CRIMINOLOGY

Article

DOI: 10.17803/2713-0533.2024.4.30.788-809

Contemporary Methods of Criminal Evidence: Examining Modern Scientific Techniques and Their Legal Implications

Noor Saad Mohammad, Rusul Faisal Dalool

Al-Iraqia University, College of Law and Political Science, Baghdad, Iraq

© N.S. Mohammad, R.F. Dalool, 2024

Abstract: The study focuses on the topic of contemporary methods of criminal evidence, which holds significant importance within the area of criminal justice. Modern scientific evidence serves as a crucial foundation for determining the occurrence or non-occurrence of criminal incidents. It is utilized as a key tool to substantiate or refute claims in criminal cases. Given the current societal context undergoing rapid evolution, particularly the rise of information technology, it is imperative to remain updated on the advancements in this field. Criminals with expertise in information technology are increasingly employing modern scientific and technical methods to perpetrate crimes. Consequently, it becomes necessary to utilize contemporary evidence and investigative techniques to mitigate such crimes effectively. This approach facilitates the identification and apprehension of offenders, thereby ensuring appropriate punishment and the attainment of justice in a timely manner.

***Keywords*:** Iraq; Iraqi law; criminal evidence; brain print; DNA fingerprint; iris scan; voiceprint

Cite as: Mohammad, N.S. and Dalool, R.F., (2024). Contemporary Methods of Criminal Evidence: Examining Modern Scientific Techniques and Their Legal Implications. *Kutafin Law Review*, 11(4), pp. 788–809, doi: 10.17803/2713-0533.2024.4.30.788-809

Contents

I. Introduction

Scientific evidence plays an important role in criminal investigations and adjudication, as it is a way to identify the perpetrators as quickly as possible, protect the rights of the victims, and ensure the imposition of appropriate punishment on the perpetrators of the crime. Police departments apply these techniques as reliable motive evidence to help them identify the offenders, while judges use scientific evidence to make informed decisions. In fact, the evolution of criminal techniques has made it more challenging to identify the offenders. Scientific data indicates violations of fundamental human rights, making it very challenging for the legal system to uncover the truth. Technological development has been accompanied by an enhancement of criminal strategies as well as developments in the methods used to uncover evidence, enabling criminals to use the most up-to-date scientific tools to commit their crimes. This development has two aspects, one of which is adopting novel investigative methods that were not previously available to attain previously known scientific evidence. On the other hand, it is based on modifying and developing the use of traditional methods in a way that increases their effectiveness and reliability.

Thus, the study aims to explain the fundamental and indispensable role of modern scientific evidence in addressing crimes committed by professional criminals. The frequency of such crimes, along with

increasing technology advancements, demands the use of sophisticated scientific procedures in criminal investigations.

New crimes have arisen, and the ways in which they are committed have improved technologically as a result of the scientific and technical advancements that have impacted society and warranted legal systems to adapt and innovate. Therefore, it is the duty of all Arab laws in general and Iraq in particular to keep pace with this development to detect crimes. Nonetheless, it is accurate to say that the inability to address these crimes will push society into a state of lawlessness, representing "the law of the jungle." Therefore, the relevance of our study on this critical topic is justified, especially in combating cross-border terrorist crimes. These topics, especially Iraqi law, must adapt to keep up with the developments in our society and the frequent commission of such crimes. Therefore, we urge our legislators to update the legal system. A special law, or addition or amendment of a legal article under the Iraqi Penal Code addresses these technologically advanced crimes in terms of investigative and trial procedures.

The problem with the research is that the criminal justice system in Iraq does not often rely on modern evidentiary techniques such as genetic fingerprints, brain fingerprints, and dental fingerprints because of the courts' predominant reliance on traditional means of proof, which are deemed sufficient to prove reality. In this research, we will study the reasons that led to the judicial system's reluctance to accept contemporary methods. Additionally, this study will also explore the best strategies that enable the judiciary to embrace modern methods of advanced evidentiary practices.

The first section of the paper covers the idea of proof and scientific evidence, which examines the origins of evidence techniques and their growth in criminal justice. The second section elaborates on the distinct sorts of contemporary criminal proof, which are further broken down into two categories. It also addresses the challenges and issues faced by the judiciary when considering the reliability of modern evidence while deciding how to resolve a criminal case. The objective of this analytical research is to fill the void between conventional and contemporary methods to gather criminal proof, delivering practical insights that will help the judiciary successfully adjust to developing issues.

II. The Concept of Proof and Scientific Evidence

The primary goal of proof in criminal matters is to uncover the truth in judging the accused while delivering justice. This means that establishing evidence requires establishing the occurrence of the crime and attributing it to the accused. The proof in this matter is the result that is achieved by using various means and methods of proof to gather the evidence that the judge uses to extract the truth of the facts presented to him in accordance with the law (Abdullah and Khattab, 2017). The modern methods of proof have become prominent in the field of criminal justice, in addition to the traditional methods. We must develop evidence-gathering techniques as crimes have become advanced with technological advancements. We must always develop methods of proof that are compatible with criminal development. Adapting and improving criminal proof-gathering techniques ensures conformity with more complex criminal activities, raising the overall efficacy of the judicial system.

Given the complementarity of the evidence concept, the criminal judge has discretionary authority to weigh the evidence in line with their personal beliefs, which are established in the fullest freedom of decision-making. Preceding evidential force continues to exist. For instance, the Yemeni legislation offered the criminal prosecution judges the freedom to rule in accordance with their convictions and provided them a constructive role in seeking the truth. Rather than listing all forms of proof in the criminal case, Art. 32 of the Penal Procedures outlines specifically listed evidentiary categories associated with the criminal cases (Hosni, 1992, pp. 62–63).

Based on the aforementioned information, we will split this subject into two parts: the first part will address the meaning of proof and the attributes of scientific evidence, while the second part will address the legal implications of integrating scientific evidence into the criminal justice system. These analyses try to illustrate the transforming potential of new evidence methodologies in modern criminal probes and judgments.

II.1. The Definition of Proof, Scientific Evidence, and their Characteristics

Linguistically, the term "proof" refers to a condition of verification, consistency, and accuracy. It stems from the idea of confirming or proclaiming something as genuine or fixed. The reverse meaning of proof denotes elimination or instability. For example, expressions such as "fix the thing," "prove," or "establish proof" imply permanence, need, and confirmation. Likewise, "so-and-so has proven" implies an attribute or truth that is clearly established and substantiated (Oxford English Dictionary, 1993).

For the legal terminology, it is defined as "establishing evidence of the occurrence of the crime and its attribution to the perpetrator of the crime" (Al-Kilani, 1995). Some scholars have further defined it as "establishing evidence of the occurrence of the crime and its attribution to the accused. It is intended to prove the facts to show the point of view of the lawmaker and the truth of his intent. Research in this relates to the application of the law and its interpretation, which is the Work of the court" (Mahmoud, 1988, p. 421).

Others defined it as "the establishment of evidence by the competent authorities of a certain fact in the ways specified by the law in accordance with the rules to which it is subject" (Al-Zoghbi, 2002, p. 377).

Whenever a technical expert provides reports based on scientific judgment regarding particular facts, it is considered scientific evidence. Thus, scientific evidence is defined as follows: it is the evidence whose source is a scientific opinion about a material or verbal report, or expert analysis (Muhammad, 2006, p. 152).

Furthermore, the features of proof derived from science fall in line according to the definition given above, scientific evidence is any evidence that a criminal judge uses to establish the veracity of a particular piece of evidence in order to construct a decision in the case at hand. It relies on contemporary methods to demonstrate the commission of the crime after reaching a conviction based on that particular piece of evidence. For example, the judge considers contemporary scientific evidence, such as DNA testing, computer-generated evidence, and

biometric identifiers like voice, iris, and fingerprint analysis, which are examples of criminal tests.

In order to accomplish social justice, scientific evidence — which is just a way of establishing a connection between the criminal and the crime — is one of the most crucial components of criminal proof that minimizes the possibility of a court's mistake. It displays the data obtained by contemporary scientific techniques that improve the accuracy of legal investigations, considerably contributing to the quest for social justice (Farghaly, 2011). The appearance of scientific evidence in criminal proof may lead to an increased role of experts in doing an illustrious job of demonstrating their technical and scientific expertise. In fact, scientific evidence is the result of scientific and practical experiments and methods carried out by a technical specialist. However, medical evidence or the use of contemporary cutting-edge technology in testimony in deriving these types of evidence typically calls for the availability of highly technical, eminent, and uncommon skills as well as the legal framework that supports its admissibility (Arhouma, 2007, p. 41).

A wide range of modern scientific methods is used in the field of detection of criminal proof for addressing contemporary crimes, including cybercrimes, forgery crimes, and even traditional crimes. Among this modern scientific evidence is the evidence derived from genetic fingerprint examination (Khalifa et al., 2023, p. 128). The evidence derived from biometric identifiers, such as voice, ear, and iris fingerprints, as well as, other modern scientific evidence has revolutionized the realm of criminal proof (Musa, 2011, p. 353).

Accordingly, scientific evidence may affect the basic human rights stipulated in the Constitution of the Republic of Iraq of 2005 and the rest of the constitutions of other countries. Scientific evidence confronts the discoveries made by science to reveal the truth, and thus the judiciary's work is extremely difficult as it necessities the reconciliation of two critical objectives: 1. punishing the offender; and 2. protecting individual rights.

Therefore, the use of modern scientific methods, particularly in invasive procedures, must be limited to some people because of the risk of violation of their rights. On the other hand, this evidence must

be subject to stringent oversight and effective control. Competent regulatory frameworks must guarantee that such evidence is used only when accompanied by strong safeguards to avert infringement of individual rights (Al-Saghir, 2002, pp. 3–4).

II.2. The Legal Implications of the Scientific Evidence

The legal nature of the scientific evidence leads one to conclude that, in cases where its application is not tied to a particular accused it rather serves as a procedural tool. For example, in the case of lie detectors, which are employed to reveal the accused's psychological state during questioning or to hypnotize the accused to elicit statements — they become an inference procedure rather than definitive adjudicatory protocols.

We note that the latter trend criticizes the first trend because this trend gave absolute status to scientific forensic evidence by resembling scientific truth. The latter is subject to change and the errors of the natural sciences are less than the errors of the human sciences. In the field of scientific evidence, the focus shifts from the events and phenomena that depend on material science principles or immutable laws to the facts and the extent of their attribution to the accused. Thus, the decision is made through judicial rulings, not through the formulation of general scientific principles or laws, and this represents the opinions of the majority of jurists in France and England (Nokes, 1952).

The scientific methods that are used in scientific evidence collection may be apparent and announced to those who confront them, such as anesthesia, hypnosis, a lie detector, genetic fingerprinting, and fingerprinting of all kinds. Conversely, they may be hidden, meaning that they may be used secretly by those who confront them, such as audio recording and monitoring telephone communications (El-Gammal, 2013, p. 155).

Scientific evidence is subject to the discretion of the criminal judge (i.e., the emotional conviction of the criminal judge). This guide is subject to two things:

— The scientific validity of the electronic evidence.

— The circumstances in which the evidence was found.

The first matter is not addressed or is not subject to the judge's discretion because the value of the evidence is based on precise scientific foundations, and here the judge has no freedom to discuss established scientific facts. However, the second factor is within the judge's discretion because it is at the core of their judicial function. Judges need to assess whether the evidence is consistent with the facts of the occurrence and, if discrepancies exist, construe them in favor of the accused under the concept of reasonable dissent.

The mere availability of scientific evidence does not bind the judge to deliver a conviction or acquittal. Instead, the judge must assess the evidence's credibility and significance in the context of the case, alongside other factors.

Scientific evidence is therefore not a mechanism designed to assess the judge's persuasion regarding an unconfirmed issue. Rather, it is evidentiary support based on a foundation of science and knowledge, and the judge may interpret it in light of the surrounding circumstances and facts (Mustafa, 2011, pp. 249–250).

III. The Types and Role of the Modern Methods in Criminal Proof

The criminal laws have clarified the traditional means of proof, including confession, witness testimony, expert opinions, and evidence. However, some criminal laws have not managed the integration and regulation of modern scientific evidence, and some of them argue that the principle of free proof is what makes room for the judge's emotional conviction in accepting or excluding some evidence (Hassan, 2012, p. 1). This notion stems from the fact that the judge is the expert of experts and the ultimate arbiter of facts (Fouad, 1939, p. 223). However, when confronted with technical or specialized issues, the judges must seek the assistance of experts in technical matters, and this modern scientific expertise is an example of genetic fingerprint analysis and biometric identifiers of all kinds, such as ear, tongue, voice prints, and other modern scientific evidence, serving as a pivotal tool in criminal investigations.

With the rapid development of civilization, the role of scientific evidence in criminal proof has increased multifold, and the role of this scientific progress has profoundly impacted diverse fields of science.

We will divide this discussion into two parts. The first part deals with fingerprints and their role in criminal proof, while the second part talks about the problems and difficulties in using modern means in criminal inquiries and the role of the Iraqi legislators in comparison with some other laws.

III.1. Types of Fingerprints

The scientific progress in the field of criminal proof has resulted in its reliance on modern scientific methods to uncover the truth in the commission of the crime in order to reach and achieve justice. In the beginning, the discovery of the crime relied on forensic techniques and criminal expertise of various kinds, fingerprint examinations, and the assistance of police dogs to identify or reach the perpetrator of the crime (Champod and Chamberlain, 2013, p. 57).

However, the technological development that has affected society no longer relies on traditional scientific methods and means of criminal proof. Rather modern methods have emerged that are embraced in most countries for criminal investigations, and we will discuss them in detail.

A. Genetic fingerprint

The genetic fingerprint is the personal identification card that God Almighty has bestowed on a person's limbs because it contains many lines and features that remain unaltered and cover the tips of our fingers, the palms of our hands, and the soles of our feet from birth until a certain period after death (Al-Droubi, 2006, p. 7). The genetic fingerprint is a process of isolating DNA from its biological sources using special enzymes that break down the cells so that it has a specific sequence (Al-Saghir, 2002, p. 59).

Accordingly, from a legal perspective, genetic fingerprinting is defined as one of the scientific methods used to prove or deny the act committed by the accused, whether from a civil or criminal perspective

(Cherril, 1959, p. 13). This process is conducted by a scientifically competent expert in forensic medicine based on his referral by the competent judicial authorities to examine the samples or traces taken from the crime scene and compare them with the samples of the suspect or the accused.

Considering the genetic fingerprint as evidence in criminal cases is relatively recent. The use of genetic fingerprinting allows the resolution of many crimes, and as a result, investigations were opened, whereby the genetic fingerprint exonerated many people, and vice versa, convicted actual perpetrators. Genetic fingerprinting was the main reason for identifying the perpetrator of the crime, in the Sam Shepard case (Hosni, 2009, p. 109).

In this case, in 1955 Ohio State Court found the perpetrator guilty of killing his wife by beating her to death. The case became a matter of public concern, and the doctor's husband decided to close it in response to media pressure since it raised the potential that a third person may have been present when blood traces from that person were discovered on the victim's bed during resistance. After serving ten years in jail, Sam retried in 1965 and he was acquitted. However, many people were not persuaded of this until 1993, when Sam's only son requested that the case be reopened and a genetic fingerprint test be used to show that the blood on the bed did not belong to Sam Shepard. However, because it was the longest trial in 2000 history, he was found guilty by genetic fingerprinting of the blood of a family acquaintance. As a result, we see how genetic fingerprinting plays a part in identifying the perpetrator of the aforementioned incident. Here, we observe that it served as the decisive proof in identifying the criminal.

We highlight that some European and Arab countries have acknowledged the genetic fingerprint as conclusive evidence or a key piece of corroborative evidence in proving the perpetrators of the crime. It has been used in various fields to prove filiation, resolve murders, rape, and other crimes. Nonetheless, the extraction of fingerprints must be done by scientific experts with high practical precision. Highly qualified specialists using specialized equipment for this purpose ensure the accuracy and reliability of the results.

B. Fingerprints

Fingerprints are defined as the prominent ridges and grooves located on the tips of the fingers (Hoover, 1954, p. 6), featuring unique patterns that leave their mark when fingers come into contact with surfaces and objects, especially smooth ones (Hamdi, 1961, pp. 145, 153). Some scholars define fingerprints as the impressions left by the papillary lines of the phalanges of the fingers visible due to sweat secretions (Al-Jubouri, 1984, p. 32). We note that fingerprints hold special importance in the field of criminal investigations, owing to their inherent uniqueness because the fingerprints of the same hand of the same person do not match, and even identical twins, despite sharing DNA, have distinct fingerprints (Hanna, 2011, pp. 114, 116).

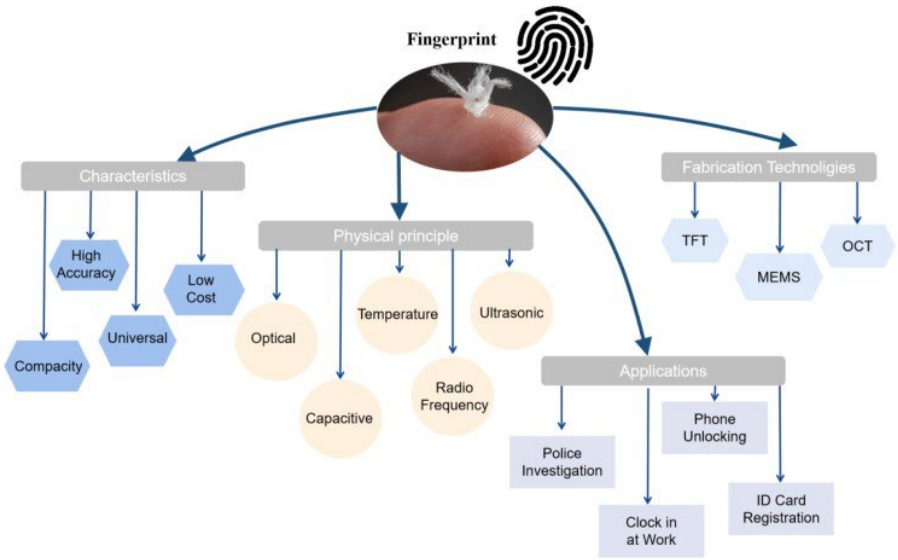

Figure 1. The diagram summarizes the properties, underlying ideas, and technologies used in the production of fingerprint sensors for various uses. OCT (optical coherence tomography), MEMS (micro electromechanical system), and TFT (thin film transistor) (Yu et al., 2023).

Among the most important crimes in which the fingerprint played a role in discovering crime in Jordan involved investigators who solved three murders and robberies that occurred on different dates and regions using exceptional analytical skills and fingerprint evidence. These crimes were similar in terms of their occurrence wherein the victims' necks were slit apart in all three crimes and a letter was sent anonymously through mail to one of the investigating officers responsible for investigating these crimes. The investigator treated this letter with caution and forensic scrutiny. The investigator examined this letter because it revealed the details and narration of the events of the crime committed by the perpetrator. This letter was examined by the forensic laboratory to match the fingerprints that might be found. The result of the laboratory examination revealed the fingerprint of an unknown third person, and after examination, it was revealed the involvement of an acquaintance. It was between a girl and a young man who had a romantic relationship. The young man secretly married that girl after she divorced her previous husband. After analyzing the letter and cross-referencing, the fingerprint was matched with the letter found in the file of the young man who had a prior criminal record. Thus, the investigator was convinced that the young man and the girl were the ones who carried out the killings.

The theft was done for the victims in the three cases. By collecting information, it was found that the girl and the young man had left the Hashemite Kingdom of Jordan, however, the address of the country they were in was found. After coordination with Interpol, they were brought to Jordan by one of the tourism marketing institutions, and they were in possession of free promotional passports to travel. They killed the victims by slitting their necks and then the theft process was completed. That is why the fingerprints on the letter were the only essential and key piece of evidence that unraveled many unknown crimes committed earlier. This case highlights the importance of fingerprint analysis in present-day criminal investigations, emphasizing its dependability and efficacy in securing justice (Al-Dabbas, 2007, pp. 123, 129).

C. Voice Fingerprint

Voice fingerprint is one of the most recent fingerprints that has appeared in the field of criminal evidence. Every person has a unique voice pattern that is different from the voice of another person. Therefore, identifying the perpetrator through their voice has become a valuable tool of scientific evidence, contributing to development in the field of identity verification and forensic science (Hanna, 2011, p. 262).

Thus, the voice fingerprint is prominent in the technical field, especially in military applications, where it is used as a means of criminal proof, in particular, while investigating terrorist operations. However, we noticed through our study that the voice fingerprint oscillates between two sides of experts in terms of its scientific use as evidence in criminal proof. The first side of critics questions the validity of using voice fingerprinting as a means of proving that sound is subject to change using electronic devices through electronic devices and manipulation. Thus, many scientists specializing in the field of sound analysis have proven that the voice fingerprint method lacks scientific robustness in criminal investigations thus falling short of being accepted in a court of law (Al-Dabbas, 2007, pp. 123, 129).

D. Brain fingerprint

Brain fingerprinting is defined as an investigative technique that helps stimulate perception by measuring the brain's electrical wave and its responses to words, phrases, and images on the computer screen. It relies on the notion that hidden signals of information about the crime remain in a person's internal memory through which all information is recorded and analyzed by automated computer systems (Azmi, 2006).

Brain fingerprinting is considered one of the new discoveries in the world of forensic science, as it determines the extent and manner of the suspect's knowledge of the crime because it is a technique that helps analyze the nature of the electrical responses of the suspect's brain while confronting him with information linked to the crime (Hosni, 2009, p. 140). For example, if the killer is presented with a physical object from the site of the crime, the brain records their recognition in

an involuntary way, and their reactions to it using electrodes attached to the head that monitor the brain's activity in the form of electrical waves. Conversely, if there was a person who was not present at the crime scene, they would exhibit no such recognition (Hanna, 2011, p. 262). This fingerprint is used in foreign countries in the areas of intelligence and counter-terrorism operations.

III.2. The Problems and Difficulties in Using Modern Means of Criminal Proof and a Statement of the Iraqi Legislator's Position on Them Compared to the Laws of Other Countries

The crime scene is the place from which all evidence emerges, and the use of modern evidence intends to reveal the mystery of the criminal in how he committed the crime and identify the perpetrator by establishing evidence despite the accused's keenness to destroy evidence and information. Modern forensic techniques entail a high degree of accuracy and honesty due to their link with the material traces of the crime scene. The crime represents the sincerity of the motive and the summary of experience and laboratory results, which places it in a distinguished position compared to information obtained by other less scientific means.

The law permits proof by all means, and the material evidence resulting from certain scientific research is established due to its permanence and objectivity. Forensic evidence such as fingerprints, voice, genetic fingerprints, and ear and eye scans, remain unaffected by change no matter how circumstances change. These biometric identifiers accompany a person from the cradle to the end. Since scientific evidence indicates that the fingerprint is considered evidence of proof of identity, the analogy that makes the fingerprint and the eyeprint original is therefore relevant in determining people's identity for criminal investigations (Hosni, 2009, p. 459).

Here, we note that the position of Arab and foreign legislation regarding modern means of proof differs from one country to another according to the procedural law of each country. Jordanian legislation does not stipulate in the Code of Criminal Procedure that the DNA fingerprint is valid, as the judges in the State of Jordan, based on the

principle of free proof in force and in effect there, resort to taking the genetic fingerprint and ruling on it based on the aforementioned principle. It can then also be taken into account by seeking the assistance of experts in proof in criminal cases (Hassan, 2012, p. 148).

Articles 27–226 of the Jordanian legislation stipulated and considered the genetic fingerprint as an independent piece of evidence in criminal cases based on the aforementioned law. The use of the genetic fingerprint was specified in three areas or cases: criminal investigations, identity verification, and judicial proceedings.

Iraq, akin to the rest of the Arab criminal legislation, does not explicitly stipulate the consideration of the genetic fingerprint and the rest of the fingerprints but rather considers them on the basis of the principle of emotional conviction that reaches the end in pronouncing the ruling.

This conviction is generated by the judges through the availability of modern scientific evidence or when they come across such evidence to base their final decision while issuing their ruling on the case presented before them.

The Iraqi law states in Art. 213/A that: "The court shall decide the case based on its conviction based on the evidence presented in any stage of the investigation or trial, which is the confession, witness testimony, investigation records, other official statements, reports of experts and technicians, and evidence. Other legally prescribed."[1]

The Iraqi legislator also stipulated in the Code of Criminal Procedure in Art. 70 that the investigating judge or investigator may force the accused or the victim of a felony or misdemeanor to undergo a physical examination and submit their photograph, fingerprint, or blood, hair, nails, or anything else that would be useful to the investigation. The examination of a female's body must be compulsorily done by a female investigator.

It is clear from these penal texts that the Iraqi legislator was granted asylum by collecting the genetic fingerprint and other fingerprints, which include the fingerprints of the brain, voice, fingers, and other scientific evidence, that are the same as other criminal evidence affecting the personal freedom of the accused (the individual). Hence, while

[1] The Iraqi Code of Criminal Procedure No. 23 of 1971, as amended.

collecting samples, all care must be taken into account. The personal rights of the individual need to be secured because the principle of law presumes the innocence of all human beings.[2]

From the above-mentioned details, the judge's authority granted by law and supported by the previously mentioned texts allows them to rule on modern criminal scientific evidence. This power is based on the principle of mixed proof, which allows the judges to evaluate this modern scientific evidence and separate modern scientific evidence in line with their emotional conviction. Since these fingerprints fall within the realm of scientific medical expertise, the judge is considered an expert by evaluating this evidence and basing their judgment and decision on it.[3]

In fact, I made a field visit to the Directorate of Criminal Evidence Investigation. This visit examined the most recent techniques utilized in criminal evidence, such as the voice fingerprint, which is referred to as digital evidence (Electronic Crime Division).

This fingerprint is proven effective through a system specialized in matching voices, containing a set of filters specialized in clarifying and isolating voices and performing matching and emulation with the criminal statements sent by the judges. Regarding the photos and video recordings, matching is carried out through the aforementioned system, utilizing a comprehensive database of these people and their photos.

Social media sites (Facebook, Instagram, etc.) are places where the competent authority contacts the appropriate judge to request authorization to investigate content on these sites. The problem with this situation is that there is no law that specifically addresses it because some foreign laws, including American law, allow every person the freedom to express their opinions on social media.[4]

[2] The Constitution of the Republic of Iraq for 2005 stipulated in Art. 19/F5 that "the accused is innocent until proven guilty in a fair legal trial." The basic principle of human beings is innocence, and thus it is a constitutional right before it is a legal right.

[3] I made a field visit to the Directorate of Criminal Evidence Investigation in accordance with the task facilitation letter, No. 18136 dated 9 April 2023, issued by the College of Law and Political Science/Iraqi University.

[4] An interview with the pioneer programmer and cybercrime expert: Mahmoud Iyad Safaa El-Din — Cybercrime Division — a field visit to the Directorate of Criminal Evidence Investigation on Thursday, 19 October 2023.

The second type of modern means of criminal proof and entry into Iraq is the dental fingerprint, which is one of the internationally approved fingerprints, and through it, we presume that:

1. We can obtain the embryonic map (DNA) from teeth grinding.

2. We can obtain a forensic dental fingerprint from the traces of teeth left on the victim's body and compare it with the dental database in place in the Arab and international markets. Arab countries have been working with this examination since 2007, and Britain is the leading country in this examination and the first in the world.

3. We can estimate the victim's age by dental impression.

4. We can determine the sex of the victim if the body is completely mutilated, charred, with unknown features, or completely rotten, considering the teeth are the most resistant and solid part to influential external conditions.

5. Through the forensic dental fingerprint, we can identify the patterns of violence, including violence against children, women, or the elderly, and distinguish them from cases of murder and rape.

The method of examining the dental fingerprint involves the Alo-PG device, which takes x-rays of the palms and stores them in a special dental database for humans.

More than 60 % of the unidentified bodies after the mall bombing incident in the United States were identified, and 973 victims were identified in the first year itself using the dental registry.

This method is considered one of the advanced methods in Iraq as a means of criminal proof and is presented as a project that is being studied and applied on the ground.[5]

Moreover, experts confirmed that there is no defect in this technique, but there is a postponement in legislation in keeping pace with modern progressions, particularly, when we look at the kinds of crimes committed and the tools used. For this reason, it is necessary to enact the cybercrime law as quickly as possible. In addition, there is an urgent need to enhance the skills of employees in this field through targeted training courses and developing the curriculum of police institutions.

[5] An interview with Chemical pioneer and forensic laboratory expert: Wissam Ibrahim Abbas — field visit to the Forensic Investigation Directorate on Thursday, 19 October 2023.

IV. Conclusions and Recommendations

After completing the research, several results and recommendations have been recorded as follows:

Conclusions

Modern scientific evidence has gained wide recognition in the criminal justice field because it has contributed to the discovery and resolution of many crimes committed in society as evidence of proof or denial. At the same time, despite its advantages, it affects the personal rights of the individual, which is its only flaw.

We noticed that genetic fingerprinting is one of the modern scientific methods that is used as evidence of innocence or an accusation in the field of criminal evidence. The result derived from the genetic fingerprint after collecting and analyzing the samples in the correct manner is considered evidence that has substantial scientific and technical force and is granted authority as proof in some legislation, including Iraq, especially when corroborated by other evidence.

The modern scientific evidence used in criminal proof, including fingerprints, voiceprints, eyes, and other biometric identifiers, helps investigators prove the identity of the perpetrators of crimes through the presence of traces of the perpetrators' fingerprints at the crime scene. The judge may resort to using this modern scientific evidence, provided they adhere to procedural safeguards. There is no harm in the judge resorting to medical or scientific matters derived from the crime scene or any place related to the crime, as they may affect the resolution of the criminal case and at the same time influence the rights of the accused potentially leading to serious implications, such as convictions or mitigating defenses.

It is noteworthy that the judge has the discretionary power to apply these contemporary scientific procedures, which are classified as technical medical knowledge, depending on their emotional convictions in the context of the criminal case's resolution.

Recommendations

We call on the Iraqi legislator to explicitly stipulate the adoption of modern scientific evidence in criminal investigations. Even though the judge has discretionary authority to evaluate the evidence and take it into account, formal legislative backing would regulate its implementation and confirm its legality.

This is what we noted as stipulated in Art. 213/A, 70 of the Amended Code of Criminal Procedure No. 23 of 1971. However, we suggest that the Iraqi legislator explicitly stipulate, in light of the previously mentioned law, that modern scientific evidence be taken into account in criminal investigations.

Articles 213/A, 70 should read as follows, in our opinion: The court will base its verdict regarding a criminal case on its belief derived from the evidence put forth at any stage during the investigation or trial, including the confession, testimonies, and evidence. In addition, legally required evidence, such as contemporary scientific evidence, shall be used in criminal prosecutions as valid proofregarding the wording of the same law's Art. 70, we propose the following.

The investigating judge or investigator may force the accused or victim of a felony or misdemeanor to undergo a physical examination that might require collecting his photograph, fingerprint, or a small amount of his blood, or hair. The genetic fingerprint, eye fingerprint, ear fingerprint, brain fingerprint, or anything else that is useful to the investigation is collected in order to conduct the necessary examination on them.

Based on interviews with experts in the field of forensic evidence, we suggest organizing specialized cultural and educational programs of a scientific and legal nature focusing on the use of modern scientific methods or evidence in criminal investigations. Specialists must be equipped with knowledge so that they know how to demand the use of these scientific methods as evidence of innocence or accusation in resolving a criminal case. These courses must be held by highly qualified competent people from technical and scientific fields. Additionally, we suggest that these courses must be held in the Forensic Medicine Department, the Forensic Evidence Department, and other relevant

institutions. Training courses, workshops, and seminars accessible to all state department employees must be announced and managed by the Forensic Medicine Department and the Forensic Evidence Department as teams specialized for this purpose.

Spreading comprehensive cultural awareness among the security services with all their formations regarding information related to modern scientific evidence in criminal investigations so that the right personnel or interest holder can invoke it and use it for resolving criminal cases effectively.

References

Abdullah, N.A. and Khattab, A.K.A., (2017). The role of modern imaging devices in proving a criminal case. *Al-Rafidain Law Journal*, 15(55), pp. 397–398.

Al-Dabbas, M.N.K., (2007). *The reality of organized crime in Jordan*. Amman: Diana Scientific Publishing House.

Al-Droubi, K.F., (2006). *Introduction to Fingerprint Science*. Dar Al-Thaqafa Publishing House.

Al-Jubouri, M.O., (1984). *Technical inspection of accidents*. Research presented to the scientific symposium of the Arab Center for Studies and Training. Riyadh.

Al-Kilani, F., (1995). *Lectures on the Jordanian and Comparative Code of Criminal Procedure*. 3rd ed. Beirut, Lebanon: Dar Almoroaj.

Al-Saghir, J.A.B., (2002). *Criminal Evidence and Modern Technology*. Cairo: Dar Al-Nahda Al-Arabiya.

Al-Zoghbi, J., (2002). *The General Theory of the Crime of Slander*. Amman; Wael Publishing House.

Arhouma, M.M., (2007). *The freedom of a judge to form his belief*. Libya: Dar Al-Jamahariya.

Azmi, B.A.B., (2006). *Procedural legitimacy of scientific evidence*. Cairo: Dar Al-Nahda Al-Arabiya.

Champod, C. and Chamberlain, P., (2013). Fingerprints. In: *Handbook of Forensic Science*. Willan Publ.

Cherril, F.R., (1959). *The Finger print system at Scotland Yard*. London; Her Majesty stationary office.

El-Gammal, M.S.M., (2013). *Scientific evidence and its criminal validity. A comparative study between Egyptian and American law*. Dr. Sci. (Law) Diss. Tanta University.

Farghaly, A.N.M.M., (2011). *Scientific Proof of the Crimes of Forgery of Traditional and Electronic Documents*. Dr. Sci. (Law) Diss. Cairo; Cairo University.

Fouad, A., (1939). *Criminal Investigation. Scientific Department*. 5th ed. Cairo.

Hamdi, A.A., (1961). *Detecting crime using modern scientific means*. 1st ed. Cairo.

Hanna, M.R., (2011). *Forensic medicine and the scientific and police methods used in detecting crimes and tracking down perpetrators*. Alexandria: Dar Al-Fikr Al-Jami'i.

Hassan, A.A.R.Y., (2012). *Modern scientific evidence and its role in criminal proof*. Master's Thesis. Amman: Middle East University.

Hoover, J.E., (1954). *Fingerprint Identification*. Washington DC: Federal Bureau of Investigation.

Hosni, A.D., (2009). *The genetic fingerprint and its extent of validity in proof*. Alexandria: Dar Al-Fikr University.

Hosni, M.N., (1992). *Jurisdiction and Evidence in the Code of Criminal Procedure*. Egypt: Dar Al-Nahda Al-Arabiya for Publishing and Distribution.

Khalifa, O.A.A., Yaacob, A.C. and Masri, (2023). The Modern Scientific Proofs and their Authenticity in Criminal Evidence: Literature. *International Journal of Academic Research in Business and Social Sciences*, 13(2), pp. 970–980.

Mahmoud, M., (1988). *Explanation of the Code of Criminal Procedure*. Cairo: Cairo University Press and University Textbook.

Muhammad, F.Z., (2006). *The Authority of the Criminal Judge in Evaluating Evidence*. Jordan: Dar Al-Thaqafa for Publishing and Distribution.

Musa, M.M., (2011). *Investigating the crimes of the information society and the virtual society*. Cairo: Dar Al-Kutub Al-Qanuni.

Mustafa, A.Q., bin (2011). *Authoritative electronic evidence in the field of criminal evidence*. Egypt; New University House.

Nokes, G.D., (1952). *An Introduction to Evidence*. London: Sweet & Maxwell.

Yu, Y., Niu, Q., Li, X., Xue, J., Liu, W. and Lin, D., (2023). A Review of Fingerprint Sensors: Mechanism, Characteristics, and Applications. *Micromachines (Basel)*. 2023 June. 14;14(6), p. 1253, doi: 10.3390/mi14061253.

Information about the Authors

Noor Saad Mohammad, Al-Iraqia University, College of Law and Political Science, Baghdad, Iraq
noor.mohammed @aliraqia.edu.iq
ORCID: 0000-0001-6840-2784

Rusul Faisal Dalool, Al-Iraqia University, College of Law and Political Science, Baghdad, Iraq
rusul.f.d@aliraqia.edu.iq
ORCID: 0000-0002-8247-3017