

SUBJECT	FORENSIC SCIENCE
Paper No. and Title	PAPER No.1: General Forensic Science
Module No. and Title	MODULE No.30: Track Marks- I
Module Tag	FSC_P1_M30

Principal Investigator	Co-Principal Investigator	Co-Principal Investigator (Technical)
Dr. A.K. Gupta Professor and Head, Department of Forensic Science Sam Higginbottom Institute of Agriculture, Technology & Sciences SHIATS, Allahabad	Dr. G.S. Sodhi Associate Professor Forensic Science Unit Department of Chemistry SGTB Khalsa College University of Delhi	Dr. (Mrs.) Vimal Rarh Deputy Director, Centre for e-Learning and Assistant Professor, Department of Chemistry, SGTB Khalsa College, University of Delhi <i>Specialised in : e-Learning and Educational Technologies</i>
Paper Coordinator	Author	Reviewer
Dr. Mukesh Kumar Thakar Professor, Department of Forensic Science, Punjabi University, Patiala	Dr. Mukesh Kumar Thakar Professor, Department of Forensic Science, Punjabi University, Patiala	Dr. G.S. Sodhi Associate Professor Forensic Science Unit Department of Chemistry SGTB Khalsa College University of Delhi
Anchor Institute : SGTB Khalsa College, University of Delhi		

TABLE OF CONTENTS

1. Learning Outcomes
2. Introduction
3. Nature
4. Footprints
5. Footwear Marks
6. Tyre Marks
7. Skid marks
8. Pugmarks
9. Extraneous Matter
10. Collection and Preservation of Track Marks
 - Footprints on Floors
 - Footwear and Tyre marks
11. Summary

1. Learning Outcomes

After studying this module, you shall be able to know about-

- Nature of various prints and marks
- Their collection and preservation

2. Introduction

Tracking is one of the oldest sciences known to man. Before the development of agriculture, hunting was major occupation of the primitive man and was the main source of supplying him food and clothing. The men of these ages had to learn to recognize and distinguish between the tracks left by the various types of animals. He had learnt to distinguish the track made by the dangerous animals from the track made by other animals, which were likely to call an easy prey to his crude weapons and provide him with food. His existence depended on the ability to master the science of tracking. This science of tracking has been kept alive by 'Shikaris' and professional trackers in remote regions of various countries of the world – *Murras of Saudi Arabia; Bedouins of Egypt and nearer home by the Khojis of Rajasthan, Gujarat, Punjab and some parts of neighboring Pakistan*. The Khojis, a group of untrained and illiterate tribal people is known for their skill in tracking down criminals. Though they may have difficulty in explaining their methods, but have a high degree of skill in observing, tracking and comparing the criminals even from the partial footprints by observing the presence of an additional toe, absence of any toe, scars or wrinkle pattern and other peculiarities such as tissue growth on foot; each of these taken as an extra advantage for the identification of an individual. The police in tracking down the criminals employ a few of these professional trackers. There are numerous stories of the incredible feats performed by these professional trackers.

An expert Khoji is confident to say from the track of the person whether it belongs to man or woman and that too whether he is young or old and has any deformity or not?

Despite advancements in the scientific aids in the investigation of crime, the older techniques of tracking by Khojis are still capable enough to produce good results.

Nature:

Track marks are varied in nature; naked footprints, footwear marks, paw marks, tyre marks, dragline of a load; impression of a stick or pugmarks of a beast are also included in track evidence. Individual marks and their collective patterns are both useful in the identification of individuals.

A mark may be a print or an impression. A mark having two dimensions like length and breadth is called print, while a mark with three dimensions length, breadth and height or depth, is an impression. The terms 'print' (which is usually found on hard surface) and impression (which is mostly found in comparatively soft surface) have been used erratically in literature, so the term 'marks' includes both prints and impressions.

Objects smeared with powders and liquids leave prints on various surfaces. Thus, a foot or footwear smeared with either dust, ink, oil or blood etc. leaves print. Prints can also be found on oiled, waxed or dusty surfaces without being smeared.

Foot and footwear impressions can also be found on surfaces like soft clay, mud and snow etc.

Principles and methods for the evaluation of all types of marks are alike, though procedure for collection differs for prints and impressions. The following types of the track marks are significant forensically:

3. Footprints

The footprints are generally found almost at every crime scene as none can tread on the ground without leaving foot or footwear prints/impressions (collectively termed as marks). These marks are mostly found at the following points:

- At the point of entry,
- At the scene where crime took place. In homicide and/or rapes where the struggle or fight has taken place.
- The route through the crime scene. This may or may not be apparent.
- At the point of exit. It can sometimes be harder to find than at the point of entry.

Footprints are particularly helpful in personal identification of the suspect because each footprint is unique. Careful scientific examination of these footprints yields information, which aids in linking the suspect with the crime scene or conclusively demonstrates that the suspect was present at the scene of the crime.

Footprints also give indications about the number of individuals present at the scene of crime. They may also indicate whether struggle has taken place or not, about the routes taken by the culprit, their assembly points, their conference site, their hiding places etc.

Still some percentage of people in India including majority of the criminals in rural areas, usually move around bare-footed. The naked footmarks are, therefore, frequently found at and around the scene of crime. But, it has been found that due to following reasons the positive and definite identity of the footmark could not be established in many cases:

- Either the footmarks are incomplete or
- The marks do not carry ridge details or
- The marks have only few individualizing characteristics or
- The specimen marks are carelessly lifted.

Or the investigator overlooks these marks and valuable information is lost, this might have happened due to number of reasons like:

- Incomplete searching
- Entry and Exit points of crime scene are not known
- Arrived at the scene after the area has been walked all over, or
- Weather may not be conducive to record permanently.

It is well established that every body part including feet are in proportion to the total body height. Thus, the foot measurements can be useful to find approximate height of the person.

4. Footwear Marks

Footwear marks include the marks of shoes, sandals and chappals. The footwear can be factory-made or handmade. It is made up of leather, rubber (natural or synthetic) or plastics. Cloth is used in canvas shoes.

In some parts of India shoes are also made from strings alone. The persons especially in rural areas wear hand-made leather shoes.

The soles of a pair of shoes may be stitched, nailed or pasted with the upper leather. Ordinarily this stitching and nails are used in combination. The adhesive are increasingly used.

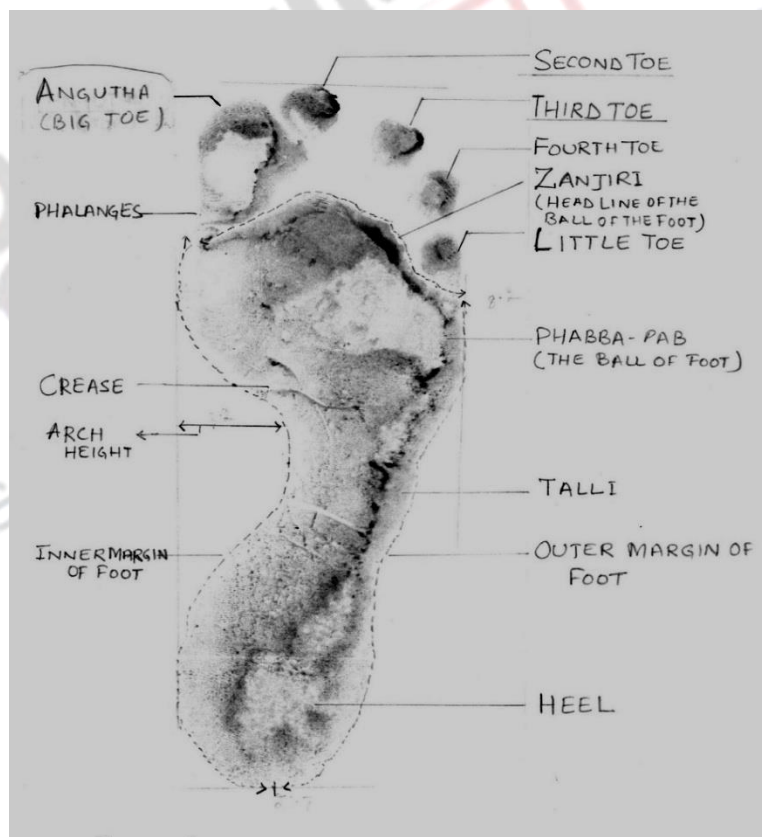


Fig-1: Inked Foot Print Showing Various Parts

The footwear evidence suffers from one great drawback. If the culprit is not taken in custody soon after the commission of crime and continues to wear the shoes, the additional wear and tear will change the original surface pattern and identification of the marks may not be possible with respect to shoes. The time after which the marks become unidentifiable cannot be given. It varies or deteriorates with the extent of use or misuse, nature of the sole material and the territory in which it is used.

It is always advisable to get the footwear marks compared even when it is recovered after a considerable interval of time.

On the other hand, footwear marks are identified with respect to the footwear in about eighty percent cases. The belief of the judiciary, the bar and the investigating officer that the naked footmarks are more valuable than the footwear marks is, therefore, not correct. The forensic importance of the footmark, if identified accurately, is, of course, greater because it links the culprit directly with the crime. In case of footwear marks, it is necessary to establish that the culprit owned and wore the particular shoe at the material time as the footwear mark identifies the footwear and not the wearer. Other evidence must establish the latter.

5. Tyre Marks

In crime cases motor vehicles are very frequently involved for coming at and going away from the crime scene after commission of crime. The tyre marks left by the vehicles used can be valuable evidence in narrowing down the type of vehicle involved and the route adopted before and after the commission of crime. The tyre marks are also like footprints, either two-dimensional prints or three-dimensional impressions depending upon the surface on which they are present.

6. Skid Marks

Skid marks are the marks left by wheels of motor vehicles, which are no longer rotating. These marks are characteristic in appearance and caused due to the wheels sliding across the surface of the road. Skid marks are short-lived type of evidences, which are left at the scene and play an important role in the successful reconstruction of a road traffic incident. They help in the estimation of speed of the vehicle which is an important consideration in a 'hit and run' crime scene or in case of vehicle clashes.



Fig-2: Showing Skid Marks Left by a High Speed Vehicle

7. Pug-Marks

The term pugmark refers to the footprints of almost all the animals. Every individual animal species has a distinct pugmark and it is used as a means for identification. Wildlife conservationists are often engaged in collecting different sort of data regarding the pugmarks in the areas specifically assigned to them. Pugmarks are also used for tracking rogue animals which may be a danger to mankind or even to themselves because of injuries etc. Trained wildlife investigators make an accurate identification of species, sex, age and physical condition of an animal by analyzing their specific pugmarks.

8. Extraneous Matter

Footwear sometime also picks up secondary evidences like dust, dirt, paint and other materials from the places through which the wearer passes. The study of these traces or secondary evidences proves useful in cases where the places visited have characteristic soil or dust. For example, the shoe will pick up flour in a flourmill, coal from a colliery, dye from a dye factory, and fibers from a cloth mill and so on. Even the soils from different places give significant variations when chemically analyzed in the forensic science laboratory.

9. Collection and Preservation of Track Marks

After carefully observing the track marks at most probable locations (mostly at the point of entry, crime scene and at the point of exit or away from the scene), it is most important to collect and preserve the track marks (Which include foot print, footwear marks and tyre marks). Depending upon the marks whether they are two or three-dimensional, proper technique is required to be adopted.

❖ Footprints on Floors

Footprints are often present at the inner location of the crime scene, especially on hard surfaces such as floors, glass, counter tops, desktops, and chair seats etc. A simple procedure to locate these indoor prints is by means of a high-intensity light at a low angle. Often these prints (two dimensions) are dust prints and very easily destroyed (Fig-2). Once detected, every care must be taken to preserve it.

❖ Footwear and Tyre marks

Although great emphasis has been given to the footprints, much of what follows concerning collecting and preservation, this type of evidence applies equally well to tyre marks evidence.



Fig- 3a

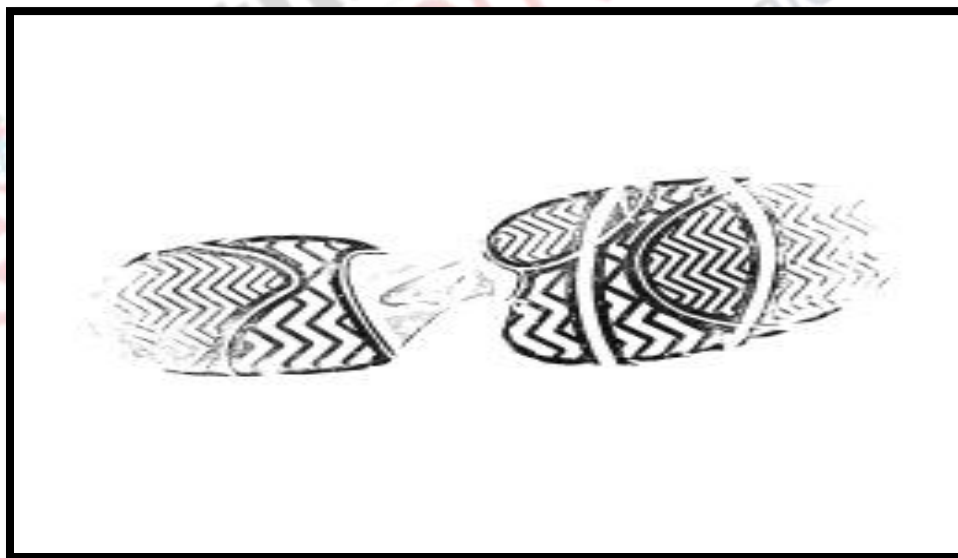


Fig- 3b

Fig- 3a & b: Showing Photographs of Foot Wear Marks with and Without Scale

Foot impressions (three dimensional) are generally found outside the crime scene i.e. at the point of entry or exit; the first precautionary measure is therefore to protect the impression from alteration or destruction, preferably by covering it with a box or cordoning off the whole area. Impressions in thawing snow are especially difficult, so a box covered with snow to prevent thawing should protect them. If a foot impression is in such a position that it is possible for it to gradually fill up or be damaged by running water, it must be surrounded by a wall of earth, sand, or snow; alternatively, a hole may be dug close to the impression and the water drained toward the hole. However, these protective measures are only stopgaps and the actual preservation should be undertaken as soon as possible.

10. Summary

1. Track marks are varied in nature; naked footprints, footwear marks, paw marks, tyre marks, dragline of a load; impression of a stick or pugmarks of a beast are also included in track evidence. Individual marks and their collective patterns are both useful in the identification of individuals.
2. The footprints are generally found almost at every crime scene as none can tread on the ground without leaving foot or footwear prints/impressions (collectively termed as marks).
3. Footwear marks include the marks of shoes, sandals and chappals. The footwear can be factory-made or handmade. It is made up of leather, rubber (natural or synthetic) or plastics. Cloth is used in canvas shoes. In some parts of India shoes are also made from strings alone. The persons especially in rural areas wear hand-made leather shoes.
4. The term pugmark refers to the footprints of almost all the animals. Every individual animal species has a distinct pugmark and it is used as a means for identification. Wildlife conservationists are often engaged in collecting different sort of data regarding the pugmarks in the areas specifically assigned to them.
5. Footwear sometime also picks up secondary evidences like dust, dirt, paint and other materials from the places through which the wearer passes. The study of these traces or secondary evidences proves useful in cases where the places visited have characteristic soil or dust.