

Using Money to Learn Forensics

by Philip Brewer

It used to be that spotting a “good” counterfeit bill was impossible for ordinary people. If it was good enough to pass the “look and feel” test, an ultraviolet light or a magnetic ink detector would be needed to detect fraud. But for the past 10 years, the U.S. Bureau of Engraving and Printing has been making bills that are easy to check for authenticity.

The amount of counterfeit money in the United States is low enough that most people feel safe taking money with barely a minimal check for counterfeits. Does it look and feel like money? Then it probably is. But have you ever gotten a bill and thought something -- either the bank note or the person giving it to you -- seemed a little off? Ever wished you could quickly check to see if it's good?

Well, here's how:

Look and feel. This is as far as most people go, and it's good enough most of the time. U.S. bank notes are printed on special paper that's 75% cotton and 25% linen. The linen gives it an extra stiffness. Also, red and blue fibers are imbedded in the paper. Bank notes are printed in a process called “intaglio” that leaves ink on top of the paper, giving the money a distinctive texture. The printing is also of very high quality, so the lines are sharp and clear, not broken, fuzzy or blobby.

Color-shifting ink. On bank notes bigger than \$5, color-shifting ink is used to print the denomination in the lower right-hand corner. Look at the number head-on and then from an angle. On genuine notes, the color will shift from copper to green or green to black.

You can get this far pretty discreetly. You're automatically checking for the look and feel as soon as the

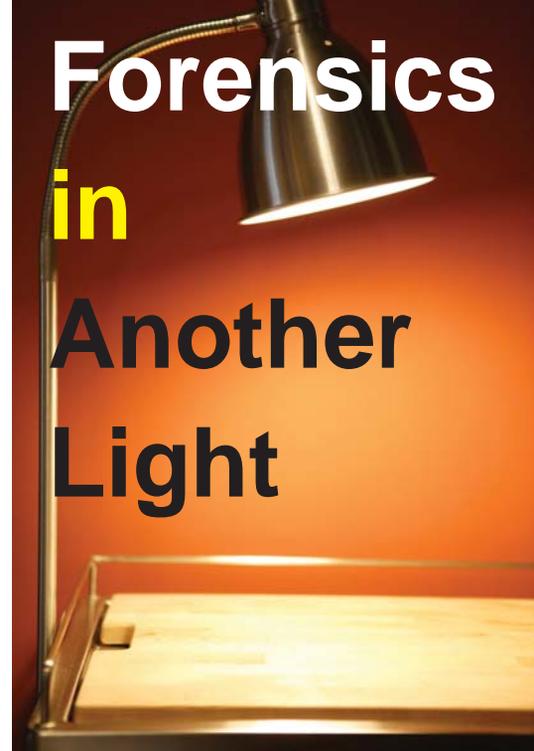
bill is handed to you, and you can confirm the color-shifting ink with a quick glance. Going further will require that you hold the note up to the light -- which is basically saying that you think you might have gotten counterfeit money.

A lot of people hesitate to do that, but it's the next step if you want to be sure.

Watermark. All bills bigger than \$2 now have a watermark. Just hold the bill up to the light to see it. For the \$10, \$20, \$50 and \$100 bills, the image matches the portrait. That's also true of the current \$5 bill, but on the new \$5 coming out in early 2008, the watermark will be a big numeral 5. Either way, you can use it to spot bills that have been bleached and reprinted with a higher denomination. The watermark is part of the paper and is visible from the back of the note as well.

Security thread. All bills bigger than \$2 have a security thread running vertically through them. As with the watermark, you hold the bill up to the light to see it. The thread has text with the bill's denomination and an image that is unique to that denomination. Each denomination's is in a different place, so you can spot bills that have been bleached and reprinted with a higher denomination. (The

Forensics in Another Light



threads also glow different colors under ultraviolet light, but that's not much help to ordinary folks.)

Genuine bills

That's it. A bill is almost certainly genuine if it:

- looks and feels like a U.S. bank note
- has color-shifting ink in the lower right-hand corner
- has a watermark that matches the portrait
- has a security thread with text that matches the denomination.

What about older bills?

These security features gradually were added starting in 1996, but older bills are still around. Now that it has been more than 10 years, it's time to simply refuse to accept them. Old bills still in circulation -- especially high-denomination bills -- are much more likely to be counterfeit. The innocent holder of an old bill can easily take it to the bank and get new currency, so your refusal to take it is no burden. (Also, your homeowners insurance may cover you if you accept bad bills. Really. Read more in "Insurance you didn't know you had.")

More info

If you're interested in this sort of thing, here are some other pages worth checking out:

- The U.S. Secret Service covers spotting counterfeit money the old-fashioned way, without using the security features of modern bills.
- The How Stuff Works article "How counterfeiting works" walks you through making your own counterfeit with a scanner and a color printer. It explains why it's harder than it looks and how most counterfeiters are caught and sent to prison for a long time.

Currency design in the United States and abroad: counterfeit deterrence and visual accessibility," from the St. Louis Federal Reserve, describes how different countries have tried to optimize the trade-offs between fighting counterfeiting, making their money accessible to people with limited vision, and making the money easy for banks and other high-volume users of currency to handle.

More information and lesson plans can be found at <http://www.moneyfactory.gov>.

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Solution to the Mini-Mystery

"It's the old Sherlock Holmes maxim," Stanwick went on. "'If you have eliminated the impossible, then whatever remains, however improbable, must be the truth.' Or at least include the truth. If the poison was not administered by food or drink or inhalation (since no one else was affected), then it must have been administered by touch. Specifically, through Dunhope's skin pores."

"But what could he have touched right around midnight that no one else touched?" Walker frowned.

"Just one thing," said Stanwick. "You'll remember that cocktail napkins were served with the hors d'oeuvres. Miss Schultze was still holding hers just now. Dunhope, and no one else, touched the inside of his cocktail napkin at the critical time. And he touched nothing else that could have been poisoned. Therefore the inside of his napkin was doctored."

"The critical event," he continued, "was Dunhope being bumped and spilling his champagne. He didn't carry a handkerchief -- you found none in his pockets -- so he must have opened his napkin to clean himself and so touched the poison."

"Henson!" exclaimed Walker.

Stanwick nodded. "Henson helped serve the hors d'oeuvres (and the napkins) and then bumped into Dunhope, causing him to open his napkin to clean up the spilled champagne. Since Dunhope's pockets didn't contain the napkin, Henson probably disposed of that somewhere in the house during the confusion. And as an ambitious junior partner, he might have an interest in the death of his senior. He's your killer."

"So happy hunting, Matt! And yes... Happy New Year!"

For your classroom:

A fascinating exercise is to take a \$1, 5, 10, & 20 bill and enlarge both sides on a photocopier until they're each nearly eight inches long. Give them to groups of students and ask them to examine the bills under a dissecting scope or with magnifying glasses and write down six to ten things they never noticed before in the details on the bills. Most people never take the time to really look closely at their money. Your students will be amazed at the level of detail.

After they're done, tell the class that one of the bills **might** be counterfeit and ask them to examine them again and see if they can spot a fake. Ask them to document their findings, present them to the class, and defend their conclusions. When you reveal all of the bills to be genuine you're still going to have students who don't believe you. A trip to a computer lab will reveal our currency's history, safeguards, manufacturing, and trivia. This lesson will interest students not only because of the incredible world residing in their wallets and purses, but also because it represents something they care about deeply: money.

Modern Marvels, a popular program on The History Channel, has an episode called Money that reveals how bills and coins are made. Their website also has the episode for sale.