Fighting Illicit Trafficking of Maps – The Methodology of the ENIGMA Project

Patias P., Georgiadis Ch., Roustanis Th., Chalkidou S., Georgoula O.

Introduction

- Illicit Trafficking of Cultural Objects (C.O) has been an increasing concern among legislative, law enforcement agencies, customs and other international authorities, along with looting and theft.

- The problem has been exacerbated by political unrest and armed conflicts in regions with rich cultural history (e.g. Middle East, Central America, Asia, Africa).

- Another Contributing factor has been the increasing options that technology and digital networks (e.g. the dark web) provide to smugglers along with the use of existing and well-established networks, transportation channels, and practices of organized crime.

- The internet has also provided and additional option for illicit dealers to act in small and decentralized groups.

Astrolab from the Emergency Red List for Syria (ICOM)
https://tinyurl.com/yz6ckbjw

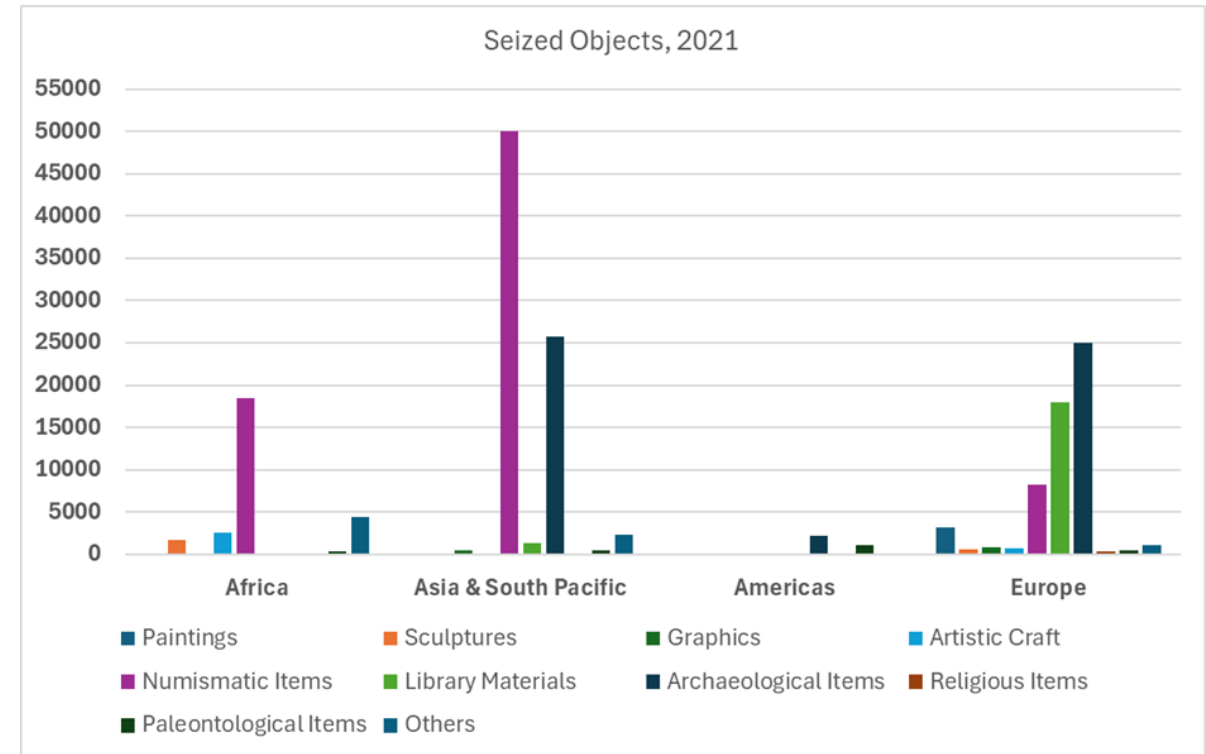# Recent Reporting on C.H related crimes

- Interpol is one of the agencies that provide regular reports on crimes against Cultural Heritage (C.H), thus documenting the complexity and the spatial variability of the problem.

Location of Crimes against Cultural Property, 2021

Stolen Objects, 2021 (INTERPOL'S REPORT)
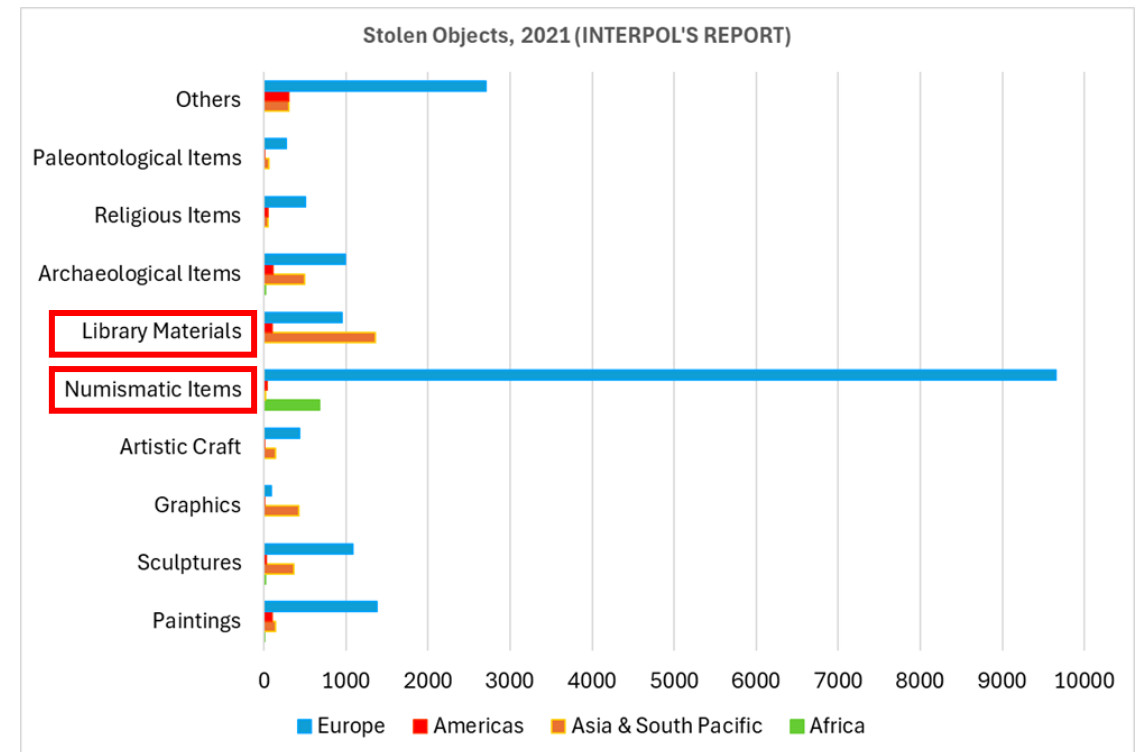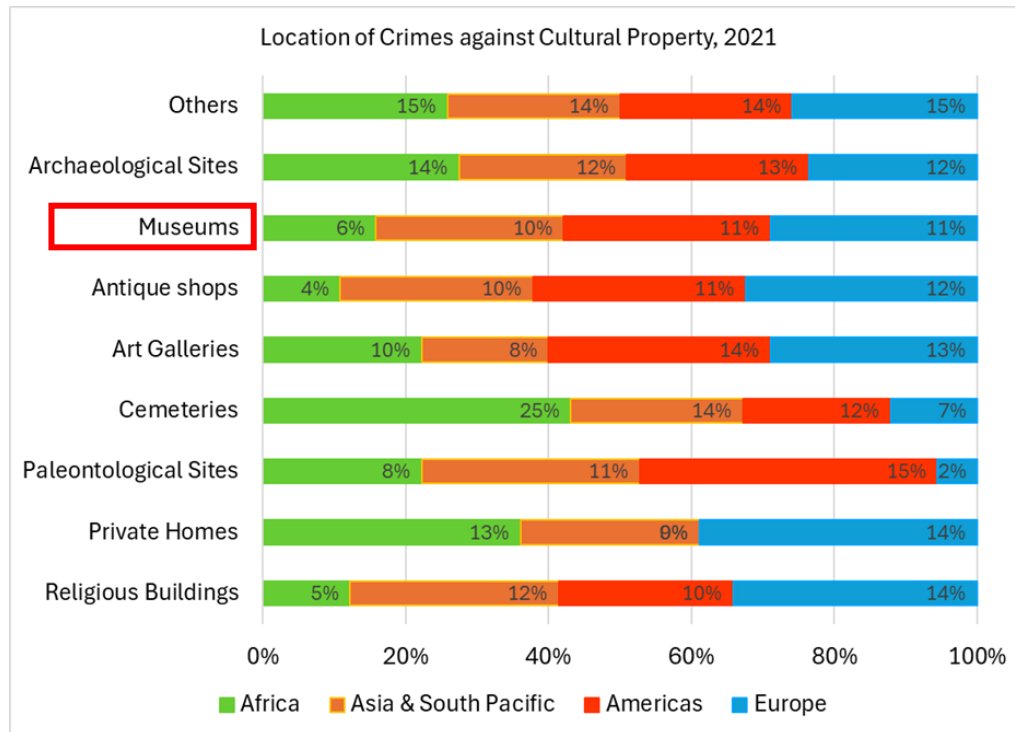
Recent Reporting on C.H related crimes

Findings:

- Smuggled objects are usually of small size (e.g. numismatic objects, paintings, small archaeological items).

- Most end buyers are located in the richer parts of the world (i.e. Europe, North America).

- Significant Number of robberies occurs in locations that have security installations (e.g. Museums, Libraries).

- Increased and targeted Custom checks allow for the seizing of Objects.

Seized Objects, 2021

Legend: Paintings, Sculptures, Graphics, Artistic Craft, Numismatic Items, Library Materials, Archaeological Items, Religious Items, Paleontological Items, Others

Regions: Africa, Asia & South Pacific, Americas, Europe

Cartographic Objects and Heritage

- Cartographic Objects (e.g. manuscript and historic maps, atlases, books, etc.) can be considered as a quasi-form between art, science and a graphic testimony of the technology used at particular time periods to measure and represent the earth's surface.

- Typically maintained in G.L.A.M (Galleries, Libraries, Archives and Museums) institutions but there are also many private collections that have not been documented.

- Current auction prices vary depending on the object's uniqueness, designer, time-period and condition.

Sale 2642 - Lot 147 - Jun 22, 2023

(ATLAS MINOR.) Gerard Mercator; and Jodocus Hondius. Atlas sive Cosmographicae Meditationes de Fabrica Mundi et Fabricati Figura.

Estimate
$8,000 - $12,000

Price Realized
$15,000
(with Buyer's Premium)

Sale 2555 - Lot 296 - Dec 17, 2020

SANSON, NICOLAS. Atlas Nouveau.

Estimate
$2,500 - $3,500

Price Realized
$11,250
(with Buyer's Premium)

Theatrum orbis terrarium.

£145,000

ORTELIUS, ABRAHAM

Add to basket

Liber Cronicarum [Nuremberg Chronicle]. Registrum huius operislibri cronicarum cu[m] figuris et ym...

£375,000

SCHEDEL, HARTMANN.

Add to basket

18th Conference Digital Approaches to Cartographic Heritage (ICA-DACH), Bologna (IT), 23-25 October 2024

Is there however Illicit Trafficking of Cartographic Objects?

2005   The FBI requests GLAMs to audit their map collections after several thefts were reported in the British Library, Boston Library, Yale Library et al.

2007   Ptolemy's Geography maps reported missing from the National Library of Spain → later retrieved in the U.S.A.

2012   Sweden's National Library reported that one of their collection maps depicting the New World was offered for sale in an auction house.

2017   Carnegie Library audit reveals that maps worthing around $8 million were missing from a maximum-security room.

Special Characteristics of the above incidents

1. The robber was working alone.

2. Had some expertise on maps.

3. Most of the cases were to some extent an inside job.

Funded by the European Union

Existing Databases for Stolen Cultural Objects

Archeo

Developed by the Regional Intelligence Liaison Office of the World Customs Organization.
Enables real time communication between Customs Authorities, Ministry of Culture officers and academic to identify potentially fraudulent objects.

Art Loss Registry

Developed by the International Foundation of Art Research, it currently contains more that 700,000 recorded lost items. Contributors include law enforcement agencies, insurance companies, art owners, etc.

Lost Art Database

Private database procured by the German Lost Art Foundation to document C.O seized by the Nazi's between 1933-1945. Currently contains more than 645 records regarding maps.

Existing Databases for Stolen Cultural Objects

Interpol's Database of Stolen Works of Art

Currently contains more than 52,000 records of objects that have been official reported as stolen. Follows the ObjectID international standard for documentation. The database can also be accessed upon request through a mobile application.

National Stolen Art File

Developed by the F.B.I, it can be accessed through desktop or mobile applications. Several Records regard cartographic objects including a copy of Novus Atlas Sinensis, a copy of Atlas Minor of Gerard Mercator, etc.

Leonardo

Developed by the Command for the Protection of Cultural Heritage of the Italian Carabinieri, currently holds more than 1,250,000 records of stolen objects

Metadata recorded in Databases of Stolen Cultural Objects

ObjectID	Lost Art Database	Interpol's Stolen Works of Art	F.B.I's NSAF	Art Loss Database
Description	Object Report	Information		Information
ID	Lost-Art ID	ID	ID	ID
Image	Image	Image	Image	Image
Maker	Author	Artist	Maker	Artist
	Editor			
Title	Title	Title	Title	Title
	Place of Publication			Publication History
Date/Period	Document Date	Period	Period	Date
Object Type	Object Type	Object Type	Object Type	
	Group of Reported Objects			
Material/Technique	Material/Technique	Material/Technique	Materials	Medium
Measurements	Dimensions	Dimensions	Measurements	Dimensions
	Circumstances of loss		Incident Type	
	Provenance			Provenance (Historic and Current)
Subject	Description	Description	Description	Description
Inscriptions & Markings / Distinguishing Features	Signature	Signature/Markings (State/Position)		Signature/Markings
	Published Since			
	Contact	Country		
		Shape		

Documenting Cartographic Heritage

- **ObjectID Paradigm:** Developed by the Ghetty Trust in 1993, is currently an international Standard for documenting Cultural Objects.
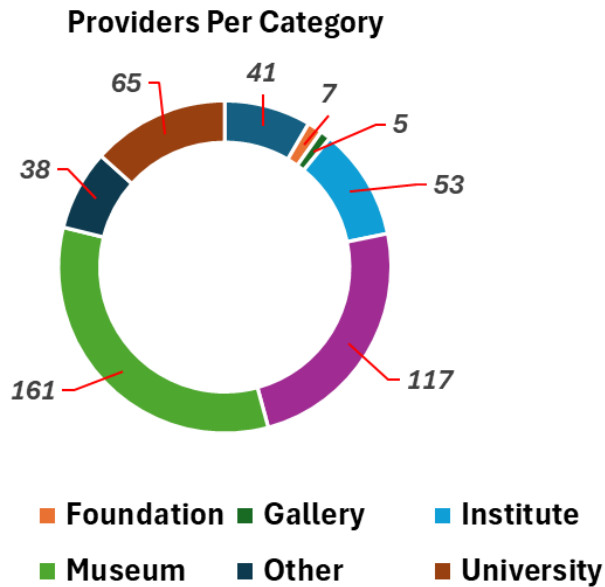
Recorded Properties	Recording Process
i.) Type of Object (e.g. painting, sculpture, etc)	1.) Take high-resolution images of the object
ii.) Materials and Techniques (e.g. paper, brass, wood)	
iii.) Measurement (e.g. dimension, weight)	2.) Identify and record the necessary information on the object.
iv.) Inscriptions and markings (e.g. signature, marks)	
v.) Distinguishing Features (e.g. damage, repairs)	3.) Provide a short description of the object with any additional information in free text format.
vi.) Title	
vii.) Subject (e.g. landscape)	4.) Keep the ObjectID documentation Secure
viii.) Date or Period	
ix.) Maker	

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Documenting Cartographic Heritage

- **Europeana:** digital platform that provides access to the collections of G.L.A.M institutes.
  - Currently holds more that 50 million records of Cultural Objects.
  - Follows its own Data Model (Europeana Data Model), which is an interoperable framework that allows Europeana to collect, connect and enrich cultural heritage metadata.

- **Cartographic Heritage in Europeana:**
  - Four main Keywords were used:
    - "**Atlas**" (concept code: 2826)
    - "**Manuscript Map**" (concept code: 2916)
    - "**Map**" (concept code: 43)
    - "**Cartography**" (concept code: 2971

Cartographic Heritage in Europeana

The request returned more than ***298,000*** records with metadata pretty similar to ObjectID's documentation standards.

Providers Per Category

65
41
7
5
38
53
161
117

■ Archives ■ Foundation ■ Gallery ■ Institute
■ Library ■ Museum ■ Other ■ University

TOP 10 CONTRUBUTİNG COUNTRİES BASED ON NO OF RECORDS

1. Czech Republic: 120995
2. France: 81365
3. Germany: 45865
4. Poland: 13505
5. Spain: 5459
6. Netherlands: 5229
7. Greece: 3938
8. United Kingdom: 3550
9. Italy: 3134
10. Israel: 2696

TOP 10 CONTRUBUTİNG PROVİDERS BASED ON NO. OF RECORDS

1. National Library of the Czech Republic: 114445
2. National Library of France: 70746
3. Architecture Museum at T.U. Munich: 25631
4. Deutsche Fotothek: 13357
5. National Archives of France: 9813
6. National Library of Spain: 4988
7. Royal Museums Greenwich: 2996
8. Library of the Wroclaw University: 2746
9. National Library of Israel: 2683
10. Aikaterini Laskaridis Foundation: 2393

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Cartographic Heritage in Europeana

- **Data Analysis revealed documentation issues:**
  - Cartographers' names appearing in different formats (e.g Blaeu, Joan; Blaeu, Joan (1596-1673), Blaeu, Johann)
  - Many documentation fields contain Null Values.
  - No separate field regarding the scale of the map. The information is recorded in text format as part of the title of the object.
  - No separate field regarding the region/area that the map is depicting. The information is recorded in text format as part of the title of the object.
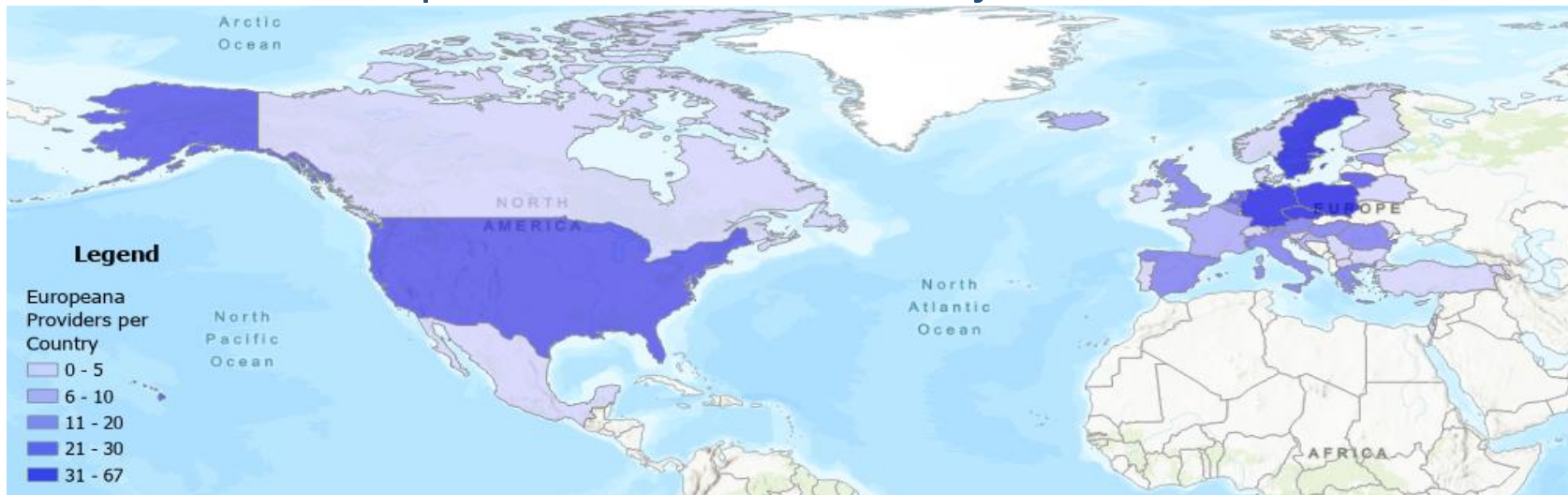
Current Situation – The ENIGMA Project

- Illicit Trafficking of C.O remains a very complex problem.

- Each C.O has a different legal protection status at a national and international level which can lead to confusion.

- There is still no standardization in the documentation of C.O and there are many independent databases that do not communicate with one another.

- **Time is of the essence** → when do we realize that an item has been missing? How much time does a Law Enforcement Agent has to decide on whether to confiscate an item or not?

- The **ENIGMA Project** (2023-2026) brings together 12 partners from 7 countries to develop a **toolkit** that will assist stakeholders in responding promptly and adequately to the challenge by using advanced technological tools including remote sensing, database communication platforms, ML/computer vision algorithms, etc.

The ENIGMA Approach

- **ENIGMA's** mission against the illicit trafficking of cultural objects evolves around three objectives:
  - **Scientific and Innovation Objectives**
    - design a Unique Authenticity Identifier (U.A.I) as a composite index for each object.
    - Integrate Earth Observation and G.I.S analysis techniques to monitor illegal excavation sites.
    - Develop a novel decision support and communication platform.
  - **Technical Objectives**
    - Develop and test U.A.I tools.
    - Use machine learning (M.L) algorithms for object clustering.
    - Perform advanced metadata analysis to reveal potential links between different data sources and objects.
  - **Demonstration, Dissemination and Exploitation**
    - Utilize a communication Strategy to draft policy recommendations.

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The ENIGMA Toolkit (1/3)

Cultural Good Transfer pre-registration tool ➔ Pre-register the intention of transporting a C.O.

Unique Authenticity Identifier ➔ query and similarity scoring to a reported stolen item.

Fast on-site documentation➔ provide a user-friendly interface to non-experts to document C.O including providing a high-resolution 3D model of each object.

Documented Cultural Objects D.B➔ store the collected information in databases that be accessed by all relevant authorities.

The ENIGMA Toolkit (2/3)

C.O spatial Connection Tool ➔ record and track the object through various nodes

Crowd Sourcing D.B ➔ search for similar C.O in crowd-sourcing databases

Internet and Social Media Crawler➔ crawl webpages and social media to identify C.O for sale

C.O origin detection➔ similarity comparison to other recorded objects to identify potential origin.

The ENIGMA Toolkit (3/3)

Global L.E.A open access database→ create the structure for a database than can integrate already existing data

Hot Spot Satellite Monitoring→ monitor hotspots of potential illegal excavations using open access satellite imagery.

Let's Present an Operational Scenario

- **An individual arrives at a custom service check with a map entitled "Oost-Frise, ou le comté d'Embden subdivisé en ses principals jurisdiction" (East Frisia or the County of Emden, divided into six judicial districts).**

- **The custom officer sees that the pre-registration documentation is missing or the documented object differs from the one presented in the control check.**

- **The officer initiates a search using the fast on-site documentation toolkit in the stolen art databases by entering simple information seen on the map, i.e:**
  - **Cartographer's name: Sr. Sanson**
  - **Design Year: 1709**
  - **Dimensions: 56.5x43cm**
  - **Scale transcribed as "eschelle" and followed by a graph scale**
  - **Inscription: est. 1512 (205)**
  - **Stamp : "Biblioteque de l'Arsenale" and partially colored**

43cm

56.5cm

Let's Present an Operational Scenario

- **The Lost-Art Database of the German Lost Art Foundation returns a finding of a similarly entitled map reported as Nazi confiscated property. However, there are some differences:**

	Map presented at the Customs	Lost Art Database
Cartographer	Sanson	Sanson
Design Year	1709	1709
Dimensions	56.5x43	62.8x54.10
Scale	Graphic (escelle)	Graphic (escelle)
Inscription	Est. 1512 (205)	Several distinct handwritten markings, "around 1600",
Stamp	Biblioteque de l'Arsenale	No
Color	Partially colored	Yes
Other		Water Stains, heavily worn edges

Let's Present an Operational Scenario

- **These different characteristics will lead to different Unique Object Identifier's scores and thus provide low similarity scores, indicating that the object has not been reported as stolen.**

Discussion

- The very diverse nature of heritage objects increases the difficulty in drafting a common standard of metadata documentation that can be implemented by G.L.A.M institutes or individuals.

- The first line of defense in this fight are non experts (L.E.A officers) who have very limited time to document an object, check and verify its paperwork and decide on whether to confiscate it or not.

- The ENIGMA Project aims at developing a toolkit to assist all involved stakeholders in having access to data and new technology that will allow them to track and seize stolen Cultural Objects.

- A core concept is the U.A.I which will be a composite metric to describe the similarity of each object with other reported as stolen.

- Other technologies including earth observation, machine learning, web crawlers, 3D scanning, 3D reconstruction will also be available to facilitate the decision-making process but also allow for early warning alarms for stolen objects.

Thank you for your attention!

Visit our website at:

https://eu-enigma.eu/

or scan the QR code