

# Encyclopedia of Nanoscience and Society

## Reflexive Modulation

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Reflexive modulation is a form of research and development (R&D) that is based on the recognition of its wider human, social, and material profile and constituent parameters. Its purpose is to integrate within material practices of natural scientists and engineers a type of thinking about their modes of thought and action. It opens them to different rationalities and a wider number of considerations, without, from their perspective, hindering the research process itself.

Because of its somewhat innovative profile within established R&D environments, reflexive modulation represents a modest perturbation and is thought of as a first step toward progressively wider changes in practices. The systematic reflection on what is actual, possible, and desirable to achieve in a given research project is intended to open space for subsequent shifts in established routines. This type of analysis is meant to help stimulate the emergence of latent or new vectors of thought and action, potentially redefining both individual projects and the R&D enterprise itself. Reflexive modulation consists of an extension of R&D practitioners' own frames of reference, rather than an externally driven intervention. It thus is less likely to occasion resistance as well as unproductive criticisms of research.

Reflexive modulation constitutes the second stage of midstream modulation, which is a framework for explaining sociotechnical change arising from ongoing integration of social and natural scientific concerns. It arises out of the first stage of midstream modulation, [p. 656 ↓ ] de facto modulation, in which the “normal” constitution of research projects by a variety of human, social, and material factors is observed and described, primarily by means of interdisciplinary collaborative inquiry. Reflexive modulation is posited as a necessary condition for a third stage, that of deliberate modulation, in which natural scientists and engineers construct their decisions in light of clearly defined societal goals, ethical values, or deliberative processes.

Philosophically, the idea of reflexive modulation is intimately related to the tradition of virtue ethics. It represents the potential integration within R&D environments of a mode of thought guided—primarily but not exclusively—by the injunction of *plus respicere* (“take more things into account”), as articulated by philosopher of technology

Carl Mitcham. It seeks to do so in a threefold sense: on a discursive level, it articulates —starting with the already present, embedded discourses, expectations, and civic epistemologies of the researchers—an explicit and detailed examination about what is actual, possible, and desirable within the workflow. Second, on a typological level, it seeks to open established discourses and practices to a wider array of social, ethical, environmental, and other dimensions than those that—for a variety of reasons, and which themselves should become object of analysis—are usually considered within daily research. Third, on a content level, it incorporates a focus on a different sort of actual, possible, and desirable considerations than those registered in the de facto stage. The difference and relevance of those new considerations is always grounded, in a questioning and recursive way, on the de facto conditions of the research.

In practice, practical attempts to stimulate reflexive modulation—such as the collaborations between social and natural scientists in the international STIR project —have at their core diverse forms of contextualized dialogue, which could be thought of as contemporary, if somewhat heterodox, forms of Socratic practices. Ideally, the effects of reflexive modulation are enacted on both individual and institutional levels. As it is presented in the STIR project, reflexive modulation is primarily achieved through ongoing yet individual interactions between R&D “insiders” and “outsiders.” Nevertheless, interactions at these levels are meant to enhance institutional and collective activities, which are no less crucial for systemwide modulations of research trajectories. Different types of, and perhaps new virtues with respect to those analyzed by the tradition of ethics, will be pertinent for each level.

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*See Also*

#### Further Readings

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