

Title of paper I- Introduction to Forensic Science

Basic Principles of Forensic Science	Introduction to Forensic Science	Prof. Devasish Bose	
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Basic Principles of Forensic Science

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Check List

MODULES	FAQS	LOR	OBJECTIVE S	SUMMARY	QUIZ	ASSINGMENTS	REFERENC E	GLOSSARY	LINKS
✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Full academic script (around 3000 words)

Module 1: Introduction of forensic science principle,

Module 2: Law of Exchange

Module 3: Principle of Individuality

Module 4: Law of Comparison

Module 5: Principle of Linkage

Module 6: Law of Probability

Module 7: Law of Progressive change

Module 8: Law of Analysis

Module 9: Conclusion

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Module- 1: Introduction of forensic science principle-

Dear students, today, we shall learn another beautiful topic principle of forensic science. As we know that these are the principles that make the footing of the any subject or we can say, these give a particular dimension to the subject. Moreover, each and every subject has its own

principles like forensic science. In addition to this, chemistry, physics and biology have their basic principles that are connected to each other. Here, in forensic science we have borrowed some principles from other disciplines. So, let's start with the principle of forensic science. For the sake of convenience, we will study them one by one. Therefore, before beginning them, I would like to make you familiar with them such as principle of exchange, principle of individuality, law of comparison, principle of linkage, law of circumstantial facts, law of probability, law of progressive change and finally, law of analysis.

Now, we are going to turn towards another fantastic module law of exchange.

Module 2: Law of Exchange-

Dear students, now, we are going to discuss the principle of exchange. So, let's have definition of principle of exchange that was given by Sir Edmond Locard- "every contact leaves trace." or in simple words he said "when two objects come into contact with each other a cross-transfer of material occur." Dear students, he strongly believed that every perpetrator can be connected to a crime scene or crime by their foot prints, fingerprints, hair, their clothes fiber or even dust particles or soil carried at the crime scene or brought from the crime scene.

Therefore, let's apply this principle on crime scene how does it work. According to this principle, when a perpetrator and/or his or her instruments of crime touch and come in contact with the objects at the scene or the victims then they leave the traces or on the other hand, they can also bring the other things knowingly or unknowingly. So, there is the mutual exchange of things takes place between the perpetrator, victim, objects and scene. Now, this is the ability of the investigating officer to search and find out the physical evidence that depends on the skill, experience and knowledge of the investigating officer.

Now, we will try to understand this with help of different case examples such murder case, suicide case, theft case, robbery case etc. We will take one example in which we will try to look the principle of exchange. Suppose that in case of murder, investigating officer will get the fingerprint, footprint, blood, soil, tools by which crime has committed and on the other hand one can pick up the hair of the victim, dust from the crime scene, if one is passing from the garden so one can bring the grass of the garden. Therefore, we can say that this is the principle of exchange. Or the most important thing is that it is difficult to imagine such type of crime scene where evidences do not exist. On the other hand, if perpetrator will come in

contact with the victim, the object involved, would not exchange traces. So, in the essence of the principle, we can say this is the natural process that happens.

Having finished this lecture, now we will move towards another module principle of individuality.

Module 3: Principle of Individuality-

Dear students, now, we will study principle of individuality. Principle of individuality has great relevance in forensic science. As we know that everything is unique in nature even nature does not duplicate the live things. Now, you will be remembering the case of monozygotic twins they look exactly alike but somewhere they are different from each other. Even, when you will see the leaves of same branch at plant you will find the difference between them. So, this is the individuality of the nature. But, you will be thinking that what about those things which has been build and made by the human being. Dear students, these things are also unique in nature. Let's take the example, have you seen the coin, currency notes or firearms etc. All the coins of the same denominations in the same mint look exactly alike but they are different from each other during the time of manufacturing they get the individuality that are not easy to observable or understand but when you will see with high concentration you will seek the difference. One more interesting example is firearm. They are similar to each other while firearm created in the same factory, with same batch, by same machine or at the same time and with same workers. Now, they are different to each other in their class characteristics as well as individual characteristics

Dear students, when we talk about in the context of forensic science, there are many examples that show the individual characters. You can take the example of the fingerprints still there is no single case been reported which shows the same fingerprints even in case of monozygotic twins they have similar DNA but different fingerprints. So, this is the quality of fingerprints. Moreover, like fingerprints there is also other evidence that illustrate their individual characters.

So, we will have a definition of the principle of individuality "Every object, natural or man-made, has an individuality, which is not duplicated in any other object. It is unique. Neither the nature has duplicated itself, nor can man. (Sharma, B.R., Forensic Science in Criminal Investigation & Trials, Universal Law Publishing Company.)

In the last, the essence of the principle is that everything is individual in them. For example, physical evidence is unique, crime scene is unique, modus operandi is unique and different people have his different mind make up etc.

I hope you have enjoyed this module. So, now, we are going to move towards the next interesting module law of comparison.

Module 4: Law of Comparison-

Dear students, now, we will have another beautiful lecture that is law of comparison. As we know very well “only similar things can be compared with similar” for example gold can be compared with gold not with silver. So, this is the principle of comparison that explains the different things cannot be compared to each other while only similar. Currently, you will be thinking this how it is. Let’s see, suppose, you received exhibit for the comparison. After opening it you found that both were different object such as one was hair or other one is fiber. As we know that both are different from each other in every point such as appearance, morphology, texture, shape, size, color, chemical components and biological characters. So, this is the principle of comparison that emphasizes the necessity of providing like exhibits for comparison with the suspected one. Now, we will have a definition of the principle according to this principle “only the same exhibits must be compared with the same.” Here, i would like to give another interesting example- suppose that in a burglary, glass is recovered from the crime scene as an exhibit. Forensic science experts opine that the glass has been from window glass. So, it is useless to send vehicle glass such as car pane, truck window glass etc. One more example is that if investigating officer gets human blood at the crime scene and then to send animal blood would be futile. Forensic experts can not reveal the truth or the most important thing is that both exhibits are different from each other. So, here, the principle of comparison is applied with all the physical evidence. In the essence of the principle, we can say this is the duty of the investigating officer to recognize physical evidence in a proper way and then send to the forensic science laboratory. Now, we are going to move for another beautiful principle that is principle of linkage.

Module 5: Principle of linkage –

Dear students, now, we will discuss the principle of linkage. As we all are familiar with this beautiful proverb “people lie evidence doesn’t”. So, here, according to this principle if investigating officer gets the physical evidence at the crime scene, one can easily link a suspect to a victim. On the basis of physical evidence, there can be two type of linkage- direct

linkage or indirect linkage. Apart from suspect or victim linking it also link suspect to the crime scene, suspect with physical evidence. We can understand this with the help of figure that is depicted below.

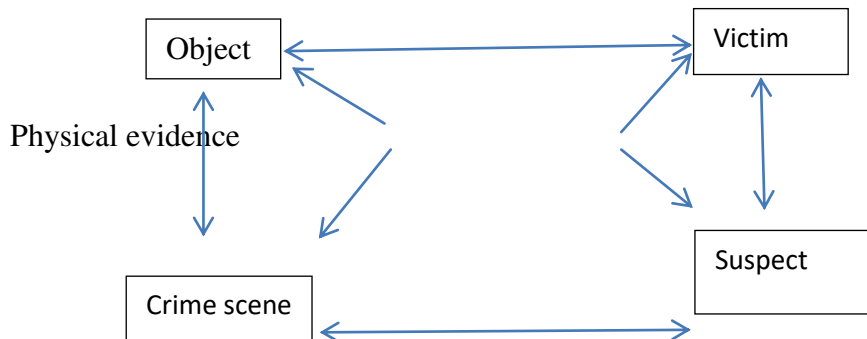


Figure- Linkage between the elements of the crime

Here, in this figure we can see the relation between the different elements of the crime how they are related to each other. For more clearance, let me put the example that will remove out the fog from the fact. Suppose that if one commits crime or one leaves their identity card at crime scene. After some time, investigating officer asks to suspect where you were present while committing the crime. Definitely, one will say that one was out of town. Investigating officer will inquire about the identity card. As we know that this identity card linkage the suspect with the crime scene. The question that arises here how identity card reach at the crime scene if the suspect was out of town that day. So, dear students, there are many tremendous examples that links the physical evidence with the crime scene, victim, object and suspect. These things also link themselves to each other. Let me give one more example, you can take the example of fingerprint. Fingerprints are the most valuable and trustable physical evidence that direct link the suspect with the crime scene without any doubt. One more thing that i want to explain to you that is with the advent of newer laboratory techniques now commonly being used in forensics science laboratories, toxicological evidence such as viscera, plant poison animal poison and chemical poison can be used direct linking of persons to the crime scene. Moreover, you can take the example of biological evidences such as blood, semen and saliva that can be used for the direct linking of suspect to the crime as well as crime scene. In these examples, we have discussed the direct linkage of the perpetrator with the crime scene. But, there are also physical evidence that provide the indirectly link the suspect with the crime scene like footwear impressions, tire tread marks, tool marks etc.

Module 6: Law of Probability-

Dear students, now, we are going to talk about the probability. You might have heard this term in previous classes or you might be familiar with the probability. Here, we will study how probability is used in the forensic science to punish the perpetrator on the basis of physical evidence. Moreover, this is just like this common example if so and so gang robbed the bank. Now, investigating officer has to put the probability which one gang has done this. On the other hand, forensic scientist also makes the probability with the physical evidence like if forensic scientist receives the blood and other biological fluid as physical evidence then what will be the probability of the blood that is belong to so and so person. In addition to this, it might be 90%, 95% and 99% or may be 100%. Here, we are noticing one thing that's it is varying according to physical evidence. It will vary because different evidence has different in nature. Probability is a mathematical concept.

Now, we are going to define the probability "it determines the chances of occurrence of a particular event in a particular way out of a number of ways in which the event can take place or fail to take place with the equal facility. (Sharma, B.R., Forensic Science in Criminal Investigation & Trials, Universal Law Publishing Company). Dear students, we will not discuss the mathematical portion of the probability. So, let's move to the next module.

Module7: Law of Progressive change-

Dear students, now, we will discuss the law of progressive change. As we know that "everything is change with passage of time". Or in other word we can say that nothing is permanent, until or unless one day it will change from one form to another. Here, i would like to give the example; even you can take our own example- our journey start from our ancestors and in the end it changes in a magnificent human being. Indeed, it also applies on other things. Moreover, we talk about in the context of crime. One commits the crime, so and so perpetrator uses the instruments for committing the crime. These instruments work as a physical evidence. On the other hand, these evidences will also change their nature. If these evidences are not recognized, preserved and forwarded to the forensic science laboratories at right time, they would be spoiled before analyzing and give false result to the investigating officer. Indeed, it will ruin out the whole investigation. So, there is a dire need for the investigating officer to recognize and preserve physical evidence as soon as possible. In the above, we have taken our own examples in the context of progressive change; it also applies on the perpetrator because if one commits crime, today, after passing some day you cannot

book that person why. Because the face and the body texture of the criminal would be changed. So, it would be difficult to identify. So, this is principle of progressive change that applies on physical evidence as well as human being. Now, we will discuss another module.

Module 8: Law of Analysis-

Dear students, now, we are going to discuss the law of analysis that is most important from the investigation point of view. As we know that by analyzing the physical evidence forensic scientist opines his report regarding the analysis of the physical evidence. After committing the crime perpetrator leaves the physical evidence at the crime scene. Now, the investigating officer would recognize and preserve them for the analysis and send to the forensic science laboratory. Here, investigating officer has to be conscious while treating with the physical evidence otherwise improper sampling and contamination render the best analysis useless. Let me give the example to clear the talk. Suppose that investigating officer blood and biological fluid at the crime scene. If one collect and preserve the exhibit with naked hand and without taking other precaution definitely the result would be disputed. So, we can say this principle emphasizes the necessity of correct sampling and packing of the physical evidences. So, now, we will have the definition of the principle “the analysis can be no better than the sample analyzed”. (Sharma, B.R., Forensic Science in Criminal Investigation & Trials, Universal Law Publishing Company).)

Module 9: Conclusion-

Having finished the lecture, dear students, now; we are going to discuss the conclusion of the lecture. As we know that principles of the forensic science led the foundation for the subject. Moreover, these principles are the soul for the subjects, students, as well as investigating officer. These principles teach us how to treat with the physical evidence and also if you will go in the right direction it means you are doing everything right you will have best results otherwise wrong result. After studying this lecture, students will know the principle of forensic science and how these principles lead the crime scene. As we have seen in the principle of exchange that stated “every contact leaves a trace”. It depends on the skill, expertise and knowledge of investigating officer to identify them. Moreover, like this principle other principle also work in the same manner for example law of analysis, if you will give the good sample indeed you will have best results in your bucket. In the last, we can say that all the principle work together.

II.LOR Questions:

1. What is forensic science?

Ans: The application of scientific methods and techniques to matters under investigation by a Court of Law.

2. Define law of analysis.

Ans. “the analysis can be no better than the sample analyzed”.

3. How will you define probability?

Ans: it determines the chances of occurrence of a particular event in a particular way out of a number of ways in which the event can take place or fail to take place with the equal facility”.

4. Define principle of Individuality.

Ans: Every object, natural or man-made, has an individuality, which is not duplicated in any other object. It is unique. Neither the nature has duplicated itself, nor can man.

5. What do you mean by principle of exchange?

Ans: when two objects come into contact with each other a cross-transfer of material occur.

6. What do you mean by crime scene?

Ans: Scene of crime is a place where crime has been occurred.

7. What is the principle of comparison?

Ans: Only similar things can be compared with similar”.

III. FAQs-

1. Who did give principle of exchange and write about it?

Ans- Edmond Locard gave principle of exchange. He told, “every contact leaves trace” Or in simple words he said “when two objects come into contact with each other a cross-transfer of material occur.”

2. What is the principle of uniqueness?

Ans- Principle of uniqueness told that everything in this world is unique even nature does not duplicate the live things. All human beings are different even **monozygotic twins** they look exactly alike but somewhere they are different from each other. Leaves of same branch at plant also are having different. So, this is the individuality of the nature.

3. Give definition of Forensic Science?

Ans- Forensic Science is an applied science. In this science all the principles of basic science (Physics, Chemistry, Biology, mathematics etc) are utilized for the purpose of law and administration.

4. What is the principle of Analysis?

Ans- This principle emphasizes the necessity of correct sampling and packing of the physical evidences. This principle states, “The analysis can be no better than the sample analyzed”. On the basis of this principle different physical evidences are analyzed in the Forensic Science Laboratory.

5. What is the law of comparison?

Ans- Likes can be compared with likes. According to this principle “only the same exhibits must be compared with the same.” Things which are different from each other in every point such as appearance, morphology, texture, shape, size, color, chemical components and biological characters, but if they are having some similarities they can be compared. So, this is the principle of comparison that emphasizes the necessity of providing like exhibits for comparison with the suspected one.

6. What is law of probability?

Ans- This law determines the chances of occurrence of a particular event in a particular way out of a number of ways in which the event can take place or fail to take place with the equal facility. Forensic scientist always apply the law of probability with the physical evidence like if forensic scientist receives the blood and other biological fluid as physical evidence then what will be the probability of the blood that is belong to so and so person.

7. What is law of progressive change?

Ans- This law states, “Everything changes with passage of time”. Or in other word we can say that nothing is permanent, until or unless one day it will change from one form to another.

8. Explain principle of linkage.

Ans- According to this principle if investigating officer gets the physical evidence at the crime scene, one can easily link a suspect to a victim. On the basis of physical evidence, there can be two type of linkage- direct linkage or indirect linkage. Apart from suspect or victim linking it also link suspect to the crime scene, suspect with physical evidence.

IV. Objective

1. To make the students aware about Law of Exchange
2. To make the students aware about Principle of Individuality
3. To make the students aware about Law of Comparison & Principle of Linkage
4. To make the students aware about Law of Probability & Law of Progressive change

5. To make the students aware about Law of Analysis

V. Summary-

Forensic Science is an applied science in which all the principles of basic Science are utilized for the purpose of law. As other sciences are based on some fundamental principles, Forensic Science is also based on some principles. The main principles of Forensic Science are Law of Exchange (Every contact leave traces), Principle of Individuality (Everything is unique), Law of Comparison (only similar things can be compared with similar), Principle of Linkage (crime scene, evidences, victim and accused somewhere linked with each other), Law of Probability (Probability is a mathematical concept which determines chance of occurrence of event or phenomenon), Law of Progressive change (Everything changes with passage of time) and Law of Analysis (The analysis can be no better than the sample analyzed). These all principles are very useful for solving the crime and in identification of accused. These principles are useful in linking of suspect with crime scene, as well as with victim. These principles are very useful in analysis of physical evidences.

VI. Quiz

1. Principle of exchange is given by
 - a) Edmond Locard
 - b) Sharma B R
 - c) Sharma J D
 - d) None

Ans- a

2. Which system is used for the examination of fingerprints?
 - a) Vahan samanvay
 - b) AFIS
 - c) SPM
 - d) None

Ans- b

3. For the comparison of tool marks which instrument is useful?
 - a) Compound Microscope
 - b) HPLC
 - c) GC
 - d) Comparison Microscope

Ans- d

4. In paternity disputes which principle/s of Forensic Science are useful
 - a) Law of Probability
 - b) Law of comparison
 - c) Both a and b
 - d) None

Ans- c

5. Physical evidences are preserved because;
 - a) Everything changes with passage of time
 - b) Everything is unique
 - c) Everything in this world can be compared
 - d) None of above

Ans- a

VII. Assignments

1. Make the list of physical evidences.
2. Find out which principle is applied in their examination.
3. Write about Principle of analysis.
4. What do you mean by law of progressive change?
5. Explain principle of exchange with example.

VIII. References

1. James, S.H. and Nordby, J.J.; Forensic Science; an Introduction to Scientific and Investigative Techniques, CRC Press, USA, 2003.
2. John Horswell: The Practice of Crime Scene Investigation, CRC Press, 2016.
3. Saferstein: Criminalistics – An Introduction to Forensic Science, Prentice hall Inc. USA 1995.
4. Sharma B R: Forensic Science in Criminal Investigation and Trials, Universal Law Publishing Company, 2003.
5. Stuart H. James: Forensic Science: An Introduction to Scientific and Investigative Techniques, 4th edit., Taylor & Francis, 2014.

IX. Glossary

1. **Exchange**- An act of giving one thing and receiving another
2. **Individuality**- Separate existence
3. **Comparison**- Estimation of the similarities or dissimilarities between two things or people
4. **Linkage**- The action of linking or the state of being linked
5. **Probability**- The extent to which something is likely to happen
6. **Progressive**- Happening or developing gradually or in stages
7. **Analysis**- Detailed examination of the elements
8. **Forensics**- Scientific tests or techniques used in connection with the detection of crime
9. **Forensic expert**- Person which are having deep knowledge in Forensic science.
10. **Crime scene**- Place where crime has been committed.

X. Links

1. www.unacademy.com

2. www.adgarrett.com
3. www.forensicscience.ufl.edu
4. www.handbook.uts.edu.au
5. www.wikiopedia.com