Designs for Life

Molecular biology has come to dominate our perceptions of life, health and disease. In the decades following World War II, the Medical Research Council Laboratory of Molecular Biology at Cambridge became a world-renowned centre of this emerging discipline. It was here that Crick and Watson, Kendrew and Perutz, Sanger and Brenner pursued their celebrated investigations. Soraya de Chadarevian's important new study is the first to examine the creation and expansion of molecular biology through the prism of this remarkable institution. Firmly placing the history of the laboratory in the postwar context, the author shows how molecular biology was built at the bench and through the wide circulation of tools, models and researchers, as well as in governmental committees, international exhibitions and television studios. *Designs for Life* is a major contribution both to the history of molecular biology, and to the history of science and technology in postwar Britain.

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Designs for Life

Molecular Biology after World War II

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Soraya de Chadarevian

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For Livia and Flavia

Contents

Figures

Tables

Preface

Especially in the summer months, when I approach the neo-gothic archway of the Cavendish building which, from Free School Lane, leads to one of the central laboratory sites of the University of Cambridge as well as to my office, a group of tourists often crowds the entrance. While I slowly push my bike around the group, the local tourist guide unfailingly pronounces the names of James Watson and Francis Crick, two scientists in a long series of Nobel Prize winners who made this place a memorable site. The two researchers, one American, one British, 'unveiled' here the double helical structure of DNA, the 'stuff' from which our genes are made. The next stop of the guided tour is just down the road and across the street to the Eagle, the pub where the two scientists celebrated their breakthrough discovery.

Invariably these encounters intrigue me. This book is my attempt to explain how molecular biology has become a landmark on our cultural map. Like the tourist trail it leads to Cambridge, yet not just to follow in Watson and Crick's footsteps, but to understand, through an in-depth study of one of the world's centres of the field, how molecular biology took shape in the postwar years.

Acknowledgements

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Research started on a Unit Project set up by Harmke Kamminga and Andrew Cunningham at the Wellcome Unit for the History of Medicine at the University of Cambridge. Without their initiative and their decision to recruit me for the project I might never have moved from nineteenth- to late twentieth-century history. From 1991 to 1996 (with some brief interruptions) the Wellcome Trust generously funded the project. A brief spell on a 'poste rouge' of the CNRS at La Villette in Paris in spring/summer 1995 brought the chance for some comparative work in the archives. From January till October 1997 funding came from the Hamburg Institute for Social Research. A generous grant from the Laboratory of Molecular Biology and the continuing hospitality of the Department of History and Philosophy of Science at Cambridge allowed me to complete the manuscript. I am grateful to all these institutions and for the help and support of many colleagues and friends. In Cambridge my thanks extend to all staff, although Nick Jardine, Simon Schaffer, Jim Secord and Nick Hopwood have been most involved in the different phases of the work. In Paris John Krige, Dominique Pestre, Jean-Paul Gaudillière, Ilana Löwy and Patrice Pinell offered work space, friendship and many useful discussions. In Hamburg I thank Paula Bradish, Regine Kolleck and Jens Lachmund for endless conversations on my monthly visits. For the later phase of my work at Cambridge special thanks go to Richard Henderson and the History, Archive and Library Committee of the Laboratory of Molecular Biology for unconditional support and complete freedom in completing work on the book, and to Peter Lipton for welcoming me as research associate and affiliated lecturer in the department.

Work on the book would not have been possible without the help of many librarians and archivists who retrieved and granted access to archival holdings (often specially lifting existing restrictions) and without the generous collaboration of numerous participants who agreed to be interviewed and who made their private archives available to me. For their substantial help with archival research I would like to mention in particular Elisabeth Leedham-Green at the University Archives in Cambridge; Mary Nicholas and later Alexandra McAdam Clark and Phillip Thoms at the Medical Research Council; Margaret Brown and later Kirsty Knott at the Laboratory of Molecular Biology in Cambridge; Colin Harris and Steven Tomlinson at the Bodleian Library, Western Manuscripts Room; Denise Ogilvie and Madeleine Brumerie at the Pasteur Institute; Thomas Rosenbaum at the Rockefeller Foundation Archives and Christopher Booth who wrote a decisive letter. More specific acknowledgements are given at particular places in the text.

For granting interviews (in some cases several ones), engaging in long telephone conversations, answering my many questions in writing, providing papers or photographic material from their personal collections (many did all of that) I thank: Uli Arndt, Antony Barrington Brown, David Blow, Sydney Brenner, Robert Bud and his assistants at the Science Museum, Francis Crick, Robert Diamond, Richard Dickerson, Rita Fishpool, Mick Fordham, Michael Fuller, Sandy Geis, John Gray, Freddie Gutfreund, Brian Hartley, Richard Henderson, Jonathan Hodgkin, David Hopwood, Hugh Huxley, Vernon Ingram, Bernard Katz, John Kendrew, Richard Keynes, Annette Lenton, Joan Mason, Hilary Muirhead, Ann Newmark, Leslie Orgel, Peter Pauling, Richard Perham, Max Perutz, Philip Randle, Paul Rayner, Alexander Rich, Martin Richards, Fred Sanger, Eileen Southgate, John Spice, Bror Strandberg, John Sulston, David Wheeler, Maurice Wilkes, Elie Wollmann and Tony Woollard.

Sadly, some of the people just mentioned to whom I owe much gratitude are not here anymore. Among these are, in particular, John Kendrew who supported the project from its very inception, and Margaret Brown who, on her own initiative, had started creating an archive of the institution, the LMB in Cambridge, in which for over twenty years she had served as the director's secretary.

All along, friends, colleagues, students and family, at home and abroad, have helped with comments, reading drafts, offering encouragement and keeping up my spirits. Robert Olby has offered continuous support throughout the project; he also read and commented on substantial parts of the manuscript. Conferences and an exhibition organised with Harmke

Kamminga, Jean-Paul Gaudillière, Nick Hopwood and Bruno Strasser helped in focussing questions and clarifying issues, as did discussions with colleagues at seminars and conferences where I presented my work. Among those not yet mentioned who have followed this work over several years and have helped it along in many ways were especially Pnina Abir-Am, Angela Creager, Lily Kay (now sorely missed) and Hans-Jörg Rheinberger. Nearer to home Jim Secord was always approachable and exceptionally helpful. He also volunteered to read the whole manuscript, as did Nick Hopwood with an earlier draft, and Richard Henderson, Mark Bretscher and John Finch. Their comments and critique as well as encouragement were invaluable. Single chapters or larger parts of the manuscript were read by Jon Agar, Mary Croarken, Jean-Paul Gaudillière, John Krige, Tim Lewens, Ilana Löwy, Sybilla Nikolow, Maria Jesus Santesmases, Simon Schaffer and Mona Singer. They have helped to correct mistakes and sharpen arguments. Any remaining errors are of course my own responsibility. In preparing the photographic material Kirsty Knott of the LMB and Ian Bolton of the Anatomy Department Audio Visual Media Group have been most helpful. Patricia Fara, Annette Faux, Judy Foreshaw, Richard Newbury and Jim Secord helped with the very final work on the manuscript. To all of them my special thanks.

At the Press, my thanks go to Richard Fisher who, as editor of the book, provided the necessary dose of excitement and encouragement for the project and, assisted by Sophie Reed and Teresa Sheppard, successfully guided the manuscript through its different stages; to Frances Brown who gently tweaked some of my not so English sentences into shape and most thoroughly copy-edited the whole text; to Karl Howe who oversaw production; and to Helen Peters who compiled the index. Many thanks also to the three anonymous referees who provided feedback on the book proposal and on a first draft of the book.

Nina de Chadarevian most persistently asked when she would be able to see the book. I thank her for her nagging, Livia and Flavia for distracting me and Michael Cahn for making it all possible.

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Acknowledgements for permission to reproduce photographic material are included in the figure captions. Every reasonable effort has been made to obtain permission to reproduce the figures. In the few cases where the photographers could not be traced, I offer apologies in the hope that they will not be displeased to see their photographs reproduced in this book.

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Chronology

Events in British and international politics (including science policy) mentioned in this book

1935	Establishment of Tizard Committee for the development of radar
September 1938	'Munich crisis': Britain signs non-agresssion pact with Germany; Central Register of scientists and technical personnel for national work in an emergency set up
1939	Beginning of World War II
1940/1	Battle of Britain
1944	British nuclear physicists join the Manhattan Project
May 1945	Capitulation of Germany
July 1945	Labour Party wins general election; Clement Attlee Prime Minister
August 1945	Atomic bombs dropped on Hiroshima and Nagasaki; end of World War II
1947	Britain's atomic bomb project launched; politics of 'nuclear deterrent'
1950–3	Korean War
1951	Festival of Britain; Conservatives win general election
1956	Suez crisis
1957	Sputnik (first artificial satellite) launched by the Soviet Union
1959	Lord Hailsham nominated as first Minister of Science
1962	Cuba missile crisis
1963	Trend Committee reports on the organisation of civil science
1964	Labour Party wins general election on a 'scientific' platform
1971	Rothschild Report on the organisation and management of government R&D
January 1972	Britain signs treaties of accession to European Union; effective January 1973
1979	Conservatives win general election; Margaret Thatcher becomes Prime Minister
1980	Celltech founded

Abbreviations

Archives

AIP	Archives de l'Institut Pasteur
APSL	American Philosophical Society Library, Philadelphia, PA
BBC-WAC	BBC Written Archives Centre, Reading
Bodl. Lib.	Bodleian Library, Oxford (Western Manuscripts)
CUL	Cambridge University Library
LMB Archives	Laboratory of Molecular Biology Archives, Cambridge
MRC Archives	Medical Research Council Archives, London*
RAC	Rockefeller Archive Center North Tarrytown, NY
RI	The Royal Institution of Great Britain, London
RSL	The Royal Society Library, London

Other abbreviations used

CERN	Centre Européen de Recherche Nucléaire
CNRS	Centre National de la Recherche Scientifique
CSP	Council for Scientific Policy
DGRST	Délégation Générale à la Recherche Scientifique et Technique
EDSAC	Electronic Delay Storage Automatic Calculator
EMBC	European Molecular Biology Conference
EMBL	European Molecular Biology Laboratory
EMBO	European Molecular Biology Organisation
ICI	Imperial Chemical Industries
LMB	MRC Laboratory of Molecular Biology
MRC	Medical Research Council
NIH	National Institutes of Health (USA)
NRDC	National Research Development Corporation

* Most MRC files consulted for this book for which the thirty-year rule has lapsed have meanwhile been transferred from MRC Head Office to the Public Record Office at Kew. These can be identified in the Public Record Office online catalogue using the file references given here. 'Vol.' should be replaced by 'pt', e.g. the file reference E243/109, vol. 1 should be entered as E243/109 pt1 (no comma).