TRADING THE GENOME

TRADING THE GENOME

Investigating the Commodification of Bio-Information

BRONWYN PARRY

COLUMBIA UNIVERSITY PRESS NEW YORK

Columbia University Press
Publishers Since 1893

New York Chichester, West Sussex

Library of Congress Cataloging-in-Publication Data
Parry, Bronwyn.
Trading the genome: investigating the commodification o bio-information / Bronwyn Parry.
p. cm.
Revised ed. of author's PHD thesis entitled The fate of the collections (Univ. of Cambridge, 1998).
Includes bibliographical references and index.
ISBN 0–231–12174–1 (cloth : alk. paper)
1. Biotechnology—Social aspects. 2. Germplasm resources.
3. Bioinformatics. I. Title.

TP248.23.P376 2004
303.48'3—dc22

2004045456

Columbia University Press books are printed on
permanent and durable acid-free paper.
Printed in the United States of America

c 10 9 8 7 6 5 4 3 2 1

For Jack, Win, and Juliet

CONTENTS

ILLUSTRATIONS

TABLES

ACKNOWLEDGMENTS

This book, like its subject matter, has been a product of constant reimagining and re-engineering. It began life as a doctoral dissertation at the University of Cambridge, but has since been reworked and refined to take account of phenomena that are, themselves, subject to constant and highly complex processes of change. It would not have been possible for me to produce this work without the continued support of a number of individuals and institutions. Professor Richard Howitt first set me on the path to Cambridge by instilling in me a deep respect for work that is both intellectually rigorous and imaginative and for helping to expand my (then) limited conception of what it is to think "geographically." Professor Linda McDowell provided me with all the strengths of a Cambridge education, encouraging me to think "outside of the box" while simultaneously tempering my more fanciful tendencies with her incisive critique and editorial skill. Beyond this, I am also indebted to her for introducing me to Newnham College, Cambridge. Traveling halfway across the world to undertake a Ph.D. might have been a very alienating experience had I not been made to feel so welcome and supported there by friends such as Eldrid Herrington, Andrew Taylor, Karen McAuley, Kate Dailinger, Cate Hancock, Julia Hoggett and Clare Drury.

More recently, I have benefited enormously from holding a research fellowship at King's College, Cambridge. I am particularly indebted to King's, firstly, for recognizing the importance of undertaking research of this nature and, second, for providing me with the funding and intellectual and material space in which to conduct it. Their continued support has enabled me to convert the dissertation into a book and to extend my research into new domains. It is hard to imagine how I could ever expect to find a more supportive or intellectually challenging work environment.

This research was interdisciplinary in nature, and, as such, it required me to acquaint myself with a number of unfamiliar literatures and epistemologies. I could not have managed this without the patient tutelage of a number of colleagues and friends whose specialties lie in different disciplines: in philosophy and the history and philosophy of science, I owe particular thanks to Cathy Gere, Onora O'Neill, Jim Secord, Neil Manson, and Peter Lipton; in anthropology: Caroline Humphrey, Cori Hayden, Marilyn

Strathern, and Sarah Franklin; in English: the late Tony Tanner, Maud Ellmann, and Iain Patterson; and in molecular biology: Matt Garner. In law, I would particularly like to thank a triumvirate of Australian women lawyers at Cambridge: Natasha Cica, Renee Leon, and Susan Marks. In geography, I would like to thank David Pinder, Phil Howell, Michael Bravo, Laura Cameron, Kristian Teleki, Gerry Kearns, and Catherine Nash, all of whom spoke my language and kept me sane throughout. For their help in conceptualizing this work, I am most grateful. That said, responsibility for the final analysis (and any inaccuracies or misconceptions that it might contain) remains mine alone.

I discovered during the course of this research just how much it costs to do a "multisite ethnography." Investigating global processes really does require travel over great distances, and I could not have undertaken this without the generous financial support of the British Council, The University of Cambridge, Newnham College, and King's College. I would also like to sincerely thank my friends and colleagues in New York and Washington, D.C., including Nora Conant and her family, Art Herrington, Christine Padoch, and Miguel Vasquez-Pinedo, who provided me with accommodation, wonderful meals, support, encouragement, and transportation during the course of my long fieldwork in the United States.

I also owe a very special debt of thanks to all of those people in the United States who agreed to be interviewed or surveyed for this study. The sensitivity of the subject matter is such that all took great risks (both personal and professional) in agreeing to answer my probing questions. Although it has not been possible for me to name all of them here, they all gave several hours, or indeed days of their time, to provide a detailed account of their work practices and relationships, beliefs, and practical and ethical concerns. Their openness and honesty was, in part, generated by their desire to be reflexive about their own practice. I cannot stress how much I appreciate their willingness to involve me in that project. I sincerely hope that the findings of this research can feed back into that process in a constructive way.

Columbia has been as generous, accommodating, and encouraging a press as any first author could possibly hope for. I would like to thank Holly Hodder for inspiring me with exciting ideas as to the shape that the book could take and my editor Robin Smith for successfully guiding the manuscript through the necessary stages to completion. Michael Haskell's copyediting, which I think of as a special kind of orchestration, was extraordinarily sensitive and intelligent, so to my own Robert Russell Bennett, my very sincere thanks. I would like to thank Dr. Jill Whitlock of the Whipple Mu-

seum of the History of Science, Dor Duncan of the Kew Royal Botanical Garden Library, Miriam Gutierrez-Perez at the Wellcome Trust's History of Medicine Library, Jessica Schwarz of Columbia University Press, and Owen Tucker in the Cartography Office of the Department of Geography at the University of Cambridge for their very kind help in selecting and reproducing the images. My thanks also go to the two anonymous readers whose enthusiasm and feedback on a first draft provided some much appreciated assurance and valuable guidance.

On a more personal note I would like to thank Rosie Harris, Trudy Dalgleish, Sue Fern, Wendy Brown, Jenny Vuletic, Ian Bryson, Trish Barker, and Sam Causer for their continued support. I would also particularly like to thank Flora Gathorne-Hardy. Her intellectual curiosity, belief in the thesis, empathy, and good humor enabled all manner of ideas to be realized here. Finally, I would like to thank my family. My parents, Jack and Win have offered unconditional love and support over many years, as have my wonderful sisters Sue, Ann, and Jill, while the Davis family provides me with a very special home away from home, all of which I greatly appreciate. Last, but most important, I want to thank Juliet for her unfailing loyalty and love, for sharing my passions, and for giving me a future I want to run toward.

PREFACE

It is a peculiar fact of life that profound change rarely occurs cataclysmically. In many cases, the revolutions that transform lived experience begin as minor ones that start unnoticed and go on unremarked. Changes occur subtly, almost imperceptibly, and it takes some while before their cumulative and transformative effects become fully apparent. This has certainly been the case with the information-processing revolution and its effect on the way we experience and use particular commodities. If I think back to when I received my first pay envelope, it strikes me as rather odd to recall that it was, actaully, an *envelope*, containing cash and coins. This money was put to use straight away—I used it to pay for my rent, my groceries, and a host of other goods and services. Sometime over the past two decades that practice stopped, for me and for millions like me. Now, I receive my salary electronically, and I pay for everything from train tickets to dry cleaning to car repairs electronically. too. A casual enquiry at any supermarket, garage, or restaurant (in Western countries at least) reveals that cashless transactions like these are now very much the norm. This is not to suggest, however, that hard currency is becoming extinct—the recent introduction of the new two-pound coin in England, the Sacagawea "golden dollar" in the United States, and the creation of Euromoney all confirm that it is not. Nevertheless, it is clear that at some point "money" underwent a transformation, becoming accessible in new ways.

Similar processes have been at work in other domains. Earlier in my academic career, less than ten years ago, undertaking research required some physical stamina. This was not because it entailed strenuous fieldwork but rather because it was necessary to cart back from the library armloads of heavy books and other texts. This too is gradually changing. Much of the information that was once available only in "hard copy"—books, journals, and newspapers—is now obtainable in new digital or electronic forms, as Web pages that I can access instantaneously from any computer terminal, for example. Of course, the books, newspapers, and articles continue to enjoy a hard-copy existence in various locations; I just sometimes choose not to access them in that form, as it is more convenient, or faster, or more efficient to download the material directly from the Internet. Interestingly, is now possible for me to

acquire and circulate the information contained in a book or a newspaper without ever actually having had possession of that book or newspaper. Equally, it has now become possible for me to download music directly from the Net without ever having to purchase a tape or a compact disc.

In each case, the information that is embodied in, or represented by, the material object (the currency, the book, or the compact disc) has, as a consequence of the application of new technologies, become available to me in new forms and through new media. This is not a new phenomenon. Inventions such as the phonograph, the wireless radio, the camera, the photocopier, and other similar technologies have all served to allow information to be embodied and conveyed in new ways. The new informational technologies—microprocessors, satellites, electronic circuitry, and the like—have converged to create another information-processing revolution that is perhaps then not so different in type as it is in degree. It has been possible, for example, to convey "money" by a wireless transaction for more than a hundred years. However, it is only now that the number of transactions that take this form has become so large, and their use so pervasive, that they begin to fundamentally alter understandings of how money is, or can, be constituted, and how it can be accessed and utilized. Global twenty-four-hour-a-day currency trading, for example, could not have eventuated without the development of technologies that enable multiple thousands of electronic financial transactions to occur instantaneously.

New modes of transaction are appearing in many different domains that are only made possible by the development of technologies that enable information-based resources and commodities to be "rendered" in new, more transmissible forms. This rerendering involves a process of "stripping down" these commodities or resources to what might be thought of as their bare informational essentials. So, for example, the information in books or journals, maps, architectural plans, or musical compositions is extracted and conveyed digitally or electronically as web pages, digital images, or MP3 files. Much of the existing body of the work (as we have known it) is divested; the pages of the book and the binding, the notes and coins, the paper plans and plastic discs are dispensed with in order to render the information they contain in new *and highly transmissible* electronic or digital forms.

In the frenetic marketplace of the early twenty-first century, the ability to access information at great speed provides an important competitive advantage. In the worlds of business and finance, at least, an hour-long expedition to the library to gather information that can now be accessed online is a luxury few can afford. Nonetheless, there remain other consumers who con-

sider the experience of visiting the library and handling the books or journals a more enriching one than that involved in accessing the same material online. Over time, separate markets have emerged for the same commodity in variously constituted forms: for online and hard-copy newspapers, for live music, for music recorded on tape or compact disc, and for music conveyed in digital form, as an MP3 file, for example. It is the subject of considerable debate as to whether these markets compete with or complement each other. What is clear, however, is that the ability to present information in new forms is radically altering the existing market dynamics for trade in particular resources or commodities, creating new, vibrant economies in all manner of new entities.

The ability to translate some commodities into highly mobile informational forms has enabled producers to increase the speed at which they can be circulated around the global economy. It also enables them to replicate, combine, and modify these new forms with much greater ease. While this clearly has some distinct advantages, it may also create some complex dilemmas. One of the most serious of these is how to prevent the *unauthorized* use, replication, or modification of information-based products. This particular dilemma has been amply illustrated in the recent legal actions taken against Napster. Napster is a computer interface that enables people to locate and download music in a digital MP3 format from the Internet. It does so by connecting them with other users who have created personal libraries of MP3 files by copying music from compact discs. A recent U.S. report suggested that traffic in these recordings has grown so dense that some 75 percent of computer use in U.S. universities is taken up in the pursuit of MP3 recordings.[1] As most MP3 recordings are illicit copies, their exchange generates no further royalties for the creators of the work.

Unlicensed duplication of recordings has, of course, been commonplace for some time; however, the ability to translate music into digital forms that can be conveyed and downloaded instantaneously via the Internet has dramatically increased both the number of unauthorized recordings and consequent loss of revenue for recording artists, producers, and retailers. At the "Music on the Net" conference held in San Francisco on 20 September 2000, it was reported that record labels are now losing $3.1 billion annually in music sales to unauthorized methods of digital distribution.[2] New products are also being created by combining or manipulating information, such as data and images, that have recently been rendered in new digital or electronic forms. However, the status of many of these "derivatives" remains uncertain. Questions of who should have rights to or interests in works such as

databases that are compiled by combining or manipulating digital or electronic renderings of existing images or data remain hotly contested.

All of this raises the question of whether there are any restrictions on the *types* of information that could be rendered in these new ways and through these new mediums? This becomes immensely significant when we think about the parallels that exist between informational technologies and biotechnologies. Biotechnologies could be said to have a similar effect as other informational technologies, in that they enable biological materials to be stripped down, or rendered, in new more artifactual or even purely informational forms: as cryogenically stored tissue samples, as extracted DNA, as cell lines, MRI scans, or sequenced DNA coded onto databases. These new technological artifacts, (like their counterparts—MP3 files, digital images, e-publications, and the like) privilege the informational attributes of the resource in question (in this case, the genetic or biochemical information embedded in biological material) at the expense of other attributes (such as the majority of the body of the organism), which are divested. When rendered in an either partially or wholly decorporealized form, genetic and biochemical material and information (what I term here "bio-information") becomes infinitely more transmissible, replicable, and manipulable. This is advantageous to many consumers (particularly those working in the life sciences industry) who wish to access and act on this information as quickly and efficiently as possible.

New and potentially very lucrative markets in these forms of bio-information are consequently beginning to emerge. As the science journalist Tim Radford noted recently, these advancements are "fuel[ing] new multi-billion pound industries based on the software of life."[3] The crucial question is: Who is securing control of this new market economy and on what terms? The conflicts that have raged around the public or private ownership of information derived from the Human Genome Project, the controversies surrounding the patenting of gene sequences, and the debate over the commodification of body parts and tissues show that the questions of who "owns" genetic and biochemical materials and information and who should profit from their exploitation remain unresolved. We cannot begin to answer these questions, it seems to me, until a great deal more is first known about how this emerging resource economy in bio-information actually functions. It is particularly important to understand how this new economy will operate, as it has the capacity to create not only new dynamics of biological-resource exploitation but, more importantly, new geographies of justice and injustice. I thus set out in 1995 to investigate how "bio-

informational" resources are being collected and transacted in the global economy and to consider who is securing control of these resources and on what terms, and this book is the end product of that investigation. My hope is that it will illuminate for the reader some of the complex ethical, political, and economic implications of this new trade bio-information and, in so doing, contribute to our understanding of how new technologies will transform our relationship to the natural world in this rapidly evolving, techno-scientific age.

TRADING THE GENOME