The Clash of Meta-Models: A Study of Conflicts that Undermine the Flourishing of Big Science

We report on the South Carolina Project for Organ Biofabrication, a twenty million dollar Research Infrastructure Improvement Award from the NSF, whose explicit goal is to bioprint a branched vascular tree that can be used for perfusing an artificial organ. This research initiative is representative of an emerging form of science variously described as "mode-2" or "post-academic." We simply call it "big science". Our role in this project was to better understand the conditions under which big science does and does not flourish.

We considered conflicts that prevented ideal synergies from forming among participants. While some conflicts that arose in this project were exacerbated by idiosyncratic features of persons and institutions, most were representative of problems commonly reported in other big science initiatives. Surprisingly, we noticed that most conflicts could easily be understood simply by considering whether the agents involved in the conflicts regarded the initiative as pure or applied science. Our findings do not undermine the general views of historians and social scientists who reject the value of "pure science" and "applied science" as meta-models for categorizing and describing actual scientific practices. But we argue that these meta-models don't just play the purely rhetorical function attributed to them by those in the STS community. For the agents we studied, the meta-models have a normative and heuristic function, framing expectations and mobilizing individuals to act and interact in specific ways. Agents who regarded the organ biofabrication initiative as an applied science emphasized the stated project goal and viewed the project as unfolding linearly through a series of coordinated milestones. They were intolerant of research activities that did not have a clear instrumental value in attaining the project goal, strongly emphasized coordination and synergy of project activities, and viewed infrastructure building as central. Those who regarded project research as "pure science" were more tolerant of side excursions that didn't clearly advance project goals as long as these excursions were likely to produce "high quality science." They also wanted a sharper division between research activities and infrastructure building activities of the project, and between the jurisdictions of researchers and those of administrators involved with the project. Conflicts between agents could be readily explained in terms of clashing meta-models.

Despite their invalidity as descriptive categories, the meta-models of pure and applied science often function effectively as heuristics for facilitating the goals of normal science. The very meaning of "emergent" as opposed to "normal" science may be closely associated with the features of practices that undermine the heuristic utility of the traditional meta-models. Additional research is needed to clarify how these traditional heuristics enable agents to advance their research, and to identify the characteristics of big science that undermine the capacity of agents to effectively deploy one of the meta-models as a heuristic. Such research might provide the basis for developing a new meta-model that can be used heuristically to manage the conflicts in big science that arise from the way agents use the traditional meta-models.