

Integrating Science and Society in the Laboratory

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Society in the Lab?

- Legitimate concerns
 - Unnecessary constraints on research
- Recent trends
 - Legislation, agency goals, public groups, etc.
- Capacity for responsiveness
 - How to address societal considerations

Deep Interdisciplinarity

- Interactions between
 - Natural and Human/Social Sciences
- Prior experiences
 - Humanities advisor
 - Courses, programs, support structures
- Humanistic collaboration in a lab
 - Embedded in research environment
 - Systematically probe capacity
 - Develop and test methods

Seamless Integration Project

- Motivation
 - Factor in issues at every stage of research
- Investigate possibility and utility
 - Flexibility and constraints
 - Costs and benefits
- Three phases
 - Observation and analysis (18 months)
 - Develop collaborative model (9 months)
 - Test model (3 months)

Phase I: Observation

- Iterative approach
 - Observation, analysis, and feedback
- Opportunities
 - Decisions made constantly
 - High degree of flexibility
- Constraints
 - Trial and error
 - Illusion of predictive certainty
 - Cultural conditions

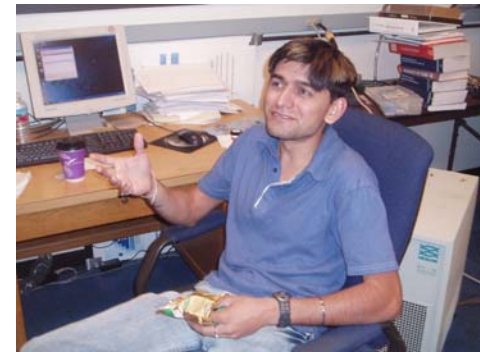


Science and Technology Policy

UPSTREAM	MIDSTREAM	DOWNSTREAM
Authorization “what”	Implementation “how”	Adoption “whether”
Priority Setting	R&D practices	Regulation
Policy makers	Scientists & Engineers	Users, Consumers, Agencies, Market forces, The courts

Phase II: Developing the model

- Prescriptive Protocol
 - Algorithmic overlay
 - Check boxes
- Descriptive Model
 - Generic and intuitive
 - Trace emergence of ongoing decisions
 - Create spaces for reflection
 - Identify “wiggle room”



Decision Model

- Opportunity
 - Problem recognition, framing
- Factors
 - Values, concerns, objectives, demands
- Alternatives
 - Options for moving forward
- Outcomes
 - Actual response, anticipated results

Decisions: in flux, overlapping, constantly revised

Phase III: Testing the Model

- Three levels of interaction
 - High, low, none
- Pre- and post- surveys
 - Measure changes in awareness
- Minimal stimuli
 - Not about specific issues
- External verification
 - Other research group members

Example

- Opportunity
 - CNTs grown in 3 mm quartz tube
 - “Can we grow tubes in a fiber?”
- Factors
 - “We didn’t know if it had any potential applications.”
 - Uncertainties: temperature, size, experimental procedure
- Alternatives
 - “I can only think of Ferrocene”
 - Maybe ferrofluid, but...
- Outcome
 - Ferrocene: failed experiment
 - [Later, ferrofluid: “Now it’s actually turning out to be something”]



Results

- Increase in awareness of all three participants
- Decision modulation
 - Chose alternative catalyst
 - Modified disposal method
 - Modified experimental setup
 - Formulated safety rules
- Possibility
 - Project “could have been a whole different thing”
- Utility
 - More in line with environmental, safety concerns



Conclusions

- Proof of concept
 - Bottom-up approach
 - Stimulated new decision factors and alternatives
 - Led to enhanced lab practices
- Dual value
 - Research effectiveness ('rapid development')
 - Societal concerns ('responsible development')
- May instill longer-term habits of reflection
- Would require broader decision support
 - Timely and comprehensive inputs about issues

Questions