Driving interdisciplinary search for collaborative studies of long-term human ecodynamics

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What is DataARC?

**Research community** studying long-term human ecodynamics in the North Atlantic

**Building digital tools** to encourage *interdisciplinary approaches* at the data discovery phase of research

**Contextually connecting** data from archaeology, literature and historic documents (e.g. the Sagas), paleoecology, paleoclimate
The diverse DataARC community
Project overview:

Analysis of textual, genetic, and archaeological evidence for premodern North Atlantic marine mammal populations (whales, seals, walrus)

https://norsemarinemammalproject.wordpress.com
Phil Buckland  
*Umea*

Analysis of paleoecology through aggregated data including modern and historical distributions of insects and pollen.
Storied Lines: Farm histories and resources networks in Iceland
1. kaflí


Náttfari sá er Garðar hafði út fylgt hafnið eignað sér Reykjavík áður og markað til að vél að hvert vitt henn skyldi eiga. En er Eyvindur fann hann gerði hann honum tvö kosti, að hann skyldi eiga Náttfarkild að ás ekk. Pangaður Náttfari.


Mylaugur háð náði hans. Hann bjó á Mýlaugastöðum. Hann var barnfóstri Hávarðs Fjörulfarsonar. Mylaugur var aðugur máður og...
Intentionally Transdisciplinary Search

Goal: Encourage researchers to look at data from outside their own specialism early in the research process

What do transdisciplinary search results look like?

- Organized by concept?
- Arranged by domain?
- Connections explained?
- Summaries provided?

Image credit: Bill Watterson
Knowledge model

CONCEPTS – COMBINATORS – DATA
Developing a shared conceptual model
Agricultural building

\textit{specialization:}

Agricultural building – canine:

\textit{houses: dog}

\rightarrow

Physical Man-Made Thing .E24

\rightarrow

Has type .P2

\rightarrow

Physical Man-Made Thing .E24

\rightarrow

Had participant .P11
### Concept Map

#### Insects

- Animal husbandry
- Cultivation/farming
- Land management
- Woodland management

#### Paleoclimate Model

- Ecological area

#### Shieling Shed

- Church farm
- Sheep bone

#### Shearing

- took place at

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![Concept Map](image-url)
I think CIDOC-CRM can be used most fruitfully if you have some control data creation practices, where the people creating the data understand the model and the inference implications inherent in the model. So institutionally created and managed data may be OK. But the big question is what do people really want to do with the data? There's value in following standards, but not for the sake of the standard, especially if that involves lots of cost and complexity. So, if people really see a value in the inference opportunities of the CIDOC-CRM, go for it! If not, maybe a more loose / partial use?
How do we connect concepts to data?
Icelandic Saga Map
Concept tagging units of data in texts
Online in new version:
Environmental archaeology
• >1 655 sites
• >15 000 datasets*
Ceramic Thin Sections:
• 421 sites
• 3499 samples

www.sead.se
qsead.sead.se
Connection at environmental indicator level

Allows presence only and relative importance visualisation (one of several alternatives)

### Habitats/landscape elements

| Visualization                  | Aquatics | Indicators | Standing water | Pasture/Dung | Meadowland | Wood and trees | Indicators: Deciduous | Wetlands/marshes | Open wet habitats | Disturbed/arable | Sandy/dry/disturbed/arable | Dung/foul habitats | Carnivore | Indicators: Dung | Molel beetles | General synanthropic | Dry dead wood | Heathland & moorland | Halotolerant | SumRep | Abundance | NSpec |
|-------------------------------|----------|------------|----------------|--------------|------------|----------------|-----------------------|----------------|-------------------|----------------|------------------------|--------------------|-----------|-----------------|----------------|---------------------|---------------|--------|-----------|--------|
| Species richness, sum.rep., to species id’s only | 1.11     | 0.37       | 15.50          | 9.59         | 10.70      | 1.48           | 8.12                  | 0.37           | 11.07             | 10.70         | 12.92                  | 2.95               | 3.69      | 2.58            | 4.06          | 0.37                | 3.32          | 1.11   | 271       | 606    | 156    |
| Abundance, sum.rep., to species id’s only          | 0.28     | 0.09       | 24.95          | 7.14         | 9.74       | 0.74           | 3.06                  | 0.09           | 8.16              | 10.11        | 20.69                  | 2.04               | 1.67      | 4.08            | 4.92          | 0.09                | 1.58          | 0.56   | 1078      | 606    | 156    |
Combinators: Choosing a level of detail

- Interdisciplinary Analysis Addressing Long-Term Human Ecodynamics in the North Atlantic
- Example Combinators:
  - Ratio of Sheep to Cows Indicate Changing Wealth and Status of Sites
  - Ratio of Tree to Grass Pollen Indicates Changing Woodlands
- Example Raw Data:
  - Individual Faunal Elements in tDAR
  - Pollen Counts from Environmental Samples in SEAD
HOW TO CREATE COMBINATORS FROM YOUR DATA AND LINK THEM TO CONCEPTS

YOUR DATA SET
DATA FIELDS
COMBINATOR
Multiple fields in database that mean something to an expert when combined

SOMEONE ELSE’S DATA SET
DATA FIELDS
COMBINATOR

EXAMPLE
NABONE
(Archaeological Fauna)

SPECIES
AGE
Identify which species are subadult cow bones

Mapped to the concept of milking

concept
milking
concept
concept
Presenting search results
Matched, Related and Contextual Results
Why did you get these results? We will explain how the results were obtained in order to provide a level of confidence for how the data was processed to produce what you are seeing.
Ongoing Challenges
Challenges

Data and User Diversity

Experts and sufficient expertise

Knowledge Modelling
The alien other and domain specific assumptions

‘We All Know That a 14 Is a Sheep’ (Kansa 2103)
Multiple roles / Multiple mappings?

Driftwood is a biological object – in its relation to trees

Driftwood is a legal object – in its relation to resources

Driftwood is a participant – as an actor in an economic system

Where to stop mapping?: The rule of three degrees

A close up of driftwood in Martensøya, Svalbard.
Credit: Georgia Hole
Continuing to evolve

Transdisciplinarity as Complex System

conflict, existential crisis, transformation, new vitality, time

emergent states

transdisciplinary context

diverse, interconnected, free to self-organize, globally constrained

safe and caring community

Image credit: Vanasupa et al. 2014
Thank you!

Find us online:

http://beta.data-arc.org/

https://www.data-arc.org/

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