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CRMarchaeo: A CIDOC CRM extension to support archaeological excavations

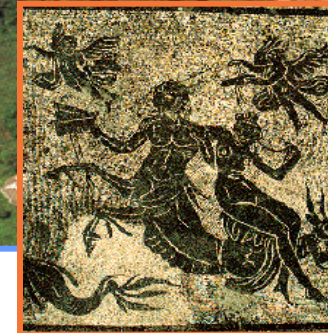
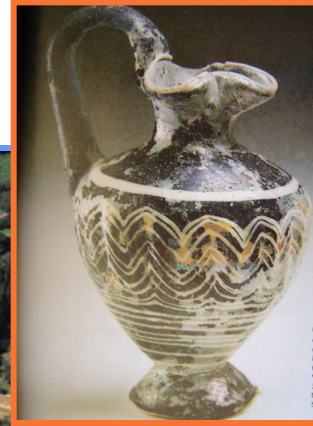
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Archaeology and heterogeneity ...



Archaeological excavation

- Destructive activity !!
- Lack of documentation could cause the loss of important information forever



What is CRMarchaeo

- Extension of CIDOC CRM to support archaeological excavation process
- To facilitate the semantic encoding, exchange, interoperability and access of existing archaeological documentation
- Starting from standards and models already in use by national and international cultural heritage institutions
- Enriched by continuous collaboration with various communities of archaeologists from different countries and schools
- Relies on concepts provided by *CRMsci* extension
 - geological and stratigraphic principles that govern archaeological stratigraphy
 - extending and adapting these principles for archaeology

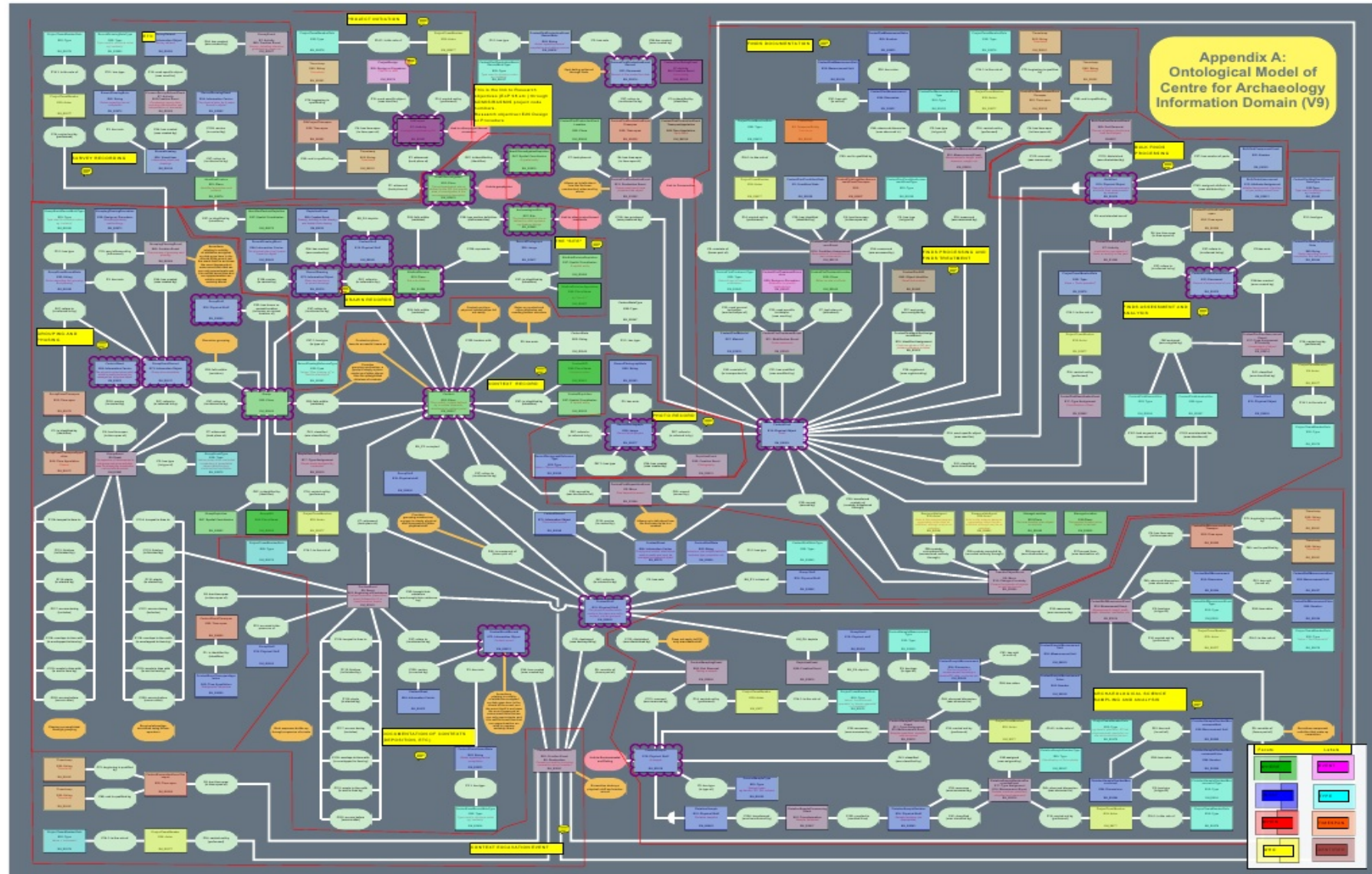
The CRMarchaeo Model

- Besides others, we have analyzed
 - **collection databases** (artifacts, numismatic etc.)
 - **5 different national methods** of excavation recording
 - **10 different kinds** of analytical investigation, including DNA, thermoluminescence etc.
 - **temporal gazetteers** and “thesauri of periods” (*PeriodO*)
- Archaeologists, physicists, chemists, microbiologists, biologists and other specialists
 - surprising analogy of procedures, which could be modeled as generic concepts
- **CRMarchaeo+ CRMsci**: a coherent global ontology for deep integration of scientific and cultural-historical evidence and facts, probably the most elaborate and generic currently existing for descriptive sciences

The CRMarchaeo Model

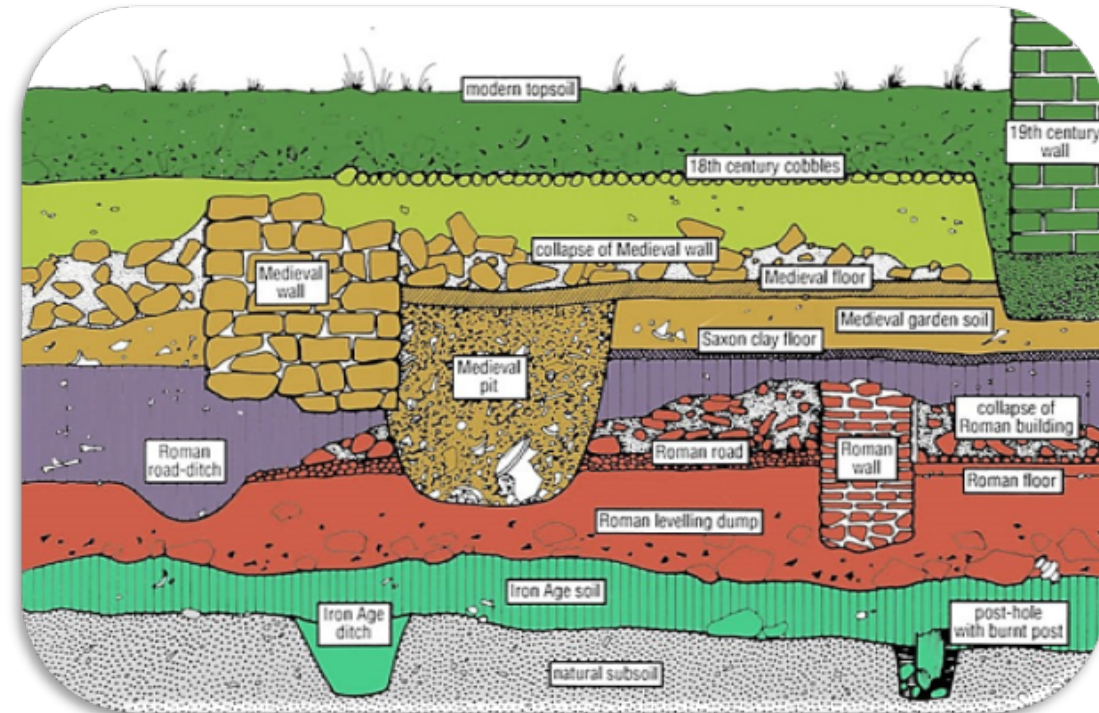
- Collaboration between many cultural heritage institutions
- Unifying efforts of many European projects
 - EPOCH, ARIADNE, PARTHENOS ...
- Officially approved by CRM SIG to be formally and methodologically compatible with CIDOC CRM
- Open to every possible integration and addition that may become necessary as a result of its practical use on real archaeological problems
- Intended to be maintained and promoted as an international standard

CRMarchaeo „ancestors“: CRM EH



CRM Archaeology and Stratigraphy

- Basic idea on which archaeology is based
 - “... the **features** of an archaeological site are to be found in the **stratified context**, which is investigated by an **archaeological excavation**”
[Harris 1989]
- Basic elements
 - physical arrangement of archaeological stratification
 - events that led to the formation of particular stratigraphic situations
 - activities performed to reconstruct the process



CRMarchaeo entities

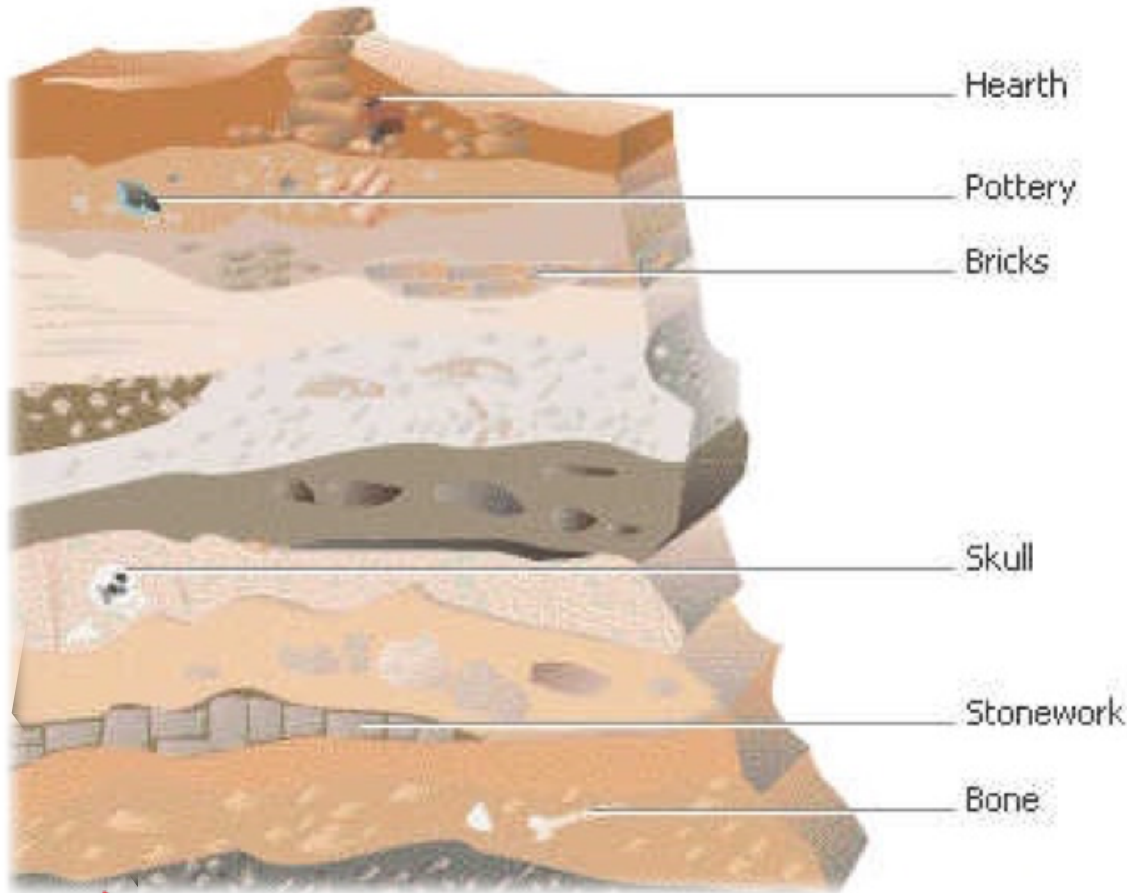
- Stratigraphic **genesis** and **modifications**
- **Natural phenomena** or **human intervention** that led to their creation
- **Nature** and **shape** of existing stratifications and surfaces
- Analysis of the **human remains** or **artifacts** found within the strata
- Analysis of relative **chronological** order in which stratification was formed

CRMarchaeo potential

- To enable **interpretation of chronological sequences**
 - space-time analysis of a specific site
- To **enable historical reconstructions**
 - identity, life, beliefs, behavior and activities of a given group of people in the past in that specific place
- To **overcome the differences** resulting from the application of **different excavation techniques** and **procedures**
 - different **traditions** and **schools** of archaeology
 - unified view that can express the **common concepts**
 - integration of various **methodologies**

CRMarchaeo classes: physical features

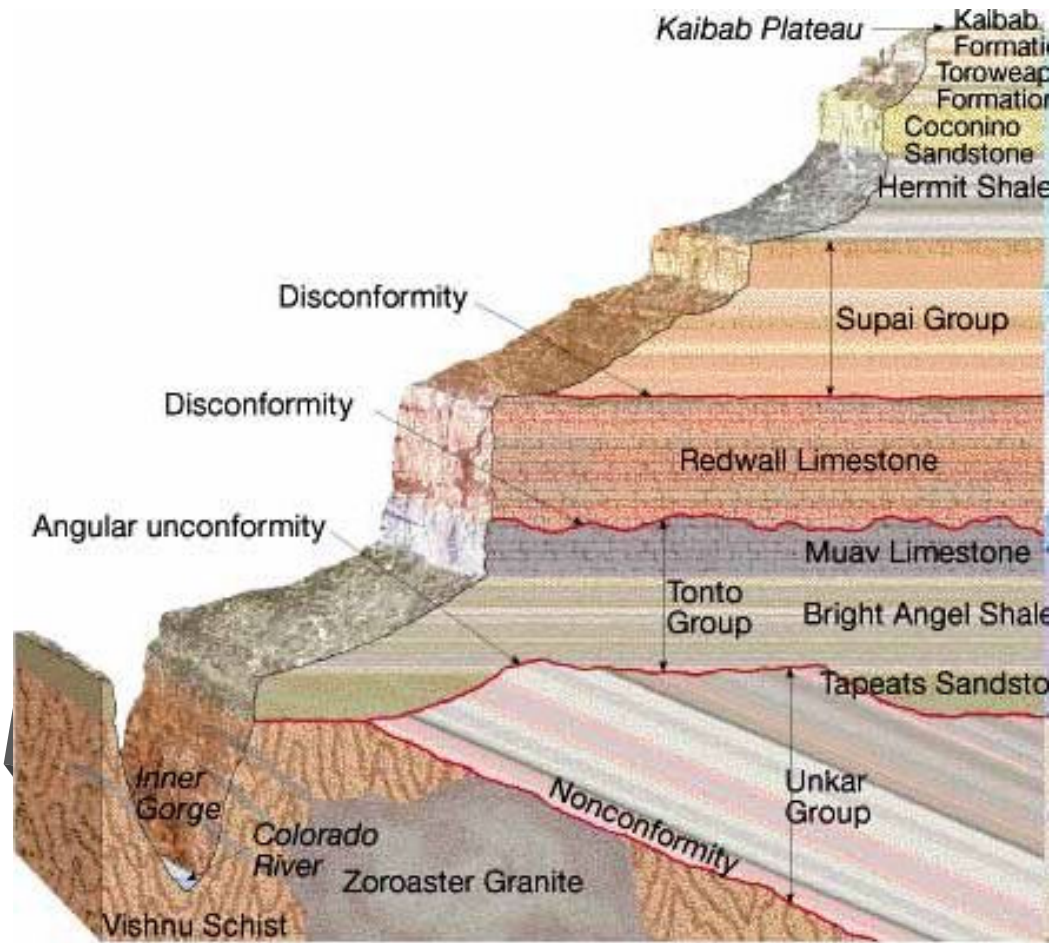
- **A2 Stratigraphic Volume Unit**



- connected portions of terrain or other solid structure on, in, or under the surface of earth or seafloor exhibiting some homogeneity of structure or substance
- completely bounded by surfaces or discontinuities in substance or structure with respect to other portions of the terrain or surfaces of objects/finds
- may contain physical objects
- the internal continuity and the boundaries should be of a kind that can be attributed to a single genesis event or process

CRMarchaeo classes: physical features

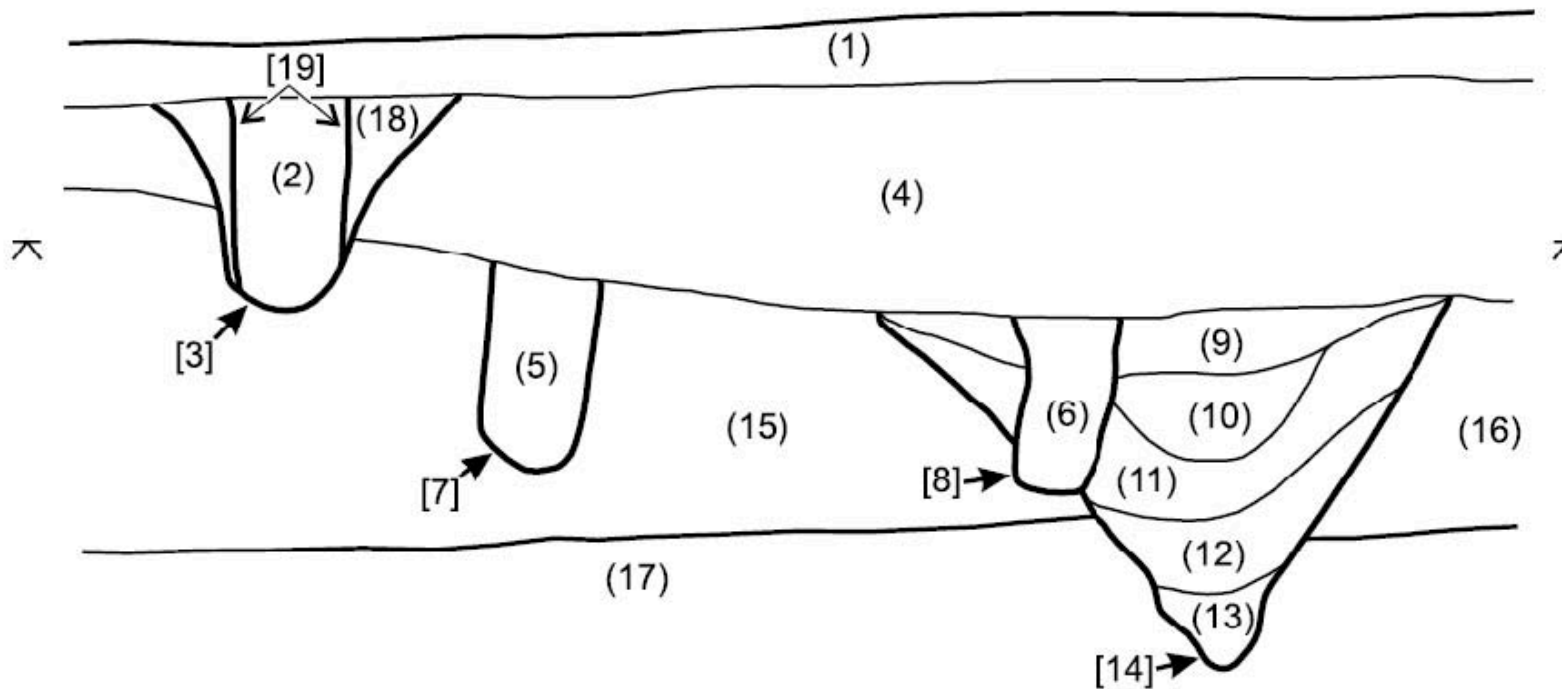
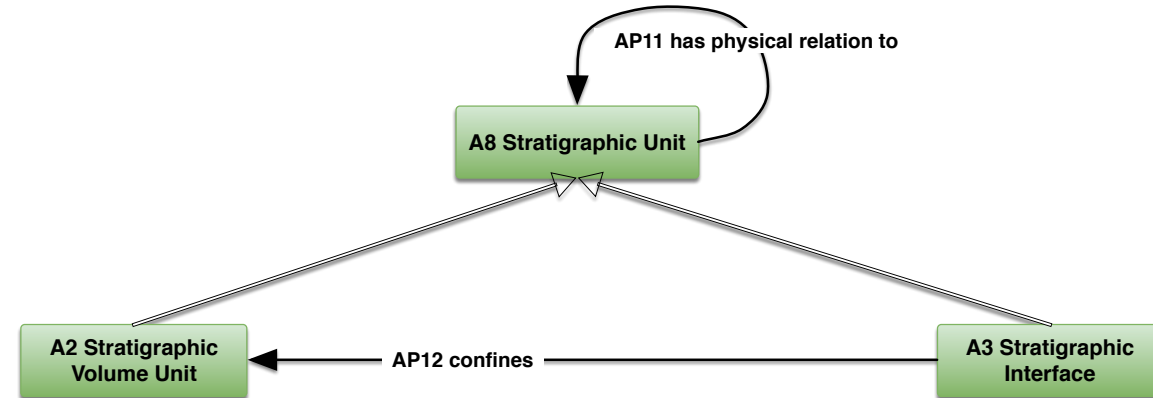
• A₃ Stratigraphic Interface



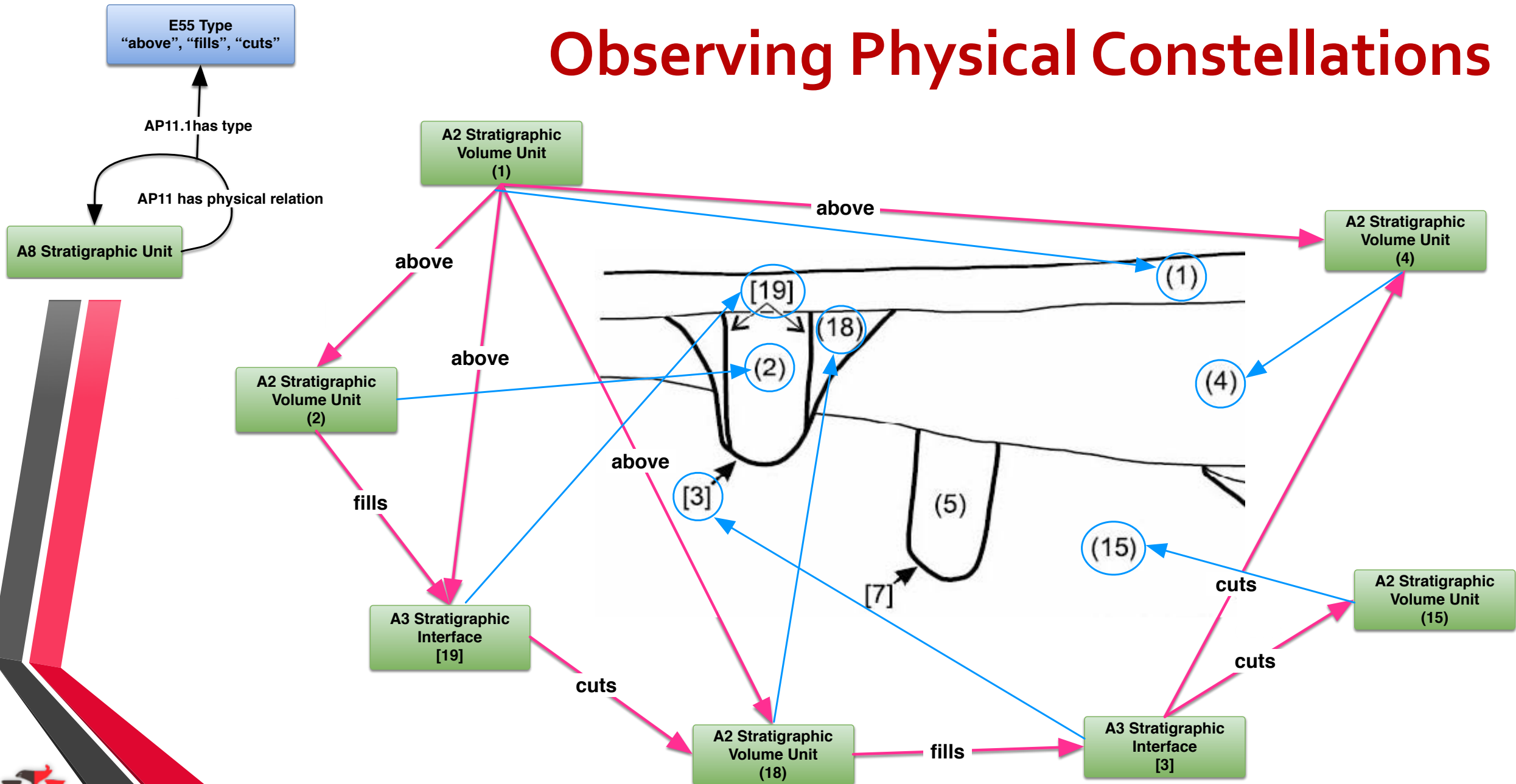
- coherent parts of the boundary surface resulting from a stratigraphic genesis event or process
- marks the extreme limit of the effect of a genesis or modification event, by indicating where the effect of this event ended
- each event of creation/destruction of a deposition layer implies the creation of new interfaces
- 2 main types of interface:
 - surfaces confining strata
 - surfaces only -> formed by the removal or destruction of existing stratifications

- **A8 Stratigraphic Unit:** comprises *S20 Physical Features* that are either *A2 Stratigraphic Volume Units* or *A3 Stratigraphic Interfaces*

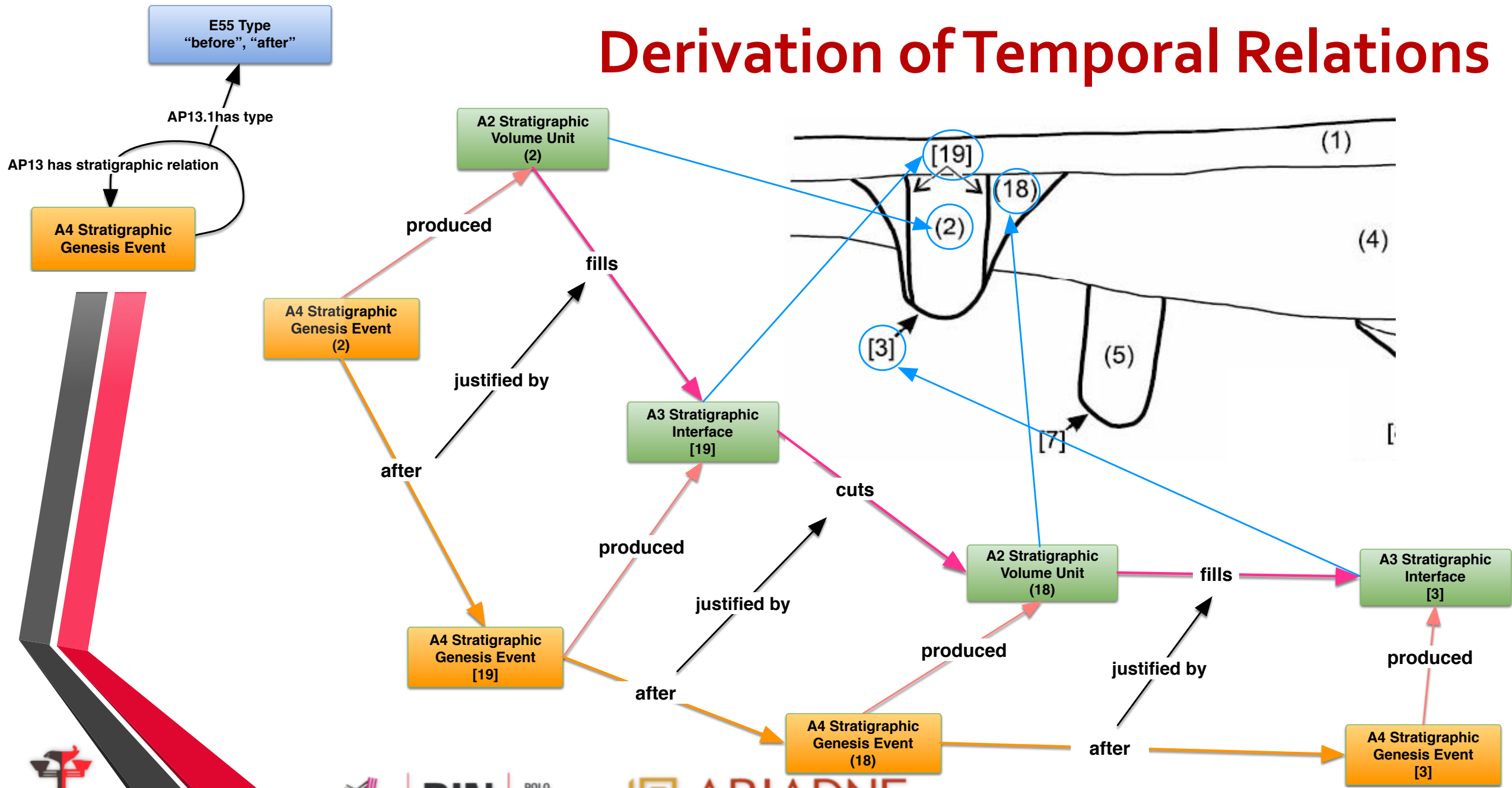
CRMarchaeo classes



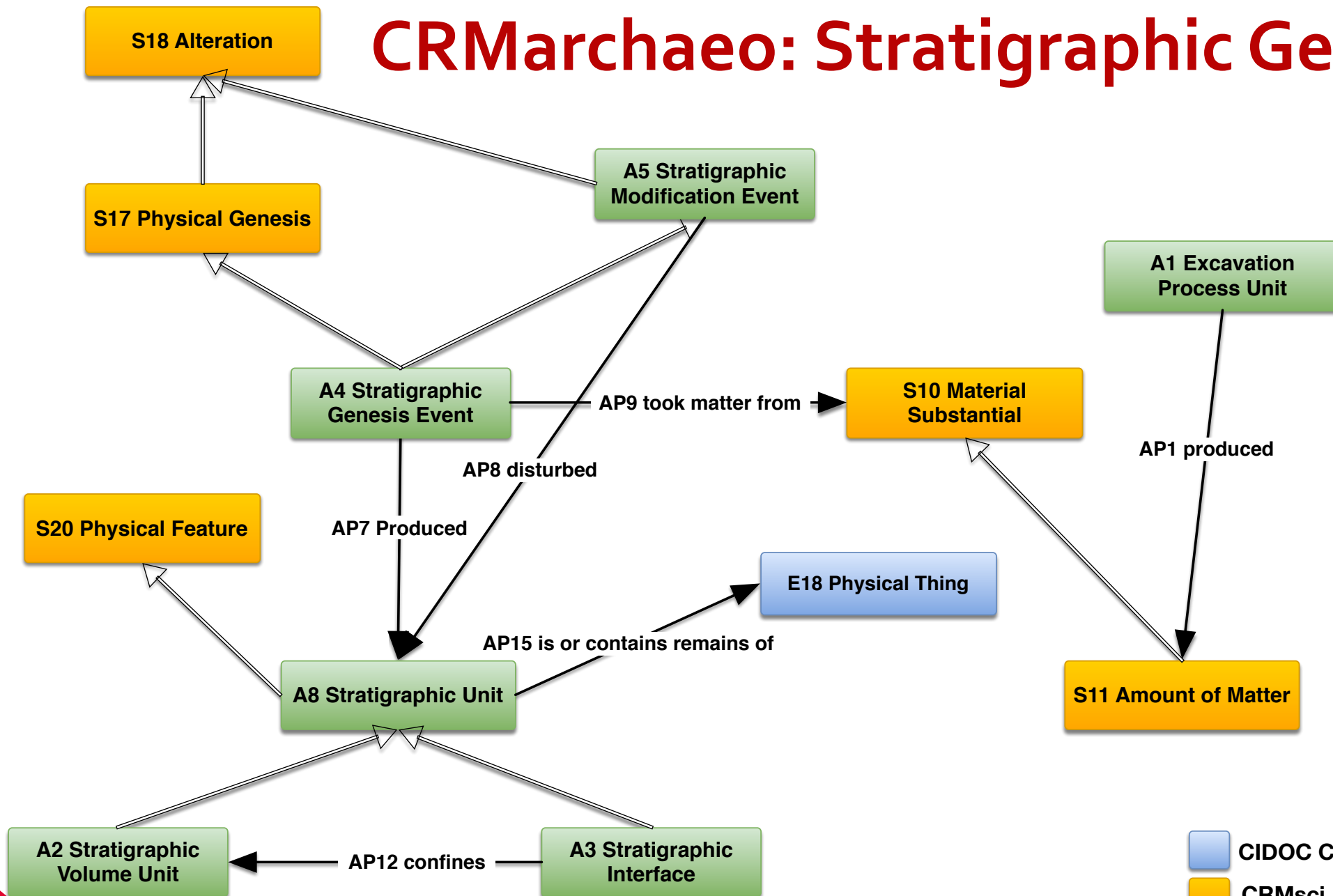
Observing Physical Constellations



Derivation of Temporal Relations



CRMarchaeo: Stratigraphic Genesis



- CIDOC CRM Core
- CRMsci
- CRMarchaeo

- **A1 Excavation Process Unit**

CRM Archaeo classes: activities

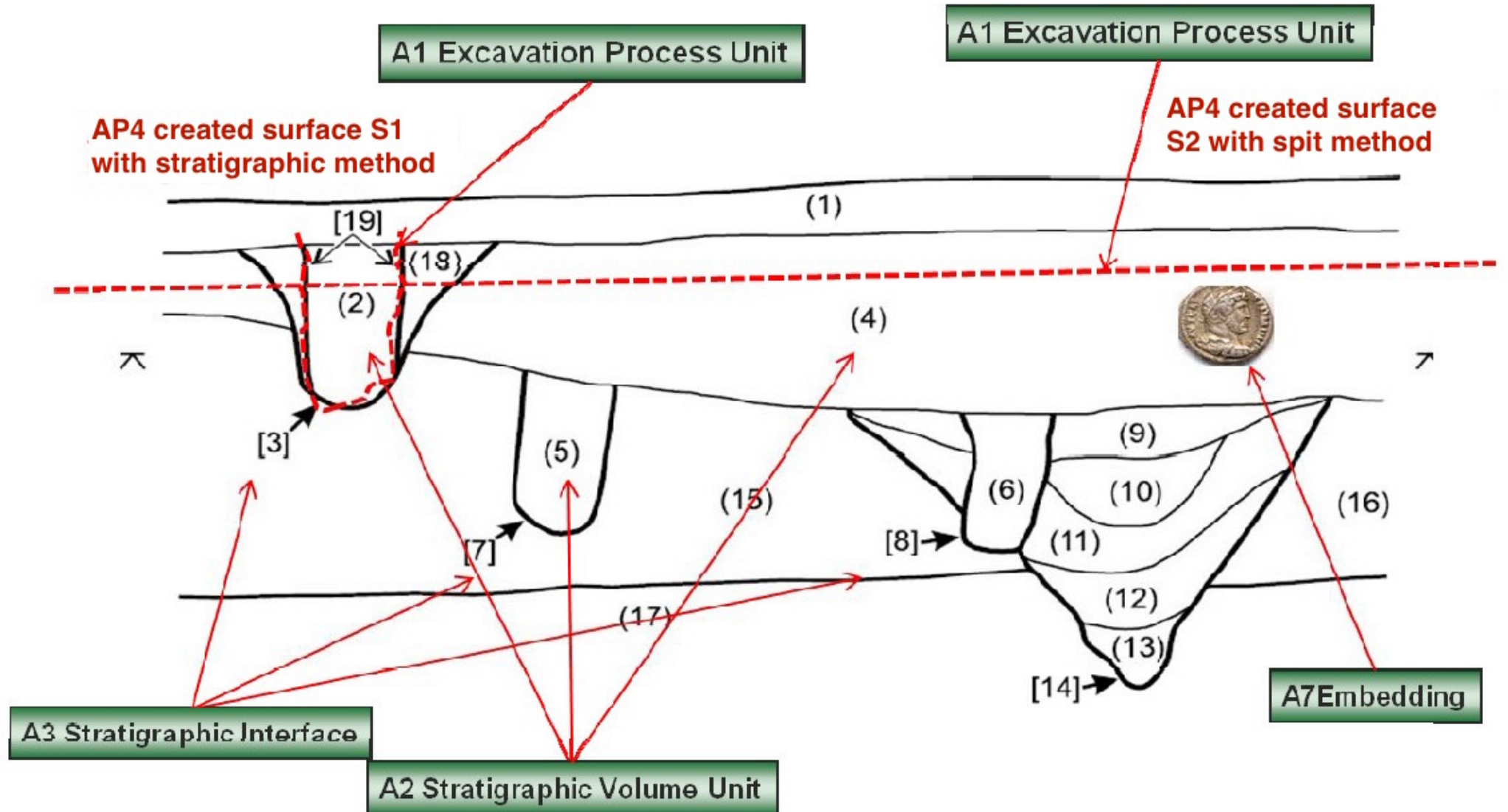


"...And right above the Stone Age strata you can clearly see artefacts from the 'Iron Age!'"

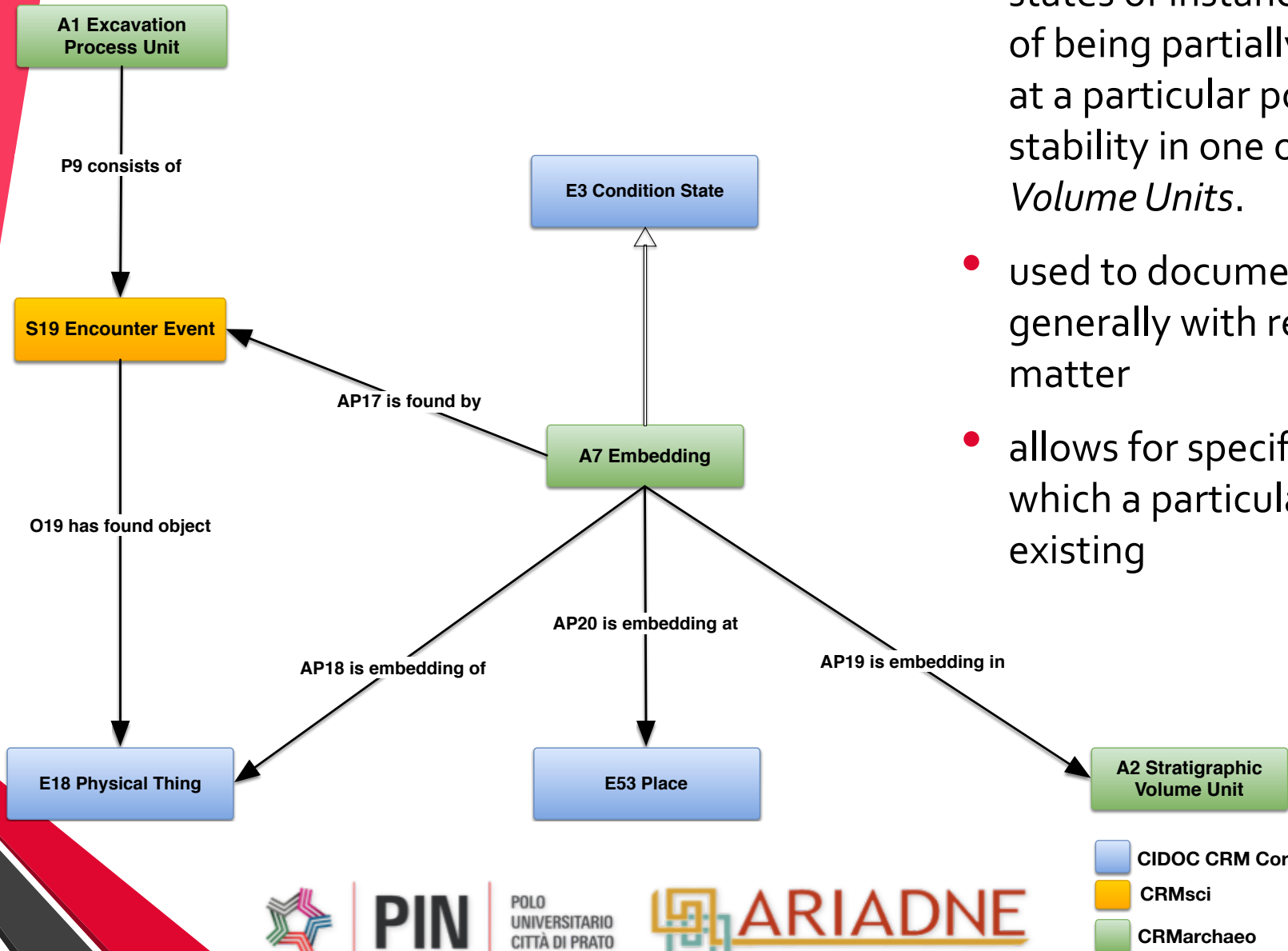
- activities of excavating in the sense of archaeology, documented as a coherent set of actions of progressively recording and removing matter from a pre-specified location under specific rules

- intended to remove matter within the boundaries of a particular stratigraphic unit, or pre-declared spatial extent such as a trench
- results in the production of a set of recorded (documentation) data that should be sufficient to provide researchers enough information regarding the consistence and spatial distribution of the excavated segment of matter

Modeling Excavation Activities

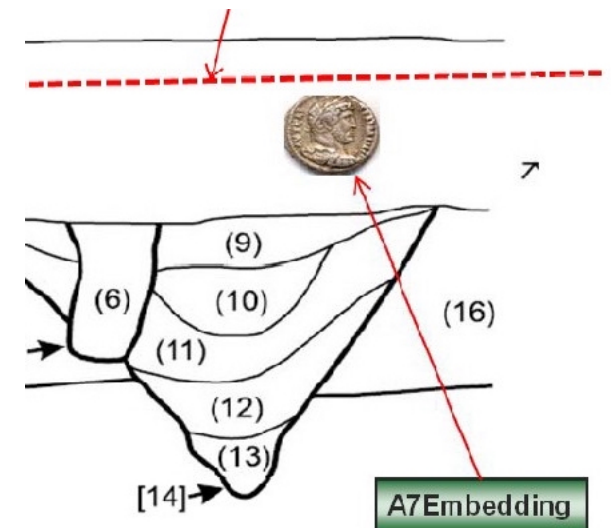


• A1 Excavation Process Unit



In situ findings

- states of instances of *E18 Physical Things* of being partially or completely embedded at a particular position with relative stability in one or more *A2 Stratigraphic Volume Units*.
- used to document the fact of embedding generally with respect to the surrounding matter
- allows for specifying temporal bounds for which a particular embedding has been existing



• Ag Archaeological Excavation CRMarchaeo classes: activities



- general concept intended as a coordinated set of activities performed on an area considered as part of a broader topographical, rural, urban, or monumental context
- usually under the responsibility of a coordinator, officially designated, which is legally and scientifically responsible for all the activities carried out and is also responsible for the documentation of the whole process

CRMarchaeo: Future works

- Extending the model
 - Concept of Archaeological Site/Archaeological Campaign
- Inference making mechanism (*CRM_{inf}*)
- Testing the model against existing archaeological archives
 - ARIADNE Project -> item level integration
 - ICCD Italian archaeological model
 - English Heritage, ADS, DANS, DAI ...
 - Would you like to contribute?
 - <http://www.ics.forth.gr/isl/CRMext/>



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Thank you

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 **ARIADNE**