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# Knowledge Base with Xper3 in Paleontology: Calculated Descriptors Offer New Functionalities

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## Xper 3

- Web platform that
  - manages descriptive data
  - provides interactive identification keys
- Used for various taxonomic groups.
- Well adapted for identification in paleontology, because fossils are often incomplete and unsuitable for identification by means of classical dichotomous keys.
- Compatible with TDWG's Structured Descriptive Data (SDD) format.
- Descriptive model with three descriptor types:
  - categorical (i.e., qualitative or intervals)
  - numerical (continuous data)
  - calculated (logical combination of other descriptors).

Archaeocyathan knowledge base (Ca...)

Name	Definition	Detail
Hypocyathus	Hypocyathus (Rued.) 1978	
Hypocyathus	Hypocyathus (Rued.) 1978	
Hypocyathus	Hypocyathus (Rued.) 1978	

```

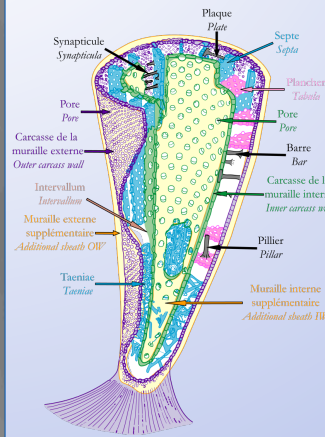
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    <generator name="Xper3" />
    <notes>This software is developed and distributed by LIS
    </notes>
    <representation>
      <label>Archaeocyathan knowledge base (Cambrian)</label>
      <detail>The computer-aided knowledge base is composed by
    </representation>
    <revision date="2016-11-25T09:42:15" />
    <revision date="1978-01-01T15:03:00" />
  </dataset>
</datasets>
    
```

Xper3 interface and SDD export

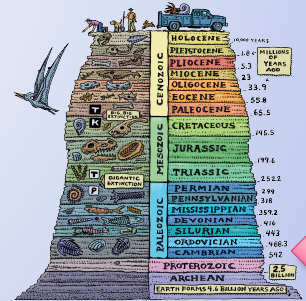
See <http://www.xper3.com>

## Paleontological example: archaeocyaths ?

- 1st animal reef-builder
- Oldest calcified-sponges
- Exclusively Cambrian fossils



Schematic archaeocyath (modified from Debréne 1964)



Time scale  
<http://www.earth-time.org/trollart.html>

## Schematic morphology:

- 2 walls
- 1 intervallum
- Vertical elements
- Horizontal elements
- Links between intervallum elements

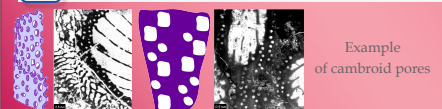
See <http://www.infosyslab.fr/archaeocyatha/>

## Calculated descriptors

- New type of descriptors
- Automatically computed from other descriptors by using logical operators.
- Do not exist in SDD format => exported as categorical descriptors, losing the origin of the values.

## Terminology

- Reconstruct the literature terminology from a set of more detailed descriptors.
- Example: "cambroid pores":  
*(Shape: simple or polygonal) AND (Repartition: regular distribution) AND (Repartition type: random)*



Example of cambroid pores

## Phylogeny

- Express the data in a new way.
- Example: for phylogenetic purpose, simple tumuli is equivalent to the combination of three detailed descriptors expressed for identification:  
*(Presence of bumps: present) AND (Number of perforation: simple) AND (Direction of bump perforation: simple)*

simple tumuli

- Presence of carcass bumps: out State: Present is: selected
- Number of perforation on carcass State: Simple is: selected
- Direction of carcass bumps perfor: State: Downwardly opening is: selected

character 11. Presence of carcass bumps: None (0), Multiperforate tumuli (1), Simple tumuli (2), Pustulae (3).

## Multilingual identification key

- Create a consistent multilingual interactive identification key.
- => All translations are computed from a single language set of knowledge.
- Example: here, the English version is the original dataset and the French one is a mirror. When you modify the description of a species in the English version, the French one changes automatically.

