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Addressing contrasting cognitive models in scientific collaboration

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If the social aspects of scientific communities and their internal dynamics is starting to be recognized and acknowledged in the everyday lives of scientists, it is rather difficult for them to find tools that could support their activities consistently with this perspective.
Issues span from gathering researchers to mutual awareness, from information sharing to building meaning, with the last one being particularly critical in research fields as the geo-sciences, that deal with the reconstruction of unique, often non-reproducible, and contingent processes.
Reasoning here is, in fact, mainly abductive, allowing multiple and concurrent explanations for the same phenomenon to coexist. Scientists bias one hypothesis over another not only on strictly logical but also on sociological motivations. Following a vision, scientists tend to evolve and isolate themselves from other scientists creating communities characterized by different cognitive models, so that after some time these become incompatible and scientists stop understanding each other.
We address these problems as a communication issue so that the classic distinction into three levels (syntactic, semantic and pragmatic) can be used.
At the syntactic level, we highlight non-technical obstacles that condition interoperability and data availability and transparency. At the semantic level, possible incompatibilities of cognitive models are particularly evident, so that using ontologies, cross-domain reconciliation should be applied. This is a very difficult task to perform since the projection of knowledge by scientists, in the designated community, is political and thus can create a lot of tension. The strategy we propose to overcome these issues pertains to pragmatics, in the sense that it is intended to acknowledge the cultural and personal factors each partner brings into the collaboration and is based on the idea that meaning should remain a flexible and contingent representation of possibly divergent views. This can be achieved through the introduction of boundary objects (Star and Griesemer, 1989) that are weakly structured in common use while strongly structured in individual use. In our experience, these are very effective in coordinating collaborative work, creating a map of activities, tasks, concepts or events that can be used to drive through the collaborative space in order to locate information. The collaborative work itself, populating this space with information, will build the contingent meaning of the represented features. We report on the use of several types of maps, from geographical maps that are inborn in the geosciences, to mind maps, event bushes and workflows, and we describe then how this space can be populated through messaging and data upload, access and analysis.