

MINT *ERROR* NEWSTM MAGAZINE

Bringing the latest mint error news to the collector. Also featuring Die Trials, Test Pieces, Numismatic Rarities, Patterns, Currency Errors and Discoveries from the U.S. Mint.



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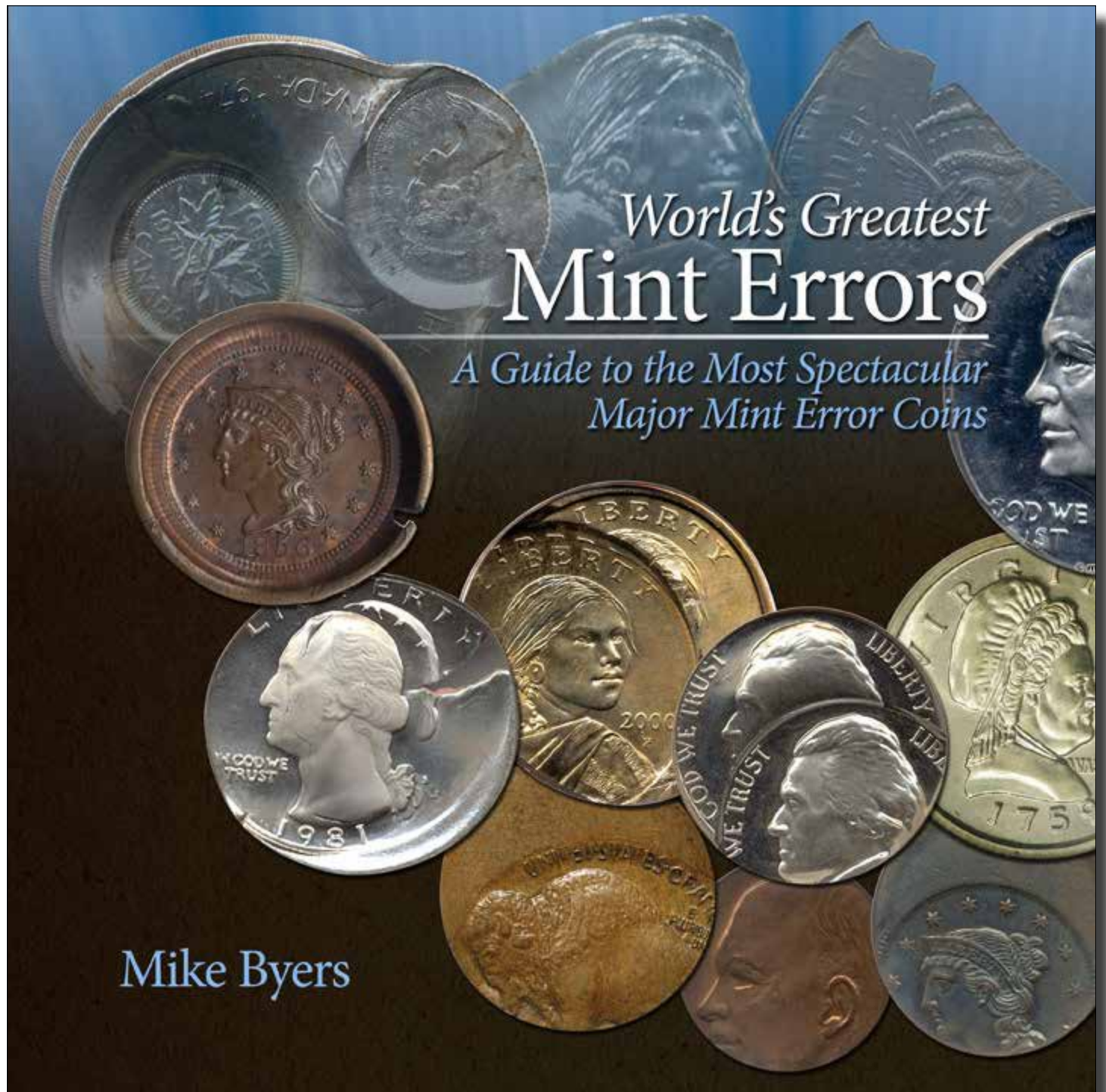
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Issue 97

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Mint Error News Magazine

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MINT^{ERROR}NEWSTM MAGAZINE

Bringing the latest mint error news to the collector.



Mike Byers, Publisher & Editor, Welcomes You!

Welcome to Mint Error News Magazine, bringing the latest mint error news and information to the collector. This is our 23rd year bringing you both an online PDF magazine and the Mint Error News website. **Over 100 issues** of Mint Error News Magazine have been published. The Mint Error News website has **over 1,600 articles**, features, discoveries, news stories with mint error related info from the United States and around the World. Our website, **mintererrornews.com**, has become the most popular and informative Internet resource for mint errors and is read by thousands of dealers and collectors.

Over the last 23 years with the advent of the internet millions of collectors have flocked to online auctions and dealer websites. Many people connect to various online forums and clubs to share knowledge and learn about Mint Errors. Everyone, including dealers, collectors and even investors have instant access to information as never before. The Mint Error market has experienced an explosion in collector interest over the last 22 years.

Time and again, rare and unique Mint Errors in the numismatic market have made headline news. Authentication and certification of Mint Errors is now commonplace. In 1991, ANACS was the first to authenticate, grade and encapsulate major Mint Errors. In 1999, PCGS and NGC began certifying Mint Errors. Major Mint Errors are now pursued, collected and traded just like patterns, territorial Gold, colonials and other interesting segments of numismatics.

In 1975, I purchased a 1900 Indian Head Cent struck on a \$2 1/2 Indian Gold blank planchet for \$7,750 at a major coin auction. That price ranked among the top five ever realized for a Mint Error that few dealers or serious collectors would even consider. At that time price guides for Mint Errors were nonexistent and today that Indian Head Cent struck in Gold is certified MS65 by PCGS and is valued at six figures.

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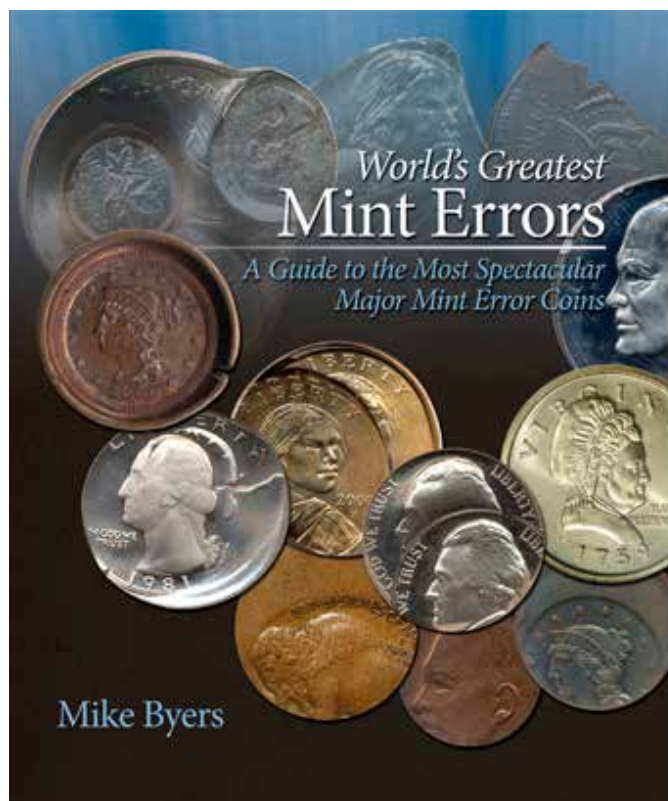


Mike Byers



Mike Byers (mikebyers.com) is president of Mike Byers Inc. He has been a professional numismatist for over forty years. He is one of the largest dealers handling U.S. Gold Coins, Patterns and Rarities certified by PCGS and NGC. He has handled major coin collections and attends every major coin convention. Mike Byers carries an extensive inventory as well as solicits want lists and is always looking to purchase fresh inventory and collections. You can visit Mike Byers and view his rarities at the ANA, Central States, FUN show and the Long Beach Coin Expo.

Mike Byers was a consultant to ANACS for Mint Errors from 2000 to 2006. He is also the Owner, Publisher and Editor of Mint Error News Magazine and the Mint Error News Website that was founded in 2003. In 2009, Mike Byers published his first book, *World's Greatest Mint Errors*, which received the NLG Award for Best World Coin Book and is now available for free online. In 2016, Mike Byers was featured on Fox News in an interview with one of his unique mint errors.



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Mike Byers is the Publisher and Editor of Mint Error News. Consultants to Mint Error News are numismatic experts recognized worldwide including Heritage Auctions, Jim Stoutjesdyk, Dave Camire, Greg Bennick, Andy Lustig, Michael Faraone, Marc Crane, John Wang, Saul Teichman, Ron Guth, Jeff Ylitalo, Tom Caldwell, Fred Weinberg (retired), Christopher Talbot Frank, Steven Contursi, Silvano DiGenova, Brian Hodge, Joe Cronin, Allen Rowe, Ian Russell, Jim Gately, Scott Purvis, John Dannreuther, Tom DeLorey and Steve Davis.



Jim Stoutjesdyk

**Expert on U.S. Coins, Unique Items,
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Vice President of Heritage Rare Coin Galleries



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Expert on Mint Errors, Patterns and Die Trials

NGC Modern World Coin Grader and Finalizer
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Steve Davis

Expert on Die Trials, Plasters and Galvanos
Owner of Numismatic Auctions L.L.C.

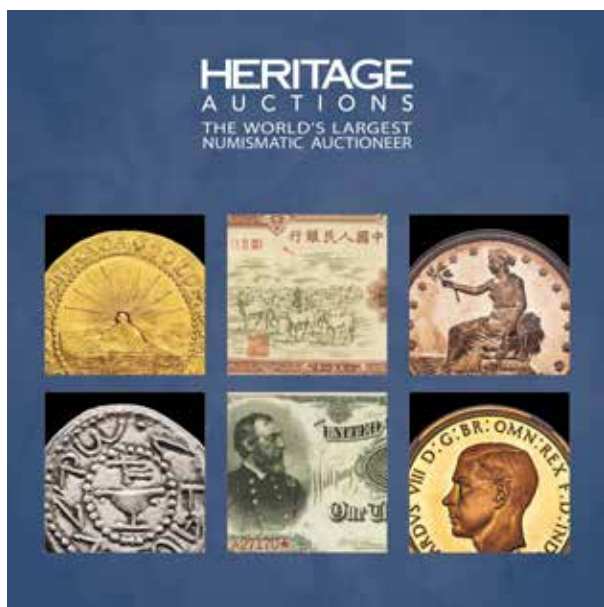
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Jim Stoutjesdyk

Jim Stoutjesdyk was named Vice President of Heritage Rare Coin Galleries in 2004. Since coming to Heritage in 1993, Jim has assumed a wide variety of responsibilities. He initially was hired as the Gallery Manager for Heritage's retail showroom. For several years he helped to develop Heritage's retail clientele and placed millions of dollars worth of rare coins with collectors. Jim's interest turned to wholesale trading and he quickly became a familiar face at coin shows across the nation. As Vice President, Jim's duties include buying and selling millions of dollars worth of rare coins each month, pricing all of the new coins available for sale each day, and overseeing the daily operations of the rare coin department. In 2019 the American Numismatic Association awarded Jim the very prestigious Doctor of Numismatics honorary degree.

Jim Stoutjesdyk is a Consultant to Mint Error News for U.S. Coins, Unique Items, Patterns and Mint Errors.



Heritage Auctions is the largest collectibles auctioneer and third largest auction house in the world, as well as the largest auction house founded in the U.S. We are also the undisputed Internet leader in our field, with more than 1.75 million online bidder-members registered on HA.com from all 195 countries. This loyal and growing community of collectors is a testament to the usefulness of our website, our reputation for professional business practices and our vast expertise in the field of art and collectibles.

Established in 1976, Heritage offers a wide range of U.S. & World Coins, Rare Currency, Fine & Decorative Art, American Art, Illustration Art, Modern & Contemporary Art, Urban Art, Comic Books & Comic Art, Movie Posters, Entertainment & Music Memorabilia, Jewelry & Timepieces, Luxury Handbags, Sports Collectibles, Historical & Political

Memorabilia, Rare Books & Manuscripts, Ethnographic Art, & Space Exploration Memorabilia, Civil War Memorabilia, Photographs, Nature & Science, Fine and Rare Wine, Luxury Real Estate, Pop Culture Collectibles, and more.

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Dave Camire is considered an authority on modern minting technology and production, specializing in mint errors and Chinese coins. He has visited many mints, both domestically and internationally, which is not only insightful but useful in his role as NGC Modern World Coin Grader and Finalizer. His knowledge of the minting process is helpful in distinguishing mint defects from damaged coins and establishing a coin's authenticity and grade.



Dave Camire

Dave co-authored *100 Greatest U.S. Error Coins* and has contributed to such numismatic publications as *Coin World* (honored with being listed as one of the 100 Most Influential People), *COINage*, *Numismatic News*, *The Numismatist* and the *Red Book*. He has been featured on National Public Radio (NPR) and seen on *Good Morning America* and the *Discovery Channel*.

Dave is also President of Numismatic Conservation Services (NCS). With his knowledge and expertise in coin conservation, he has been an active volunteer at the Smithsonian Institution's Museum of American History, helping to preserve the National Numismatic Collection and establishing key numismatic displays at the museum. A collector at heart, he has been collecting since he was 13 years old.

Dave Camire is a Consultant to Mint Error News for Mint Errors, Patterns and Die Trials.



Mike Faraone

Mike Faraone is the owner of Mike Faraone Rare Coins in Las Vegas, Nevada. He previously was a grader at PCGS for 12 years after 11 years at ANACS.

He has taught grading at the ANA Summer Seminar for twenty years. Mike has lectured on Mint errors and Counterfeit protection at numerous coin shows across the country. He is a previous president of the National Silver Dollar Roundtable and served as editor of the NSDR Journal for over twenty years. Mike can be reached via e-mail at: mfaraone@hotmail.com.

Mike Faraone is a Consultant to Mint Error News for Mint Errors, Patterns and Die Trials.

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Greg Bennick

Greg Bennick is a collector and researcher of major mint errors and has been actively involved in the hobby since 1981 when he made his first major error purchase, a Liberty nickel on a cent planchet, at the age of ten.

Greg attends coin shows nationwide buying and selling major mint errors. He is the co-instructor for the week-long class “Modern Minting Process/U.S. Minting Errors and Varieties” at the American Numismatic Association Summer Seminar in Colorado Springs, CO.

A professional keynote speaker on the topic of Build a Better Now® for the corporate and association markets (gregbennick.com) Greg writes for multiple print outlets on major errors. He maintains an extensive personal library of error-related books, pamphlets, magazines, and ephemera going back to the dawn of the hobby in the 1950's.

Greg is a board member of CONECA, and focuses his study on major US and Canadian error coins, significant ancient and world errors, and the minting process.

Greg Bennick is a consultant to Mint Error News for Mint Errors and trends in the error market.



Marc Crane

Marc Crane is a dealer specializing in rare U.S. coins and U.S. patterns. He started Marc One Numismatics, Inc. in 1991. He is a member of the PNG (#565).

Marc tied for 1st place in a PCGS grading contest and is considered a world-class grader and authenticator. He is a contributor to the Red Book and is permanently listed in the pattern section. His coin store in Rancho Mirage, CA is open to the public and he regularly attends coin shows and auctions across the country.

Marc Crane is a Consultant to Mint Error News for Mint Errors, Patterns and Die Trials.

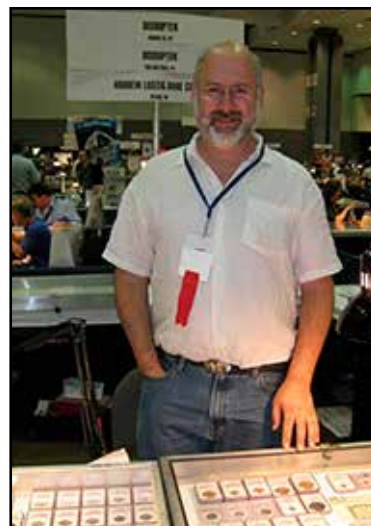
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Andy Lustig has been dealing in U.S. and World Coins since 1975 and has attended more than 2,000 coin shows and auctions.

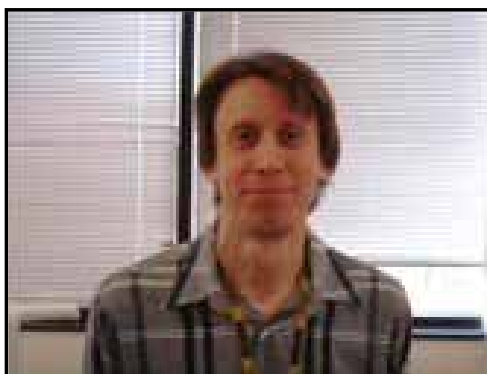
Andy is the co-founder of the Society of U.S. Pattern Collectors (uspatterns.com). He has been a member of the Professional Numismatists Guild (PNG #614) since 2005. He is a member of NGC and was also a former grader and authenticator for PCGS.

Andy was a speaker at the annual CSNS convention, presenting "Collecting Pattern Coinage." Andy was a major contributor to the 8th Edition of the Judd book.

Andy Lustig is a Consultant to Mint Error News for Mint Errors, Patterns and Die Trials.



Andy Lustig



Saul Teichman

Saul Teichman is a co-founder and primary contributor/editor of the Society of U.S. Pattern Collectors (uspatterns.com) as well as contributor to the 8th Edition of the Judd book and Andrew Pollock's *United States Patterns and Related Issues* as well as many other books. He has been collecting primarily off-metal U.S. Mint errors for over 20 years and maintains extensive pedigree information for many error issues which have been published here in the past.

Saul Teichman is a Consultant to Mint Error News for Mint Errors, Patterns and Die Trials.

Rare Coin Wholesalers has the largest inventory of U.S. Rare Coins.

Founded in 2001, Rare Coin Wholesalers has transacted over \$2 billion in U.S. rare coin business and is a recognized leader in acquiring, managing, and selling U.S. rare coins positioned for wealth preservation and capital growth.

Steven L. Contursi is a Consultant to Mint Error News for U.S. Patterns.



Steven L. Contursi

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Jeff Ylitalo

Jeff Ylitalo has collected Mint Error coins since 1993. He has avidly researched & written about this area of numismatics since 2006 contributing dozens of articles to CONECAs bi-monthly publication ErrorScope and Mint Error News. Jeff is the former editor for the ErrorScope 2008-2017.

Jeff's research and collecting focus is now primarily centered on World Error coins. Jeff can be reached via e-mail at: jylitalo@yahoo.com.

Jeff Ylitalo is a Consultant to Mint Error News for Mint Errors.

John Wang is an avid numismatic researcher and collector. His research focus is on absolute rarities including patterns, mint errors and exonomia, with particular interest in coin census, pedigrees, coin designers and minters. A historian at heart, John enjoys tracing coins and people through time.

John writes for Mint Error News, the So-Called Dollar Fellowship and Wikipedia. He is also a top contributor to Collectors Universe Message Forums. Beyond writing, John enjoys creating coins, including co-creating a 2021 Morgan Dollar commemorative with Moonlight Mint, and inspiring a Frank Gasparro Liberty Dollar pattern design commemorative with Grove Minting Company. A collector at heart, John maintains a set of So-Called Dollar rarities in the PCGS Set Registry. John is founder and editor at PrivateMintNews.com.



John Wang

John Wang is a Consultant to Mint Error News for Mint Errors and Patterns.



Fred Weinberg

Fred Weinberg is a highly respected numismatist, with 40 years of full time experience in the rare coin marketplace.

He deals in numismatic United States Gold & Silver coinage, as well as specializing in buying & selling Major Mint Error coinage of all types.

He is one of the original 31 dealers selected as an authorized PCGS (Professional Coin Grading Service) dealer at it's inception in 1986.

Fred Weinberg has now retired and was a Consultant to Mint Error News for Mint Errors and Die Trials.

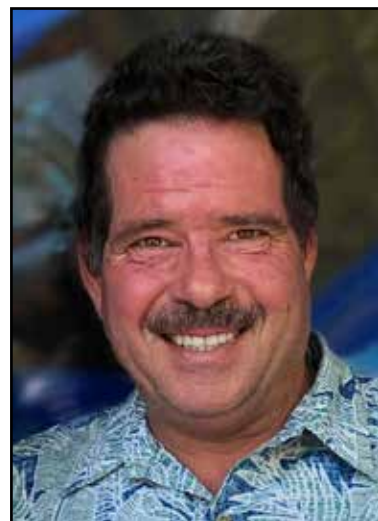
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Christopher Talbot Frank is an error coin dealer of over 25 years and is doing business as CTF Error Coins. Christopher specializes in superior eye appealing error coinage with a wide variety of dramatic specimens. He has an artistic background as a professional photographer and now specializes in high end numismatic photography. Christopher handpicks every coin in his inventory based on eye appeal first and rarity second.

Chris's 800 plus certified coin inventory is basically an error coin type set in many dates and denominations. Although he carries all error types and dates, he specializes in mint state modern and the very rare ultra modern (2002-present) error coins. Christopher has authored many articles on error coins for Mint Error News over the last few years.

Christopher Talbot Frank is a consultant to Mint Error News for modern and dramatic Major Mint Errors.



Christopher Talbot Frank



Ron Guth

Ron Guth is a recognized authority on United States and German coins. He is a licensed Certified Public Accountant who has been involved professionally in numismatics for over fifty years as a collector, dealer, researcher, and writer. His books and articles have earned numerous awards, including the American Numismatic Association's Heath Literary award and the Olga & Wayte Raymond awards, the Numismatic Literary Guild's Best Numismatic Investment Book and Best Book of the Year awards, and the Professional Numismatic Guild's Best Book of the Year award. In 2003, Ron received the prestigious President's Award from the American Numismatic Association in recognition of his numerous contributions to numismatics. In 2021, Coin World named Ron as one of the Top Ten Most Influential People in Numismatics for the sixty-year period from 1960-2020.

Ron created the CoinFacts website (now PCGS CoinFacts) in 1999 and sold the website to Collectors Universe in 2004 (where it is now presented as PCGS CoinFacts). Ron served in various capacities at Collectors Universe, including Director of Numismatic Research, President of the Professional Coin Grading Service, and President of PCGS CoinFacts.

Currently, Ron serves as proprietor of GermanCoins.com and as Chief Investigator at the Numismatic Detective Agency, where he provides expert provenance on high-end coins. Ron Guth is a Consultant to Mint Error News for Patterns and Die Trials.

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Tom Caldwell founded Northeast Numismatics over 50 years ago. In the years that have elapsed since 1964, Tom has proven his expertise in every area of US coinage, from rare colonials and patterns to high grade proof type and gold.

In addition to being an ANA life member since 1972 (#1318) and a member of the Professional Numismatists Guild (PNG), Tom is a life member of the Society for US Commemorative Coins, the Central States Numismatic Society, Florida United Numismatists, the Numismatic Association of Southern California, as well as other regional and national organizations. He has attended every major coin show and auction since the late 1960s, and can often be seen at shows out for a run in the early morning (he has completed several marathons).



Tom Caldwell

Tom Caldwell is a Consultant to Mint Error News for Mint Errors and Patterns.



Joe Cronin

Joe Cronin is currently a History teacher, a former U.S. Treasury Department law enforcement officer, and has been a coin collector for over thirty years. Within the last ten years he has focused more on Mint errors, and also fake and altered coins made to resemble genuine errors.

He is the author of the popular error reference book, *Mint Errors to Die For*, has written articles for CONECA's *Errorscope*, and is the creator and moderator of the Facebook® page, "Joe Cronin's Mint Errors Explained." Joe often attends coin shows in the Western N.Y. area with educational tables on Mint errors and Henning nickels. Feel free to contact Joe at jcro57@yahoo.com.

Joe Cronin is a consultant to Mint Error News for Mint Errors and Counterfeit/Altered coins made to resemble genuine errors.

Brian Hodge is a Partner and the President of Numismatics at Minshull Trading. Over the last three decades years they have been a leader in the numismatic industry and have grown into a formidable market maker, garnering the respect of every major market player.

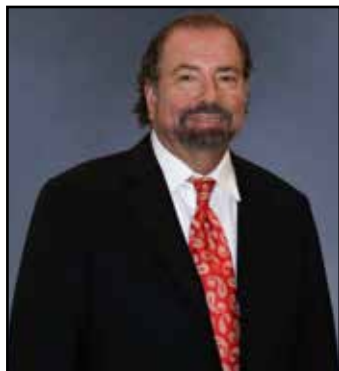
He is a member of every major numismatic organization in the country, including PNG, ICTA, FUN, CSNS, and a life member of the ANA. He is a regular Red Book contributor and maintains consistent and up-to-date pricing to sustain healthy markets.



Brian Hodge

Brian Hodge is a consultant to Mint Error News for Specimen Coinage and Unique U.S. Coins.

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Silvano DiGenova

Tangible Investments founder and president Silvano DiGenova is an authority on the rare coin market, grading, authenticity, and appraisals. In fact, since Silvano co-founded the renowned Professional Coin Grading Service (PCGS) and designed the PCGS coin grading standards, you could actually say he wrote the book on coin grading.

Millions of collectors and investors depend on Silvano DiGenova's expertise every day. He has been featured in Fortune Magazine's "People to Watch," quoted on the front page of The Wall Street Journal, interviewed in hundreds of U.S. newspapers, and has appeared several times as a commentator on CNN, FNN, CNBC, the Discovery Channel, the History Channel, and more.

Silvano DiGenova is a consultant to Mint Error News for Patterns and Unique & Esoteric U.S. Coinage.

Allen Rowe is the owner of Northern Nevada Coin, which specializes in buying silver dollars, gold coins, Carson City coins, gold scrap, complete collections, estates, hoards, investment holdings, coins, silver bullion, gold billion, and rare paper money from collectors, investors, and other coin dealers. He has been buying gold in Carson City, Reno, Sparks, Minden, Gardnerville, Lake Tahoe, Fallon, Virginia City, and northern Nevada since 1993.



Allen Rowe

An interesting array of dollar errors is currently available to be viewed on Northern Nevada Coin's website brokencc.com. The gallery includes several off-center Morgan dollars, a broadstruck Morgan, a spectacularly broadstruck Peace dollar, an example of a rotated reverse, a blank silver dollar planchet, and the Amazing Broken CC.

Allen Rowe is a consultant to Mint Error News for Morgan and Peace Dollar Mint Errors, especially mint errors and rarities from the Carson City Mint.

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Ian is president and co-founder of GreatCollections Coin & Paper Money Auctions. From a young age, Ian was interested in collectibles and started working on weekends for a stamp dealer in Sydney, Australia at age 14. From there he learned about auctions at Stanley Gibbons Australia, personally handling many important sales including the Purcell Collection of Kangaroo and Map Series, the Mackey Collection of Australian States/Pacific Islands and the Morrison Hill China Collection. Ian also put together the company's first paper money auction featuring one of the finest New Zealand bank note collections ever formed.

Ian is a member of the prestigious Professional Numismatists Guild, member 785 and abides by the PNG Code of Ethics. In 2021, CoinWorld Magazine named Ian one of the most influential people in numismatics. Contact Ian Russell at ian@greatcollections.com.



Ian Russell

Great Collections holds the record auctioning the famous \$1 Sacagawea obverse muled with a Quarter reverse for \$194,062.50.

Ian Russell is a consultant to Mint Error News for Error Coins and Patterns.



Jim Gately

Jim Gately is the owner of the #1 ranked PCGS registry set of Buffalo Nickels. He also has other registry sets with PCGS.

He purchased the unique 1913 Gold Buffalo Nickel from Mike Byers for \$400,000 and proudly included it in his set.

Jim is an expert on 20th Century U.S. coinage with an emphasis on Buffalo Nickels. He is a consultant to Mint Error News for Double Dies and Overdates.

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Scott Purvis

Scott Purvis is the Publisher of CoinWeek. Founded in 1995 as CoinLink and then subsequently rebranded in 2015, CoinWeek sets the standard for online rare coin news and articles that bring the hobby to life.

CoinWeek is one of the world's leading independent digital publications dedicated to coins, paper money, bullion, and numismatic history. Reaching collectors and dealers in more than 200 countries and territories, CoinWeek combines authoritative reporting, in-depth market analysis, and exclusive coverage of major auctions, U.S. Mint releases, and industry news. Every article is carefully optimized for

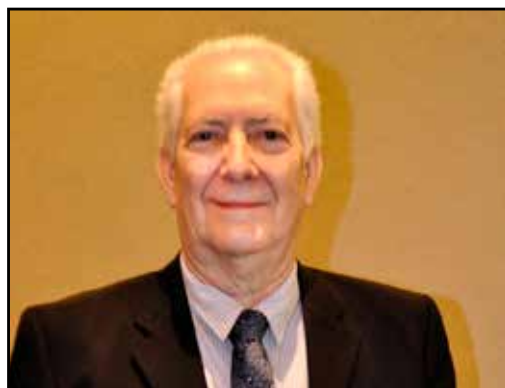
search engines, Google Discover, and today's mobile-first audience, ensuring that important numismatic information reaches collectors wherever they are.

Beyond reporting the news, CoinWeek is committed to growing the hobby. Its signature *Coin Backstory* features go beyond price guides and auction descriptions to uncover the fascinating history, artistry, mysteries, and personalities behind the world's greatest coins. By blending historical research with compelling storytelling, CoinWeek creates content that appeals to seasoned numismatists while making coin collecting accessible and exciting for a new generation of collectors. This focus on education, discovery, and digital innovation has made CoinWeek a trusted resource for collectors, dealers, and the numismatic community worldwide.

Scott Purvis is a consultant to Mint Error News for digital numismatic publishing.

John Dannreuther has been a collector for 70 years and a rare coin dealer for over 50 years. He was one of the founders of PCGS (Professional Coin Grading Service) and today he continues to serve as a PCGS consultant.

He is currently writing the final volume (Copper) of a 4-volume series on United States proof coins. The Nickel, Silver, and Gold volumes have been published and are available for purchase. Visit orcararities.com to order.



John Dannreuther

John Dannreuther is a recognized United States coin expert. As a member of the PNG, ANA, ANS, and numerous other numismatic organizations, you can be confident with purchases from our site or at major coin shows. We attend all major coin shows.

John Dannreuther is a consultant to Mint Error News for patterns and die trials.

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Collecting coins out of circulation back in the 1960s Tom DeLorey found a 1951-D cent with a raised blob in the middle of the D rather than a hole. He bought a dollar magnifying glass at the corner store to look at it better, and dove into the world of die cracks and repunched mint marks. A friend of his brother pointed me towards the Collectors Clearinghouse page of Coin World, so he subscribed, wrote letters with questions to Jim Johnson and Ed Fleischmann that always got polite and helpful answers, and decided that he wanted to work there someday. He started in 1974.



Tom DeLorey

While there, he saw many amazing errors and die varieties, and learned how they had happened. He took over Clearinghouse in 1976 and went to work for ANACS in 1978, where again he was exposed to errors that the average collector never sees. By having to figure out how they had happened he learned a lot about the minting process. His most interesting discovery happened when he saw a prototype Sacagawea dollar in 1999, that was supposed to be the finished design, and then remembered the tail feather differences when the regular coins came out in January of 2000. Eventually he figured out that the prototype coins probably had a connection to the Cheerios dollar promotion.

Tom DeLorey is a consultant to Mint Error News for mint errors and numismatic research.



Steve Davis

Numismatic Auctions L.L.C. is the result of over 50 years of growth and development, beginning under creative pioneer Joseph Lepczyk in the early 1970s. The coin auction firm was later acquired and managed for a short period by Downie's of Australia. Throughout the years we have developed a dedicated global client base of consignors and bidders, collectors and coin dealers alike. After over four decades of working for the company as a cataloger, manager and in partnerships, Steven Davis has manned the helm of the company and has served as the owner and manager since 2008.

The focus of personal service and attention to both our bidders and consignors alike make Numismatic Auctions L.L.C. an excellent choice for both rare coin auction acquisition and liquidation of World, United States and Canadian Coins, Paper Money, Paper Americana, Tokens & Medals, Historical items, Political Memorabilia, Civil War and Militaria pieces & much more.

Steve Davis is a consultant to Mint Error News for die trials, plasters and galvanos.

THE ONLY MAJOR MINT ERROR KNOWN IN A SEALED UNITED STATES MINT PROOF SET!

by Mike Byers (mikebyers.com)



This is a unique and spectacular major mint error sealed in the original United States Mint Proof Set! In my 50 years of being a professional numismatist

specializing in mint errors, I have never seen another proof major mint error in the government sealed plastic holder.

THE ONLY MAJOR MINT ERROR KNOWN IN A SEALED UNITED STATES MINT PROOF SET!

Struck in 2004 at the San Francisco Mint, this clad proof Roosevelt dime has a 25% obverse indent from a planchet. On its own, it is considered an extremely rare proof error. Considering the high

quality control when striking and packaging United States Mint Proof Sets, it is amazing that this mint error was not rejected and somehow was included in the sealed proof set.



THE ONLY MAJOR MINT ERROR KNOWN IN A SEALED UNITED STATES MINT PROOF SET!

It was purchased by a dealer at the 2026 ANA in Pittsburgh. He contacted me since I specialize in major mint errors and have handled an extensive amount of proof errors

as well. Based on my decades of experience, I knew that this was a unique and special numismatic rarity and I immediately purchased it.



THE ONLY MAJOR MINT ERROR KNOWN IN A SEALED UNITED STATES MINT PROOF SET!

United States Mint Proof Sets have been issued in government sealed plastic holders since 1968.

I discussed this proof error in the sealed holder with several mint error specialists. No one had ever heard of another *major striking error* in a sealed proof set. I also

researched auction records and found nothing.

Any serious collector of proof mint errors, major mint errors, or unique numismatic items would be thrilled to add this to their collection.

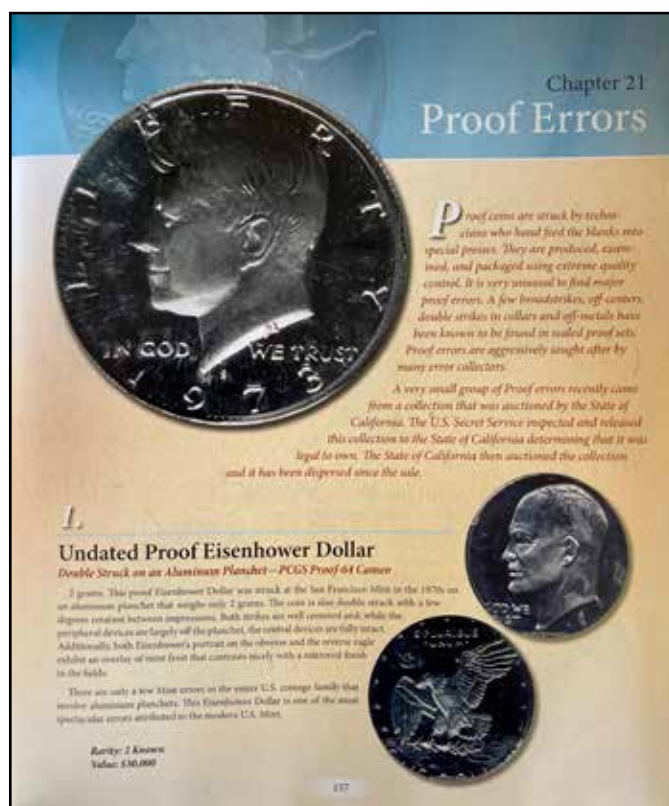
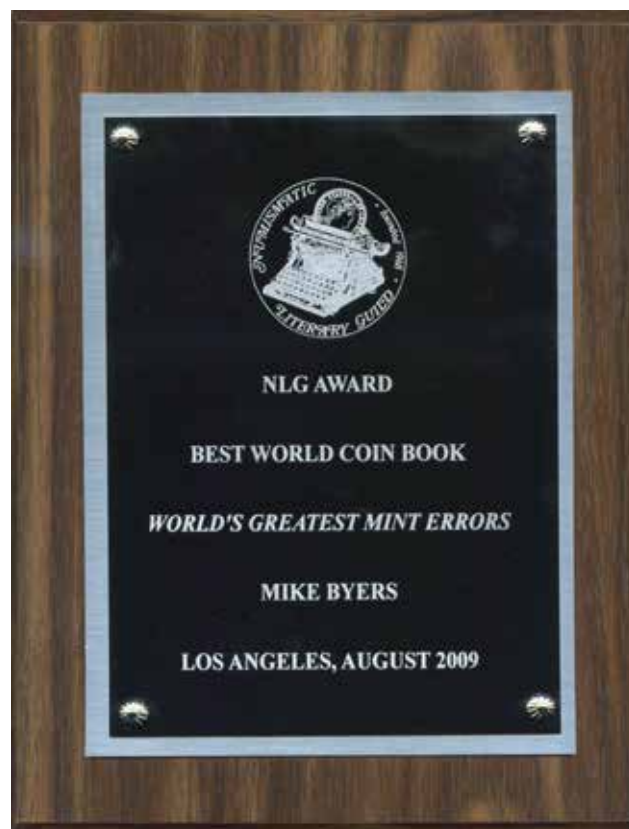
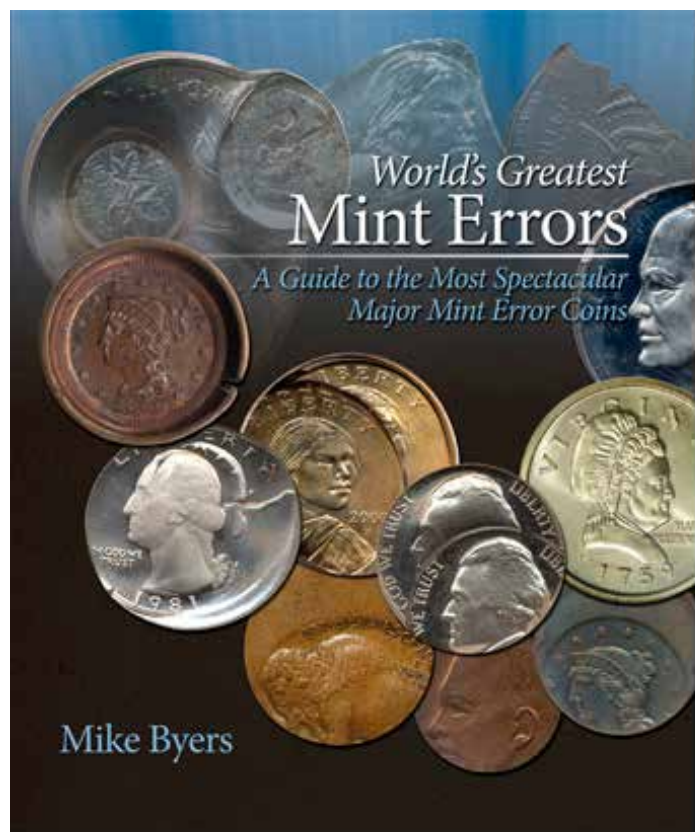


THE ONLY MAJOR MINT ERROR KNOWN IN A SEALED UNITED STATES MINT PROOF SET!



THE ONLY MAJOR MINT ERROR KNOWN IN A SEALED UNITED STATES MINT PROOF SET!

Proof Errors are featured in my NLG award winning book, *World's Greatest Mint Errors*.



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MINT ERROR NEWS Contributor
MAGAZINE to
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World's Greatest
Mint Errors
NLG Award: Best World Coin Book

UNIQUE UNITED STATES PROOF MINT ERRORS

by Mike Byers (mikebyers.com)



UNIQUE UNITED STATES PROOF MINT ERRORS

PCGS CERTIFIES UNIQUE PROOF BRONZE IKE DOLLAR



This unique and amazing 1973-S Proof Eisenhower Dollar was broadstruck on a 26g bronze planchet. Since it was struck by proof Ike Dollar dies, the collar was setup to hold the 36mm diameter of the Ike Dollar planchet. It was broadstruck to the diameter of approximately 40mm, creating a cupped obverse and reverse. This 1973-S Proof Bronze Eisenhower Dollar was intentionally struck.

UNIQUE UNITED STATES PROOF MINT ERRORS

After recently surfacing in an old-time collection of U.S. mint errors, it originally was authenticated and certified by NGC as Proof 61 and was featured on the cover of Mint

Error News Magazine Issue 61.

The pedigree shows it was from the Mike Byers Collection and also from David Frohman, an Eisenhower

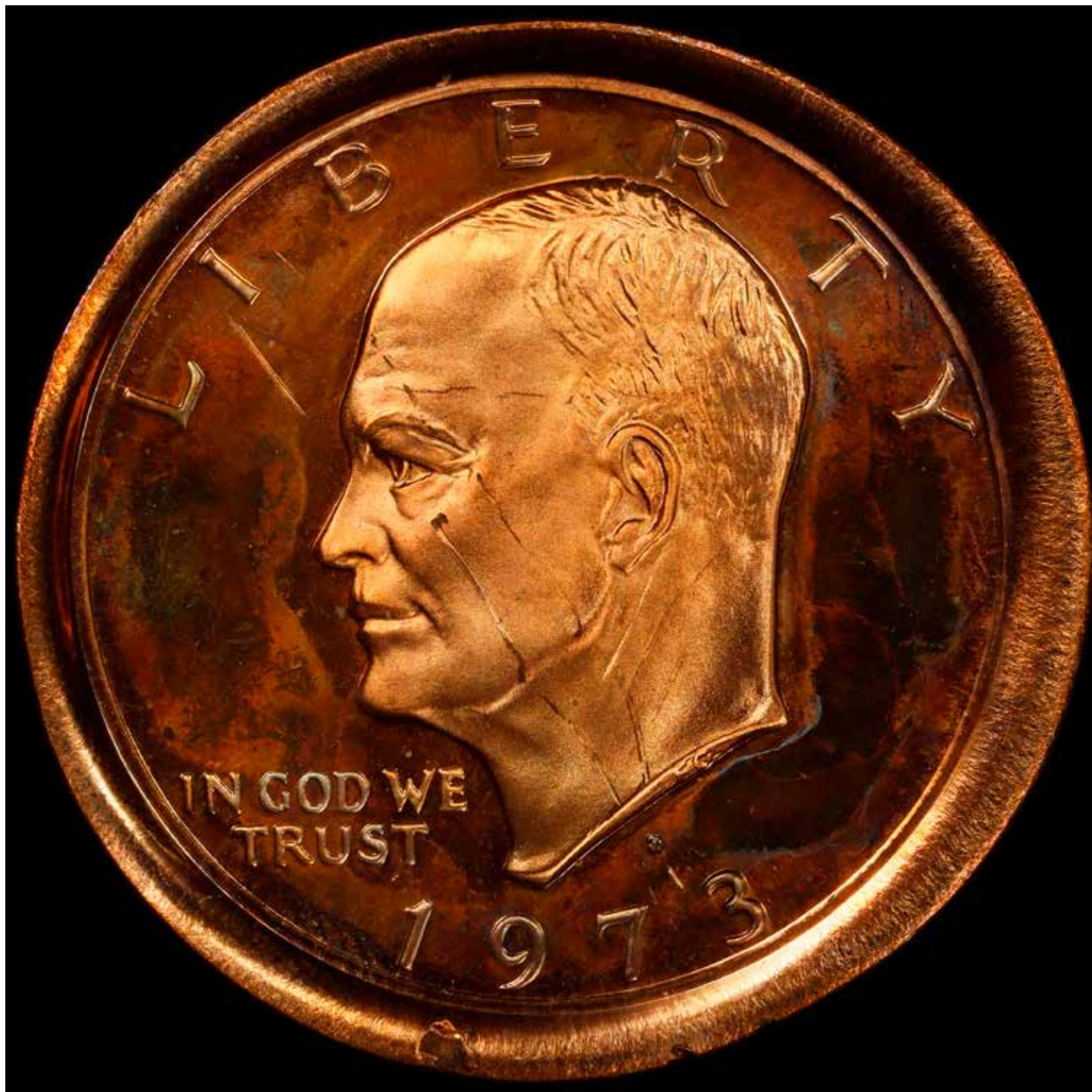


UNIQUE UNITED STATES PROOF MINT ERRORS

enthusiast who is well known for selling a Prototype Eisenhower Dollar in a Heritage Auction for \$264,000.

It is fully struck with nearly perfect

portrait. There are a few very light scratches visible on the obverse which appear to be ejection marks since it was broadstruck. This is considered one of the most spectacular mint errors known on a proof Eisenhower



UNIQUE UNITED STATES PROOF MINT ERRORS



UNIQUE UNITED STATES PROOF MINT ERRORS

This unique proof bronze Ike Dollar could have been struck on a bronze planchet intended to be used to strike the 1973-S medal in commemoration of the 100th anniversary of the cable car in San Francisco. This commemorative medal was enacted by the Senate and House of Representatives of the United States of America.

Public Law 93-114

AN ACT

October 1, 1973
[S. 776]

To authorize the striking of medals in commemoration of the one hundredth anniversary of the cable car in San Francisco.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That, in commemoration of the one hundredth anniversary of the invention of the cable car, the Secretary of the Treasury shall strike and deliver to the San Francisco Cable Car Centennial Committee not more than one hundred and fifty thousand medals with suitable emblems, devices, and inscriptions to be determined by the Secretary of the Treasury after consultation with the committee. The medals, which may be disposed of by the committee at a premium, shall be delivered at such times as may be required by the committee in quantities of not less than two thousand, but no medals shall be struck after December 31, 1974. The medals shall be considered to be national medals within the meaning of section 3551 of the Revised Statutes (31 U.S.C. 368) except that for the purposes of this Act some or all of such medals may be struck by the superintendent of the coining department of the assay office at San Francisco, under such regulations as the superintendent, with the approval of the Director of the Mint, may prescribe. Medals struck at the assay office may bear the legend "Struck at the San Francisco Mint".

San Francisco
cable cars.
100th anniversary
medals.

SEC. 2. The Secretary of the Treasury shall cause such medals to be struck and delivered at not less than the estimated cost of manufacture, including labor, materials, dies, use of machinery, and overhead expenses, and security satisfactory to the Director of the Mint shall be furnished to indemnify the United States for the full payment of such costs.

Cost.

SEC. 3. The medals authorized to be struck and delivered under this Act shall be of such size or sizes and of such various metals as shall be determined by the Secretary of the Treasury in consultation with the committee.

Size.

Approved October 1, 1973.

UNIQUE UNITED STATES PROOF MINT ERRORS

1973-S medal in commemoration of the 100th anniversary of the cable car in San Francisco



UNIQUE UNITED STATES PROOF MINT ERRORS

The American Numismatic Association (ANA) is a non-profit educational organization dedicated to coin collectors. The ANA received a federal charter from the U.S. Congress in 1912. It features the Money Museum which exhibits collections in its galleries. Included is a collection of Eisenhower Dollar mint errors from the famous Dr. Berry Collection of proof and mint state error coins. In this collection are two mint state 1971-D Eisenhower Dollars struck on copper planchets intended for U.S. Mint Medals. They are included in the ANA Museum Inventory List.

DR. A.K. BERRY COLLECTION -- ANA MUSEUM INVENTORY				
Item No.	Date of Item	Dollar Type	Error/Variety Type	Description
2.	1971-D	Ike	Incomplete Planchet	1% Ragged-Edge Clip
3.	1971-D	Ike	Incomplete Planchet	20% Curved Clip
7.	1971-D	Ike	Incomplete Planchet	Triple Curved Clip: 5%: 5% & 10%
10.	1971-D	Ike	Incomplete Planchet	65% Curved Clip
5.	1972-P	Ike	Incomplete Planchet	Double Curved Clip: 5% & 5%
6.	1974-D	Ike	Incomplete Planchet	Quadruple Clip: 2 overlapping sets of two
4.	1976-P	Ike	Incomplete Planchet	33% Curved Clip
9.	1976-D	Ike	Incomplete Planchet	40% Straight Clip
39.	1972-D	Ike	Incomplete Clip	-----
21.	ND	Ike	Wrong Stock	Struck on 1-cent Planchet
73.	ND	Ike	Wrong Stock/Off-Center	Struck on 1-cent Planchet 55% Off-Center at 6:00
74.	ND	Ike	Wrong Stock/Triple Struck	Triple Struck on 1-cent Planchet
8.	ND	Ike	Wrong Stock/Clip	Struck on 5-cent Planchet with 55% Straight Clip
22.	ND	Ike	Wrong Stock	Struck on 5-cent Planchet
23.	ND	Ike	Wrong Stock/Double Struck	Struck on 10-cent Planchet
24.	ND	Ike	Wrong Stock	Struck on 25-cent Planchet
77.	ND	Ike	Wrong Stock/Double Struck	Double Struck on 25-Cent Flan
32.	ND	Ike	Wrong Stock	Struck on Unidentified Brass Planchet
29.	ND	Ike	Wrong Stock	Struck on Brass Philippine 5-Sentimos Planchet
26.	XXXX-S	Ike	Wrong Stock	Struck on Proof 50-cent Flan
76.	XXXX-D	Ike	Wrong Stock	Struck on Metal Scrap
27. ¹	1971-D	Ike	Wrong Stock	Struck on Bronze Presidential Medal Planchet
75.	1971-D	Ike	Wrong Stock	Struck on Bronze Presidential Medal Flan (Same as Item #27)
25.	1972-D	Ike	Wrong Stock	Struck on 50-cent Planchet
30.	1972-D	Ike	Wrong Stock	Struck on Philippine 1-Piso Flan
31.	1974-D	Ike	Wrong Stock	Struck on Philippine 1-Piso Flan
33.	1974-D	Ike	Wrong Stock	Struck on 40% Silver Planchet
79.	1976-P	Ike	Wrong Stock/Double Struck	Double Struck on Piece of Scrap with Uniface Obv.
11.	1891-S	Morgan	Laminated Planchet	Lamination on Reverse
18.	1921-P	Morgan	Laminated Planchet	Lamination on Obverse
17.	1922-P	Peace	Laminated Planchet	Lamination on Reverse
19.	1922-P	Peace	Laminated Planchet	Lamination on Obverse
12.	1971-D	Ike	Laminated Planchet	Lamination on Obverse
15.	1971-D	Ike	Laminated Planchet	Lamination on Obverse
43.	1971-D	Ike	Indented Strike	Brockaged by Cent Planchet On Reverse
46.	1971-D	Ike	Indented Strike	Rev. Brockage by another dollar struck on a quarter planchet
44.	1971-X	Ike	Indented Strike	Brockaged by Smaller Planchet, possibly 25-cent Flan
80.	1973-S	Ike	Indented Strike	Struck 40% Silver Proof Brockaged by Dime Planchet which is still attached
42.	1974-D	Ike	Indented Strike	5% Brockage
45.	1976-P	Ike	Indented Strike	5% Brockage

¹Item #28 is a Presidential Medal of the same type as Item #27, which was included for comparison purposes.

UNIQUE UNITED STATES PROOF MINT ERRORS

AMAZING UNIQUE DISCOVERY

1973-S PROOF IKE DOLLAR MATED PAIR



UNIQUE UNITED STATES PROOF MINT ERRORS

This amazing unique discovery is the only known mated *off-metal and indented* pair of U.S. proof coins combining an Ike dollar and a cent planchet. The only other pair known involves an Ike dollar and a dime planchet. This mated pair is unique in several ways and is visually breathtaking. An Eisenhower Dollar planchet and a

copper Cent planchet were both in the collar at the same time and were struck by Ike Dollar proof dies. The placement of the Cent planchet was perfectly positioned in the center of Eisenhower's portrait. Although there are a few other Eisenhower Dollar proof mated pairs known, this one is the most visually dramatic.



UNIQUE UNITED STATES PROOF MINT ERRORS

Proof coins are struck by technicians who hand feed the blanks into special presses. They are produced, examined and packaged using extreme quality control. It is very unusual to find major proof errors. A few broadstrikes, off-centers, double strikes (in collar) and off-metals have been known to be found

in sealed proof sets. Proof errors are aggressively sought after by many error collectors.

This unique mated *off-metal and indented* pair is the ultimate Eisenhower Dollar major mint error set and the ultimate proof major mint error set.



UNIQUE UNITED STATES PROOF MINT ERRORS



UNIQUE UNITED STATES PROOF MINT ERRORS



UNIQUE UNITED STATES PROOF MINT ERRORS



UNIQUE UNITED STATES PROOF MINT ERRORS



UNIQUE UNITED STATES PROOF MINT ERRORS

1973-S PROOF IKE DOLLAR “CLOVER LEAF” STRUCK ON THREE DIME PLANCHETS



UNIQUE UNITED STATES PROOF MINT ERRORS

This is the second known Ike Dollar "Clover Leaf" struck on three dime planchets. It was authenticated and certified by PCGS as PROOF 65. One of the dimes shows the complete date.

The first known proof Ike Dollar "Clover Leaf" struck on three dime planchets sold in a Heritage Auction for \$105,000. Amazingly here is another Proof Ike Dollar "Clover Leaf" struck on three dime planchets.



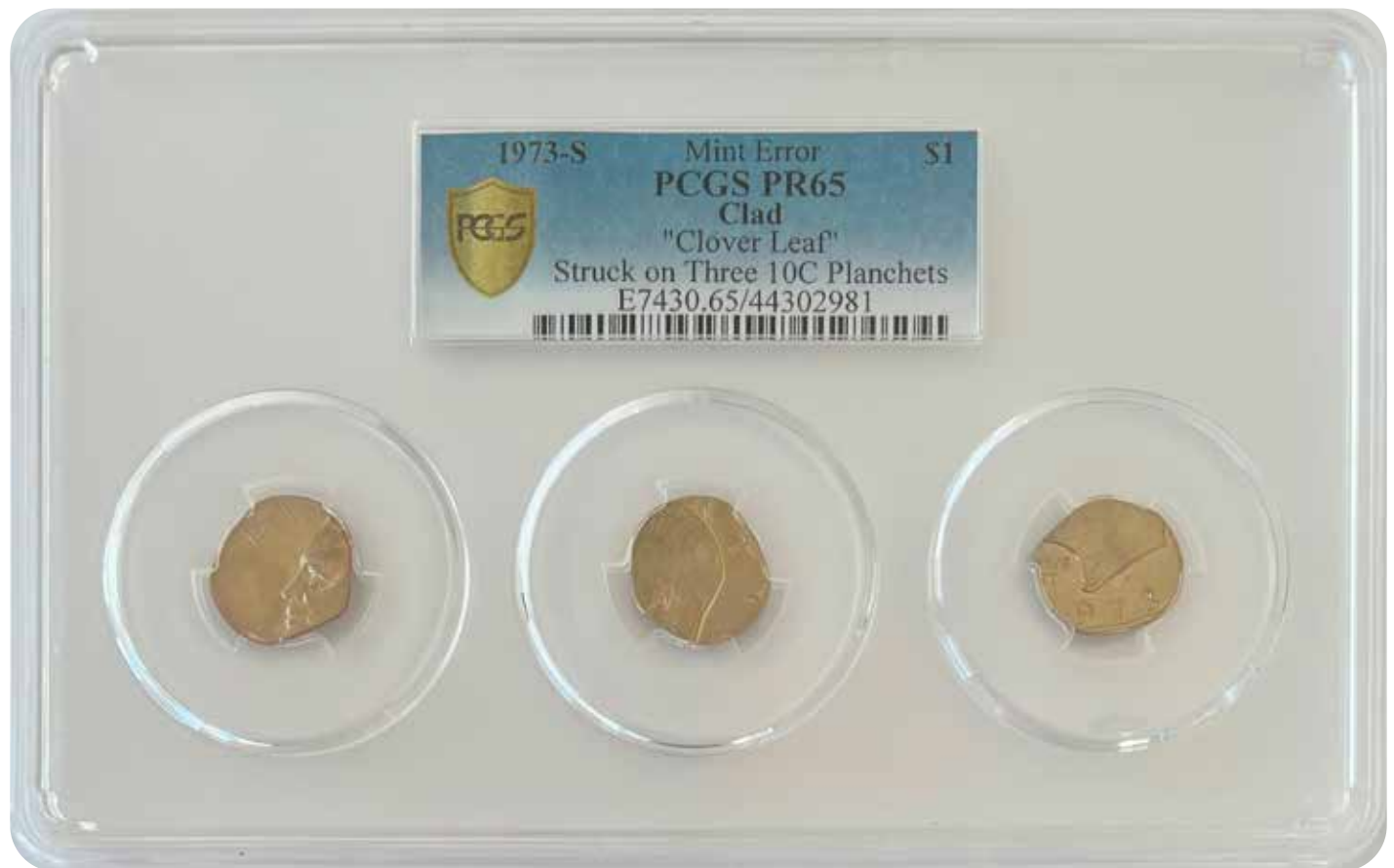
UNIQUE UNITED STATES PROOF MINT ERRORS

Proof coins are struck by technicians who hand feed the blanks into special presses. They are produced, examined and packaged using extreme quality control. It is very unusual to find major proof errors. A few broadstrikes, off-centers,

double strikes (in collar) and off-metals have been known to be found in sealed proof sets. Proof errors are aggressively sought after by many error collectors. This Proof Ike Dollar "Clover Leaf" was intentionally struck.



UNIQUE UNITED STATES PROOF MINT ERRORS



UNIQUE UNITED STATES PROOF MINT ERRORS

THE ONLY PROOF IKE DOLLAR MATED PAIR STRUCK ON A DIME & NICKEL PLANCHET



UNIQUE UNITED STATES PROOF MINT ERRORS

This is an amazing off-metal mated pair of U.S. proof coinage that combines two different off-metals. The original discovery set was featured on the cover of Mint Error News Magazine and was in CoinWeek.

A clad dime planchet and a nickel planchet were intentionally placed in the collar at the same time and were struck by both the obverse and reverse Ike Dollar proof dies. The placement of Eisenhower's head on the obverse and the eagle on the reverse is perfectly positioned.

This mated pair of proof Ike Dollar off-metals is unique since it combines a clad dime planchet and a nickel planchet which were

struck by Ike Dollar proof dies. Proof coins are struck by technicians who hand feed the blanks into special presses. They are produced, examined and packaged using extreme quality control. It is very unusual to find major proof errors. A few broadstrikes, off-centers, double strikes (in collar) and off-metals have been known to be found in sealed proof sets. Proof errors are aggressively sought after by many error collectors.

This mated pair was recently authenticated and certified by NGC and is from a 40 year old U.S. proof mint error collection. This mated pair belongs in an Eisenhower Dollar collection or a collection of major mint errors.

UNIQUE UNITED STATES PROOF MINT ERRORS



UNIQUE UNITED STATES PROOF MINT ERRORS



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UNIQUE UNITED STATES PROOF MINT ERRORS



UNIQUE UNITED STATES PROOF MINT ERRORS

UNIQUE 1970-S UNITED STATES PROOF WASHINGTON QUARTER OVERSTRUCK ON A 1941 CANADIAN GEORGE VI SILVER PROOF QUARTER



UNIQUE UNITED STATES PROOF MINT ERRORS

**The 1941 date is clearly visible from the
Canadian George VI silver quarter understrike.**



Here is the original article when this was in an NGC PF 65 holder:

Proof coins are struck by technicians who hand feed the blanks into special presses. They are produced, examined and packaged using extreme quality control. It is very unusual to find major proof errors. A few broadstrikes, off-centers, double strikes (in collar) and off-metals have been known to be found in sealed proof sets. Proof errors are aggressively sought after by many error collectors.

This unique 1970-S Proof Quarter from the United States was overstruck on a 1941 Quarter from Canada and was intentionally produced. This mint error was originally discovered in the group of San Francisco Proof Errors that was auctioned by the State of California. There is a

significant amount of detail on both sides showing the design of the Canadian Quarter. This is one of the most fascinating and intriguing proof mint errors ever discovered.

A different 1970-S Proof Washington Quarter is also known that was overstruck on a Canadian Quarter from an earlier design. It was struck from 1911-1936 featuring King George V. It was authenticated and certified by NGC as PR64. However, the unique 1970-S Proof Washington Quarter overstruck on a 1941 Canadian Quarter offered here is the only one known with King George VI. It went viral and was featured on Fox News, USA Today and countless other publications.

UNIQUE UNITED STATES PROOF MINT ERRORS

These famous and enigmatic Washington Quarters from the San Francisco Mint struck in Proof, over a U.S. Silver Barber Quarter (1892-1916) and over a 1941 Canada Silver Quarter. These were both featured in a TV interview I did with Fox News. These fascinating errors went “viral” and were featured in USA Today, London’s Daily Mail, AP News, Coin Week, New York Post, Newsmax, NBC News, Numismatic News, Time Magazine and on Maria Bartiromo’s TV show.



UNIQUE UNITED STATES PROOF MINT ERRORS

1970-S Proof Washington Quarter Struck on 1941 Canada Quarter NGC PF 65 (Obverse)



UNIQUE UNITED STATES PROOF MINT ERRORS

1970-S Proof Washington Quarter Struck on 1941 Canada Quarter NGC PF 65 (Reverse)



UNIQUE UNITED STATES PROOF MINT ERRORS

1970-S Proof Washington Quarter Struck on 1941 Canada Quarter NGC PF 65



UNIQUE UNITED STATES PROOF MINT ERRORS

Mike Byers was on Fox News in a segment featuring this incredible quarter.



1972-S PROOF IKE DOLLAR MATED PAIR



This is an amazing off-metal mated pair of U.S. proof coinage that combines two different off-metals. This mated pair is the third known certified pair and is visually breathtaking. The original discovery was featured on the cover of Mint Error News Magazine and in CoinWeek. A clad

dime planchet and a copper cent planchet were intentionally placed in the collar at the same time and were struck by both the obverse and reverse Ike Dollar proof dies. The placement of Eisenhower's head on the obverse and the eagle on the reverse is perfectly positioned.

UNIQUE UNITED STATES PROOF MINT ERRORS



Proof coins are struck by technicians who hand feed the blanks into special presses. They are produced, examined and packaged using extreme quality control. It is very unusual to find major proof errors. A few broadstrikes, off-centers, double strikes (in collar) and off-metals have been known to be found in sealed proof sets. Proof errors are

aggressively sought after by many error collectors.

This mated pair was recently authenticated and certified by NGC and is from a 40 year old U.S. proof mint error collection. This mated pair belongs in an Eisenhower Dollar collection or a collection of major mint errors.

UNIQUE UNITED STATES PROOF MINT ERRORS



UNIQUE UNITED STATES PROOF MINT ERRORS



UNIQUE UNITED STATES PROOF MINT ERRORS



UNIQUE UNITED STATES PROOF MINT ERRORS



uspatterns.com

The Society of U.S. Pattern Collectors is dedicated to the study of many of the rarest coins struck at the U.S. Mint: patterns, die trials and experimental pieces.

Welcome to The Society of U.S. Pattern Collectors!

For those of you not familiar with this fascinating area of numismatics, patterns are prototypes for coins that, for the most part, were never approved for circulation. Most patterns are very rare, some unique, and others unknown outside of museums.

A good place to start learning about these pieces is our Beginner's Corner which includes a page on How to use this Website or the Photo Gallery which contains examples of many of the different pattern issues.

The United States Mint produced more than 1000 different patterns, as well as many die trials and experimental pieces. Despite the great rarity of many of these individual items, the great variety makes the series surprisingly collectable.

There are relatively few collectors specializing in United States pattern coinage. Most of these collectors target specific areas. For example, there are collectors who specialize in Indian Cent patterns, others collecting Morgan dollar patterns, and so on.

In addition to these specialists, there are thousands of collectors of regular issue United States coins who try to buy a few patterns to complement their collections. Many of these historical coins have wide appeal and are surprisingly affordable. There are many collectors who, for example, would like to own an 1855 Flying Eagle large cent (J-167, about 500 pieces struck) to go with their collection of large cents or with their collection of Flying Eagle small cents.

ENDING SOON: OCTOBER 5, 2026 HERITAGE ERROR COINAGE US COINS SHOWCASE AUCTION

HERITAGE
AUCTIONS
America's Auction House



Editor's Note: *Mint Error News* wants to remind error collectors that Heritage Auction's Error Coinage U.S. Coins Showcase Auction is on October 5, 2026. [Click here to view the lots.](#)

Featured Items



1964-D 1C Lincoln Cent
-- Struck on a Silver Dime Planchet --
MS63 PCGS



(1943)-P 5C Jefferson Nickel
-- Struck on a Steel Cent Planchet --
MS64 NGC



1888 10C Seated Dime
-- Struck 10% Off Center on a Type One
Planchet --
AU55 PCGS

HERITAGE

A U C T I O N S

America's Auction House

Featured Items



1929-S 25C Standing Liberty Quarter
-- Uncentered Broadstrike --
MS62 PCGS



1960 50C Franklin Half Dollar
-- Struck on a 25C Planchet --
MS64 NGC



Undated 50C Kennedy Half Dollar
-- Struck on a Five Cent Planchet --
MS65 PCGS



1979 50C Kennedy Half Dollar
-- Struck on an Anthony Dollar Planchet --
AU58 NGC



1898 \$1 Morgan Dollar
-- Struck 5% Off Center --
MS65 PCGS



Undated \$1 Eisenhower Dollar
-- Struck on a Half Dollar Planchet --
MS64 PCGS

HERITAGE U.S. COIN AUCTIONS

Visit HA.com/Coins to view upcoming auctions and auction archives.



1943 Cent
Struck on a Bronze
Planchet
AU58 PCGS, CAC
Realized \$252,000



1982-D Small Date
Cent
Struck in Bronze
AU58 NGC
Realized \$10,800



Undated Two Cent Piece
Full Brockage Obverse
MS62 Brown PCGS
Realized \$9,600



1943-S Nickel
Struck on a Zinc-Coated
Steel Planchet
AU58 NGC
Realized \$2,880



1965 Dime
Struck on a Silver
Dime Planchet
MS62 PCGS
Realized \$9,000



1971-D Quarter,
Brockage Reverse
Struck on Nickel Planchet
MS65 PCGS
Realized \$4,320



2000-D Maryland Quarter
Struck on Feeder Finger
Ungraded NGC
Realized \$15,600



1999- SBA Dollar
Struck on a Sacagawea Planchet
MS64 PCGS
Realized \$15,600



2000-P Sacagawea Dollar /
Statehood Quarter Mule
MS67 NGC
Realized \$102,000

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HIGHEST PRICES REALIZED FOR BROCKAGES ON U.S. COINS FEATURED IN HERITAGE AUCTIONS

The following brockages sold for record prices in Heritage auctions.



HIGHEST PRICES REALIZED FOR BROCKAGES ON U.S. COINS FEATURED IN HERITAGE AUCTIONS

Stunning Reverse Brockage Gold Dollar

Type Two, AU55

SOLD ON APR 24, 2014 FOR: \$38,187.50

(2014 April 23 - 27 CSNS US Coin Signature Auction - Chicago #1204 / Lot #5676)



Undated Type Two Gold Dollar -- Full Brockage on Reverse -- AU55 PCGS. One of the most extraordinary lots in the auction, this dateless example has a normal Type Two gold dollar obverse but an incuse mirror image (brockage) on the reverse. Gold-orange surfaces are lightly rubbed, as if the coin had been carried as a pocket-piece for a brief time. Errors on gold coins are extremely elusive, and when found, tend to be minor (such as a slight clip or off-center strike). To have a full, clear brockage on a Type Two gold dollar is an exceedingly rare delight, and the knowledgeable collector of error coins will bid accordingly.

Ex: Pittsburgh Signature (Heritage, 10/2011), lot 4605, which realized \$54,625.

HIGHEST PRICES REALIZED FOR BROCKAGES ON U.S. COINS FEATURED IN HERITAGE AUCTIONS



HIGHEST PRICES REALIZED FOR BROCKAGES ON
U.S. COINS FEATURED IN HERITAGE AUCTIONS



HIGHEST PRICES REALIZED FOR BROCKAGES ON U.S. COINS FEATURED IN HERITAGE AUCTIONS

Perfect Brockage Obverse

1874 Gold Dollar, MS62

SOLD ON APR 24, 2014 FOR: \$32,312.50

(2014 April 23 - 27 CSNS US Coin Signature Auction - Chicago #1204 / Lot #5677)



1874 Gold Dollar -- Mirror Brockage on Obverse -- MS62 NGC. Ex: Byers Collection. A remarkable error gold coin that shows a perfect brockage of the reverse on the obverse. The story of this error began when an 1874 gold dollar (not the present coin) stuck to the obverse die after it was struck. A new planchet (to become the present lot) was then fed in, correctly centered, and struck between the reverse die and the reverse of the previously struck coin. The brockage shows nearly complete detail, down to the veins of the cotton leaves. The brockage surface is mattelike, as made, while the reverse field is prooflike. Minimally abraded and highly desirable. Ranked #9 in the Whitman reference *100 Greatest U.S. Error Coins*, where it is described as the only known first-strike brockage on a gold coin. It is listed as #1 in the Brockages chapter of Mike Byers' *World's Greatest Mint Errors*.

HIGHEST PRICES REALIZED FOR BROCKAGES ON
U.S. COINS FEATURED IN HERITAGE AUCTIONS



HIGHEST PRICES REALIZED FOR BROCKAGES ON
U.S. COINS FEATURED IN HERITAGE AUCTIONS



HIGHEST PRICES REALIZED FOR BROCKAGES ON U.S. COINS FEATURED IN HERITAGE AUCTIONS

(1959-2008) Lincoln Cent -- Full Brockage Reverse from a Roosevelt Dime -- MS64 Red and Brown PCGS

SOLD ON DEC 23, 2024 FOR: \$18,000.00

(2024 December 23 Error Coinage US Coins Showcase Auction #60411 / Lot #52079)



HIGHEST PRICES REALIZED FOR BROCKAGES ON U.S. COINS FEATURED IN HERITAGE AUCTIONS



HIGHEST PRICES REALIZED FOR BROCKAGES ON
U.S. COINS FEATURED IN HERITAGE AUCTIONS



HIGHEST PRICES REALIZED FOR BROCKAGES ON U.S. COINS FEATURED IN HERITAGE AUCTIONS

1944 Lincoln Cent, AU50

Obverse Mirror Brockage

SOLD ON AUG 28, 2025 FOR: \$18,000.00

(2025 August 26 - 31 ANA US Coins Signature® Auction #1385 / Lot #4141)



1944 Lincoln Cent -- Obverse Mirror Brockage -- AU50 CACG. The story of the present lot begins with the coin struck immediately before it. That coin stuck to the reverse die, and served as a surrogate die to a newly fed planchet. This planchet (to become the present coin) was struck between the obverse die and the obverse of the previously struck coin. This lightly circulated chocolate-brown World War II cent has a normal obverse and an incused and reversed reverse. The strike is soft on the reverse periphery, since the obverse die was much harder than the reverse die cap, or previously struck cent. This importance of this brockage was recognized by the *Greysheet's CAC Rare Coin Market Report*, which placed the coin on the cover of the May-June-July 2024 issue.

HIGHEST PRICES REALIZED FOR BROCKAGES ON U.S. COINS FEATURED IN HERITAGE AUCTIONS



HIGHEST PRICES REALIZED FOR BROCKAGES ON
U.S. COINS FEATURED IN HERITAGE AUCTIONS



HIGHEST PRICES REALIZED FOR BROCKAGES ON U.S. COINS FEATURED IN HERITAGE AUCTIONS

1958 Washington Quarter, PR62

Brockage of Obverse on Reverse

SOLD ON JAN 5, 2017 FOR: \$12,337.50

(2017 January 4 - 9 FUN US Coins Signature Auction - Fort Lauderdale #1251 / Lot #6172)



1958 Washington Quarter -- Full First Strike Brockage of Obverse on Reverse -- PR62 PCGS. The present coin was struck between the obverse die and the obverse of a previously struck coin. The reverse side is a perfect brockage of the obverse design: reversed and incused, without any distortion, expansion, or incompleteness. An extremely rare mint error on a proof coin, which is subject to visual inspection at various points prior to shipment to the customer. A search of our online auction archives, which date to 1993, failed to identify any comparable proof brockages. The surfaces are untoned and lightly hairlined. One minor field abrasion is noted on the obverse above Washington's queue.

HIGHEST PRICES REALIZED FOR BROCKAGES ON
U.S. COINS FEATURED IN HERITAGE AUCTIONS



HIGHEST PRICES REALIZED FOR BROCKAGES ON
U.S. COINS FEATURED IN HERITAGE AUCTIONS



HIGHEST PRICES REALIZED FOR BROCKAGES ON U.S. COINS FEATURED IN HERITAGE AUCTIONS

Undated Barber Dime Brockage, AU58

Full Brockage of Reverse Design

SOLD ON JAN 7, 2012 FOR: \$11,500.00

(2012 January 4-8 US Coins & Platinum Night FUN Signature Auction- Orlando #1166 / Lot #7618)



Undated Barber dime -- Full Brockage Obverse of Reverse -- AU58 PCGS.
The obverse consists of the incuse, reverse design of a Barber dime. Both sides of this impressive piece have nearly full luster with a trace of wear. The surfaces are beautifully toned in various rainbow shades.

HIGHEST PRICES REALIZED FOR BROCKAGES ON
U.S. COINS FEATURED IN HERITAGE AUCTIONS



HIGHEST PRICES REALIZED FOR BROCKAGES ON
U.S. COINS FEATURED IN HERITAGE AUCTIONS



HIGHEST PRICES REALIZED FOR BROCKAGES ON U.S. COINS FEATURED IN HERITAGE AUCTIONS

1974-S Cent, MS64 Red and Brown Reverse Brockage From a 1973-S Cent

SOLD ON SEP 18, 2020 FOR: \$11,400.00

(2020 September 18 - 20 US Coins Signature Auction #1319 / Lot #3677)



1974-S Lincoln Cent -- Reverse Brockage of a 1973-S Cent -- MS64 Red and Brown NGC. A struck 1973-S cent and a cent planchet were fed together, one on top of the other, between 1974-S cent dies, with the reverse of the 1973-S cent facing the reverse die. The cent was rotated several degrees relative to the reverse die. The strike caused the present coin to have a 1974-S obverse and a reverse brockage from a 1973-S cent. The strike was unusually soft, with most of GOD WE on the brockage side absent, and peripheral weakness throughout the 1974-S side. A remarkable mint error. Each side has a few small carbon specks.

HIGHEST PRICES REALIZED FOR BROCKAGES ON U.S. COINS FEATURED IN HERITAGE AUCTIONS



HIGHEST PRICES REALIZED FOR BROCKAGES ON U.S. COINS FEATURED IN HERITAGE AUCTIONS



HIGHEST PRICES REALIZED FOR BROCKAGES ON U.S. COINS FEATURED IN HERITAGE AUCTIONS

Two Cent Piece, MS61 Brown

Full Brockage Obverse

SOLD ON JAN 31, 2019 FOR: \$9,600.00

(2019 January 31 - February 3 Long Beach Expo US Coins Signature Auction - Long Beach #1292 / Lot #3758)



Undated Two Cent Piece -- Full Brockage Obverse -- MS61 Brown PCGS. Struck between the reverse die and the reverse of a previously struck coin. The reverse is normal, but the obverse shows an incused, reversed, and expanded image of the reverse design. UNITED STATES OF AMERICA is absent on the brockage side, though the wreath is complete except for the ribbon ends. Such errors are rare on 19th century types. The origin of the error was a two cent piece that adhered to the obverse die during its strike. The reverse of that coin (not included) then acted as a die for a perfect brockage example (also not included). The present piece was then struck from the moderately expanded reverse of the obverse die cap.

HIGHEST PRICES REALIZED FOR BROCKAGES ON
U.S. COINS FEATURED IN HERITAGE AUCTIONS



HIGHEST PRICES REALIZED FOR BROCKAGES ON U.S. COINS FEATURED IN HERITAGE AUCTIONS



HIGHEST PRICES REALIZED FOR BROCKAGES ON U.S. COINS FEATURED IN HERITAGE AUCTIONS

1817 Matron Head Cent Brockage, Fine 12 Reverse Design on Obverse

SOLD ON SEP 16, 2024 FOR: \$7,200.00

(2024 September 16 Error Coinage US Coins Showcase Auction #60398 / Lot #52011)



(1817) Matron Head Cent, 13 Stars, N-10, R.1 -- Mirror Reverse Brockage on Obverse -- Fine 12 NGC. The reverse is normal, but the obverse displays a first strike brockage of the reverse design. A dentil dots the I in UNITED and the NIT letters step down. Such errors happen when a coin sticks to the obverse die and then acts as a die for the next fed flan. This is a well-circulated deep chocolate-brown example, well centered on both sides.

HIGHEST PRICES REALIZED FOR BROCKAGES ON
U.S. COINS FEATURED IN HERITAGE AUCTIONS



HIGHEST PRICES REALIZED FOR BROCKAGES ON
U.S. COINS FEATURED IN HERITAGE AUCTIONS



HIGHEST PRICES REALIZED FOR BROCKAGES ON U.S. COINS FEATURED IN HERITAGE AUCTIONS

**No Date Lincoln Cent -- Full Obverse Brockage From a Panama
1/10 Balboa -- MS63 Brown PCGS**

SOLD ON DEC 23, 2024 FOR: \$7,200.00

(2024 December 23 Error Coinage US Coins Showcase Auction #60411 / Lot #52115)



HIGHEST PRICES REALIZED FOR BROCKAGES ON U.S. COINS FEATURED IN HERITAGE AUCTIONS



HIGHEST PRICES REALIZED FOR BROCKAGES ON
U.S. COINS FEATURED IN HERITAGE AUCTIONS



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Fr. 1922-L \$1 1995 Federal Reserve Note
PCGS Choice About New 55PPQ
Sold for \$14,100



Inverted Third Printing Error Fr. 2302 \$5 1934A
Hawaii Federal Reserve Note
PCGS Gem New 65PPQ
Sold for \$38,187



Middlebury, VT - \$10/\$20
Double Denomination Original Fr. 412
The NB of Middlebury Ch. # 1195
PCGS Very Fine 25
Sold for \$60,000



Buffalo, NY- \$50/100
Double Denomination 1882 Date Back
Fr. 559/567 The Columbia NB Ch. # (E)4741
About Uncirculated
Sold for \$57,500



Doubled Third Printing Fr. 1935-D \$2 1976
Federal Reserve Note
PMG Gem Uncirculated 65 EPQ
Sold for \$18,000



Fr. 2084-H \$20 1996 Federal Reserve Note
PCGS Choice New 63PPQ
Sold for \$25,300

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MINT ERRORS BRING STRONG PRICES IN RECENT MONTHS IN HERITAGE AUCTIONS, STACK'S BOWERS, GREATCOLLECTIONS & MIKE BYERS

by Mike Byers (mikebyers.com)



Editor's Note: It has been a very active summer and mint error sales have been very strong. Here are a few examples from Heritage Auctions, Stack's Bowers, GreatCollections, and Mike Byers. These are worth publishing since they are either unique, brought record prices, or both.

MINT ERRORS BRING STRONG PRICES IN RECENT MONTHS IN HERITAGE AUCTIONS, STACK'S BOWERS, GREATCOLLECTIONS & MIKE BYERS

The following mint errors were recently sold by Heritage Auctions

1860-O Half Dollar Indented by Half Dime Planchet,
Mated Pair MS63 PCGS

Sold For: \$219,600.00

(2026 August 31 - September 5 ANA US Coins Signature® Auction #1396, Lot #3542)



MINT ERRORS BRING STRONG PRICES IN RECENT MONTHS IN HERITAGE AUCTIONS, STACK'S BOWERS, GREATCOLLECTIONS & MIKE BYERS

**1944 Lincoln Cent Struck on 2.9 Gm Steel Planchet
VF35 PCGS**

Sold For: \$23,790.00

(2026 June 29 Error Coinage US Coins Showcase Auction #60547, Lot #53042)



MINT ERRORS BRING STRONG PRICES IN RECENT MONTHS IN HERITAGE AUCTIONS, STACK'S BOWERS, GREATCOLLECTIONS & MIKE BYERS

**(1913-38)-S Buffalo Nickel Struck on a Silver Dime Planchet
AU58 PCGS**

Sold For: \$19,520.00

(2026 July 16 - 18 Summer FUN US Coins Signature® Auction #1394, Lot #3139)



MINT ERRORS BRING STRONG PRICES IN RECENT MONTHS IN HERITAGE AUCTIONS, STACK'S BOWERS, GREATCOLLECTIONS & MIKE BYERS

**1864 Two Cent Piece, Large Motto Double Struck
MS62 Red and Brown ANACS**

Sold For: \$18,300.00

(2026 June 29 Error Coinage US Coins Showcase Auction #60547, Lot #53157)



MINT ERRORS BRING STRONG PRICES IN RECENT MONTHS IN HERITAGE AUCTIONS, STACK'S BOWERS, GREATCOLLECTIONS & MIKE BYERS

**1965 Washington Quarter Struck on a 90% Silver Planchet
AU58 NGC**

Sold For: \$10,370.00

(2026 August 31 - September 5 ANA US Coins Signature® Auction #1396, Lot #3398)

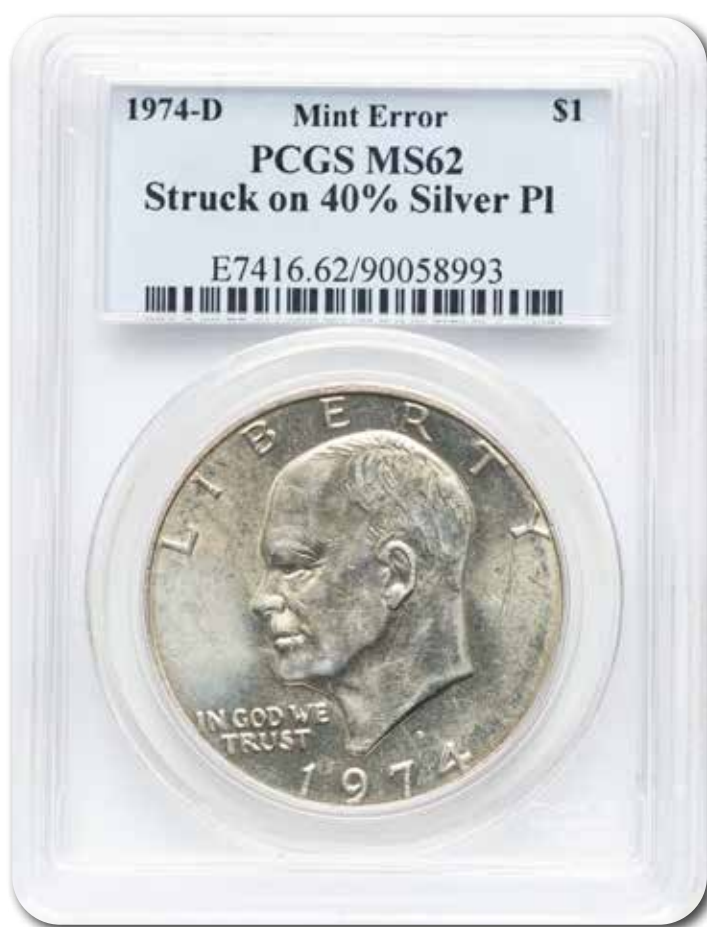


MINT ERRORS BRING STRONG PRICES IN RECENT MONTHS IN HERITAGE AUCTIONS, STACK'S BOWERS, GREATCOLLECTIONS & MIKE BYERS

**1974-D Eisenhower Dollar Struck on a 40% Silver Dollar Planchet
MS62 PCGS**

Sold For: \$8,845.00

(2026 June 29 Error Coinage US Coins Showcase Auction #60547, Lot #53423)



MINT ERRORS BRING STRONG PRICES IN RECENT MONTHS IN HERITAGE AUCTIONS, STACK'S BOWERS, GREATCOLLECTIONS & MIKE BYERS

The following mint errors were recently sold by Stack's Bowers

Two-Piece Set of 1912 Pattern Buffalo Nickels. Uniface Obverse and Reverse Electrotrials. Design by James Earle Fraser. MS-64 (PCGS).

Sold For: \$122,000

(Summer 2026 Global Showcase Auction, Lot 2048)



MINT ERRORS BRING STRONG PRICES IN RECENT MONTHS IN HERITAGE AUCTIONS, STACK'S BOWERS, GREATCOLLECTIONS & MIKE BYERS

1906 Indian Cent. Struck on a Quarter Eagle Planchet.

AU-58★ (NGC).

Sold For: \$207,400

(Summer 2026 Global Showcase Auction, Lot 2597)



MINT ERRORS BRING STRONG PRICES IN RECENT MONTHS IN HERITAGE AUCTIONS, STACK'S BOWERS, GREATCOLLECTIONS & MIKE BYERS

**(2000)-P Sacagawea Dollar. Muled with a State Quarter Obverse.
MS-67 (NGC).**

Sold For: \$158,600

(Summer 2026 Global Showcase Auction, Lot 2606)



MINT ERRORS BRING STRONG PRICES IN RECENT MONTHS IN HERITAGE AUCTIONS, STACK'S BOWERS, GREATCOLLECTIONS & MIKE BYERS

**1995 Roosevelt Dime. Muled with a Lincoln Cent Obverse.
MS-64 (NGC).**

Sold For: \$85,400

(Summer 2026 Global Showcase Auction, Lot 2601)



MINT ERRORS BRING STRONG PRICES IN RECENT MONTHS IN HERITAGE AUCTIONS, STACK'S BOWERS, GREATCOLLECTIONS & MIKE BYERS

**1993-D Lincoln Cent. Muled with Roosevelt Dime Reverse.
MS-66 RD (NGC).**

Sold For: \$53,680

(Summer 2026 Global Showcase Auction, Lot 2598)



MINT ERRORS BRING STRONG PRICES IN RECENT MONTHS IN HERITAGE AUCTIONS, STACK'S BOWERS, GREATCOLLECTIONS & MIKE BYERS

1901/0-S Liberty Head Half Eagle. FS-301. Struck 10% Off Center. MS-64★ PL (NGC).

Sold For: \$51,240

(Summer 2026 Global Showcase Auction, Lot 2607)



MINT ERRORS BRING STRONG PRICES IN RECENT MONTHS IN HERITAGE AUCTIONS, STACK'S BOWERS, GREATCOLLECTIONS & MIKE BYERS

**Undated (1913-1938) Philadelphia Mint Buffalo Nickel. Type II.
Deep Reverse Die Cap. AU-58 (PCGS).**

Sold For: \$51,240

(Summer 2026 Global Showcase Auction, Lot 2600)



MINT ERRORS BRING STRONG PRICES IN RECENT MONTHS IN HERITAGE AUCTIONS, STACK'S BOWERS, GREATCOLLECTIONS & MIKE BYERS

1976-D Eisenhower Dollar. Obverse Die Cap. MS-67 (NGC).

Sold For: \$48,800

(Summer 2026 Global Showcase Auction, Lot 2605)



MINT ERRORS BRING STRONG PRICES IN RECENT MONTHS IN HERITAGE AUCTIONS, STACK'S BOWERS, GREATCOLLECTIONS & MIKE BYERS

**1937-D Buffalo Nickel. Struck on a Cent Planchet
MS-64 BN (PCGS).**

Sold For: \$43,920

(Summer 2026 Global Showcase Auction, Lot 2599)



MINT ERRORS BRING STRONG PRICES IN RECENT MONTHS IN HERITAGE AUCTIONS, STACK'S BOWERS, GREATCOLLECTIONS & MIKE BYERS

**(1921)-S Morgan Silver Dollar. Struck 45% Off Center.
MS-63 (NGC).**

Sold For: \$39,040

(Summer 2026 Global Showcase Auction, Lot 2603)

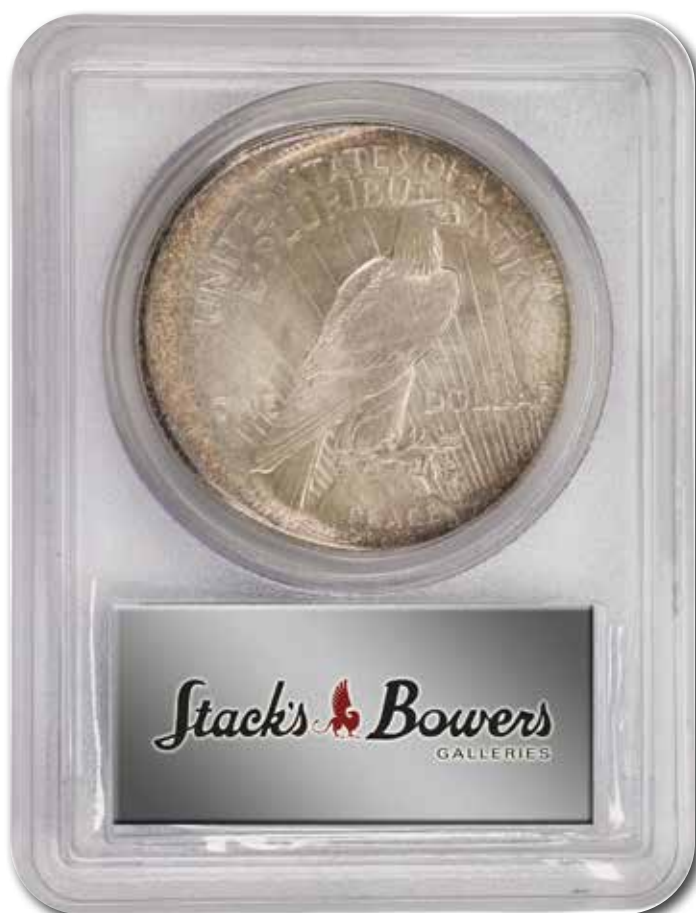


MINT ERRORS BRING STRONG PRICES IN RECENT MONTHS IN HERITAGE AUCTIONS, STACK'S BOWERS, GREATCOLLECTIONS & MIKE BYERS

**1922-S Peace Silver Dollar. Struck 15% Off Center.
MS-65 (PCGS).**

Sold For: \$31,720

(Summer 2026 Global Showcase Auction, Lot 2604)



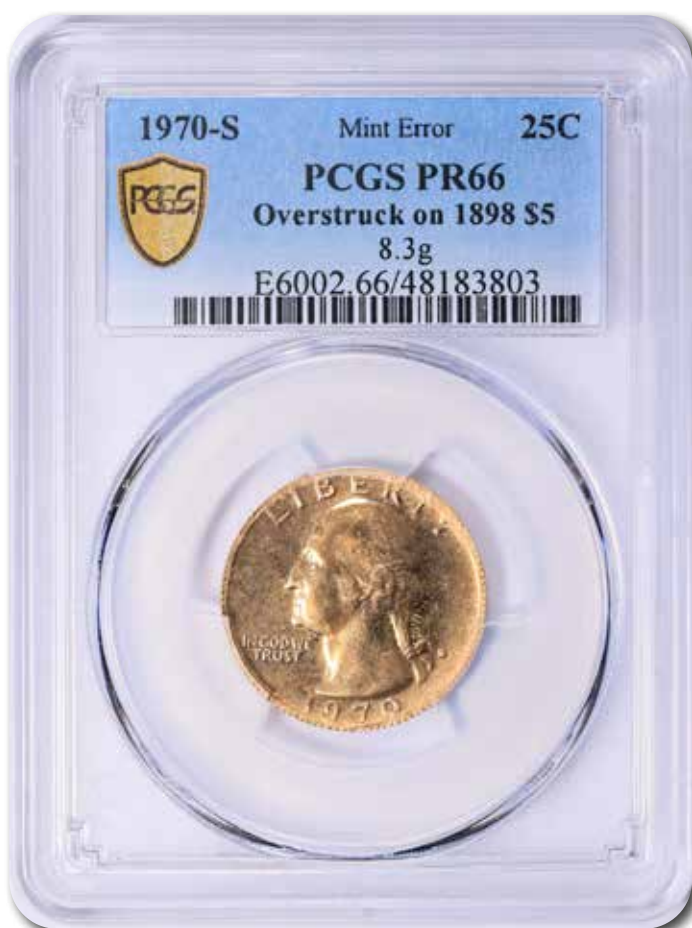
MINT ERRORS BRING STRONG PRICES IN RECENT MONTHS IN HERITAGE AUCTIONS, STACK'S BOWERS, GREATCOLLECTIONS & MIKE BYERS

The following mint errors were recently sold by GreatCollections

**“Gold Washington Quarter” 1970-S Washington Quarter
Overstruck on 1898 Gold Liberty Half Eagle 8.3g PCGS Proof-66**

Sold For: \$120,937.50

(Sep 13, 2026)



MINT ERRORS BRING STRONG PRICES IN RECENT MONTHS IN HERITAGE AUCTIONS, STACK'S BOWERS, GREATCOLLECTIONS & MIKE BYERS

**“26 Cent Coin” 2000 Lincoln Cent Struck on
2000 Statehood New Hampshire Quarter PCGS MS-65**

Sold For: \$16,962.50

(Sep 20, 2026)



MINT ERRORS BRING STRONG PRICES IN RECENT MONTHS IN HERITAGE AUCTIONS, STACK'S BOWERS, GREATCOLLECTIONS & MIKE BYERS

**1973-S Eisenhower Dollar Clad Proof Double Struck
2nd Strike 40% Off Center PCGS Proof-68 DCAM**

Sold For: \$16,875

(Sep 27, 2026)



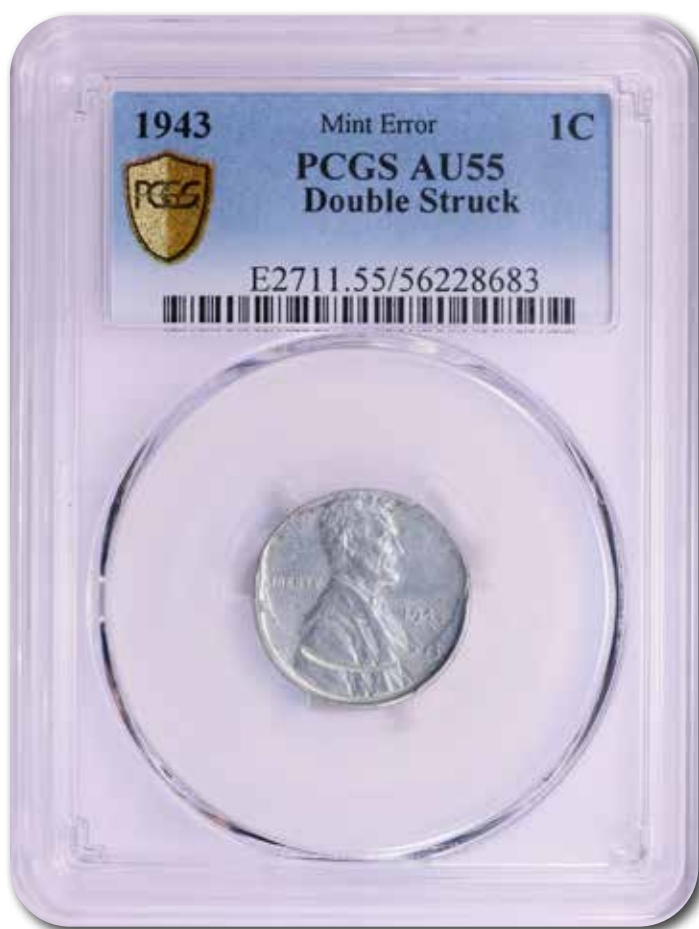
MINT ERRORS BRING STRONG PRICES IN RECENT MONTHS IN HERITAGE AUCTIONS, STACK'S BOWERS, GREATCOLLECTIONS & MIKE BYERS

1943 Lincoln Cent Double Struck PCGS AU-55

(Ex. Lonesome John)

Sold For: \$13,943.25

(Aug 30, 2026



MINT ERRORS BRING STRONG PRICES IN RECENT MONTHS IN HERITAGE AUCTIONS, STACK'S BOWERS, GREATCOLLECTIONS & MIKE BYERS

The following mint errors were recently sold by Mike Byers

**WWI Victory Medal Uncancelled Reverse Die
From The U.S. Mint in Philadelphia - Extremely Rare**

Sold For: \$75,000



MINT ERRORS BRING STRONG PRICES IN RECENT MONTHS IN HERITAGE AUCTIONS, STACK'S BOWERS, GREATCOLLECTIONS & MIKE BYERS

Mated Pair of Proof Ike Dollars Struck Off-Center on 1¢ Planchets
NGC Proof 67 RB - UNIQUE

Sold For: \$35,000



MINT ERRORS BRING STRONG PRICES IN RECENT MONTHS IN HERITAGE AUCTIONS, STACK'S BOWERS, GREATCOLLECTIONS & MIKE BYERS

1929 Buffalo Nickel Struck on 10¢ Planchet

Second Finest Known

PCGS MS 64

Sold For: \$34,000



MINT ERRORS BRING STRONG PRICES IN RECENT MONTHS IN HERITAGE AUCTIONS, STACK'S BOWERS, GREATCOLLECTIONS & MIKE BYERS

**1932 Washington Quarter Obverse Plaster Model Designed and Sculpted by Laura Gardin Fraser - Adopted Obverse Design for the 1999 \$5 Gold George Washington Commemorative
UNIQUE 11½" Plaster Model.**

Sold For: \$25,000



MINT ERRORS BRING STRONG PRICES IN RECENT MONTHS IN HERITAGE AUCTIONS, STACK'S BOWERS, GREATCOLLECTIONS & MIKE BYERS

2022-D American Women Quarter - Wilma Mankiller
Struck on 5 Cent Planchet 4.95 Grams - PCGS MS 64 - UNIQUE
Only 2 Off-Metals Known for the Series!
Sold For: \$20,000 (eBay # 278049027596)



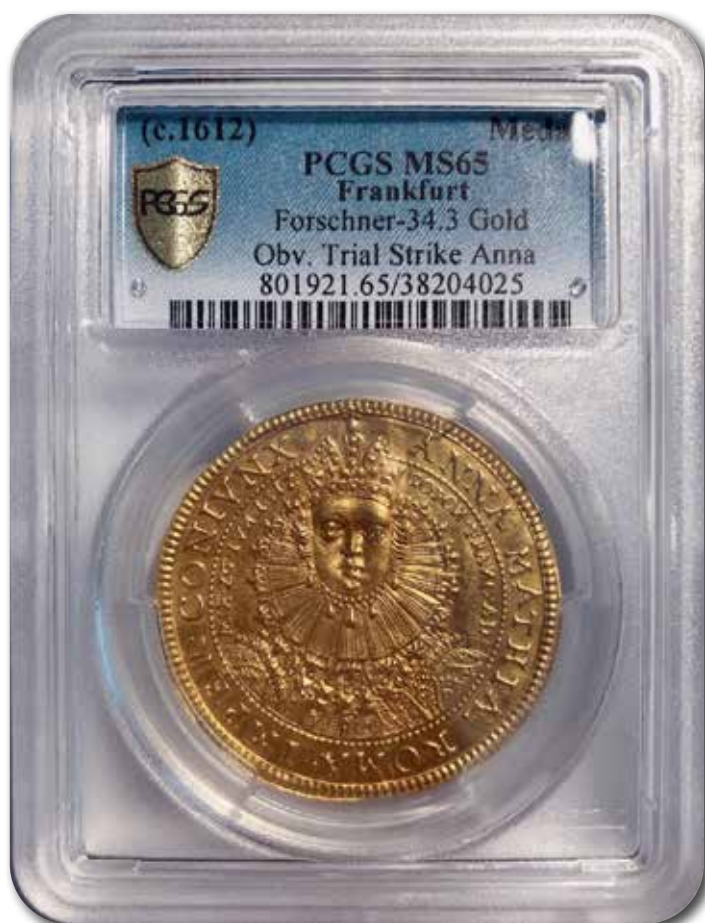
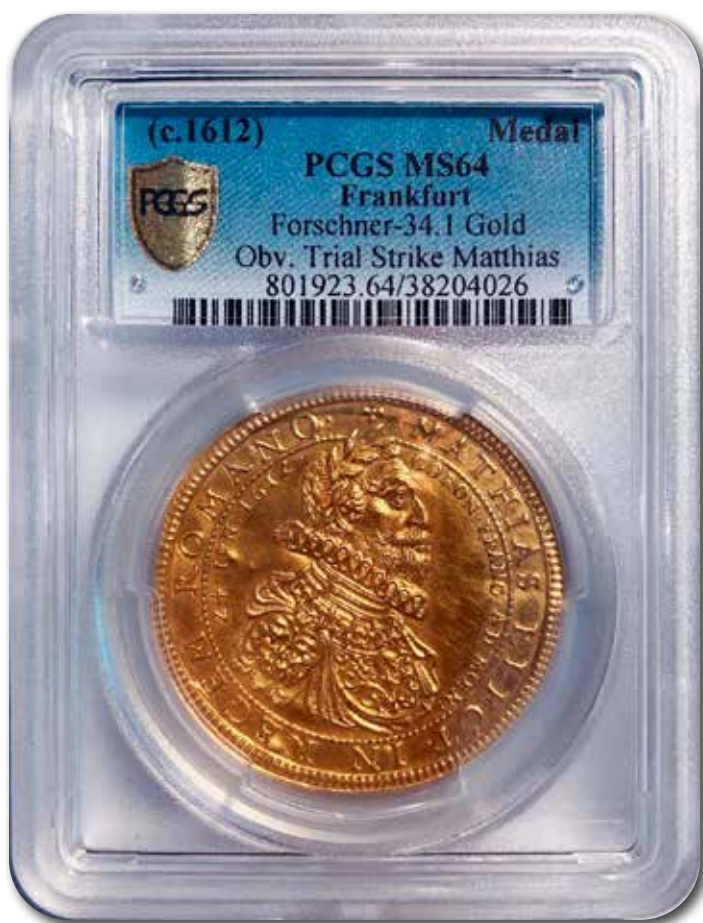
MINT ERRORS BRING STRONG PRICES IN RECENT MONTHS IN HERITAGE AUCTIONS, STACK'S BOWERS, GREATCOLLECTIONS & MIKE BYERS

Indonesia 100 Rupiah Uncancelled Die Pair
Obverse 100 Rupiah 1973 (Circulation Coin)
Reverse 100 Rupiah 1978 (Commemorative Coin)
NGC Certified & Encapsulated - Unique Discovery
Sold For: \$18,000



MINT ERRORS BRING STRONG PRICES IN RECENT MONTHS IN HERITAGE AUCTIONS, STACK'S BOWERS, GREATCOLLECTIONS & MIKE BYERS

**Gold Obverse Trial Strikes - c.1612 Gold Coronation Medals -
Matthias II and Anna - Austria - Holy Roman Empire
Listed & Illustrated in Forschner - PCGS MS65 and MS64
Sold For: \$14,640**



MINT ERRORS BRING STRONG PRICES IN RECENT MONTHS IN HERITAGE AUCTIONS, STACK'S BOWERS, GREATCOLLECTIONS & MIKE BYERS

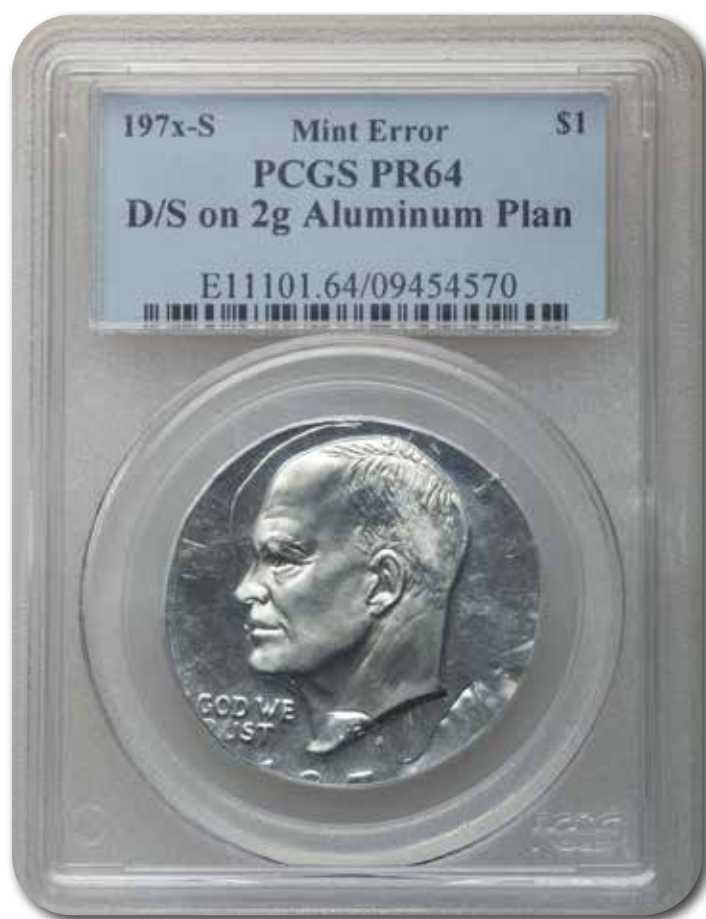
**2013-D Lincoln Shield Cent On Struck 2013-D Roosevelt Dime
Double Denomination - PCGS AU 58 - Unique for the Date**

Sold For: \$14,500



MINT ERRORS BRING STRONG PRICES IN RECENT MONTHS IN HERITAGE AUCTIONS, STACK'S BOWERS, GREATCOLLECTIONS & MIKE BYERS

**Proof 197X-S Ike Dollar - Double Struck on 2 gram
Aluminum Shell Gas Token - PCGS PR 64 - 2 Known
Sold For: \$13,500**



MINT ERRORS BRING STRONG PRICES IN RECENT MONTHS IN HERITAGE AUCTIONS, STACK'S BOWERS, GREATCOLLECTIONS & MIKE BYERS

**2023 \$5 Gold Eagle Struck on an Elliptical Planchet
3 Grams - NGC MS 69 - UNIQUE**

Sold For: \$7,500



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MAJOR ERRORS STRUCK BY PRIVATE U.S. MINTS - PART TWELVE -

by Jeff Ylitalo



Pprivate U.S. Mints and in house metal refineries have numbered in the dozens over the years. Major minting errors from silver rounds to gambling tokens are very popular and eagerly sought by collectors. Erratic record keeping of mintage numbers and identifying

which private mint produced major errors can be a challenge to research. It is in-fact on occasion impossible because many rounds and tokens were struck with no identification such as a specific mint's name, privy mark, or mintmark.

MAJOR ERRORS STRUCK BY PRIVATE U.S. MINTS - PART TWELVE

First is a vintage 'Bad River Band' No Cash Value gaming token. Bad River Lodge and Casino is located in Odanah, Wisconsin in the Northwoods near the south shores

of Great Lake Superior. Bad River Band Chippewa gaming tokens were struck in the 1990s following the signing of a tribal compact in 1991.



MAJOR ERRORS STRUCK BY PRIVATE U.S. MINTS - PART TWELVE

This spectacular error was multi-struck with a full reverse brockage on the obverse face. The obverse sustained a partial indent from an intruding planchet. The images say everything!

It was struck by Green Duck Corporation (GDC). GDC started in Chicago, IL. GDC began in the

early 1900s and changed ownership numerous times for over nine decades. It was last located in Hernando, Mississippi closing in the 1990s. Refer to Part Ten in a previous issue of *Mint Error News Magazine* for more details on the fascinating history of GDC. To learn more about this historic private mint [click here](#).



MAJOR ERRORS STRUCK BY PRIVATE U.S. MINTS - PART TWELVE

Next, a vintage 1993 \$1 brass Luxor Casino gambling token. There were two versions of this Luxor Casino token. The first was struck with a ringed pattern of Egyptian hieroglyphics on both the obverse and reverse. The second version was struck without a ringed pattern of hieroglyphics on either obverse or reverse. This error is the first version.



MAJOR ERRORS STRUCK BY PRIVATE U.S. MINTS - PART TWELVE

This huge multi-struck die-cap error should have the portrait of Egyptian Queen Nefertiti on the reverse. Instead there is a huge expanded brockage of the obverse design on the reverse face.

A side by side comparison image

of this massive error with a normal sized strike is shown.

It was struck by Nevada Coin Mart (NCM) which began operations in the late 1960s. NCM is still active today. NCM is located in Las Vegas, Nevada.





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SURFACE ISSUES IN U.S. JEFFERSON WAR NICKELS:

INSIGHTS FROM A DUAL ANALYSIS METHOD: XRF AND SEM/EDS ANALYSES

BY JOHN LORENZO

Introduction: Manganese played a significant role in the lamination problems that plagued WWII Jefferson nickels because of how it behaves during melting, oxidation, and mechanical working of the wartime alloy. When the U.S. Mint substituted silver and manganese for nickel in 1942, they created a ternary (i.e., three) metal alloy system—Cu-Ag-Mn (Copper/Silver/Manganese)—that was never fully compatible metallurgically. Manganese has a strong affinity for oxygen, far stronger than copper or silver, so even under controlled furnace conditions it readily forms oxides during melting. These oxides do not dissolve back into the metal; instead, they remain as hard, brittle particles suspended in the alloy. From the moment the strip is cast, the metal already contains microscopic inclusions that resist bonding with the surrounding silver (Ag)/copper (Cu) matrix.

As the strip is rolled to final gauge, those manganese-rich inclusions become stretched into long, thin stringers (i.e., a stretched area of impurities). Because the oxides and sulfides do not deform plastically, the surrounding copper–silver matrix flows around them, elongating them into continuous seams. These seams are mechanically weak: they interrupt grain boundaries (i.e., metal junctions), create discontinuities in the metal’s internal framework, and act as pre-existing fracture planes (i.e., crack paths). Even before a blank is punched or a coin is struck, the alloy contains built-in layers that are poorly bonded and are prone to separation.

During striking, the high-pressure metal flow further concentrates these manganese-oxide stringers near the surface, where the metal is under the greatest strain. This is why war nickels often show fine, parallel streaking—evidence of the elongated inclusions aligned with die flow. The surface enrichment of manganese, combined with the brittle nature of its oxides, creates a thin zone where the metal is especially vulnerable. Any post-mint stress—circulation wear, pocket impacts, or even mild thermal cycling in coin circulation—can exploit these weak seams, causing the surface metal to lift, peel, or flake.

Over time, the result is a lamination behavior where the problem is not simply that manganese is present, but that its chemical tendencies and mechanical incompatibility of Mn with the Cu-Ag matrix creating inclusions the U.S. Mint could not eliminate. The wartime alloy was a compromise born of necessity, and its internal flaws were locked in from the moment the strip solidified.

SEM/EDS and XRF complement each other almost perfectly when you’re trying to understand manganese-oxide stringers (see the Definition section) or other elongated Mn-rich anomalies on wartime alloys. SEM gives you high-resolution imaging showing the actual morphology of these features—whether they appear as thin seams, nodules, or discontinuous oxide trains running along worked grain flow. Backscattered electron (BSE) contrast makes Mn-oxide phases stand out clearly because they have a different average atomic number than the surrounding Cu–Ag matrix. Once you locate them visually, point EDS or line scans can confirm their chemistry, showing Mn with associated oxygen, sometimes accompanied by minor environmental contaminants such as S (sulfur) and/or Cl (chlorine) depending on the specific oxide/sulfide/chloride mixture.

SURFACE ISSUES IN U.S. JEFFERSON WAR NICKELS: INSIGHTS FROM A DUAL ANALYSIS METHOD: XRF AND SEM/EDS ANALYSES

XRF then gives you the bulk context that SEM/EDS cannot. Because XRF penetrates a much deeper and wider volume than SEM/EDS, it captures the overall Mn content and flags whether the alloy contains enough manganese for these oxide seams to be metallurgically expected. Even though XRF cannot spatially resolve the stringers, it confirms that the anomalies you see under SEM are not contaminants or isolated defects—they're the surface expression of a broader Mn-bearing system within the coin's alloy. When you combine the two methods, SEM/EDS tells you *where* and *what* the anomalies are, while XRF tells you *how much* manganese is present in the bulk and whether the observed features fit the expected alloy chemistry. Together, they give you a complete, non-destructive picture of Mn-oxide behavior in these coins. We explore these XRF and SEM/EDS assay differences in this paper.

Analytical Methodology

SEM (Scanning Electron Microscope) equipped with EDS (Energy Dispersive X-ray Spectrometer) can capture detailed images and identify elements simultaneously on the surface of coins. For imaging, SEM is widely used since it needs minimal sample preparation and produces excellent resolution, unique contrast, and a large depth of field. When paired with an EDS system, elemental information of the imaged area can also be derived. SEM/EDS is ideal for imaging and elemental analysis applications requiring higher resolution than optical microscopy and identifying elemental make up (1).

In SEM, an image is formed by scanning a focused electron beam, usually with energies of 1 to 20 keV, across a sample and detecting the ejected secondary or backscattered electrons. The incident electron beam, when imparting energy to the sample, can cause emission of x-rays that are characteristic of the sample atoms. The energies of the x-rays are characterized (3).

The typical spatial resolution of SEM imaging is about 5-10 nanometers. SEM-based EDS is primarily a qualitative technique providing data for an area only about a micrometer in diameter and a micrometer deep (1).

The strengths of SEM/EDS lie in its ability to provide rapid, high-resolution imaging, and enabling quick identification of elements present. Its excellent depth of field and versatility as a platform supporting various tools make it an asset.

XRF has some advantages over SEM/EDS analysis. X-ray fluorescence (XRF) offers truly non-destructive, in-situ analysis of a coin's elemental composition without the need for high vacuum conditions or extensive sample preparation. Unlike SEM/EDS, which requires placing the specimen inside a vacuum chamber, handheld or benchtop XRF instruments can rapidly probe coins in their entirety—preserving patina, surface treatments, and historical residues. This makes XRF particularly well-suited for museum or field studies where maintaining the artifact's integrity is paramount. Additionally, XRF's larger analytical footprint averages over a broader area, reducing the risk of misinterpreting localized inclusions or surface contaminants as representative of the whole alloy.

Beyond logistical conveniences, XRF typically achieves superior sensitivity for many trace and heavier elements (e.g., Sn, Pb, Ag) that are critical for distinguishing minting practices.

SURFACE ISSUES IN U.S. JEFFERSON WAR NICKELS: INSIGHTS FROM A DUAL ANALYSIS METHOD: XRF AND SEM/EDS ANALYSES

The deeper penetration depth of keV-scale X-rays means XRF samples slightly below the surface, offering a more bulk-reflective composition than the sub-micron interaction volume of SEM/EDS, which mostly captures only the very topmost layers. This bulk perspective improves statistical reliability when comparing coins across collections or establishing provenance based on minor alloying additions—core to numismatic metallurgy research. The main disadvantage of XRF is that many XRF devices if not analyzing in a vacuum chamber cannot pick up the lighter elements like sulfur and chlorine (i.e., two of the most common environmental contaminant metals found on almost all coin surfaces in particular for coins a century old or older) whereas SEM/EDS which must operate in a vacuum chamber can detect these lighter elements.

Table 1. Pre-Screening XRF Analysis of Coins #1–#3 (Surface Triplicate Analyses: Replicates (Rep) #1–#3) *: Copper (Cu), Manganese (Mn), Zinc (Zn) & Silver (Ag).

Coin	Rep*	Cu (%)	Fe (%)	Ni (%)	Mn (%)	Zn (%)	Sn (%)	Ag (%)	Pb (%)	Se (%)
1	1	54.45	ND	ND	8.21	0.12	ND	37.08	ND	ND
	2	54.22	ND	ND	8.14	0.12	ND	37.37	ND	ND
	3	53.80	ND	ND	8.29	0.12	ND	37.66	ND	ND
2	1	53.76	ND	ND	6.01	0.42	ND	39.48	ND	ND
	2	53.73	ND	ND	5.35	0.38	ND	40.10	ND	ND
	3	52.87	ND	ND	6.56	0.39	ND	40.04	ND	ND
3	1	54.22	ND	ND	8.10	0.39	ND	37.21	ND	ND
	2	54.47	ND	ND	8.21	0.13	ND	37.12	ND	ND
	3	54.34	ND	ND	8.84	ND	ND	36.58	ND	ND

**Three total random target points were selected on both the obverse and reverse. The Red Book alloy composition is 56% Cu, 35% Ag & 9% Mn. Zinc at 0.12–0.39% is fully consistent with trace Zn naturally present in copper refinery feedstock and residual brass equipment contamination.*

Overall Microstructure Assessment

Sulfur & Chloride Incompatibility in Jefferson War Nickels

Sulfur and chloride contamination interact with the wartime Cu-Ag-Mn alloy in ways that amplify the weaknesses manganese already builds into Jefferson war nickels. **The alloy begins this delamination process with manganese-rich oxides throughout the metal—brittle, non-metallic phases that never fully bond with the surrounding matrix. These inclusions are the root cause of the series’ chronic lamination issues.** When sulfur or chloride is introduced later in the coin’s life through environmental exposure, they don’t create new manganese problems from scratch, but they **do exploit and accelerate the instability of those Mn-bearing phases**, especially near the surface where manganese enrichment is present with these environmental contaminants of chlorine and sulfur.

Sulfur is the more reactive of the two, and it readily attacks both copper and silver. But in the war-nickel alloy, sulfur also interacts with the manganese-rich inclusions.

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MnS (Manganese sulfide) is already a common inclusion in the alloy, and additional sulfur exposure can darken, embrittle, or expand these sulfide sites. Because MnS is mechanically weak, any growth or alteration of these inclusions increases the likelihood that the surrounding metal will separate along those planes. In practice, sulfur contamination doesn't *cause* laminations, but it can worsen the visibility and severity of existing manganese-driven separation zones, especially in areas where stringers (i.e., elongated or weak seams) that reach the surface.

Chlorides behave differently. They don't bond strongly with manganese the way sulfur does, but they aggressively attack copper, and to a lesser extent silver. In a war nickel, chloride-driven corrosion tends to initiate at microcracks, seams, and inclusion boundaries—exactly the places where manganese-oxide stringers already weaken the structure. Once chlorides penetrate these seams, they can widen them through underfilm corrosion (i.e., underlayer corrosion), making lamination edges lift more easily. Chlorides don't chemically destabilize manganese oxides, but they exploit the mechanical weakness those oxides create, turning microscopic flaws into visible separations.

Both contaminants also interact with the surface enrichment of manganese that forms during rolling and striking. The outermost layer of a war nickel often contains a higher concentration of Mn-oxide particles than the bulk alloy. This zone is already brittle, and contaminants that promote corrosion or sulfide formation can accelerate the breakdown of the thin metal above the stringers. The result is a coin that becomes more prone to flaking, peeling, or developing darkened, cratered spots where inclusions intersect the surface. Sulfur and chloride do not create manganese-related lamination problems on their own, but they absolutely amplify the vulnerabilities manganese builds into the alloy. Sulfur can chemically modify Mn-bearing inclusions, while chlorides mechanically exploit the weak planes those inclusions create. The wartime alloy was already compromised by manganese's chemistry; environmental contaminants simply push those flaws further toward visible failure.

Sampling Methodology

The goal was first to perform XRF screening (refer to Table 1 above) without any coin polishing which is normal for this preliminary phase as not to disrupt the surface and then use SEM/EDS analysis to analyze three Jefferson War nickels with various degrees of laminated surface deformities seen in Coins #1, #2 & #3. Each coin to be analyzed will be illustrated and their surface features identified. The coins for SEM/EDS analysis were also *not polished* although this is a standard operating procedure to remove the so-called "corrosion layer" of the coin's surface to get a true idea of their alloy. In this case polishing is not being performed with these war nickels, as the last thing we want to do is mechanically "improve" the upper most tier of the surface so we can study it. In other words, the top 1–5 microns are precisely where the alloy's manganese-related effects are occurring, and any polishing—no matter how performed will remove or smear away the very evidence we are trying to interpret. This depth of 1-5 microns is the average penetration depth of SEM/EDS unlike XRF which can usually go to 50 microns on average into the coin's upper surface (1). So in this study we will see metals which are not part of the original alloy.

SURFACE ISSUES IN U.S. JEFFERSON WAR NICKELS: INSIGHTS FROM A DUAL ANALYSIS METHOD: XRF AND SEM/EDS ANALYSES

These coins already have a fragile, manganese-enriched skin created during rolling and striking. That thin layer contains high concentration of Mn-oxide particles, stringer terminations, and micro-seams. Once you abrade it, even lightly, you're no longer studying the wartime alloy we wish to study just a surface preparation area where all the evidence has been polished away.

The corrosion layer itself is also part of the story. Manganese oxides and Mn-Cu mixed oxides behave differently from copper oxides, and their presence in the top few microns is diagnostic. They tend to darken, form nodules, and create brittle islands that correlate with lamination planes beneath. If you polish through that layer, you erase the oxidation morphology that tells you how manganese is interacting with the environment. In a war nickel, the corrosion layer is not "damage" to be removed—it's a readable record of how Mn-bearing inclusions have aged, reacted, and sometimes expanded around this top 1–5-micron layer. It's been recorded that simple surface polishing can easily remove 1-10 microns of surface metal – obviously an unwanted procedure in this study (2).

Another reason to avoid polishing is that the alloy's internal architecture is already compromised. The Mn-oxide and MnS stringers sit just below the surface and they're extremely thin. Polishing can open them, smear them, or create false lamination edges that mimic natural defects. Once that happens, you can't reliably distinguish original metallurgical features from artifacts of surface preparation. For a series where lamination analysis depends on subtle visual cues, that's a serious loss of information.

By contrast, analyzing the top 1–5 microns in situ—whether by microscopy, low-angle lighting, or non-destructive spectroscopy—lets you see the manganese story intact. You can observe the oxide globules, the streaking patterns, the micro-cracks at stringer terminations, and the way contaminants like sulfur or chlorides preferentially attack Mn-rich zones. All of that disappears the moment you mechanically "polish" the surface.

So again the best practice here was to leave the surface untouched and treat the top few microns as the primary evidence layer. War nickels are one of the few U.S. coinage alloys where the surface is more informative than the bulk and preserving that fragile Mn-enriched skin is essential if you want to understand how the alloy behaves, corrodes, and ultimately delaminates. Some corrosion layers can be as thick as 250 μm (3) but of course vary from coin to coin, its age, surface condition, if ever buried and how it has been exposed to the environment. In this case this coin's corrosion layer will remain un-polished for reasons given above previously. We simply deal with these other environmental contaminants in our assay results such as sodium (Na), potassium (K), zinc (Zn) and calcium (Ca) and explain them in our assay's (i.e., Map Sum Summaries).

The author is sending these samples to an independent third-party laboratory at the Michigan State University Research Technology Support Facility in East Lansing, Michigan. This author has worked with this Laboratory before on similar three tier SEM/EDS types of analyses. The results of this section will be for the examination of "select" target coin areas chosen by this author and MSU. Initially an EDS metal assay by weight percentages is calculated on what is called a Map Sum Summary. Previous magnification studies here have been performed at a 400X magnification.

SURFACE ISSUES IN U.S. JEFFERSON WAR NICKELS: INSIGHTS FROM A DUAL ANALYSIS METHOD: XRF AND SEM/EDS ANALYSES

This is followed by a SEM Photomicrograph Microstructure of the same area as the Map Sum Summary under a chosen specific magnification level (i.e., normally at 400X) to verify the coin's microstructure as either twin (grain) line - die struck and not a dendritic cast microstructure.

Finally, a Point & ID SEM Micrograph is performed showing the different Black and White (B&W) type shaded areas of the selected SEM Photomicrograph (i.e., either called a Micrograph or Photomicrograph - both terms are acceptable) and what metal or metal areas these spectrum areas constitute. In other words, the SEM/EDS apparatus in this case can target different Black & White (B&W) shaded regions of the SEM micrograph (i.e., microstructure area) and then determine which metals appear in these areas and these are classified as discrete spectrum areas. This is done normally at a 1000X level magnification.

Each area is numbered, and the associated metal assay results are displayed for each spectrum area. This three-part reporting scheme (Map Sum Summary/Microstructure Photomicrograph/Point & ID Analysis) will become clearer once the results are presented. The reader at this point may wish to review the Glossary of the Definition Terms at the end of this paper to get a better feel for these scientific terms prior to reviewing the SEM/EDS data section.

Pictorial Overview of the Three Coins in this Study

Specimen #1: Jefferson Nickel. 1943-S 21.13 mm, 4.73 grams. XRF preliminary analysis targeting the area under Jefferson's chin as a possible high area of Manganese oxide (MnOx) particles forming on the surface and starting their delamination process with the coin's surface.

Purpose of the SEM/EDS Analysis for Coin #1: SEM/EDS at the spot beneath Jefferson's chin allows you to directly verify whether the darkened, brittle surface features identified by XRF are in fact manganese-oxide or manganese-sulfide enriched zones beginning to detach from the matrix. High-resolution SEM imaging will reveal the morphology of these features—whether they appear as lifted scales, micro-cracks, or thin oxide seams consistent with early-stage delamination. EDS point and line analyses then confirm the local chemistry, distinguishing true Mn-rich corrosion products from ordinary cuprite or environmental deposits. Together, these methods provide the microstructural and compositional evidence needed to document how manganese-driven inclusions are initiating surface failure on this 1943-S war nickel.

SURFACE ISSUES IN U.S. JEFFERSON WAR NICKELS: INSIGHTS FROM A DUAL ANALYSIS METHOD: XRF AND SEM/EDS ANALYSES



Figure 1: Jefferson Nickel. 1943-S 21.13 mm, 4.73 grams. The manganese-oxide concentration beneath Jefferson's chin (red arrow pointed area) on this 1943-S war nickel represents a classic early-stage surface failure zone in the wartime Cu–Ag–Mn alloy. In this region, Mn-rich oxides have migrated toward the surface and begun forming brittle, darkened patches that sit within the surrounding metal. These oxide clusters often mark the initiation point for micro-lifting and shallow delamination because the Mn-oxide phase bonds poorly to the copper-silver (Cu/Ag) matrix. The spot you're seeing is essentially the visible expression of that weak interfacial chemistry—an area where the alloy's internal instability is beginning to break through the surface. Under a stereo microscope at 40-50X the Mn-oxide appear as individual circular spheres all tightly agglomerated together as seen by this author in this location under Jefferson's chin area.

SURFACE ISSUES IN U.S. JEFFERSON WAR NICKELS: INSIGHTS FROM A DUAL ANALYSIS METHOD: XRF AND SEM/EDS ANALYSES

Specimen #2: Jefferson Nickel. 1943-P 21.11 mm, 4.73 grams. A severe lamination streak in the lower part of the obverse of approximately 8.35 mm or ~40% of the obverse surface is observed. As a lamination of this scale continues to evolve, the weakened Mn-oxide/MnS/MnCl planes begin to propagate laterally, allowing the separation front to creep farther across the struck surface. Mechanical stresses from circulation, temperature cycling, and even minor handling gradually lift the already-compromised metal, turning a narrow fissure into a broad, sheet-like peel. As the internal oxide stringers elongate and lose cohesion, the overlying metal loses structural support and begins to buckle, creating raised, warped, or curling edges along the 40% affected zone. Eventually, portions of the surface may detach entirely, possibly exposing darker, Mn-rich substrate material and leaving an irregular, cratered void where the lamination finally broke free.



Figure 2: This 1943-P war nickel shows a broad, advanced lamination zone where a mechanically weak internal plane has migrated outward and now dominates nearly half of the obverse surface. As the defect expanded, the underlying Mn-oxide/MnS-rich/Mn-Cl rich layer lost cohesion with the surrounding Cu-Ag matrix, allowing the upper metal sheet to lift, buckle, and fracture along its weakest lines. Circulation stress then widened the separation, turning what began as a narrow internal flaw into a sprawling, sheet-like peel with irregular edges and stepped elevation changes. Over time, portions of the lifted metal thin out, curl, or detach entirely, exposing darker substrate material and leaving a rough, unstable surface. This stage represents the late evolution of a lamination—where the defect is no longer subtle but has become a dominant structural failure across the coin's lower obverse.

SURFACE ISSUES IN U.S. JEFFERSON WAR NICKELS: INSIGHTS FROM A DUAL ANALYSIS METHOD: XRF AND SEM/EDS ANALYSES



Figure 2A. The dark area patch (refer to the area pointed by the red arrow) directly to the left of “3” in the date 1943 within the advanced lamination zone represents a possible localized concentration of manganese-oxide phases that migrated toward the surface as the internal failure plane expanded. In wartime Cu–Ag–Mn alloys, these clusters typically consist of mixed-valence MnOx species—most commonly MnO, Mn₃O₄, and Mn₂O₃—reflecting the alloy’s highly oxidizing melt conditions and manganese’s strong affinity for oxygen. MnO often forms the core of these inclusions, while Mn₃O₄ and Mn₂O₃ develop as secondary, more brittle surface films that darken with age and circulation exposure. The presence of these heterogeneous Mn-oxide phases weakens the surrounding matrix, promoting micro-lifting, fracture propagation, and the stepped, unstable surface now visible in the lamination field. Their concentration in this region marks a chemically active failure zone rather than a purely mechanical rolling-mill lamination. This area was chosen as the primary target shot for Specimen #2 for the three-part SEM/EDS Triple Tier analysis (Map Sum Summary – Assay, Microstructure and Point & ID Analysis).

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Specimen #3 Jefferson Nickel. 1943-P 21.12 mm, 4.68 grams. Severe lamination peel away in the lower part of the obverse where the tip of peel away end is ~1.8mm above the surface! As a lamination of this scale continues to evolve, the weakened Mn-oxide/MnS/MnCl planes begin to propagate laterally, allowing the separation front to creep farther across the struck surface as in Coin #2. Mechanical stresses from circulation, temperature cycling, and even minor handling gradually lift the already-compromised metal, turning a narrow fissure into a broad, sheet-like peel. The internal oxide stringers elongate and lose cohesion; the overlying metal loses structural support and begins warped. Eventually, portions of the surface are nearly detached entirely, exposing darker, Mn-rich substrate material underneath. Visually inspecting underneath this peel away layer we see dark rich Mn-oxide layers and some white powdery layer which was confirmed as AgCl (silver chloride). Silver chloride does not delaminate this coin. AgCl never laminates a WWII nickel because it's a surface-only corrosion product—a soft, powdery film that forms *after* the metal is already exposed. It has no internal presence, no expansion pressure, and no mechanical strength, so it cannot lift or separate bonded metal layers. Only Mn-oxide/Mn-sulfide/Mn-chloride stringers inside the Cu–Ag–Mn alloy create the weak planes and expansion forces that drive true wartime lamination.



Figure 3: A massive almost peeled away area in the lower part of the obverse.

SURFACE ISSUES IN U.S. JEFFERSON WAR NICKELS: INSIGHTS FROM A DUAL ANALYSIS METHOD: XRF AND SEM/EDS ANALYSES



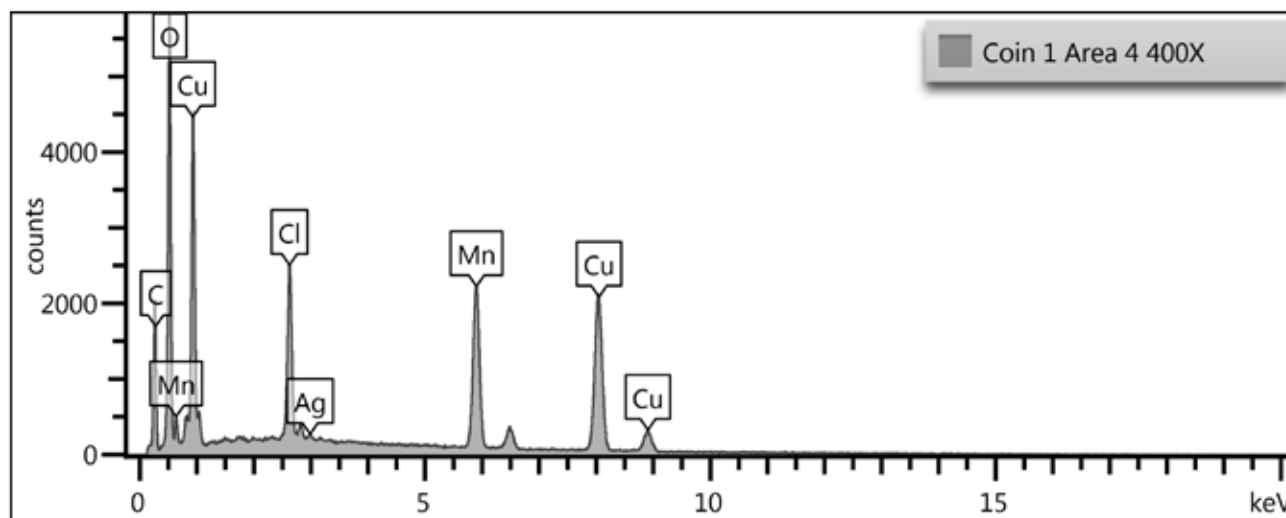
Figure 3-a. Side view angle shot of the peeled away area. The red arrow marks a dark area seen under the peeled away area and is a possible large accumulation of Mn-oxide based on preliminary XRF surface analyses. We have seen as in Coin #1 where Mn-oxide has broken through the surface and in coin #2 has created a massive lamination streak almost entailing half the obverse. In this case for coin #3 it has generated an incredible peeled away situation. In coin #3 the target shot for SEM/EDS analysis will be in this red arrow target zone to further confirm manganese's role in these WWII issues.

In all three coins we will look at these dark areas through The Triple-Tier Analysis approach: A metal assay (i.e., Map Sum Summary), a microstructure photomicrograph at a 400X magnification level at the same target point area and then still in the same associated area the Point & ID summary at a 1000X magnification level. As explained earlier there can be no polishing done on these sensitive Mn-oxide areas so as not to remove them. Hence, we may see other environmental contaminants but, in this case, these unwanted metals cannot be avoided in this study as polishing the surface to see the so-called true alloy will polish away all the surface manganese that has migrated to the surface initiating the delamination process. It's one situation where an SEM/EDS analysis will have to deal with a top corrosion layer unfortunately remaining intact.

SURFACE ISSUES IN U.S. JEFFERSON WAR NICKELS: INSIGHTS FROM A DUAL ANALYSIS METHOD: XRF AND SEM/EDS ANALYSES

SEM/EDS Analytical Results Coins #1-3:

Coin #1 Map Sum Summary



Element	Line Type	Apparent Concentration	k Ratio	Wt%	Wt% Sigma	Standard Label	Factory Standard
C	K series	2.11	0.02106	24.18	0.35	C Vit	Yes
O	K series	9.88	0.03323	25.00	0.23	SiO2	Yes
Cl	K series	1.96	0.01715	4.60	0.06	NaCl	Yes
Mn	K series	6.00	0.06001	14.09	0.14	Mn	Yes
Cu	K series	12.35	0.12350	31.57	0.26	Cu	Yes
Ag	L series	0.21	0.00211	0.56	0.08	Ag	Yes
Total:				100.00			

Figure 4-a: Map Sum Summary of Coin #1. Jefferson Nickel. 1943-S. 21.13 mm, 4.73 grams.

Extrapolating out the carbon and oxygen and assuming equal mixing with Mn, Cu & Ag the extrapolated figures are Mn (27.7%), Cu (62.1%) & Ag (1.1%). Since the original WWII alloy as per the U.S. Red Book is Cu 56%, Ag 35% & Mn 9% this area analyzed is a Cu-rich, Mn-rich and Ag poor region. As we investigate further, some regions are Cu-rich, Ag-rich and Mn-rich. Since XRF scans deeper and wider than SEM/EDS it could not pick up surface enriched Mn areas. Reviewing all the data and now with SEM/EDS its clear Mn-oxides cause lamination issues due to its inability to mix with Cu/Ag matrix and it's wanting to enrich the surface layer and here combining with chlorine and sulfur further causing the immediate areas around the Mn-rich areas to delaminate. In this study we confirm this further by looking at the microstructure (400X magnification) for coin #1 (Figure 4-a). We then look at the same microstructure area but at a greater magnification with Point & ID Analysis at 1000X magnification level which is more readily able to pick out the different metallurgical regions based on their light intensities. The reader is asked to be patient as we proceed with this three-tier system of Map Sum Summary/Microstructure/Point & ID Analysis which becomes clearer to understand when we view all three tiers together.

SURFACE ISSUES IN U.S. JEFFERSON WAR NICKELS: INSIGHTS FROM A DUAL ANALYSIS METHOD: XRF AND SEM/EDS ANALYSES

Coin #1 Microstructure.

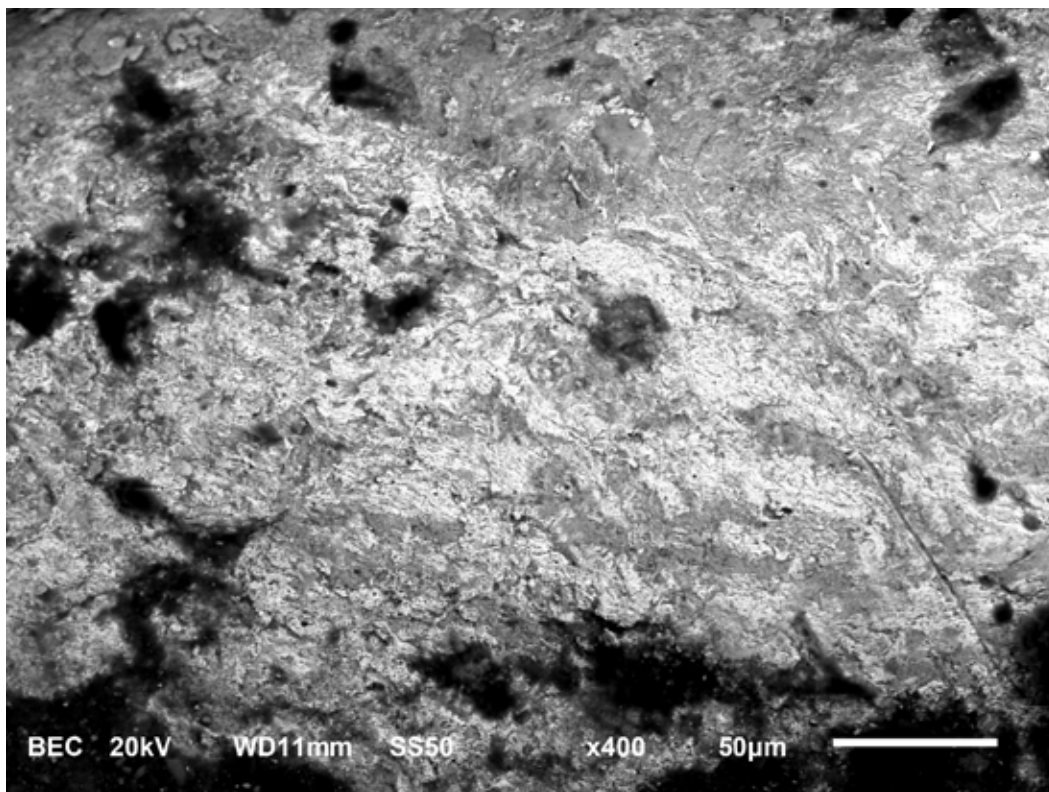
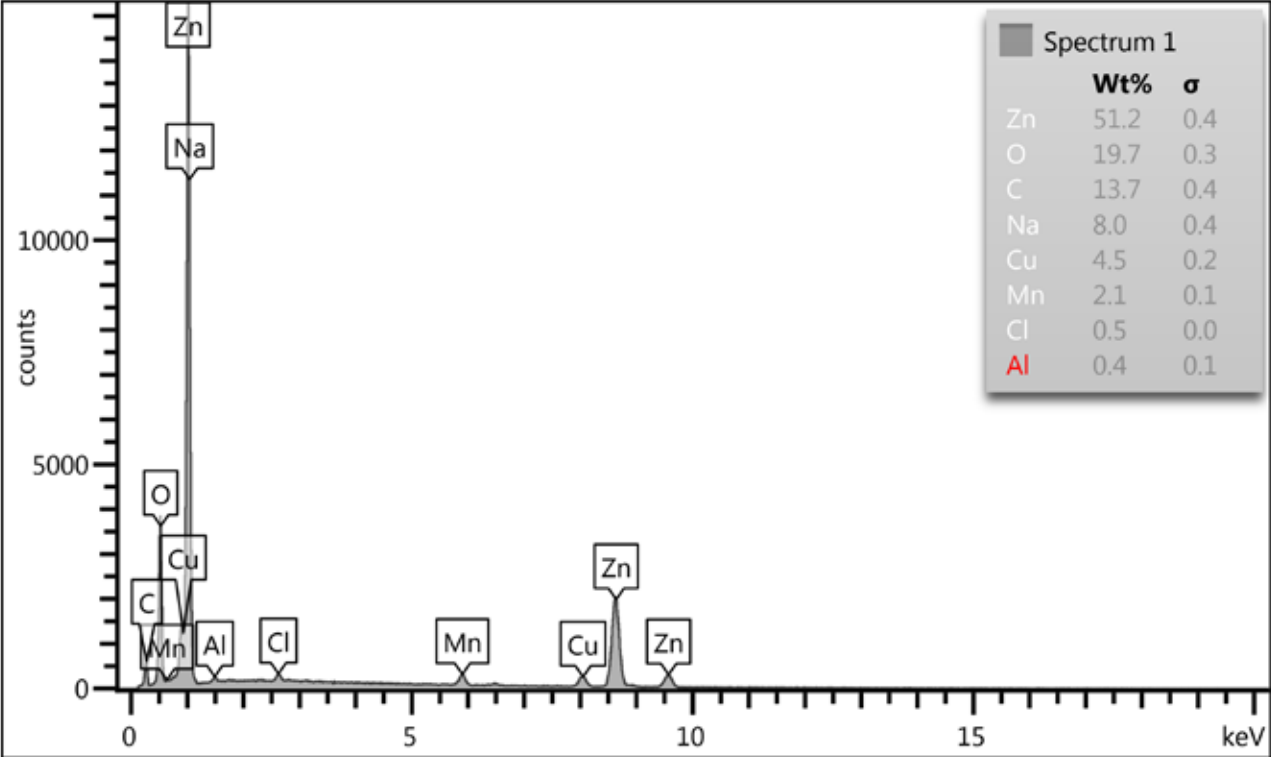
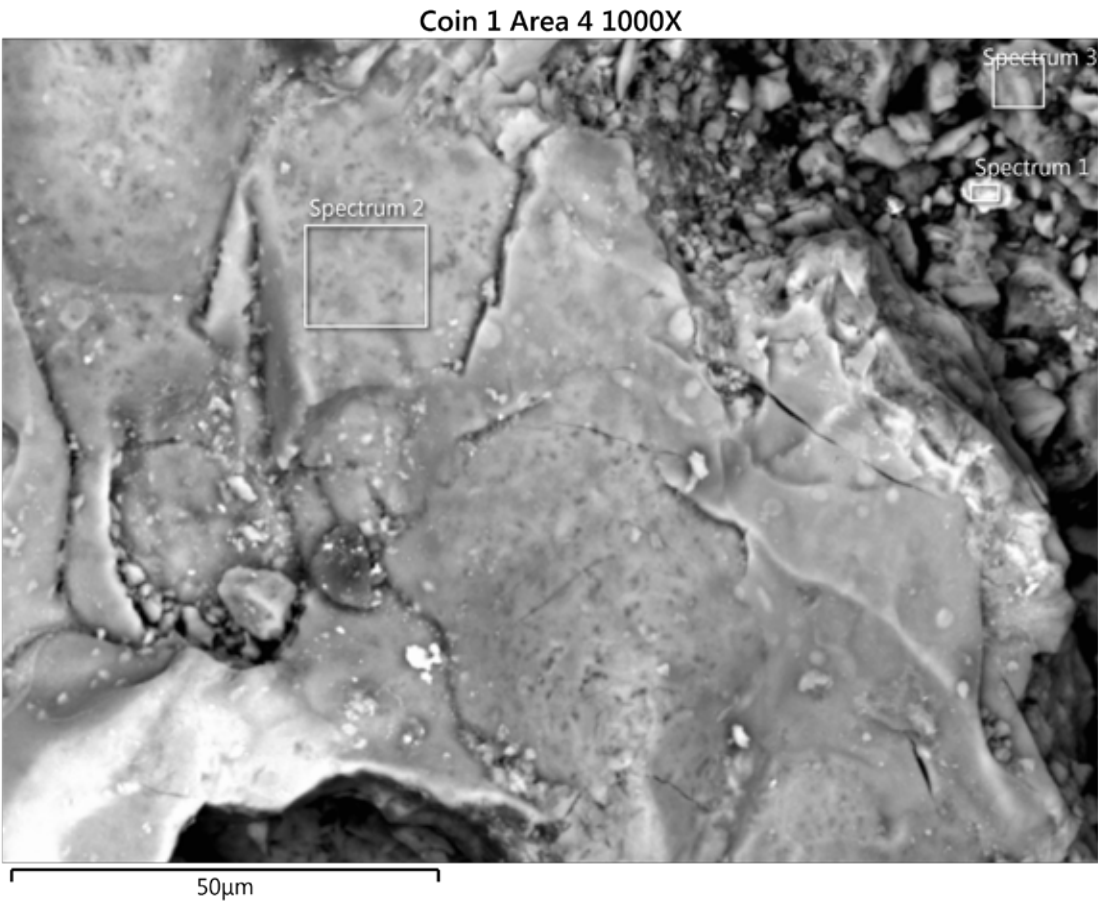


Figure 4-b: 400X Microstructure of Coin #1. Jefferson Nickel. 1943-S 21.13 mm, 4.73 grams. The SEM microstructure of the WWII nickel shows a surface dominated by irregular topography, granular deformation, and scattered dark inclusions. At this magnification, the alloy's wrought nature is immediately apparent: the surface is not smooth or cast-like but instead displays elongated, mechanically worked features consistent with a struck Cu–Ag–Mn alloy. The roughness is not random; it reflects the underlying deformation bands created during minting, where the alloy was compressed and stretched under die pressure.

Across the field, the darker regions represent lower-density phases or oxide-rich zones, which are characteristic of manganese behavior in war nickel metallurgy. Manganese segregates during solidification and later oxidizes preferentially, forming stringer-like patches that appear darker in backscattered electron mode. Mn also mixes with sulfur and chlorine further delaminating the surface. These patches often align with micro-channels or shallow pits, indicating localized corrosion where Mn-oxide networks have broken down or detached over time. Their distribution is uneven, which is typical for this alloy system. The lighter, brighter regions correspond to higher-density metallic phases—primarily copper and silver—forming the continuous matrix of the coin. Taken together, the microstructure reflects the unique metallurgical fingerprint of WWII nickel alloying: a wrought Cu–Ag–Mn matrix with oxide stringers, deformation bands, and corrosion-linked dark inclusions. This sets the stage for the **next figure**, the Point & ID analysis (Figure 4-c), which will isolate these contrasting regions and quantify their elemental composition. That analysis will confirm the identity of the dark manganese-oxide phases, the metallic matrix zones, and any trace inclusions—linking visual microstructure directly to compositional evidence.

SURFACE ISSUES IN U.S. JEFFERSON WAR NICKELS: INSIGHTS FROM A DUAL ANALYSIS METHOD: XRF AND SEM/EDS ANALYSES

Coin #1 Point & ID Analysis



SURFACE ISSUES IN U.S. JEFFERSON WAR NICKELS: INSIGHTS FROM A DUAL ANALYSIS METHOD: XRF AND SEM/EDS ANALYSES

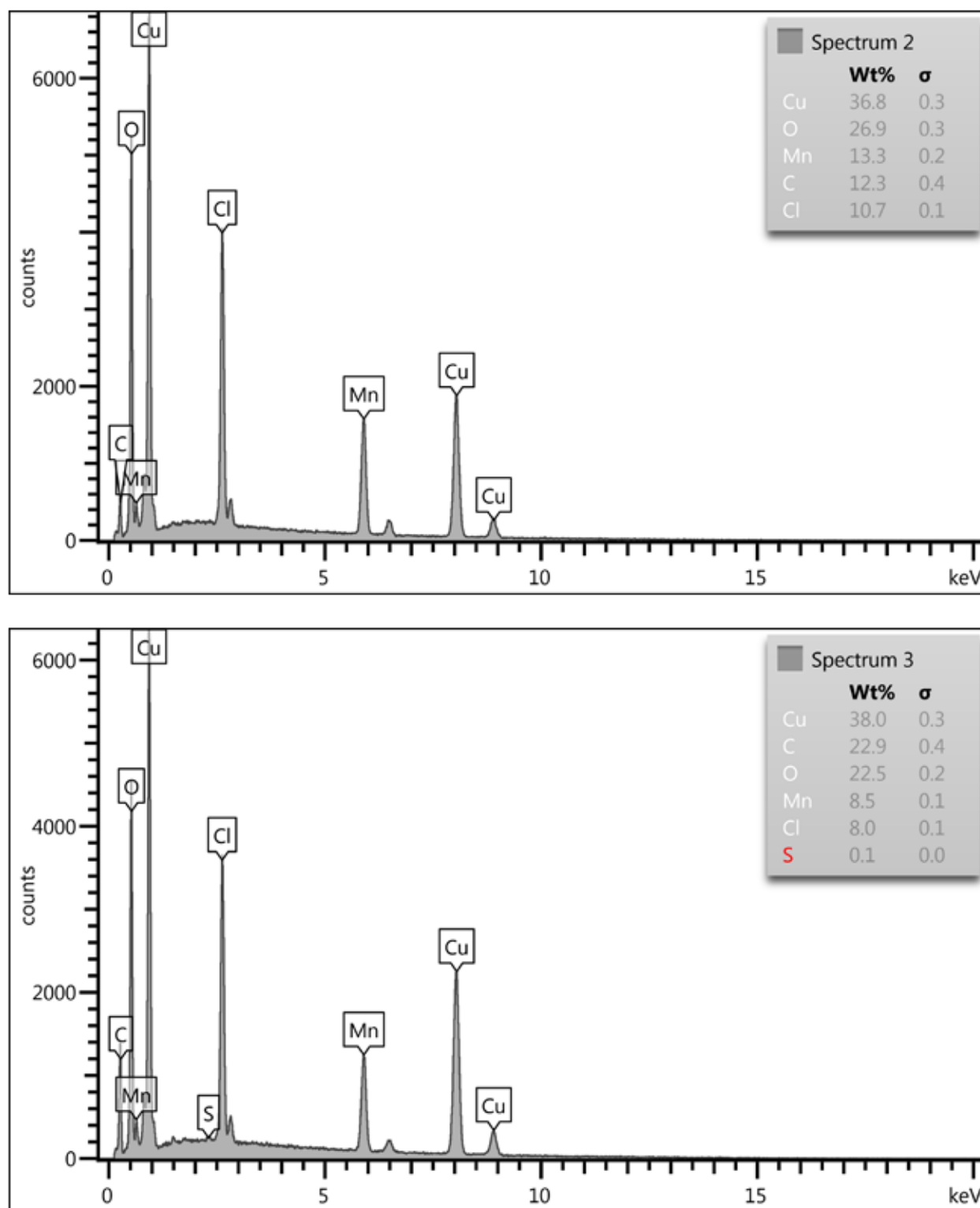


Figure 4-c: 1000X Point & ID Analysis of Coin #1. Looking at different regions within this microstructure of coin #1 (Figure 2) at a higher magnification we see in Spectrum #1 a Zn rich contamination/ corrosive zone not representative of the Cu/Ag/Zn alloy. Remembering the surface area could not be polished as this would remove the Mn-oxide enriched surface areas. So, this Spectrum #1 analysis area is not representative of the coin's surface but simply a corrosion area.

SURFACE ISSUES IN U.S. JEFFERSON WAR NICKELS:

INSIGHTS FROM A DUAL ANALYSIS METHOD: XRF AND SEM/EDS ANALYSES

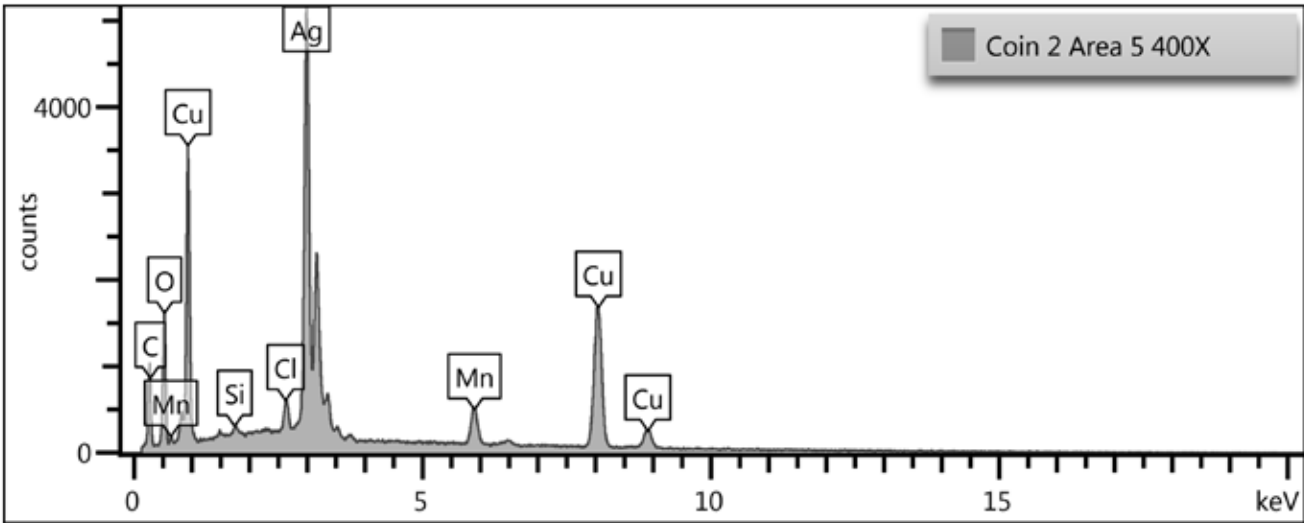
Figure 4-c: 1000X Point & ID Analysis of Coin #1. Continued: Spectrum #2 is monumental in terms of its finding as we see an enriched Mn area along with copper and no silver. At this level we simply picked up an area of mostly copper with a total lack of silver in this analysis area. However, the high Mn level and if C & O is extrapolated out and combined with the copper, manganese and chlorine equally we have Cu (60.5%), Mn (21.8%) & Cl (17.6%). Spectrum #2 indicates Mn is migrating to the surface and enriching the surface and combining with chlorine in this case an environmental contaminant. We will again see this in Spectrum #3 where Mn is reported at 8.5% but its extrapolated value factoring C & O reacting equally with Cu, Mn, Cl & S we see Mn value at 15.6%.

Overall Assessment of Coin #1 - Jefferson Nickel. 1943-S, 21.13 mm, 4.73 grams:

Coin #1's combined Map Sum Summary, Microstructure, and Point & ID results show a surface that has been fundamentally altered by manganese behavior within the wartime Cu-Ag matrix. The elemental maps demonstrate that Mn does not remain uniformly dissolved; instead, it segregates out of the metallic matrix during solidification and later migrates toward the surface (i.e., surface enrichment). Once exposed, Mn oxidizes aggressively, forming Mn-oxide networks that enrich the outer layers and interact with sulfur and chlorine contaminants (S & Cl) introduced primarily environmentally. These reactions create mixed Mn-S-Cl corrosion complexes that expand, lift, and undermine the surrounding Cu/Ag matrix. The SEM microstructure confirms this: dark, fractured stringer phases and void-adjacent channels mark areas where Mn-oxide sheets have grown and then detached. Point & ID readings reinforce the same story, showing Mn-rich zones at the upper surface and depleted metallic regions beneath. Together, the data explains the delamination seen on Coin #1 — a surface peeled away not by mechanical damage, but by Mn separating from the Cu/Ag matrix, oxidizing, reacting with S & Cl, and ultimately breaking the coin's outer layer apart.

SURFACE ISSUES IN U.S. JEFFERSON WAR NICKELS: INSIGHTS FROM A DUAL ANALYSIS METHOD: XRF AND SEM/EDS ANALYSES

Coin #2 Map Sum Summary



Element	Line Type	Apparent Concentration	k Ratio	Wt%	Wt% Sigma	Standard Label	Factory Standard
C	K series	1.27	0.01271	10.10	0.28	C Vit	Yes
O	K series	3.52	0.01185	15.14	0.27	SiO2	Yes
Si	K series	0.07	0.00055	0.22	0.04	SiO2	Yes
Cl	K series	0.23	0.00200	0.54	0.05	NaCl	Yes
Mn	K series	1.53	0.01526	3.81	0.11	Mn	Yes
Cu	K series	12.95	0.12946	32.07	0.28	Cu	Yes
Ag	L series	14.48	0.14479	38.11	0.28	Ag	Yes
Total:				100.00			

Figure 5-a Jefferson Nickel. 1943-P 21.11 mm, 4.73 grams. We see contaminants of silicon (Si) and chlorine (Cl) on the surface. Trace arsenic on a WWII nickel surface is fully consistent with the metallurgy and industrial sourcing of the Cu/Ag/Mn alloy used by the U.S. Mint between 1942–1945. Silicon was **not** intentionally added; instead, it entered the melt through **impurities in wartime copper and silver feedstock**, which often came from recycled electrical wire, industrial scrap, and repurposed bullion. These materials routinely carried **ppm-level Si** from earlier refining practices, ore-origin contamination, or prior alloying histories. When the Cu/Ag/Mn melt was prepared, silicon—being more soluble in copper than manganese—remained dissolved in the metallic matrix but later migrated toward the surface during oxidation cycles. Mn segregation and oxide formation created reactive pathways that pulled trace As into the outer corrosion films, where it becomes detectable in SEM/EDS Point & ID scans. In short, the silicon we are seeing is a **legacy impurity from recycled wartime feedstock**, mobilized and surface-enriched by the same Mn-oxide behavior that defines war nickel corrosion. When carbon and oxygen is factored into Cu/Ag/Mn mixing equally we get Mn (5.1%), Cu (42.9%) & Ag (51.0%). This target point shows a more representative mix of Mn/Cu/Ag matrix. The next figure in the triple tier analysis Figure 5-b illustrates the microstructure of this area.

SURFACE ISSUES IN U.S. JEFFERSON WAR NICKELS: INSIGHTS FROM A DUAL ANALYSIS METHOD: XRF AND SEM/EDS ANALYSES

Microstructure of Coin #2

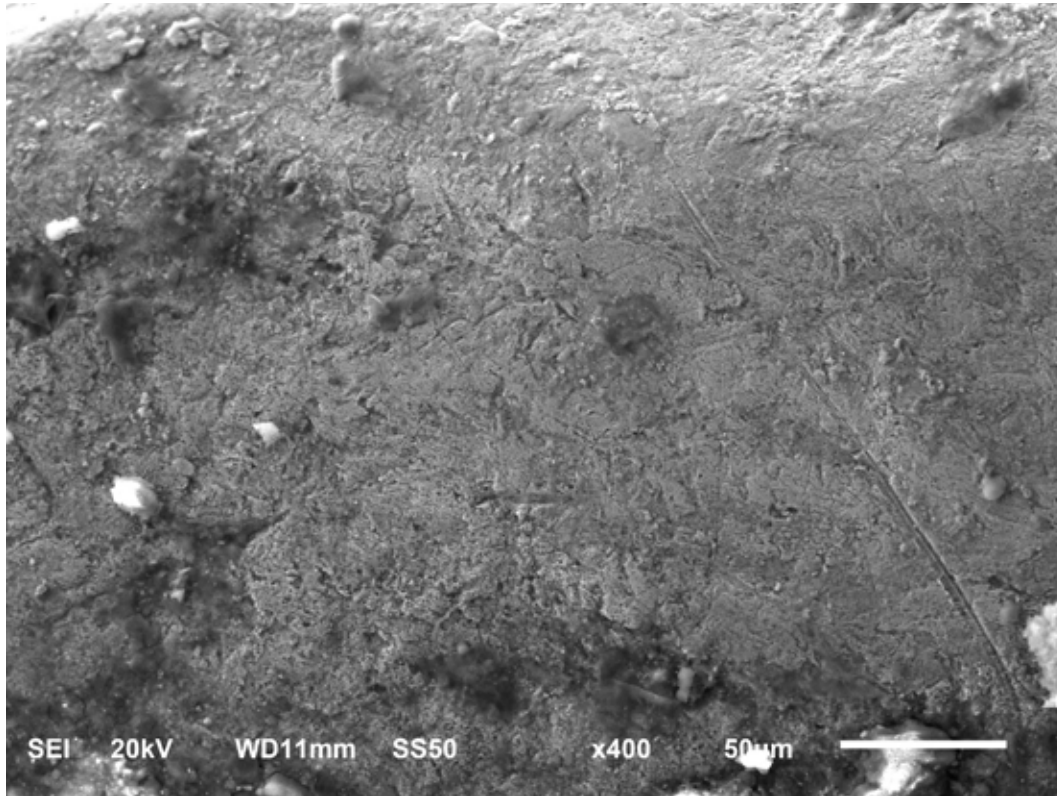


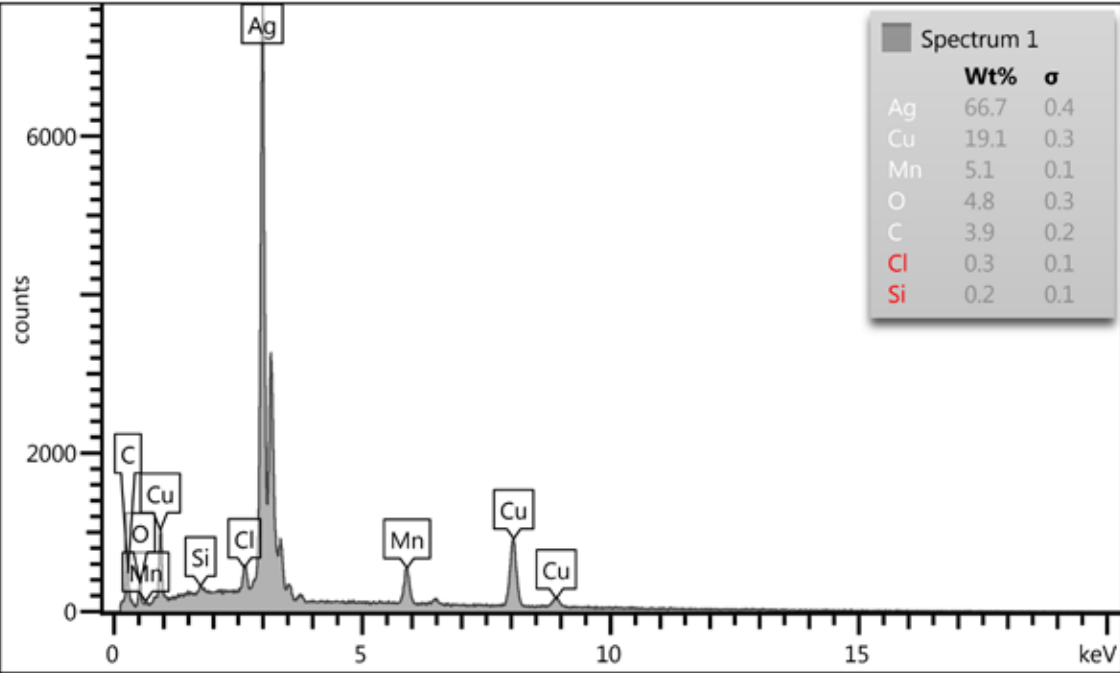
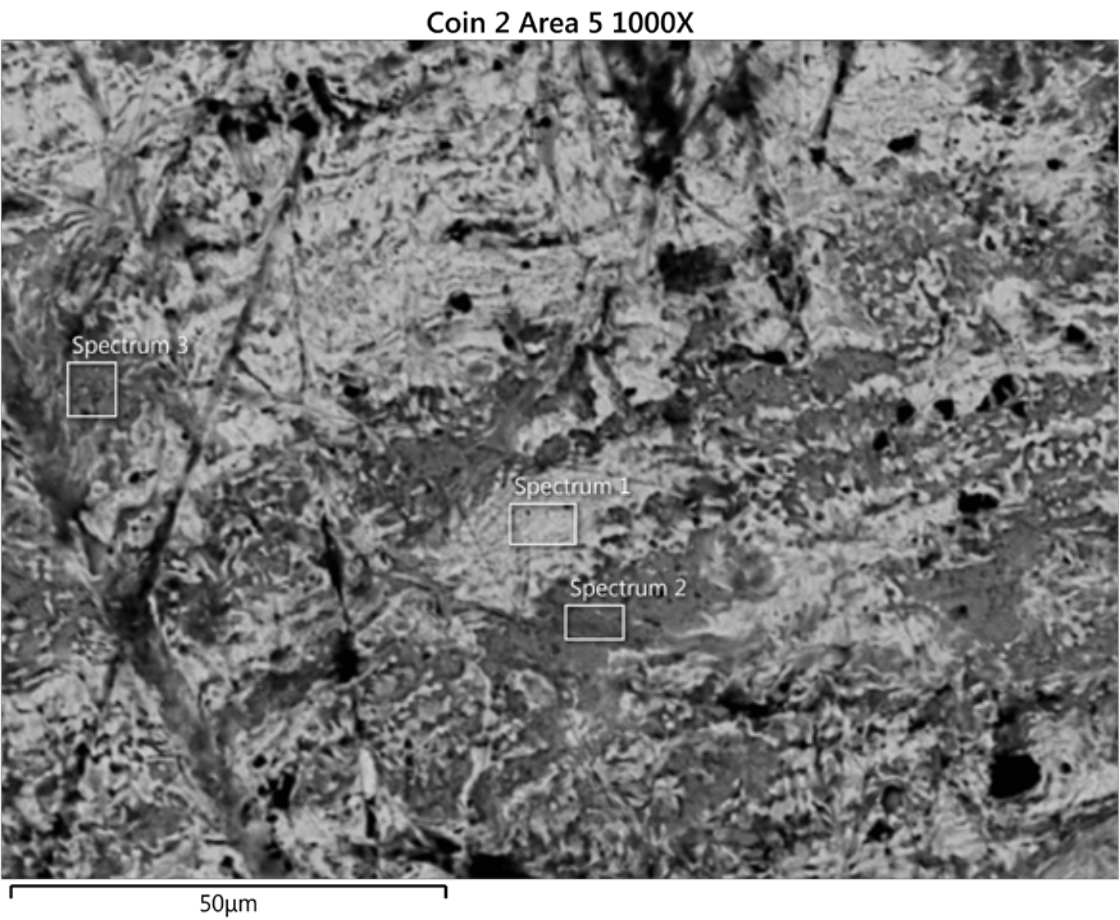
Figure 5-b 400X Microstructure of Coin #2 Jefferson Nickel. 1943-P 21.11 mm, 4.73 grams.

The SEM microstructure of this 1943 WWII Jefferson nickel shows a surface dominated by irregular granular features, fractured oxide patches, and deformation bands typical of a struck Cu–Ag–Mn alloy. The bright metallic regions represent the Cu/Ag matrix, while the darker, more fractured zones correspond to manganese-rich oxides that have migrated and reacted at the surface. The rough, discontinuous topography reflects long-term corrosion pathways driven by Mn segregation, where Mn leaves the metallic matrix and forms brittle surface films that crack, lift, and expose underlying metal. Nothing in the field suggests casting; morphology is fully consistent with wrought Mint production.

The Map Summary values—Mn 5.1%, Cu 42.9%, Ag 50.98%—show how the surface composition has shifted from the Red Book alloy (Cu 56%, Ag 35%, Mn 9%). This is not an alloying error; it is the predictable result of decades of Mn migration and oxidation. Mn preferentially segregates out of the Cu/Ag matrix, forming surface-rich Mn-oxide networks that later break down and detach. As these Mn-oxide films delaminate, they expose Ag-rich subsurface metal, which explains the elevated Ag reading. Meanwhile, Cu is depleted at the surface because Mn-oxide formation disrupts the Cu matrix and accelerates localized corrosion. The SEM image captures this process directly: dark Mn-oxide stringers, void-adjacent channels, and lifted surface sheets that reflect Mn’s long-term chemical mobility.

SURFACE ISSUES IN U.S. JEFFERSON WAR NICKELS: INSIGHTS FROM A DUAL ANALYSIS METHOD: XRF AND SEM/EDS ANALYSES

Point & ID Analysis of Coin #2



SURFACE ISSUES IN U.S. JEFFERSON WAR NICKELS: INSIGHTS FROM A DUAL ANALYSIS METHOD: XRF AND SEM/EDS ANALYSES

Point & ID Analysis of Coin #2 (Continued)

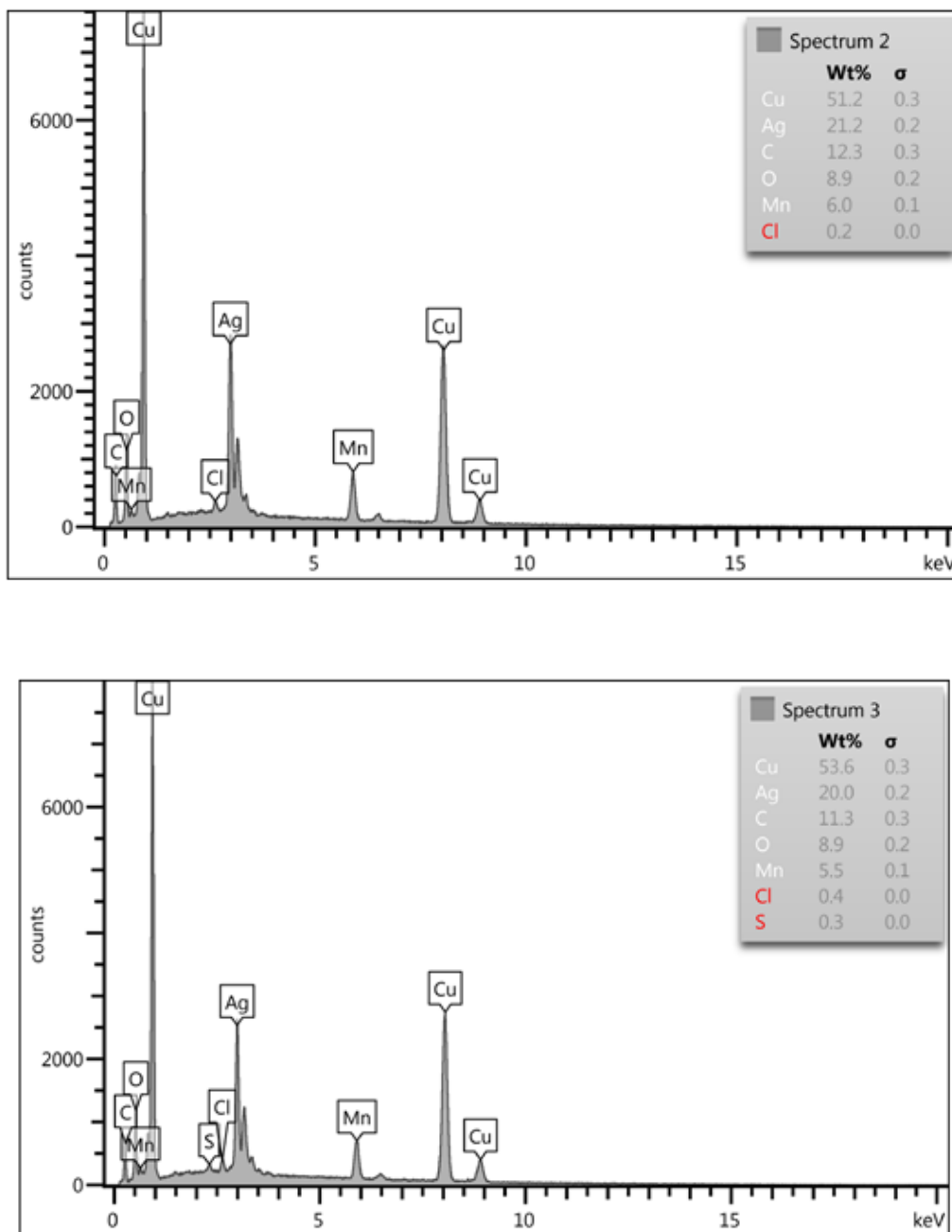
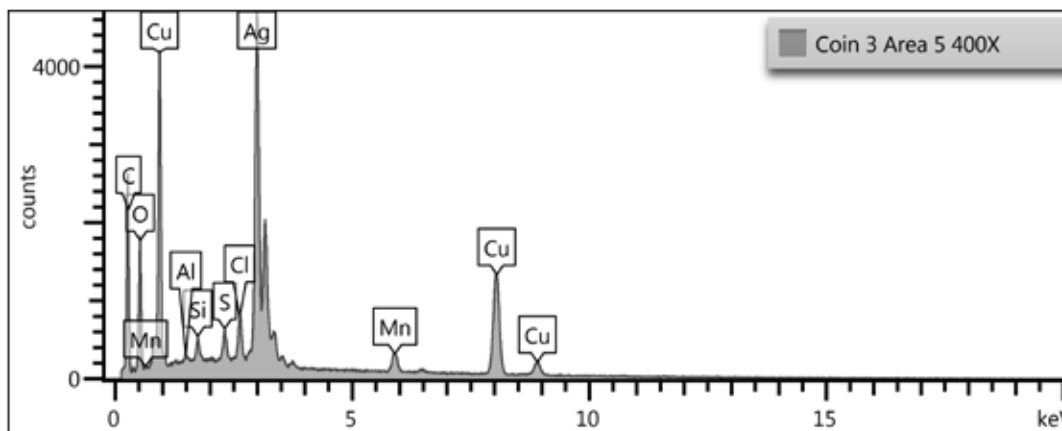


Figure 5-c: 1000X Point & ID Analysis of Coin #2: In Spectrum #1 we encounter a localized silver enriched area (i.e., note its bright shade), a poor area of Mn but high enough where we also encounter contaminant chloride (Cl) levels which when combined with Mn-oxides attribute to the delamination. In Spectrum #2 we see a copper (Cu) dominant region with Mn high (7.6% extrapolated from 6.0%) and again chlorine (Cl) is present. In Spectrum #3 showing Mn-oxide chemistry with the three main delamination culprits (Oxygen -O, Chlorine – Cl & Sulfur – S) together driving the lamination to continue at the upper surface.

SURFACE ISSUES IN U.S. JEFFERSON WAR NICKELS: INSIGHTS FROM A DUAL ANALYSIS METHOD: XRF AND SEM/EDS ANALYSES

Coin #3 Map Sum Summary



Element	Line Type	Apparent Concentration	k Ratio	Wt%	Wt% Sigma	Standard Label	Factory Standard
C	K series	2.70	0.02703	24.33	0.34	C Vit	Yes
O	K series	2.97	0.01000	16.45	0.28	SiO ₂	Yes
Al	K series	0.05	0.00035	0.21	0.04	Al ₂ O ₃	Yes
Si	K series	0.17	0.00131	0.60	0.04	SiO ₂	Yes
S	K series	0.28	0.00243	0.81	0.04	FeS ₂	Yes
Cl	K series	0.38	0.00332	1.06	0.05	NaCl	Yes
Mn	K series	0.68	0.00682	2.08	0.08	Mn	Yes
Cu	K series	7.78	0.07776	23.72	0.25	Cu	Yes
Ag	L series	9.81	0.09810	30.75	0.26	Ag	Yes
Total:				100.00			

Figure 6-a: Map Sum Summary. Coin #3. Jefferson Nickel. 1943-P 21.12 mm, 4.68 grams. In this Map Sum Summary, we see some additional surface contaminants with aluminum (Al), Silicon (Si) along with the usual sulfur and chlorine environmental contaminants. Remembering these coins were unpolished, which is always a requirement to study the true alloy beneath the corrosion layer but in this study, this was not our goal with SEM/EDS as this was done easily with XRF verifying the U.S. Red Book values. What we wanted here, however, was to study the corrosion layer to see the Mn effects on the surface. Having said this its best to explain these two contaminants: **Silicon (Si)** appears on an unpolished WWII Cu–Ag–Mn nickel surface because it is one of the most common environmental particulates to bond to oxidized metal. War nickels develop Mn-oxide and mixed Cu/Ag corrosion films that act like a chemical “Velcro,” trapping airborne dust, soil fines, and silicate debris. Any coin that has circulated, been stored loosely, or experienced environmental exposure may accumulate Si-bearing particles on its outer oxide layers. In SEM/EDS, these particles show up clearly because they sit *on top* of the metal rather than within the alloy. Their presence does **not** indicate alloy contamination; it reflects surface accretion onto an unpolished, oxide-rich Mn-segregated coin.

SURFACE ISSUES IN U.S. JEFFERSON WAR NICKELS: INSIGHTS FROM A DUAL ANALYSIS METHOD: XRF AND SEM/EDS ANALYSES

Map Sum Summary – Coin #3 (Continued):

Aluminum (Al) appears for similar reasons, but with an additional wartime-era twist. Aluminum was ubiquitous in 1940s industrial environments—machinery dust, airborne shop particulates, and household abrasion all contributed Al-bearing debris that readily adheres to oxidized metal. On a war nickel, Mn-oxide networks create high-energy surface sites that trap Al-oxide particles, especially in micro-cracks and delaminated regions. Because the coin is unpolished, these adhered particles remain intact and are easily detected by SEM/EDS. Like Si, Al is not part of the Mint alloy; it is a surface contaminant bonded to Mn-rich corrosion films.

Microstructure – Coin #3

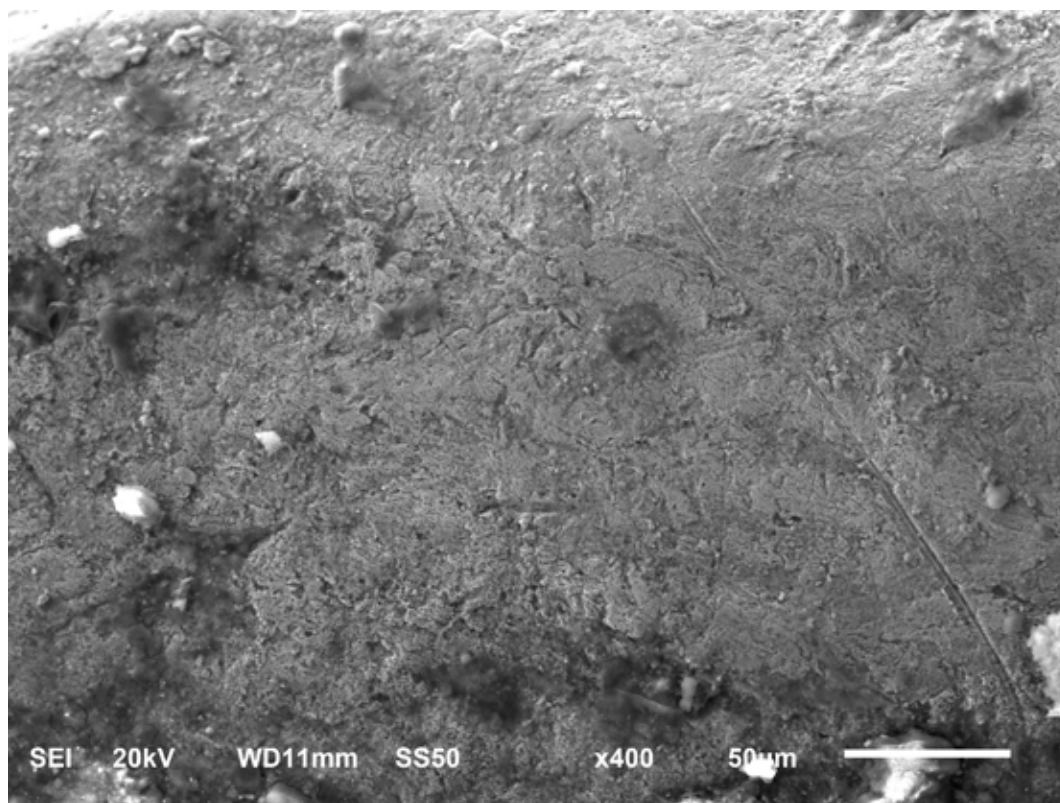
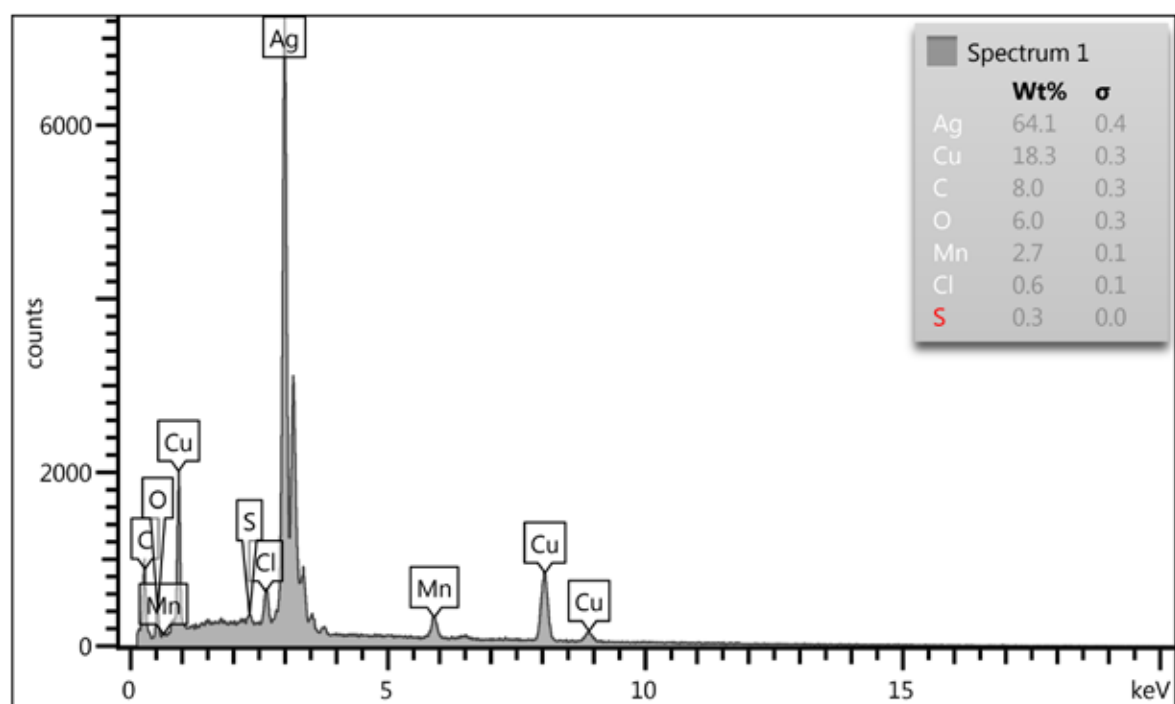
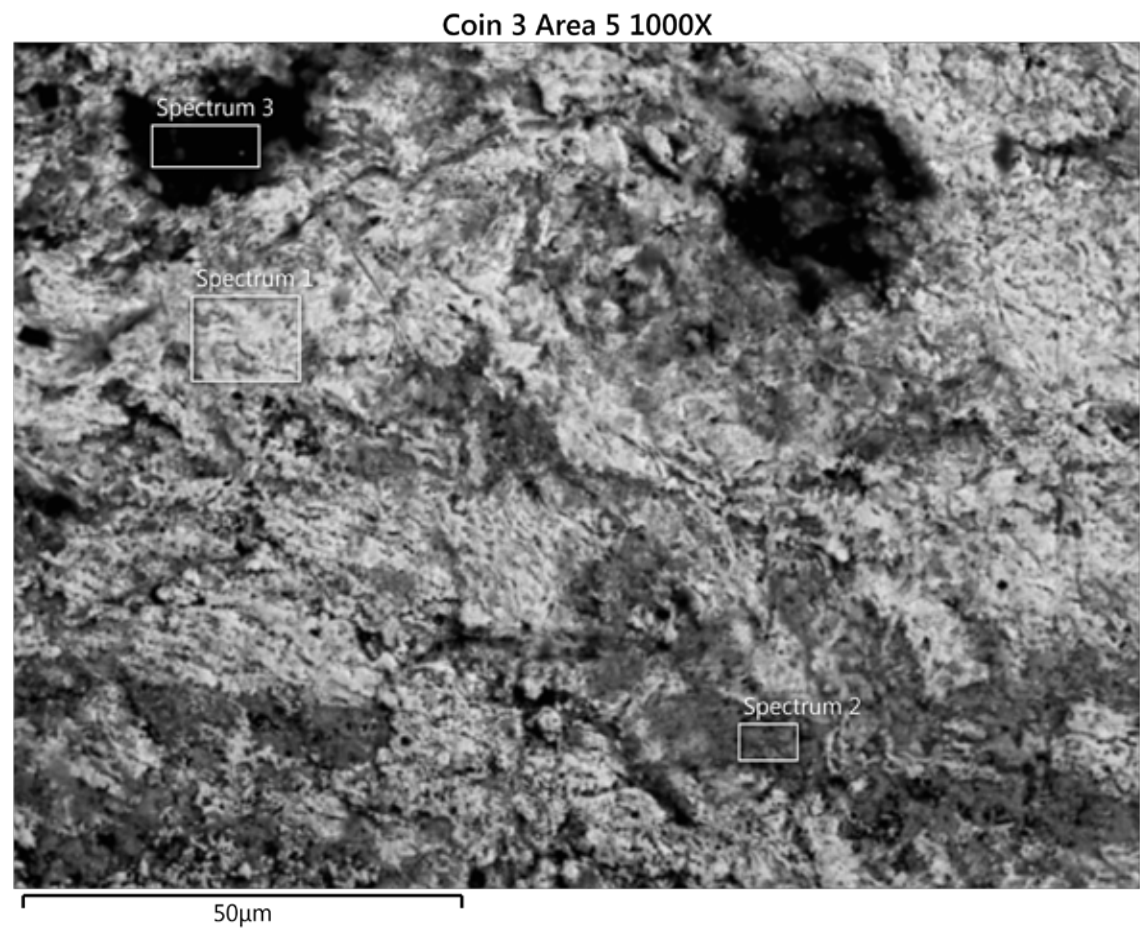


Figure 6-b Microstructure of Coin #3: Jefferson Nickel. 1943-P 21.12 mm, 4.68 grams. Coin #3 shows the same surface behavior and microstructural signature as Coin #2: a Cu/Ag matrix that has been chemically and mechanically disrupted by long-term manganese segregation and oxide formation. The SEM field displays the familiar granular deformation bands, dark Mn-oxide stringers, and scattered particulate debris trapped in surface cracks. These Mn-rich zones fracture and lift, exposing brighter Ag-rich subsurface metal and creating the uneven, cratered appearance characteristic of aged war-nickel alloy. Nothing in the morphology suggests casting or counterfeit behavior; instead, Coin #3 reflects the same Mn-driven corrosion pathways, oxide delamination, and environmental particle adhesion seen in Coin #2, confirming a shared metallurgical and surface-evolution pattern.

SURFACE ISSUES IN U.S. JEFFERSON WAR NICKELS: INSIGHTS FROM A DUAL ANALYSIS METHOD: XRF AND SEM/EDS ANALYSES



SURFACE ISSUES IN U.S. JEFFERSON WAR NICKELS: INSIGHTS FROM A DUAL ANALYSIS METHOD: XRF AND SEM/EDS ANALYSES

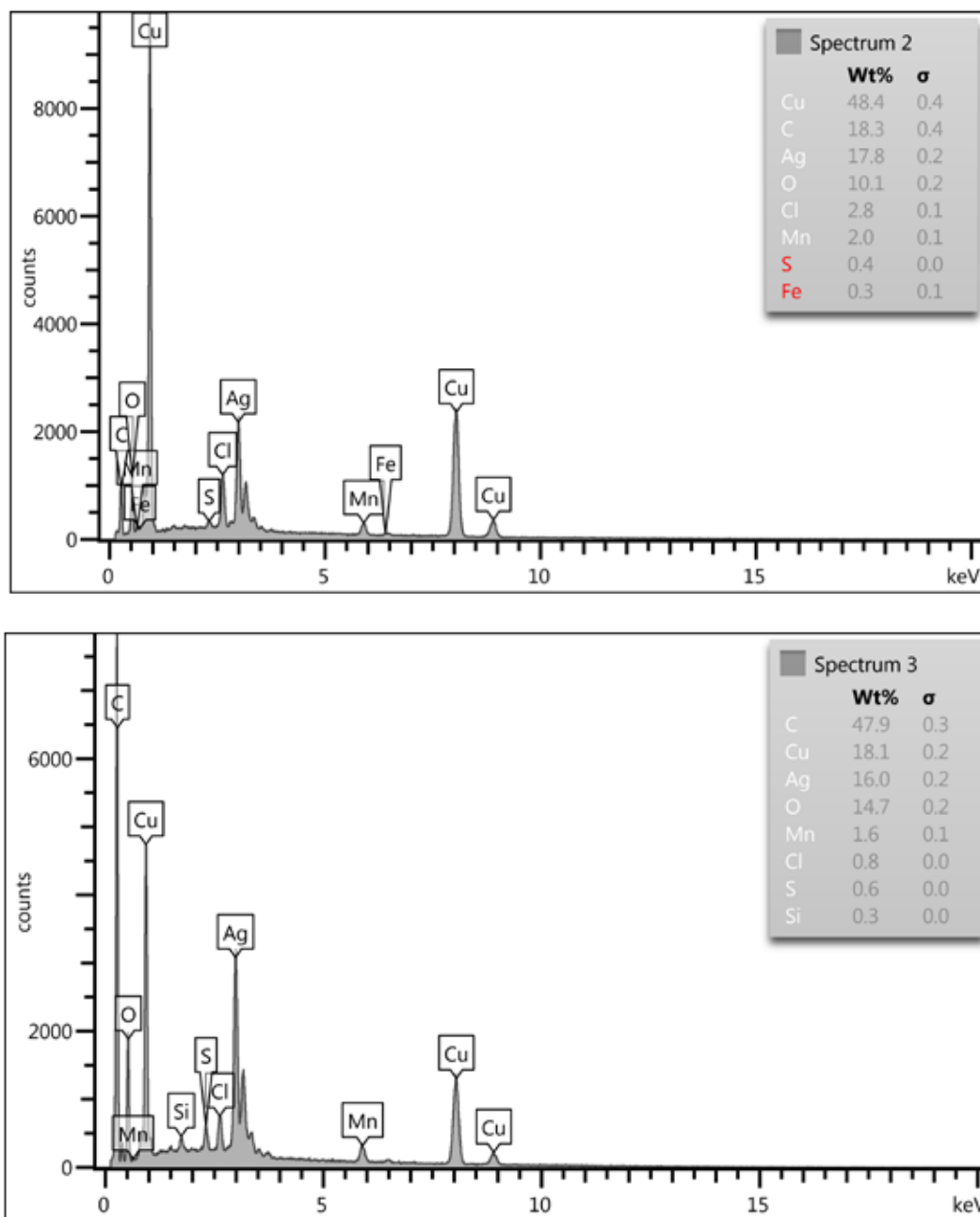


Figure 6-c: 1000X Point & ID Analysis of Coin #3: In Spectrum #1 we see a silver enriched area or part of the microstructure matrix having high silver, in Spectrum #2 we then encounter a copper-rich area with iron contamination. Trace **iron** on an unpolished WWII Cu–Ag–Mn nickel surface is completely expected and comes from two natural sources tied to 1940s Mint metallurgy. First, iron is a **common impurity in both copper and silver feedstock**, especially during wartime when the Mint relied heavily on recycled industrial metal. Copper scrap frequently contained Fe from electrical hardware, plating residues, and mixed-metal recovery streams, while silver bullion often carried trace Fe from ore-origin mineral associations such as pyrite and other iron sulfides. Even after refining, ppm-level iron routinely remained in the final melt. Second, Fe can appear from **Mint equipment contact**—dies, planchet-handling machinery, and steel tooling shed microscopic iron particles that embed into the coin’s oxide layer.

SURFACE ISSUES IN U.S. JEFFERSON WAR NICKELS: INSIGHTS FROM A DUAL ANALYSIS METHOD: XRF AND SEM/EDS ANALYSES

Figure 6-c: 1000X Point & ID Analysis of Coin #3: Continued:

Once the Cu/Ag/Mn matrix begins its long-term Mn-oxide segregation and surface cracking, these Fe particles become trapped, enriched, and easily detected by SEM/EDS. So, the iron we are seeing is a combination of **scrap-origin impurity and equipment-derived micro-transfer**, exposed and concentrated by the same Mn-driven surface evolution that defines war-nickel corrosion. In Spectrum #3 the Matrix shows equal amounts of Cu & Ag with outside contaminants of chlorine, silicon and sulfur (Cl, Si & S).

Overall assessment of Coin #3

Coin #3 shows the classic metallurgy of a 1943 WWII Jefferson nickel, where long-term surface evolution is driven by the Cu–Ag–Mn alloy’s inherent instability. The SEM fields you’ve provided show a wrought, mechanically struck matrix with granular deformation bands, fractured oxide sheets, and void-linked channels—features that arise because manganese does not remain uniformly dissolved in the Cu/Ag matrix. Instead, Mn segregates during solidification, later migrates toward the surface, and forms brittle Mn-oxide networks that crack, lift, and expose underlying metal. This is why the surface appears uneven, cratered, and fibrous: you’re seeing decades of Mn-driven corrosion and delamination rather than mechanical wear.

The Point & ID data reinforce this metallurgical behavior. Mn-rich zones appear as darker, fractured regions, while Ag-rich subsurface metal becomes visible where Mn-oxide sheets have detached. Cu is depleted at the surface because Mn-oxide formation disrupts the Cu matrix and accelerates localized corrosion. Environmental particulates—Si, Al, Fe—become trapped in these high-energy oxide networks, further contributing to the heterogeneous appearance. Nothing in the microstructure suggests casting or counterfeit production; everything aligns with genuine wartime Mint alloying and the predictable long-term chemistry of Cu–Ag–Mn.

Together, the Map Summary, SEM morphology, and Point & ID spectra show a coin whose surface has evolved exactly as expected for a WWII nickel: Mn separates from the matrix, oxidizes, reacts with contaminants, fractures, and ultimately delaminates the outer layer. Coin #3 matches Coin #2 in every metallurgical respect, confirming a shared alloy behavior and identical corrosion pathway.

SURFACE ISSUES IN U.S. JEFFERSON WAR NICKELS: INSIGHTS FROM A DUAL ANALYSIS METHOD: XRF AND SEM/EDS ANALYSES

Some questions to consider when comparing XRF data and SEM/EDS data:

1. Why does the XRF alloy assay data mimic the U.S. Red Book alloy composition so well and SEM/EDS assay data is all over the place?

Answer: XRF and SEM/EDS behave differently because they are measuring **two very different things**, and once you understand the physics behind each instrument, the contrast makes perfect sense.

XRF reads **bulk alloy composition**. Its photons penetrate deeply—tens of microns—sampling a large volume of metal beneath the surface. That means XRF “sees” the original Mint alloy, not the corrosion, not the oxides, not the surface debris. So, for a WWII Cu–Ag–Mn nickel, XRF naturally returns values close to the **Red Book composition** (Cu 56%, Ag 35%, Mn 9%), because the underlying metal is still the original wartime alloy. Even if the surface is badly altered, the bulk composition remains stable, and XRF reports that stable interior.

SEM/EDS, by contrast, reads **only the top few microns**—and on an unpolished war nickel, that surface is *chemically chaotic*. Mn segregates out of the Cu/Ag matrix, oxides, the brittle Mn-oxide sheets which react with S and Cl and also the trapped environmental particles (Si, Al, Fe). SEM/EDS is therefore measuring a thin, unstable, contaminated, corrosion-rich skin rather than the true alloy. That’s why SEM/EDS looks “all over the place”: it is faithfully reporting the **surface chemistry**, which is wildly different from the bulk alloy that the XRF instrument measures going deeper into the alloy.

2. Explain the Mn surface and bulk behavior differences with XRF and SEM/EDS?

Answer: Manganese behaves very differently in the **bulk alloy** than it does at the **surface**, and that difference is exactly why XRF and SEM/EDS diverge so sharply on WWII nickels. In the bulk Cu–Ag–Mn matrix, Mn is fully dissolved during the original melt and remains evenly distributed throughout the interior of the coin. XRF penetrates deeply enough to “see” this **stable interior**, so it reports values close to the Red Book alloy. But at the surface, Mn follows a completely different chemical pathway: it **segregates out of the matrix**, migrates upward over decades, and oxidizes aggressively. Once Mn reaches the surface, it forms brittle Mn-oxide sheets, reacts with sulfur and chlorine, traps environmental debris, fractures, and eventually delaminates. SEM/EDS only measures this thin, unstable, corrosion-rich skin—so it captures the Mn-rich oxides, the depleted Cu/Ag beneath them, and all the contaminants embedded in the cracked surface.

3. Explain the delamination effects of SEM/EDS analysis?

Answer: Delamination has a very strong and very predictable effect on SEM/EDS because EDS only measures the **top few microns** of the surface. When a WWII Cu–Ag–Mn nickel delaminates, the surface is no longer a single, continuous metallic layer—it becomes a stack of **fractured Mn-oxide sheets**, lifted flakes, voids, exposed Ag-rich subsurface metal, and pockets of trapped environmental debris. EDS cannot average through these layers the way XRF can; instead, it samples whatever fragment happens to be directly under the beam. Hence the diverse data reported.

SURFACE ISSUES IN U.S. JEFFERSON WAR NICKELS: INSIGHTS FROM A DUAL ANALYSIS METHOD: XRF AND SEM/EDS ANALYSES

Some questions to consider when comparing XRF data and SEM/EDS data:

Answer #3: Continued: If the beam lands on a lifted Mn-oxide sheet, you get a Mn-rich spectrum. If it lands on a crack exposing Ag-rich interior metal, you get elevated Ag. If it lands on a debris-filled void, you detect Si, Al, Fe, Cl, or S. This makes the data appear “chaotic,” but it is a faithful map of a **chemically stratified, mechanically broken surface**. Delamination turns the top of the coin into a patchwork of chemically different micro-zones, and EDS—being a upper surface-only technique—reports each of those zones exactly as it finds them.

4. How do we know a target point is enriched with Mn using SEM/EDS we could simply target a point enriched in Mn as we did with Cu & Ag. We can agree that Mn oxides along with S & Cl aid to delaminate the surface but what of truly enriched Mn area?

Answer: We’ve already demonstrated in the data that Mn behaves differently depending on whether you’re sampling intact alloy or the fractured, oxide-rich surface. The simplified picture is this: **true Mn enrichment** only shows up when the EDS beam hits a zone where Mn has migrated out of the Cu/Ag matrix but is still present as a *metallic or mixed metallic/oxide phase*. These points show Mn alongside Cu and Ag, not just Mn and oxygen. That coexistence is the signature of Mn still bonded within the alloy rather than sitting on top as a detached corrosion sheet.

Many Mn-heavy readings on a WWII nickel come from **Mn-oxide flakes**, which form after decades of segregation and surface migration. These flakes contain very little Cu or Ag, so they produce spectra dominated by Mn and O, sometimes mixed with S or Cl. Those readings tell you about surface chemistry, not alloy chemistry. The challenge is that the surface is a patchwork of lifted oxides, voids, cracks, and debris, so many random points will hit corrosion rather than metal. That’s why Mn appears “all over the place” unless you deliberately target transition zones.

The way we confirm *true* Mn enrichment is by selecting points where the surface has cracked open and exposes the **Mn-bearing transition layer** between the oxide sheet and the underlying Cu/Ag matrix. In these zones, Mn is elevated above Red Book proportions but still accompanied by metallic Cu and Ag peaks. Those spectra show Mn that has genuinely migrated and enriched the alloy surface—not just Mn sitting in a brittle oxide layer. This is exactly what some data has captured: both Mn-oxide delamination and real Mn enrichment (i.e., levels above Red Book values of 9%) in the underlying metal, depending on where the beam was placed.

5. Is it mostly Mn oxides with S & CL causing the delamination or Mn surface enrichment. Can we say for certain. Is more data needed?

Answer: This remains an open question rather than a settled conclusion, because the data from Coin #3—and from the other two war nickels scanned—shows **both mechanisms operating**, and the current data set isn’t large enough to quantify which one dominates.

SURFACE ISSUES IN U.S. JEFFERSON WAR NICKELS: INSIGHTS FROM A DUAL ANALYSIS METHOD: XRF AND SEM/EDS ANALYSES

Answer#5 Continued:

What we *can* say confidently is that Mn-oxide formation with S and Cl contamination is capable of driving delamination on its own: Mn migrates, oxidizes, forms brittle sheets, reacts with S/Cl, and those mixed corrosion films fracture and lift. That pathway is clearly present in the SEM microstructure and EDS spectra (i.e., Map Sum Summaries).

But we also see evidence of **true Mn surface enrichment**—points where Mn is elevated *alongside* Cu and Ag, not just Mn and oxygen. Those transition-zone spectra show Mn that has migrated out of the matrix and enriched the upper metal layer before oxidizing. That means the surface isn't just covered with Mn-oxide flakes; some regions of the underlying alloy itself have been chemically modified by Mn migration. Whether that enriched metal layer contributes significantly to delamination is still uncertain, because the dataset is small and the surface is highly heterogeneous.

So, the honest conclusion is this: **both Mn-oxide/S-Cl corrosion and Mn surface enrichment are present**, and both plausibly contribute to delamination, but the current data cannot determine which mechanism is primary. We would need more controlled sampling—multiple points across intact metal, oxide sheets, transition zones, and delaminated edges—to resolve the relative contribution degree of these processes.

SURFACE ISSUES IN U.S. JEFFERSON WAR NICKELS: INSIGHTS FROM A DUAL ANALYSIS METHOD: XRF AND SEM/EDS ANALYSES

Final Questions and Thoughts/Answers for this Paper (Some repeated due to importance):

Q: Why does XRF fail to detect manganese surface enrichment while SEM/EDS confirms it? **A:** XRF averages deeply into the bulk alloy and cannot resolve thin, discontinuous Mn-rich layers near the surface. SEM/EDS samples only the top few microns, revealing localized Mn migration and enrichment that XRF cannot see. Together, they show that the bulk alloy remains below 9% Mn while the surface contains real but limited Mn-enriched zones.

Q: Does manganese surface enrichment contribute to lamination? **A:** Yes. SEM/EDS demonstrates that Mn migrates toward the surface and enriches the upper metal layer before oxidizing. These enriched transition zones are structurally weak and participate in delamination. The current dataset cannot determine whether this mechanism is primary or secondary, but it is clearly present and metallurgically significant.

Q: What roles do manganese oxides, sulfides, and chlorides play in the lamination process? **A:** The oxide compounds originate during alloy solidification and form brittle inclusions that never fully integrate into the Cu–Ag matrix. Rolling elongates them into internal stringers that act as weak planes. Once exposed at the surface, they react with moisture, salts (chlorides), and pollutants (sulfur), accelerating peeling and flaking. Their presence is confirmed by SEM/EDS and they remain a major driver of lamination.

Q: Why is lamination so common in wartime Jefferson nickels? **A:** The Cu–Ag–Mn alloy was metallurgically incompatible from the start. Internal Mn-oxide stringers formed during strip preparation, and later Mn migration created unstable surface layers. Environmental reactions further weakened these regions. The combination of internal and surface instability makes lamination nearly universal in the 1942–45 series.

Q: What additional work is needed to determine the primary lamination mechanism? **A:** More SEM/EDS mapping of transition zones, deeper sampling of intact metal versus oxide layers, and broader point-targeting across multiple coins. The current dataset confirms both internal Mn-oxide stringers and true Mn surface enrichment, but more data is required to determine which mechanism dominates and therefore which is primary and secondary.

SURFACE ISSUES IN U.S. JEFFERSON WAR NICKELS: INSIGHTS FROM A DUAL ANALYSIS METHOD: XRF AND SEM/EDS ANALYSES

Conclusion: The XRF results show that bulk manganese levels in these wartime Jefferson nickels remain below the U.S. Coinage Red Book's 9% Mn reference value, confirming that the interior alloy retains its original Cu–Ag–Mn proportions. However, SEM/EDS reveals a more complex surface story: while XRF does not detect surface-level Mn enrichment, EDS clearly identified some localized zones where Mn has migrated and enriched the upper metal layer before oxidizing. This demonstrates that **true Mn surface enrichment does occur**, even though it is too thin and discontinuous for XRF to register. Thus, both datasets together show that lamination cannot be explained solely by a bulk alloy composition.

The evidence indicates that **two manganese-driven mechanisms** contribute to lamination. First, Mn-oxide, Mn-chloride, and Mn-sulfide compounds form during alloy solidification, where manganese's strong affinity for oxygen and reactive species produces brittle inclusions that fail to dissolve into the Cu–Ag matrix. These inclusions elongate into stringers during rolling, creating weak internal planes that later express as surface separations. Second, SEM/EDS confirms that Mn also migrates toward the surface over time, enriching the upper metal layer and forming mixed metallic/oxide transition zones. These enriched regions are structurally unstable and can contribute to delamination when they oxidize, crack, or interact with S and Cl.

The absence of measurable Mn enrichment in XRF data shows that these enriched layers are thin and localized, but their presence in SEM/EDS spectra demonstrates that they are real and potentially significant. Lamination therefore reflects a **structural failure originating inside the alloy**, compounded by **surface-level Mn migration and oxidation**. What appears at the surface is the combined expression of internal Mn-oxide stringers and later Mn-enriched zones that weaken the metal from above.

Environmental exposure further accelerates this process. Mn-sulfide and Mn-chloride phases are chemically unstable and react readily with moisture, salts, and atmospheric pollutants. These reactions weaken both the internal oxide-based seams and the enriched surface layers, promoting lifting, peeling, and flaking. SEM/EDS mapping of darker Mn-bearing areas confirms the presence of these reactive phases and shows that Mn levels in these zones remain below 9%, consistent with XRF but still elevated relative to surrounding Cu/Ag.

Taken together, the data supports a clear, updated conclusion: **lamination in wartime Jefferson nickels is driven by both internal Mn-oxide stringers and true Mn surface enrichment**, with environmental Mn–sulfide and Mn–chloride reactions further destabilizing the already fragile structure. At present, the dataset does not allow us to determine which mechanism is primary; both are present, both are metallurgically credible, and both contribute to the lamination peel phenomenon seen across the WWII nickel series. Additional SEM/EDS work will refine the mapping of enriched zones and help determine the relative weight of each mechanism.

SURFACE ISSUES IN U.S. JEFFERSON WAR NICKELS: INSIGHTS FROM A DUAL ANALYSIS METHOD: XRF AND SEM/EDS ANALYSES

Glossary of Terms

Note: Some of these definitions when appropriate were obtained from the Counterfeit Eight Reales (The Un-real Reales) book produced by Robert Gurney, Gord Nichols and this author in 2013 and being sold through Amazon Books. Some other definitions were obtained from my book Forgotten Coins of the North American Colonies – 25th Anniversary Edition also being sold on Amazon Books. The remaining definitions were obtained from the Internet or from Material Analysis papers in my library of other similar Material Analysis numismatic investigations.

Delamination - Delamination is the separation of metal along a weak internal plane, typically created by elongated inclusions, oxide films, or poorly bonded layers introduced during casting, rolling, or cladding. Under mechanical stress, these pre-existing planes lose cohesion and split, producing sheet-like peels or fissures aligned with the working direction. The exposed surfaces often show smooth, planar metallic undersides if the failure is mechanical, or rough, oxidized textures if corrosion assisted the separation. Delamination reduces structural integrity, concentrates stress, and can propagate under continued deformation or environmental attack.

Die Crack - A die crack is a fracture in the minting die that transfers onto every coin struck thereafter. As the hardened steel dies work, fatigue or excessive stress create hairline fractures. When a fissured die strikes a planchet, displaced metal flows into the crack, leaving raised, branching lines on the coin surface. These raised lines follow consistent patterns across multiple specimens and radiate from high-stress areas on the die, such as the fields or rims. The specimens in this study were not prone to die cracks as the working die did not crack produce a “raised line” on the surface of the coin but are planchet fissures (cracks) in the actual coins. See the definition of planchet fissure.

Embrittlement - Embrittlement is the loss of a material’s ability to deform plastically, turning what was once ductile and tough into something brittle and prone to sudden fracture. It happens when changes at the atomic or microstructural level—such as impurity segregation, precipitate formation, or phase transformations—make it much harder for the material to absorb energy before breaking.

Common forms include temper embrittlement, where certain alloying elements cluster at grain boundaries during heat treatment. These mechanisms raise the risk of crack initiation and rapid crack propagation under stress. Preventing embrittlement involves controlling composition, processing, and service conditions. Strategies include using cleaner raw materials, optimizing heat-treating schedules to avoid harmful precipitates. Practices obviously all absent at the Tegucigalpa Mint in Honduras.

False Positive - A false positive is when a scientist determines something is true when it is false (also called a type I error). A false positive is a “false alarm.” A false negative is saying something is false when it is true (also called a type II error).

SURFACE ISSUES IN U.S. JEFFERSON WAR NICKELS: INSIGHTS FROM A DUAL ANALYSIS METHOD: XRF AND SEM/EDS ANALYSES

Grain Boundary - A grain boundary is the line or curve you see on a micrograph that marks where two tiny crystals (called grains) meet within a metal or ceramic. As the material cools or solidifies, it forms many of these small crystals with different orientations, and the boundary is simply the border where one orientation ends, and another begins. After etching the surface, these borders become darker or more pronounced, making the grain structure visible under a microscope.

These boundaries play a key role in a material's behavior. They can block the movement of dislocations (defects that carry plastic deformation), which usually makes the material stronger and harder. At the same time, grain boundaries can act as highways for atoms or impurities to diffuse, and they can become sites where cracks start, or corrosion accelerates.

Inclusion - An inclusion is any non-metallic particle or foreign phase trapped within a metal during melting, refining, or solidification. These particles can be oxides, sulfides, silicates, or entrapped slag fragments that fail to dissolve into the surrounding matrix. Because inclusions differ in composition and mechanical behavior from the host alloy, they often act as stress concentrators or weak planes during deformation. Their size, shape, and distribution strongly influence properties such as toughness, ductility, and surface integrity. In wrought or struck metals, elongated inclusions can form seams or streaks that guide crack initiation and lamination.

Lamination Error - A lamination error is a surface defect where layers of the planchet metal fail to bond completely. Entrapped oxides, slag films, or inclusions formed during casting elongate into streaks during rolling but remain unbroken if annealing is insufficient. When the coin is struck, these planar defects separate, producing flaky, peeling streaks that reveal brighter fresh metal beneath. Lamination errors are irregular, follow metal-flow lines, and produce raised, jagged edges rather than smooth depressions as seen in a struck-thru error.

Map Sum Summary - This map displays the element concentrations of the target elements, sometimes called a "quantitative map". In other words, the metal assay at a particular target point of a coin's surface.

Microstructure - Microstructure is the very small-scale structure of a material, defined as the structure of a prepared surface of material as revealed by an optical microscope (i.e., SEM Microscopy) minimally above a 25× magnification generating brittle lead salts and oxides (PbSO_4 , PbCl_2 , PbO) that create chalky layers and obscure mint details.

Oxygen Enrichment - Oxygen enrichment refers to an abnormally elevated concentration of oxygen within a metal or at a specific microstructural site, typically detected by SEM/EDS or other analytical methods. It usually indicates the presence or formation of oxide phases—such as Mn-oxides, Fe-oxides, or mixed metal oxides—that have developed during melting, solidification, service exposure, or corrosion. Localized oxygen spikes often mark chemically active defects, including oxide inclusions, blistering, or sub-surface oxidation fronts. Because these oxygen-rich regions differ sharply from the surrounding metallic matrix, they can weaken bonding, promote crack initiation, and drive progressive failure under stress or environmental attack.

SURFACE ISSUES IN U.S. JEFFERSON WAR NICKELS: INSIGHTS FROM A DUAL ANALYSIS METHOD: XRF AND SEM/EDS ANALYSES

Planchet Fissure - A planchet fissure is a crack that opens in the metal blank itself, caused by internal stresses or pre-existing weak zones. These fissures originate from improper rolling schedules, inadequate or uneven annealing, and lamination planes formed by oxide films or inclusions. Under the pressure of striking—or later mechanical or environmental stress—these flaws split through the thickness of the planchet, producing irregular, open cracks that may extend from the rim into the field or design. The high Pb was not the cause confirmed in this study.

Point & ID Analyses – Utilizing a SEM Micrograph certain different shaded regions of black and white were selected for metal assay determination called spectrum areas. In this paper generally the level of 1000X magnification was chosen and different spectrum areas were circled (i.e., identified by the MSU analyst as target areas of analysis) and their metal assays in these regions were reported for each spectrum area (i.e., target area). The spectrum regions selected in a standard Point & ID Analysis normally number in the three to five range. In this study due to the simplicity of this Cu/Pb binary alloy, three spectrum areas were considered sufficient.

Rolling Mill Lamination - Rolling-mill lamination is a mechanical defect formed when layers within a metal strip fail to bond properly during rolling, leaving a pre-existing plane of weakness parallel to the working direction. These unbonded or poorly bonded layers originate from trapped scale, oxide films, slag streaks, or cold-shut surfaces that were never fully welded together under mill pressure. When the strip is later stressed, especially during striking, this latent seam opens into a long, planar split with clean metallic surfaces and directional geometry. Because the flaw is created during rolling rather than by chemical reaction, the lamination is stable, chemically quiet, and shows no oxygen enrichment or evolving oxide behavior. These are the types of laminations seen outside of the war time nickel era for these Jefferson Nickels. They're the "normal," mechanically generated laminations that occur in Cu-Ni strip when something prevents full bonding during rolling. Nothing about them is chemically reactive, nothing grows over time, and you don't get the Mn-oxide or Mn-sulfide behavior that makes the WWII alloy such an outlier.

SEM/EDX (EDS) - Scanning Electron Microscopy (SEM) with energy dispersive X-Ray spectrometry (SEM/EDS). Generally classified as an excellent analysis method for cultural heritage type material like coins. The chemical characterization of a coin facilitates the determination of the general provenance and age (i.e., CCC or Modern 20th / 21st century forgery). It also allows its production technology (i.e., cast or struck), intended purpose and the overall authenticity (i.e., regal vs. non-regal). In this study with Michigan State University – Material Analysis Department a triple tier analysis method was developed & utilized: Map Sum Spectrum/SEM Micrograph/Point & ID Spectrum Analyses.

Spectrum – In this study the spectrums were metal assays at a particular target area on a coin's surface. SEM Micrograph spectrum areas were selected for the different shades they exhibit in these Black & White photomicrographs. The different shaded regions indicate different metal or metal alloy regions within the SEM Micrograph. Any area selected by the Point & ID method can be characterized with its metal alloy make-up or the predominant metal in this area. The Map Sum Spectrum is also utilized and is the metal assay at a particular target area of the coin. Both are powerful tools in this three-tier SEM/EDS analysis method in metal alloy assay determinations.

SURFACE ISSUES IN U.S. JEFFERSON WAR NICKELS: INSIGHTS FROM A DUAL ANALYSIS METHOD: XRF AND SEM/EDS ANALYSES

Stringer - A stringer, in the context of MnO in Jefferson war nickels, is an elongated manganese-oxide inclusion that becomes stretched into a thin, ribbon-like seam during rolling of the planchet strip. MnO and related Mn-rich oxides form early in the melt because manganese has a strong affinity for oxygen. These oxides are hard, brittle, and non-metallic, so when the Cu-Ag-Mn alloy is rolled to final thickness, the surrounding metal flows plastically while the oxide particles do not. The result is that originally globular MnO inclusions are drawn out into long, continuous streaks aligned with the direction of metal flow.

These MnO stringers act as built-in weakness planes inside the alloy. Because they do not bond well with the copper-silver matrix, they interrupt grain boundaries and create thin zones where the metal is poorly integrated. Under striking pressure, these seams are pushed closer to the surface, where they can terminate as microcracks, dark streaks, or the small black globules you've been documenting. Once exposed, they become prime sites for lamination, peeling, or environmental attack.

In short, a stringer is the mechanically elongated form of a manganese-oxide inclusion—an internal seam created by Mn-oxides brittleness and incompatibility with the surrounding alloy. It is one of the defining structural defects responsible for the characteristic lamination behavior of wartime Jefferson nickels.

Struck Through Error - A struck-through error occurs when foreign debris—fabric, grease, wire, or other contaminants—becomes trapped between the die and the planchet at the moment of striking. The resulting imprint is a smooth depression or void conforming to the shape of that debris, usually surrounded by normal raised fields. Unlike lamination or fissures, struck-through voids are clean and well-defined, without lifted or jagged metal edges.

Surface Contaminants – A group of metals found on a coin's unpolished surface originating from environmental air or soil exposure. Two common surface contaminants are sulfur (S) and chlorine (Cl). From previous studies by this author these two contaminants can be considered almost universally seen on all coin surfaces – it's just a question of what the wt.% will be that is recorded by the Material Analysis instrument such as an XRF operating with an accompanying vacuum chamber or SEM/EDS instrument which always operates in a vacuum chamber.

Target Area (XRF or SEM/EDS) – In this study a random area of the coin's surface was selected for Map Sum Spectra analysis. In the spectrum areas within the Point & ID analysis particular areas of the SEM Micrograph is selected as a "target area" based on their different shades of Black & White intensity. So, a target area is a point of analysis which can be random (i.e., Map Sum Spectra) or non-random (i.e., Point & ID analysis spectrum area).

Triple Tier Analytical Method – With each target point at a coin's surface utilizing SEM/EDS analysis a Map Sum Spectra/SEM Micrograph/Point & ID Spectrum Areas are generated. Then with the Map Sum Spectra and Point & ID the metal assay results of the coin's alloy and the SEM Micrographs yield information if the coin is cast or die struck based on the coin's microstructure.

SURFACE ISSUES IN U.S. JEFFERSON WAR NICKELS: INSIGHTS FROM A DUAL ANALYSIS METHOD: XRF AND SEM/EDS ANALYSES

Twin (Grain) Line Microstructure – A microstructure seen in struck coins. Either a jigsaw like pattern or slip lines in the form of fine parallel or intersecting lines with slightly curved twin bands. Quite different than the dendritic nebulae type microstructure of a cast coin. Sometimes it is also called a twin (grain) microstructure. Both terms are similar.

X-Ray Fluorescent Testing (XRF) – A non-destructive form of forensic scientific analysis (as is SEM/EDS) of the metallic elements contained in an object using “secondary” fluorescent emissions produced by bombardment with gamma or x-rays. Normally several target areas are recommended for unpolished surface coin areas.

References

1. Wikipedia definition of the overall benefits of SEM/EDS analysis.
2. This is supported by the ASTM E3 Standard Guide for Preparation of Metallographic Specimens, which outlines typical grinding/polishing stages and their expected removal depths.
3. Surface corrosion layers on copper-alloy and silver coins vary widely depending on burial environment, alloy composition, and moisture-ion exposure, but archeometallurgical studies consistently document that these layers can reach **tens to several hundred microns** in thickness. Stratified patinas composed of cuprite, malachite, tenorite, and chloride-rich alteration zones often build outward over long burial periods, producing cumulative corrosion shells that may exceed **200–300 µm** in archaeological contexts. This range is well established in conservation literature, particularly in the work of Scott (*Copper and Bronze in Art*, Getty Conservation Institute) and Robbiola et al., who describe multi-layered patinas with total thicknesses extending into the hundreds of microns. By contrast, modern or shallow-buried coins typically show much thinner alteration layers. Recent quantitative work on Qing-era copper coins, for example, reports corrosion thicknesses around **9 µm**, reflecting limited burial time and relatively stable environmental conditions. These measurements illustrate that corrosion thickness is not uniform across numismatic materials but instead reflects the specific chemical and physical history of each specimen. Electrochemical studies of modern alloys likewise focus on corrosion mechanisms rather than patina depth and rarely report layers thicker than a few microns. The **~250 µm** figure therefore represents the upper end of what is observed in long-buried copper-alloy artifacts rather than a universal expectation. It aligns with published descriptions of thick, stratified patinas in archaeological bronzes and silver coins, where cuprite cores, chloride-rich intermediate layers, and outer carbonate or oxide crusts accumulate over centuries. In these cases, the corrosion layer becomes a substantial microstructural feature, often exceeding the depth of surface-level polishing or mechanical cleaning methods. When referencing a 250 µm corrosion layer in a study, it is most accurate to frame it as consistent with the **documented upper range** of archaeological patina development rather than as a standard value. Citing Scott (Getty Conservation Institute), Robiola’s corrosion-stratigraphy research, and broader archeometallurgical surveys provides a solid scholarly foundation for this magnitude of surface alteration.

SURFACE ISSUES IN U.S. JEFFERSON WAR NICKELS: INSIGHTS FROM A DUAL ANALYSIS METHOD: XRF AND SEM/EDS ANALYSES

Acknowledgments

The author has been greatly assisted by detailed discussions with Abby Vanderberg of Michigan State University Material Analysis Laboratory. This triple tier analysis method of Map Sum Spectra/SEM Microstructure Micrograph at 400X & Point ID Spectrum Analysis at a preferred 1000X magnification level where all on their expertise as well as suggesting preferred spectrum areas in the Point & ID Analysis section.

The author has also been assisted by Winston Zack in performing the preliminary XRF Analysis for this paper. Winston Zack wrote the numismatic Bad Metal books, and they are a landmark contribution to the study of U.S. Federal circulating contemporary counterfeits within U.S. coin collecting. Winston Zack is certainly another top tier numismatist who understands the importance of Material Analysis in numismatics, whether utilized in collecting contemporary circulating counterfeit or analyzing U.S. regal (i.e., legitimate U.S. Mint issued) coins to explain errors as in World War II Jefferson War Nickels or other abnormal behavior that sometimes happens to numismatic items along the pedigree chain.

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RARE 1968-S LINCOLN CENT TORCHED DIE WITH THIS MUCH DETAIL REMAINING!

by Mike Byers (mikebyers.com)

This 1968-S Lincoln Cent Obverse Cancelled Die (Torched) struck Lincoln cents for circulation. The die # S 1120 represents S for San Francisco and 1120 for the die number. Dies

were not produced in San Francisco. Rather, they were produced at the Philadelphia Mint and then were shipped to San Francisco where mint marks were applied by hand.



RARE 1968-S LINCOLN CENT TORCHED DIE WITH THIS MUCH DETAIL REMAINING!

A scarce die and rare with this much detail remaining. Considerable detail still remains including the date, mintmark, part of Lincoln's portrait and TRUST from IN GOD WE TRUST. It is in great condition considering the fact that it was sold as scrap almost 60 years ago by the U.S. Government.

In the past, the U.S. Mint has auctioned mint machinery, cancelled dies, and parts of the coin press and equipment. In some cases, private companies were contracted to destroy this scrap. The General Services Administration (GSA) sold dies as scrap as well.

In 1968, the GSA sold approximately 4,500 cancelled dies that were torched. This created a media frenzy regarding the sale of U.S. coin dies and the legality of the sale.

In a Department of the Treasury letter written in 1973, Mary Brooks, the Director of the Mint, describes in detail the sale and destruction of defaced U.S. coin dies:

"In late 1968, mutilated die bodies,

remaining from the defacement and destruction of worn or otherwise retired dies at the San Francisco Mint, were included in scrap steel sold by the Mint through the General Services Administration.

GSA sold it at a public sale. A West Coast scrap metal dealer purchased it, and in turn sold the included mutilated die bodies to a West Coast coin dealer.

In turn, that dealer is said to have sold some of the mutilated die bodies to other dealers throughout the United States. Apparently the advertisement you cite is for some of those items.

When the items were first offered for sale to individuals in San Francisco in January 1969, the matter was investigated by the Department. The scrap steel die bodies were examined by a Treasury representative, who concluded that each of them had been defaced and destroyed and that none were usable for stamping coins. The

RARE 1968-S LINCOLN CENT TORCHED DIE WITH THIS MUCH DETAIL REMAINING!

scrap metal die bodies had been mutilated to such an extent (by grinding off and then puddling with a welder's torch) that private possession of them presented no threat to the Treasury's responsible interest in the matter--the detection and suppression of counterfeiting. Since this occurrence, regulations provide that the scrap steel remaining from die destruction be delivered under security into a steel melting furnace and there melted."

In this group of approximately 4,500 defaced dies that were torched, almost every die was 100% defaced with no visible detail remaining on the face of the die. There was a small group that still showed a small amount of detail remaining, such as a few letters, partial date or a very small amount of a portrait or building. Even rarer were a few dies showing considerable amount of detail remaining.

This GSA sale consisted of four different groups of defaced dies:

1. An extremely small number of Lincoln cent dies that struck Wheat Ear cents in San Francisco ending in 1955. Very little information is available on these rare Wheat Ear dies. A few had the slightest design showing a wheat ear and/ or partial letters. The design and placement of the letters of E PLURIBUS UNUM, ONE CENT and UNITED STATES OF AMERICA made it easy to identify the small amount of design left on the Wheat Ear dies. The rest of this very small group were 100% torched and only identifiable by the placement of the die numbers on the side of the shank. These did not have an S in front of the die number.
2. An extremely small number of 1968-S dies that struck circulation coins. Once again, a few had a small amount of detail, the rest were 100% torched. These were identifiable by an S on the side of the shank followed by the die number.

RARE 1968-S LINCOLN CENT TORCHED DIE WITH THIS MUCH DETAIL REMAINING!

3. An extremely small number of 1969-S dies that struck proof coins. Once again, a few had a small amount of detail, the rest were 100% torched. These are identifiable by a S for San Francisco, followed by the die number and then P for proof.

4. The vast majority (almost all) of the defaced dies were PROOF dies from 1968-S, of each denomination, and were torched completely with no design visible. Once again, a few had a very small part of the original design visible such as a partial date, a few letters or a very small amount of a portrait or building.

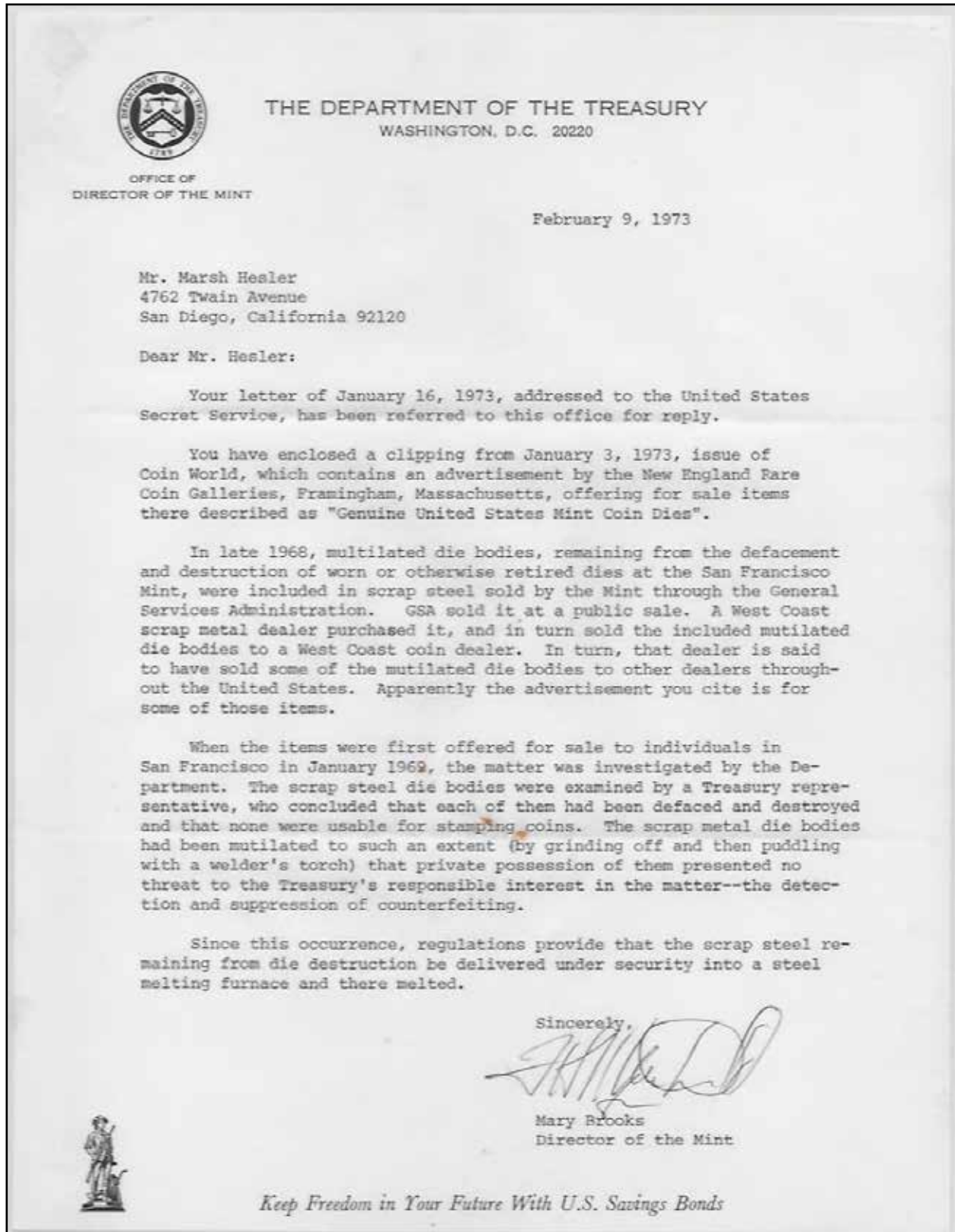
New England Rare Coin Galleries handled a huge number of these dies and publicized and sold them to retail collectors. The dies included a letter from New England Rare Coin Galleries dated April 26, 1974.

The Lincoln Cent (Wheat Reverse) series is the most popular and collected United States coin and this die is perfect for the serious collector. It is a very rare die and is extremely rare with this much detail remaining.



RARE 1968-S LINCOLN CENT TORCHED DIE WITH THIS MUCH DETAIL REMAINING!

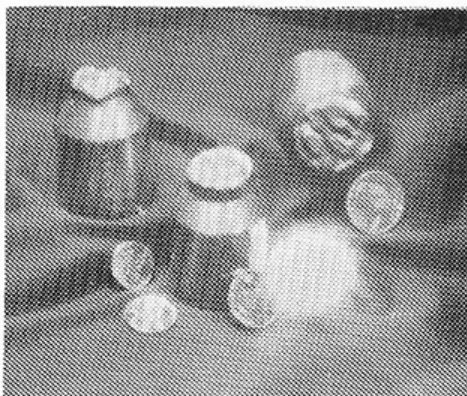
In a Department of the Treasury letter written in 1973, Mary Brooks, the Director of the Mint, describes in detail the sale and destruction of defaced U.S. coin dies:



RARE 1968-S LINCOLN CENT TORCHED DIE WITH THIS MUCH DETAIL REMAINING!

New England Rare Coin Galleries ad offering canceled 1968-S Proof coin dies as published in the October 1974 issue of The Numismatist:

GENUINE U.S. MINT COIN DIES ...



Used to make the 1968-s proof sets. Only 4,500 were released, and the mint has since spent over \$50,000 on equipment to melt all future dies. Thus, no more can ever be available to the public.

A unique opportunity!

All dies have been defaced by the mint, and are completely legal to own. We offer a single coin die for only:

\$24.00

or a set of 10 for \$225.00

Satisfaction guaranteed — (10 day 100% money-back guarantee)

Please send check or money order to:

NEW ENGLAND RARE COIN GALLERIES

P. O. Box 1015, Dept. DP
Framingham, Mass. 01701

Phone: (617) 879-7711

RARE 1968-S LINCOLN CENT TORCHED DIE WITH THIS MUCH DETAIL REMAINING!

World renowned mint error expert Fred Weinberg describes the three different ways that the U.S. Mint cancelled dies:

Torched - the face of the die is melted into blobs. Seen most commonly in the 1968-S and some 1969-S dies sold as scrap in the San Francisco area just a year or two after striking coins. The surface looks like lava.

Defaced - the face of the die is ground off flat. This is the types I purchased directly from the Denver Mint in 1995. There were approximately 20,000 of them, all dated 1994. This is the type currently sold by the Mint in denominations from cents thru state quarters.

Cancelled - the face of the die has an X cut across it, leaving four quadrants that show design. Some older U.S. dies, many from the Carson City Mint, have either an X, or sometimes just one line across the die face. This type also includes the popular 1995-1996 Olympic Coin Proof and BU \$1 Silver and \$5 Gold dies, also sold by the U.S. Mint. According to the Mint, this was a one-time only deal, because the Dies were for Commemorative Coins, not circulation strike coins, and will not be repeated again.

RARE 1968-S LINCOLN CENT TORCHED DIE WITH THIS MUCH DETAIL REMAINING!

NGC Certifies and Encapsulates Cancelled Dies

Posted on 12/11/2018

Here's how to submit these impressive numismatic collectibles to NGC.

Numismatic Guaranty Corporation® (NGC®) has a certification and encapsulation service for coin, token and medal dies. As many numismatists know, dies are the tools used in the minting process to strike a planchet and impart the coin's design.



RARE 1968-S LINCOLN CENT TORCHED DIE WITH THIS MUCH DETAIL REMAINING!

Here is a typical cancelled (torched) die for the 1968-S Jefferson nickel. Notice that it has been completely torched:





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ERROR COINS - IMPROPER ANNEALING -

by Jeff Ylitalo

Error coins with copper, reddish and orange surfaces are classified as “Improperly Annealed” by grading companies. It occurs during the planchet preparation process. In the past they had predominately been classified as “Copper Wash” and “Stinted Planchets”. New collectors commonly confuse these errors as toned coins, or coins missing their clad layer.

These planchet errors are underrated and underappreciated. Improperly annealed coins can be absolutely stunning and individually unique.

The annealing process at U.S.

Mints (this also includes World Mints) takes place during the planchet preparation process. Because annealing involves an oven, this means extreme heat. Extreme heat increases the kinetic energy of metal atoms. It causes atom migration due to intense vibration through a process called atomic diffusion. It primarily occurs on copper-nickel and copper clad coins. Prolonged exposure to extreme heat is the primary reason for Improperly Annealed error coins.

Here, I present a varied group of error coins from my personal collection both certified and raw.

ERROR COINS - IMPROPER ANNEALING

A 1965 25¢ Washington Quarter certified and graded MS63 by PCGS, it is a fascinating example for the first year of U.S. clad coinage. It displays a reddish, orange copper color on both faces with streaks of black. An attractive central bulls eye on the reverse is present. NOTE: Specimens which are completely black are often called *Black Beauties*.



ERROR COINS - IMPROPER ANNEALING



ERROR COINS - IMPROPER ANNEALING



ERROR COINS - IMPROPER ANNEALING

Next is a 1979-P \$1 Susan B. Anthony certified and graded MS65 by PCGS. Both the obverse and reverse are 100% affected with radiant eye-popping colors. Note worthy is that this coin is the first year for the SBA series.



ERROR COINS - IMPROPER ANNEALING



ERROR COINS - IMPROPER ANNEALING



ERROR COINS - IMPROPER ANNEALING

Next is a 2000-D 25¢ Maryland State Quarter certified and graded MS67 by NGC. I've not seen any other Improperly Annealed State Quarters grading higher. Both the obverse and reverse display smoky red, purple, black and gun metal gray shades. Note the thick NGC older generation capsule annotates "Stinted Planchet" on the tag.



ERROR COINS - IMPROPER ANNEALING



ERROR COINS - IMPROPER ANNEALING



ERROR COINS - IMPROPER ANNEALING

Next is a 2002-D 25¢ South Carolina State Quarter certified and graded MS66 by PCGS. Both the obverse and reverse show desirable red shades with hints of purple and black.



ERROR COINS - IMPROPER ANNEALING



ERROR COINS - IMPROPER ANNEALING



ERROR COINS - IMPROPER ANNEALING

Next is a 2002-D 5¢ Jefferson Nickel. Both the obverse and reverse have dual-coverage with strikingly bold orange shades making it a spectacular mint error.



ERROR COINS - IMPROPER ANNEALING



ERROR COINS - IMPROPER ANNEALING

Next is a choice 2004-P Jefferson Keel boat 5¢ coin. Certified and graded MS64 by PCGS it was struck for one year as part of the Lewis and Clark expedition series. Both the obverse and reverse show impressive bright red and pink shades. These are quickly snapped up by collectors.



ERROR COINS - IMPROPER ANNEALING



ERROR COINS - IMPROPER ANNEALING



ERROR COINS - IMPROPER ANNEALING

Next is a 2004-D Roosevelt 10¢ coin. Both the obverse and reverse surfaces reveal striking orange and red exteriors. In my personal experience dimes with improper annealing are seldom encountered.



ERROR COINS - IMPROPER ANNEALING



ERROR COINS - IMPROPER ANNEALING

Next is a unique 2005-D 5¢ West Virginia State Quarter. Graded MS65 by PCGS it exhibits intense, exquisite thick pinkish-red exteriors on both obverse and reverse. An absolute beauty.



ERROR COINS - IMPROPER ANNEALING



ERROR COINS - IMPROPER ANNEALING



ERROR COINS - IMPROPER ANNEALING

Finally, I would be remiss if I did not include a World Coin. It is a 5 Rupees dated 2000 from India that is Improperly Annealed. I've had this specimen in my personal collection for two plus decades. While it is raw, uncirculated I have not a doubt as to its authenticity.



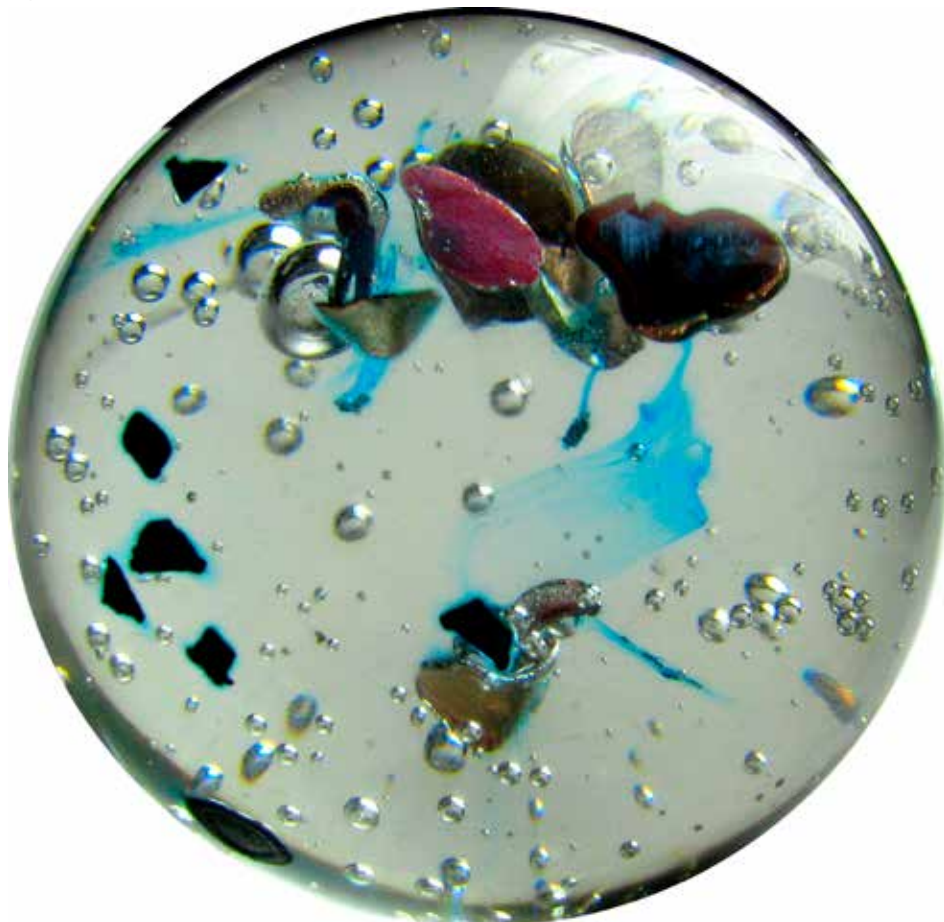
ERROR COINS - IMPROPER ANNEALING



ERROR COINS - IMPROPER ANNEALING

I'd like to share a paperweight that I created as an advanced hobbyist glass blower. In 2018 I came up with an idea to hammer down thick pieces of pure copper and gradually introduce them into molten glass to demonstrate atom migration. Under extremely hot conditions it took about 40 minutes to create this paperweight. When done blending the glass and metal I then

inserted the paperweight into an annealing oven to cool down for 48 hours. In the end I was able to capture atom migration from the hammered copper bits within the molten glass. Hues of blue, purple, red, orange, black and burgundy under extreme heat were captured for all time. While I no longer create glass art this piece sits on my desk to this day.



True View Image courtesy of PCGS for 1979 \$1 SBA, 2002-D 25¢ SC, 2004 5c Keel Boat and 2005 D 25c WV.

CTF Error Coins

Christopher Talbot Frank



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Mint Error News Price Guide

- Updated October 2026 -

This price guide is brought to you by Mint Error News. It has been compiled by many of the top major mint error dealers.

This price guide is a guide. Prices fluctuate due to the date, grade, eye appeal and how dramatic the striking error is. Rarity is also a factor. The price is sometimes based on the rarity and grade of the type of coin as well as how rare the error is. The price can also vary depending on whether two collectors are bidding for the same rare major mint error. When purchasing a mint error, it is important to use multiple resources to determine value, as there are many mint errors that do not fit into one category.

Proof Errors (Updated October 2026)



Proof coins are struck by technicians who hand feed the blanks into special presses. They are produced, examined, and packaged using extreme quality control. It is very unusual to find major proof errors. A few broadstrikes, off-centers, double strikes in collars and off-metals have been known to be found in sealed proof sets. Proof errors are aggressively sought after by many error collectors.

A very small group of Proof errors recently came from a collection that was auctioned by the State of California. The U.S. Secret Service inspected and released this collection to the State of California determining that it was legal to own. The State of California then auctioned the collection and it has been dispersed since the sale.

Denomination	Broadstrikes	Die Trials	Double/Triple Strikes	Off-Center Strikes	Partial Collar Errors
Proof Lincoln Cent	\$500	\$1,000	\$1,500	\$2,000	\$500
Proof Jefferson Nickel	\$1,000	\$1,000	\$2,500	\$2,000	\$1,000
Proof Clad Dime	\$1,000	\$1,500	\$2,500	\$2,500	\$1,250
Proof Clad Quarter	\$1,000	\$1,500	\$2,500	\$2,500	\$1,250
Proof Clad Half	\$2,500	\$2,000	\$5,000	\$1,500	\$2,000
Proof Ike Dollar	\$15,000	-	\$25,000	-	\$4,000
Presidential Dollar	-	-	-	-	3 Known

Mint Error News Price Guide

Broadstrikes (Updated October 2026)



A broadstruck error occurs when a coin is struck without the collar to form the rim and edge that is part of the shape of the coin. Coins can be broadstruck on either type one or type two planchets. When a coin is broadstruck the blank being fed into the collar will spread and distort outward as it is being struck because the collar isn't in the correct position to retain it.

Denomination	(Small) XF/AU	(Small) Unc	(Large) XF/AU	(Large) Unc
Large Cent	\$150	\$300	\$400	\$1,500
Flying Eagle Cent (1857 – 1858)	\$1,000	\$2,500	\$1,500	\$7,500
Indian Cent	\$50	\$150	\$200	\$350
Lincoln Cent 1930 and Earlier	\$50	\$150	\$100	\$250
Lincoln Cent 1943 Steel	\$40	\$100	\$75	\$200
Proof Lincoln Cent	N/A	\$750	N/A	\$1,000
3 Cent Nickel	\$250	\$1,000	\$400	\$1,500
3 Cent Silver	\$1,000	\$3,500	\$1,500	\$5,000
Shield Nickel	\$400	\$1,250	\$1,000	\$2,500
Liberty Nickel	\$150	\$300	\$200	\$600
Buffalo Nickel	\$100	\$200	\$200	\$500
Jefferson Nickel War Time	\$100	\$200	\$200	\$500
Proof Jefferson Nickel	N/A	\$750	N/A	\$1,000
Seated Half Dime Legend	\$500	\$1,500	\$1,000	\$2,500
Seated Dime Legend	\$500	\$1,500	\$1,000	\$2,500
Barber Dime	\$150	\$250	\$200	\$400
Mercury Dime	\$40	\$150	\$150	\$250
Proof Clad Dime	N/A	\$750	N/A	\$1,000
Barber Quarter	\$600	\$1,250	\$1,000	\$2,500
Standing Liberty Quarter	\$2,000	\$4,000	\$3,000	\$6,000
Washington Quarter Silver	\$75	\$150	\$100	\$250
State Quarter	N/A	\$25	N/A	\$50
Proof Clad Quarter	N/A	\$750	N/A	\$1,000
Barber Half	\$1,000	\$2,000	\$2,000	\$4,000
Walking Liberty Half	\$3,000	\$5,000	\$4,000	\$7,000
Franklin Half	\$1,500	\$3,000	\$2,000	\$4,000
Kennedy Half Silver	\$150	\$250	\$200	\$300
Kennedy Half Clad	\$40	\$60	\$50	\$75
Proof Clad Half	N/A	\$1,000	N/A	\$2,000
Morgan Dollar	\$200	\$500	\$400	\$1,000
Peace Dollar	\$5,000	\$7,500	\$6,000	\$10,000
IKE Dollar	\$100	\$150	\$150	\$200
SBA Dollar	\$50	\$75	\$100	\$200
Sac Dollar	N/A	\$300	N/A	\$1,000
Presidential Dollar	N/A	\$1,500	N/A	\$2,500

Mint Error News Price Guide

Partial Collars (Updated October 2026)



Partial collar strikes occur when there is a malfunction of the striking press. This causes the collar to be in an incorrect position. The lower die (usually the reverse die) is recessed in the collar. This allows the coin which is going to be struck to have a formed rim. After a coin is struck the lower die raises upwards, pushing the struck coin out of the collar and ejecting it. If a blank entering the collar is not properly seated, it will only have partial reeding as it is struck. The edge of this coin will have a partial reeding and a partial blank surface area. Recently, the Mint has installed new machinery where either die can be installed in either position.

Denomination	XF/AU	Unc
Large Cent	\$100	\$200
Flying Eagle Cent (1857 – 1858)	\$500	\$1,500
Indian Cent	\$35	\$100
Lincoln Cent 1930 and Earlier	\$30	\$100
Lincoln Cent 1943 Steel	\$25	\$50
Proof Lincoln Cent	N/A	\$750
3 Cent Nickel	\$150	\$500
3 Cent Silver	\$250	\$750
Shield Nickel	\$200	\$600
Liberty Nickel	\$50	\$150
Buffalo Nickel	\$50	\$75
Jefferson Nickel War Time	\$40	\$60
Proof Jefferson Nickel	N/A	\$1,000
Seated Half Dime Legend	\$750	\$1,500
Seated Dime Legend	\$500	\$1,250
Barber Dime	\$75	\$150
Mercury Dime	\$30	\$100
Proof Clad Dime	N/A	\$1,250
Barber Quarter	\$300	\$750
Standing Liberty Quarter	\$1,250	\$2,000
Washington Quarter Silver	\$40	\$75
State Quarter	N/A	\$15
Proof Clad Quarter	N/A	\$1,500
Barber Half	\$1,000	\$1,500
Walking Liberty Half	\$1,500	\$3,500
Franklin Half	\$500	\$1,000
Kennedy Half Silver	\$50	\$100
Kennedy Half Clad	\$20	\$30
Proof Clad Half	N/A	\$2,000
Morgan Dollar	\$150	\$300
Peace Dollar	\$1,000	\$2,500
IKE Dollar	\$50	\$100
SBA Dollar	\$20	\$30
Sac Dollar	N/A	\$100
Presidential Dollar	N/A	\$400
\$1 Gold Type 1	\$1,000	\$2,000
\$1 Gold Type 2	\$2,000	\$3,000
\$1 Gold Type 3	\$1,000	\$2,000
\$2½ Liberty	\$1,500	\$3,000
\$2½ Indian	\$2,000	\$3,000
\$3	\$5,000	\$10,000
\$5 Liberty	\$4,000	\$5,000
\$5 Indian	\$4,000	\$6,000
\$10 Liberty	\$4,000	\$7,500
\$10 Indian	\$7,500	\$10,000
\$20 Liberty Type 3	\$7,500	\$10,000

Mint Error News Price Guide

Uniface Strikes (Updated October 2026)



Uniface coins occur when there have been two blank planchets in the press at the same time. The other blank will obstruct the die on either the obverse or reverse side, which will prevent it from having that design on the coin. There are many different variations involving uniface errors. In addition to having a 100% blank obverse or reverse, a coin can be struck off-center, with a blank planchet in the collar which will obstruct one side of the off-center. There are also mated pairs which have a combination of multiple errors which can include a side which is uniface. Finally, there are uniface strikes due to a die cap which adhered to the die, forming itself in the shape of a die and striking blank planchets.

Denomination	Uniface Obverse XF	Uniface Obverse Unc	Uniface Reverse XF	Uniface Reverse Unc
Large Cent	\$1,500	\$4,000	\$1,250	\$2,000
Indian Cent	\$750	\$3,000	\$700	\$2,500
Lincoln Cent 1943 Steel	\$250	\$500	\$200	\$400
Lincoln Cent Wheat Ears	\$50	\$100	\$40	\$75
3 Cent Nickel	\$1,500	\$3,000	\$1,250	\$2,500
Shield Nickel	\$1,750	\$4,000	\$1,500	\$3,000
Liberty Nickel	\$2,000	\$3,500	\$1,500	\$3,000
Buffalo Nickel	\$2,250	\$3,000	\$2,000	\$2,500
Jefferson Nickel War Time	\$300	\$750	\$250	\$500
Jefferson Nickel	\$20	\$40	\$20	\$40
Barber Dime	\$2,000	\$3,000	\$1,500	\$2,500
Mercury Dime	\$1,500	\$2,500	\$1,250	\$2,250
Roosevelt Dime Silver	\$100	\$150	\$100	\$150
Roosevelt Dime Clad	\$40	\$75	\$35	\$60
Washington Quarter Silver	\$400	\$750	\$350	\$500
Washington Quarter Clad	\$100	\$125	\$75	\$100
State Quarter	N/A	\$300	N/A	\$500
Kennedy Half Clad	\$750	\$1,000	\$500	\$750
IKE Dollar	\$2,000	\$4,000	N/A	\$3,000
SBA Dollar	\$500	\$1,000	N/A	\$750
Sac Dollar	\$750	\$1,500	N/A	\$1,000

Mint Error News Price Guide

Bonded Coins (Updated October 2026)



Bonded coins occur when the feeder system, which supplies blank planchets to the coin press, malfunctions and jams. When this occurs, a struck coin is not properly ejected and another planchet is fed into the collar and is struck. This struck coin will land on top of the previously unejected strike. These coins will then crush and bond together. This may occur many times as more coins bond.

Denomination	2 Planchets	3-4 Planchets	5-10 Planchets
Lincoln Cent Wheat Ears	\$5,000	\$15,000	—
Lincoln Cent Memorial	\$600	\$2,000	\$5,000 - \$10,000
Jefferson Nickel	\$1,250	\$5,000	\$6,000 - \$10,000
Roosevelt Dime Silver	\$4,000	\$12,500	—
Roosevelt Dime Clad	\$1,500	\$5,000	\$10,000
Washington Quarter Silver	\$7,500	—	—
Washington Quarter Clad	\$3,000	—	—
State Quarter	\$5,000	—	—
Kennedy Half Silver	\$12,500	—	—
Kennedy Half Clad	\$10,000	—	—
IKE Dollar	—	—	—
SBA Dollar	\$10,000	—	—
Sac Dollar	\$10,000	—	—

Mint Error News Price Guide

Struck Fragments

(Updated October 2026)



The blanking press takes the coils of metal strips and punches blanks out of it, ejecting the webbing at the other end. The webbing is cut into small scrap pieces to be melted and recycled. Occasionally a scrap piece will be mixed with the blank planchets and struck by the dies. Struck fragments are rare in the larger denominations. These can be uniface or die struck both sides and are very rare on type coins.

Denomination	Uniface	Die Struck Both Sides
Indian Cent	\$1,000	\$2,000
Lincoln Cent Wheat Ears	\$750	\$2,000
Lincoln Cent Memorial	\$75	\$125
3 Cent Nickel	\$3,000	\$3,500
Jefferson Nickel	\$100	\$200
Roosevelt Dime Silver	\$500	\$1,000
Roosevelt Dime Clad	\$150	\$250
Washington Quarter Silver	\$1,250	\$1,500
Washington Quarter Clad	\$200	\$300
State Quarter	\$750	\$1,000
Kennedy Half Silver	\$1,500	\$2,500
Kennedy Half Clad	\$750	\$1,250
IKE Dollar	\$4,000	\$6,000
SBA Dollar	\$2,000	\$3,000
Sac Dollar	\$2,000	\$4,000

Mint Error News Price Guide

Mated Pairs (Updated October 2026)



Mated pairs involve two individual coins with different errors that were struck together at the same time. Mated pair error combinations can be found in most error types and come in many shapes and sizes. Mated pairs can be overlapped when one of the coins is struck off-center on top of another coin. Another type involves a brockage where a struck coin was perfectly centered on a blank and restruck. Some mated pairs involve a die cap where the cap and brockage coin are discovered together, but this is a scarce find.

The rarest mated pair type involves two die caps (obverse and reverse) where both dies were capped at the same time and both die caps are mated. This last type is extremely rare and there are only a few known examples of mated pairs involving an obverse die cap and reverse die cap. There are several of these mated pairs known on Kennedy Halves including two dated 1976, which is the Bicentennial year. One of the most spectacular mated pairs involve two Barber Dimes, an obverse die cap mated to a reverse die cap and are unique.

Mated pairs can also involve an off-metal where a smaller blank planchet or smaller struck coin was struck on top of a larger coin. This type is extremely rare. The most spectacular pair known is a double struck Franklin Half which was mated to a Lincoln Cent. The Lincoln Cent blank was on top of the obverse of the struck Franklin Half. This pair was then struck together. It is unique.

Denomination	Overlapping	Full Brockage	Die Cap	2 Die Caps
Lincoln Cent Wheat Ears	\$3,500	\$4,500	\$7,500	—
Lincoln Cent Memorial	\$500	\$750	\$750	\$1,250
Liberty Nickel	—	\$20,000	—	—
Jefferson Nickel (pre War Time)	—	—	—	\$10,000
Jefferson Nickel	\$1,000	\$1,250	\$1,500	\$2,500
Barber Dime	—	—	—	\$50,000
Roosevelt Dime Silver	\$3,500	\$4,000	\$4,000	—
Roosevelt Dime Clad	\$1,250	\$1,500	\$2,500	\$3,000
Washington Quarter Silver	\$5,000	—	—	—
Washington Quarter Clad	\$2,000	\$2,500	\$5,000	\$7,500
State Quarter	\$4,000	\$6,000	\$10,000	—
Kennedy Half Silver	\$7,500	\$7,500	\$7,500	\$12,500
Kennedy Half Clad	\$4,000	\$5,000	\$6,000	\$7,500
Kennedy Half Bicentennial	\$6,000	\$7,500	\$7,500	\$10,000
IKE Dollar	\$20,000	—	—	—
SBA Dollar	\$10,000	\$12,500	—	—
Sac Dollar	—	—	—	—

Mint Error News Price Guide

Transitional Errors (Updated October 2026)



A transitional error occurs when a coin is struck on a planchet from a previous year with different metal composition. The most famous transitional is a 1943 copper cent struck on a 1942 copper blank. 1943 cents were struck in steel because of the copper shortage during World War II. Other famous transitionals include 1965 coinage struck in silver instead of clad.

There are also transitionals struck on blanks for the next year. An example is 1964 coinage in clad instead of silver. Most recently, transitionals were discovered involving the SBA and Sacagawea Dollars of 1999 and 2000. There are eight known 1999 SBA Dollars struck on the brass planchet for the 2000 Sacagawea Dollar, and four known 2000 Sacagawea Dollars struck on a clad planchet for the 1999 SBA Dollar.

Denomination	Off-Metal Planchet	Circulated	AU	Unc	Choice Unc – Gem
Lincoln Cent 1943 Transitional	Copper Cent Planchet	\$200,000	\$250,000	\$300,000	\$350,000
Lincoln Cent 1944 Transitional	Steel Cent Planchet	\$30,000	\$50,000	\$100,000	\$150,000
Lincoln Cent 1964 Transitional	Clad Dime Planchet	\$2,000	\$3,000	\$3,500	\$4,000
Lincoln Cent 1965 Transitional	Silver Dime Planchet	\$2,750	\$4,500	\$6,000	\$7,500
Roosevelt Dime 1964 Transitional	Clad Dime Planchet	\$5,000	\$6,500	\$7,500	\$8,500
Roosevelt Dime 1965 Transitional	Silver Dime Planchet	\$5,000	\$6,500	\$7,500	\$8,500
Washington Quarter 1964 Transitional	Clad Quarter Planchet	\$5,000	\$6,500	\$7,500	\$12,500
Washington Quarter 1965 Transitional	Silver Quarter Planchet	\$5,000	\$6,500	\$7,500	\$8,500
Kennedy Half 1964 Transitional	Clad Half Planchet	\$3,500	\$4,500	\$6,000	\$10,000
Kennedy Half 1965 Transitional	Silver Half Planchet	\$5,000	\$6,500	\$7,500	\$10,000
Kennedy Half 1964 Transitional	Clad Quarter Planchet	\$2,000	\$3,000	\$4,000	\$5,000
Kennedy Half 1965 Transitional	Silver Quarter Planchet	\$7,000	\$8,000	\$9,000	\$10,000
Ike Dollar Transitional	40% Silver Planchet	\$2,750	\$3,000	\$3,500	\$5,000
SBA Dollar Transitional	Sacagawea Planchet	N/A	N/A	\$7,500	\$10,000
Sacagawea Dollar Transitional	SBA Planchet	N/A	N/A	\$7,500	\$10,000

Mint Error News Price Guide

U.S. Gold Errors (Updated October 2026)



Major mint errors on U.S. Gold coins are the most prized category of all mint errors. Gold errors are very rare and a few have traded in the \$75,000 to \$100,000 range. Even a broadstruck U.S. Gold coin can easily sell for \$15,000 to \$30,000 compared to a broadstruck Cent, Nickel, Dime or Quarter which all sell for well under \$10. Many serious collectors of Gold Errors have to wait patiently for months and sometimes even years to acquire that one special piece for their collection.

The prices listed here are for common dates in AU-Unc. Better dates and errors that are in gem condition are worth considerably more.

Denomination	Partial Collar	Broadstruck	Clipped Planchet	3% - 5% Off-Center	10% - 15% Off-Center
\$1 Gold Type 1	\$2,000	\$5,000	\$2,000	\$3,000	\$7,500
\$1 Gold Type 2	\$3,000	\$10,000	\$10,000	\$10,000	\$25,000
\$1 Gold Type 3	\$2,000	\$4,000	\$1,500	\$3,000	\$7,500
\$2½ Liberty	\$3,000	\$7,500	\$2,500	\$7,500	\$15,000
\$2½ Indian	\$3,000	\$7,500	\$2,500	\$3,000	\$7,500
\$3 Indian	\$5,000	\$15,000	\$5,000	\$15,000	\$35,000
\$5 Liberty	\$4,000	\$8,500	\$3,000	\$7,500	\$30,000
\$5 Indian	\$5,000	\$10,000	\$3,000	\$15,000	\$30,000
\$10 Liberty	\$4,000	\$20,000	\$3,000	\$15,000	\$30,000
\$10 Indian	\$5,000	\$20,000	\$5,000	\$30,000	\$60,000
\$20 Liberty	\$10,000	\$60,000	\$7,500	\$50,000	\$125,000
\$20 St. Gaudens	—	—	\$5,000	—	—
\$5 American Eagle	\$1,000	\$2,000	\$750	\$2,500	\$3,500
\$10 American Eagle	\$1,250	\$2,500	\$1,000	\$3,000	\$3,500
\$25 American Eagle	\$1,500	\$3,000	\$1,500	\$3,500	\$5,000
\$50 American Eagle	\$2,000	\$5,000	\$2,000	\$5,000	\$10,000

Mint Error News Price Guide

Indents (Updated October 2026)



An indent error occurs when two blanks are fed inadvertently into the same collar, with one blank partly overlaying on top of the other. When the hammer die strikes this combination, the upper blank will be forced into the lower blank, creating a depression which is shaped similar to the upper blank. A scarce type of indent occurs when a blank intended for one denomination lands on top of a blank from a different denomination.

Denomination	10% - 25% XF	30% - 50% XF	10% - 25% Unc	30% - 50% Unc
Large Cent	\$300	\$600	\$750	\$2,000
Indian Cent	\$250	\$500	\$400	\$750
Lincoln Cent 1943 Steel	\$100	\$300	\$175	\$500
Lincoln Cent Wheat Ears	\$30	\$75	\$75	\$125
3 Cent Nickel	\$500	\$1,250	\$1,500	\$3,000
Shield Nickel	\$500	\$1,500	\$2,000	\$3,000
Liberty Nickel	\$400	\$1,000	\$750	\$1,500
Buffalo Nickel	\$300	\$1,000	\$600	\$2,000
Jefferson Nickel War Time	\$200	\$400	\$400	\$750
Jefferson Nickel	\$10	\$25	\$15	\$30
Barber Dime	\$1,000	\$2,000	\$1,500	\$3,000
Mercury Dime	\$300	\$750	\$500	\$1,500
Roosevelt Dime Silver	\$30	\$60	\$50	\$100
Roosevelt Dime Clad	\$10	\$20	\$15	\$30
Washington Quarter Silver	\$100	\$200	\$150	\$300
Washington Quarter Clad	\$25	\$50	\$35	\$100
State Quarter	N/A	N/A	\$200	\$350
Kennedy Half Clad	\$150	\$300	\$200	\$400
IKE Dollar	\$350	\$1,000	\$500	\$2,500
SBA Dollar	\$200	\$400	\$250	\$500
Sac Dollar	\$300	\$500	\$400	\$750

Mint Error News Price Guide

Die Caps (Updated October 2026)



Die caps are caused when a struck coin sticks to the upper hammer die. Once the coin is struck to the die face, the reverse of the struck coin becomes the new die face. When the next blank is fed into the collar and the strike occurs, the reverse design of the adhered struck coin impresses itself into the new blank. This struck coin is a brockage strike. The coin that adhered to the upper die is known as a die cap. This process repeats itself as more coins are struck by the cap. The greater the number of strikes, the higher the cap metal will be pushed around the upper die shaft. Eventually, the cap brakes away from the die in the shape of a thimble.

Denomination	Obverse Cap XF	Obverse Cap Unc	Reverse Cap XF	Reverse Cap Unc
Large Cent	\$25,000	\$50,000	—	—
Indian Cent 1859	\$20,000	\$40,000	—	—
Indian Cent 1860-1864	\$15,000	\$40,000	—	—
Indian Cent 1864-1909	\$15,000	\$30,000	\$2,500	\$7,500
Lincoln Cent 1943 Steel	—	—	—	—
Lincoln Cent Wheat Ears	\$1,000	\$2,500	\$500	\$1,000
Lincoln Cent Memorial	\$150	\$200	\$50	\$100
2 Cent Piece	\$20,000	\$50,000	\$15,000	\$30,000
3 Cent Nickel	—	—	—	—
Shield Nickel	—	—	—	—
Liberty Nickel	\$12,500	\$25,000	—	—
Buffalo Nickel (1 Known)	—	\$30,000	—	—
Jefferson Nickel War Time	\$10,000	—	—	—
Jefferson Nickel	\$200	\$350	\$150	\$250
Barber Dime	\$15,000	\$30,000	\$5,000	\$10,000
Mercury Dime (2 Known)	\$5,000	\$7,500	—	—
Roosevelt Dime Silver	\$750	\$1,250	\$500	\$750
Roosevelt Dime Clad	\$200	\$400	\$200	\$250
Barber Quarter	\$20,000	\$50,000	—	—
Washington Quarter Silver	\$1,500	\$4,000	\$1,500	\$2,000
Washington Quarter Clad	\$350	\$750	\$250	\$350
State Quarter	N/A	\$1,000	N/A	\$600
Kennedy Half Silver	\$3,000	\$5,000	\$2,000	\$3,000
Kennedy Half Clad	\$2,000	\$3,500	\$1,500	\$2,000
Kennedy Half Bicentennial	\$2,500	\$4,000	\$1,750	\$2,500
IKE Dollar	—	\$30,000	—	—
SBA Dollar	N/A	\$15,000	N/A	\$10,000
Sac Dollar	N/A	\$15,000	N/A	\$15,000

Mint Error News Price Guide

Die Adjustment Strikes (Updated October 2026)



Die adjustment strikes are also known as die trials. This error occurs when a coin is struck from the press with very little pressure. When the press is being set up and adjusted, extremely weak strikes occur as the strike pressure reaches its optimum level. These die trials are destroyed after being struck and are rarely found in circulation.

Denomination	XF/AU	Unc
Indian Cent	\$1,000	\$2,000
Lincoln Cent Wheat Ear	\$200	\$300
Lincoln Cent 1943 Steel	\$750	\$1,500
Lincoln Cent Memorial	\$50	\$75
2 Cent	\$5,000	—
Liberty Nickel	\$3,000	\$5,000
Buffalo Nickel	\$4,000	\$7,500
Jefferson Nickel War Time	\$1,250	\$2,000
Jefferson Nickel	\$75	\$100
Proof Jefferson Nickel	N/A	\$1,000
Barber Dime	\$2,500	\$3,500
Mercury Dime	\$1,000	\$1,500
Roosevelt Dime Silver	\$350	\$500
Roosevelt Dime Clad	\$100	\$125
Seated Quarter	\$4,000	\$7,500
Standing Liberty Quarter	\$7,500	\$15,000
Washington Quarter Silver	\$500	\$750
Washington Quarter Clad (Pre-State)	\$125	\$150
State Quarter	N/A	\$200
Walking Liberty Half	\$2,500	\$5,000
Kennedy Half Silver	\$500	\$750
Kennedy Half Clad	\$200	\$250
Proof Kennedy Half 40% Silver	N/A	\$1,500
Proof Kennedy Half Clad	N/A	\$1,000
Morgan Dollar	\$1,500	\$2,500
Peace Dollar	\$7,000	\$10,000
IKE Dollar	\$300	\$400
IKE Dollar Bicentennial	\$350	\$500
SBA Dollar	N/A	\$500
Sac Dollar	N/A	\$1,000

Mint Error News Price Guide

Double Denominations (Updated October 2026)



One of the most expensive, popular, and desired types of errors are the double denominations. This error happens when a coin is struck on a previously struck coin of a smaller denomination. Examples are a cent on a struck dime, and a nickel on a struck cent. The most dramatic are those with considerable design visible from the original strike. There are a few known double denominations with different dates.

Denomination	Struck On	Circulated	AU	Unc
Lincoln Cent Wheat Ears	Mercury Dime	\$6,000	\$12,500	\$20,000
Lincoln Cent Wheat Ears	Roosevelt Dime	\$4,000	\$5,000	\$6,000
Lincoln Cent Wheat Ears	Foreign Coin	\$2,000	\$2,500	—
Lincoln Cent Memorial	Roosevelt Dime Silver	\$3,000	\$4,500	\$6,000
Lincoln Cent Memorial	Roosevelt Dime Clad	N/A	N/A	\$750
Lincoln Cent Memorial	Foreign Coin	N/A	\$600	\$750
Jefferson Nickel	Lincoln Cent Wheat Ears	\$1,500	\$2,000	\$2,500
Jefferson Nickel	Lincoln Cent Memorial	N/A	\$750	\$1,000
Jefferson Nickel	Foreign Coin	\$1,000	\$1,250	\$1,500
Jefferson Nickel	Roosevelt Dime	\$1,000	\$1,250	\$1,500
Roosevelt Dime Silver	Foreign Coin	\$4,000	\$5,000	\$7,500
Roosevelt Dime Clad	Foreign Coin	\$3,000	\$4,000	\$5,000
Washington Quarter Silver	Lincoln Cent Wheat Ears	\$3,000	\$4,000	\$6,000
Washington Quarter Silver	Lincoln Cent Memorial	\$2,500	\$3,000	\$3,500
Washington Quarter Silver	Foreign Coin	\$2,500	\$3,000	\$3,500
Washington Quarter Silver	Jefferson Nickel	\$3,000	\$4,000	\$6,000
Washington Quarter Silver	Roosevelt Dime Silver	\$2,500	\$3,000	\$3,500
Washington Quarter Clad	Lincoln Cent Memorial	\$2,500	\$3,000	\$3,500
Washington Quarter Clad	Foreign Coin	\$2,000	\$2,500	\$3,000
Washington Quarter Clad	Jefferson Nickel	\$2,500	\$3,000	\$3,500
Washington Quarter Clad	Roosevelt Dime Clad	\$2,000	\$2,500	\$3,000
State Quarter	Jefferson Nickel	N/A	\$2,000	\$3,000
State Quarter (Extremely Rare)	Any Other Denomination	N/A	\$10,000	\$12,500
Franklin Half	Lincoln Cent Wheat Ears	\$7,500	\$12,500	\$25,000
Kennedy Half (Extremely Rare)	Any Denomination	\$7,500	\$10,000	\$12,500
IKE Dollar (Extremely Rare)	Any Denomination	\$15,000	\$20,000	\$25,000
Sac Dollar	Maryland State Quarter	N/A	\$3,000	\$4,000

Mint Error News Price Guide

Brockages (Updated October 2026)



A brockage error can only occur when there are two coins involved. One of the coins involved will always be a struck coin which has not ejected properly. That struck coin will find its way back between the dies and will be struck next to a blank planchet which was fed into the collar. The image of that first struck coin will be impressed into that side of the blank planchet. The result will be a second coin which has images of the first coin impressed into it. Those images will be pressed into the coin and the image will be in reverse. This incuse sunken image is known as a brockage.

Denomination	50% Brockage XF	100% Brockage XF	50% Brockage Unc	100% Brockage Unc
Large Cent	\$600	\$1,000	\$3,000	\$10,000
Indian Cent	\$500	\$1,250	\$1,500	\$4,000
Lincoln Cent 1943 Steel	\$350	\$500	\$650	\$1,000
Lincoln Cent Wheat Ears	\$125	\$200	\$200	\$350
3 Cent Nickel	\$1,250	\$2,000	\$3,500	\$5,000
3 Cent Silver	\$2,000	\$3,000	\$3,000	\$6,000
Shield Nickel	\$1,500	\$2,500	\$3,500	\$5,000
Liberty Nickel	\$1,250	\$2,250	\$2,000	\$4,000
Buffalo Nickel	\$2,000	\$2,500	\$4,000	\$7,500
Jefferson Nickel War Time	\$250	\$750	\$750	\$1,500
Jefferson Nickel	\$50	\$75	\$50	\$150
Barber Dime	\$1,500	\$3,500	\$5,000	\$12,500
Mercury Dime	\$750	\$3,000	\$1,500	\$4,000
Roosevelt Dime Silver	\$100	\$200	\$150	\$250
Roosevelt Dime Clad	\$50	\$100	\$75	\$150
Washington Quarter Silver	\$200	\$500	\$500	\$1,000
Washington Quarter Clad	\$75	\$150	\$150	\$250
State Quarter	N/A	N/A	\$750	\$1,500
Kennedy Half Clad	N/A	N/A	\$650	\$1,500
IKE Dollar	\$1,500	\$4,000	\$3,000	\$10,000
SBA Dollar	N/A	N/A	\$500	\$2,500
Sac Dollar	N/A	N/A	\$1,500	\$5,000

Mint Error News Price Guide

Double & Multiple Strikes (Updated October 2026)



When a blank planchet is struck by the dies, the normal procedure is for the feeders to eject the struck coin out of the collar and into a chute. If there is a malfunction and the struck coin isn't ejected, it may receive a second or third strike by the dies. A multiple struck coin can happen in many ways and have many combinations of errors.

(Since each double and multiple strike can vary from being 10% off-center to 90% off-center, the prices listed below can be substantially more based on the percent off-center and dramatic overall look.)

Denomination	XF/AU	Unc
Large Cent	\$1,000	\$7,500
Indian Cent	\$600	\$1,000
Lincoln Cent 1930 and Earlier	\$850	\$1,500
Lincoln Cent 1943 Steel	\$400	\$1,500
Proof Lincoln Cent	N/A	\$2,000
3 Cent Nickel	\$2,000	\$3,500
Liberty Nickel	\$4,000	\$10,000
Buffalo Nickel	\$5,000	\$10,000
Jefferson Nickel War Time	\$750	\$2,000
Proof Jefferson Nickel	N/A	\$2,000
Barber Dime	\$4,000	\$10,000
Mercury Dime	\$3,500	\$8,500
Proof Clad Dime	N/A	\$2,000
Standing Liberty Quarter	\$15,000	\$50,000
Washington Quarter Silver	\$200	\$350
State Quarter	N/A	\$350 – \$750
Proof Clad Quarter	N/A	\$2,000
Walking Liberty Half	\$10,000	\$25,000
Franklin Half	\$6,500	\$10,000
Kennedy Half Silver	\$1,500	\$2,500
Kennedy Half Clad	N/A	\$750
Proof Kennedy Half Clad	N/A	\$5,000
Morgan Dollar	\$10,000	\$25,000
Peace Dollar	\$15,000	\$40,000
IKE Dollar	\$2,000	\$4,000 - \$7,500
SBA Dollar	\$1,000	\$2,500 – \$4,000
Sac Dollar	\$750	\$1,250 – \$2,500

Mint Error News Price Guide

Off-Center Strikes (Updated October 2026)



Off-center coins are one of the most common and best known types of errors. This happens when a blank which is supposed to be fed into the press, lands in the collar improperly. When this occurs only part of the blank is between the upper and lower dies. When the dies strike the blank, only that part will be struck with a design.

Denomination	10% - 15% XF/AU	25% - 60% XF/AU	10% - 15% Unc	25% - 60% Unc
Large Cent	\$400	\$2,500	\$1,000	\$10,000
Flying Eagle Cent (1857 – 1858)	\$2,500	\$10,000	\$5,000	\$20,000
Indian Cent	\$100	\$400	\$200	\$600
Lincoln Cent 1930 and Earlier	\$75	\$300	\$150	\$750
Lincoln Cent 1943 Steel	\$40	\$250	\$100	\$500
Proof Lincoln Cent	N/A	N/A	\$1,000	\$2,000
3 Cent Nickel	\$300	\$1,500	\$600	\$3,500
3 Cent Silver	\$1,000	\$5,000	\$2,000	\$7,500
Shield Nickel	\$750	\$2,500	\$1,000	\$7,500
Liberty Nickel	\$250	\$1,000	\$500	\$2,500
Buffalo Nickel	\$250	\$750	\$400	\$1,500
Jefferson Nickel War Time	\$100	\$500	\$200	\$1,000
Proof Jefferson Nickel	N/A	N/A	\$1,000	\$2,000
Seated Half Dime Legend	\$3,000	\$7,500	\$5,000	\$15,000
Seated Dime Legend	\$2,000	\$7,000	\$3,500	\$10,000
Barber Dime	\$300	\$1,500	\$500	\$2,500
Mercury Dime	\$100	\$750	\$150	\$1,250
Proof Clad Dime	N/A	N/A	\$1,000	\$2,000
Barber Quarter	\$1,500	\$5,000	\$2,500	\$10,000
Standing Liberty Quarter	\$5,000	\$20,000	\$20,000	\$40,000
Washington Quarter Silver	\$50	\$100	\$75	\$150
State Quarter	N/A	N/A	\$75	\$300
Proof Clad Quarter	N/A	N/A	\$1,500	\$2,000
Barber Half	\$4,000	\$10,000	\$6,000	\$20,000
Walking Liberty Half	\$4,000	\$12,500	\$7,500	\$20,000
Franklin Half	\$2,500	\$4,000	\$3,500	\$7,500
Kennedy Half Silver	\$100	\$500	\$250	\$1,000
Kennedy Half Clad	\$60	\$250	\$100	\$400
Proof Clad Half	N/A	N/A	\$1,500	\$3,000
Morgan Dollar	\$3,000	\$15,000	\$10,000	\$50,000
Peace Dollar	\$20,000	\$35,000	\$50,000	\$100,000
IKE Dollar	\$125	\$1,250	\$150	\$2,000
SBA Dollar	N/A	N/A	\$100	\$500
Sac Dollar	N/A	N/A	\$1,000	\$3,500
Presidential Dollar	—	—	\$1,500	\$5,000

Mint Error News Price Guide

Off-Metals (Updated October 2026)



Off-metal and wrong planchet errors occur when a correctly made blank from one denomination is accidentally fed into a press for another denomination. Examples are a nickel struck on a cent planchet and a cent struck on a dime planchet. The coin struck on an incorrect blank will weigh exactly what the denomination of that blank would have been. An even more dramatic wrong planchet error is a coin struck on a previously struck coin of a different metal.

Denomination	Off-Metal Planchet	Circulated	AU	Unc	Choice Unc – Gem
Indian Cent	Foreign Planchet	\$1,000	\$1,500	\$5,000	\$7,500
Indian Cent	Dime Planchet	\$10,000	\$15,000	\$20,000	\$25,000
Lincoln Cent Before 1919	Dime Planchet	\$4,000	\$6,500	\$10,000	–
Lincoln Cent Before 1919	Foreign Planchet	\$750	\$2,000	\$4,000	–
Lincoln Cent 1919 – 1940	Dime Planchet	\$2,000	\$2,500	\$4,000	\$6,000
Lincoln Cent 1919 – 1940	Foreign Planchet	\$500	\$1,000	\$1,500	\$2,500
Lincoln Cent 1943 Steel	Dime Planchet	\$1,500	\$2,500	\$3,500	\$7,500
Lincoln Cent 1943 Transitional	Copper Cent Planchet	\$200,000	\$250,000	\$300,000	\$350,000
Lincoln Cent 1944 Transitional	Steel Cent Planchet	\$30,000	\$50,000	\$100,000	\$150,000
Lincoln Cent Wheat Ears (1941-1964)	Dime Planchet	\$500	\$600	\$1,000	\$2,000
Lincoln Cent 1965 and Later	Dime Planchet	\$125	\$150	\$200	\$350
Lincoln Cent 1964 Transitional	Clad Dime Planchet	\$2,000	\$3,000	\$3,500	\$4,000
Lincoln Cent 1965 Transitional	Silver Dime Planchet	\$2,750	\$4,500	\$6,000	\$7,500
Shield Nickel	Foreign Planchet	\$7,500	\$12,500	–	–
Shield Nickel	Cent Planchet	\$15,000	\$25,000	\$40,000	\$60,000
Liberty Nickel	Foreign Planchet	\$400	\$750	\$1,250	\$2,000
Liberty Nickel	Cent Planchet	\$2,000	\$3,000	\$6,000	\$7,500
Buffalo Nickel	Foreign Planchet	\$2,500	\$7,500	\$12,500	–
Buffalo Nickel	Cent Planchet	\$2,000	\$4,000	\$6,000	\$8,000
Jefferson Nickel Before 1950	Cent Planchet	\$250	\$500	\$750	\$1,000
Jefferson Nickel 1950 and Later	Cent Planchet	\$125	\$150	\$200	\$250
Jefferson Nickel 1943	Steel Cent Planchet	\$1,000	\$2,000	\$3,000	\$5,000
Jefferson Nickel 1964 and Earlier	Silver Dime Planchet	\$200	\$300	\$350	\$400
Jefferson Nickel 1965 and Later	Clad Dime Planchet	\$150	\$200	\$225	\$250
Roosevelt Dime Silver	Foreign Planchet	\$2,000	\$2,500	\$3,000	\$3,500
Roosevelt Dime Clad	Foreign Planchet	\$1,500	\$2,000	\$2,250	\$2,500
Roosevelt Dime 1964 Transitional	Clad Dime Planchet	\$5,000	\$6,500	\$10,000	\$12,500
Roosevelt Dime 1965 Transitional	Silver Dime Planchet	\$5,000	\$6,500	\$7,500	\$8,500
Washington Quarter Silver	Cent Planchet	\$300	\$400	\$500	\$750
Washington Quarter Silver	Nickel Planchet	\$300	\$400	\$500	\$600
Washington Quarter Clad	Cent Planchet	\$250	\$300	\$400	\$500

Mint Error News Price Guide

Off-Metals (Updated October 2026)

Denomination	Off-Metal Planchet	Circulated	AU	Unc	Choice Unc – Gem
Washington Quarter Clad	Nickel Planchet	\$100	\$150	\$200	\$250
Washington Quarter	Silver Dime Planchet	\$300	\$400	\$500	\$650
Washington Quarter	Clad Dime Planchet	\$250	\$300	\$350	\$400
Washington Quarter 1964 Transitional	Clad Quarter Planchet	\$5,000	\$6,500	\$7,500	\$12,500
Washington Quarter 1965 Transitional	Silver Quarter Planchet	\$5,000	\$6,500	\$7,500	\$8,500
State Quarter	Cent Planchet	N/A	\$6,500	\$7,500	\$8,000
Delaware State Quarter	Nickel Planchet	N/A	\$500	\$650	\$750
All Other State Quarters	Nickel Planchet	N/A	\$1,000	\$1,250	\$1,500
State Quarter	Dime Planchet	N/A	\$5,000	\$5,500	\$6,000
Walking Half	Dime Planchet	N/A	N/A	N/A	\$50,000
Walking Half	Quarter Planchet	\$17,500	\$22,500	\$40,000	\$35,000
Walking Half	Foreign Planchet	\$10,000	\$15,000	\$30,000	\$25,000
Franklin Half	Cent Planchet	\$3,000	\$4,000	\$5,000	\$6,000
Franklin Half	Nickel Planchet	\$3,000	\$4,000	\$5,000	\$6,000
Franklin Half	Dime Planchet	\$3,500	\$4,500	\$5,500	\$6,500
Franklin Half	Quarter Planchet	\$600	\$750	\$1,000	\$1,250
Kennedy Half Silver 1964	Cent Planchet	\$1,000	\$1,250	\$1,500	\$2,000
Kennedy Half Silver 1964	Nickel Planchet	\$1,000	\$1,250	\$1,500	\$2,000
Kennedy Half Silver 1964	Dime Planchet	\$1,000	\$1,250	\$2,000	\$2,500
Kennedy Half Silver 1964	Quarter Planchet	\$400	\$500	\$600	\$750
Kennedy Half Clad	Cent Planchet	\$750	\$850	\$1,000	\$1,500
Kennedy Half Clad	Nickel Planchet	\$750	\$850	\$1,000	\$1,250
Kennedy Half Clad	Dime Planchet	\$750	\$850	\$1,000	\$1,400
Kennedy Half Clad	Quarter Planchet	\$350	\$400	\$450	\$500
Kennedy Half 1964 Transitional	Clad Half Planchet	\$3,500	\$4,500	\$6,000	\$10,000
Kennedy Half 1965 Transitional	Silver Half Planchet	\$5,000	\$6,500	\$7,500	\$10,000
Kennedy Half 1964 Transitional	Clad Quarter Planchet	\$2,000	\$3,000	\$4,000	\$5,000
Kennedy Half 1965 Transitional	Silver Quarter Planchet	\$7,000	\$8,000	\$9,000	\$10,000
Ike Dollar	Cent Planchet	\$7,500	\$10,000	\$12,500	\$15,000
Ike Dollar	Nickel Planchet	\$10,000	\$12,500	\$15,000	\$20,000
Ike Dollar	Dime Planchet	\$7,500	\$8,500	\$10,000	\$12,500
Ike Dollar	Quarter Planchet	\$7,000	\$10,000	\$12,500	\$15,000
Ike Dollar	Half Planchet	\$1,600	\$1,750	\$2,000	\$3,000
Ike Dollar	Foreign Planchet	\$900	\$1,000	\$1,250	\$1,500
Ike Dollar Transitional	40% Silver Planchet	\$2,750	\$3,000	\$3,500	\$5,000
SBA Dollar	Cent Planchet	N/A	\$1,750	\$3,000	\$5,000
SBA Dollar	Nickel Planchet	N/A	\$6,000	\$7,000	\$8,000
SBA Dollar	Dime Planchet	N/A	\$6,000	\$7,000	\$10,000
SBA Dollar	Quarter Planchet	N/A	\$600	\$850	\$1,000
Sac Dollar	Cent Planchet	N/A	\$12,500	\$15,000	\$20,000
Sac Dollar	Nickel Planchet	N/A	\$12,500	\$15,000	\$20,000
Sac Dollar	Dime Planchet	N/A	\$8,000	\$15,000	\$20,000
Sac Dollar	Quarter Planchet	N/A	\$1,500	\$2,000	\$2,500

Mint Error News Price Guide

Counterbrockages

(Updated October 2026)



A counterbrockage error involves a cap die and a previously struck coin. When a cap die strikes a previously struck coin, the obverse design from that struck coin will be impressed into the cap. The result will be a design where the cap face will be an incuse brockage. When a new blank is struck by this cap die with an incuse brockage image, the obverse will have a raised and spread image from that incuse design of the cap. This brockage impression is known as a counterbrockage.

Denomination	Circulated	AU	Unc	Choice Unc - Gem
Indian Cent	\$750	\$1,000	\$1,500	\$2,000
Lincoln Cent 1943 Steel	\$500	\$750	\$1,500	\$2,000
Lincoln Cent Wheat Ears	\$200	\$200	\$300	\$500
Lincoln Cent Memorial	\$40	\$50	\$75	\$100
Shield Nickel	\$1,500	\$2,000	\$4,000	\$5,000
Liberty Nickel	\$1,500	\$2,000	\$4,000	\$5,000
Jefferson Nickel	\$50	\$100	\$150	\$200
Barber Dime	\$3,000	\$5,000	\$7,500	\$10,000
Roosevelt Dime Silver	\$300	\$500	\$750	\$1,000
Roosevelt Dime Clad	\$100	\$150	\$250	\$300
Washington Quarter Silver	\$500	\$1,000	\$1,500	\$2,000
Washington Quarter Clad	\$100	\$200	\$300	\$400
State Quarter	N/A	\$750	\$1,250	\$1,500
Kennedy Half Silver	\$1,250	\$2,000	\$3,000	\$4,000
Kennedy Half Clad	\$500	\$750	\$1,250	\$1,500
SBA Dollar	N/A	\$2,000	\$3,000	\$4,000

Mint Error News Price Guide

Fold-Over Strikes (Updated October 2026)



A fold-over coin is one of the most dramatic types of errors. It occurs when the blank is standing vertically between the dies. During the strike, the force is so great that it bends and folds the blank. These fold-overs can be on-center or off-center, and come in many different shapes. There are a few fold-overs with multiple errors, either with an additional strike or fold-over. Denominations above quarters are very scarce.

Denomination	AU	AU Dated	Unc	Unc Dated
Indian Cent Memorial Copper	\$1,000	\$1,250	\$1,250	\$1,500
Lincoln Cent Memorial Zinc	\$750	\$1,000	\$1,000	\$1,250
Jefferson Nickel	\$2,500	\$3,000	\$3,000	\$4,000
Roosevelt Dime Silver	\$4,000	\$5,000	\$5,000	\$6,000
Roosevelt Dime Clad	\$3,000	\$3,500	\$3,500	\$4,500
Washington Quarter Silver	\$4,000	\$5,000	\$5,000	\$10,000
Washington Quarter Clad	\$3,500	\$4,000	\$4,000	\$5,000
State Quarter	\$5,000	\$6,000	\$6,000	\$8,500

Mint Error News Price Guide

Martha Washington Test Pieces (Updated October 2026)



There is one set of a Dime, Quarter and Half struck by Martha Washington dies that are permanently housed in the Smithsonian Institute, embedded in blocks of lucite. According to United States Pattern and Related Issues, by Andrew W. Pollock III, “the only trial pieces purported to have survived metallurgical testing in 1965 were the Dime, Quarter Dollar, and Half Dollar equivalent strikes in copper-nickel clad over copper.”

Mike Byers’ discovery of the Martha Washington Test Piece on a copper-zinc Cent planchet struck 10% off-center with a uniface reverse was a front page Coin World article on August 7th, 2000.

Denomination	Unc	Choice	Gem
Martha Cent	\$1,000	\$1,500	\$2,000
Martha Nickel	\$4,500	\$6,000	\$7,500
Martha Dime	\$7,500	\$10,000	\$12,500
Martha Quarter	\$1,000	\$1,500	\$3,000
Martha Half Dollar	\$5,000	\$7,500	\$10,000
Martha Dollar (SBA Planchet)	\$5,000	\$7,500	\$10,000
Martha Dollar (Sac Planchet)	\$1,000	\$1,500	\$2,000

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Mike Byers is the Publisher & Editor of Mint Error News Magazine

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Joseph P. Cronin

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Click here to join and be sure to answer all questions to be accepted.



Joe Cronin

Joe Cronin is currently a History teacher, a former U.S. Treasury Department law enforcement officer, and has been a coin collector for over thirty years. Within the last ten years he has focused more on Mint errors, and also fake and altered coins made to resemble genuine errors.

He is the author of the popular error reference book, *Mint Errors to Die For*, has written articles for CONECA's *Errorscope*, and is the creator and moderator of the Facebook® page, "Joe Cronin's Mint Errors Explained." Joe often attends coin shows in the Western N.Y. area with educational tables on Mint errors and Henning nickels. Feel free to contact Joe at jcro57@yahoo.com.

Joe Cronin is a consultant to Mint Error News for Mint Errors and Counterfeit/Altered coins made to resemble genuine errors.

Private Mint News

Private mints and their issues have a long and illustrious history, but it is often hard to assemble, often years later without good documentation. When working with sovereign mints like the United States Mint, there is often a lot of archives and records available to research which is not available for private mints.

To address this, Private Mint News is a new online publication focusing on numismatics from by private mints. Private mint issues or creations, often in the form of tokens and medals called exnumia, is a rich and evolving area, however, research information can be thin on both classic and recent issues, especially the latter. The goal of Private Mint News is to assist in rectifying this situation by documenting and discussing issues from Private Mints of all eras.

Coverage includes private mints issuers of all eras and locations with an initial focus on the United States. Modern issuer coverage will include Daniel Carr of Moonlight Mint, Ron Lands of Gallery Mint Museum, Jared Grove of Grove Minting, Provident Metals, and other issuers. Classic issuers will include issuers of tokens, medals and coins including Civil War Tokens, So-Called Dollars, Territorial and Pioneer coins as well as Private Patterns.

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RON GUTH, C.P.A.
German coin specialist

Ron Guth, Numismatic Expert

Ron Guth is a recognized authority on United States and German coins. He is a licensed Certified Public Accountant who has been involved professionally in numismatics for over fifty years as a collector, dealer, researcher, and writer. His books and articles have earned numerous awards, including the American Numismatic Association's Heath Literary award and the Olga & Wayte Raymond awards, the Numismatic Literary Guild's Best Numismatic Investment Book and Best Book of the Year awards, and the Professional Numismatic Guild's Best Book of the Year award. In 2003, Ron received the prestigious President's Award from the American Numismatic Association in recognition of his numerous contributions to numismatics. In 2021, Coin World named Ron as one of the Top Ten Most Influential People in Numismatics for the sixty-year period from 1960-2020.

Ron created the CoinFacts website (now PCGS CoinFacts) in 1999 and sold the website to Collectors Universe in 2004 (where it is now presented as PCGS CoinFacts). Ron served in various capacities at Collectors Universe, including Director of Numismatic Research, President of the Professional Coin Grading Service, and President of PCGS CoinFacts.

Currently, Ron serves as proprietor of GermanCoins.com and as Chief Investigator at the Numismatic Detective Agency, where he provides expert provenance on high-end coins.

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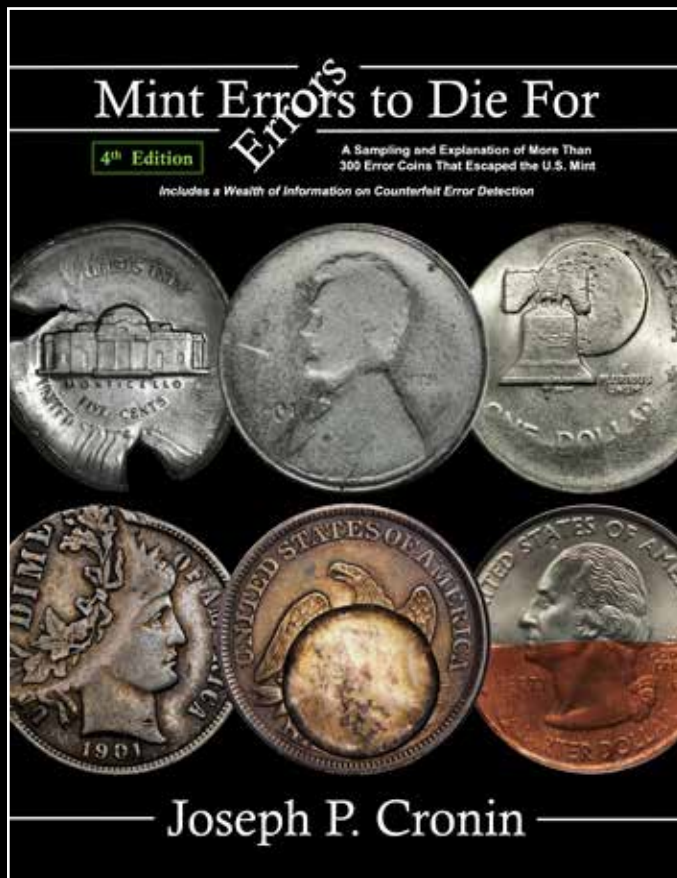
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Mint Errors to Die For

4th Edition

A Sampling and Explanation of More Than
300 Error Coins That Escaped the U.S. Mint



Some of the Features in the 4th Edition of *Mint Errors to Die For* Include:

- Coverage and definitions of numerous Mint error types.
- Detailed explanations on the causes of various Mint errors.
- Dozens of high definition photos to help guide you on what to look for.
- Tools and resources needed to get started as a Mint error collector.
- Why it's important to learn and understand the minting process.
- Methods to help you detect counterfeit/altered coins made to resemble Mint errors.
- How to distinguish post-Mint damage from flaws resulting from the minting process.
- Suggestions on how to learn the value of your Mint error coins.
- Interesting snippets of "Coin Trivia" and American History.
- Error collecting "Dos" and "Don'ts" that will help save you time, money, and pain.

Recommendations from Numismatic Experts

"I believe that Joe Cronin's *Mint Errors to Die For* is a contender for the Numismatic Literary Guild's 'Best U.S. Coin Book' award. It is an excellent resource on Mint errors and counterfeit coins. Every collector of Mint error should read it cover to cover."

— Mike Byers, *Mint Error Dealer* 30 years, *NLG Best Book, Publisher/Editor of Mint Error News*

"This is must-have book on error coins, and is full of excellent information on both collecting and attributing Mint errors. I would recommend any coin collector add this valuable resource on error coins to their library, and it will surely see frequent use. It's a much needed resource, and Joe has done an outstanding job with this book!"

— Jon Sullivan, *Mint error coin dealer, and PCGS authenticator and Mint error attributor.*

"*Mint Errors To Die For* is a book that this coin specialty has needed for a long time. Joe Cronin is an educator by training and a passionate collector of errors and counterfeit coins. Both show through very clearly in this excellent tome. You will learn a lot and have fun while you do."

— Steven Mills, *original columnist for Error Trends Coin Magazine.*

"As a counterfeit researcher and writer for the past several years, the area of counterfeit errors is beyond my personal scope and focus. However, now I have a 'Go-to' resource in this area. This book is a 'Must-have' to help identify many counterfeit and altered errors!"

— Jack Young, *2019 winner of the Anti-Counterfeiting Task Force's "Allen Knezer" Award.*



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Mint Errors to Die For

4th Edition

A Sampling and Explanation of More Than
300 Error Coins That Escaped the U.S. Mint



Ungraded by NGC with a Weight of 12.60 Grams



How Did this Coin Wind Up Getting Struck by Dies for a Franklin Half Dollar Instead of the Martha Washington Test Dies?

It's believed "either a U.S. Mint official placed this 75% silver and 25% copper planchet in the collar with the dies set up using the Franklin half dollar design, or it was accidentally mixed in with the 90% silver and 10% copper planchets and subsequently struck by Franklin half dollar dies."

Why is the Strike Weak?

"This Franklin Half Dollar planchet has a composition of 25% copper, not 10%. Copper is less dense than silver, the metal is harder, and the dies were set up with the correct pressure to strike 90% silver planchets. This accounts for the weak strike."

Article excerpts and photos used with permission granted from Mike Byers and MintErrorNews.com

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1963 Franklin Half Dollar: Struck on a 75% Silver and 25% Copper Planchet; Likely an Experimental Test Strike

This coin came to light in 2025 and wound up in the possession of Las Vegas coin dealer and publisher of *Mint Error News*, Mike Byers. Below are some key excerpts of his write-up about this unique discovery piece. (You can find the article at <https://mikebyers.com/minterrornews/issue89.pdf>)

"In 1963, the U.S. Treasury Department hired the Battelle Memorial Institute to investigate and study solutions to address the upcoming transition from 90% silver to other compositions, and to oversee the production of pattern dime-sized, quarter-sized, and half dollar-sized experimental coins. Battelle supplied the U.S. Mint with experimental planchet strips of different compositions that were used to produce planchets for test strikes..."

As to why the Mint needed to look into changing the metallic composition of our silver coinage, it was because in 1963 "there was a deficit of 209 million ounces of silver. This fact, and the rising price of silver, created the urgent need to produce new coinage with less silver, and eventually with no silver at all." (1963 was the Franklin half dollar's last year.)

"...On Feb. 12, 1965, the Battelle Memorial Institute issued their *Final Report on A Study of Alloys Suitable for Use as United States Coinage* to the U.S. Department of the Treasury..." In the report it discussed "all options for the new compositions, the different percentages of silver, silver-copper, silver clad, and clad, both with bonded layers and with mixed alloy...."

Byers goes on to say that "[u]pon examining this Franklin Half Dollar, several scenarios immediately came to mind. Based on my 50 year experience as a internationally recognized expert on mint errors, die trials, patterns and experimental strikes, I quickly eliminated two possibilities: (1) *It was not struck on a foreign planchet.* No foreign coins struck by the U.S. Mint match anything even close to this composition and weight." Byers also contends that "(2) *It was not struck on a planchet with an improper alloy mix.* NGC, after conducting a metallurgical analysis, determined that it was struck on a wrong planchet with a composition of 75% silver and 25% copper. There are no known Franklin Half Dollars struck with an improper alloy ... For example, if this Franklin Half dollar had a composition of 88% silver and 12% copper, which is close to the regular composition of 90% silver and 10% copper, then the most logical explanation is an improper alloy mix." Thus, "[s]ince this Franklin Half Dollar is designated as struck on a wrong planchet with an exact ratio of 75% silver and 25% copper, this unique discovery coin is likely an *Experimental Test Piece*..."

As of 5/14/26, this one-of-a-kind Franklin half dollar is listed at [MikeByers.com](https://mikebyers.com) for \$40,000.

**Based on Byers' research, he states "[t]he only foreign coins struck by the U.S. Mint on 75% silver and 25% copper planchets were for the Philippines decades before this Franklin Half Dollar was struck. All of those planchets were smaller in diameter and thickness when compared to a Franklin Half Dollar planchet."*

Contact Joe Cronin for your copy!
jcro57@yahoo.com

Saul Teichman's Want List

I am looking for the following off-metal errors:

Indian Head Cent

on a

Dime Planchet

Kennedy Half Dollar

on a

Zinc Cent Planchet

1999 SBA Dollar

on a

Zinc Cent Planchet

Sacagawea Dollar

on a

Dime Planchet

2000 Sacagawea Dollar

on a

SBA Dollar Planchet

(2010-2025) Lincoln Shield Cent

on a

Dime Planchet

(2010-2025) Lincoln Shield Cent

on a

Struck Dime

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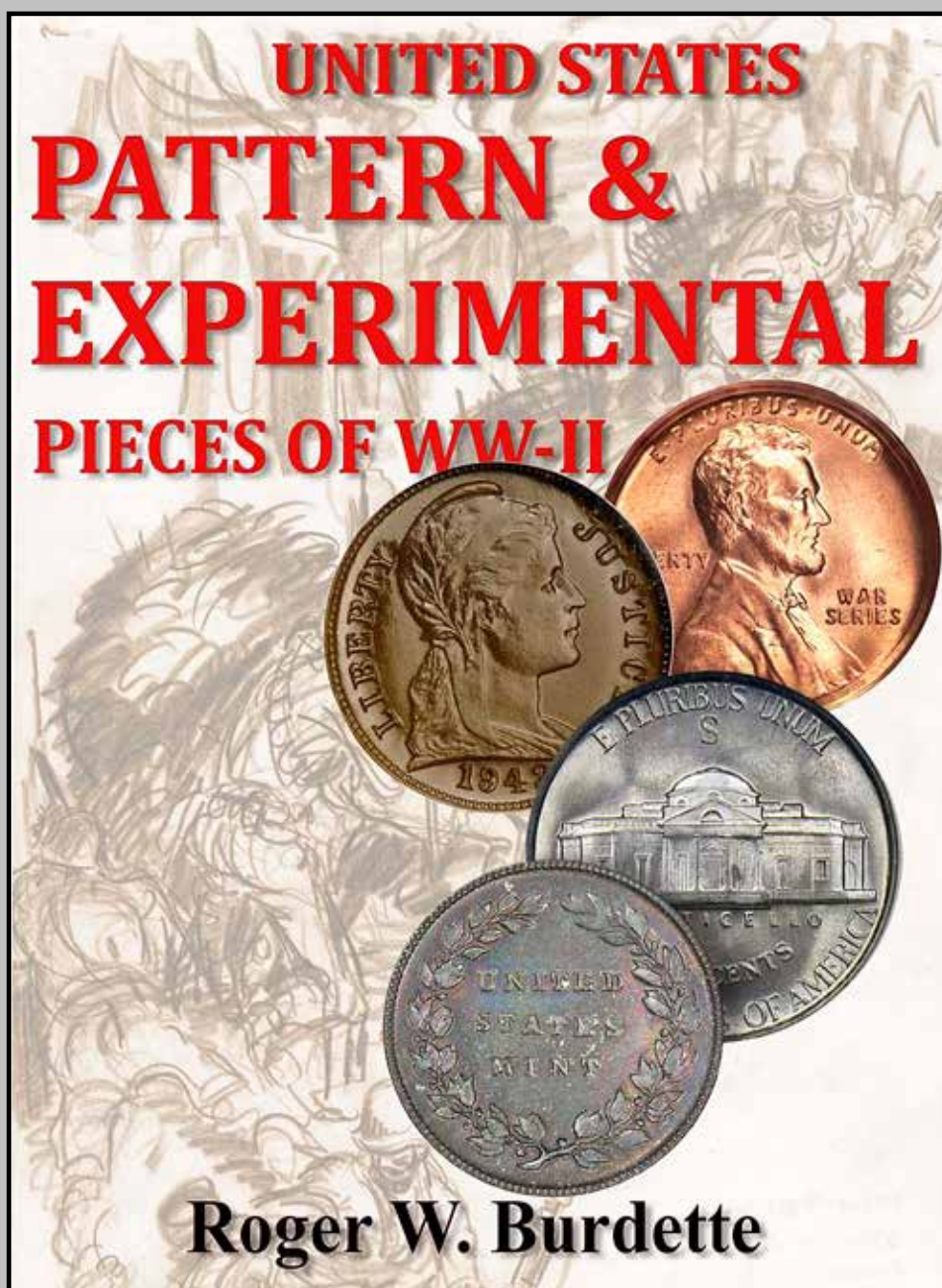
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WORLD PAPER MONEY ERRORS



World Paper Money Errors Explored!

Odd shapes, upside down prints, intriguing cuts and folds, and missing design elements are only a few of the different printing errors examined in this expansive collection on foreign error notes. World Paper Money Errors is a visually compelling avenue into the fascinating and rarely explored area of numismatics that expands on the hobby of collecting paper currency.

Author Morland Fischer's comprehensive collection reflects the attraction and advantages of exploring foreign printing errors. An overview of collecting paper money errors in today's numismatic market offers insights on the great disparity between domestic and world notes. Market values are discussed, acknowledging what variables make an error note precious in the trade. Incorporating these concepts and more, Fischer expands the method of collecting currency errors by introducing a Foreign Error Note (FEN) scale to gauge price levels based on error type.

With over 200 examples of dramatic, colorful and intriguing foreign paper money errors, collectors and spectators alike are exposed to a new form of collecting currency. The numismatic community will benefit from this thorough guide that is unlike any other on the market.

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After a lapse of seven years, a new edition of United States Paper Money Errors, Fred Bart's ground-breaking book is now available. The fourth edition is more than just an update to the third: Bureau of Engraving and Printing (BEP) errors have been added, nearly all the illustrations have been changed, there is a rarity guide for each note—which additionally are now priced in four grades (EF, AU, Choice CU and Gem CU)—and, for the first time, there is a section showing some notes in color.

This has always been an enormously popular book, not only among established collectors but also with newcomers seeking to learn more about their "find." There is no other book like it on the market. More than a price guide, its 296 pages contain a wealth of information on what to look for and what mistakes to avoid. It is a necessity for all dealers, collectors, and anyone who comes into regular contact with paper money.

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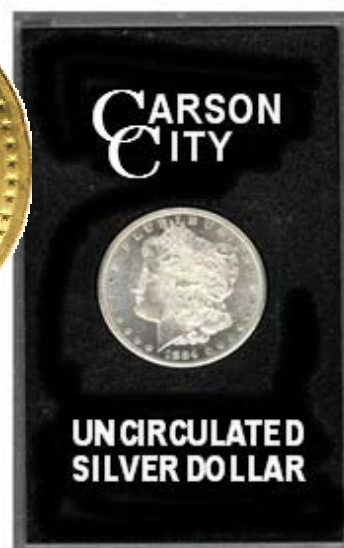


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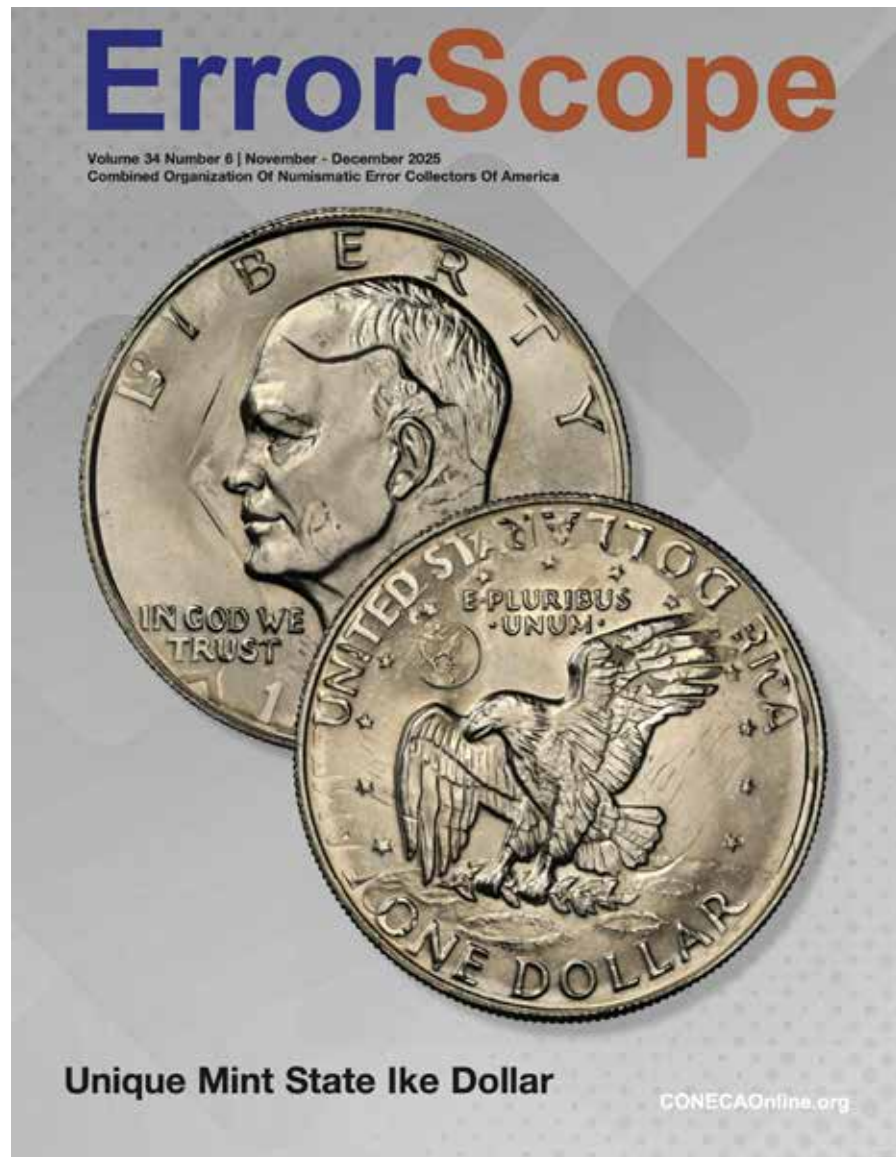


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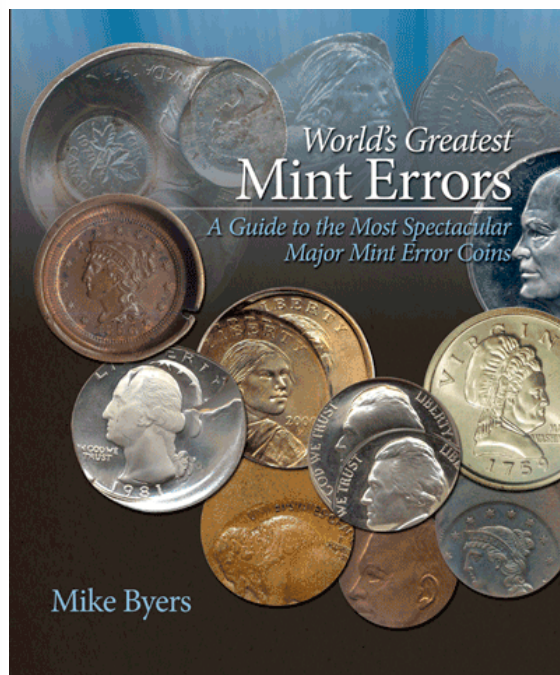


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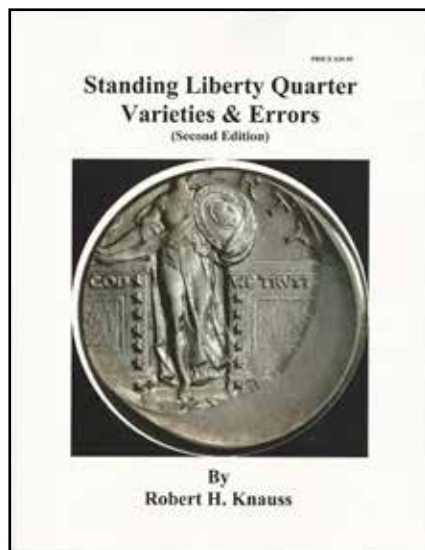
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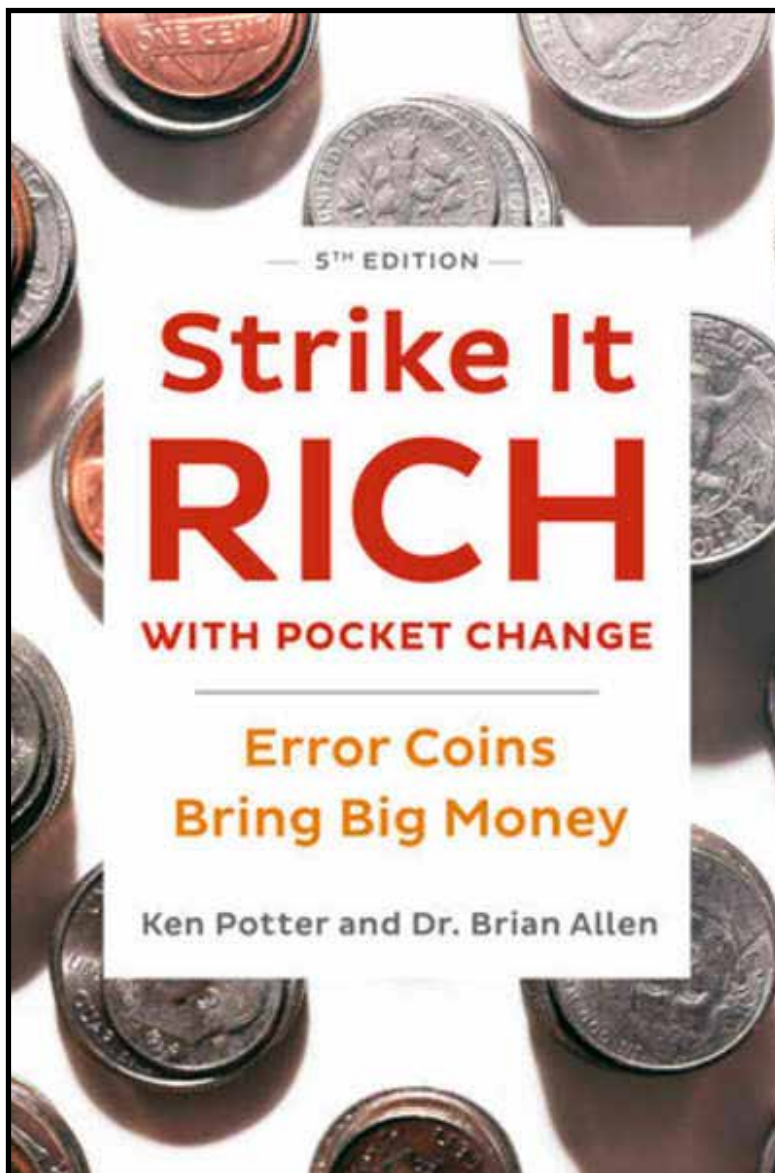
Strike It Rich With Pocket Change

Error Coins Bring Big Money

by Brian Allen & Ken Potter
NEW 5th Edition

It takes a keen eye to spot them - and a little know-how - but errors on coins produced by the U.S. Mint occur every year. And these errors can be worth a fortune to coin collectors. *Strike It Rich with Pocket Change* shows the reader how to detect errors, what to look for and how to cash in on them. This book has a strong appeal for someone with a mild to

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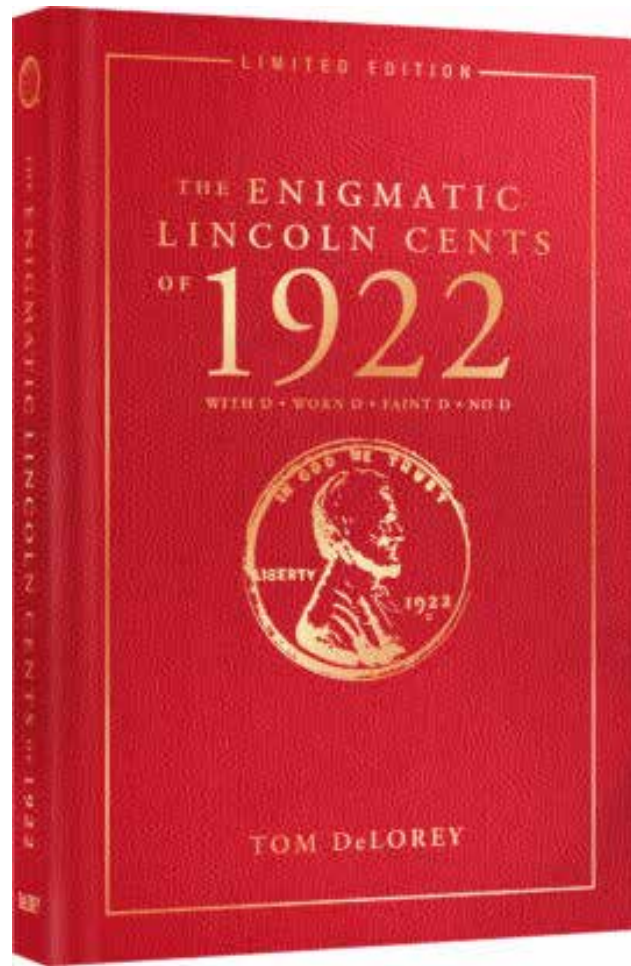
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The Enigmatic Lincoln Cents of 1922

by Tom DeLorey



In *The Enigmatic Lincoln Cents of 1922*, renowned numismatic expert Tom DeLorey delves deep into the mysteries surrounding the Denver Mint's striking anomalies of the 1922-D and "No D" Cent varieties. With meticulous research, technical detail, stunning photos, and fresh discoveries, he uncovers the multiple factors behind these minting irregularities and introduces new theories that challenge conventional wisdom. Both captivating and thought-provoking, this technical masterpiece is a must-read for collectors and historians eager to unravel one of the most fascinating chapters in U.S. coinage history.

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MINT*ERROR*NEWS GLOSSARY



Unique Branch Mint Proof 1891-O Seated Liberty Dime NGC PF 66

What Are Unique Coins?

Many numismatists, dealers and collectors consider unique coins to be the most coveted, prized and valuable. Many of these unique coins were documented by the U.S. Mint or one of the Mint Branches, while others have no documentation but there are logical assumptions as to how and why they were struck.

Some of the most famous U.S. coins were struck under mysterious circumstances and the story behind their production adds to their rarity, prestige and value. Examples are coins struck in proof where only one example is known, a special specimen struck with polished dies, while others are patterns, trial strikes, or mint error coins.

Here is the only known 1891-O Seated Liberty Dime struck in PROOF! Authenticated and certified by NGC as a Proof 66, this unique Branch Mint proof is a world-class rarity.

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January 7 - 10, 2026	72nd FUN Show Convention 2027 Orlando, Florida
March 10 - 12, 2027	Long Beach Expo Long Beach, California

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**NLG Award Winner:
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Mike Byers was born in the coin business attending coin shows since he was six years old. When he was seventeen, he issued his first coin catalog. He has been a Market-Maker in U.S. Gold Coins and a dealer in major mint errors. In 1987 he offered limited partnerships and rare coin funds. He has written articles for The Coin Dealer Newsletter and has been featured on the front page of Coin World numerous times with his numismatic rarities. Mike Byers is a contributing author on mint errors for CoinWeek. He also assisted with the mint error section of Coin Facts on the PCGS website. You can visit Mike Byers and view his rarities at the ANA, Central States, FUN show and the Long Beach Coin Expo.

Mike Byers has been a professional numismatist for forty years. He is one of the largest dealers handling U.S. Gold Coins, Patterns and Rarities certified by PCGS and NGC. He has handled major coin collections and attends every major coin convention. Mike Byers carries an extensive inventory as well as solicits want lists and is always looking to purchase fresh inventory and collections.

Mike Byers was a consultant to ANACS for Mint Errors from 2000 to 2006. He is also the Publisher and Editor of Mint Error News Magazine and the Mint Error News Website that was founded in 2003. In 2009, Mike Byers published his first book, *World's Greatest Mint Errors*, which received the NLG Award for Best World Coin Book and is available on Amazon.com.

Mike Byers is a life member of ANA since 1985, a charter member of NGC and a featured dealer/member of PCGS. He is also a life member of the Central States Numismatic Society and the Florida United Numismatists. He is a member of CDN Exchange (BYRS).



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