYSICAL MATCH PROBLEMS 3	WEAPONS 4	STRUCTURAL MATERIAL 5	TRANSFER MATERIAL 6	DOCUMENT MATERIALS 7	CHEMICAL PROBLEMS 8
1. HOMICIDE	90	18[1] .14[2] .16[3]	22 .17 .17	13 .10 .12	66 .51 .25	2 .02 .04	5 .04 .24	2 .02 .15	3 .02 .15
2. RAPE	132	16 .10 .15	89 .57 .68	15 .10 .14	23 .15 .09	3 .02 .06	1 .06 .05	5 .03 .42	5 .03 .25
3. ROBBERY	46	26 .41 .24	2 .03 .02	6 .10 .06	23 .36 .09	3 .05 .06	1 .02 .05	1 .02 .08	1 .02 .05
4. ASSAULT	163	13 .07 .12	11 .06 .08	12 .07 .11	129 .73 .48	6 .03 .12	1 0 .05	1 0 .08	4 .02 .20
5. BURGLARY	121	35 .22 .32	7 .04 .05	52 .33 .50	18 .11 .07	30 .19 .60	9 .06 .43	4 .03 .31	3 .02 .15
6. LARCENY	6	0	0	0	3 .60 .01	1 .20 .02	0	0	1 .20 .05
7. ARSON	13	2 .15 .02	0	2 .15 .02	3 .23 .01	3 .23 .06	1 .07 .05	0	2 .15 .10
8. BOMBING, Expl.	4	0	0	2 .40 .02	1 .20 0	1 .20 .02	0	0	1 .20 .05
9. HIT & RUN	10	0	0	3 .38 .03	0	2 .25 .04	3 .38 .14	0	0

[1]CASES IN OFFENSE CATEGORY WITH PHYSICAL EVIDENCE UTILIZATION.

[2]CASES IN OFFENSE CATEGORY WITH PHYSICAL EVIDENCE UTILIZATION /ALL PHYSICAL EVIDENCE UTILIZATIONS IN OFFENSE CATEGORY

[3]PHYSICAL EVIDENCE UTILIZATION IN OFFENSE CATEGORY/PHYSICAL EVIDENCE UTILIZATION IN 9 OFFENSE CATEGORIES

Figure 23 CRIME-SPECIFIC UTILIZATION OF PHYSICAL EVIDENCE

The numbers in Figure 23 indicate the pattern of evidence utilization found at the three sites. A question not answered by the tabulation is whether the frequency of examination of certain evidence categories relative to crime categories is a reflection of the perception of the investigator as to the gravity of the case or whether it is merely a reflection of evidence submission activity.

The vast difference between the frequency of use and the benefit of use of latent print information and other underutilized physical evidence matching potential has already been pointed out. On one hand, our finding is that the use of cold search for latent print matching can be expanded with the help of technological advances in characterization, storage, retrieval and matching. On the other hand, we recommend effort to apply similar techniques to firearms and ammunition comparison, toolmark comparison and any recurring transfer evidence problems. Open firearms identification files are maintained in one form or another at each of the sites, if only as physical exhibits. Only one of the sites has a recently started systematic toolmark record system. Both firearms and toolmark matching can benefit from characterization aimed at computerization of retrieval. In both categories, an intermediate matching result and guide to the investigator is the establishment of class characteristics. Thus, the information that in two adjoining districts, during a certain time period, locks have been forced with a 1/4" wide tool, may remain insufficient for individualization in any given case, but it may provide valuable modus operandi leads to investigators. The problem of transfer evidence matching appears to be the least advanced technologically; a logical first step would be the selection of frequent transfer materials as candidates and intensive research effort directed at characterization.

The training and consultation function of the criminalistics laboratory has been shown in Figure 8 without indicating where in the criminal investigation it applies. The need to convey acquaintance of criminalist capabilities and requirements, not the criminalist skill itself, to the patrol as the most generally and least specifically trained among those having potential contact with physical evidence has been pointed out. Here broadly, we view the problem of conveying information on maintaining awareness of criminalist capability and potential contribution to investigation as an essential continuing education task. While the close organizational proximity between criminalistics laboratory and police departments has been criticized in other respects, this proximity may become an advantage in scheduling regular, periodic training sessions. Enhancement of the consultation function is a more subtle and less formally approachable problem requiring the buildup of mutual confidence.

There are vast differences between the perceived and the actual role of each of the laboratories. A number of the questions by the field observers in the study were asked almost identically of the record, laboratory personnel and detectives. Although time requirements for laboratory work are seldom found in the written record and although the criminalists do not seem to be aware of it, there is generally dissatisfaction on the part of detectives with slow service. The introduction of realistic, reviewable and recorded scheduling requirements on the part of the submitting agency is recommended. Further, while at least in two of the sites the investigators generally volunteer expression of satisfaction with laboratory performance, these expressions are in conflict with the underutilization of the full capability of the laboratory and the apparent relegation of the laboratory to corroboration of findings rather than cooperative investigative effort.

One hindrance to more and more effective utilization of criminalistics operations has been pointed out repeatedly in the preceding sections: The fragmented record keeping. The lack of physical evidence orientation in the offense report form is but one example. Separate record numbering systems are employed in all sites to an extent that makes physical evidence utilization review, really the entire criminal investigation review, on a case-by-case basis extremely difficult. In one of the sites, offense report, mobile crime laboratory report, identification section report on latent prints, crime laboratory report and property log number are kept in separate, very inadequately cross-referenced files. We find then a lack of record that is symptomatic of a lack of systematic attention to and appreciation of the role of physical evidence in criminal investigation.

While the study has not been particularly concerned with management and supervision of the criminalistics or the investigative operation, we must note that the lack of detailed and systematic reporting must also be a hindrance to effective supervision and management of these operations. As but one example, the criminalist and his supervisor should have a record of the result of the investigation and adjudication of every case to which they were asked to contribute. On the part of the management of investigation, review and revision of operating procedures as related to criminalistic operations would appear fruitful. Revision of procedures should contain strong endorsement for, if not mandatory use of, criminalist services.

Section 13

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Section 14

GLOSSARY

Case	An incident that is the subject of a police Offense Report or a court action.
Cold Search	Search for a match between latent prints, or between latents and 10-finger records, without reference to named suspects whose prints are available.
Criminal Justice System	All criminal justice operations that use or are affected by physical evidence information.
Criminalistics Operations	All scientific support of the criminal justice system involving physical evidence, excluding Forensic pathology. (Note: This definition includes lifting, processing, evaluating and comparing latent fingerprints).
Effectiveness	How often used and/or how valuable is information on physical evidence examination in obtaining investigative and/or adjudicatory disposition of a reported offense.
Forensic Laboratory Criminalistics Laboratory Crime Laboratory	Used interchangeably.
Individualization	Uniquely or with high probability linking one substance to another; e.g., the finding that a certain bullet was fired from a certain gun.
Measure Of Effectiveness	A function of a controllable variable of the criminal justice system that is highly correlated with effectiveness.
Screening Test	A test, usually simple and readily performed, designed to establish whether there are gounds to investigate or hold a suspect; such a test is not necessarily adequate for filing a formal charge.

END