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## THE ONTOGENY OF CRIMINALISTICS

PAUL L. KIRK

Paul L. Kirk, Professor of Criminalistics, University of California, Berkeley, California, is well known to the readers of this journal and to all active in the field of criminalistics. Professor Kirk has published a number of articles in this and other technical journals, and is the author of *Crime Investigation* (Interscience Publishers, 1953). His present paper has been prepared from material presented before the California Association of Criminalists of which he is an active member.—EDITOR.

Historically, the development of science as we know it is relatively recent. Throughout its period of development, science has been characterized by altruism. When a need became apparent, the scientist moved to meet it. Thus, the realization of the necessity of identifying persons who, for one reason or another were the subject of public attention, attracted some outstanding scientists of the day to the study of fingerprints as a means of positive identification. Of the numerous contributors to this development, the names of Sir William Herschel, Dr. Henry Faulds, Sir Francis Galton, and Sir Edward Richard Henry stand out. This contribution to identification was the starting point for what we now recognize as a law-science profession, termed by some "criminalistics", by others "forensic science", and given by still others a variety of appellations.

Further early progress in the subject came when some firearms enthusiasts, Col. Calvin Goddard, Major Julien S. Hatcher, and others elucidated means for identifying the firearm that had fired a particular bullet or cartridge case; Albert S. Osborn and others proved that handwriting could be traced to the writer; Stas and Otto, and many others, showed how poisons could be isolated from tissues and identified; and many other chemists, microchemists, physicists and biologists carried on their respective developments in identification. These contributions were sporadic, isolated, and spontaneous. They were also highly significant.

During the last fifty years or so, especially, the practical application of laboratory methods has made great and valuable contributions to law enforcement and court procedure. At the present time a formidable array of techniques is available to the crime investigator, and most of them have achieved acceptance by the courts in all but the most backward areas. As with space science, few understand it, but most of the public as well as

the interested officials believe what they are told about it.

With all of the progress that has been made in this field, and on a wide front, careful examination shows that for the most part, progress has been technical rather than fundamental, practical rather than theoretical, transient rather than permanent. Many persons can identify the particular weapon that fired a bullet, but few if any can state a single fundamental principle of identification of firearms. Document examiners constantly identify handwriting, but a class of beginners studying under these same persons, would find it difficult indeed to distinguish the basic principles used. In short, there exists in the field of criminalistics a serious deficiency in basic theory and principles, as contrasted with the large assortment of effective technical procedures. This evaluation is made with the full knowledge of the claims for "scientific principles and approach" so commonly made in some standard books dealing with isolated segments of the broad field. Such statements appear to rest on a misconception that science consists merely of an orderly presentation of facts or methods, rather than elucidation of basic laws and principles.

All sciences rest on simple principles. Mechanics was born with the three simple laws of motion enunciated by Newton. Thermodynamics came into existence when two (later three) simple principles were enunciated. As complex as is the field of chemistry, its basic laws are simple, brief, and to the point. Even atomic energy originated with the simple equation of Einstein which contains only three terms. The true architects of science have always penetrated the superficial to reach the basic design which they could express in brief but truly fundamental terms. On these formulations and generalizations, the detailed scientific structure could be erected in an orderly manner.

As a science criminalistics is new, even though many of its techniques are not. The fact that few architects of this science have emerged is perhaps due more to the lack of acceptance of criminalistics as a science in its own right than to the lack of persons who could have simplified the principles operating in this synthetic and conglomerate subject. Whatever the cause, it appears worth while to outline the nature of criminalistics and to point some of the directions in which progress may be made.

The terms "identification" and "identity" are used constantly by practitioners in the field. Few stop to define the terms. *Identity* is defined by all philosophical authorities as uniqueness. A thing can be identical only with itself, never with any other object, since all objects in the universe are unique. If this were not true, there could be no identification in the sense used by the criminalist. Bowing to general scientific usage, we must however accept the term *identification* in a broader context, referring only to placing the object in a restricted class. This is necessary because every science has its own small realm of identification, which may refer to species (botany and zoology), compound (chemistry), and mineral (geology and mineralogy). In this sense, the criminalist would identify the object as a paint chip, but not relate it to the painted surface from which the chip was derived. He would even identify the marking as a fingerprint, but without relation to the hand that placed it, and another object as a bullet, without reference to the firearm that fired it.

For the criminalist to use the word "identification" in its accepted context is to admit that there is no reason for his special existence. If the best that could be done by the document expert were to testify that the sample is handwriting, he would never reach the witness stand. Yet this is precisely what would be meant in the other sciences, and this is *all* that would be specified by the term. It is clear that the time has arrived to be more specific and precise.

The criminalist does not attempt identification except as a prelude to his real function—that of individualizing. The real aim of all forensic science is to establish individuality, or to approach it as closely as the present state of the science allows. *Criminalistics is the science of individualization.* It is concerned only incidentally with identification in its ordinary sense. This unfortunate failure of nomenclature undoubtedly derives from the

development of methods for identifying an individual by his fingerprints or otherwise, which gave rise to the "identification bureaus" in most police departments. What was actually done was not the identification of the fingerprint, but rather the individualization of a person as the one who left the fingerprint. Thus, the entire subject of criminalistics started with a nomenclature that was inconsistent with science at large, and the terminology has never been brought into line by making the critical distinction of the field as a separate science of individuality.

For the same reason, the submergence of the concept of individuality by the very different concept of identification has retarded progress since it was not clear in which direction such progress lay. Once the concept of individuality is accepted, a thousand challenging problems are immediately apparent. This statement may be clarified by a specific example.

Blood has been, and is, one of the most frequent and important forms of evidence in crimes of violence. Most laboratories identify blood. They identify it often as human blood, and sometimes they identify it as human blood, group A (+). Such an identification is admittedly the first step toward establishing its individuality, but speaking objectively, it is little more informative than saying that the chemical in the bottle is sodium chloride C.P. At least partially, the lack of any great progress in individualizing blood has stemmed from satisfaction with the techniques that identify it. Yet this concept would be entirely unacceptable in the case of a bullet or a document. If the firearms examiner said that the bullet was a Colt 45 A.C.P. but could not individualize the gun that fired it, his value would be relatively slight. Neither may the document examiner state only that the sample is human handwriting of the late Spencerian system and stop there. In some areas, individualization has long been required. In others, simple identification is still acceptable. Yet it appears that few practitioners have clarified in their own minds the obvious conflict in these points of view. Some may even go so far as to deny the possibility that blood is individual, even when they admit that every other part of the body is. It is not intended to single out blood as the glaring example of philosophical inconsistency, but only to emphasize that in unknown areas such as this the criminalist seems often content to identify, while at the same time demanding individualization in

the better-understood areas of practice. This state of mind is not conducive to general progress and understanding in the field.

Criminalistics is sometimes referred to as a profession, sometimes as a science, and sometimes merely an occupation. No doubt the mode of entry into the field is a factor in determining the designation. To those who have entered as apprentices in operating laboratories, it may be only an occupation. To those who have devoted many years of serious study to the field, and practiced it with distinction, it may well be a profession. To those who see it as a systematic and basically orderly subject with a unique content, it may be considered as a science. Whatever it is, the time appears ripe for some clarification of its status. To neglect this clarification can only delay further the development of the field—a development that is urgently needed. Though the definitions ordinarily applied to the three designations are reasonably clear, it may be profitable to consider them briefly in their practical application.

*Is criminalistics a profession?* This is a difficult question to answer because the nature of a profession itself is not well characterized. Medicine and the law represent the traditional norms of the professions, but in popular usage, the word is loosely applied to almost any habitual occupation. We speak of the "oldest profession," and of the "professional housepainter" as distinguished from the amateur. Similarly, in golf and other sports the "pro" is sharply distinguished from the amateur. It seems clear that most informed persons recognize the difference between a true profession and what is only a vocation. The burgeoning of professional colleges in our universities has given respectability to the inclusion of numerous activities in the ranks of the professions, this move having followed careful scrutiny of the activity in question by learned men. The criteria generally applied by the universities would appear sufficient for a determination of status. Three basic criteria seem to apply:

1. A profession is based on an extensive period of training at a high educational level. In general, university or college work of considerable duration is necessary to qualify in the recognized professions. Far too slowly, but at a finite rate, the universities and colleges are beginning to offer training that may be considered at a professional level in criminalistics. Much progress in this direction is needed.

2. A profession is characterized by some generally recognized and accepted code of behavior or ethics. In the words of Vannevar Bush, the professional must "minister to the people". The professional is in some degree set apart from the layman, and he must accept his responsibilities as he exercises his prerogatives. The California Association of Criminalists has adopted a code of ethics as complete as could ever be required of any profession. Thus, a start has been made in meeting this essential requirement of professional activity. As a rule, even those practitioners not bound by any official code of ethics tend to be objective, fair and just in their relations to the people and the law. The exceptions are not more glaring than those in many of the established professions. It seems fair to state that criminalistics is inherently in accord with the principles of the recognized professions in this regard and may properly be considered to meet this requirement.

3. A profession requires established competence. This requirement may seem to be subsidiary to 1. above. Actually this is not necessarily true. Graduates of medical schools may not immediately practice without being examined by a licensing board. Schools which claim to train in criminalistics may fall far short of their stated objectives, since there is no way of checking on the quality of their offerings. Even when satisfactory courses are available, there is no guarantee that a student who has passed these courses is ready to assume professional practice. Whether licensing, certification, or some other indication attesting a person's competence is adopted ultimately, there is at present no method of assuring the quality of practice by any individual except as the courts qualify him as an expert witness. As every witness knows, this process is not immune to error, nor is it uniform from jurisdiction to jurisdiction, or even from one court to another. There is great need for serious consideration of this problem, and for application of more uniform criteria of qualification. Despite the limitations still apparent in this relatively new field, the practice of criminalistics is clearly meeting the requirements of a professional discipline.

*Is criminalistics a science?* According to most definitions, a science consists of an orderly and consistent body of knowledge, based on fundamental principles that can be clearly stated. Such a body of knowledge allows prediction as well as interpretation. Recognized sciences are characterized by research effort that produces constantly

increasing theoretical and technical knowledge. Does criminalistics qualify? It is based on apparently simple but not clearly enunciated principles of individualization and individuality. In this sense it does not encroach on other sciences, but is a separate and unique area. It is unfortunate that the great body of knowledge which exists in this field is largely uncoordinated and has not yet been codified in clear and simple terms. This body of knowledge is constantly being increased by a moderate research effort, largely technical rather than theoretical. It seems fair to state that criminalistics may now be considered a science in its own right, but that it lacks at this time the full development that will allow general recognition. Even in its present state, it allows prediction as well as interpretation. It should be developed so as to achieve full recognition as a separate scientific discipline.

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

While it may be both correct and useful, too much room still exists for honest disagreement between witnesses. Much of this problem would be avoided if systematic study were devoted to the development of sound probability considerations applied to evidence interpretation and also to the areas in which statistical analysis could properly contribute to correct evaluations. This is a field for combined effort by the mathematician and the criminalist. It should prove to be a most fruitful area for research—one that would strengthen the theoretical foundation on which the more practical technical structure could rest with confidence.

This short discourse is offered to evoke questions rather than as a set of answers. Criminalistics is an occupation that has all of the responsibility of medicine, the intricacy of the law, and the universality of science. Inasmuch as it carries higher penalties for error than other professions, it is not a matter to take lightly, nor to trust to luck. Great divergence of philosophy and opinion exists; we often travel separate roads; the goal is not always clearly recognized. When answers are incomplete, restatement of the question is useful. Where is criminalistics, forensic science, or whatever it may be called, going? Is it not time to make a serious effort to define a goal, so that we may all talk about the same thing and move in similar directions, in order that the field will command greater respect, and generate more pride in its accomplishments?