The Relevance of Forensic Science

*Nnodim Johnkennedy1 and Ezekwonna, Celestine Sopuluchukwu2

1Department of Medical Laboratory Science, Faculty of Health Science, Imo State University, Owerri.
2Department of Medical Laboratory Science, Madonna University, Elele, Rivers State, Nigeria.

Abstract

There is growing consensus that there is a crisis in forensic science at the global scale. Whilst restricted resources are clearly part of the root causes of the crisis, a contested identity of forensic science is also a significant factor. A consensus is needed on the identity of forensic science that encompasses what forensic science ‘is’, and critically, what it is ‘for’. A consistent and cogent identity that is developed collaboratively and accepted across the entire justice system is critical for establishing the different attributes of the crisis and being able to articulate effective solutions. The degree to which forensic science is considered to be a coherent, interdisciplinary yet unified discipline will determine how forensic science develops, the challenges it is able to address, and how successful it will be in overcoming the current crisis.

INTRODUCTION

Forensic science, also known as criminalistics is the application of science to criminal and civil laws, primarily—on the criminal side—during criminal inquiry. A variety of disciplines make up the field of forensic science, including entomology, anthropology, odontology, pathology, epidemiology, footwear and tire tread analysis, drug chemistry, paint and glass analysis, digital audio video and photo analysis, DNA analysis, fingerprint analysis, blood stain pattern analysis, firearms examination and ballistics, tool mark analysis, serology, toxicology, hair and fiber analysis, and more (Crime Scene Investigator EDU, 2013).

During an investigation, forensic scientists gather, preserve, and process scientific data. Some forensic scientists go to the crime scene to gather the evidence firsthand, but others work in laboratories and analyze the evidence that has been given to them by others. Others analyze financial, banking, or other numerical data for use in financial crime investigation; these individuals may work as consultants for private companies, academics, or the government (Suter et al., 2010).

In addition to their work in the lab, forensic scientists can work for the prosecution or the defense and provide expert testimony in both civil and criminal cases. Although technically any field might be considered forensic, certain divisions have evolved over time to cover the majority of forensically linked instances (American Academy of Forensic Sciences, 2015).

Etymology

The Latin word fonsis, which means “of or before the forum,” is where the word “forensic” originates. The term’s origins can be traced back to ancient Rome, when a criminal charge entailed presenting the case in front of a forum full of onlookers. Both the accused and the accuser would make speeches outlining their respective versions of events. The person who presented the strongest argument and delivered it most persuasively would win the case. The two modern uses of the word “forensic,” as a type of legal evidence and
Development of forensic science

Medical professionals in military and academic institutions started compiling data on the method and cause of death in 16th-century Europe. A French army surgeon named Ambroise Paré conducted extensive research on the impact of traumatic death on internal organs (Kelly, 2009). Fortunato Fidelis and Paolo Zacchia, two Italian surgeons, laid the groundwork for contemporary pathology by examining alterations in bodily composition brought on by disease. Writings on these subjects first appeared in the latter part of the 18th century. These books included The Complete System of Police Medicine by German medical authority Johann Peter Frank and A Treatise on Forensic Medicine and Public Health by French physician Francois Immanuele Fodéré (Madea, 2014). (Lindemann, 1999).

The use of torture to elicit confessions was restricted, and belief in witchcraft and other occult abilities essentially ceased to influence the court's rulings as the rational values of the Enlightenment era permeated society more and more in the 18th century. The rising application of logic and process in criminal investigations at the period is illustrated by two examples of English forensic science in individual court procedures. John Toms was tried and found guilty in Lancaster in 1784 of shooting Edward Culshaw to death. A ripped newspaper discovered in Toms' pocket and a pistol wad (crushed paper used to keep powder and balls in the muzzle) discovered in Culshaw's head wound during an examination led to the conviction (McCrery, 2013).

A farm worker was tried and found guilty of killing a young maidservant in Warwick in 1816. She had been violently assaulted and had been drowned in a small pool. In the soggy ground close to the pool, the police discovered footprints and a corduroy cloth impression with a patched patch. Wheat and chaff grains were also dispersed. When the breeches of a farm worker who had been nearby threshing wheat were examined, they absolutely matched the impression on the ground close to the pool (Kind and Overman, 1972).

Forensic science in crisis

The most recent House of Lords inquiry (House of Lords Science and Technology Select Committee, 2019) stood out for having a broad scope to investigate the entire forensic science ecosystem (from crime scene to court). In doing so, it gathered voices from a wide range of pertinent fields (the police, advocates, judiciary, scientists, researchers, government ministries and policy makers). the impact of the unstable and unsustainable market for forensic science provision; the challenges around agreeing, achieving, and enabling quality standards; how science is used and understood within the justice system; and in supporting and enabling technological developments, among others. While the inquiry's focus was on England and Wales, its key themes included the current lack of oversight, accountability, and responsibility for forensic science. These difficulties have an impact on many phases of the forensic science process (Morgan, 2017). For instance, the current forensic science market in England and Wales has a significant impact on the materials that are collected from crime scenes and those that are not, the tests that are ordered and those that are not, the manner in which the tests are conducted, and the manner in which the results are ultimately reported. The weight accorded to scientific evidence in a case, the form of requests for extra documents (such digital evidence from a tablet device), and the deadlines set to generate those materials for a court may all be influenced by how science is viewed in court (House of Lords Science and Technology Select Committee, 2019).

For forensic science to advance and provide the science required to contribute to the effective administration of justice, these systemic difficulties must be addressed. However, there are two important variables that have arguably made these problems worse and reached a crisis point for the system. First, the sector as a whole has endured financial cuts and a shortage of resources (not only in policing and the courts but also in forensic service provision and research). The second issue that has become apparent is that the crisis circumstances are, at least in part, a result of the ill-defined or ambiguous character of forensic science as a discipline outside of it. Different presumptions about what forensic science is, what it should be, and what it is for are influenced by its contentious identity. Because of this, different sectors and stakeholders may have varying opinions about what the crisis "is," what causes it, and what the best course of action is (s). After all, it is challenging to agree on the appropriate course of treatment if the diagnosis cannot be reached (Smith and Cape, 2017).

The importance of identity and epistemology

A discipline's name serves to define it, determine its course of development, and influence the viewpoints of both those who are involved in it and those who are not (Armstrong and Fontaine, 1989). Therefore, a discipline's name and identity are essential to its credibility, strategic
significance, and consequently, to its future. Over time, forensic science has developed as an area of study and is frequently referred to as a "patchwork of sciences" that can be used to address issues related to forensic investigations. In order to convey the idea that it is a multidisciplinary area that applies methods and techniques from "parent" or "core" sciences to "forensic" concerns, it is frequently referred to as "forensics" or the "forensic sciences" (Roux et al., 2015).

Forensics

The nomenclature of the word "forensics" is difficult. Technically speaking, the term "forensic" was first used as an adjective to denote something that belonged to, was employed in, or was appropriate for a court. As a result, the phrase "forensic science" started to be used to refer to the application of science to legal issues. Even if the word "forensic science" is arguably (technically) useless in and of itself, "forensics" has established itself as a term and is frequently used as a synonymous (but condensed) version of "forensic science" (Cook et al., 1998).

The term "forensics" has developed a unique (and much disputed) connotation. A "forensics" model has arisen within forensic science that has become a dominant approach to and understanding of the identity of "forensic science," even though it is still frequently used interchangeably with the term (Roux et al., 2012). The primary focus of "forensics" is on how related fields (such as chemistry, biology, computer science, and geology) may help in the use of evidence in the criminal justice system. This method treats the crime scene as a separate activity that the police often handle in an operational and processing capacity. Frequently, these actions aim to provide answers to queries about the crime's origin and identity. As a result, the term "forensics" is now frequently used in the policing industry. The entire crime reconstruction process, which takes into account a consideration of activity and offence level propositions, within the matrix of various stakeholders and external factors that frames the deployment of forensic science from crime scene to court, may be conveyed as having a narrow focus on the detection of forensic materials (source attribution), as opposed to this (Morgan, 2017).

Legal studies

The phrase "forensic sciences" refers to a group of applicable "core sciences," making it a "area of interest" as opposed to a clearly defined discipline. This method is appealing because it meets the practical needs that arise in crime detection and call for solutions to the "what" and "who" source issues (what is this particle made of? Who left this DNA sample behind? A concentration on these operational requirements also results in beneficial technology advancements to obtain those answers more quickly and precisely (for example enabling rapid DNA analysis in a custody suite, or real time fingerprint analysis).

However, this method or "model" of forensic science has two drawbacks. First technologies are frequently used to a "forensic" issue without taking into account the unique context of forensic reconstruction. Consider the creation of a potent new technique for detecting small amounts of material to tell apart materials from various sources. The new method, however, necessitates a lengthy sample preparation period and an expensive piece of equipment not typically found in typical forensic science laboratories. The use of this ground-breaking new technique is probably improbable (at least in the short term) due to the financial implications of both qualities (Woods et al., 2014). Even though the newly developed method solves the 'forensic problem' (of differentiating between materials from two locations) on its own, it cannot be referred to as 'forensic science' because the research was not done with consideration for the context in which the new method must be used (i.e. it does not address the constraints of finance, time and personnel inherent to forensic science). The second problem is that classifying forensic science as part of the "forensic sciences" precludes the development of a cogent, genuinely interdisciplinary strategy for the study of crime reconstruction and assessment (Morgan 2018). It presents a very constrained view of forensic science, one that confines it to a small set of activities (typically related to the crime scene and the analysis of specimens for forensic service delivery), and it prevents a full consideration and appreciation of the contribution of science to the intricate web of the legal system. As a result, it becomes exceedingly challenging to provide a thorough grasp of the value of forensic science, which has important implications for how resources are allocated (Bitzer & Margot, 2019).

Ecosystem fragmentation in forensic science

Therefore, there is disagreement over what "forensic science" actually "is." However, there is disagreement over what forensic science is "for." Forensic science can be seen as a practice, a science, a service, or as proof from several angles. This identity dilemma has led to the very fragmented ecology that is forensic science. This can be observed on a smaller scale, in a single instance, where the 'atomization' of the forensic science process results in different people and organizations being in charge of distinct parts, as opposed to a coordinated approach (for instance, one team handles the scene, one scientist examines trace evidence on one exhibit, and a different scientist in a different institution handles the DNA analysis from a different exhibit). It can also be observed on a wider scale in the UK's fragmented forensic service industry, which includes both internal
police departments and for-profit businesses. Additionally, investigations are sometimes conducted in a fragmented manner with little coordination between probes and the courts (Valjarevic & Venter, 2015).

This identification problem is also apparent in the scientific field. Arguments over whether the primary goal of forensic science research is to develop analytical or technological solutions for investigators or service providers, or whether there is also value in conducting foundational science that develops theory to underpin the entire forensic science process from detection to evaluative interpretation, have arisen regarding the question of what forensic science is for. Because of this ambiguity, it is frequently difficult to determine who is accountable for conducting research and development in the field of forensic science and where that obligation lies.

It is maybe not unexpected that forensic science is having such big problems given how fragmented the ecology is. It is challenging for forensic science to fit into the existing institutions that support and enable its services or its research and development without a clear understanding of what it is and what it is for. A clear definition of forensic science and agreement on its nature are therefore essential to the field's future and unquestionably go beyond simple semantics. Given the depth and variety of forensic science, it is impossible to formulate this from a single angle. It will call for a team effort that integrates the diversity of viewpoints that forensic science encompasses. For a consensus to be formed, this will need time for incubation and room for ideas to develop (Evision, 2018).

**A discipline with coherence is forensic science.**

There is however significance in assessing where forensic science stands right now to open the door for that group approach to consensus. It is now feasible to see how "forensic science" is evolving into a distinct discipline with all the characteristics of a "subject" in more recent times. It has a name that is widely recognized ('forensic science' appears in job descriptions and building names), professional societies, a large number of university courses, and a body of published literature that has undergone international peer review and contains an increasing variety of research methods and hypotheses. Parallel to this, it is possible to see the evolution of forensic science from the application of parent sciences to a "forensic problem" to a more unique, unified interdisciplinary study (Strand, 2007).

It is feasible to identify shared concepts and procedures within the various disciplines of forensic science since it is a cohesive, unique discipline (such as DNA, trace evidence, digital evidence).

- The identification and articulation of the fundamental and overarching principles (reconstruction, detection, and prediction), processes (authentication, identification, classification, reconstruction, and evaluation), and activities (survey, preservation, examination, documentation, analysis, integration, and interpretation) of forensic science materials as a single discipline of forensic science (albeit a truly interdisciplinary one).
- The uniform, repeatable, and open application of forensic science's common concepts and procedures that permits evidence-based practice (Organization of Scientific Area Committees for Forensic Science, 2018).
- A field that accepts both analog and digital evidence as part of a single, cohesive field (i.e., as part of a common framework with shared forensic principles, processes, activities to underpin research and the practice of forensic science).
- A field of study that can take into account and incorporate the complexity of the entire forensic reconstruction process by taking into account the environments—physical, human, and digital—as well as the theoretical and practical requirements (Page et al., 2019).
- A field that, in forensic reconstruction theory and practice, can address the entire process from the crime scene to the courtroom (to include source attribution as well as activity level and offence level propositions), fostering cooperation among the many stakeholders (science, policing, government, policy, law).

Forensic science can identify the priorities for both foundational research that will address the issues of "how?" and "when?" and technical advancements that will address the questions of "what?", "who?", and when. Additionally, it may take into account factors like uncertainty, context, and evaluative interpretation in human decision-making. By applying the full range and capabilities of science to the holistic and complex ecosystem of the justice system, it is also able to foster the development of new theory and lay the groundwork for the advancements required to face the challenges that lie ahead as well as those that will arise in the future.

It is conceivably helpful to think about the nature of forensic science as a coherent field in this way in order to get agreement on what forensic science "is" and, more importantly, what it "is for." Taking up casework and providing science "services" to support the legal system are both important components of developing a comprehensive understanding of the practice of forensic science. In order to handle each step of the forensic science process and guarantee the health of the innovation pipeline, it also
needs to integrate the practice of research to create new theories and instruments.

**Criminology**

Criminalistics is the practice of recognizing, gathering, identifying, and comparing physical evidence produced by criminal or illegal civil conduct using scientific methods. It also entails the analysis of the physical evidence and the crime scene in order to reconstruct such incidents. Criminalists, also referred to as "forensic scientists," examine evidence such as bodily fluids in order to ascertain whether the DNA included therein corresponds to blood collected at a crime scene (DNA fingerprinting). Physical evidence at a crime scene may be identified, gathered, and evaluated with the aid of additional forensic experts.

**Forensic pathology**

A forensic pathologist is responsible for determining the cause and manner of death in cases of suspicious death. In the United States, each state has its own laws defining what counts as a forensic case and a framework for carrying out forensic pathology’s duties. A chief medical examiner, who must be a doctor, is appointed by a city or county in many states that use the medical examiner system. The practical responsibilities of the forensic pathologist are carried out by a small number of associate medical examiners who report to the chief medical examiner. In some states, the coroner system is used, where the chief officer may not be a doctor and instead hires forensic pathologists to perform the essential tasks.

There are three main tasks that forensic pathologists must complete. They are called to crime scenes to do an initial inspection of the body and possibly make a preliminary assessment of the postmortem period (the time since death). They will assume control of the body and give the trained death scene investigators instructions on how to meticulously prepare, remove, and transport the body to the mortuary for further examination.

The postmortem examination, or autopsy, is used by forensic pathologists to ascertain the cause and manner of death. An autopsy involves carefully dissecting the body to look for signs of sickness, injuries, or poisons that could indicate the cause of death. The forensic toxicologist will collaborate closely with the forensic pathologist during this process to examine tissue samples and identify any compounds that may have been present in the body that may have contributed to or caused the death. To obtain a thorough picture of the events leading up to the death, forensic pathologists collaborate closely with criminal investigators. When determining the cause and manner of death, the forensic pathologist may occasionally collaborate with forensic anthropologists or entomologists.

A death certificate must be filled out and signed by a doctor when someone passes away. A method of death must be listed on the certificate in every forensic case. Homicide, an accident, suicide, and natural causes are among the potential causes of death. One of those four is required to be listed in some states. The pathologist may also enter "undetermined" or a similar phrase in other states. Even if the determination might be simple in a typical situation, it might be difficult in a scenario when the death’s cause is questionable.

The forensic pathologist’s final responsibility is to give testimony in court regarding the cause and manner of death. Coroners and medical examiners are frequently summoned to testify in court and must be able to do so without upsetting the jury. Judges frequently restrict or disallow graphic images of the deceased out of concern that they might sway the jury.

Medical professionals that specialize in pathology through a residency that may last three to four years after medical school are known as forensic pathologists. A pathologist can get certified in forensic pathology after completing an additional one-year residency in the field. An inexperienced pathologist could easily determine the cause and manner of death incorrectly in complex death cases, which could result in an injustice. Therefore, it is crucial to encourage pathologists who plan to work in forensics to obtain certification.

**CONCLUSION**

It is evident that concern over the forensic science dilemma is growing. Due to the ecosystem's complexity, this crisis includes a wide range of symptoms, and finding the underlying causes is still very much a work in progress. To be able to express not just the various aspects of the situation at hand but also persuasive remedies, it is crucial to explain the identity of forensic science across that ecosystem. Undoubtedly, the lack of funding and resources to date is a significant exacerbating factor, but given the importance of identity in forensic science (and the consequences of a contested identity), it is now more important than ever to adopt a broad yet clear definition of what forensic science is and what it is used for. The instruments required to deal with the complex matrix in which it must work are very well suited for forensic science because it is a coherent interdisciplinary study. The development of forensic science, the challenges it can address, and how adaptable it will be in facing the challenges that are just now emerging on the horizon will depend heavily on reaching agreement on its identity and communicating it in ways that are meaningful to various audiences while being consistent across the justice system.
References