



## **Visualizing taxonomic knowledge: open nomenclature and synonymy ontologies**

**R. Huber** and J. Klump

(1) Marum, University of Bremen ([huber@stratigraphy.net](mailto:huber@stratigraphy.net)), (2) GeoForschungsZentrum Potsdam ([jklump@gfz-potsdam.de](mailto:jklump@gfz-potsdam.de))

Although the taxonomy of many fossil groups is still incomplete, enough species have been investigated and described to make them important tools in stratigraphy or paleoclimatology. Such large volumes of information, however, are only useful if they are organized effectively and made accessible, so that the data needed can be quickly identified and retrieved. The standard method in paleontology to organize and disseminate taxonomic information is by publication in journals. Traditionally, the careful preparation of synonymy lists is of special importance in these publications. During the last decades, a community wide agreement has been reached on a certain form for synonymy lists, and most journals now demand the use of the so-called 'Open Nomenclature'. The use of Open Nomenclature allows working with taxonomic classifications that are uncertain and allows the author to comment on the identification of specimen by other authors. Open Nomenclature synonymy lists are ideally suited for information management. They can be formulated as ontologies, the taxon descriptions representing concepts and the synonymies representing directed, non-cyclic graphs interconnecting between concepts (taxa). These ontologies can be expressed in XML, using e.g. the Resource Description Framework (RDF) standard or the Ontology Web Language (OWL) standard. By combining synonymy lists from several authors, taxonomic knowledge networks can be assembled and visualized. They can also be used for inductive reasoning. These networks may contain both corresponding and differing taxonomic opinions. Visualization or machine-based inductive reasoning can also be used to identify taxonomic inconsistencies, such as contradictory opinions or cyclic definitions. This information can be extracted and re-compiled to represent the taxonomic opinions of certain authors or schools. TaxonConcept offers the possibility to store taxonomic information and annotation in the Open Nomen-

clature system. We will demonstrate the use of this system, taking the taxonomy of planktonic foraminifera of various authors as an example, and show possibilities to graphically visualize these ontologies. Further we will show how this can be used to assist researchers to manage and analyse the large amount of taxonomic information from databases and from the literature.