Blood Drop Analysis

Topic

Interpretation of the patterns and shapes of blood drops

Introduction

Careful investigation of bloodstains found on articles that may have been lying on the ground at a crime scene and later moved (e.g., discarded clothes or newspapers) can tell much about a crime, including where the crime may have taken place. Use of extreme force (e.g., explosion or gunshot) produces a very fine spray of blood, but a less violent assault causes a more predictable pattern of bleeding. Scientists know that drops of blood falling from a wound have a volume of about 0.05 ml. Such drops make a bloodstain of predictable size when falling from a certain height. These drops also make a bloodstain of a predictable shape when falling on a surface at a particular angle. This information enables forensic scientists to determine the distance above the ground of the wound – if the victim was standing, sitting, or prone – and if the victim was on flat or sloping ground when he was bleeding. A trail of bloodstains of equal size shows that the victim was moving while bleeding – the further apart the bloodstains, the quicker he was moving. In this experiment, you will use diluted tomato ketchup to simulate blood. You will find the size of a stain made by "blood" falling from different heights onto a flat surface and then observe what happens when "blood" falls on a surface at an angle.

Time required

45 minutes

Materials

tape measure at least 1 meter long
tall support stand (120 cm high)
2 clamps
at least 5 sheets unlined paper (8½ × 11)
fake blood (50 g tomato ketchup mixed with 100 ml water in a beaker or glass)
funnel (15 cm long and 10 cm in diameter at the open end)
25 ml graduated cylinder
aluminum foil (approximately 20 × 20 cm)
straight pin
sheets of paper towel
plastic board (about 35 × 25 cm)
translucent tape
sheets of newspaper (to protect the floor)
pen
stopwatch or watch with second hand
modeling clay (optional)
laboratory apron

Safety note

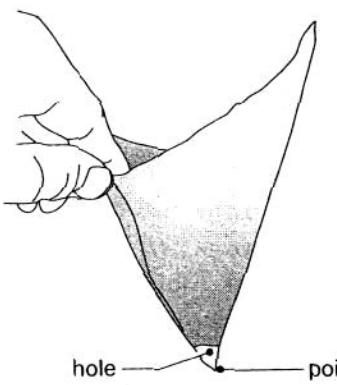
Please read the general safety precautions at the beginning of the book.

Procedure

You will need a partner for this experiment. One person (the "dripper") is responsible for the "blood" falling from the funnel. The other person (the "catcher") is responsible for moving the sheets of paper to catch the drops.

Part A: Drops of "blood" falling onto a flat surface from different heights

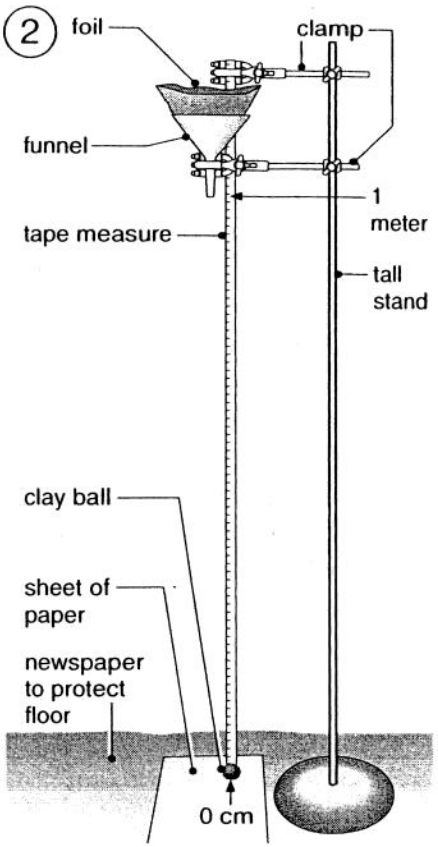
(1)



Hole in "funnel" of aluminum foil

1. Protect the floor with newspapers and put on your laboratory apron.
2. Fold the aluminum foil into quarters and then unfold one quarter to make a funnel shape. Use the pin to make a hole in the side of the foil about 2 cm from the point (see diagram 1 above).
3. Put the foil cone inside the funnel. (The hole in the foil is intended to allow the "blood" to seep out slowly and collect to form a drop at the end of the funnel.)
4. Place both clamps on the support stand as shown in diagram 2 on the next page (i.e., one clamp at the top of the stand and the other slightly below it).
5. Support the funnel in the lower clamp as shown in diagram 2 so that the end of the funnel is 1 meter above the floor.
6. Attach the tape measure to the upper clamp so that the "0 cm" end is just touching the floor. If necessary, attach a ball of modeling clay to the end of the tape measure to weight it down.
7. Label four pieces of paper: "1 meter," "50 cm," "20 cm," and "10 cm."
8. The "dripper" pours about 20 ml of the diluted tomato ketchup into the funnel until it starts to drip onto the newspaper.
9. When the drips are coming about 2 seconds apart, the "catcher" wipes the newspaper quickly with the paper towel and slides the piece of paper marked "1 meter" on the floor to collect a drop of "blood." The "catcher" moves the piece of paper to collect 4 – 5 more drops, making sure that each drop falls on a clean part of the sheet of paper. The "catcher" then moves the sheet of paper away and lays it flat.

10. The "dripper" moves the funnel so that its end is 50 cm above the floor.
11. If necessary, the "dripper" tops off the level of "blood" in the funnel before the "catcher" repeats step 9 using the sheet of paper labeled "50 cm."
12. The "dripper" moves the funnel to a point where its end is 20 cm above the floor. If necessary, the "dripper" tops off the level of "blood" in the funnel before the "catcher" repeats step 9 using the sheet of paper labeled "20 cm."
13. The "dripper" moves the funnel to a point where its end is 10 cm above the floor. If necessary, the "dripper" tops off the level of "blood" in the funnel before the "catcher" repeats step 9 using the sheet of paper labeled "10 cm."
14. Use the ruler to measure the diameter of the drops on each sheet of paper. Enter your results in data table A below and calculate the average diameter for each distance.



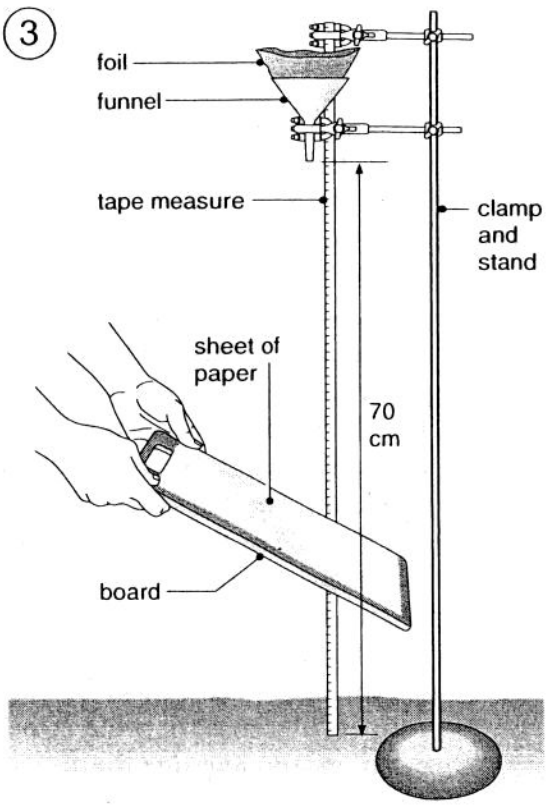
Experimental set-up for drops of "blood" falling on a flat surface

DATA TABLE A

	Height from which drop fell			
Diameter of "blood" drop (cm)	1 meter	50 cm	20 cm	10 cm
Drop 1				
Drop 2				
Drop 3				
Drop 4				
Drop 5				
Drop 6				
Average				

Part B: Drops of "blood" falling onto an angled surface

1. The "catcher" attaches a sheet of paper to the plastic board using translucent tape.
2. The "dripper" positions the bottom of the funnel about 70 cm above the floor and pours about 20 ml diluted tomato ketchup into the funnel until it starts to drip onto the newspaper.
3. The "catcher" holds the board about 30 – 35 cm from the floor and at an angle beneath the funnel to catch 4 – 5 drops of "blood" (see diagram 3 opposite).
4. Examine the drops of "blood" and record your observations in data table B below.



Experimental set-up for drops of "blood" falling on an angled surface

DATA TABLE B	
Description of drops of "blood" falling on the angled sheet of paper	

Analysis

1. What did you notice about the shape of the "bloodstains" that fell onto the floor?
2. What did you notice about the size of "bloodstains" when the "blood" fell from different heights onto the floor?
3. What shape were the "bloodstains" that fell on the angled board?
4. Why do you think the funnel arrangement was used to make the "blood" drops?

Want to know more?

See Section 10: Our Findings