

# **THE TECHNOLOGICAL INFRASTRUCTURE OF SCIENCE**

by

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## ABSTRACT

In this dissertation, I explore a selection of recent work in the philosophy and history of experiment, with an eye toward reformulating its focus and redirecting its future path. Specifically, I re-examine a traditional problem in the philosophy of experiment: how to make sense of scientists' attempts to separate experimental "signal" or "entity" from background "noise" or "artifact." This aspect of the analysis of the *practice* of scientists—the day to day task of getting one's experimental equipment and techniques to give reliable results that will be accepted by prevailing scientific standards—requires modifications in order to be made compatible with an adequate notion of historiography and with a philosophically and historically tenable view of scientific epistemology. I show that the concept of *historical narrative* is a crucial, if not primary, construct in answering these questions about interpreting experimental practice. Particular historical narratives, and the historiographies that guide their construction, constitute the crucial evidence for any legitimate view of the epistemological and cultural significance of scientific experimentation. However, narrativity and historiography must be deconstructed before their conceptual significance for experimentation can be evaluated adequately. The metahistorical construct I implement in order to analyze questions concerning scientific experimentation is *the technological infrastructure of science*.

Joseph Pitt's concept of the *technological infrastructure of science*, a material/cultural network of artifacts and structures that enables and sustains the mature

sciences, provides the theoretical foundation for my analysis of experimentation. I extend and refine Pitt's concept of technological infrastructure in order to create a metahistorical tool that researchers in many fields, including Science and Technology Studies (STS), Philosophy of Science, Philosophy of Technology, Cultural Studies (of Science and Technology), History of Science, and History of Technology, may utilize when analyzing experimentation. To this end, I develop the technological infrastructure as an incorporation, extension and/or replacement of, for example, Thomas Kuhn's "disciplinary matrix," Bruno Latour's "network," Peter Galison's "short-, middle-, and long-term constraints," Ian Hacking's "coherence of thought, action, materials, marks," Hans-Jörg Rheinberger's "experimental system," Andrew Pickering's "mangle of practice," and Richard M. Burian's "interaction of mechanisms, of structures and functions, at a great many levels."

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## DEDICATION

The purpose of life  
is to live it,  
to taste experience  
to the utmost,  
to reach out eagerly  
and without fear  
for newer and  
richer experience.

—Eleanor Roosevelt

I dedicate this dissertation to my teachers—to those who have had the most important and profound influences on my learning, on my psyche, and on who I am as a human being:

To the memory of Willi Reinhardt (1918-1980), my grandfather, who taught me the value of learning, of education, of doing the right thing, and how to live;

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To all the students, faculty, staff, administration, parents, family, law enforcement, health care workers, emergency personnel, alumni, citizens of Blacksburg and Virginia, and all those who grieve for the students and faculty who lost their lives and for all who were injured in the tragedy on that Monday morning; and

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Imagination is more important than knowledge.

—Albert Einstein

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