ÖAW AUSTRIAN ACADEMY OF SCIENCES

OREA Institute for Oriental and European Archaeology

Ludwig Boltzmann Institute
Archaeological Prospection and Virtual Archaeology

‘A puzzle in 4D’
Modelling resources and ‘documented reality’ of a long-term excavation project

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acdh austrian centre for digital humanities

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Project & Aims

A puzzle in 4D

Digital long-term preservation of ressources from Austrian excavations at Tell el Daba (Egypt)

- Funding: Austrian Academy of Sciences digital long-term preservation program (ÖAW/ACDH Digital Humanities) & ARIADNE (FP7-313193)
- February 2015 – January 2020
- OREA & ACDH (Austrian Academy of Sciences)
- **Case study to develop archaeology data archive at the Austrian Academy of Sciences**

Cooperations with:

- Ludwig Boltzmann Institute ArchPro
- Chicago University
- Österreichisches Archäologisches Institut, Grabung Tell el Dab‘a
- Archaeology Data Service
- PIN Scri - Polo Universitario "Città di Prato"

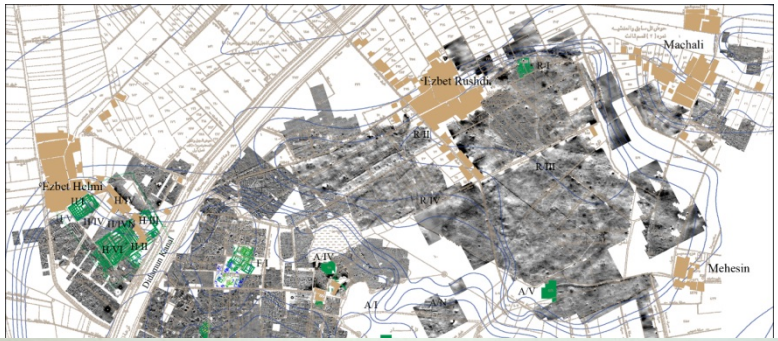
Tell el Daba (TED)

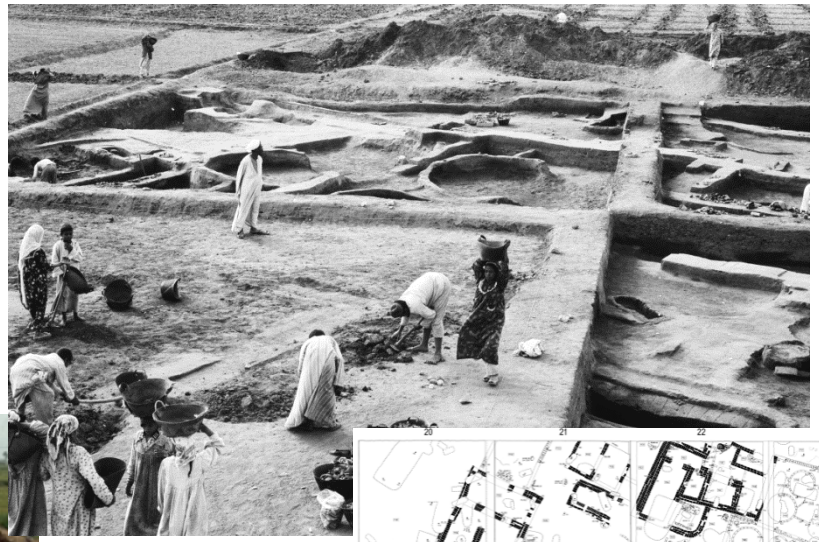
- 12th – 18th Dynasty (early second millenium BC)
- Wealthy society with contacts to eastern Mediterranean and Minoan culture

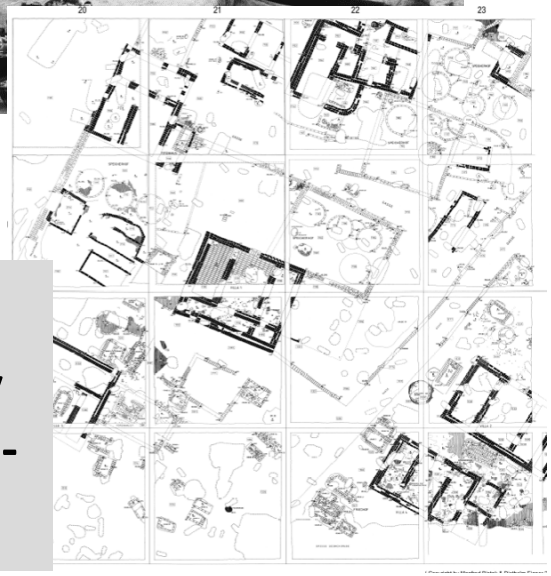
TED wall painting depicting bull leapers

Excavation

Since 1966 - 88 fieldwork campaigns - 8 excavation areas





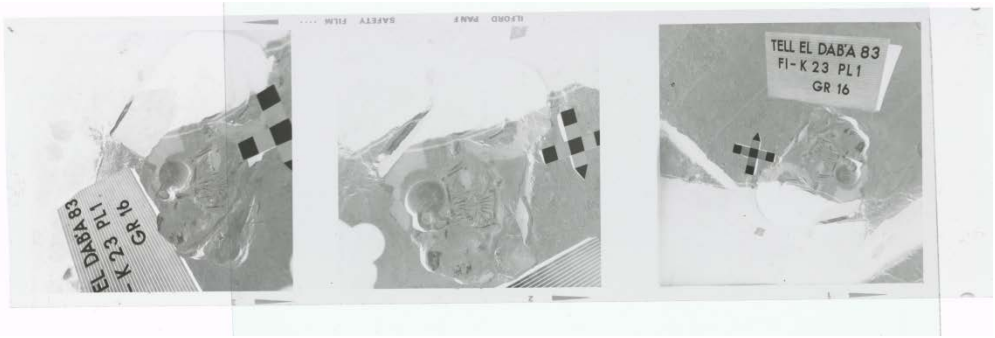


Excavation methodology
Planquadrate - squares

ANALOGUE resources

Photos

- 15 000 photos
- 200 000 photo negatives
  of which 1/3 are 6x6 negatives
- 45 000 slides



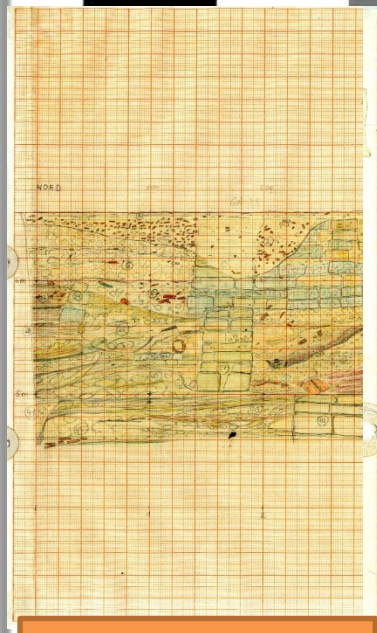
Drawings

- find drawings: 15 200 pencil on cardboard
  + 8000 ink on cardboard
- 35 000 field drawings (plana, sections, details): colour pencils on millimeter paper
- 4500 plans, nearly all DIN A2 or A1: ink on tracing paper

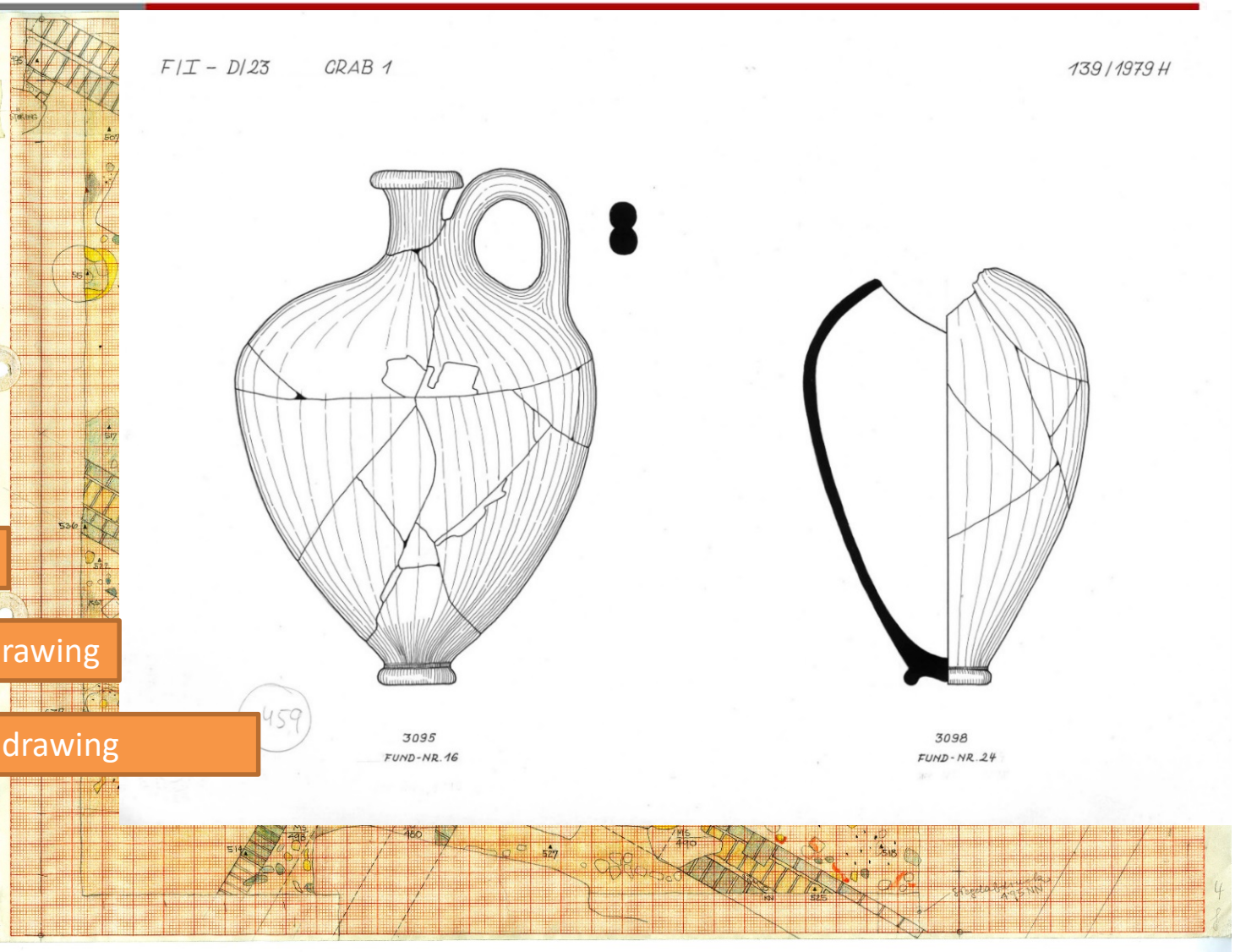
Written documentation

- 5 folders of excavation protocols - 300 pages each
- Lists, find cards, etc.

ANALOGUE resources



Profile drawing



Ground plan drawing

Find drawing

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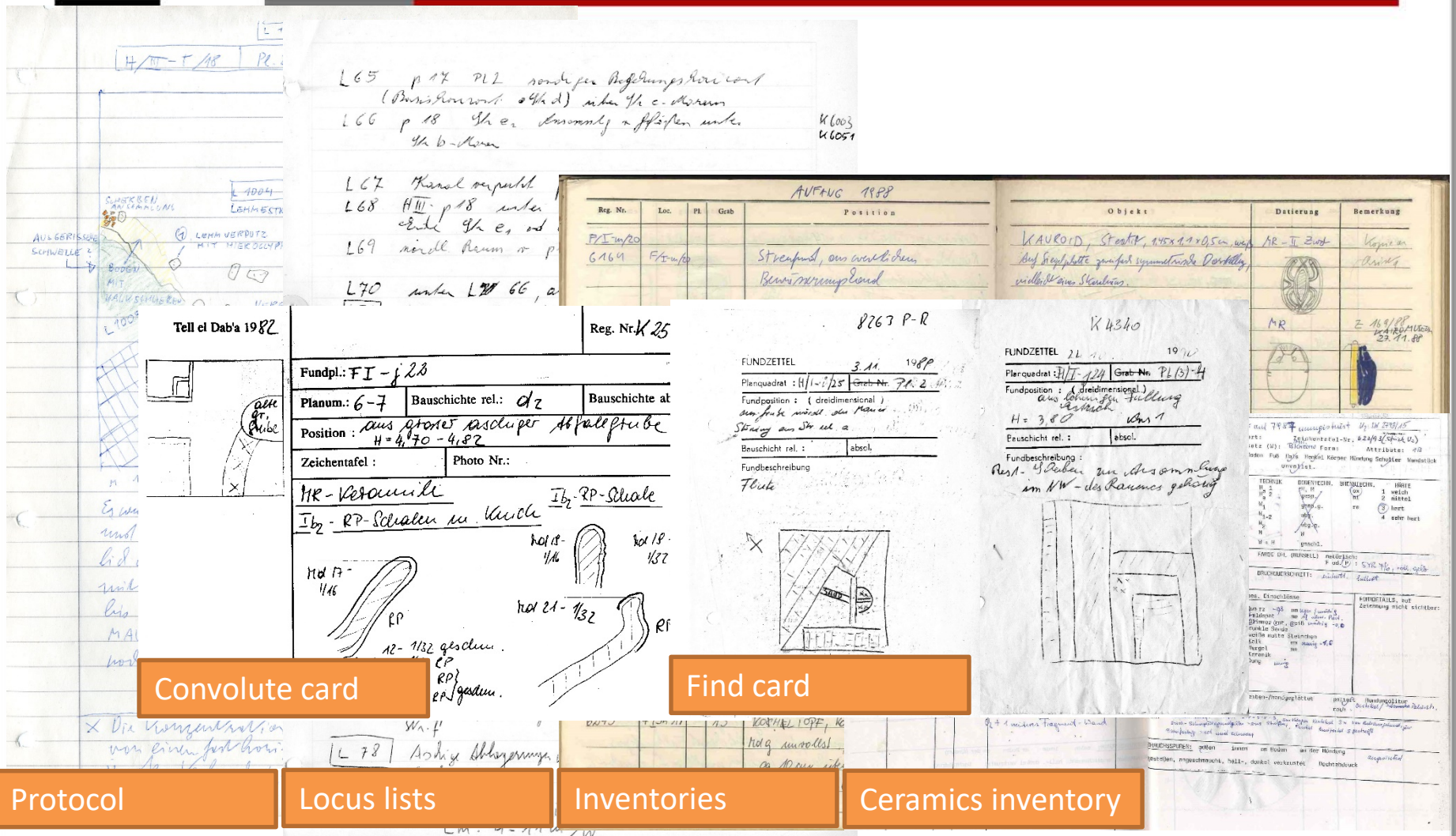
ANALOGUE resources



Convolute card

Find card

Protocol

Locus lists

Inventories

Ceramics inventory

DIGITAL resources

Photos

- Photos: field- and finds-photos, since 2007

Drawings

- AutoCAD Plans: fieldplans of some areas digitized
- Scans of finds drawings, since 2011 complete, before only occasionally

Written documentation

- TED Documentation access database, since 2007 (protocol-, locus- &wall lists)
- Scans of inventories of Pottery and small finds (complete)

Other

- Databases: wall painting fragments, stone tools, human remains, animal bones, botanic remains, seals
- Spreadsheets: C14 measurements
- Geophysical surveys (geo-magnetic and geo-physics)
- GPS-plans
- Various maps
- Illustrator files: reconstruction drawings

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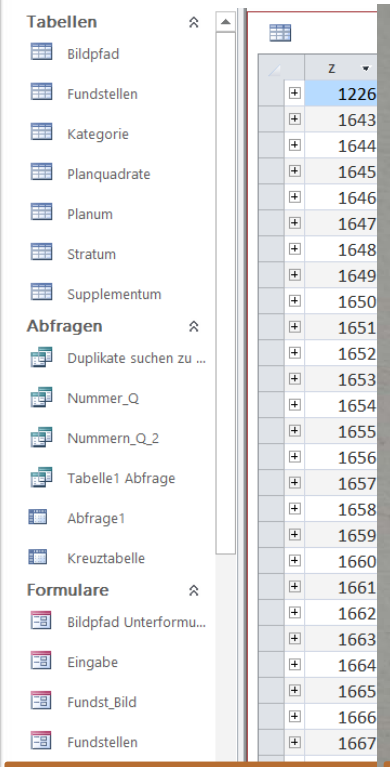
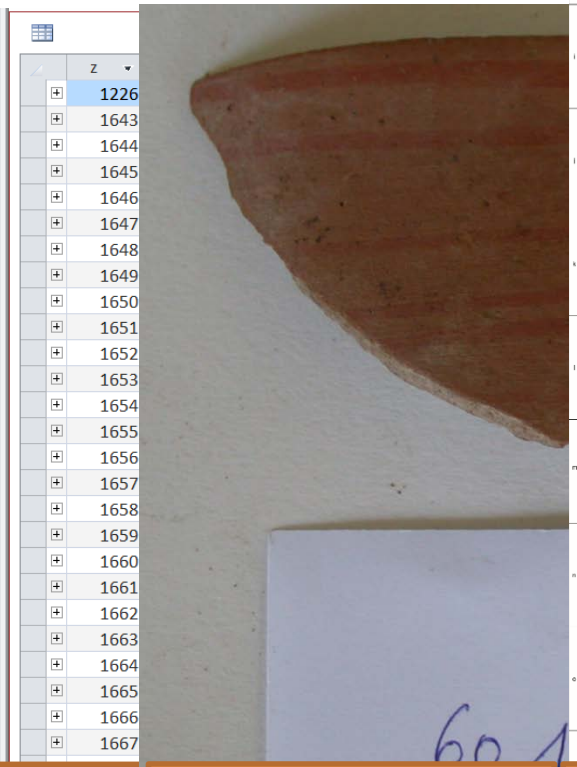
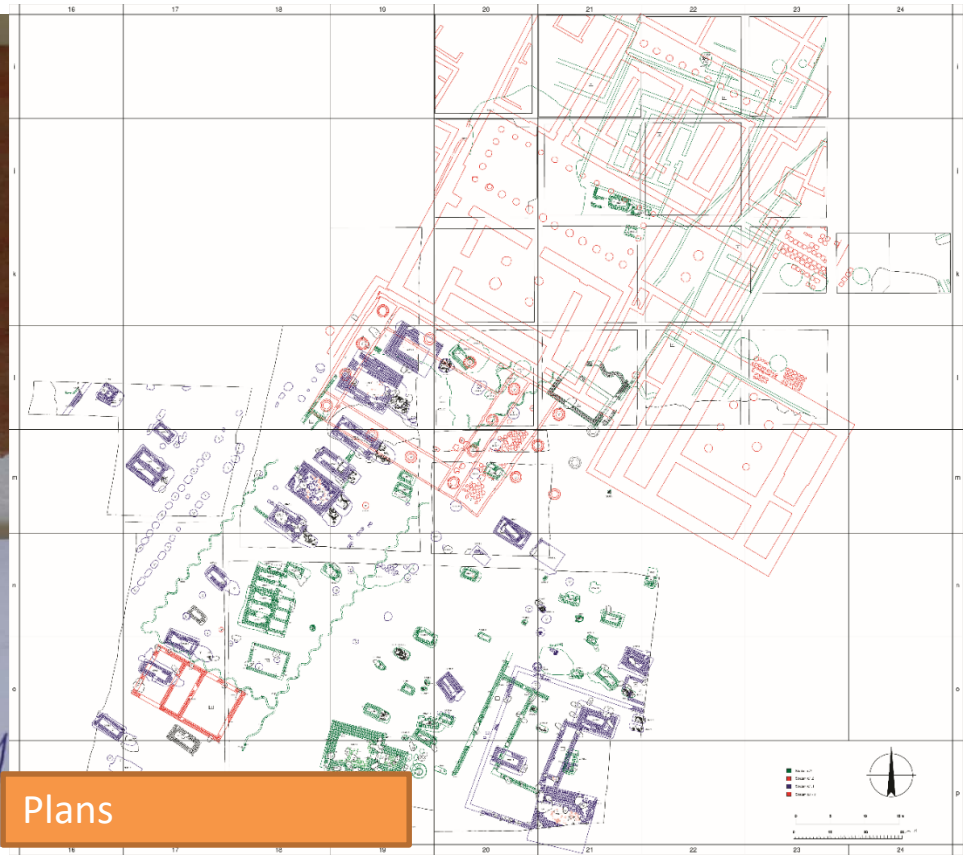
DIGITAL resources







Database

Photos

Plans

Metadata creation

Tasks:

Creation of metadata for analog resources

Extraction/Creation of metadata for digital resources

What questions do we want to answer with our Metadata

- All documents of a specific **excavation area** (e.g. Area F/1)
- All documents of a specific **archaeological feature/find type (**grave, wall , vase, ….)
- All **archaeological features/finds** of a specific **type** in an **excavation area** (all graves in area F/1)
- All documents of specific **archaeological features/finds** in an **excavation area** (e.g. grave 5 in Area F/1)
- All **archaeological features/finds** within one **stratigraphy**

Object/Identifier creation

Challenges:

Of which nature are the objects identified in the documentation and how to create identifiers and an identifier workflow that will allow for the identification of the same object in two or more different documents/digital resources?

Which **context information** has to be added to the identifiers used in the analog or digital documentation (in what context is a name unique)

- Analog Documents
- Archaeological features/finds
- Excavation areas
- Physical storage
- Digital Documents

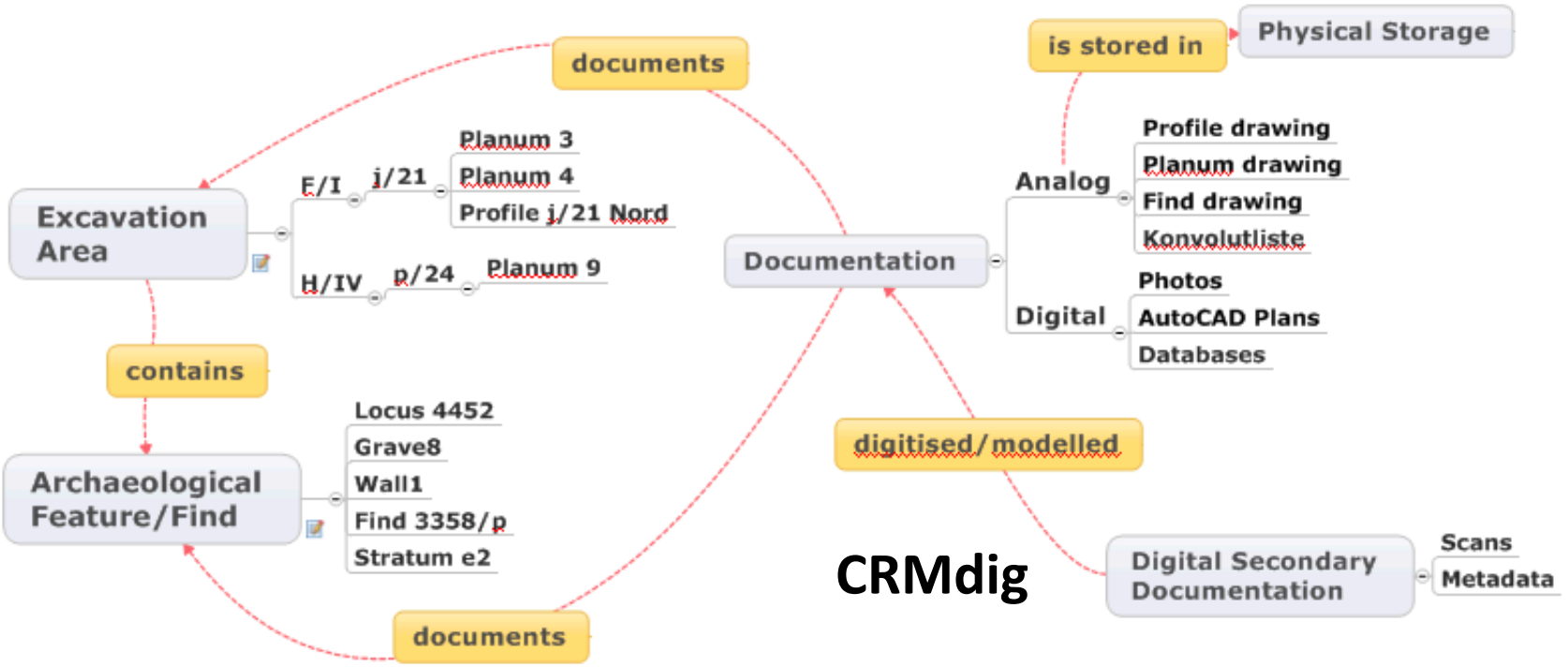
Differentiation between

- Archaeological objects and structures created in ancient times (stratigraphic units)
- Excavation structures created during excavation time (excavation units/objects)

Data model

CIDOC CRM & Extensions

Excavation obj. – Archaeological obj. – Documentation - Digitization

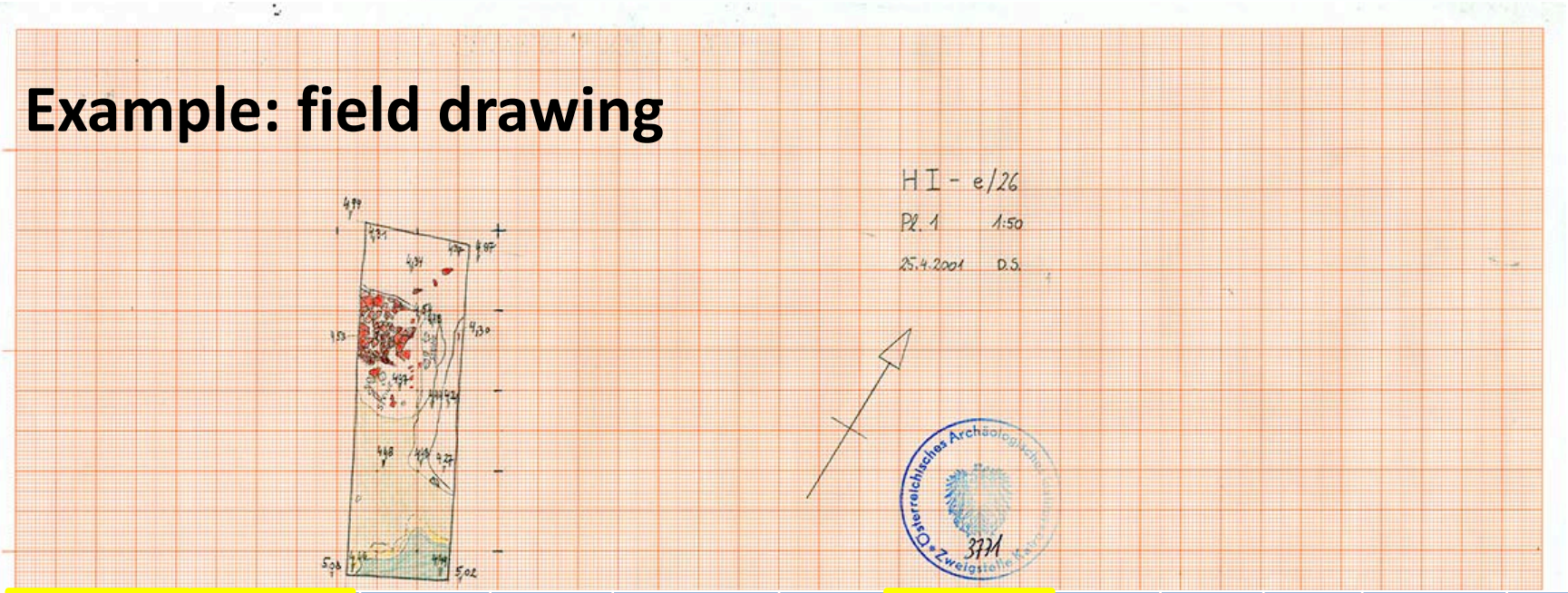


CRMdig

CRMscience &
CRMarchaeo

Creation of metadata for analog resources

Example: field drawing



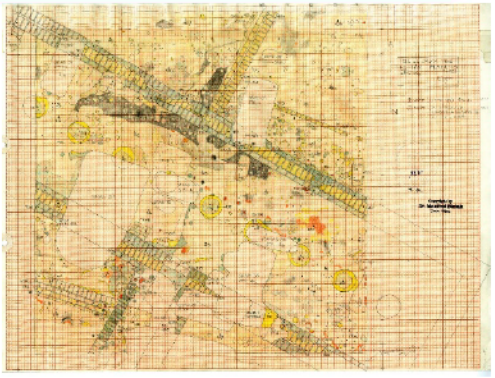
Filename	Scan_Titel	Scan_Date	Creator	Equipment	Resolution_dpi	Dokument_ID	Mappe	Dokumententyp	DT_Abk	Dokumenten_Detailtyp	DDT_Abk
TD_H-I_e26_Planum1__TD_FZ_3771	TD_H-I_e26_Planum1	15.04.2016	Natalie Monschein	EPSON expression 10000XL	600	TD_FZ_3771	H I_e/26 Pl. Det. Prof.	Feldzeichnung	FZ	Planum	PL

Inventar	Inventar_Sig	Datum	Jahr	Saison	Monat	Zeichner	Zeichner Monogramm	Copyright	Maßstab	Typ	Fundstelle
3771		25.04.2001	2001	F	April	Dieta Svoboda	DS	ÖAI	1:50	Millimeterpapier	TD

Areal	Planquadrat_Schnitt	Planum	Locus	Profilrichtung	Stratum	Excavation obj ID	Arch_objekte ID	Feldbeobachtung_Aufarbeitung	Blattvermerk	Scanvermerk
H-I	e26	1				TD_H-I_e26_Planum1		Feldbeobachtung		

Creation of metadata for analog resources

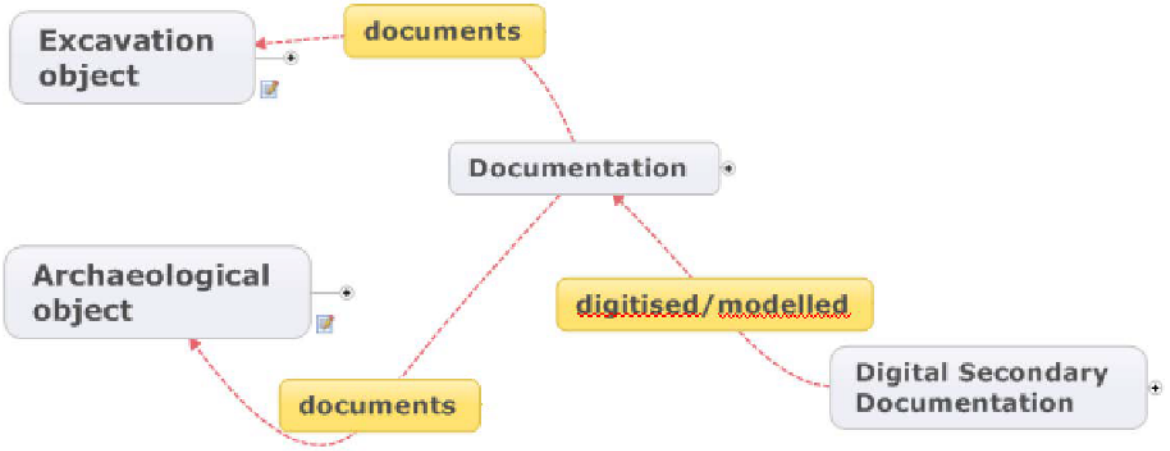
Metadata entry in Excel sheets



- 1:n relations
- Controlled vocabularies (Identifiers & Terms)

Physical Documentation - Field Drawings

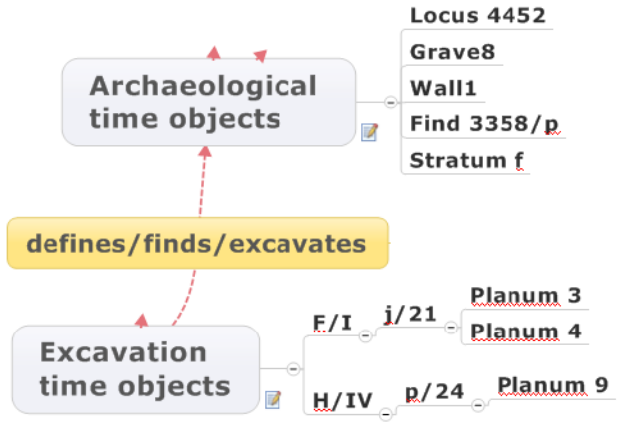
Filename	Dokument_ID	Excavation_objekte ID	Arch_objekte ID
TD_FZ_1030__TD_F-I_j	TD_FZ_1030		TD_F-I_j21_Grab4
TD_FZ_1029__TD_F-I_j	TD_FZ_1029	TD_F-I_j21_Planum2_1979|TD_F-I	TD_F-I_j21_Grab8
TD_FZ_1070__TD_F-I_j	TD_FZ_1070	TD_F-I_j21_Planum2_1979|TD_F-I	TD_F-I_j21_Grab8
TD_FZ_1083__TD_F-I_j	TD_FZ_1083	TD_F-I_j21_Planum2_1979|TD_F-I	TD_F-I_j21_Grab8
TD_FZ_1071__TD_F-I_j	TD_FZ_1071	TD_F-I_j21_Planum3_1980	TD_F-I_j21_Grab9|TD_F-
TD_FZ_1072__TD_F-I_j	TD_FZ_1072		



Creation of metadata for analog resources

Identifiers, hierarchies, terms and relations for Excavation Objects and Archaeological Objects

Arch_objekte_ID	Arch_obj_type	Excavation_object ID
TD_F-I_i21_Grab9	Grab	TD_F-I_i21_Planum1_1979
TD_F-I_j21_Grab8	Grab	TD_F-I_j21_Planum2_1979|TD_F-I_j21_Planum
TD_F-I_j21_Grab9	Grab	TD_F-I_j21_Planum3_1980
TD_F-I_j21_Grab10	Grab	TD_F-I_j21_Planum3_1980
TD_F-I_j21_Grab10	Grab	TD_F-I_j21_Planum3_1980



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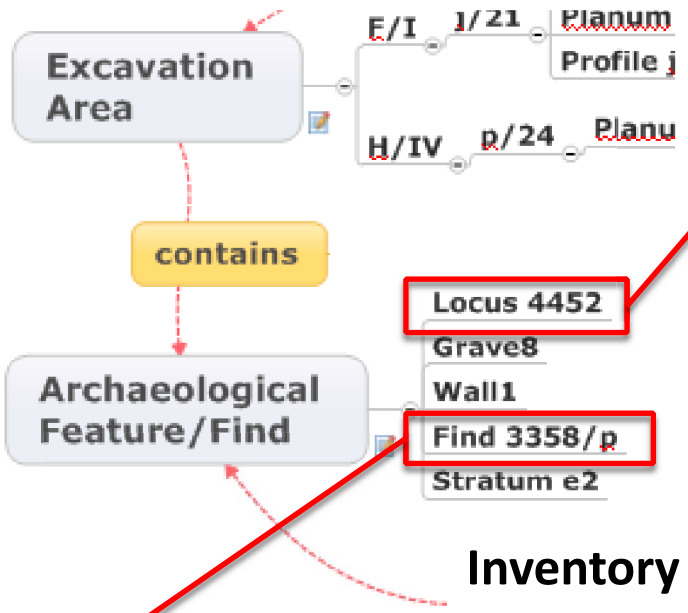
Extraction/Creation of metadata for digital resources



Locus Databases

Locus ID Type Description

Nummer	Kategorie	Beschreibung
L6153	Schicht	Sandschicht, darauf Steinsplitter, ve
L6154	Schicht	Füllschutt, Lehmziegel, in Innenraun
L6155	Grube	flache Grube, schneidet in L6035 ein,
L6156	Grube	Grube, tief, mit Lehm gefüllt, Tonsch
L6157	Grube	Grube gerundet rechteckig, NNO-SS
L6159	Treppe	Gestuckte Treppe, führte von L6106
L6160	Raum	Gestuckter Boden, nördlich der Trep

Inventory Database

INVNR	PHOTO	AREA	PL	GI	FINDN	DAT	TYPE	ZN	WA	FAB	FEINI	TECH	BODEI	BR	HA	MI	HD
0178	2783/05	AII-I12		2	bur 3	E1	TEY krug	66/034	SPI	Id	f	W2	W gef	re	3	2.8	1.2
0179		AII-I12		2	bur 3	E1	TEY krug	66/036	SPI	Id	f	W2	W gef	re	3	2.7	1.2
0180	2783/06	AII-I12		2	bur 3	E1	TEY krug	66/034	SPI	Id	vf	W2	W gef	re	3	2.7	1.3
0181	2783/07	AII-I12		2	bur 3	E1	TEY krug	66/034	SPI	Id	f	W2	W gef	re	3	2.8	1.3
0182	2783/08	AII-I12		2	bur 3	E1	TEY krug	66/034	SPI	Id	f	W2	W gef	re	3	2.8	1.3
0183	2783/09	AII-I12		2	bur 3	E1	TEY krug	66/034	SPI	Id	vf	W2	W gef	re	3	2.7	1.4
0184	2783/10	AII-I12		2	bur 3	E1	TEY krug	66/039	SPI	Id	f	W2	W gef	re	3	2.75	1.2

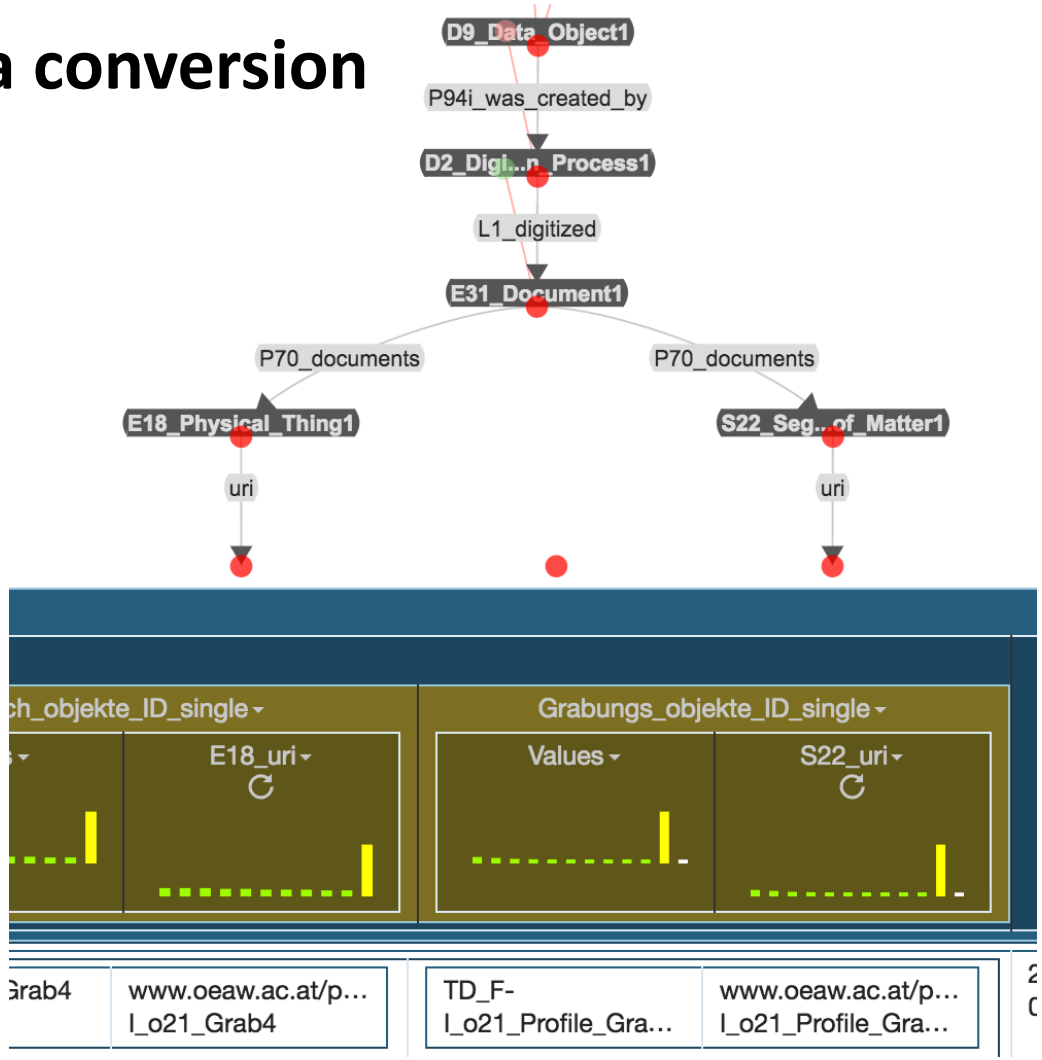
Metadata/digital data conversion

- Transform Excel/digital data(databases) to RDF applying CIDOC CRM and extensions

  (Karma tool or 3M)

- Integrate data of different sources (Field Drawings, Fotos, Controlled Vocabularies, Archiving System,…)

- Ingest into **triple store** and/or to the **repository**



Questions

Questions modelling:

- To what detail does it make sense/is it possible to model the information contained in the documentation?
- Model the excavation events in addition to the excavation objects ?
- Part of relations of archaeological objects?
- Which details of archaeological objects like material, texture,..
- Model provenance of e.g. assignments to stratigraphy (may change between field documentation and office)

Questions tools:

- Which tools are available for modelling, visualisation and query of RDF.
- Which tools are available for modelling, visualisation and query of SKOS Thesauri.

Thank you for your attention!

Acknowledgements:
The 'A Puzzle in 4D' project has been made possible through funding from the Nationalstiftung für Forschung, Technologie & Entwicklung (DH 2014/12), ÖAW call: Digital Humanities: Long term projects in cultural heritage).