



Not So Super Notes

How Well Does US Dollar Note Security Prevent Counterfeiting?

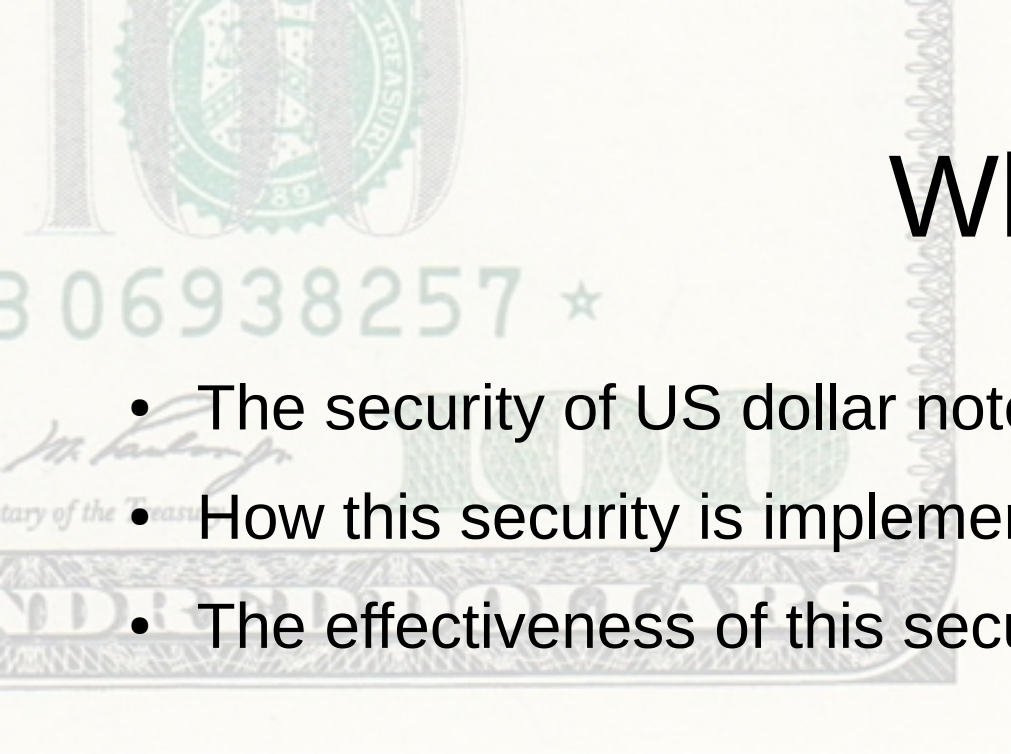


Who?

- Member of Technical Staff for VMware
- Bachelors and Masters degree in Computer Science
- Software engineer for almost 10 years
- Love thinking about the limits of systems
- Amateur lock-picker
- Amateur beer brewer

What?

- The security of US dollar notes
- How this security is implemented
- The effectiveness of this security



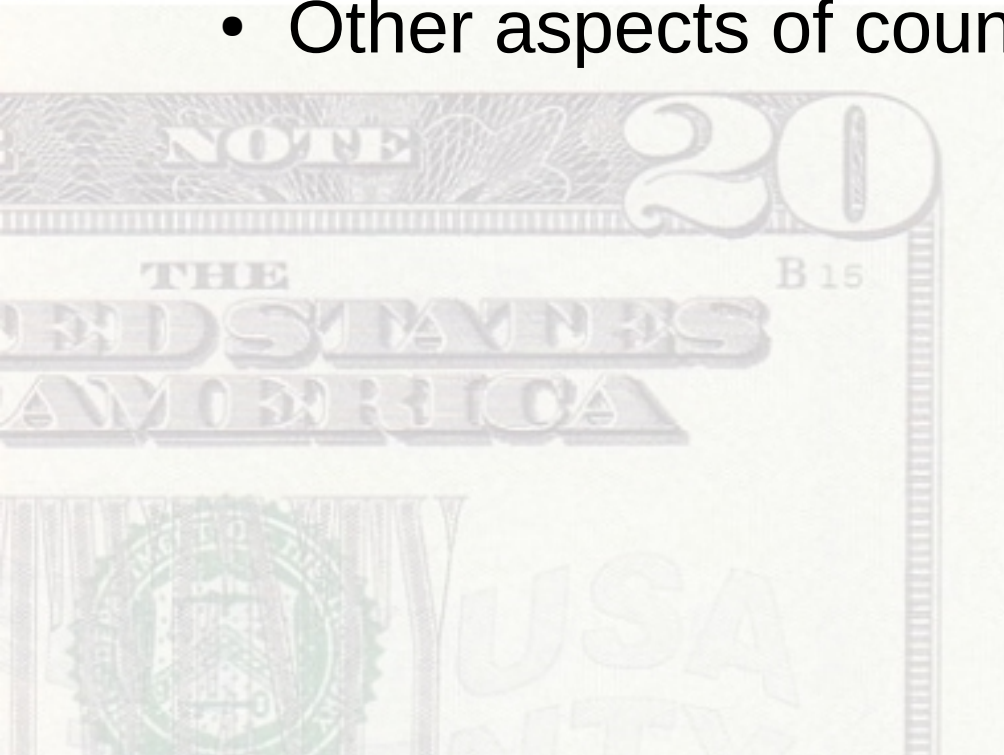
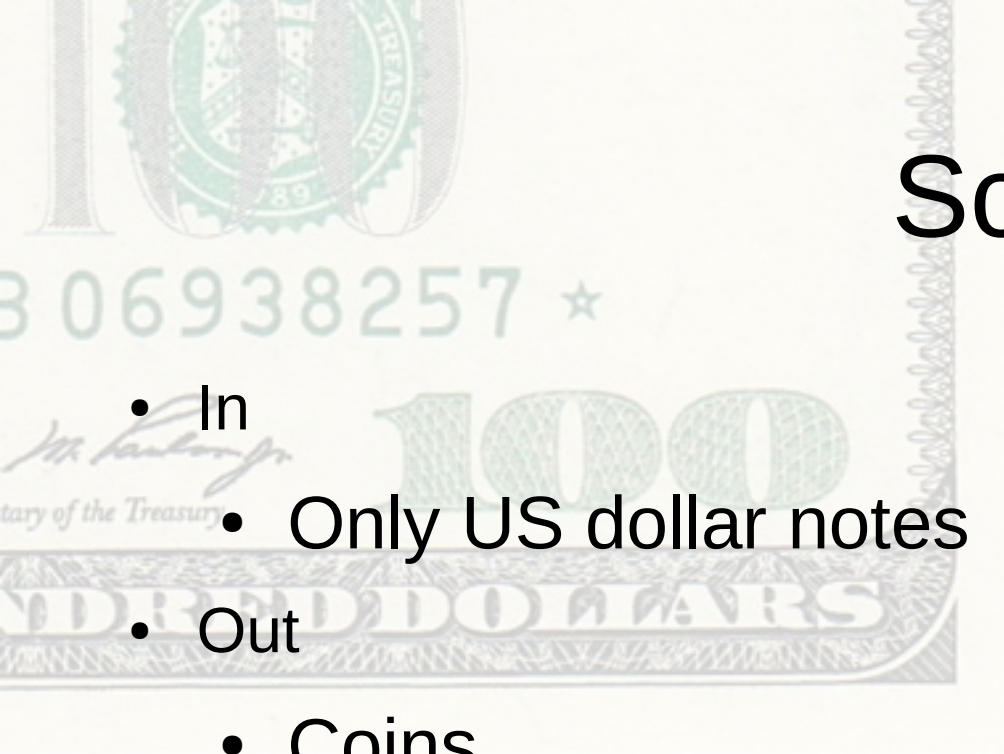
Why?

- US dollar notes widely used
- The value of US dollar notes is dependent on its security (among other things)
- Counterfeiting can reduce the value of the dollar and potentially destabilize economies



Scope

- In
- Only US dollar notes
- Out
 - Coins
 - Other aspects of counterfeiting



Warning/Disclaimer

- Counterfeiting is a very serious crime, do not attempt under any circumstances
- Making counterfeit dollars is bad, passing it is worse
- It is on the short list of crimes defined directly in the US Constitution, along with piracy and treason

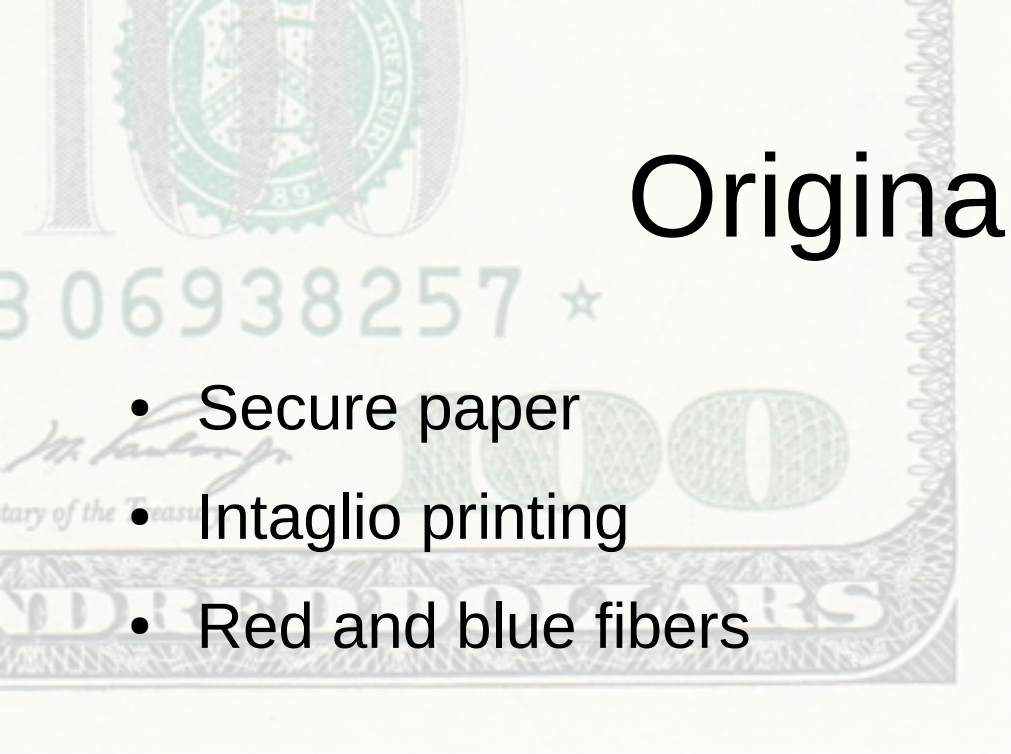
US Dollar History

- Prior to 1996, US dollar design had been mostly unchanged since 1928
- The threat from advances in cheap color scanning and printing equipment prompted redesign efforts in 1993
- Design security was revisited in 2006, 2007
- Contributions to anti-counterfeit research were made by experts from institutions including:

The National Academies, National Research Council, National Materials Advisory Board, IBM Research, Drexel University, New York University, Sandia National Laboratory, Rockefeller University, Innovative Technology Associates, University of Colorado Boulder, Apple Computer, University of Rochester, AT&T Bell Laboratories, University of Arizona Tucson, GE Aviation, Michigan State University, Xerox Innovation Group, Alfred University, Carnegie Mellon University, NASA Glenn Research Center, University of Michigan, Georgia Institute of Technology, University of Illinois at Urbana-Champaign, Rubenstein Studios, France Telecom, Microsoft, OFS Laboratories, Boeing, Wayne State University, AFL-CIO, Massachusetts Institute of Technology, Hitachi Global Storage Technologies, Intellectual Assets Inc, Oshkosh Truck Corporation, University of Wisconsin Milwaukee, National Center for Manufacturing Sciences, Rochester Institute of Technology, Plexus Corporation, PPG Industries, Dow Corning Corporation, Rockwell Collins Inc, Ex One Corporation, Gartner Inc, Virginia Polytechnic University, Altarum

Original Security

- Secure paper
- Intaglio printing
- Red and blue fibers



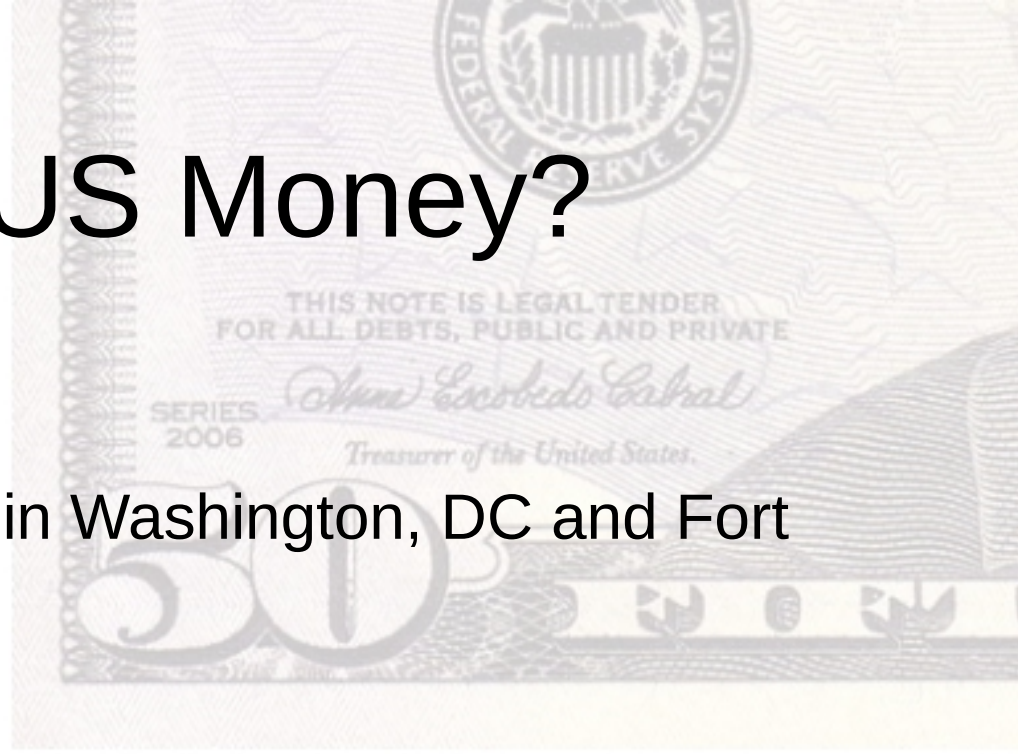
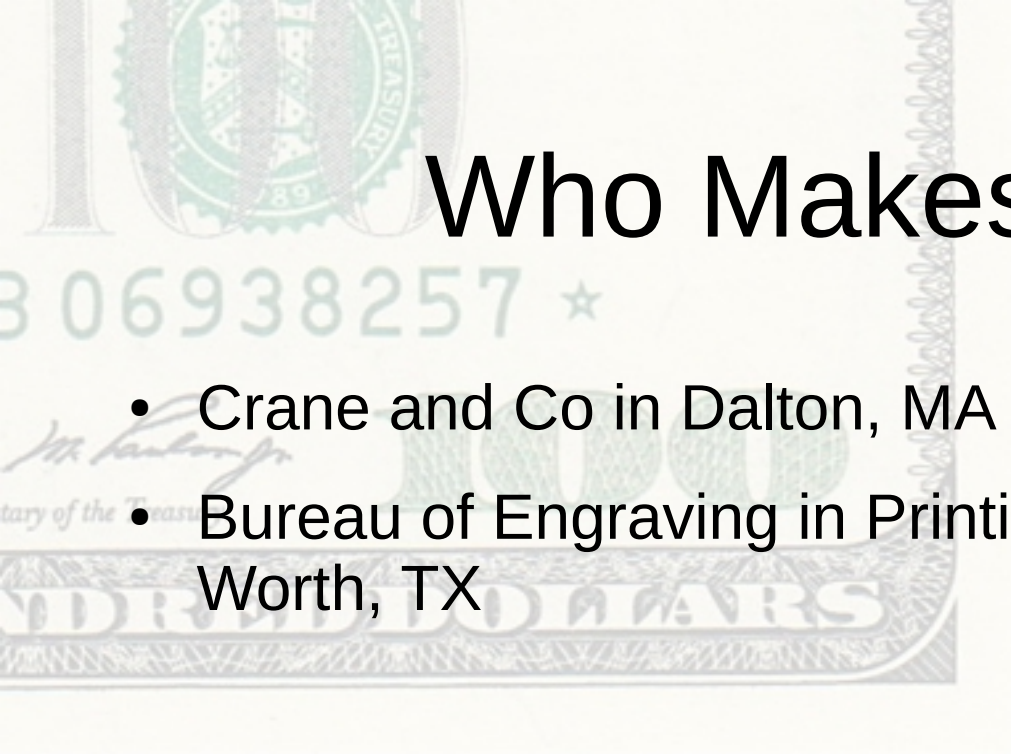
Current Security

- Secure paper
- Intaglio printing
- Red and blue fibers
- Microprinting
- Multicolor background
- Watermark
- Optically Varying Ink (OVI)
- Security Strip
- Magnetic ink
- IR ink



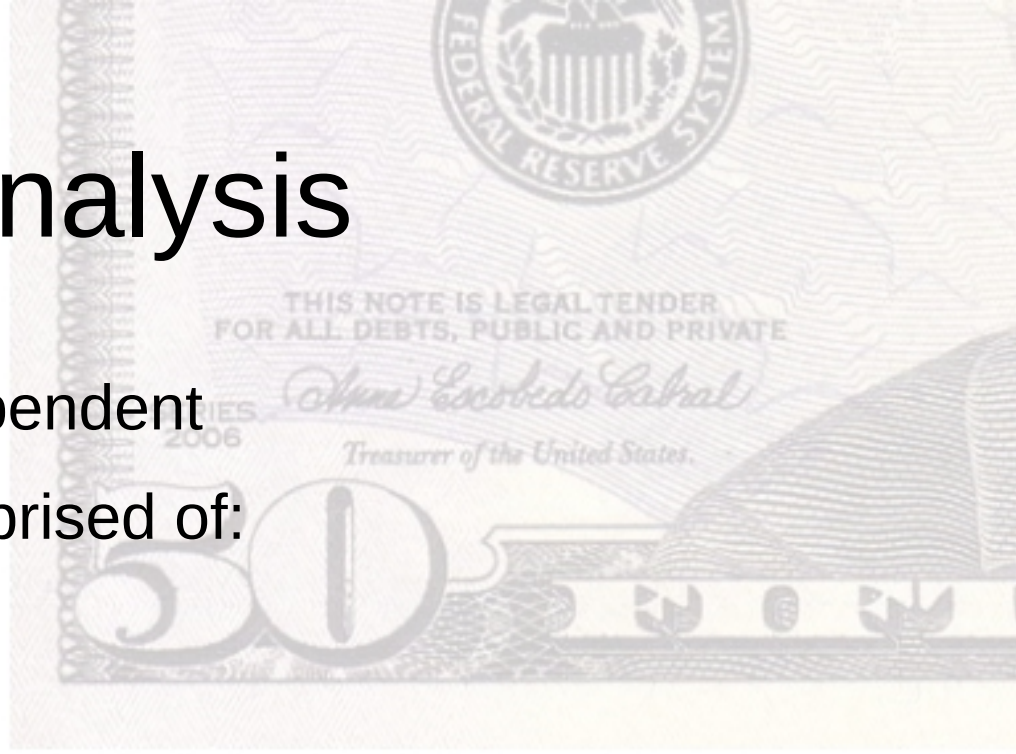
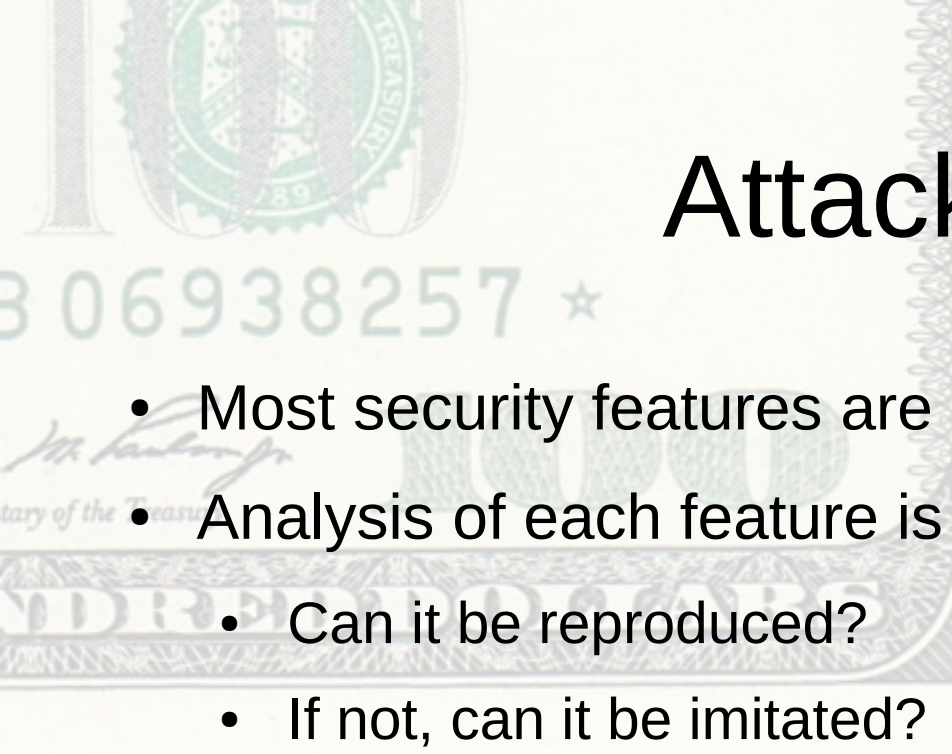
Who Makes US Money?

- Crane and Co in Dalton, MA
- Bureau of Engraving and Printing in Washington, DC and Fort Worth, TX



Attack Analysis

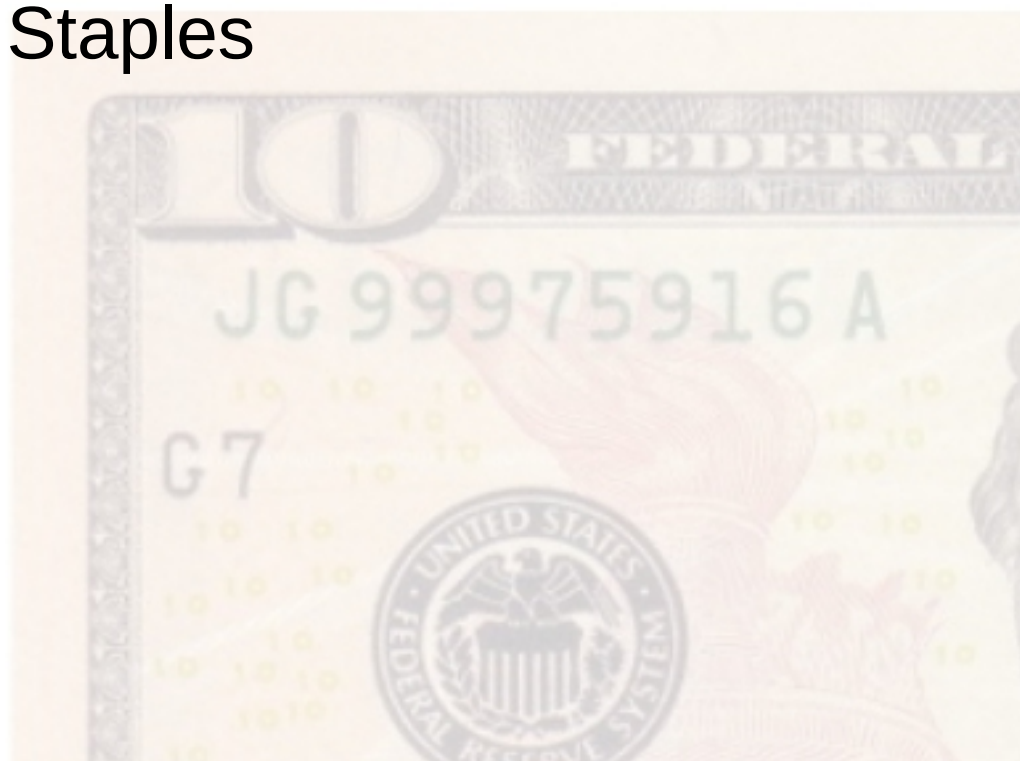
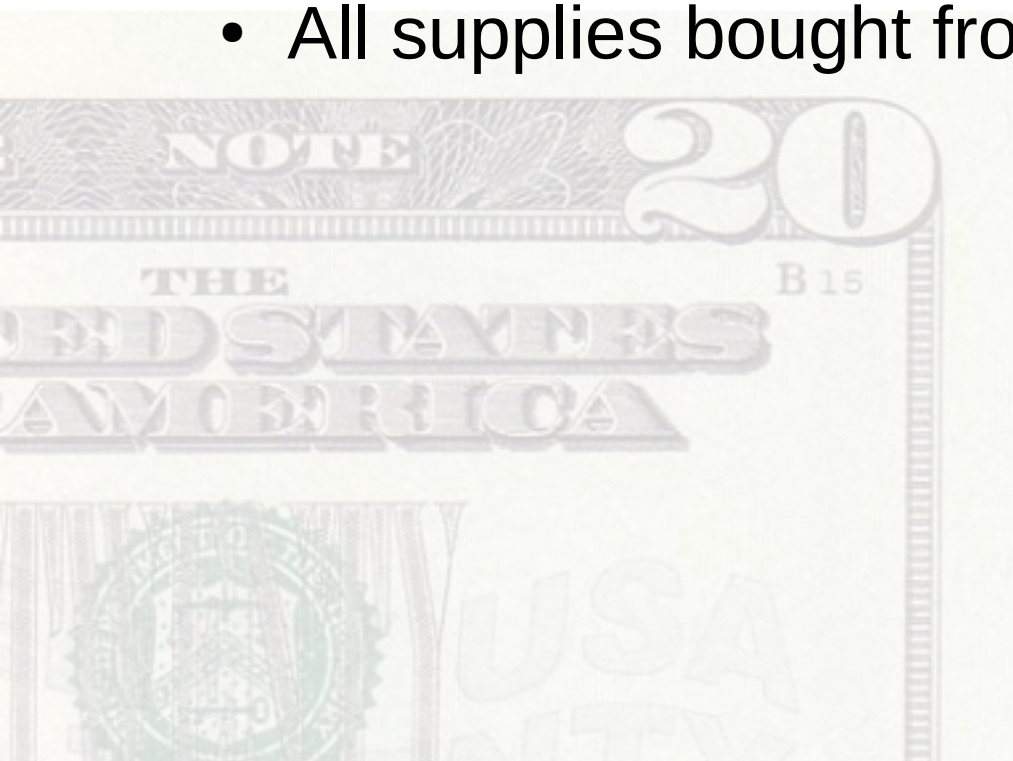
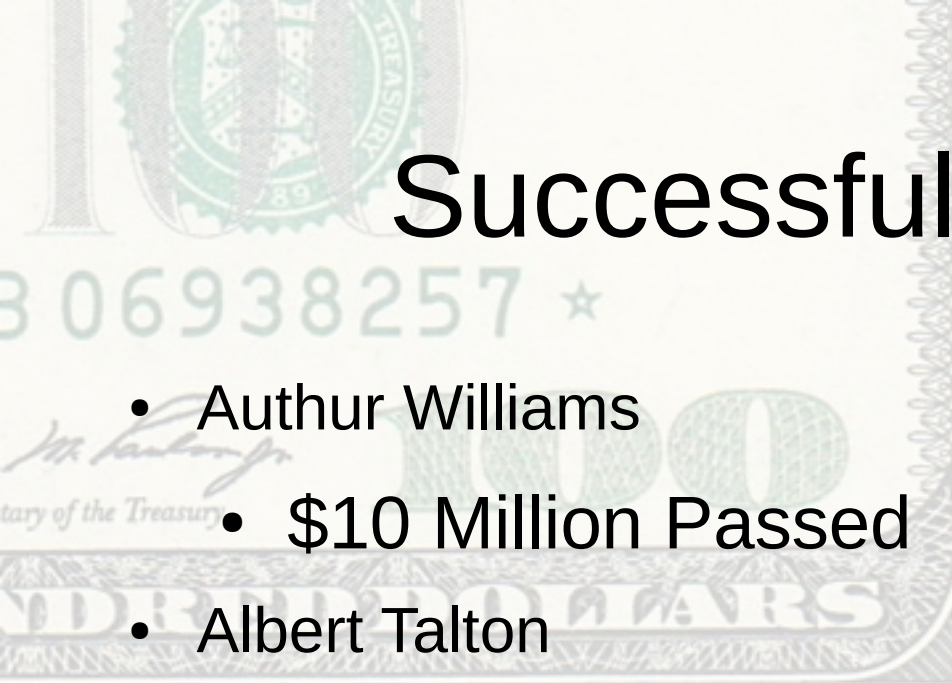
- Most security features are independent
- Analysis of each feature is comprised of:
 - Can it be reproduced?
 - If not, can it be imitated?



Feature	Replication	Imitation	Cost
Paper	Infeasible	Feasible	\$0.02/Bill
Watermark	Infeasible	Feasible	<\$0.01/Bill
Security Strip	Feasible		<\$0.01/Bill
OVI	Infeasible	Feasible	\$2.50/Bill
Printing	Infeasible	Feasible	\$0.04/Bill
Serial Number	Feasible		NA
Magnetic Ink	Feasible		<\$0.01/Bill
IR Ink	Feasible		\$0.05/Bill

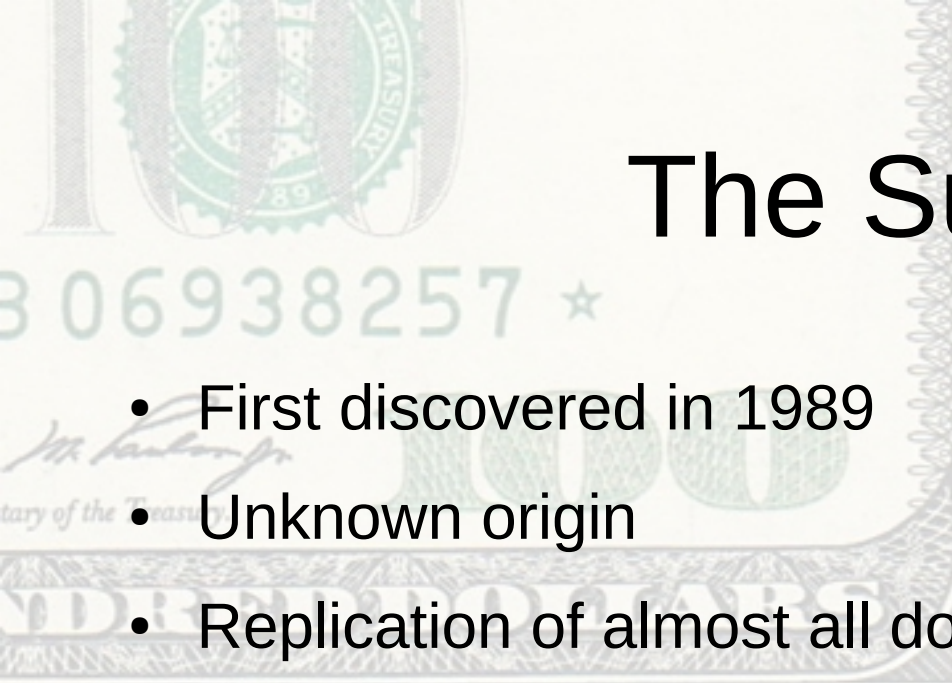
Successful Counterfeiters

- Authur Williams
 - \$10 Million Passed
- Albert Talton
 - \$7 Million Passed
 - All supplies bought from Staples



The Supernote

- First discovered in 1989
- Unknown origin
- Replication of almost all dollar features
- Adapted to all design changes thusfar



Information Sources

- Moneymakers by Klaus Bender
- The Art of Making Money by Jason Kersten
- Publications on counterfeit deterrents by The National Academies, initiated by the Bureau of Engraving and Printing
 - Counterfeit Deterrent Features for the Next-Generation Currency Design, 1993
 - Is that Real? Identification and Assessment of the Counterfeiting Threat for U.S. Banknotes, 2006
 - A Path to the Next Generation of U.S. Banknotes: Keeping them Real, 2007



Questions?

