The archaeological excavation report of Rigny: an example of an interoperable logicist publication

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The perspective of consultation

- too many publications
- not enough time to read everything
- required selection of readings
- we do not read, we consult
  
  ➢ but we still write in the same way…

Is it possible to reconcile both speed-reading and in-depth consultation in the same publication?
The archaeological excavation of Rigny

- Indre-et-Loire (France), from 1986 to 1999
- Retrace the formation and transformations of a parish centre
- Study the population buried in the cemetery
- Occupation from 7th to 19th century
- Computerization since 1990 in ArSol Database
- Training excavation for students in archaeology at the University of Tours since 1989
From the outset, a twofold objective:

1. of an epistemological nature:
   clarify the mechanisms and foundations of the reasoning used in archaeological constructions

2. of an editorial nature:
   reduce the imbalance between the flood of publications and our capacities of assimilation, to solve the problem of scientific overproduction
• The argumentation is a series of inference operations from the initial propositions \( \{P_0\} \) (basic data) to the final interpretative propositions \( \{P_n\} \)

• The inference rules are expressed as “If \( P_1 \), then \( P_2 \)”
Application to an electronic publication

• Logicism aims to make the steps of reasoning explicit by removing the cognitive construction from its rhetorical packaging
Access to field data

- In-depth examination of the evidence
ArSol database

- Online access to the primary data
- Consult in a few clicks the field data on which the argument is based.

From field recording to logicist publication
Observation data selected from excavation records

- intrinsic properties of archaeological entities (materials, form, etc.)
- relative chronology (stratigraphic relationships)
- small selection of the field-recording and post-excavation databases.
Comparative data

- statement of similarity (analogical reasoning)
- never the result of a well-defined mathematical or logical procedure
- Gardin: attribute transfer

“ If a first element is comparable to a second one with known attributes, these attributes can be transferred to the first. ”
Reference data

Background knowledge:
- common sense
- specialist knowledge:
  - laboratory analyses (radiocarbon dating)
  - artifact dating based on a established typo-chronology

Reference data are not demonstrated in publication
Rules of inference

• From intermediate propositions to final propositions
• Assigning to one or several entities:
  • a function
  • a chronology
  • a morphology
The architecture of the publication

- Linear reading
  - Block 1: Narrative
    - Chapitres 1 à 4
  - Block 2: Logicist diagrams
- Synoptic reading
  - Block 3: Chronological diagrams
- Speed-reading
- In-depth consultation
  - Block 4: Logicist Arguments
    - Sections 1 to 5
    - \{P0\} to \{Pn\}
  - Online RDBMS
    - ArSol
Logicist diagrams in the publication

Diagrams provide a synoptic representation of the argumentation and allow a quick assessment of its validity.
Helping building logicist trees

Under the current situation, the buildings are oriented in the same way as they were discovered in the field:

- The plans of the rooms show that they were arranged in a standardized manner around the courtyard of the building.

Orientation of the buildings is determined by the building 14:

- The construction of the oldest and largest building 14, contemporary with the utilization of building 14.

The building Y was constructed in the second half of the 10th century and was in use until the construction of building Z:

- Building Z was constructed in the late 7th century, at the beginning of the 8th century, and was in use until the 10th century.

L'orientation des églises est déterminée par le bâtiment 14.

 vl_3

Les églises ont la même orientation que le bâtiment 14 utilisé découvert au nord du site.

 vl_4

L'utilisation de l'église X est prolongée jusqu'au 10e siècle, d'après la datation des tessons de céramique conservés dans les niveaux d'occupation antérieurs.

 vl_5

Tous égènes se succèdent sur le site de Kajay.

 vl_6

La construction de l'église la plus ancienne (église X) est contemporaine de l'utilisation du bâtiment 14.

 vl_7

L'église Y a été construite dans la seconde moitié du 10e siècle et fut en usage jusqu'à la construction de l'église Z.

 vl_8

L'église X est construite à la fin du 7e ou au début du 8e siècle et fut en usage jusqu'au 10e siècle.

 vl_9
Another work in progress

- medieval and modern ceramics
- material evidence from 40 sites

online DB

http://iceramm.univ-tours.fr
Towards semantic interoperability
Typologies of propositions

P0_1. Under the standing church, two earlier buildings discovered during the excavation were oriented along the same axis as the church.

P0_2. The ground-planes of the excavated buildings can be interpreted as two successive apses.

P0_3. There is a discrepancy between the common axis of the three churches and the usual east-west orientation.

P0_4. The orientation of the three churches cannot be accounted for by topographical constraints.

P0_5. The three churches are following the orientation of building 14, which was built after 668 and destroyed before 776 (see Section 2).

P0_6. Church X has remained in use until the 10th century according to the dating of the pottery found in the external occupation layers.

P1_1. Three churches have been successively built in Rigny.

P1_2. The orientation of the churches has been determined by building 14.

P2_1. The oldest church (church X) has been built while building 14 was still in use, in the late 8th or early 9th century.

P3_1. Church X was built in the late 7th or early 8th century and remained in use until the 10th century.
Mapping with CRMinf

**Observation data or comparison data**

- $\text{S15\_Observable\_Entity} \rightarrow O11\_was\_described\_by \rightarrow \text{S6\_Data\_evaluation (IsA I5\_Inference\_Making IsA I1\_Argumentation)} \rightarrow J2\_concluded\_that \rightarrow \text{I2\_Belief} \rightarrow J4\_that \rightarrow \text{I4\_Proposition\_Set}$
- $\text{I5\_Inference\_Making} \rightarrow J3\_applies \rightarrow \text{I3\_Inference\_Logic}$

**Reference data**

- $\text{E31\_Document (IsA E73\_Information\_Object)} \rightarrow J7\_is\_evidence\_for \rightarrow \text{I7\_Belief\_Adoption (IsA I1\_Argumentation)} \rightarrow J6\_adopted \rightarrow \text{I2\_Belief} \rightarrow J4\_that \rightarrow \text{I4\_Proposition\_Set}$

**Intermediate proposition**

- $\text{I4\_Proposition\_Set} \rightarrow J4\_is\_subject\_of \rightarrow \text{I2\_Belief} \rightarrow J1\_was\_premise\_for \rightarrow \text{S8\_Categorical\_hypothesis\_building (IsA I5\_Inference\_Making IsA I1\_Argumentation)} \rightarrow J2\_concluded\_that \rightarrow \text{I2\_Belief} \rightarrow J4\_that \rightarrow \text{I4\_Proposition\_Set}$
Formalisation of this mapping in TEI

```xml
<div type="chapitre" xml:id="main_div">
    <div type="section1" xml:id="sec1_1">
        <div type="i4_proposition_set" xml:id="section1P0_1" subtype="evidence:observation">
            <head>initial proposition title</head>
            <figure>illustration</figure>
            <p>comment</p>
            <ref>!-- link to arsol data --></ref>
        </div>
        <div type="i4_proposition_set" xml:id="section1P1_1" subtype="proposition:function">
            <head>intermediate proposition title</head>
            <figure>illustration</figure>
            <p>comment</p>
            <div type="i5_inference_making">
                <ptr subtype="j1_used_as_premise" target="section1P0_1">premise P0_1</ptr>
            </div>
            <div type="i5_inference_making">
                <ptr subtype="j1_used_as_premise" target="section1P0_2">premise P0_2</ptr>
            </div>
        </div>
    </div>
</div>
...
Conclusion

Reasoning in archaeology need to be clarified.

There's a growing flood of publication.

Our assimilation capacities remain unchanged.

We CAN'T read all. We just consult.

Jean-Claude Gardin presents the logicist programme.

Web development provide access to new tools.

Online logicist publications are feasible. A new way of publishing?
Thanks

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