

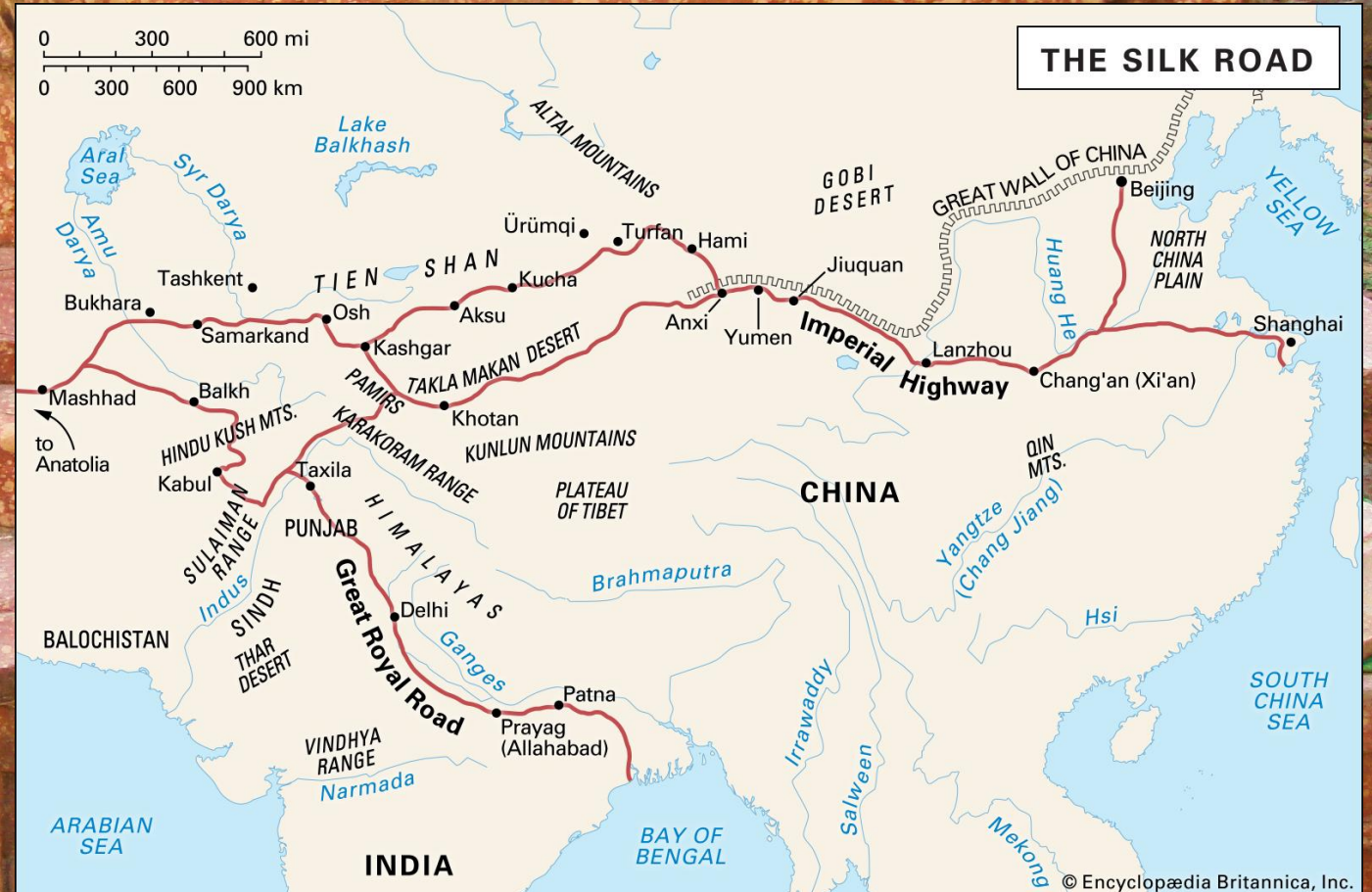


INTRODUCTION

An introduction to the UNIT theory of coin metrology as presented to various international conferences.

THE ACCEPTANCE OF COINAGE IN SILK ROAD TRADE

by Arthur Needham
with Mohammed Tariq Ansari



THE INVENTION OF COINAGE

- Traditional knowledge suggests around 600 BCE
- Originally on islands near Greece or in modern day Turkey.
- Replaced barter originally for the payment of government fees, taxes and charges.
- Definition of a Coin
- A piece of manufactured metal authorized by an authority of a known weight and metal (usually) that is used as a medium of exchange.
- *Note: A more thorough research on the subject of the date and place of the introduction of coinage may produce a different answer.*

Shah Alam Bahadur,
Dar-ul-Sultanat Lahore Mint, AH 1121/RV 4
NT 175.3500.1.a.a.100 (M7.55)



Badshah Ghazi Shah Alam Sikkah 1121
(Stamped Coin of the Warrior Emperor Shah Alam AH 1121)



Zarb Dar-ul Sultanat Lahore Sanah 4 Jalus Manus Maimanat
(Struck at The Court of the Realm Lahore in Year 4
of the Reign Associated with Prosperity)

WHAT IS NEEDED TO PRODUCE A COIN

- METAL TO PRODUCE A COIN FLAN
- A DIE OR MOLD TO PRODUCE AN IMPRESSION ON THE METAL
- A SYSTEM TO PRODUCE A NEW COIN IN A KNOWN WEIGHT (WITH MULTIPLIERS AND DIVIDERS)
- A SYSTEM THAT CAN PRODUCE THE METAL, ESPECIALLY THE PRECIOUS METALS, IN A KNOWN AND CONSISTANT FINENESS
- METHODS TO CHECK BOTH THE WEIGHT AND FINENESS OF THE METAL THAT ARE RELATIVELY SIMPLE TO USE.

WHAT WAS AVAILABLE

- A NUMBER OF TYPES OF METAL WERE AVAILABLE TO PRODUCE COINS. THESE INCLUDED GOLD, SILVER AND COPPER PREDOMINATELY BUT ALSO IRON, TIN, ZINC ETC AS WELL AS VARIOUS ALLOYS OF COPPER.
- DIES TO STRIKE COINS COULD BE PRODUCED AS WELL AS MOLDS SHOULD THE COINS BE MOLDED RATHER THAN STRUCK.
- ALTHOUGH SOMEWHAT RUDIMENTARY COINS COULD BE PRODUCED TO AN APPROXIMATE WEIGHT EVEN IF BY COMPARATIVE WEIGHING AGAINST A KNOWN STANDARD.
- A SYSTEM EXISTED FOR THE PRODUCTION OF METALS AND ALLOYS THAT CONTAINED A KNOWN FINENESS OF METAL ESPECIALLY THE FOR THE PRECIOUS METALS.
- SIMPLE SYSTEMS EXISTED FOR THE CHECKING OF THE WEIGHT OF A COIN AND THE FINENESS OF THE PRECIOUS METAL.

COINAGE: A SYSTEM OF WEIGHTS AND MEASURES. METROLOGY



- COINS ARE MANUFACTURED TO A KNOWN WEIGHT, SIZE AND FINENESS OF METAL.
- FOR EACH COIN ISSUING AUTHORITY THERE IS A DESIGN THAT CAN BE REPLICATED WITHIN THE LEVEL OF TECHNOLOGY BUT CAN BE CHANGED AT WILL.
- THE WEIGHT OF THE COIN CAN BE CHANGED AT WILL.
- THE FINENESS OF THE PRECIOUS METAL CAN BE ALTERED TO ANY DESIRED LEVEL.
- THE FINENESS OF THE METAL CAN BE CHANGED AT ANY TIME TO ANY SPECIFICATION.
- Note: Precious metal could be supplied to or by the mint at any fineness and the required fineness for the metrology of the series produced.

INTERIM SUMMARY

COINS WERE PRODUCED BY VARIOUS AUTHORITIES ALONG THE SILK ROAD AND ITS VARIOUS ADJACENT TRADE TERRITORIES.

THE METROLOGY OF THE VARIOUS COIN SERIES UTILISED ON THE LENGTH AND BREADTH OF THE SILK ROAD VARIED.

THE OFFICIAL MINTS ON THE SILK ROAD HAD THE TECHNOLOGY TO PRODUCE COINS FOR THEIR OFFICIAL METROLOGY FROM ANY FEED MATERIAL OF A SIMILAR METAL

THERE WAS TECHNICALLY NO IMPEDIMENT FOR ANY COIN TO BE ACCEPTED AT ANY PLACE ON THE SILK ROAD.

IT ESSENTIALLY DID NOT MATTER WHAT WAS INSCRIBED ON THE COINS BECAUSE IT WAS WEIGHT, METAL CONTENT AND FINENESS THAT GOVERNED ITS VALUE AT ANY POINT.

REALITY OF COINS ON THE SILK ROAD DISPELLING MYTHS

AS A RESEARCHER IN NUMISMATICS THERE HAS BEEN A NEED TO DISPELL A NUMBER OF MISCONCEPTIONS THAT WERE TAUGHT TO ME AS A RESEARCHER. FROM THIS POINT A BASELINE IS NECESSARY.

1. THE SILK ROAD WAS, IN FACT, A HIGHLY ORGANISED SYSTEM OF TRADE AND COMMERCE.
2. ALONG THE ROAD COINAGE FROM ANY ISSUER COULD BE ACCEPTED .
3. THE EXPERTISE OF BANKERS, MONEY CHANGERS AND VENDORS WAS SUCH THAT ANY COIN COULD BE ACCEPTED AS PAYMENT AT A FAIR RATE. ANY COIN OFFERED COULD BE EASILY TESTED FOR WEIGHT AND METAL FINENESS AND A TEST CUT OR PUNCH COULD SHOW THAT THE METAL WAS NOT JUST A COATING.
4. LOCAL OFFICIAL MINTS COULD PROCESS METAL PRESENTED AND ULTIMATELY PRODUCE COINS AT A KNOWN AND DEFINED METROLOGY. THE REFINING SYSTEM FROM ANTIQUITY, CUPELLATION, HAD BEEN MASTERED FOR CENTURIES.
5. MINTS WERE OFTEN LARGE AND TECHNICALLY SKILLED MANUFACTURING ENTERPRISES THAT BELIE THE ETCHINGS OFTEN SHOWN FOR EUROPEAN MINTS.

TESTING OF HAND STRUCK COINS

1. A comparative weight test could be done with a simple handheld balance and known weights.
2. A test for the fineness of the metal could be easily done by the streak or touchstone test. The edge of the coin would be drawn across a piece of very dark or black stone and a comparison made to a standard colour swatch. Accuracies of greater than 1/4% of precious metal content were readily available in skilled hands.
3. The final test or punch mark could be applied to test the depth of the precious metal as a final test. The illustration shows a test mark on the obverse and reverse. Such punch test marks did not affect the weight of the object.

Prepared illustration shown from the up coming fourth numismatic book by Mohammed Tariq Ansari and Arthur Needham. The Coins of Aurangzeb.

ADONI
AH 1098/Ry 30
NT 155.1025.2.a.a.100 Rupee (M6.XX)



Sikkah Dar Jahan Zad Chu Badr-e-Munir
Shah Aurangzeb Aalamgir 1098



Zarb Adoni Sanah 30 Jalus Manus Maimanat

THE REALITY OF COINS ON THE SILK ROAD


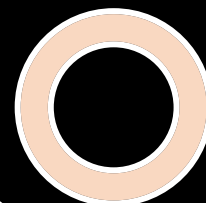


1. Any coin was acceptable in trade along the Silk Road
2. Even with the technical expertise of money changers etc. many coins would have been unreadable.
3. The testing of coins and nominal comparative values was a simple process.
4. Varying comparative values between different metals could be a source of profit in trade.
5. The organisational structure of commerce along the road allowed for free and open trade.

Gresham's Law: Bad Money Drives Out Good


1. Essentially did not apply to Silk Road trade.
2. All coins could be accepted and valued by a known and accepted system.

The Significance of Hoard Finds

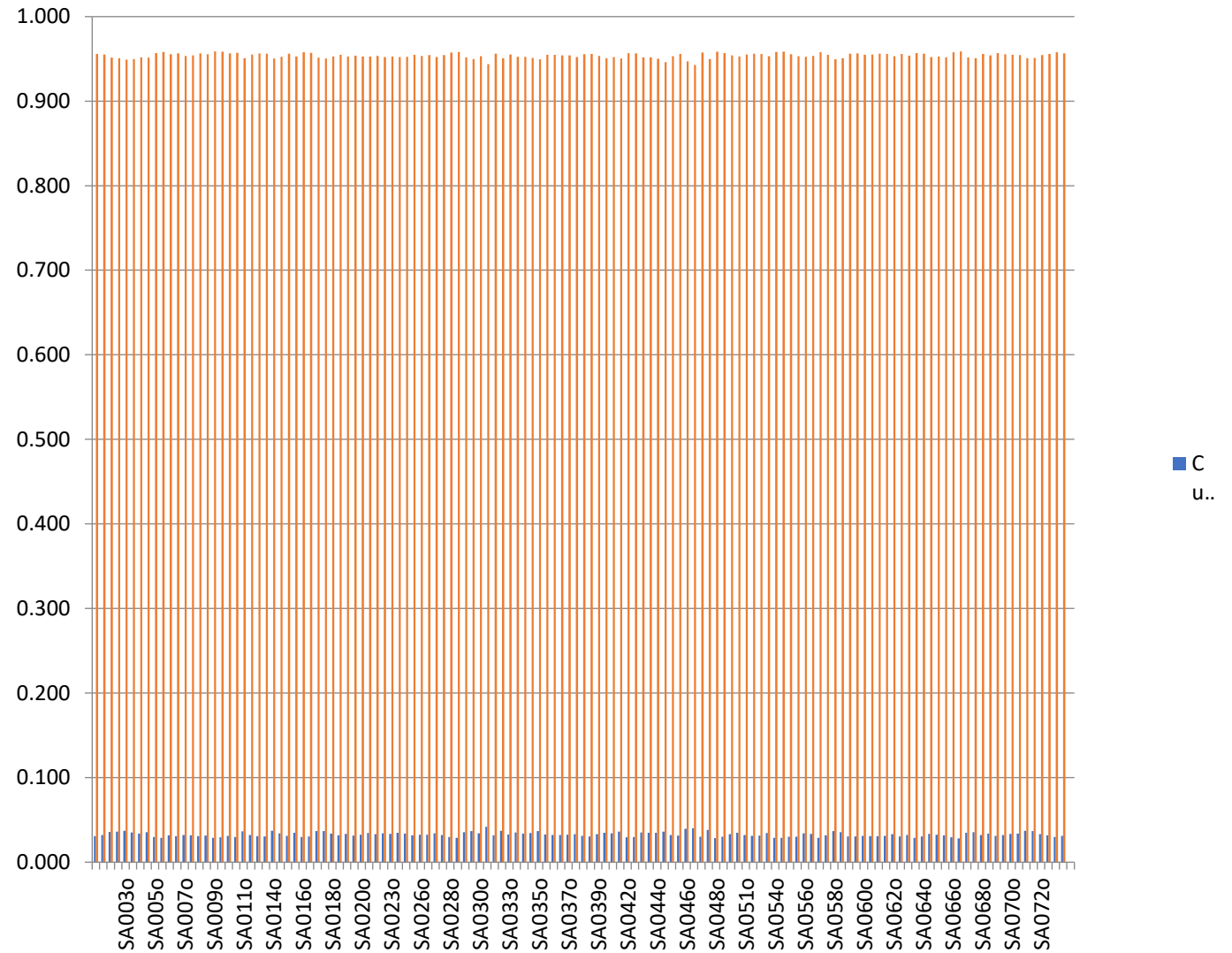
1. Coins of all types were accepted on the Silk Road
2. Coins from any issuer could be easily recoined to "coin of any realm" and there is no real significance in such finds other than that they were part of normal trade.



NEW PATHWAYS IN COIN METROLOGY STUDIES I

- WITH NEW TECHNOLOGIES METROLOGY STUDIES CAN BE UNDERTAKEN RAPIDLY AND NON-INVASIVELY.
 - WITH THE UNDERSTANDING THAT ALL COINS COULD BE RAPIDLY VALUED BY COMPETENT PEOPLE AT THE TIME OF ISSUE REGIONALLY SPECIFIC METROLOGIES CAN BE STANDARDISED.
 - METROLOGY OF COINS MUST NOW INCLUDE WEIGHT, METAL TYPE, PERCENTAGES OF CONTAINED METALS AND PHYSICAL DIMENSIONS.
 - FOR REGIONAL SERIES A SIMPLE DECISION CAN BE MADE FOR THE METROLOGY OF THE STANDARD UNIT FOR EACH METAL
 - THE STANDARD UNIT IN EACH METAL (INCLUDING BILLON) IS DESCRIBED WITH THE IDENTITY OF 100. A SERIES MAY CONSIST OF MULTIPLERS AND DIVIDERS OF A UNIT. THE METROLOGY OF A STANDARD UNIT MAY CHANGE AT ANY TIME IN WEIGHT, PHYSICAL DIMENSION AND METAL FINENESS.
- 

- SILVER CONTENT:
MUGHAL RUPEES
- TESTING SITE:
ASHMOLEAN MUSEUM:
FULL QUALITY CONTROL
- TEST ORGANISER:
ARTHUR NEEDHAM



SIMILARITIES: THE SILK AND THE SUBCONTINENT MARKETPLACES



Humayun's Tomb: Photo: Mohammed Tariq Ansari

**CLARIFICATION OF THE DECIMALISATION OF THE
BILLON COINAGE OF IBRAHIM SHAH: JAUNPUR
SULATANT.**

**Mohammed Tariq Ansari
Arthur John Needham**

With Shri Ram College.

An Insignificant Looking Coin

- Metal type: Billon
- Weight: .91 gram
- Ruler: Ibrahim Shah
- Dynasty: Jaunpur Sultanat



ONE UNIT BILLON: IBRAHIM SHAH

Ibrahim Shah Sharqi

NT J3.3060.1.a.a.Bi100 Billon One UNIT (JS 07)



Ibrahim Shah Sultani khaldat mamlakatuhu

- Weight: 9.3gr



Al-khalifa amir al-momineen khulidat Khilafatuhu 840 or 845?

.40 UNIT BILLON: IBRAHIM SHAH

Ibrahim Shah Sharqi

NT J3.3060.1.a.a.040 Billon Two-Fifths UNIT (JS 8)



Ibrahim Shah Sultani khaldat mamlakatuhu

• Weight: 3.65gr



Al-khalifa amir al-momineen khulidat Khilafatuhu

THE NEW COIN IN METROLOGY.

It is $1/10$ of the
standard unit.

It is now the
smallest UNIT in
the billon
system.

We now have a
 1 , $4/10$ and
 $1/10$ UNIT
within the
billon system.

Change can be
given easily for
even small
transactions
within the
billon system.

THE SYSTEM IS DECIMALISED AT LEAST WITHIN BILLON

- It can be seen from comparison of the One UNIT (.100) and .4 (.040) UNIT illustrations that this billion coin uses the common obverse die and the reverse die from the 1 UNIT coin.

HOW DID THIS FIND HAPPEN?

The knowledge of numismatist
Mohammed Tariq Ansari of the coin series.

The knowledge of numismatist
Mohammed Tariq Ansari of metrology.

Joint discussions with Arthur Needham to
place the find in context.

Teamwork and fundamental knowledge.

NEW PATHWAYS IN COIN METROLOGY STUDIES II.

- THE COMMON NAMES FOR COINS OFTEN USED IN NUMISMATIC LITERATURE CAN BE CONFUSING AND SIMILAR NAMES CAN BE USED FOR COINS OF DIFFERENT METALS AND SIZES.
- THE ACTUAL COMMON NAME OR ANY NAME MAY OR MAY NOT APPEAR ON THE COIN ITSELF.
- THE UNIT SYSTEM WHEN UTILISED WITH THE ACTUAL FINENESS OF THE METAL AND WEIGHT PRODUCES A WORKING FIGURE FOR INSTANT COMPARISON OF REAL VALUE ACROSS EMPIRES.

CONTRARY TO POPULAR THOUGHT THE MARKETPLACE COULD ADJUST RAPIDLY TO ANY CHANGES IN METAL CONTENT AND WEIGHT.

THE COROLLARY TO THE THEOREM IS THAT THE VALUE OF THE COIN REFLECTS THE METAL CONTENT AND THIS FOR THE TIME AND TRADE OF THE HISTORIC SILK ROAD WAS AN ACCURATE ASSUMPTION.

NON INVASIVE METAL TESTING: XRF

FUNDAMENTALLY, THE TECHNOLOGY IS LONG ESTABLISHED AND WHEN USED WITH A STANDARD OPERATING PROCEDURE AND TRAINED OPERATOR PRODUCES RESULTS THAT CANNOT BE TECHNICALLY CHALLENGED.

1. I HAVE LONG PERSONAL EXPERIENCE WITH USING THIS TECHNOLOGY IN HIGH END COMMERCIAL USE.
2. I HAVE USED THE TECHNOLOGY IN NUMISMATICS FOR A NUMBER OF YEARS INCLUDING ARRANGING MAJOR TESTING AT SUCH LOCATIONS AS THE ASHMOLEAN MUSEUM AT OXFORD UNIVERSITY.
3. MAJOR DISCOVERIES HAVE BEEN MADE.
4. THE NEGATIVITY SURROUNDING THE USE OF MODERN XRF TECHNOLOGY IS BASED ON ERRORS OF ASSUMPTION DUE TO EITHER LACK OF TECHNICAL UNDERSTANDING OF ITS USE AND POSSIBLE LIMITATIONS (ALTHOUGH ITS APPARENT LIMITATIONS CAN BE OVERCOME BY A CAREFULLY PREPARED SOP) OR THAT IT HAS NOT BEEN ACCEPTED BECAUSE THE UNDOUBTED RESULTS MAY NOT FIT A WORKING CURRENT NARRATIVE.
5. IT IS TIME FOR MODERN JOURNAL PAPERS TO MOVE FROM TECHNICAL DISCUSSIONS ON ITS USE TO ACTUAL RESULTS. OUR FUTURE WORK WILL INCLUDE RESULTS.
6. WE HAVE A WORKING STANDARD OPERATING PROCEDURE FOR MODERN XRF TECHNOLOGY USEAGE.

SUMMARY

TRADE ON THE SILK ROAD FOR ITS ENTIRE LENGTH WAS HIGHLY ORGANISED AND REGULATED.

COINS OF ALL TYPES AND ISSUES COULD BE ACCEPTED FOR PAYMENT IN A WELL REGULATED SYSTEM.

COINS OF ANY METAL, FINENESS AND TYPE COULD BE REMINTED TO PRODUCE COINS OF ANY DESIRED WEIGHT, DESIGN AND METAL FINENESS.

CHARGES FOR THE EXCHANGE OF COINS FROM ONE ISSUER TO ANOTHER OR FOR REMINTING ONE COIN TYPE INTO ANOTHER WERE PART OF NORMAL TRADE EXPENSES SIMILAR TO THE CURRENT BUY AND SELL RATES OF CURRENCIES ON THE MARKET TODAY.

THERE WAS IN ESSENCE A KNOWN UNIT RATE FOR ANY CURRENCY AND THAT DEPENDED ON ITS WEIGHT AND FINENESS OF THE CONTAINED METAL.

HOARD FINDS AT VARIOUS PLACES ALONG THE SILK ROAD WHILE BEING OF TECHNICAL INTEREST ARE JUST PART OF A TRADE NETWORK RATHER THAN BEING ANYTHING EXTRAORDINARY.

FUTURE RESEARCH

THE UTILISATION OF QUALITY CONTROLLED NONINVASIVE ELEMENT (METALLURGICAL AND NIN METALLURGICAL) TESTING BY USE OF XRF TO UNDERSTAND ELEMENT COMPOSITION OF COINS AND OTHER MATERIALS.

THE INTERACTION WITH VARIOUS OTHER AREAS OF STUDY SUCH AS METALLURGY, MINING, GEOLOGY AND ECONOMICS WITH TRADITIONAL NUMISMATIC STUDIES TO PRODUCE BETTER RESEARCHED AND CONNECTED CATALOGUES, MANUSCRIPTS AND DATA BASES.

THE UTILISATION OF BETTER ILLUSTRATIONS IN NUMISMATICS.

THE USE OF THE **UNIT** SYSTEM OF METROLOGY TO FULLY UNDERSTAND THE ABILITY FOR CURRENCIES TO INTERCONNECT WITHIN A HIGHLY ORDERED TRANSNATIONAL TRADING SCHEME THAT TRANVERSED THE KNOWN WORLD.

COMPLETE THE UNDERSTANDING OF THE TECHNICAL ABILITIES OF MINTS ESPECIALLY IN THE GREATER ASIA AREA.

ATTRIBUTION: PUTTING ALL THE RESEARCH TOGETHER

WHY HAS THIS BEEN LEFT UNTIL LAST YOU WILL MAY ASK!!!

1. Numismatics and numismatic studies have concentrated almost from the first sentence on coin attribution.
2. We immediately become besieged with “in crowd” terms like tanka, tanki, mohur, falus etc.
3. We become almost besieged again by reports of hoard finds and spun tall tales about the wonders of finding Roman coins in Afghanistan or Chinese coins in Iran when in fact that was just part of the life of a coin. Note: To protect such finds correctly all countries need innovative ANTIQUITIES legislation based on that of the UK specifically England.
4. Often on archaeological digs a coin that is found in situ is treated poorly and taken out of its context.

• LEARNING
ATTRIBUTION SKILLS
COMES AFTER BASIC
KNOWLEDGE

TATTA
AH 1124/R.Y 1
NT 185.5120.3.a.a.100 Rupee (M8.141)



Jahandar Sheh Badshah-e-Jahan 1124
Ba Zad Sikkah Bar Meh Chu Sahab Qiran
Master Jahandar Emperor of the World 1124
Auspiciously Struck Coin by the Great Chosen One



Zarb Tatta Sanah Ahad Jalus Manus Maimanat
Struck at Tatta in Year 1 of the Reign Associated with Prosperity



*ATTRIBUTION STUDIES:
ANOTHER STORY*