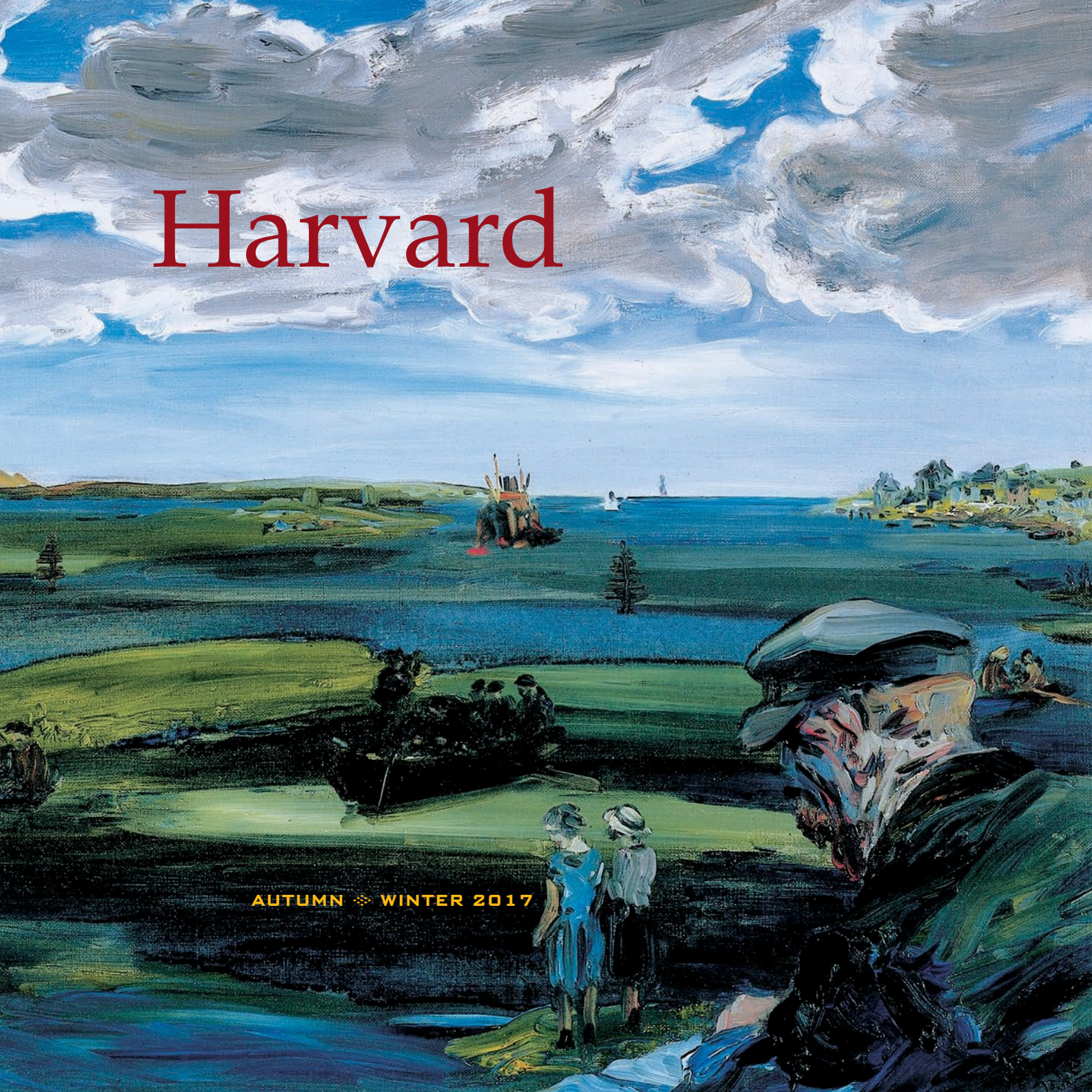
Harvard

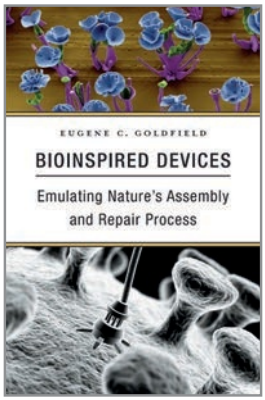


AUTUMN ✣ WINTER 2017

Bioinspired Devices

Emulating Nature's Assembly and Repair Process

Eugene C. Goldfield



Robotic exoskeletons that allow stroke survivors to regain use of their limbs, 3D-printed replacement body parts, and dozens of other innovations still in schematic design are revolutionizing the treatment of debilitating injuries and nervous system disorders. What all these technologies have in common is that they are modeled after engineering strategies found in nature—strategies developed by a vast array of organisms over eons of evolutionary trial and error.

Bioinspired Devices lays out many principles of engineering found in the natural world, with a focus on how evolutionary and developmental adaptations such as sensory organs and spinal cords function within complex organisms. Eugene Goldfield shows how the components of highly coordinated structures organize themselves into autonomous functional systems. This self-organizing capacity is just one of many qualities that allow biological systems to be robust, adaptive, anticipatory, and self-repairing. To exploit the potential of technologies designed to interact seamlessly with human bodies, properties like these must be better understood and harnessed at every level, from molecules to cells to organ systems. Goldfield offers an insider's view of cutting-edge research, and envisions a future in which synthetic and biological devices share energy sources and control, blurring the boundary between nature and medicine.

Eugene C. Goldfield is Associate Professor of Psychology in Psychiatry at Boston Children's Hospital, Harvard Medical School, and Associate Faculty at the Wyss Institute for Biologically Inspired Engineering at Harvard University.

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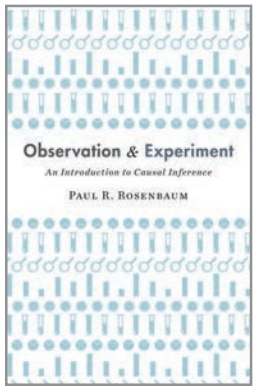
Observation and Experiment

An Introduction to Causal Inference

Paul R. Rosenbaum

"A carefully and precisely written treatment of its subject, reflecting superb statistical understanding."
—Stephen M. Stigler



In the face of conflicting claims about some treatments, behaviors, and policies, the question arises: What is the most scientifically rigorous way to draw conclusions about cause and effect in the study of humans? *Observation and Experiment* is an introduction to causal inference from one of the field's leading scholars. Using minimal mathematics and statistics, Paul Rosenbaum explains key concepts and methods through real-world examples that make complex ideas concrete and abstract principles accessible.

Some causal questions can be studied in randomized trials in which coin flips assign individuals to treatments. But because randomized trials are not always practical or ethical, many causal questions are investigated in nonrandomized observational studies. To illustrate, Rosenbaum draws examples from clinical medicine, economics, public health, epidemiology, clinical psychology, and psychiatry. Readers gain an understanding of the design and interpretation of randomized trials, the ways they differ from observational studies, and the techniques used to remove, investigate, and appraise bias in observational studies. *Observation and Experiment* is a valuable resource for anyone with a serious interest in the empirical study of human health, behavior, and well-being.

Paul R. Rosenbaum is Robert G. Putzel Professor of Statistics at the Wharton School and a Senior Fellow of the Leonard Davis Institute of Health Economics, University of Pennsylvania.

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