



HIDING THE TRUTH:

THE ARTFUL SCIENCE OF FOILING FAKES

2012

FORGERIES
OF ALL
KINDS HAVE
EXISTED FOR
THOUSANDS
OF YEARS.

Cover image:

Anonymous, *Medallion with Bust of St. Nicholas*,
Museum of Fine Arts, Boston,
Maria Antoinette Evans Fund

Whatever is valued in a culture and is beyond the reach of most people has always been fair game for those with duplicitous motives and the expertise to produce forgeries at profitable cost. Greek coins were forged by the Romans, Greek statues were forged by Italian Renaissance sculptors, so-called saints' relics were carted across Europe, and supposedly lost manuscripts of famous authors mysteriously resurfaced from time to time. The same has been true in more recent times. Replicas of Herman Miller's popular Eames chair have frequently been made over the past century, and in today's China, even fake eggs, complete with yellow yolks, are manufactured and sold as real.ⁱ The kind of forgery an individual encounters today is much more likely to be what is euphemistically called a knockoff—a "Kate Spade" bag or a pair of "Nike" sneakers sold on a New York City street corner for \$20, or a fake Rolex watch or Mont Blanc pen sold on eBay—than a counterfeit \$100 bill or a forged *Mona Lisa*. This exhibit takes a look at some objects that have been forged, including currency. It also provides an overview of the ever-developing technology that improves the odds that these fakes will be uncovered in a continuous game of leapfrog between criminals and authorities.

... is the misrepresentation of the authenticity of an object coupled with the intent to exchange that object for real cash.

In the art world, this can mean the loss of millions of dollars for an individual or an institution. In addition, when a person or institution purchases an object that turns out to be a fake, it is humiliating, and the reputations of people who are considered experts in their field can be irreparably damaged. In the case of currency, it is the last person holding the counterfeit bill who loses. When the counterfeit is discovered, the holder of the bill must surrender it to the Secret Service and absorb the loss. Being duped by a fake bill isn't usually as embarrassing as being fooled by a work of art, since no one expects the holder of the bill to be an expert, and the dollar loss to the individual is generally much lower. In the United States, most counterfeits passed are \$20 bills, while overseas, the most common is the \$100 bill.

The motives and the target audience are different for currency and art forgeries. In the case of currency, the counterfeiter's intent is unquestionably to obtain goods and services by passing fake money. Today, there are two principal kinds of currency counterfeiters. One is the print-as-you-go counterfeiter, who takes advantage of the increasingly cheap and readily available computer and printing technologies. According to the Secret Service, this generally younger and techno-savvy criminal typically prints limited numbers of bills from a home-computer system to pass at local stores.ⁱⁱ The other kind of counterfeiter is governments such as North Korea or wealthy organized crime groups such as those in Colombia and Peru that have the enormous resources behind them to manufacture nearly perfect bills using offset printers and very good paper and inks.

ART

The motives behind the forgery of works of art are murkier and much more complex than those behind the counterfeiting of currency. Sometimes, as with currency, the aim is to deceive. The fake Matisse drawing *The Lady with Flowers and Pomegranates*, on a wall in our gallery, fooled curators at Harvard University's Fogg Art Museum in 1955. It was actually the work of Hungarian Elmyr de Hory, who was one of the twentieth century's greatest art forgers. The sole intent of de Hory and other notorious modern forgers, including British painter Eric Hebborn, was to pass their work off as that of old and modern masters. Like other expert forgers, de Hory developed styles that closely mimicked particular artists, and he often even created paperwork such as a fake provenance (a history of the work of art's ownership) to support the supposed authenticity of the work.

However, not every copy of a work of art is a fake. Many copies, imitations, and replicas are produced out of admiration for another artist's work, with no intention to deceive. In addition, copying works of art has been part of an artist's training since the teaching of art

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began. In European art schools from the Renaissance on, students were instructed to copy an artist's works in order to become familiar with his composition, technique, brushstrokes, pigments, and palette (choice of colors). A sixteenth-century art historian reported that the Italian

Renaissance artist Michelangelo could reproduce other artists' drawings so accurately that he sometimes kept the original and

replaced it with his copy.ⁱⁱⁱ The motive behind the copying in the art schools was to look closely at the style of a particular artist, not to create a piece to sell. In fact, even today most museums around the world allow artists and students to make copies as long as the dimensions of the canvas or panel are different from the original's.

Before photography became widely available, it was common for wealthy people to commission copies of famous paintings. Even fragments of paintings were copied, such as the Raphael angels at the base of the *Sistine Madonna*, which was very popular in the late nineteenth century and is still popular today. Copies such as these were not expected to fool anyone. The motivation for commissioning them was not unlike what motivates people to purchase brand knockoffs today—the buyer ends up with something that has the flavor of taste and wealth even if it is not the real thing.

It can be difficult to determine whether a work of art is a fake or original. One source of the confusion has to do with the restoration of the work. The work in question may have deteriorated due to mishandling or through adverse climatic conditions, and it may have been repaired. The work of art may have started as an original, but when experts are trying to determine if it can still be considered an original, they need to consider the extent of the repairs and the amount that has been changed by the restorer. Then there are examples of paintings that were “prettied up” by a restorer for an upcoming auction sale—much like we might Photoshop out imperfections in images today. The motive here was not to defraud



Raphael, *Sistine Madonna* angels

but instead to make a painting cosmetically more attractive to potential buyers so that it would fetch a higher price. In some cases, additions to a painting were made by the restorer and not by the original artist, but it was sold as the original artist's work.

In the past, many forgers were able to get away with their forgeries in their own lifetime only to have them discovered later. This is often because forgers and restorers unconsciously stamp the biases and aesthetics of their own times onto a work of art, and since viewers see the work of art through the lens of those same cultural biases, they are often fooled. Curators have stated that it takes at least one generation to be able to see clearly the incongruities in a forged work of art and the nuances of the previous generation's style.^{iv}

Curators and conservators focus on different things when they look at a work of art. Curators view it through the study of art history, while conservators are scientists. A curator might log thousands of hours examining the works of a particular artist or school or genre,

read about the history of the times, appreciate the composition, content, and feel of the work, and look for anomalies, such as incorrect brushstrokes, or anachronistic dress or hairstyles, or a symbol that does not fit with the supposed time or place of the painting.

The scientist conservator is more concerned with anomalies found in the physical construction of the work. He or she looks for discrepancies in the materials used, whether it be the wrong pigments for the time period, the wrong type of linen canvas, the wrong binding agent, the wrong wood, or a type of marble that comes from the wrong part of the world.

Throughout the past century, and especially over the past sixty years, there has been an increase in the availability of scientific tools for authentication and preservation of works of art. With the discovery that light exists beyond the visible spectrum, the science of detecting art forgeries took a leap forward. Many of the apparatuses that employ ultraviolet (UV) radiation were originally used in medical or other fields, and they were later adopted by museums and their labs. The advances in detection through the use of X-ray technology include revealing the underlying layers of a painting, such as the artist's preliminary sketch on the canvas, identifying pigments and other materials used, and showing up cracks or weaknesses in sculpture. More recently, further gains were made as computers became ubiquitous and cheap, thereby allowing the analysis of a wide variety of data quickly. Images can now be enlarged easily and compared with others by the same artist.

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Carlo Crivelli, *Madonna and Child*, San Diego Museum of Art.
Multispectral scans courtesy of Calit2, UC San Diego and the San Diego Museum of Art.

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The detection of art forgeries has sometimes been stalled, either by individuals or by public institutions, in order to avoid the embarrassment of having been duped or to avert financial losses arising from the discovery that a previously valued work of art is worthless. If a museum purchased a work that turns out to be fake, not only is that money lost but the curatorial staff looks foolish and the reputations of the scholars who authenticated the work can be on the line.

The trend of shoving forgeries into basement storage has lessened since the mid-twentieth century. A case in point is the aforementioned drawing purchased by the Fogg Art Museum that was supposedly the work of the French artist Henri Matisse but was in fact by Elmyr de Hory. Not long after purchasing the drawing, the curators at the Fogg began to have doubts about its authenticity. Comparing it to photographs of other drawings that were supposedly by Matisse and were sold through the same dealer from whom they had purchased this drawing, as well as to drawings that were known to be by Matisse, they determined that *The Lady with Flowers and Pomegranates* was a fake. The Fogg Museum came clean publicly

about their purchase and in so doing helped make common the use of fakes as teaching tools within museums and scholarly institutions.

Despite the huge advances in the use of technology, science has not replaced the role of connoisseurship in the process of identifying works of art that are fake. All of the materials and techniques, including the canvas, the frame, and the brushstrokes, might be scientifically correct for the period of a given painter, and the work might still be



Rembrandt, *Young Man in a Black Beret*.
Courtesy of Nelson-Atkins Museum of Art.

fake. That is why further work on the history of a painting coupled with the opinion of an expert who has studied in detail numerous other works by a particular painter are crucial when it comes to determining whether a work of art is an original or a fake.

CURRENCY

Unlike in the art world, where we have seen that there can be many reasons for trying to duplicate a work of art, a counterfeit bill is created for one reason only: to deceive others for the purpose of making money. As early as the eighteenth century, counterfeiting was a problem in the United States, and anti-counterfeiting measures were put into place. In 1739, Benjamin Franklin devised a series of banknotes that included realistic images of leaves with complex detail and lines of various thicknesses in an attempt to deter forgers.^v

Counterfeiting paper currency was big business in the United States before 1861, when Congress finally authorized the creation of a national standardized paper currency. It is estimated that during the Civil War, one-third to one-half of the currency in circulation was counterfeit. More than fifteen hundred state banks were designing and printing their own bills, and there were up to seven thousand varieties of bills.^{vi} This allowed counterfeiters freedom in distributing the fake money. Without a uniform currency, individuals and banks found it difficult to be familiar with all of the legitimate notes in circulation, let alone distinguish between those that were genuine and those that were forged.

On display is a brochure called *United States Treasury Counterfeit Detector and Bankers' & Merchants' Journal*, published by Dickerman & Holler, which came out monthly during the late nineteenth century and early twentieth century. Its purpose was to alert banks, shopkeepers, and individuals to newly discovered currency forgeries that

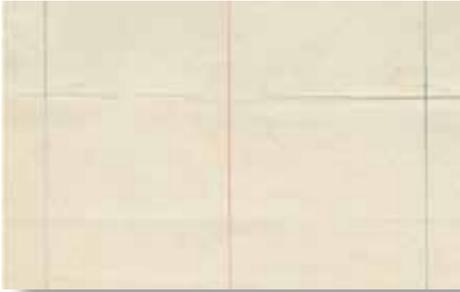
were in circulation. To deter criminal activities, this brochure also published the names and prison sentences of recently captured forgers.

Soon after Congress authorized the standardized paper currency, the Treasury Department began producing notes in denominations of \$5, \$10, and \$20. These notes were called Demand Notes because they carried the promise to pay on demand, unlike the interest-bearing Treasury Notes that were in existence at the time. The government placed the Demand Notes in general circulation by using them to pay the expenses that it was incurring during the Civil War. Unlike the State banknotes and Confederate bills, which were blank on the reverse, the Demand Notes were green on the back, which gave them the nickname “greenbacks.” The Federal government adopted this standard national currency as a way to resolve the counterfeiting problem, but it didn’t take long until the new money was being counterfeited, too. As a result, in 1865 the government founded the United States Secret Service specifically to put an end to the widespread counterfeiting across state lines.

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In 1879, the paper company Crane & Company won the bid to be the sole supplier of the paper used to print the Demand Notes. As an anti-counterfeiting device, they began embedding threads in their paper; these threads were manufactured as part of the paper itself, and they could not be convincingly drawn by pen. Some

banks chose to order the threaded paper and some did not. Crane & Company used this same technique in the paper that it sold for printing government bonds, as the large image in our exhibit shows.



Crane & Company embedded security threads in their 1881 paper.

Congress enacted the Federal Reserve Act in 1913, which created the Federal Reserve System, our country's central banking system.

The next year, the Federal Reserve began distributing paper currency to the twelve Federal Reserve Banks. This money was printed exclusively by the Bureau of Engraving and Printing. These bills were called Federal Reserve Notes, and this currency replaced the earlier Demand Notes. Few changes were made to the appearance of the bill in the first half of the twentieth century, and almost all the changes were for cosmetic rather than security reasons. For example, the size of the bill was reduced for easier handling, and the designs were standardized, with a portrait on the front and a monument or building on the reverse.

The production of counterfeit currency used to be very costly, and for that reason it was almost exclusively the domain of the professional criminal. It required the use of photographic plates, stencils, and expensive offset printing presses, the skills of accomplished engravers to create the plates, and printers adept in using multiple inks. These high upfront costs meant that large quantities of counterfeit bills had to be created in order to make the enterprise cost-effective. It was also necessary to find a way to place large quantities of

counterfeits in circulation. This was typically achieved by using money launderers and their distribution systems.

With advances in modern copying, printing, and scanning, it has become much easier and cheaper to counterfeit currency. In response, the government has developed new techniques to thwart the counterfeiters who use the new technology to create their counterfeit money.

In 1996, our currency underwent its first major redesign with the \$100 Federal Reserve Note, followed soon thereafter by the \$50, the \$20, and the \$10 bill. This time, the changes in the bill were for security reasons. Anti-counterfeiting features included a watermark on the front and back, embedded security threads, increased microprinting, and color-shifting inks.



Courtesy of Crane & Company

A watermark is a good security feature because, though visible when held up to light, it does not copy on scanners. Security threads, which, as mentioned above, had been in place since the late nineteenth century, were improved in the new currency. For each denomination, the thread now glows a specific color under ultraviolet light. This makes it very difficult to copy with a color copier, which uses reflected light to produce an image. To the naked eye, the microprinting on the bills—very small type that is crisp and sharp—appears as just a thin line, but under a magnifying glass the letters can be made out. Most copiers do not have high enough resolution to duplicate the tiny letters. The color-shifting inks that are used in the



Seizure of a group manufacturing counterfeit money.
Courtesy of the U.S. Secret Service.

number in the lower right-hand corner of the bill change color when the bill is held at different angles. It is impossible for someone to duplicate these inks in a home office.

This high-tech kind of counterfeiting accounts for a small percentage of the forged currency in circulation in the United States. Most of the high-volume counterfeit currency is produced abroad. Colombia has been the primary source of counterfeit U.S. currency flowing into the United States for more than two decades. The criminal groups that manufacture the currency are often the same groups that are involved in drug trafficking to the United States. North Korea is also a major source of the production of counterfeit notes. The Secret Service has determined that their “Supernotes” are produced and distributed with the full consent and control of the North Korean government.^{vii}

Despite the efforts of counterfeiters at home and abroad, as security measures have been put into place, the amount of counterfeit currency in circulation in the United States has dropped (though the recent recession has resulted in an uptick, according to the Secret Service statistics shown in Graph 1). The counterfeit currency that is passed and seized domestically actually represents a tiny percentage of the U.S. currency in circulation—only \$88 million out of \$942 billion, or .009 percent.^{viii}

Before thinking that you might like to try making currency on your home computer, consider the consequences of counterfeiting currency. Even a first-time offender faces a visit from the Secret Service, the seizure of all computer equipment and vehicles used in transporting counterfeits, court time, and a possible jail sentence.

Just as copying a work of art is not a crime as long as the intention is not to pass it off as an original, it is not illegal to reproduce the image of money if it is done within certain guidelines and if there is no intention to defraud. U.S. currency can be reproduced (even double-sided) at a size that is 75 percent smaller or 150 percent larger than genuine notes as long as it is done in black and white. When passing counterfeit money, it is the intention to defraud that matters. If you knowingly use a bill that is counterfeit, you are criminally liable even if you did not yourself make it.

Why does it matter if the money we use is counterfeit? In a nutshell, counterfeit currency reduces the value of real money, and that ends up costing everyone more for what they buy. Counterfeit currency could potentially cause inflation (an increase in prices) because it creates an artificial increase in the money supply that is in circulation. It also causes those who are owed money to reject paper money in favor of other forms of currency, such as wire transfers. In addition, since companies are not reimbursed for counterfeit bills they have accepted, in order to cover their losses, they increase the prices that the rest of us must pay.

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DETECTION

HOW TO DETECT COUNTERFEIT MONEY

- 1 Nearly all the world's currency features a portrait. The portrait on a U.S. banknote provides one of the best and easiest ways to detect counterfeit money. A genuine portrait appears lifelike and stands out against its background. A counterfeit portrait is usually flat and lifeless, with details merging into the background, which is often dark or mottled. Take a look at the examples on the facing page. As we see from the P-note (short for "printer note") on the top left, even a very good copy can be identified on this basis. On the newly redesigned currency, the portraits have been made much larger so that more detail can be incorporated, making it more difficult to counterfeit.
- 2 The Colombian note in the left column below the portrait is one of the best counterfeits made. It is an example of a "raised note," one of the common low-tech methods of counterfeiting currency. A bleached \$1 bill has been overlaid with \$100 printing. This is done because the paper that is used in our currency is very specific, and the feel of the paper is very hard to duplicate. Bleaching lower-denomination bills and then printing higher denominations onto the bleached bills gets around the problem of "feel." The offset printing is so good on this bill that even visual detection is difficult. One subtle difference: On genuine money, the Treasury seal and denomination of the bill are vividly distinct from one another, the result of two separate printing processes. The particular shade of green used for money is also hard to reproduce exactly. If in doubt, compare a suspect note to a genuine one, and look for differences, not similarities.



3 The fine lines in the border of a genuine U.S. bill are clear and unbroken. On a counterfeit, the lines in the outer margin and scrollwork may be blurred or indistinct. The detail in the office-machine (photocopied) counterfeit in the left column is poor, and, under magnification, one can even see the tiny colored dots made by the toner. Despite its poor quality, this bill actually made its way into circulation and was accepted by a commercial bank before it was caught at the Federal Reserve.

4 Genuine currency paper has tiny red and blue threads embedded throughout it. Often counterfeiters try to simulate these threads by printing red and blue lines on their paper, but close inspection reveals that they are only on the surface. On this counterfeit (shown in the left column, above), no concern was given for such subtleties.

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