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CRIMINAL IDENTIFICATION

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Criminal identification is indispensable in combating crime. It is the most potent factor in obtaining the apprehension of the fugitive who might otherwise escape arrest and continue his criminal activities indefinitely. Likewise, it results in the imposition of equitable sentences by the judiciary, as more severe punishment of the individual who violates the law repeatedly or even life imprisonment for the habitual offender becomes significant only when it is possible to determine accurately the number of previous convictions. Generally, the first offender can be distinguished from the recidivist or habitual criminal only through the medium of scientific criminal identification.

HISTORICAL BACKGROUND

From the earliest annals of history it would appear that personal identification of some character has been in vogue. Members of one savage tribe were distinguished from those of another through distinctive attire or even bodily decorations such as scars resulting from self-inflicted cuts or burns. In the earlier civilizations, differences in the dress of various social classes were clearly defined, sometimes by law but more often through the sanction of custom. The branding of criminals and slaves was practiced also at a time when no other method of identification was known, and various forms of tattooing were used by the Romans to identify and to prevent the desertion of mercenary soldiers. In our present civilization, some tradesmen or craftsmen still wear distinctive attire while the armed forces of various nations are identified readily by uniforms. These are all forms of personal identification, so commonplace their significance may remain unobserved unless called to our notice.

During the early part of the eighteenth century, the better organized police departments in Europe employed officers with good visual memories who attempted to record mentally the faces of criminals and the crimes connected with these individuals. No doubt, effective results were attained by these officials yet it is somewhat appalling to consider the probable consequences if law enforcement officers of contemporaneous times with their shifting populations and speedy transportation facilities, were dependent solely on visual recollection to identify criminals.

It was not until the advent of photography that law enforcement agencies initiated modern methods of criminal identification. This science resulted in the establishment by the more highly organized police departments of "rogues' galleries" and bureaus containing the photographs of thousands of criminals. These collections of photographs, generally segregated according to sex, color, height and criminal specialty, for the purpose of more ready identification, represented a great advancement over prior attempts of effective identification. Although photography continues as an important adjunct in the detection and prosecution of criminals, its early use was hampered for the lack of a method to subdivide the pictures of criminals with definite accuracy. In addition to

this defect the changing character of the features prevented a constant medium of comparison.

BERTILLON SYSTEM

The effectiveness of identifying criminals by means of photographs was greatly enhanced through the adoption of the Bertillon method of identification which derived its name from Alphonse M. Bertillon, noted French anthropologist and criminologist who devised and perfected the system in 1882. The need for the classification of photographs was so urgent that the Bertillon system was adopted promptly by France and later by most of the other civilized countries of the world. The most important feature of the method was predicated upon the theory that the size of certain bony parts of the human anatomy remained constant or unchanged during adult life. Accordingly, measurements were taken of various bony structures of the body, i.e., length and width of the head, length of left middle and little fingers, length of left foot, length of left forearm, length of right ear, cheek breadth, height of the figure, measurement of outstretched arms and measurement of the trunk. After these measurements were subdivided into three major groups of small, medium and large they were classified in a specified filing arrangement.

In addition to the bodily or anthropometrical measurements, M. Bertillon promulgated definite rules for recording the personal description of an individual. While these descriptive data supplemented the photographs and measurements in the determination of identity, yet of themselves, they were very valuable as media of identity. They consisted of the noting of certain characteristics, such as weight, color of hair, color of eyes (a "shade" chart, giving illustrations of the various colors was provided for reference purposes later), complexion, shape of nose, ear and face, location with size and shape of all scars, marks, moles and tattoos. Entries as to each of these factors were made as part of each record and the photograph, showing the front and right profile view of the head was included thereon. The supplemental identifying data, such as, photographs and descriptive information could be located readily when filed according to the measurements attained. It is well to note, that although the Bertillon system is now obsolete in most countries, the photographs and descriptive data prepared therefor continue to afford invaluable assistance to law enforcement agencies in their identification activities.

Following the perfection of the Bertillon system it was adopted by many law enforcement agencies in the United States although it was not long before deficiencies in the method were discovered. It should be observed that the success of the system depended primarily upon the anthropometrical classification attained and it was realized very soon that while one operative would take the measurements "loose" another would take them "close", thus resulting in different classifications. Even intensive training in the approved method of taking measurements did not correct the mechanical differences indicated. Furthermore, the Bertillon system, was not an effective means of identifying persons under twenty-one or over sixty years of age, for, as a general rule, in the ages mentioned the measurements of the bony structures of the body change. This second deficiency in the Bertillon system would be of material consequence today when youthful criminals commit a large percentage of crimes. Additional problems were inherent in the Bertillon system. In the first place the scientific instruments required in its application were somewhat costly and too expensive for universal usage. Next, there existed the necessity for considerable special training and instructions so the

operative would be proficient in taking the measurements and understand fully the tables followed in searching the files. A further problem existed in that the three major subdivisions of the groups, i.e., small, medium and large, did not afford an even distribution of records of the individuals measured because the measurements of persons of one nationality, physically larger than those of another, would not fall within the subdivisions, thus affecting the standardized, universal application of the system.

Despite the defects outlined and the added fact that in very rare cases it was found a mistake in identity could be made under the Bertillon system it rendered valuable service to society until it was replaced by scientific fingerprint identification. It is a compliment to the value of the work of Bertillon to know that although fingerprints and "Bertillonage" are entirely different systems of identification, the influence of the word "Bertillon" was so strong many persons believe it to be the same as the fingerprint system.

EVOLUTION OF FINGERPRINT IDENTIFICATION

During the ages when man was seeking a method of personal identification, he was carrying on the inside of the "bulb" or nail joint of each finger, numerous ridge formations or patterns, each possessing definite, distinctive outlines, by which positive identification could have been made. Physiologists are not in agreement why nature provided these distinctive formations of ridges and depressions on the fingertips. They occur elsewhere on the human body, notably on the soles of the feet and palms of the hands but with far less regularity of pattern outline and contour. Some authorities submit that the ridges offset and lessen wear while others contend they assist the sense of touch; create a "friction" surface to the skin, enabling an object to be grasped more readily than would be the case were the fingertips smooth; and elevate the pores enabling the ducts to discharge perspiration more freely. Regardless of the reason for their existence the fact remains that these ridge formations, permanently a part of the body, discernible as a rule about three months before birth, remain unchanged during the life of an individual and until putrefaction sets in after death and that no two fingers have ever been found whereon the patterns are identical. Insofar as science has been able to determine, these ridges do not indicate definitely character, race, sex or heredity. The ridges, as stated, remain constant through life although they may be affected through deep cuts or burns going beneath the tissue to the ducts, whose outline they follow, and further they may be rendered indistinct, for a time, through some occupational activity, such as mortar or plaster work or dishwashing. However, such effacement is temporary only as the ridges assume their former outlines with definite precision shortly after an individual is removed from such forms of work.

In attempting to trace the origin of the fingerprint science a distinction must be drawn between man's realization that the tips of his fingers bear a diversified ridge construction and the application of this knowledge to the problem of personal identification; the first is a matter of idle observation, the second the result of development and study. History is replete with references to prove that even in ancient times man was aware of the peculiar permanent lineations described by the ridges of the fingertips. On the face of a cliff in Nova Scotia, for instance, can be found an Indian carving or "picture writing" of the outline of a hand with ridges and patterns clearly but crudely marked. The Chinese also had used fingerprints in various forms centuries ago and many references thereto can be found in authoritative writings. In fact, the Chinese seem

to have employed finger and hand impressions for sealing documents and for other purposes although the exact symbolism of their action is unknown. The imagination of the English wood engraver, Bewick, was apparently aroused by a realization of the possibilities of utilizing finger impressions to establish the genuineness of his work, for late in the eighteenth century, he resorted to the practice of engraving the impression of his finger on several of his woodcuts.

The first known scientific observation particularly relating to fingerprints was made in 1686 by Marcello Malpighi, professor of anatomy at the University of Bologna, Italy, who alluded to the ridges which "describe divers figures". This comment was followed in 1823 when J. E. Purkinje, a professor of anatomy at the University of Breslau, published a treatise or commentary wherein he cited the diversity of ridge patterns connected with the organs of touch and even evolved a differentiation of these patterns into nine varieties.

There is a diversity of opinion as to the first practical application of fingerprints as a means of positive identification. Certain it is, however, that the imperfect impressions left on cliffs and woodcuts and the Chinese finger and hand signatures were not sufficiently clear for close comparison and they may have been manifestations of the early belief, which to some extent pervades the law of sealed instruments today, that personal contact conveys some nebular essence to the thing touched from the person touching it, thereby elevating it in dignity and binding effect. Certain it is, also, that the comments of Malpighi and Purkinje were little more than scholarly or physiological treatises on the mere phenomenon of ridge diversity from a factual basis and lacked the concluding conception of their practical value as media of identification.

It remained for Doctor Henry Faulds, an English authority on the subject of dactylography, to write the first article on the practical use of fingerprints for the identification of criminals. In 1880, Doctor Faulds, who was connected at that time with the Tsukiji Hospital at Tokyo, Japan, conducted experiments which established that the varieties of individual fingerprint patterns were very great and that the patterns remained unchangeable. Doctor Faulds published the results of his experiments in a letter appearing in the magazine "Nature", under date of October 28, 1880. Shortly after the appearance of his article, Sir William Herschel, chief administrative officer in the Hooghly district of Bengal, India, wrote an article for the same magazine commenting upon the success with which he had utilized fingerprints for twenty years in identifying government pensioners in preventing impersonation and repudiation and in identifying prisoners committed to jail. It appears, therefore, that Doctor Faulds was the first to write concerning the practical use of fingerprints and that Sir William Herschel was the first to make extensive use of them. However, neither developed a method of classification suitable for general use and the intensive application of fingerprint identification.

The next great name in the history of fingerprint identification is that of Sir Francis Galton, the noted English scientist, who became interested in the subject through his study of heredity. He not only established by extended investigations that no two fingerprints were alike but devised the first method of classification that was sufficiently scientific to subdivide large collections of fingerprint records. As a consequence of his work, a committee was appointed by the British Government to consider the advisability of employing the fingerprint system in the identification of criminals. Galton's articles relating to fingerprints were published in 1892 and 1893, and shortly thereafter, Juan Vucetich, noted Argentine dactyloscopist, claimed to have

made his first criminal identification through the medium of fingerprints. Then, Sir E. R. Henry, later Commissioner of Police of Scotland Yard, London, England, who engaged in the study ordered by the British Government, in order to lessen the difficulty of dealing with large collections of fingerprints, devised a simpler yet more comprehensive basis of filing and classifying prints. His system was successfully introduced into England and Wales in July, 1901, and forms the basis of the present system employed by all identification bureaus in the United States as well as other English speaking countries while the Vucetich system has been adopted principally by those nations wherein Spanish is the state language.

According to the Henry system all fingerprint impressions are divided into the following types of patterns: Loops, Twinned Loops, Central Pocket Loops, Lateral Pocket Loops, Arches, Tented Arches, Whorls and Accidentals. Subject to a few exceptions wherein unusual patterns occur, by studying a definite portion of each fingerprint impression, described as the pattern area, generally comprehended by the outer and inner termini, known as the deltas and cores, and by counting or tracing the individual ridges intervening between such points, it is possible to classify each of the ten fingers into a definite, fixed group. The ten fingers then are considered as a unit to attain the complete classification which permits the filing of fingerprint records in sequence, without reference to name, description or crime specialty of the individual, and enables the fingerprint expert in a bureau containing millions of prints to establish an identification in a few minutes. It has been necessary for the larger bureaus to amplify and extend the original Henry system in order to facilitate the searching of files although they have adhered to its basic principles.

FINGERPRINT IDENTIFICATION IN THE UNITED STATES

The first authentic record of the use of fingerprints in the United States reveals that Mr. Gilbert Thompson of the United States Geological Survey utilized his thumb impression to prevent the forgery of commissary orders during his supervision of a survey in New Mexico in 1882. The first practical introduction of fingerprints for criminal identification in the United States is claimed by the prison system of New York State, based on the adoption of the system at Sing Sing Prison on June 5, 1903, although the files of the Department of Correction at Albany contain fingerprints of state prisoners from the institutions at Sing Sing, Napanoch, Auburn and Clinton, which show that they were classified as early as March, 1903, by Captain James H. Parke, employed in the office of the then Superintendent of Prisons, Cornelius V. Collins. Then, on September 24, 1904, Mr. R. W. McClaughry, Warden of the United States Penitentiary at Leavenworth, Kansas, requested authority of the Attorney General to undertake sufficient expenditures for equipment to take fingerprints of Federal prisoners, which authorization was granted him November 2, 1904, only five days after the system was introduced in the police department of St. Louis, Missouri, by an officer of Scotland Yard, who was guarding the Queen's Jubilee presents, on exhibition at the St. Louis Exposition in that year.

Subsequently the use of dactylography for the identification of criminals rapidly increased until today it is the most important factor in identification work in the United States. Police departments, sheriffs, state police organizations, federal agencies, penal institutions and others realized the benefits to be derived from this comparatively simple and positive method of identification and gradually discontinued the use of Bertillon's anthropometrical sys-

tem. Local bureaus were established and employees instructed in the taking, classifying, searching and filing of fingerprint records. The small cost of the equipment and training readily permitted the adoption of fingerprint identification in all sections of the country. In order to cope with the problem presented by migratory criminals, state bureaus were established to act as local clearing houses for the information submitted by their correspondents. At the present, the following states maintain bureaus which contain large collections of fingerprint records and which render valuable service: Arizona, California, Illinois, Indiana, Iowa, Louisiana, Massachusetts, Michigan, Minnesota, Nebraska, New Jersey, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, Utah, Vermont and Washington.

The International Association of Chiefs of Police, which embraces in its membership the heads of police departments of most of the principal cities of the United States and Canada, in 1896, had established a bureau at Chicago, Illinois, which was removed later to Washington, D. C., known as the National Bureau of Criminal Identification, for the purpose of compiling Bertillon records. As its members discontinued the use of Bertillon measurements and began adopting the fingerprint system, the National Bureau of Criminal Identification gradually acquired a valuable collection of fingerprint records. As previously mentioned, the United States Department of Justice established a fingerprint bureau at the Leavenworth Penitentiary, Leavenworth, Kansas, in 1904, which first contained the fingerprints of Federal prisoners only, but this Bureau soon expanded the scope of its operations by maintaining a free exchange service whereby criminal records were received and circularized among a growing list of contributing peace officers.

IDENTIFICATION DIVISION OF THE UNITED STATES BUREAU OF INVESTIGATION

The growing and insistent demand by police officials throughout the country for one system of cooperation on a national scale finally resulted in the creation of the Division of Identification, which was placed under the jurisdiction of the United States Bureau of Investigation. In 1924, this newly organized division received and consolidated in Washington, D. C., the records of both the National Bureau of Criminal Identification and the Leavenworth Penitentiary Bureau, and since its creation has shown a remarkable growth and development. On June 1, 1933, it possessed 3,576,856 criminal fingerprint records of actual current value and 4,696,000 name index cards. Over 5,800 law enforcement agencies throughout the United States and foreign countries were submitting prints to the Bureau on that date. The extent to which law enforcement officials utilize the services of the United States Bureau of Investigation is indicated by the following statistics covering the activities of the Bureau by fiscal year from July 1, 1931 to June 30, 1932:

Fingerprint records received.....	573,731
Number of Identifications made.....	208,715
Percentage of Identifications made....	39%

The procedure utilized by the United States Bureau of Investigation in furnishing information concerning the thousands of fingerprint records received daily from peace officers is both accurate and expeditious. The first operation consists in recording the prints which then pass to the technical section where experts classify them and carefully search through the master files for cards having fingerprint impressions that are identical with those appearing on the current prints. In order to reduce the possibility of error, sometimes

present when indistinct prints are being examined, each print is again searched in the card index files for similar names and aliases. When an identification has been established, the current print is sent to the assembly section where the complete record of the individual is assembled, rechecked and a draft of instructions outlined as to the preparation of the reply. The final operation is performed by the typing section which prepares letters advising the interested officials of the information appearing in the records. About twenty-two hundred fingerprint records are now received daily by the United States Bureau of Investigation and each inquiry is answered by letter within thirty-six hours of its receipt. The subjects of about forty-five percent of all criminal fingerprints now being routed to the Bureau are found to have prior records as the files are searched. Whenever necessary, as where fugitives are being held in custody, telegraphic replies are transmitted by the Bureau to interested agencies. About 350 fugitives are identified by the Bureau each month when its fingerprint experts compare the impressions on current prints with those in the files, whereon the fugitive status of any individual is noted at the request of the interested peace officer. Further, to amplify and expand its service to identify fugitives the Bureau publishes a monthly bulletin listing the principal offenders whose apprehension is desired by various law enforcement agencies. Through this medium the Bureau places in the possession of such agencies valuable information which frequently enables fugitives to be identified promptly when they are arrested for any charge. The fugitive bulletins also contain treatises dealing with subjects of a scientific character in the field of criminology such as manuscripts relative to latent fingerprints, ciphers and other topics studied in the Bureau's criminological laboratory.

All peace officials are invited to avail themselves of the information contained in the files of the United States Bureau of Investigation. Its service is rendered to all legally constituted law enforcement agencies free of cost. In fact, fingerprint cards, franked envelopes, sheets whereon dispositions are reported, instructions as to the proper taking of fingerprints and copies of the Bureau's fingerprint classification extension system are furnished gratuitously. Further, copies of the pamphlets dealing with the subjects of latent fingerprints; court decisions as to the legality of fingerprinting and the admissibility of latent fingerprint evidence; and the pamphlet containing the modification and extension of the Henry system of classification, devised by the Bureau's technical experts and utilized in its files are furnished upon request.

Law enforcement agencies make liberal use of the fingerprint identification records of the United States Bureau of Investigation as they provide an accurate source of information in determining whether an individual is a first offender or "repeater", thus enabling the prosecutor to present his case and the court to impose sentence in the light of the defendant's past record. An extra copy of the letter prepared in the Bureau, giving the criminal record of any individual, is mailed to the arresting agency for the use of the prosecuting official in this particular. Also from these records police officials can be furnished with advice whether even the most unimportant suspect is wanted as a fugitive in some other jurisdiction.

LATENT FINGERPRINTS

Frequently, it is possible for police officers to obtain fingerprint impressions at the scene of a crime. When impressions of this character are discovered, various powders or other media can be applied to develop and emphasize

the characteristics. The comparison of such prints with actual fingerprint impressions of suspects forms one of the most interesting and valuable branches of the science. The United States Bureau of Investigation is often called upon to establish identifications from latent prints furnished by its contributors and in this way has been successful in assisting in the solution of many crimes where the only clues were the latent fingerprint impressions left by the criminals. Single fingerprint files, wherein individual prints are classified by various special systems, serve as a medium for the ready identification of latent prints found at the scenes of crimes, and such a file has been inaugurated in the Bureau recently as a further service to law enforcement agencies. This file at present is limited to the single impressions of known kidnappers and extortionists and is an adjunct to the main files wherein the ten impressions are classified as a unit. It is hoped eventually to expand the single fingerprint files to include other groups and thus permit ready identification of criminals who have left their impressions at the scenes of crimes, without the necessity of reference to the actual impressions of suspects to establish identity.

PALM AND FOOT PRINTS

Identification by means of palm impressions has progressed to a great extent. Many persons have been convicted upon testimony following the discovery of their palm impressions at the scenes of crimes. Police organizations in the United States, for obvious reasons, have not given great consideration to impressions of the feet, their principal use being confined to the practice of taking foot impressions of children in maternity hospitals.

INTERNATIONAL EXCHANGE

The United States Bureau of Investigation has arranged with the identification bureaus of foreign countries to exchange criminal identifying data in cases of mutual interest. Fingerprints and criminal records of persons arrested in this country are routed to the appropriate foreign bureaus in cases wherein the interested agency in the United States has reason to believe an individual in custody may have a record in or be wanted by the other nation. Similarly, the fingerprints of persons arrested outside the continental United States are referred by the foreign bureaus to the United States Bureau of Investigation for search in its files, when it would appear a record may be disclosed by a search of the Bureau's records. Numerous identifications, some of fugitives, have been effected in this manner and it is believed that the complete development of this project will redound to more effective law enforcement throughout the world. On June 1, 1933, bureaus in the following countries, territories and possessions were cooperating in this activity: Argentina, Australia, Austria, Bahamas, Barbados, Brazil, Belgium, Canada, Canal Zone, Chile, Colombia, Cuba, Czechoslovakia, Egypt, England, Finland, France, Germany, Greece, Hawaii, Holland, Ireland, Italy, Mexico, Norway, Peru, Philippines, Poland, Portugal, Puerto Rico, Rumania, Southern Rhodesia, Spain, Sweden, Switzerland and Turkey. Through the further development of this project, the United States Bureau of Investigation hopes to maintain an effective surveillance on criminals of an international character and insure the collection, in a centralized agency, of criminal identifying data of value throughout the world.

CRIMINAL IDENTIFICATION IN FOREIGN COUNTRIES

Generally speaking, the methods of criminal identification employed in the United States are similar to those utilized by law enforcement agencies in foreign countries. Fingerprints, photography, modus operandi files, ballistics, handwriting, scientific laboratory analyses, single fingerprints and anthropometry are used in various combinations to form the basis of criminal identification in all the civilized countries of the world. Various code systems have been devised for the detailed analysis of fingerprints and it is sometimes possible to effect identifications when code classifications are transmitted by telegram, wireless or similar means. However, it is usually necessary to have actual fingerprint impressions available to establish positive identifications and it is now possible to transmit full sets of fingerprints to various states and nations by means of the telephone and radiograph. Comments relative to some of the foreign bureaus follow.

EUROPE

In France, the Service de l'Identite Judiciaire, which is maintained in Paris, employs practically all of these methods and acts as a central clearing house of information pertaining to criminals for France and its colonial possessions. The entire police organization of France cooperates with this bureau, forwarding the fingerprint records of all persons arrested. The records numbered about 1,610,000 on December 31, 1931. While a separate Bertillon file is not maintained now by the Paris bureau, some of the Bertillon measurements are employed to amplify the fingerprint classifications of the larger groups. An alphabetical name and alias file, with cross references to fingerprints and photographs, is also maintained. The Paris bureau possesses well equipped chemical, physical, and photographic laboratories to assist in the scientific investigation of crime. In these laboratories, ballistics, latent fingerprint impressions and a large range of services of a microscopic, chemical and other scientific nature receive intensive study.

Fingerprints and photography form the basis of criminal identification in the British Empire and its various units in the British Isles, Canada, Africa and Australasia maintain independent bureaus of identification which cooperate with the New Scotland Yard bureau in London. These bureaus employ the Henry system, with certain modifications and extensions, to classify their fingerprint records. In addition to its fingerprint files, numbering over 500,000, New Scotland Yard has devised an elaborate modus operandi file. This system provides for the filing of a card, first, under the crime-specialty, then under other definite, particular factors to indicate the method of operation, to be used for future references. The maintenance of a single fingerprint file also receives careful attention.

Since the Conference of the German States in 1912, anthropometry has been discontinued as a method of criminal identification in Germany and fingerprint identification has assumed a position of foremost importance with photography playing an important but subordinate part. The laws of Germany do not provide for a national bureau of identification but in practice, the headquarters of police at Berlin acts as a national bureau and furnishes information concerning professional offenders. About 600,000 prints are in its files. A combination of the Galton and Henry fingerprint classification systems predominates throughout the country but many cities in Germany maintain independent bureaus

exchanging fingerprints with Berlin and have their own method of classifying fingerprint impressions. In 1903, the State of Hamburg adopted a system of classification devised by Mr. Roscher, who was, at that time, president of the Police at Hamburg. The Roscher system was later adopted by Japan and Russia.

Italy utilizes all the known methods of criminal identification, excepting anthropometry, and maintains a national bureau of criminal identification in Rome, which, on March 1, 1933 numbered 369,795 prints in its files. All police departments are compelled by statute to submit to the national bureau the fingerprints and record of each subject. The system of fingerprint classification employed throughout Italy is known as the "Gasti" system, which derives its name from the Professor who devised and perfected it.

In 1926, the police officials of Finland organized the Central Bureau of Criminal Identification, located at Helsinki. On March 3, 1933, 64,180 fingerprint cards were in the files, a modified form of the Henry system being utilized.

Fingerprints, photography and anthropometry are used for identification purposes in Norway. A national bureau is maintained at Oslo in which there were contained 49,797 fingerprint records on March 1, 1933.

The fingerprints of all persons arrested in Poland are forwarded to a central identification bureau located at Warsaw, which is under the direction of the Minister of the Interior. The records of this bureau comprising 474,799 prints on December 31, 1932, are classified according to the Klatt system. In the scientific field the Polish authorities perform laboratory work relating to firearms and handwriting identification as well as other technical duties.

The extensive bureau maintained at Vienna under the jurisdiction of the Federal Police, which has collected records of criminals of various nationalities for some time past, numbered 604,610 prints on March 1, 1933.

The Criminal Identification Bureau under the jurisdiction of the Federal Police at Mexico City has nearly 1,000,000 fingerprint cards in its files and receives daily about 300 cards from the outlying districts. Attention also is given to scientific investigation work.

The Canadian bureau at Ottawa on January 31, 1933, numbered 268,619 sets of fingerprints in its files. The Canadian officials have cooperated fully with the United States Bureau of Investigation for years.

Other foreign identification agencies are the central bureau at Stockholm, Sweden, which had 54,170 fingerprint cards on March 1, 1933, the Henry system being employed in its classification work; the central bureau at Berne, Switzerland, with 170,000 prints on March 1, 1933; the bureau at Prague, Czechoslovakia with its records of 169,000 prints; the central bureau at Lisbon, Portugal, which collection numbers 155,539 prints, the Italian (Gasti) system being utilized for classifying; the bureau at Sydney, New South Wales, which contained 114,126 prints in its files on March 1, 1933; the bureau at Athens, Greece, which contained the fingerprints of 156,714 individuals on March 1, 1933; the bureau at Dublin, Ireland, which on March 1, 1933, had 30,760 prints in its collection; and the bureau at Bridgetown, Barbados, British West Indies, with 2,319 fingerprint records on March 1, 1933.

The majority of the above bureaus also report progress in the development of single fingerprint systems since their recent installation.

SOUTH AMERICA

In connection with the different methods of fingerprint classification employed in foreign countries, it is important to mention again the Vucetich sys-

tem which was devised by Juan Vucetich, noted Argentine dactyloscopist. This system has been adopted by the national bureaus of the various South American countries. Of the several important collections of fingerprints, Argentina, at Buenos Aires, has by far the largest bureau. The fingerprint system of identification there has been extended not only to persons having police records but to those obtaining passports, certificates of identity, government bank and commercial positions as well as those engaged in other occupations. Over two million prints are in the files, one of the largest collections in the world.

IDENTIFICATION BY SCIENTIFIC ANALYSIS

The United States Bureau of Investigation, aware of the necessity of utilizing every scientific and advanced means available in combating crime, has established a research laboratory wherein attention is given to the development of all projects considered to be of assistance in this work. Announcements of the results of the Bureau's endeavors in this particular are made from time to time for the information of all law enforcement agencies.

Through the application of scientific laboratory processes of analysis considerable progress has been made in the development of methods of identifying persons who were present at the scenes of crimes. These methods have been principally developed in the sciences of chemistry, physics and medicine. The methods used are adaptations and developments of analytical devices heretofore used in these sciences in the procurement of information regarding the properties of matter.

This application to criminal work developed gradually at first, as experts were called upon in individual cases. The methods applied to a particular situation depended upon the particular article under examination, and no coordinated initiative was devoted to developing new methods until the multiplication of cases indicated clearly the value of the aid which was being rendered.

Because police agencies in the United States are organized in entirely distinct jurisdictions and have developed separately within those jurisdictions, the exchange of information has been limited to that which is undertaken voluntarily, being in the beginning confined to fingerprint and criminal record data. The development of scientific methods, therefore, has occurred in but few of the police departments, primarily those in the largest cities which, at most, have employed only one or two individuals whose activities have been limited to certain applications of scientific work only. Outside of the police departments individual experts have made a profession of supplying these services, and they also have specialized in particular methods of scientific work. At times laboratories connected with universities and with the Federal Government have been called upon for assistance in individual cases. In the last few years there have developed several laboratories employing more than one expert, these laboratories undertaking to report upon any task of this kind required in the case referred. Some of these have a quasi-official connection with a law enforcement agency.

Scientific assistance in the field of criminal investigation consists in the analysis of objects which are used in the commission of the crime; which are present at and bear marks or indications of the crime; which are left behind by the criminals, or which, being found upon the criminals, bear evidence of their connection with the crime.

The development of the scientific examination of firearms has progressed to the point of being regarded as a vocation. The term forensic ballistics has been adopted as a name for this procedure. Forensic ballistics has for

its object the procurement of evidence as to the firearms from which bullets used in the commission of a crime have been fired. By microscopic examination of the bullet or of the cartridge, it is possible in some cases to state whether a certain firearm was used, and to procure collateral data which are important in identifying the criminal. It was found that bullets bear surface irregularities caused by the travel through the barrel of the gun. Test bullets fired from the same gun bear similar irregularities. Similarly, the cartridge case is impressed with minute irregularities existing on the firearm in which it was fired, caused by the blow from the firing pin, the pressure against the breech block, or blows from the ejector. Before a suspected firearm is obtained for the purpose of conducting such a test, the make and caliber of the gun to be sought are frequently ascertained through the examination of the bullet. In this science instruments specifically designed for this work have been developed, such as the comparison microscope, which enables the microscopic image of two bullets to be examined in juxtaposition to each other, and the helixometer, which enables the examination and measurement of the inside of a gun barrel. In the field of chemistry special methods of analysis have been developed for the determination of characteristics of minute quantities of poisons, blood, stains and other substances.

Similarly, particular methods by which organic and mineral substances may be identified have been developed. Particularly is this true in the microscopic examination of fibers and crystalline structures, it being sometimes possible not only to describe many characteristics which are identical with those of similar specimens in the possession of suspected individuals, but to offer definite proof of the connection of that person with the crime, because the specimen found on his person could have been obtained in no other manner. This study is in its infancy, and its importance is well recognized as criminals, in their efforts to remove evidence of a crime, frequently overlook such minute evidence.

An additional method of identification, developed in the science of physics, is that of employing the use of light of wave lengths other than the visible; for instance, by means of ultra-violet or so-called black light, from which all visible light has been excluded, materials may be identified with the naked eye, even in minute quantities. Counterfeits may be exposed and many things which are invisible in normal white light are readily observed.

The X-ray, another electrical device, has been found to be of value by enabling the safe examination of packages which contain bombs.

One of the oldest of these scientific methods is that by means of which handwriting is utilized to establish the identity of an individual. The handwriting is subjected to a minute and painstaking examination, resulting in the determination of numerous characteristics. The handwriting of the suspect is then similarly examined and compared with the questioned document, resulting in an identification when a sufficient number of similar characteristics is found. The ink or pencil with which the writing is made may frequently assist in such a determination, and the paper also many times yields evidence of value.

In recent years the application of methods of examining handwriting to the examination of typewriting has resulted in the development of a procedure by which positive identifications are made. Here again the method is to make a minute examination for the purpose of determining characteristics. The writing of typewriters is distinctive because each type undergoes a life history, dependent upon conditions by which it is surrounded, and these conditions are different for each machine. This results in distinctive features of individual type, such

as physical defects in the letters and peculiarities of spacing and shading. In this procedure the questioned document is first compared with known standards, which enables the determination that the document was written on a typewriter of a particular company. It is sometimes possible to determine the approximate date of manufacture of the machine. This accomplished, it is only necessary to look for a machine of this kind in order that a test specimen may be prepared. This is then compared in detail with the questioned document, resulting in complete identification if it was the same machine.

MODUS OPERANDI

In addition to fingerprint records, many police organizations maintain what are called modus operandi files to assist in determining the identity of persons committing crimes. These records are files of data concerning individuals who come under investigation, so subdivided and classified as to show the manner in which the crimes committed have been accomplished. An habitual criminal in this manner may be identified when he later employs the same method. These records of crimes similar to the one under investigation are examined, resulting in the obtaining of information as to suspects. Photographs of the suspects are then submitted to victims or witnesses for identification. These photographs are either incorporated in the modus operandi records, or maintained as an independent unit in what are called "rogues' galleries", where witnesses may examine the features of past offenders to determine if they were involved in the present crime.

COOPERATION

Effective results have been obtained in criminal identification in the United States and abroad and the benefits following scientific methods in this important phase of police work have been established definitely. Through its collection and "clearing house" of criminal fingerprints described herein, the largest in the world, the United States Bureau of Investigation is able to furnish valuable aid to all peace agencies. However, it is obvious that complete records are required to secure the maximum efficiency. Without full cooperation in this respect the progress of criminal identification would be retarded. The Bureau is glad of the opportunity to serve law enforcement agencies in their identification activities and is pleased to render every possible assistance not only in current matters but in the solution of special problems.

