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Nanotechnology: Convergence and Integration

As opposed to nuclear technologies, for example, nanotechnology need not be encumbered by the necessities of massive physical containment. It can be embedded at its own scale, its processes and properties held in place not by macroscopic constraints but by neighboring molecules. This is one promise of nanotechnology but also (as in the case of GMOs) a source of public apprehension.

As opposed to large-scale public research investments like the arms race, space conquest, the war on cancer, the Human Genome Project, or AI-research, nanotechnology is not geared to certain, more or less narrowly specified social or political goals. Here, too, the lack of containment serves both as promise and source of apprehension.

Nanotechnology's lack of definition presents a difficulty to policy makers and funding agencies. At the same time, it serves them well since the openness of the field energizes researchers across the board, prompting novel interdisciplinary collaborations that could not be planned. Again, this ambivalence is mirrored by an apprehensive public that doesn't know what globalizing effect to fear more – "expensive" nanotechnologies that are controlled by a few governments and multinational corporations, or "cheap" nanotechnologies outside of effective political and social control.

To deal with these ambiguities, further technologies need to be developed. Sheila Jasanoff contrasts "technologies of hubris" and "technologies of humility" for dealing with the risks posed by an uncertain technical future. I propose the development of "technologies of containment" which hover between the heuristic power of hubris and the political requirement of humility. On the side of the research community, these consist of concrete visions about the ways in which properties and processes are to be contextualized (questions of control, retrieval, detection). On the side of policy and funding, these consist of framing social visions for the development of nanotechnology and its convergence with other research agendas (e.g., NBIC convergence, Canada's ecological orientation). On the side of public debate, these consist of debates regarding legitimacy, labeling, ethical codes, regulatory issues, i.e., of "informed dissent" (Jasanoff) regarding the various nanotechnological visions. All these ways of "packaging" nanotechnologies presuppose that the development of nanoscience and -technology, the driving forces behind it, and the cultural shift in the relations

of science and society, nature and technology are understood and themselves part of the debate. Indeed, an appreciation of these relations can provide a common language for the proposed technologies of containment and, for example, for the development of a negotiated European approach to the futures of nanotechnology.