

The Chemical Philosophy of Robert Boyle

*Mechanicism, Chymical Atoms,
and Emergence*

MARINA PAOLA BANCHETTI-ROBINO

OXFORD
UNIVERSITY PRESS

OXFORD
UNIVERSITY PRESS

Oxford University Press is a department of the University of Oxford. It furthers the University's objective of excellence in research, scholarship, and education by publishing worldwide. Oxford is a registered trade mark of Oxford University Press in the UK and certain other countries.

Published in the United States of America by Oxford University Press
198 Madison Avenue, New York, NY 10016, United States of America.

©Oxford University Press 2020

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, without the prior permission in writing of Oxford University Press, or as expressly permitted by law, by license, or under terms agreed with the appropriate reproduction rights organization. Inquiries concerning reproduction outside the scope of the above should be sent to the Rights Department, Oxford University Press, at the address above.

You must not circulate this work in any other form
and you must impose this same condition on any acquirer.

Library of Congress Cataloging-in-Publication Data
[To come]
ISBN 978-0-19-750250-1

1 3 5 7 9 8 6 4 2

Printed by, [To come]

Contents

| | |
|--|-----|
| <i>Preface</i> | ix |
| <i>Introduction: The Continuing Significance of Boyle's Chemical Philosophy</i> | 1 |
| 1 Chemical Philosophy in the 16th and 17th Centuries: Vitalism, Paracelsian Alchemy, and Aristotelian Hylomorphism | 8 |
| 1.1 The Vitalistic Character of Renaissance Alchemy | 11 |
| 1.2 The Scholastic Theory of Substantial Form | 13 |
| 1.3 Paracelsian Spagyria and the <i>Tria Prima</i> | 16 |
| 1.4 <i>Semina Rerum, Minima Naturalia</i> , and Vitalistic Corpuscularianism | 20 |
| 1.5 Daniel Sennert's Structural Hylomorphism and Atomicity as a "Negative-Empirical" Concept | 26 |
| 1.6 Jan Baptista van Helmont and the Chemical Interpretation of Spirit and Ferment | 34 |
| 2 Chemical Philosophy vs. Rationalistic Mechanicism: The Heuristic Limits of Cartesianism for Chemistry | 45 |
| 2.1 The Cartesian Rejection of Substantial Forms | 45 |
| 2.2 Pierre Gassendi and the Reformation of Epicurean Atomism | 47 |
| The Limitations of the Cartesian Project for Chemistry and Chemical Philosophy | 51 |
| 2.4 Mechanistic Corpuscularianism and Experimental Natural Philosophy | 60 |
| 2.5 Boyle's Relation to the Cartesian Project in Natural Philosophy | 69 |
| 2.6 The Negative and Positive Heuristic Functions of the Mechanical Philosophy in Boyle's Scientific Research Programme | 73 |
| 3 The Ontological Complexity of Boyle's Corpuscular Theory: Microstructure, Natural Kinds, and Essential Form | 79 |
| 3.1 <i>The Sceptical Chymist</i> : Against Scholastics and Spagyrist | 84 |
| 3.2 Boyle's Corpuscular Theory of Matter | 84 |
| 3.3 Composition vs. Microstructure | 90 |
| 3.4 Taxonomical Classification, Natural Kinds, and Essential Form | 99 |
| 3.5 The Empirical Nature of Essential Form: The Reduction to the Pristine State | 104 |
| 4 Boyle's View of Chemical Properties as Dispositional, Relational, and Emergent Properties | 109 |
| 4.1 The Hierarchy of Properties in Boyle's Chemical Ontology | 110 |

Vi CONTENTS

| | |
|--|-----|
| 4.2 Sensible Properties as Dispositional and Relational | 113 |
| 4.3 Chemical Properties as Dispositional and Relational | 121 |
| 4.4 Chemical Properties as Emergent and Supervenient | 130 |
| 4.5 Supervenience, Non-Summative Difference, and Underdetermination | 138 |
| 4.6 Cosmical Qualities as Dispositional and Relational Properties | 139 |
| 5. The Relation between Parts and Wholes: The Complex Mereology of Chymical Atoms | 146 |
| 5.1 Boylean Chymistry as Mereological | 147 |
| 5.2 Continuous vs. Contiguous Integral Wholes | 151 |
| 5.3 Integral Parts and Essential Parts | 153 |
| 5.4 Aquinas, Abelard, and Boyle on Substantial Unity | 154 |
| 5.5 The Mereology of Boylean Chymical Atoms as Chemically Elementary Entities | 156 |
| 5.6 A Brief Excursion into the Mereology of Epicurean Semantics | 163 |
| <i>Conclusion: The Relevance of Boyle for Contemporary Philosophy of Chemistry</i> | 168 |
| <i>Bibliography</i> | 173 |
| <i>Index</i> | 191 |