



In Partial Fulfillment of the Requirements for the Degree of

## **Doctor of Philosophy**

**Michael J. Bernstein**

Will defend his dissertation

### **Responsible Innovation and Sustainability: Interventions in Education and Training of Scientists and Engineers**

#### **Abstract**

Three dilemmas plague governance of scientific research and technological innovation: the dilemma of orientation, the dilemma of legitimacy, and the dilemma of control. The dilemma of orientation chances innovation heedless of long-term implications. The dilemma of legitimacy grapples with delegation of authority among lay publics, experts, and decision makers in democracies. The dilemma of control poses that the implications of new technologies are hard to grasp, yet once grasped, all too difficult to remedy. That humanity has innovated itself into sustainability crises is a prime manifestation of these dilemmas.

Responsible innovation (RI), with foci on anticipation, inclusion, reflection, coordination, and adaptation, aims to mitigate dilemmas of orientation, legitimacy, and control. The aspiration of RI is to bend the processes of technology development toward more just, sustainable, and societally desirable outcomes. Despite the potential for fruitful interaction across RI's constitutive domains—sustainability science and social studies of science and technology—most sustainability scientists under-theorize the sociopolitical dimensions of technological systems and most science and technology scholars hesitate to take a normative, solutions-oriented stance. Efforts to advance RI, although notable, entail one-off projects that do not lend themselves to comparative analysis for learning.

In this dissertation, I offer an intervention research framework to aid systematic study of intentional programs of change to advance responsible innovation. Two empirical studies demonstrate the framework in application. An evaluation of Science Outside the Lab (SOTL) presents a program to help early-career scientists and engineers understand the complexities of science policy. An evaluation of a Community Engagement Workshop (CEW) presents a program to help engineers

better look beyond technology, listen to and learn from people, and empower communities. Each program is efficacious in helping scientists and engineers more thoughtfully engage with science and technology governance dilemmas: SOTL in revealing the dilemmas of orientation and legitimacy; CEW in offering reflexive and inclusive approaches to control. As part of a larger intervention research portfolio, these and other projects hold promise for generating knowledge to aid responsible governance of scientific research and technological innovation.

Wednesday, March 30, 2016  
10:30 am  
WGHL 481

Faculty, students, and the general public are invited.

Supervisory Committee:  
Arnim Wiek (co-chair)  
Jameson Wetmore (co-chair)  
Nancy Grimm  
John Anderies