

ON DISCOVERY

How is new knowledge produced in the social, natural, and biomedical sciences? What is the role of serendipity versus planning? How has technology changed knowledge production, from AI to large datasets? This book presents insights into the pursuit of new knowledge from fields as diverse as medicine, engineering, linguistics, and theology. Over 20 researchers and scientists describe the modalities of discovery in their disciplines, offering a diverse survey of the social norms and politics of knowledge. Written in nontechnical language, this collection is designed to make research practices from widely different domains comprehensible to each other. A generative synthesis in the final chapter offers new insights into how discovery happens and its consequences for science and society. *On Discovery* will be essential reading for anyone interested in the social, historical, and philosophical dimensions of knowledge production.

JONATHAN JANSEN is a Distinguished Professor of Education at Stellenbosch University, South Africa, and the past president of the Academy of Science of South Africa. He is a curriculum theorist with work on the politics of knowledge in schools and universities.

ON DISCOVERY

How Knowledge Is Produced across the Disciplines

EDITED BY
JONATHAN JANSEN
Stellenbosch University



CAMBRIDGE
UNIVERSITY PRESS

Cambridge University Press & Assessment

978-1-009-59658-9 — On Discovery

Edited by Jonathan Jansen

Frontmatter

[More Information](#)



CAMBRIDGE
UNIVERSITY PRESS

Shaftesbury Road, Cambridge CB2 8EA, United Kingdom

One Liberty Plaza, 20th Floor, New York, NY 10006, USA

477 Williamstown Road, Port Melbourne, VIC 3207, Australia

314-321, 3rd Floor, Plot 3, Splendor Forum, Jasola District Centre, New Delhi – 110025, India

103 Penang Road, #05-06/07, Visioncrest Commercial, Singapore 238467

Cambridge University Press is part of Cambridge University Press & Assessment,
a department of the University of Cambridge.

We share the University's mission to contribute to society through the pursuit of
education, learning and research at the highest international levels of excellence.

www.cambridge.org

Information on this title: www.cambridge.org/9781009596589

DOI: 10.1017/9781009596541

© Cambridge University Press & Assessment 2025

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 & Assessment.

When citing this work, please include a reference to the DOI 10.1017/9781009596541

First published 2025

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

A Cataloging-in-Publication data record for this book is available from the Library of Congress

ISBN 978-1-009-59658-9 Hardback

ISBN 978-1-009-59659-6 Paperback

Cambridge University Press & Assessment 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.

Contents

<i>List of Figures</i>	<i>page</i> vii
<i>List of Tables</i>	viii
<i>List of Contributors</i>	ix
<i>Editor’s Note on the Text</i>	xi
1 On the Question of Discovery <i>Jonathan Jansen</i>	I
2 Physics: Extracting Meaning from Models <i>Irvy Gledhill</i>	20
3 Philosophy: Making Philosophical Discoveries <i>Thaddeus Metz</i>	35
4 Psychology: Discovery, Solidarity and Politics in Psychology <i>Leslie Swartz</i>	47
5 Biochemistry: Creating New Knowledge in the Field of Applied Biochemistry <i>Stephanie Burton</i>	58
6 Astronomy: Discovering the Stars <i>Justin Jonas</i>	70
7 Dentistry: Extracting Knowledge from Communities <i>Stephen James Heinrich Hendricks</i>	81
8 Surgery: What the Hands Know <i>Elmi Muller</i>	91
9 Theology: Surfacing after Being Swallowed in the Book of Jonah <i>Juliana Claassens</i>	108

vi	<i>Contents</i>	
10	Architecture: Authority, Identity, and Place in Knowledge Creation <i>Philippa Tumubweinee</i>	119
11	Palaeontology: The Knowledge in the Bones <i>Anusuya Chinsamy Turan</i>	129
12	Music: On Performing and Discovering Mozart <i>Stephanus Muller</i>	140
13	Law: Three Graces – Certainty, Originality, and Justice <i>Daniel Visser</i>	150
14	Genetics: Discovering Human Origins through DNA <i>Himla Soodyall</i>	169
15	Classics: Inventio – Archimedes, Cicero and Me <i>Grant Parker</i>	185
16	Archaeology: Disaggregation and Fragmentation of Knowledge <i>Innocent Pikirayi</i>	202
17	History: Discovering Social Histories from the Provinces <i>Neil Roos</i>	212
18	Linguistics: Discovery in Language and Linguistic Research <i>Rajend Mesthrie</i>	226
19	Public Health: Following the Data to Save Lives <i>Quarraisha Abdool Karim</i>	236
20	Engineering: The Search for a Black Cat in a Dark Room <i>Thokozani Majozi</i>	244
21	Microbiology: Discovering Microbes <i>Thulani Makhalanyane</i>	255
22	Conclusion: Discovering New Knowledge – An Integrative Synthesis <i>Jonathan Jansen</i>	265
	<i>Index</i>	290

Figures

1.1	Overview of the sampled disciplines.	page 17
8.1	Ring retractor.	99
8.2	Kidney in abdominal swab.	100
9.1	John B. Flannagan, <i>Jonah and the Whale: Rebirth Motif</i> .	114
9.2	Cosimo Miorelli, “Stranded.”	115
9.3	Bonnie Ntshalintshali, <i>Jonah and the Whale</i> .	116
9.4	Ardmore commemorative ewer sculpted by Sfiso Mvelase and painted by Elvis Mkhize.	117
12.1	Wolfgang Amadeus Mozart, Piano Sonata in A Minor (KV310).	141
13.1	Example of a medieval manuscript of Justinian’s <i>Corpus Iuris Civilis</i> .	158
20.1	The solution with a flaw in the scheduling of multi-purpose batch plants.	250
20.2	The optimum solution in the scheduling of multi-purpose batch plants.	251
20.3	Comparison of optimal and predicted time points.	252
21.1	Discovery pathways in microbiome science.	260

Table

18.1	Loanword realization in Fanakalo and two Indian languages of KZN	<i>page</i> 231
------	--	-----------------

Contributors

- QUARRAISHA ABDOOL KARIM, Centre for the AIDS Programme of Research in South Africa, Durban, South Africa
- STEPHANIE BURTON, University of Pretoria, Pretoria, South Africa
- ANUSUYA CHINSAMY TURAN, University of Cape Town, Cape Town, South Africa
- JULIANA CLAASSENS, Stellenbosch University, Stellenbosch, South Africa
- IRVY GLEDHILL, University of the Witwatersrand, Johannesburg, South Africa
- STEPHEN JAMES HEINRICH HENDRICKS, Sefako Makgatho University, Pretoria, South Africa
- JONATHAN JANSEN, Stellenbosch University, Stellenbosch, South Africa
- JUSTIN JONAS, Rhodes University, Makhanda, South Africa
- THOKOZANI MAJOZI, University of the Witwatersrand, Johannesburg, South Africa
- THULANI MAKHALANYANE, Stellenbosch University, Stellenbosch, South Africa
- RAJEND MESTHRIE, University of Cape Town, Cape Town, South Africa
- THADDEUS METZ, University of Pretoria, Pretoria, South Africa
- ELMI MULLER, Stellenbosch University, Stellenbosch, South Africa
- STEPHANUS MULLER, Stellenbosch University, Stellenbosch, South Africa
- GRANT PARKER, Stanford University, Stanford, USA, and Stellenbosch University, Stellenbosch, South Africa

INNOCENT PIKIRAYI, University of Pretoria, Pretoria, South Africa

NEIL ROOS, University of Fort Hare, Alice, South Africa

HIMLA SOODYALL, Academy of Science of South Africa, Pretoria,
South Africa

LESLIE SWARTZ, Stellenbosch University, Stellenbosch, South Africa

PHILIPPA TUMUBWEINEE, University of Cape Town, Cape Town,
South Africa

DANIEL VISSER, University of Cape Town, Cape Town, South Africa

Editor's Note on the Text

The word “Colored” is used with great reservation. It is a political classification that gained legal status and social import as an everyday separator between whites and Africans. The consequences have been devastating for relationships across these stigmatizing categories. That said, I recognize that “race is an enduring fiction that draws real blood” and that to ignore its operations in society without further commentary is to sustain its value for those invested in difference.

Words of Robin Kelley reflecting on the book of Jeff Chang, *We Gon’ Be Alright: Notes on Race and Segregation* (Picador, 2016).