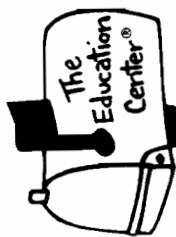


The MAILBOX



The Idea Magazine For Teachers™

INTERMEDIATE

GREGORY GRAMBO

LET YOUR FINGERS DO THE WALKING

Investigating Science Through
Fingerprinting Activities

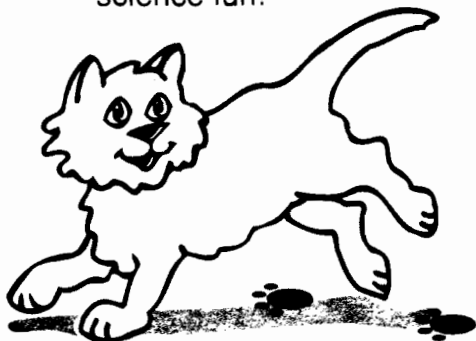
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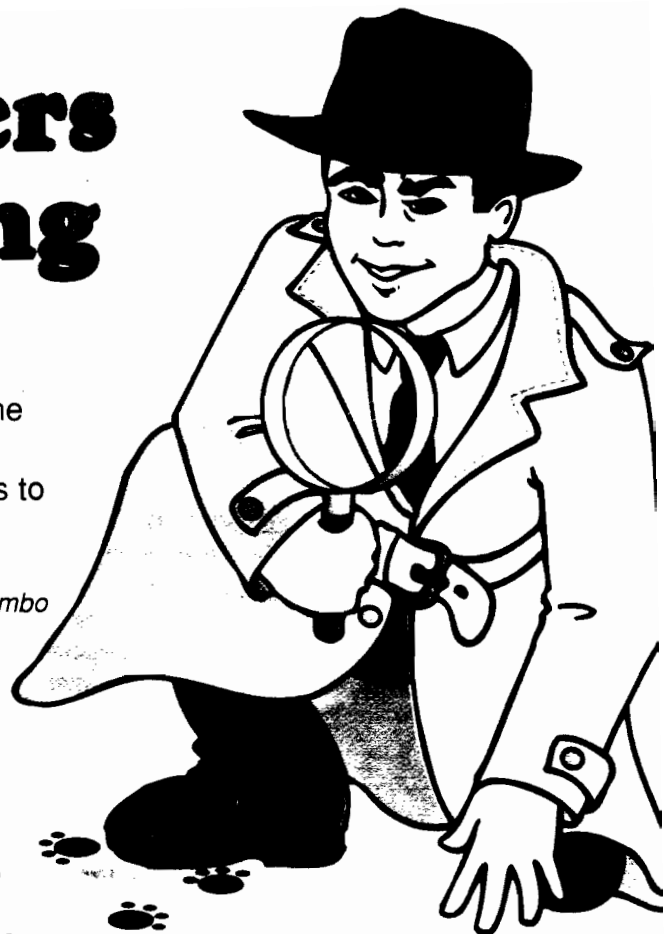
Let Your Fingers Do The Walking

Investigating Science Through Fingerprinting Activities

Looking for a fun way to introduce your students to the skills of scientific investigation? The answer is right at your fingertips! Use the following fingerprinting activities to point your students in the direction of some fingers-on science fun!



by Gregory Grambo



Background For The Teacher

What do emperors of ancient China and modern-day computers have in common? Both have used fingerprints as a means of identifying people. What makes fingerprints so reliable? No two people have the same set of fingerprints, not even identical twins! In the late 1800s, two British police officers developed an official system for classifying fingerprints. Since then people have used fingerprints to identify criminals, prevent unauthorized admission into restricted buildings, and identify victims of war and other tragedies.

No Two Alike

Hold up a penny and a dime. Ask students, "If a person cannot see, how can he tell the difference between a penny and a dime?" Students will point out that a dime has ridges around its edge and is slightly smaller than a penny. Next divide your class into groups of four. Give each group two pennies that have the same date. Instruct each group to examine its pennies. Then ask, "How can you tell the difference between these two pennies?" Students will point out that while the pennies have many similarities, they can be distinguished because they have different scratches or marks on them. No two pennies are exactly alike. Point out that the same is true of fingerprints. That's why they are such a reliable means of identification.

A Lasting Impression

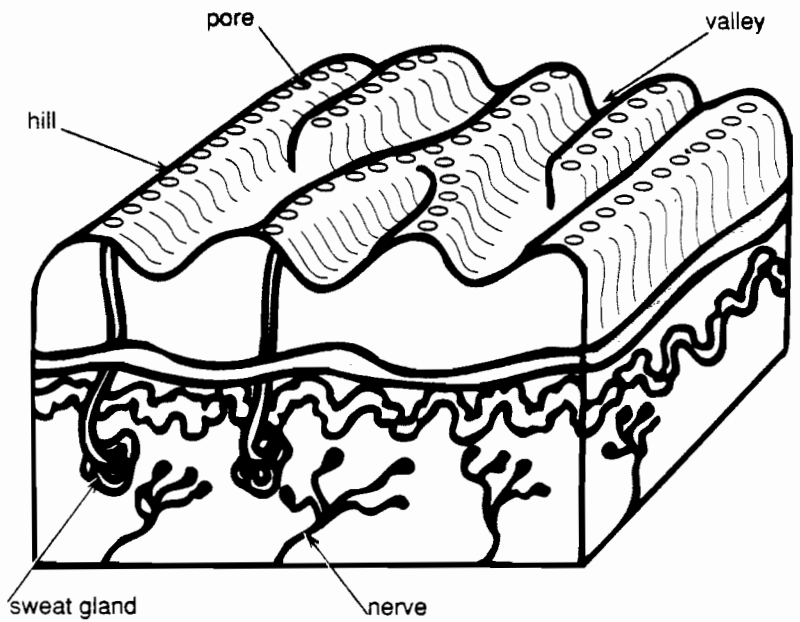
It only costs a few pennies to teach your students the fundamentals of fingerprint-making. Provide each group with a black stamp pad, a pad of paper, and a penny that has been glued—head side up—onto the end of a tongue depressor as shown. Have each member press the penny onto the pad and then onto the top sheet of paper. Ask students, "Does the print of the penny look just like the face of the penny?" Students will note that only the top edges of the penny left any impression on the paper. What conclusions can students draw from this experiment? (*In printmaking only the hills or ridges touch the paper and leave an inked impression.*)



Your Not-So-Secret Identity

Divide your class into groups of two or four. Provide each group with a stamp pad and white paper. Using the conclusions drawn from "A Lasting Impression" on page 28, have students predict what will happen if they press the tips of their index fingers into the ink and then onto the paper. Then have them explain *why* their fingers will leave prints. Students should predict that they will leave a lined print on the paper because the tips of their fingers have high spots (hills, ridges) and low spots (furrows, valleys) just like the penny (see the diagram). Allow students to experiment with making more fingerprints.

It's best to roll the finger from one side to the other while a partner presses gently on the finger. Demonstrate the technique (see the diagram on page 30). Then have each student work with a partner to practice making fingerprints with this method. Follow up by duplicating page 30 for each student to complete with a partner. Save page 30 to use again in "Is There A Pattern?" below.



Cross Section Of A Fingertip

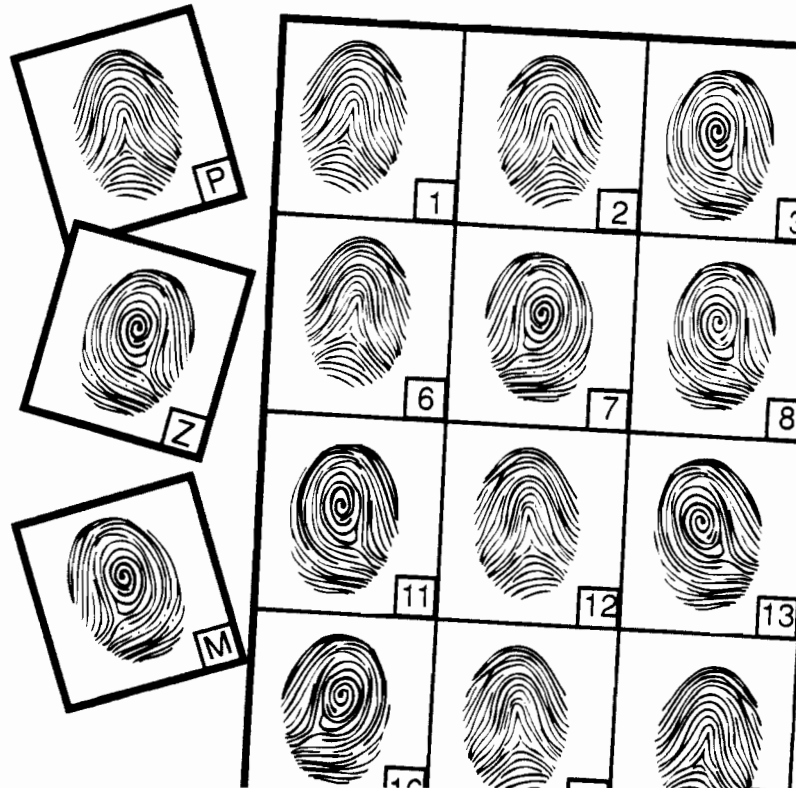
Is There A Pattern?

Do fingerprint patterns run in a family? Conduct the following investigation to find out. Duplicate page 32 for each student. Have each student use the page to collect a complete set of fingerprints from three members of her family. Instruct each student to label each print with the initials of the person. After everyone has collected their prints, have each student take out her copy of page 30. Instruct the student to cut out and glue the Common Fingerprint Patterns in a column on a 12" x 18" sheet of paper. Next have her cut apart the prints she collected from family members, arrange them in rows next to their matching patterns, and glue them in place to form a bar graph. Have the student use her graph to determine which (if any) patterns are most common in her family.

Do You Have A Clue?

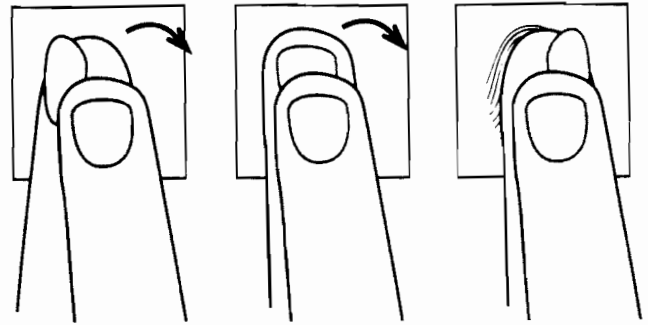
For this super sleuthing activity, duplicate five copies of page 31. Number four of the sheets identically 1 to 30; leave the last sheet unnumbered. Spread the five sheets on a table. In turn help each student make one thumbprint in the same box on each sheet, including the unnumbered one. When you have collected the thumbprint of each student, write the letters *A* through *Z* randomly in the boxes on the unnumbered sheet. (Add *AA*, *BB*, *CC*, and *DD* if you have more than 26 students.) Make a key matching each number to its corresponding letter. Cut apart the lettered sheet; then shuffle the thumbprints and divide them into four sets.

Group your class into four teams. Give each team a numbered sheet and one set of thumbprints. Challenge each group to correctly match each separate print with its partner on the numbered sheet. After a short time, have each group rotate its set of prints to the next group. Continue until each group has seen every set of prints. Read the correct answers and reward the group that correctly matches the most prints.



Who Are You?

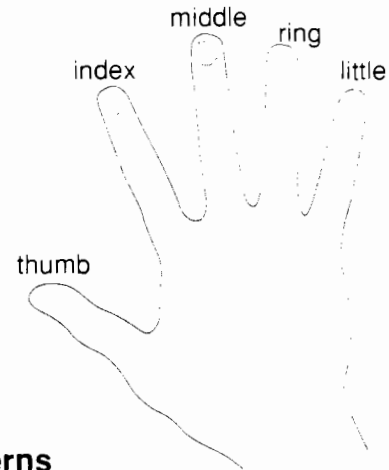
Have you ever had your fingerprints taken? Chances are, if you were born in a hospital, they took your fingerprints or footprints so that you would not be confused with the other infants. Grab an ink pad and follow the directions below to create a new set of fingerprints.



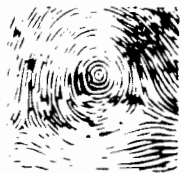
Roll your finger to the right.

Directions:

1. Work with a partner.
2. Place this paper so that the bottom edge meets the edge of your desk.
3. Roll your right thumb across an inked pad. Be sure to ink the sides of the thumb.
4. Lift your thumb from the pad; then have your partner help you roll your inked thumb inside the box labeled "Right Thumb" (see the illustration). Repeat this process with your index, middle, ring, and little fingers.
5. Wash your hands with soap and water.
6. Compare your five fingerprints with the eight common fingerprint patterns pictured below. Next to each pattern, record which of your fingers has a similar pattern. (You may not have all the patterns.)



Common Fingerprint Patterns



plain whorl



plain arch



radial loop



double loop whorl



accidental whorl



tented arch



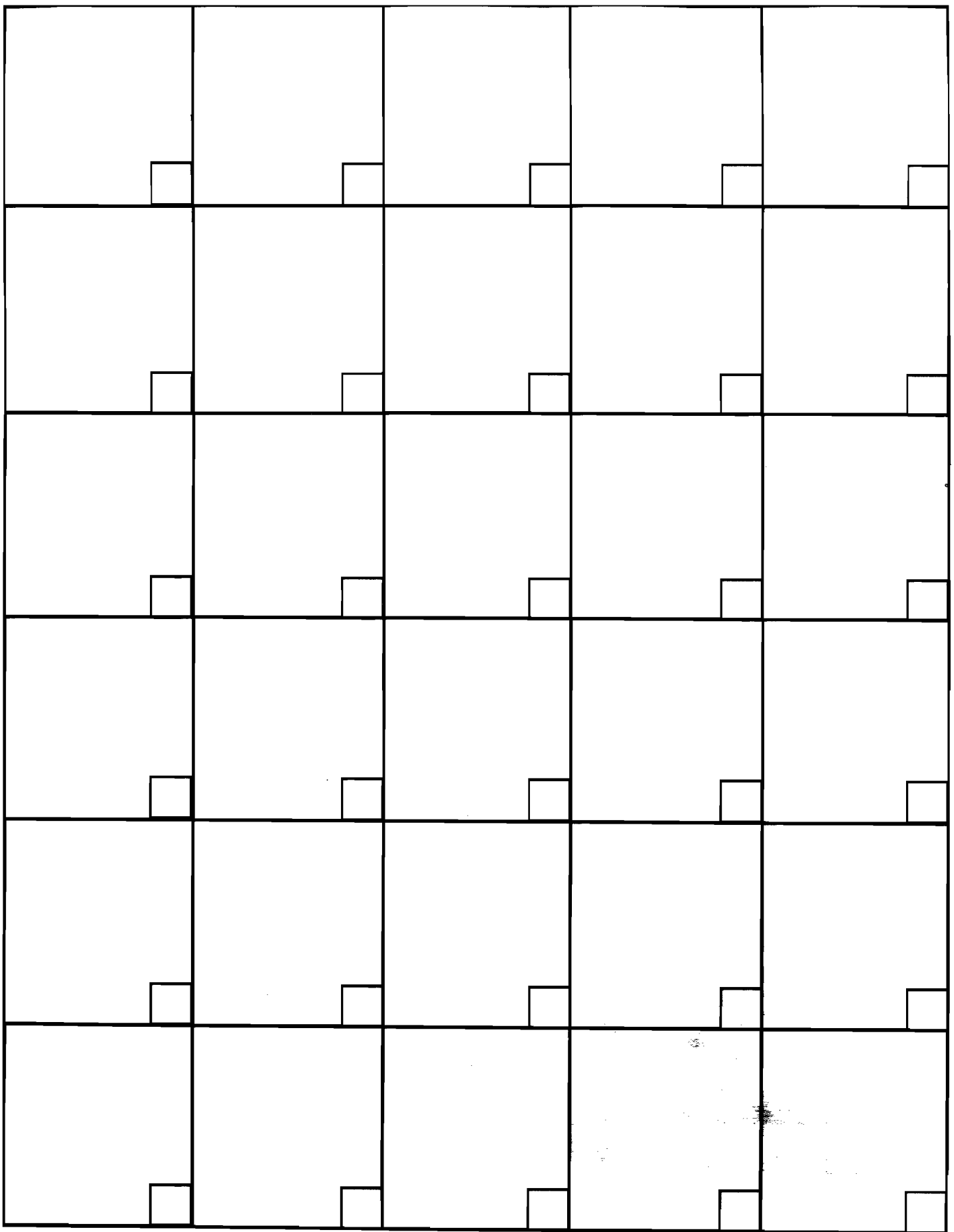
ulnar loop



central pocket loop

Bonus Box: On the back of this page, record the fingerprints of your left hand. Label each print. Compare each print to the Common Fingerprint Patterns. What patterns do you see in the prints of your two hands?

Right Thumb (RT)	Right Index (RI)	Right Middle (RM)	Right Ring (RR)	Right Little (RL)



Person #1					
	right thumb	right index	right middle	right ring	right little
Person #2	left thumb	left index	left middle	left ring	left little
	right thumb	right index	right middle	right ring	right little
Person #3	left thumb	left index	left middle	left ring	left little
	right thumb	right index	right middle	right ring	right little
Person #4	left thumb	left index	left middle	left ring	left little
	right thumb	right index	right middle	right ring	right little

The Scene Of The Crime!



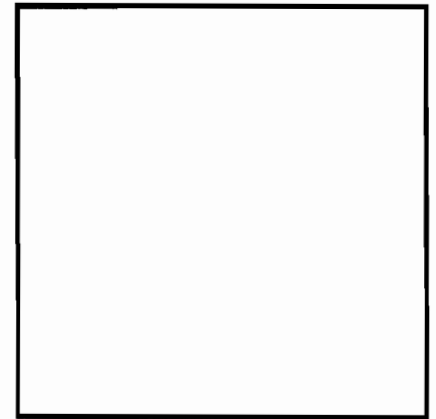
Private Eye Pete and his assistant, Kitty, are investigating the scene of a crime. Pete and Kitty have already determined that there were two intruders. One thief stuck his hand on a painted wall and left some *visible* fingerprints. But the other thief was more careful. He missed the paint, but left some *latent* (not visible) prints. Pete and Kitty know how to lift latent prints. Grab a partner and follow the directions below to discover their techniques.

Materials for each pair of students: a clean glass surface; vegetable oil; dark-colored powdered tempera paint; cornstarch; a soft, fluffy paintbrush; paper towels; one-inch-wide, clear transparent tape; a two-inch square of black paper

Lifting A Dark-Colored Fingerprint

Directions for the student:

1. Place a small amount of oil on a paper towel.
2. Rub your finger in the oil and remove the excess oil by blotting it gently.
3. Press your finger on the surface of the glass.
4. Dip the brush into the tempera paint and tap it lightly to sprinkle the printed area with powder.
5. With the very tip of the brush, gently sweep away the extra powder. Be careful—if you brush too hard, you'll remove the print, too.
6. Carefully place a strip of tape over the print. Peel up the tape slowly.
7. Place the captured print on Box A.

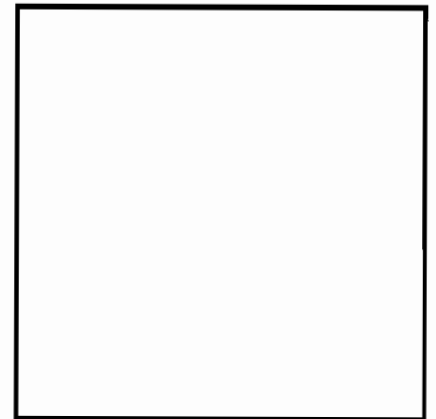


Box A

Lifting A Light-Colored Fingerprint

Directions for the student:

1. Glue the black paper square on top of Box B.
2. Follow Steps 1–6 above to create and lift a print. This time, however, substitute cornstarch for the powdered tempera paint.
3. Place the captured print on Box B.



Box B

Bonus Box: Make a *visible* print by gently rubbing the pointed end of your pencil over the tip of your finger. Place a piece of transparent tape over your fingertip. Carefully lift the tape off your finger and place it on the space under Box B. How clear is this print compared with the prints you lifted above? What other substances around school could be used to create a visible print?