

Cambridge University Press

978-1-107-04317-6 - Science and Human Experience: Values, Culture, and the Mind

Leon N Cooper

Frontmatter

[More information](#)

SCIENCE AND HUMAN EXPERIENCE



Does science have limits? Where does order come from?
Can we understand consciousness?

Written by Nobel Laureate Leon N Cooper, this book places pressing scientific questions in the broader context of how they relate to human experience.

Widely considered to be a highly original thinker, Cooper has written and given talks on a large variety of subjects, ranging from the relationship between art and science, possible limits of science, to the relevance of the Turing test. These essays and talks have been brought together for the first time in this fascinating book, giving readers an opportunity to experience Cooper's unique perspective on a range of subjects.

Tackling a diverse spectrum of topics, from the conflict of faith and science to whether understanding neural networks could lead to machines that think like humans, this book will captivate anyone interested in the interaction of science with society.



Leon N Cooper is the Thomas J. Watson Senior Professor of Science at Brown University and Director of the Institute for Brain and Neural Systems. He has received numerous awards and prizes for his scientific achievements, most notably the 1972 Nobel Prize in Physics (with J. Bardeen and J. R. Schrieffer) for his studies on the theory of superconductivity.

Cambridge University Press

978-1-107-04317-6 - Science and Human Experience: Values, Culture, and the Mind

Leon N Cooper

Frontmatter

[More information](#)

Rembrandt Harmenszoon van Rijn, *Doctor Faustus* (1652).

Cambridge University Press

978-1-107-04317-6 - Science and Human Experience: Values, Culture, and the Mind

Leon N Cooper

Frontmatter

[More information](#)

“This is a fascinating melange of essays on topics ranging from the question of fraud in science to Euclidean geometry and the ‘neural-network’ approach to brain research. Cooper’s characteristic combination of lucidity and common sense had me nodding in enthusiastic agreement on just about every page.”

Anthony Leggett

Nobel Laureate

“From black body radiation to brain circuitry; from Copenhagen to consciousness – this well-curated set of essays crackles with bracing insights about science, and about the world that science strives to fathom. An almost hushed voice (often with a slightly jocular tinge), marshaling volumes of data into an abruptly well-ordered, breathtakingly lucid condensate: that’s Leon Cooper in a nutshell.”

Richard Granger

Dartmouth College

“As a scientist and a humanist, Cooper is well-versed in philosophy, literature, art, and the practicalities of making science serve humanity, as opposed to being in thrall to special interests. His intellectual open-mindedness and compelling prose style make *Science and Human Experience* a thought-provoking pleasure to read.”

Peter Byrne

Author of *The Many Worlds of Hugh Everett III: Multiple Universes, Mutual Assured Destruction, and the Meltdown of a Nuclear Family*

Cambridge University Press
978-1-107-04317-6 - Science and Human Experience: Values, Culture, and the Mind
Leon N Cooper
Frontmatter
[More information](#)

Cambridge University Press

978-1-107-04317-6 - Science and Human Experience: Values, Culture, and the Mind

Leon N Cooper

Frontmatter

[More information](#)

SCIENCE AND HUMAN EXPERIENCE VALUES, CULTURE, AND THE MIND



Leon N Cooper

Brown University



CAMBRIDGE
UNIVERSITY PRESS

Cambridge University Press
978-1-107-04317-6 - Science and Human Experience: Values, Culture, and the Mind
Leon N Cooper
Frontmatter
[More information](#)

CAMBRIDGE
UNIVERSITY PRESS

University Printing House, Cambridge CB2 8BS, United Kingdom

Cambridge University Press is part of the University of Cambridge.

It furthers the University's mission by disseminating knowledge in the pursuit of education, learning and research at the highest international levels of excellence.

www.cambridge.org

Information on this title: www.cambridge.org/9781107043176

© L. Cooper 2014

This publication is in copyright. Subject to statutory exception and to the provisions of relevant collective licensing agreements, no reproduction of any part may take place without the written permission of Cambridge University Press.

First published 2014

Printed in the United States by Sheridan Books, Inc.

A catalogue record for this publication is available from the British Library

Library of Congress Cataloguing in Publication data

Cooper, Leon N, 1930– author.

[Essays. Selections]

Science and human experience : values, culture and the mind / Leon N Cooper.
pages cm

Includes bibliographical references and index.

ISBN 978-1-107-04317-6 (hardback)

1. Science – Social aspects. I. Title.

Q175.5.C664 2014

303.48'3 – dc23 2014012953

ISBN 978-1-107-04317-6 Hardback

Cambridge University Press has no responsibility for the persistence or accuracy of URLs for external or third-party internet websites referred to in this publication, and does not guarantee that any content on such websites is, or will remain, accurate or appropriate.

Cambridge University Press

978-1-107-04317-6 - Science and Human Experience: Values, Culture, and the Mind

Leon N Cooper

Frontmatter

[More information](#)

To

Michael, Liam, Nico and Manisha

May your world be a happy place

Cambridge University Press
978-1-107-04317-6 - Science and Human Experience: Values, Culture, and the Mind
Leon N Cooper
Frontmatter
[More information](#)

Cambridge University Press

978-1-107-04317-6 - Science and Human Experience: Values, Culture, and the Mind

Leon N Cooper

Frontmatter

[More information](#)

CONTENTS

*Preface* xi*Acknowledgement* xiii**Part One · Science and Society**

- 1 · Science and Human Experience 3
- 2 · Does Science Undermine our Values? 24
- 3 · Can Science Serve Mankind? 37
- 4 · Modern Science and Contemporary Discomfort:
Metaphor and Reality 41
- 5 · Faith and Science 57
- 6 · Art and Science 59
- 7 · Fraud in Science 64
- 8 · Why Study Science? The Keys to the Cathedral 68
- 9 · Is Evolution a Theory? A Modest Proposal 70
- 10 · The Silence of the Second 73
- 11 · Introduction to *Copenhagen* 76
- 12 · The Unpaid Debt 79

Part Two · Thought and Consciousness

- 13 · Source and Limits of Human Intellect 87
- 14 · Neural Networks 109
- 15 · Thought and Mental Experience: The Turing Test 114
- 16 · Mind as Machine: Will We Rubbish Human Experience? 124
- 17 · Memories and Memory: A Physicist's Approach
to the Brain 132
- 18 · On the Problem of Consciousness 148

Part Three · On the Nature and Limits of Science

19 · What Is a Good Theory?	155
20 · Shall We Deconstruct Science?	158
21 · Visible and Invisible in Physical Theory	170
22 · Experience and Order	177
23 · The Language of Physics: On the Role of Mathematics in Science	188
24 · The Structure of Space	198
25 · Superconductivity and Other Insoluble Problems	218
26 · From Gravity and Light to Consciousness: Does Science Have Limits?	225

PREFACE



The essays in this collection are taken from articles and lectures that I have written or delivered over many years – some of which I hadn't looked at in quite a while. Putting them together I am struck by the recurrence of certain themes. This shouldn't be surprising since I have been thinking about these subjects for a long time. They occur in somewhat different contexts and reflect the evolution of my thoughts on the relation of science to other human activities.

Since some of the articles were written years ago, I have occasionally included footnotes to update matters where the situation has dramatically changed; but otherwise I have pretty much left things the way they were because that was the way I thought about them at the time.

What is more problematic is that in the originals there are paragraphs and even sections that are repeated from one article to the next. As with itinerant actors and musicians over the centuries, each performance is pieced together from those that have come before – self-plagiarism. But each is presented in a new package and sometimes the package is as interesting as the content.

So I've deleted extended repetitions; also in some of the essays I have excised sections that, in my opinion, don't contribute to the main line of thought and, sometimes, are discussed in other essays.

However, in some cases a few paragraphs are so integral to the argument that I have decided to leave them even though they do repeat what was said before. I imagine that many readers will pick

Cambridge University Press

978-1-107-04317-6 - Science and Human Experience: Values, Culture, and the Mind

Leon N Cooper

Frontmatter

[More information](#)

among the essays so that it seems reasonable to include some repetitions to make each complete by itself. For those intrepid few who begin with the first and read through to the last, I can only express my apologies and counsel a willingness to skip the paragraph or two that they have read before.

What we have here, therefore, is a collection of my thoughts as they were and as they have evolved over many years. I've tried to put them into a sequence that makes some sense but, inevitably, one does jump from one topic to another. I hope that these essays illuminate some of my thinking on a variety of subjects concerning the meaning of science and its relation to other human endeavors.

Cambridge University Press

978-1-107-04317-6 - Science and Human Experience: Values, Culture, and the Mind

Leon N Cooper

Frontmatter

[More information](#)

ACKNOWLEDGEMENT



I would like to express my appreciation to Nicholas Gibbons, Lindsay Stewart, and the other members of the editorial team of Cambridge University Press for their assistance in editing and preparing this manuscript. I would also like to thank Pete Bilderback for his invaluable editorial, administrative, and organizational efforts as well as for his help in designing the cover.