



PALGRAVE STUDIES IN THE THEORY AND
HISTORY OF PSYCHOLOGY

Psychological Studies of Science and Technology

Edited by
Kieran C. O'Doherty
Lisa M. Osbeck
Ernst Schraube
Jeffery Yen

palgrave
macmillan

Palgrave Studies in the Theory and History of Psychology

Series Editor

Thomas Teo
Department of Psychology
York University
Toronto, ON, Canada

Palgrave Studies in the Theory and History of Psychology publishes scholarly books that use historical and theoretical methods to critically examine the historical development and contemporary status of psychological concepts, methods, research, theories, and interventions. The books in the series are characterised by an emphasis on the concrete particulars of psychologists' scientific and professional practices, together with a critical examination of the assumptions that attend their use. These examinations are anchored in clear, accessible descriptions of what psychologists do and believe about their activities. All the books in the series share the general goal of advancing the scientific and professional practices of psychology and psychologists, even as they offer probing and detailed questioning and critical reconstructions of these practices.

Series Editorial Board

Alex Gillespie, London School of Economics and Political Science, UK

Suzanne R. Kirschner, College of the Holy Cross, USA

Annette Mülberger, Universitat Autònoma de Barcelona, Spain

Lisa M. Osbeck, University of West Georgia, USA

Peter Raggatt, James Cook University, Australia

Alexandra Rutherford, York University, Canada

More information about this series at

<http://www.palgrave.com/gp/series/14576>

Kieran C. O'Doherty · Lisa M. Osbeck ·
Ernst Schraube · Jeffery Yen
Editors

Psychological Studies of Science and Technology

palgrave
macmillan

Editors

Kieran C. O'Doherty
Department of Psychology
University of Guelph
Guelph, ON, Canada

Lisa M. Osbeck
Department of Psychology
University of West Georgia
Carrollton, GA, USA

Ernst Schraube
Department of People and Technology
Roskilde University
Roskilde, Denmark

Jeffery Yen
Department of Psychology
University of Guelph
Guelph, ON, Canada

Palgrave Studies in the Theory and History of Psychology
ISBN 978-3-030-25307-3 ISBN 978-3-030-25308-0 (eBook)
<https://doi.org/10.1007/978-3-030-25308-0>

© The Editor(s) (if applicable) and The Author(s), under exclusive license to Springer Nature Switzerland AG, part of Springer Nature 2019

This work is subject to copyright. All rights are solely and exclusively licensed by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Palgrave Macmillan imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Contents

1	Introduction: Psychological Studies of Science and Technology	1
	<i>Kieran C. O'Doherty, Lisa M. Osbeck, Ernst Schraube and Jeffery Yen</i>	
 Part I Scoping a New Psychology of Science and Technology		
2	Academic Subjectivity, Idols, and the Vicissitudes of Virtues in Science: Epistemic Modesty Versus Epistemic Grandiosity	31
	<i>Thomas Teo</i>	
3	Rethinking Psychology of Technology for Future Society: Exploring Subjectivity from Within More-Than-Human Everyday Life	49
	<i>Niklas Alexander Chimirri and Ernst Schraube</i>	

- 4 **Neuroscience and the New Psychologies:
Epistemological First Aid** 77
Henderikus J. Stam

**Part II Applying Psychological Concepts to the Study
of Science and Technology**

- 5 **“Groping for Trouts in a Peculiar River:” Challenges
in Exploration and Application for Ethnographic Study
of Interdisciplinary Science** 103
Lisa M. Osbeck and Nancy J. Nersessian

- 6 **Scientists as (Not) Knowing Subjects: Unpacking
Standpoint Theory and Epistemological Ignorance
from a Psychological Perspective** 127
*Nora Ruck, Alexandra Rutherford, Markus Brunner
and Katharina Hametner*

- 7 **Social Networks in the History of Psychology** 149
Michael Pettit

- 8 **Engaging Publics on Asthma and Bacteria:
Understanding Potential Negative Social Implications
of Human Microbiome Research** 167
*Amanda Jenkins, Shannon Cunningham
and Kieran C. O'Doherty*

Part III Critical Perspectives on Psychology as a Science

- 9 **A New Psychology for a New Society: How Psychology
Can Profit from Science and Technology Studies** 191
Estrid Sørensen

10	The Social Production of Evidence in Psychology: A Case Study of the APA Task Force on Evidence-Based Practice	213
	<i>Nathalie Lovasz and Joshua W. Clegg</i>	
11	Philosophical Reflexivity in Psychological Science: Do We Have It? Does It Matter?	237
	<i>Kathleen Slaney, Donna Tafreshi and Charlie A. Wu</i>	
12	A Meeting of Minds: Can Cognitive Psychology Meet the Demands of Queer Theory?	257
	<i>Sapphira R. Thorne and Peter Hegarty</i>	
13	A Gendered Prestige: The Powers at Play When Doing Psychology with Ink Blots/Statistics	279
	<i>Katherine Hubbard and Natasha Bharj</i>	
14	Psychology in Times of Smart Systems—Beyond Cyborgs and Intra-action	299
	<i>Ines Langemeyer</i>	
	Index	325

Notes on Contributors

Natasha Bharj is a graduate student at the University of Kansas. She locates her scholarship at the intersection of decolonial feminism and critical cultural psychology. She is primarily interested in socio-cultural constructions of sexuality and sexual violence, particularly in the contexts of coloniality and narratives of development. She also conducts research on representations of history and national identity, and is invested in the scholarship of teaching & learning.

Dr. Markus Brunner is a Lecturer at the Sigmund Freud Private University in Vienna, board member of the Gesellschaft für psychoanalytische Sozialpsychologie [“Society for psychoanalytic social psychology”], and co-editor of the journals “Freie Assoziation. Zeitschrift für psychoanalytische Sozialpsychologie” [Free Associations] and “Psychologie und Gesellschaftskritik” [Psychology and Social Critique]. He has written and published broadly on psychoanalysis and critical theory with a special focus on trauma theory, anti-semitism, and the emotional legacies of Nazi Germany.

Niklas Alexander Chimirri is an Associate Professor in Social Psychology of Everyday Life at the Department of People and Technology at Roskilde

University, Denmark. Both his teaching and research explore the relevance of communication technology for children's and adults' conduct of everyday life, with a focus on technology's ethical implications for designing collaborative research across generational thresholds. The aim is to develop a praxis-philosophical, socio-material psychology of everyday life that interrelates audience research, participatory design studies and intergenerational childhood research. He currently investigates young children's and adults' relational care practices in digitalized times.

Joshua W. Clegg is an Associate Professor of psychology at John Jay College of Criminal Justice, CUNY and a member of the faculty in the Critical Social and Personality Psychology doctoral program at The Graduate Center, CUNY. He has published widely on history, methods, and epistemology in the social sciences.

Shannon Cunningham has a Ph.D. in Applied Social Psychology, with a specialization in evaluation and qualitative methods. She works as a Senior Research Evaluator and Senior Operations Consultant at Alberta Innovates, a provincially funded corporation that supports research and innovation development in the core sectors of health, environment, energy, food and fibre, and ecosystem biodiversity. Shannon supports the corporation through corporate and strategic planning, performance management and measurement activities, managing and conducting evaluations, impact assessments and narratives, and continuous improvement activities. She also freelances as a qualitative methods expert on quality improvement health communications research projects.

Ass-Prof. Dr. Katharina Hametner is a psychologist who is working at Sigmund Freud University Vienna. She wrote her Ph.D. on experiences of everyday racist practices in the field of anti-Muslim discourses at the University of Vienna. Her research and teaching expertise lies within the fields of social psychology, with special interests in racism and migration, qualitative methods and philosophy of science. She is co-editor of the journal "Psychologie und Gesellschaftskritik" (psychology and social criticism).

Peter Hegarty is a Professor of Psychology at the University of Surrey where he directs the Social Emotions and Equality in Relations research group SEER (www.surrey.ac.uk/seer), and delivers the curriculum on Conceptual and Historical Issues in Psychology (CHIP). His research interests focus on social psychology, psychology's history, and gender and sexuality, and are currently focused on public understanding of the medicalization and demedicalization of intersex. He is the author of *Gentlemen's Disagreement: Alfred Kinsey, Lewis Terman and the Sexual Politics of Smart Men* (Chicago, 2013) and *A Recent History of Lesbian and Gay Psychology: From Homophobia to LGBT* (Routledge, 2017).

Katherine Hubbard is a feminist academic at the University of Surrey. She specializes in the history of Psychology; gender and sexuality studies; and socio-historical methods. Her work centralizes on disrupting normative judgements about the past and demonstrates the how useful queer feminist histories are to the social sciences and beyond. Her book *Queer Ink: A Blotted History Towards Liberation* does this in relation to the Rorschach ink blot test and its relationship with gay liberation movements inside and outside of Psychology.

Amanda Jenkins received her Ph.D. in Applied Social Psychology from the University of Guelph in Ontario, Canada. Her research interests are health, feminist theory, and the body. Her publications include *Clean and fresh: Understanding women's use of vaginal hygiene products (Sex Roles, 2018)*. She is currently a Research Coordinator for a cross-national AGE-WELL funded project titled Older Adults' Active Involvement in Ageing & Technology Research and Development (OA-INVOLVE).

Ines Langemeyer is a Professor at the Karlsruhe Institute of Technology for the research on learning and instruction, the philosophy of education and vocational education. She obtained her Diplom in psychology at the Free University of Berlin and her Ph.D. (Dr. Phil.) at the Hamburg Helmut-Schmidt-University. Main research interests are research- or inquiry-based forms of teaching and learning, the scientification of work, historical epistemological approaches to science, the development of cooperative competence, and the conditions of high-performance workplaces on the labor market.

Nathalie Lovasz is founding partner and practicing as a clinical psychologist at the Toronto DBT Centre in Toronto, Canada. She holds a Ph.D. from Simon Fraser University and has published on various topics at the intersection of history and theory of psychology and clinical practice.

Nancy J. Nersessian is Regents' Professor (Emerita), Georgia Institute of Technology. She currently is Research Associate, Department of Psychology, Harvard University. Her research focuses on the creative research practices of scientists and engineers, especially how modeling practices lead to fundamentally new ways of understanding the world. This research has been funded by NSF and NEH. She is a Fellow of AAAS, the Cognitive Science Society, and a Foreign Member of the Royal Netherlands Academy of Arts and Sciences. Her numerous publications include *Creating Scientific Concepts* (MIT, 2008, Patrick Suppes Prize in Philosophy of Science, 2011) and *Science as Psychology: Sense-Making and Identity in Science Practice* (with L. Osbeck, K. Malone, W. Newstetter, Cambridge, 2011, APA William James Book Prize, 2012).

Kieran C. O'Doherty is an Associate Professor in the department of psychology at the University of Guelph, where he directs the Discourse, Science, Publics research Group. His research focuses on the social and ethical implications of science and technology. In this context, he has published on such topics as vaccines, human tissue biobanks, the human microbiome, salmon genomics, and genetic testing. Kieran's research also emphasizes public engagement on science and technology. In this regard, he has designed and implemented public deliberations in which members of the public engage in in-depth discussion about ethical aspects of science and technology and collectively develop recommendations for policy. Kieran's research has been funded by the Canadian Institutes of Health Research, The Office of the Privacy Commissioner of Canada, the Ontario Ministry of Research & Innovation, Genome Canada and Genome British Columbia. He is editor of *Theory & Psychology*.

Lisa M. Osbeck is a Professor of Psychology at the University of West Georgia. Her interests include historical and contemporary theories of cognition, philosophy of science, methodology, and problems of interdisciplinary research. Books include *Science as Psychology: Sense-Making*

and Identity in Science Practice (with N. Nersessian, K. Malone, & W. Newstetter, Cambridge, 2011), awarded the William James Book Award from the American Psychological Association in 2012, and *Values in Psychological Science: Re-Envisioning Epistemic Priorities at a New Frontier* (Cambridge, 2019). She is also co-editor of *Rational Intuition: Philosophical Roots, Scientific Investigations* (Cambridge, 2014), with Barbara Held. Lisa is a Fellow of the American Psychological Association and is President-Elect of the Society for General Psychology (APA Division 1). She is an associate editor for *Qualitative Psychology* and is on the editorial boards of six additional journals, including *American Psychologist*.

Michael Pettit is an Associate Professor at York University. His primary affiliation with the Historical, Theoretical, and Critical Studies area within the Department of Psychology. He works at the intersection of critical psychology, Science & Technologies Studies, and the history of the human sciences.

Nora Ruck is an Assistant Professor of Psychology at the Sigmund Freud Private University in Vienna, where she co-coordinates the master program social psychology and psychosocial practice. Her research interests concern the relations between psychology and social inequalities as well as social movements, the history of psychology, feminist epistemology, and critical psychology. She currently directs the research project “The psychological is political. A recent history of feminist psychology in Vienna, 1972–2000” (FWF P 31123-G29), which studies the history of feminist psychologies in Austria. She is recipient of the Austrian state prize for excellent university teaching (*ars docendi*) for a transnational (Austria/U.S.) seminar on “Holocaust consciousness” (with Bernadette Wegenstein & Markus Brunner) as well as co-editor of “Psychologie & Gesellschaftskritik” and associate editor of *Awry—Journal of Critical Psychology*.

Alexandra Rutherford is a Professor of psychology at York University in Toronto where she is a member of the Historical, Theoretical, and Critical Studies of Psychology graduate program. She studies the relationships between feminist psychology and society to understand how feminist science and practice can contribute to positive social change. She has examined the role of sexual assault surveys in mobilizing

anti-violence activism and policy, and the influence of neoliberalism and postfeminism in shaping gendered discourses of agency and empowerment. She received the Association for Women in Psychology Distinguished Publication Award in 2012 for her co-edited volume *Handbook of International Feminisms: Perspectives on Psychology, Women, Culture, and Rights*, and the Distinguished Member Award from the Section on Women and Psychology of the Canadian Psychological Association in 2011. She is the founder and director of the Psychology's Feminist Voices oral history and digital archive project.

Ernst Schraube is a Professor of Social Psychology of Technology in the Department of People and Technology at Roskilde University, Denmark. His research focuses on the social and political implications of modern technology in everyday life and he is currently working on a project on the significance of digital technologies in students' learning and conduct of everyday life. He studied at the Free University Berlin from where he received his diploma in psychology and his Ph.D. Among his books are *Auf den Spuren der Dinge: Psychologie in einer Welt der Technik* (Argument) and the co-edited volumes *Psychology from the Standpoint of the Subject: Writings of Klaus Holzkamp* (Palgrave Macmillan), *Psychology and the Conduct of Everyday Life* (Routledge). The 1998–1999 academic year he spent as a visiting research scholar in the Department of Science and Technology Studies at Rensselaer Polytechnic Institute in Troy, New York, USA. More information under: www.ruc.dk/~schraube.

Kathleen Slaney is a Professor of Psychology at Simon Fraser University. Her research interests and expertise span several areas, including historical and conceptual analysis of the methods and methodologies of psychological science, philosophy of psychology and related disciplines, and theoretical and applied psychometrics. She is a Fellow of the American Psychological Association, author of *Validating Psychological Constructs* (Palgrave Macmillan, 2017), and co-editor of *A Wittgensteinian Perspective on the Use of Conceptual Analysis in Psychology* (Palgrave Macmillan, 2013) and *The Wiley Handbook of Theoretical and Philosophical Psychology* (Wiley Blackwell, 2015).

Estrid Sørensen with a background in Psychology from the University of Copenhagen, has focussed her academic life on studying how things, technologies and other objects engage in everyday lives. She is the author of *The Materiality of Learning: Technology and Knowledge in Educational Practice* (Cambridge, 2009) which is based on micro-analytic studies in a primary school context in Denmark. She has studied how objects shape everyday lives in a variety of other contexts such as educational assessment exercises, computer game activities, and psychological knowledge practices. She is a former Alexander von Humboldt awardee and holds currently a Professorship in Cultural Psychology and Anthropology of Knowledge at the department of Social Science at Ruhr-University in Bochum. She has also taught at departments of anthropology, education, and sociology in Denmark and Germany.

Henderikus J. Stam is a Professor of Psychology at the University of Calgary, where he teaches courses in the history and theory of psychology as well as clinical psychology. His recent scholarly interests have focused on contemporary theoretical problems in psychology and the historical foundations of twentieth-century psychology on which he has published numerous articles and book chapters. Founding editor of *Theory & Psychology* (now Editor Emeritus), he is a former president of APA's Division 26 (Society for the History of Psychology) and of Division 24 (Society for Theoretical and Philosophical Psychology).

Donna Tafreshi is an Adjunct Professor in the Psychology Department at Simon Fraser University. Her background and scholarship are in the areas of research methodology, developmental psychology, and the history and philosophy of science.

Thomas Teo is a Professor of psychology in the Historical, Theoretical, and Critical Studies of Psychology Program at York University (Toronto, Canada). He has been active in the advancement of theoretical, critical, and historical psychology throughout his professional career. His research has been meta-psychological to provide a more reflexive understanding of the foundations, trajectories, and possibilities of human subjectivity. He considers his research program contributing to the psychological humanities.

Sapphira R. Thorne is a Postdoctoral Research Associate at Cardiff University, UK. Her research examines the role of heteronormativity in the construction of love and romantic relationships. She is also more broadly interested in relationships, gender and sexuality, intergroup discrimination, social norms, and mindfulness. Recent publications include “Equality in theory: From a heteronormative to an inclusive psychology of romantic love” (*Theory & Psychology*, 2019).

Charlie A. Wu is a graduate student currently enrolled in the Historical, Quantitative, and Theoretical Psychology department at Simon Fraser University. His interests include the history of moral psychology, qualitative and quantitative methodology in the social sciences, hermeneutic investigation in psychology, and critical psychology.

Jeffery Yen, Ph.D. is an Associate Professor in Applied Social Psychology at the University of Guelph. His teaching and research interests centre on critical history and theory of psychology, with a focus on locating psychological technoscience in its social, cultural, and historical context. He is currently researching the history of clinical psychology in South Africa, as well as continuing research on the performativity of methods used in psychological science. He has co-edited the book *Theoretical Psychology: Global Transformations and Challenges*, is currently Book Review Editor for the journal *Theory & Psychology*, and serves on the editorial board for the journal *Awry: Journal of Critical Psychology*.

List of Figures

Fig. 7.1	Sociogram by person of early APA presidents	160
Fig. 7.2	Sociogram by institution of early APA presidents	162



1

Introduction: Psychological Studies of Science and Technology

Kieran C. O'Doherty, Lisa M. Osbeck,
Ernst Schraube and Jeffery Yen

Recognition of the centrality of science and technology to almost all domains of human activity has given rise to subdisciplines such as philosophy of science, philosophy of technology, sociology of knowledge, and history of science and technology. Recent years are witness to the emergence of prominent interdisciplines such as Science and Technology Studies (STS) that offer systematic investigation of the

K. C. O'Doherty (✉) · J. Yen
University of Guelph, Guelph, ON, Canada
e-mail: odohertk@uoguelph.ca

J. Yen
e-mail: jyen@uoguelph.ca

L. M. Osbeck
Department of Psychology, University of West Georgia, Carrollton, GA, USA
e-mail: losbeck@westga.edu

E. Schraube
Department of People and Technology, Roskilde University, Roskilde, Denmark
e-mail: schraube@ruc.dk

© The Author(s) 2019

K. C. O'Doherty et al. (eds.), *Psychological Studies of Science and Technology*, Palgrave Studies in the Theory and History of Psychology,
https://doi.org/10.1007/978-3-030-25308-0_1

dynamic relationships between science, technology, and human life. Somewhat surprisingly, the discipline of psychology has been comparatively marginal to STS and related research. There are three main markers of its marginality. First, with some notable exceptions, psychology has not been prominent as an *object of study* within STS, which instead has focused more on an investigation of the natural sciences. Of course, the critical scrutiny of psychological science has contributed to the emergence of subdisciplines within psychology, including theoretical psychology, critical psychology, and feminist psychology, but interface between these efforts and STS have been minimal. Second, psychology as a scholarly discipline with a distinct analytic lens has been underrepresented in the interdisciplinary and multidisciplinary efforts of STS. Third, although we may identify a literature associated with the label *psychology of science*, that is, the psychological study of science and technology, as a focus of research it has arguably remained quite marginal to the discipline of psychology itself.

Previous attempts to articulate and develop a psychology of science and technology have not had much influence in the larger STS community. As we argue in more detail below, one reason for this is that these previous attempts have tended to have a rigid commitment to an unreflexive epistemology that does not allow for historical, critical, constructionist, qualitative, and theoretical scholarship. In contrast, STS quite explicitly draws on a plurality of disciplines and scholarly approaches, and very notably interrogates the limits of the scientific onto-epistemologies of western modernity (e.g., Latour, 1993b). Certainly, important historical work on cognitive practices of scientists using interpretive methods helped to carve out a distinct subspecialty of cognitive studies of science, beginning in the 1980s (e.g., Nersessian, 1984; Tweney, 1989), and there has been a great deal of important critical historical analysis of scientific practices specifically relevant to psychological science (e.g., Danziger, 1994; Gergen, 1973; Koch & Leary, 1992; Morawski, 1988). More recently, qualitative methods have been used to explore themes broadly relevant to social and cognitive processes in science on the part of a growing empirical philosophy of science community (see Wagenknecht, Nersessian, & Andersen, 2015). However, the relation of these efforts and the interpretive methods used

to a broader project of psychology of science have not been articulated in the formal calls for a subfield to be explicitly associated with the label “psychology of science” (e.g., Feist & Gorman, 2013). Presumably, then, psychological contributions to STS, or studies of the psychological dimensions of science, if they are to be compatible with the spirit and practice of STS, would need to exhibit a reflexivity and plurality of scholarly frameworks, approaches, and methods. This book is aimed precisely at addressing this need.

By way of introduction, we situate our project in the broader context of (1) psychological studies of science and (2) psychological studies of technology, and (3) psychological contributions to STS.

Psychological Studies of Science

Any story told about the origin and development of “psychology of science” reflects assumptions about the nature of history, psychology, and science, and about their interrelations, thus complicating the task of situating our current project. An important first task is to distinguish (1) a formal scholarly specialty identified by the name “psychology of science” and (2) empirical and theoretical analysis of science not explicitly identified as “psychology of science” that nevertheless addresses broadly psychological concerns. In the case of the latter, there are several tributaries, each of which in their own right would require extensive review to even begin to do them justice. We can consider these the narrow and broad senses of psychology of science, respectively. Greg Feist makes this distinction in his effort to summarize and schematize the enormous set of contributions that could be considered part of the overall project of psychology of science. His work, singly (2006) and in combination with Gorman (e.g., Feist & Gorman, 1998, 2013), offers comprehensive and detailed historical survey, as does Simonton (1988). Campbell (1989) and Houts (1989) conducted comprehensive historical analyses of the philosophical underpinnings of psychology of science in the pioneering *Psychology of Science: Contributions to Metascience* (Gholson, Shadish, Neimeyer, & Houts, 1989). Here we are able only to offer a sketch of both the broad and narrow sense,

drawing in part from Feist's history but also adding some thoughts of our own. Our sketch is intended only to invite further reading and conversation, especially around the question of the appropriate demarcation and units of analysis of which a psychology of science is inclusive. We should note regretfully that our summary covers only North American and European psychology and science, owing only to our limitations in space and expertise.

Philosophical Studies of Science

Most fundamentally, it is important to first recognize that epistemology itself as historically unfolded is a kind of psychology of science. From Plato forward disagreement concerning the origin of knowledge focused on which human capacity can be trusted as the basis for knowledge claims, with the primacy of intellectual powers pitted against the rock bottom importance of sensory channels. The emergence of modern science is also defended philosophically on grounds that are at least in some aspects "psychological", if by psychological we would include the forms of bias to which our everyday reasoning is prone. For example, against the rapid expansion of scientific discovery in the late sixteenth and early seventeenth centuries, Francis Bacon based the call for a "new instrument" for knowledge acquisition on what are essentially psychological grounds: four categories of "idols" of mind that serve to skew unaided observation and sense-making and thereby lead to hasty or erroneous conclusions. The idols as described represent psychological categories or kinds that would not be out of step in a contemporary curriculum: cognitive mechanisms ("the tribe"), disposition and habit ("the cave"), ambiguities stemming from language and communication ("the marketplace"), and deeply engrained culturally normative ideation ("the theater"). Bacon's call for a more systematic method of inquiry proceeds not from analysis of the nature of the objects investigated so much as on the features (the limitations) of the inquiring subject (Bacon, *Novum Organum*, 1937/1620). One might note also that historians of psychology have analyzed the psychologically thematic content of many other early modern philosophers who were concerned with the grounding of scientific knowledge (e.g.,

Descartes, Hobbs, Locke, Hume, Kant); (see Leahey, 2017; Pickren & Rutherford, 2010; Robinson, 1995).

These developments in philosophy, aimed at understanding the nature and limits of scientific discovery, are not themselves designed to produce new knowledge of the world, new scientific insights, that is. Rather, they concern the human abilities that enable or constrain the construction and advancement of knowledge. As James put it, “Locke, Hume, Berkeley, Kant, Hegel, have all been utterly sterile, so far as shedding any light on the details of nature goes... The satisfactions they yield to their disciples are intellectual, not practical...” (1987/1907, p. 568). Overlooking for the present purposes the many differences between the thinkers James links together to make his argument, their views may be considered psychological treatises on the nature of scientific reasoning—reflections on science as an object—thus psychological studies of science—in a broad but important sense.

If we were to conform with the thinking that psychology is distinguished by empirical methods, that is, by the systematic collection and analysis of data rather than philosophical reflection, we could trace the origins of a rudimentary psychology of science to the experimental study of the “personal equation,” astronomer’s awareness and experimental investigation of individual differences in estimates of the movement of planetary bodies among astronomers using the same telescope, dubbed by Schaffer as “the personality problem” (see Schaffer, 1988). Yet the inclusion of data alone cannot be specific to mark the pursuit as psychological. It remains difficult to distinguish a psychology of science from the many debates about the nature of science taking place during the late eighteenth and nineteenth centuries, including heated exchange concerning the nature and possibility of a psychological science, much of which drew from systematic collection of data relating to perceptual processes (e.g., Fechner, 1860; von Helmholtz, 1995/1868). Discussion of the mind’s contribution to the context of perception, the potential for the senses to deceive us, the relation of scientific inquiry to goals and values all straddle the philosophical and psychological realms and converge around the contribution of the observer to what is observed (e.g., Mach, 1896).

Similarly, nineteenth and early twentieth centuries scholarship on the nature of science, including the articulation of “pragmatism” by James himself (1987/1907), and encompassing the insights of Whewell (1847), Brentano (1874), Mill (1843), Peirce (1878), Dewey (1938), Husserl (1954/1936), and Wittgenstein (1953), to name only a few examples, provides ample evidence that psychological themes of one kind or another (including, importantly, our use of language) infiltrate the philosophical study of science as a form of human activity and achievement. More recent philosophy of science varies in the extent to which psychological subject matter receives emphasis (see Douglas, 2009). Polanyi’s *Personal Knowledge* is explicit in foregrounding the importance of passion, commitment, resilience, and unconscious processing to the very possibility of scientific advance (1974/1958), in calling discovery “an extremely delicate and personal art” (1964/1946, p. 34). But even within the analytic tradition, most philosophers of science demonstrated willingness to admit that at the level of “discovery” at least (i.e., distinct from the verification or “test” of an idea), scientific reasoning requires more than following a recipe, thus inviting discussion of the extent to which disposition, cognitive style, development, and sociality might have a bearing on the conditions that make science possible (Reichenbach, 1938). To the extent that the questions posed about discovery concern the nature of human creativity and insight, the overlap with psychological studies of creative and productive thought processes is obvious. Thus Popper famously levied a “sharp distinction” between the contexts of discovery and justification, and considered the former “of great interest to empirical psychology” but “irrelevant to logical analysis” (2002/1959, p. 8).

Cognitive Studies of Science

The idea that the study of scientific discovery or insight is a distinctly psychological project and not a philosophical one seems to have inspired much creative energy on the part of psychology, some of it reflecting methodological innovation. As an example, Max Wertheimer

conducted an extensive and intricate interview with Albert Einstein targeted at understanding the process of thinking to which Einstein credited his most influential insights, and those that enabled his outline of the general theory of relativity (Wertheimer, 1981/1948).

Renewed interest in cognition among postwar empirical psychologists launched an interdisciplinary subfield of cognitive studies of science later in the twentieth century. That is, the growing interest in cognitive structures and information processing invited a slew of new experimental and theoretical investigations of reasoning that had relevance for understanding scientific reasoning in particular. Herbert Simon (1981/1966), for example, argued from data related to symbol processing and selective forgetting mechanisms to an explanation of the processes of incubation and illumination common to both everyday problem-solving and leaps of creative scientific insight. Philip Johnson-Laird (1983), drawing on the earlier insights of Kenneth Craik (1943) characterized human thinking in terms of the construction and manipulation of mental models of various types and levels of complexity. This work in turn inspired a generation of cognitive scientists as well as philosophers of science to dedicate their efforts to better understand the cognitive basis of successful scientific reasoning, including the construction and use of various kinds of models (Gentner & Stephens, 1983; Giere, 1992; Gooding, 1985; Gorman & Carlson, 1990; Nersessian, 1984, 1992; Tweney, 1989; Tweney, Doherty, & Mynatt, 1981). This work was inherently interdisciplinary: their concepts and methods drew from different disciplines—cognitive psychology, of course, but also historical document analysis and philosophical methods, in the process of which these scholars contributed not only to deeper understanding of scientific reasoning but also broadened the scope of cognitive science to include fine-grained analysis of historical case studies.

Sociological Studies of Science

At the same time, seemingly in parallel, sociological studies of science offered competing accounts of both discovery and verification processes. In the 1960s, new metatheoretical accounts of scientific progress

galvanized philosophical discourse around the nature of discovery *and* verification (justification), offering what amount to largely sociological rather than logical accounts of scientific progress (e.g., Feyerabend, 1975; Foucault, 1966; Kuhn, 1962; Rorty, 1979). Instead of cognitive architecture, sociocultural arguments, including “social epistemology,” depicted science as a set of conventions and organizational structures—deeply entrenched habits of thought and linguistic practice, socially shared representations, and negotiation of conceptual and methodological norms—rules within communities, including rules for testing hypotheses (Bloor, 1975; Fuller, 2002; Latour, 1987; Latour & Woolgar, 1986). That the communities in question have agendas that are at base politically and economically driven, concerned with power and subversion, with interests that are instantiated in the institutions that support scientific knowledge production is an important aspect of accounts offered.

Similarly, feminist studies of science illuminated the role of power imbalances and intersubjective relations in the construction of scientific knowledge, including deep biases infiltrating the criteria for judging the worth of ideas, contributing to entrenched discriminatory practices that limit and devalue the contribution of women to knowledge production (Eagly, 1987; Fox-Keller, 1985; Haraway, 1985; Harding, 1986). Cultural studies of science and critical race theory, drawing inspiration from Frantz Fanon (1967/1952), the broader tradition of critical theory (e.g., Adorno & Horkheimer, 2002/1944; Foucault, 1975; Teo, 2015), and from historical documentation of racialized practices in science have offered much insight into the means by which myriad forms of prejudice affect who is entitled to make and use knowledge, who is excluded, and who is harmed by its production (Guthrie, 2004; Malone & Barbarino, 2009; Sinclair, 2004). These influences have also had a profound impact on theoretical psychologists’ critical analyses of the politicized nature of their discipline’s own knowledge producing practices (e.g., Burman, 2016; Gergen, 2000; Teo, 2017), all of which must be recognized as part of broader interdisciplinary subject matter of a psychology of science.

Psychological Studies of Science

Despite the important understandings of science arising from both cognitive science and sociocultural analysis, there remain some distinctly or at least importantly psychological contributions to the study of science. Feist and Gorman locate the “very first inklings” of a psychology of science in the late nineteenth century scuffling between historian Alphonse de Candolle, who emphasized social facts such as religious affiliation that showed an association with scientific achievement (Feist & Gorman, 2013, p. 4). Francis Galton’s analysis of survey data from 180 scientists to make a wobbly argument for the hereditary basis of scientific capacities (see Fancher, 1983). Somewhat later, Bachelard (2002/1938) illuminated links between poetry and epistemology through analysis of analogy, metaphor, and the role of imagination in scientific thinking. Similarly of note is D. L. Watson’s *Scientists Are Human*, which asserts “the scientist” to be central to an understanding of science: “Central to any estimate of the nature of scientific truth and its value for humanity are (1) an understanding of the psychological constitutions of the investigator and (2) an understanding of the social forces which produce him, encourage or oppose him, and transmit or ignore his work” (1938, p. 50).

Not surprisingly, the period surrounding WWII was characterized by increased European attention, at least, to the interrelation of science and values, to which an important contribution was made by Gestalt psychologist Wolfgang Köhler (1938) that articulates the formative relation of human values to any inquiry, drawing on principles gleaned through Gestalt research and theory. To this we should add that George Kelly’s metaphor of “person as scientist” (1955), though not intended as a psychological analysis of science, implicitly affirms the personhood of the researcher and describes the nature of the thought processes that bind scientific thinking to everyday cognition and meaning-making. Skinner demonstrated interest in the psychology of science in various ways. For example, in an essay titled “Can Science Help?” he calls science “a unique intellectual process with remarkable results” (1953, p. 11), but “first of all a set of attitudes....a disposition to deal with the facts rather than what someone has said about them” (1953, p. 12).

Elsewhere he briefly engaged Polanyi's arguments for the personal contribution of the scientist to the process of scientific knowledge production (Polanyi, 1974/1958), but concluded that although the scientist "must behave as an individual"... "he [sic] states facts or laws which make it possible for others to respond effectively without personal exposure to that world" (Skinner, 1974, pp. 144–145).

Feist and Gorman (2013) note that the psychology of science was more actively pursued in Eastern Europe during the postwar period. They highlight Mieczyslaw Chojnowski's *Institute for the Science of Science* and its corresponding publication of a journal dedicated to describing its assumptions and findings (e.g., Chojnowski, 1948), as well as a center established within the Russian Academy of Sciences focused on the psychology of scientific innovation and achievement. Feist and Gorman (2013) describe an uptake if not a surge of interest in the study of scientific creativity, including its cognitive organization and the personality characteristics that might predict it, in the decades of the 1950s through 1970s, of which studies by Roe (1953), Eiduson (1962), Taylor and Barron (1963), and Maslow (1966) are examples. Simonton (1988) credits the surge of interest in the early 1960s, at least on the part of American psychologists, to competition to win the space race, provoked by the launching of the Soviet shuttle. Although Simonton considered the psychology of science to be waning by the early 1970s, we should note an important exception in Ian Mitroff's qualitative (interview-based) analysis of NASA scientists, important not only for its contribution to the content of psychology of science but for its setting of a precedent for the contemporary strategy of interviewing scientists for the purposes of better understanding the nature of science (Mitroff, 1974). Simonton saw the momentum for psychology of science picking up again in the early 1980s, in keeping with the expansion of cognitive psychology as noted above. Building on the expanded study of creativity in the decades preceding, his own *Scientific Genius* offered a comprehensive new psychological theory ("chance configuration") to account for new combinatorial processes preceding or concurrent with creative insight (Simonton, 1988).

The first decade of the twenty-first century was witness to yet another renewal of interest in the psychology of science. Groups of researchers

seemed to be operating independently, but Greg Feist attempted to organize their efforts toward the recognition of a distinct subdiscipline of the psychology of science. Feist (2006)'s book, titled *The Psychology of Science*, summarizes historical and contemporary contributions to the study of science and offers a theoretical and empirically informed account of the developmental origin of scientific thinking. His efforts to organize a subfield of psychology of science included an international conference and a series of workshops and published anthologies specifically dedicated to the psychology of science (e.g., Feist & Gorman, 2013; Proctor & Capaldi, 2012). These collections are skewed toward understanding the cognitive mechanisms underlying science—the mechanics of scientific reasoning. The publication of anthologies dedicated to psychology of science raises important questions about the boundaries of the subfield—what is included and what is left out: What is to be counted as the *psychological* study of science in historical and contemporary contexts?

In addition to the many lines of broadly psychological study already named, we must also recognize historical studies of our own discipline as occupying a space within the broad province of the psychology of science. Heidebreder's depictions of Wundt's "order-loving mind" dedicated to the preparation of "edition after edition of his formulated system" (1933, p. 96), or of the "emotional urgency with which the thoroughgoing behaviorist takes his beliefs and taboos" (p. 268) clearly illustrate integration of dispositional and motivational considerations into an account of scientific progress. Clearly the account is interpretive, not a controlled study, but it shines light on the science in a way that has helped generations of students comprehend differences in theoretical frameworks and their epistemic values. More contemporary histories are likely to emphasize the social, cultural, and political embeddedness of psychological theory, yet where would we draw a line enabling us to say that some aspect of this analysis is not psychological study? Similarly, critical analysis of psychological research and theory, whether aimed at the level of metacritique or focused analysis of particular psychological concepts or methods (e.g., Slaney, 2017; Tissaw, 2007) surely counts as psychological study of psychological science.

More to the point of this volume is that a range of theoretical and methodological standpoints contribute to the psychological study of science, though they have not been recognized as such. It is worthwhile to note what has been happening in philosophy of science, perhaps the most entrenched of the disciplines that seek to inform or illuminate scientific process. Dominated for decades and even defined by the methods of analytical philosophy, recent years have seen radical new approaches with data collection and analysis serving as the basis upon which to evaluate philosophical claims—an empirical philosophy of science (e.g., Ichikawa, 2012; Lombrozo, Knobe, & Nichols, 2014). Yet within the philosophical community there is widespread recognition that the inherent complexity of the underlying phenomenon (science) justifies and even requires a range of methods, and that the meaning of “empirical” is inclusive of qualitative and historical analysis (Osbeck & Nersessian, 2015). A new wave of fine-grained analysis of science “in the wild” puts taken for granted assumptions about the nature of science to the test and offers richer understanding of how knowledge construction is accomplished and propagated, and to what ends (Andersen, 2016; Leonelli, 2016a, 2016b). In particular, should a psychology of science be less inclined to recognize the contribution of qualitative and historical studies to the analysis of science as practiced? We assert that it should not.

Psychological Studies of Technology

Sometimes in parallel with the study of science and sometimes integrated with it, academic study of technology has emerged as an important subfield. Again, we note a conspicuous absence: study of the psychological significance of the world of machines, systems, and techniques in human experience and action is largely absent from twentieth-century psychology. It is only within recent years that we see development toward a more systematic psychology of technology (Rosen, Cheever, & Carrier, 2015; Sørensen & Schraube, 2013; Turkle, 2008).

An important reason for the difficulty of psychology to contribute to the study of technology has to do with psychology's one-sided conception of itself as a science, primarily reliant on the foundation of a quantitative methodology. Quantitative, experimental, and statistical methodology decontextualizes psychological phenomena and separates them from the world, including the world of science and technology. Within such an approach the internal relationship between humans and technology and psychological meaning-making processes cannot really be addressed. Quantitative methodology disarticulates human subjectivity and undercuts the possibility of substantially investigating how human beings are involved in the making of the world of technology as well as what this world actually means for human experience and action.

Accordingly, STS scholars have argued for a systematic inclusion of human subjectivity in accounts of scientific research practice and technological production. On the basis of detailed empirical analyses of the production of scientific knowledge (Knorr-Cetina, 1981, 1999; Latour & Woolgar, 1986), STS scholarship calls for a notion of science and technology as socially situated processes that can only be adequately grasped through the study of their material, cultural, and subjective entangledness. For this reason, and from its earliest days, STS has questioned the idea of technological determinism, including mechanistic cause-and-effect understandings of the human–technology relationship. Instead, STS scholarship has based its scientific approach on a conception of human beings as subjects and collectives, subject to, but also actively involved in the production of the world of science and technology. As Langdon Winner emphasizes: “By changing the shape of material things ... we also change ourselves. In this process human beings do not stand in the mercy of a great deterministic punch press that cranks out precisely tailored persons at a certain rate during a given historical period. Instead the situation ... is one in which individuals are actively involved in the daily creation and recreation, production and reproduction of the world in which they live” (1989, pp. 14f.). STS acknowledges that the possibility of examining the nature and significance of technological artifacts in human experience, thought, and action requires a careful consideration of the subjective dimension of human life.