

OFFICIAL JOURNAL OF THE PHILOSOPHY OF SCIENCE ASSOCIATION

PHILOSOPHY OF SCIENCE

PROCEEDINGS OF THE 2022 BIENNIAL MEETING
OF THE PHILOSOPHY OF SCIENCE ASSOCIATION
VOLUME 91, NUMBER 5

Part II
Symposia Papers
Edited by
Holly K. Andersen

PSA22

CAMBRIDGE UNIVERSITY PRESS

Philosophy of Science

Editorial Board:

James Owen Weatherall, Editor-in-Chief
H. K. Andersen, Kenny Easwaran, Kevin Elliott,
Doreen Fraser, Marta Halina, Kareem Khalifa,
Alan C. Love, Angela Potochnik, Hannah Rubin,
and Charlotte Werndl, Associate Editors

| | | |
|-------------------------|---------------------------|--------------------|
| Jason McKenzie | Don Howard | Sarah Robins |
| Alexander | Nick Huggett | Jan-Willem Romeijn |
| Anna Alexandrova | Simon Huttegger | Alex Rosenberg |
| Colin Allen | James Joyce | Adina Roskies |
| Jeffrey Barrett | Marc Lange | Lauren Ross |
| Robert Batterman | Sabina Leonelli | Laura Ruetsche |
| William Bechtel | Chuang Liu | Rose-Mary Sargent |
| Gordon Belot | Helen Longino | Brian Skyrms |
| Katherine Brading | Edouard Machery | Chris Smeenk |
| Richard Bradley | Jane Maienschein | Miriam Solomon |
| Matthew Brown | Conor Mayo-Wilson | Mark Sprevak |
| Justin Bruner | Inmaculada de Melo-Martín | P. Kyle Stanford |
| Cameron Buckner | Roberta Millstein | Katie Steele |
| Craig Callender | Sandra Mitchell | Jacob Stegenga |
| Nancy Cartwright | Teru Miyake | Paul Teller |
| Mazviita Chirimuuta | Robert Northcott | Derek Turner |
| Heather Douglas | John Norton | Jos Uffink |
| Stephen Downes | Cailin O'Connor | David Wallace |
| Manuela Fernández Pinto | David Papineau | C. Kenneth Waters |
| Samuel Fletcher | Wendy Parker | Marcel Weber |
| Mathias Frisch | Anya Plutynski | Rob Wilson |
| Alan Hájek | Thomas Polger | James Woodward |
| Stephan Hartmann | Julian Reiss | Julie Zahle |
| Geoffrey Hellman | Alan Richardson | Kevin Zollman |

Managing Editor: Margaret E. Farrell

Governing Board of the Association

President: Michela Massimi, University of Edinburgh
President Elect: Craig Callender, University of California, San Diego
Past President: John Dupré, University of Exeter
Treasurer: Kevin Zollman, Carnegie Mellon University
Secretary: Chris Haufe, Case Western Reserve University

| | |
|----------------|-----------------------|
| Mathias Frisch | Jutta Schickore |
| Lydia Patton | Jacqueline Sullivan |
| Anya Plutynski | Jonathan Tsou |
| Stéphanie Rupy | James Owen Weatherall |

Executive Director: Max Cormendy

Philosophy of Science

Contents

- 1041 *Preface*
HOLLY K. ANDERSEN
- 1043 *The Disunity of Science and the Unity of the World Presidential Address, PSA 2022*
JOHN DUPRÉ
- Symposia Papers*
- 1058 *Strategic Constraints on Interacting Fields: Quantum Chemistry and Organic Chemistry*
WILLIAM GOODWIN
- 1068 *Causal Constraints in the Life and Social Sciences*
LAUREN N. ROSS
- 1078 *On the Role of Erotetic Constraints in Noncausal Explanations*
DANIEL KOSTIĆ
- 1089 *The Insufficiency of Statistics for Detecting Racial Discrimination by Police*
NAFTALI WEINBERGER
- 1098 *Causal Agnosticism About Race: Variable Selection Problems in Causal Inference*
ALEXANDER WILLIAMS TOLBERT
- 1109 *Exploratory Analysis and the Expected Value of Experimentation*
COLIN KLEIN
- 1118 *Rethinking the Conceptual Space for Science in Society after the VFI*
T. Y. BRANCH AND HEATHER DOUGLAS
- 1128 *How to Not Secure Public Trust in Science: Representative Values Versus Polarization and Marginalization*
SOAZIG LE BIHAN
- 1139 *Pandemic science and commercial values: An institutional account of values in science*
MANUELA FERNÁNDEZ PINTO
- 1149 *Structuring Institutions for Responsible and Accountable Science*
HEATHER DOUGLAS
- 1159 *Organizations and Values in Science and Technology*
JUSTIN B. BIDDLE
- 1169 *Minority Reports: Registering Dissent in Science*
HAIXIN DANG
- 1179 *Social Dynamics and the Evolution of Disciplines*
KEKOA WONG AND HANNAH RUBIN
- 1189 *Better than Best: Epistemic Landscapes and Diversity of Practice in Science*
JINGYI WU

- 1199 *Structural Microaggressions for Explaining Outcome Gaps*
MIKIO AKAGI
- 1210 *Against Defending Science: Asking Better Questions About Indigenous Knowledge and Science*
EMILY C. PARKE AND DANIEL HIKUROA
- 1221 *Transdisciplinary Philosophy of Science: Meeting the Challenge of Indigenous Expertise*
DAVID LUDWIG, CHARBEL N. EL-HANI, FABIO GATTI, CATHERINE KENDIG, MATTHIAS KRAMM, LUCIA NECO, ABIGAIL NIEVES DELGADO, LUANA POLISELI, VITOR RENCK, ADRIANA RESSIORE C., LUIS REYES GALINDO, THOMAS LLOYD RICKARD, GABRIELA DE LA ROSA, JULIA J. TURSKA, FRANCISCO VERGARA-SILVA AND ROBERT A. WILSON
- 1232 *Dark Energy or Modified Gravity?*
CHRIS SMEENK AND JAMES OWEN WEATHERALL
- 1242 *Equivalence and Convention*
NEIL DEWAR
- 1251 *Against Quantitative Primitivism*
ZEE R. PERRY
- 1262 *Torsion in the Classical Spacetime Context*
HELEN MESKHIDZE AND JAMES OWEN WEATHERALL
- 1274 *The Conventionality of Real-Valued Quantities*
MARISSA BENNETT AND MICHAEL E. MILLER
- 1285 *Toward a new phase of Du Châtelet scholarship: From Institutions de Physique (1740) to Institutions Physiques (1742)*
QIU LIN
- 1296 *Hume's Externalist Gambit*
HAYLEY CLATTERBUCK
- 1306 *Resolving Debates about Scientific Realism: The Challenge from Stances*
ANJAN CHAKRAVARTTY
- 1316 *Navigating in the Dark*
AMÉLIE GODARD PALLUET AND MARIE GUEGUEN
- 1327 *A New Heuristic for Climate Adaptation*
KATE NICOLE HOFFMAN AND KAREN KOVAKA
- 1338 *Is Data Science Transforming Biomedical Research? Evidence, Expertise, and Experiments in COVID-19 Science*
SABINA LEONELLI
- 1349 *Concepts of Actionability in Precision Oncology*
BENJAMIN CHIN-YEE AND ANYA PLUTYNSKI
- 1361 *What is the Replication Crisis a Crisis Of?*
ULJANA FEEST
- 1372 *The Psychologist's Green Thumb*
SOPHIA CRÜWELL
- 1382 *Where memory resides: Is there a rivalry between molecular and synaptic models of memory?*
DAVID COLAÇO AND JONATHAN NAJENSON
- 1393 *Evolutionary Transitions in Individuality and Life Cycle Closure*
GUILHEM DOULCIER, PETER TAKACS AND PIERRICK BOURRAT
- 1404 *Modeling Scaffolded Development into the Adjacent Possible Environment*
JAMES GRIESEMER
- 1415 *The Coevolution of Descriptive and Evaluative Beliefs in Aldo Leopold's Thinking*
ROBERTA L. MILLSTEIN
- 1425 *From Fitness-Centered to Trait-Centered Explanations: What Evolutionary Transitions in Individuality Teach Us About Fitness*
PETER TAKACS, GUILHEM DOULCIER AND PIERRICK BOURRAT

- 1435 *Goal Directedness and the Field Concept*
GUNNAR BABCOCK AND DANIEL W. MCSHEA
- 1445 *Do Machine Learning Models Represent Their Targets?*
EMILY SULLIVAN
- 1456 *The Propositional Account of Effective Theories*
ISAAC WILHELM
- 1467 *Path-Dependence in Measurement: A Problem for Coherentism*
MORGAN THOMPSON
- 1478 *The Representational Role of Sophisticated Theories*
CLARA BRADLEY
- 1488 *An Exploration of Parameter Duality in Statistical Inference*
SUZANNE THORNTON AND MINGE XIE
- 1498 *Bamboozled by Bonferroni*
CONOR MAYO-WILSON

Philosophy of Science (ISSN 0031-8248) is published January, April, July, October, and December by Cambridge University Press, One Liberty Plaza, New York, NY 10006, USA/Cambridge University Press, University Printing House, Shaftesbury Road, Cambridge CB2 8BS, UK.

Periodicals postage paid a New York, NY, and at additional mailing points.

Postmaster: Send address changes in the USA, Canada, and Mexico to *Philosophy of Science*, Cambridge University Press, Journals Fulfillment Department, One Liberty Plaza, 20th floor, New York, NY 10006. Send address changes elsewhere to *Philosophy of Science*, Cambridge University Press, Journals Fulfillment Department, UPH, Shaftesbury Road, Cambridge CB2 8BS, England.

Membership and Subscription Rates

Individual members of the PSA receive a subscription to the journal. Membership rates for 2024 are tiered based on income and start at \$36 print + electronic, \$27 e-only. To join the PSA visit: <https://philsci.org/membership.php>. Institutional print + electronic and e-only subscription rates are tiered according to an institution's type and research output: £261/\$363 to £534/\$738 print + electronic, £202/\$280 to £405/\$561 e-only. Institutional print-only is £295/\$405. Additional taxes may apply. Free or deeply discounted access is available for many institutions through Cambridge University Press's developing world country programme: <https://www.cambridge.org/core/services/librarians/developing-country-programme>. For additional rates, and any other subscription queries, please contact: journals@cambridge.org.

Copying Beyond Fair Use

Articles may be copied or otherwise reused without permission only to the extent permitted by Sections 107 and 108 of the US Copyright Law. Permission to copy articles for personal, internal, classroom, or library use may be obtained from the Copyright Clearance Center (<http://www.copyright.com/>). For all other uses, such as copying for general distribution, for advertising or promotional purposes, for creating new collective works, or for resale, please contact permissions@cambridge.org. Articles in the public domain may be used without permission, but it is customary to contact the author.

Articles appearing in *Philosophy of Science* are abstracted or indexed in Arts and Humanities Citation Index, Biological Abstracts, Bulletin Signalétique 519, Current Contents/Arts and Humanities, Current Contents/Social and Behavioral Sciences, Current Index to Statistics, Humanities Index, Index to Book Reviews in the Humanities, Isis Critical Bibliography, Language & Language Behavior Abstracts, Mathematical Reviews, Philosopher's Index, Philosophic, Psychological Abstracts, Répertoire Bibliographique de la Philosophie, Social Sciences Citation Index, Sociological Abstracts.

© 2024 by Philosophy of Science Association. All rights reserved.

Printed by Sheridan, a CJK Group Company.