

The Future of Meat without Animals

Future Perfect: Images of the Time to Come in Philosophy, Politics and Cultural Studies

Series editors: Michael Marder, IKERBASQUE Research
Professor of Philosophy, University of the Basque Country,
Spain and Patricia Vieira, Associate Professor, Spanish and Portuguese,
Georgetown University, USA.

The *Future Perfect* series stands at the intersection of critical historiography, philosophy, political science, heterodox economic theory, and environmental thought, as well as utopian and cultural studies. It encourages an interdisciplinary reassessment of the idea of futurity that not only holds a promising interpretative potential but may also serve as an effective tool for practical interventions in the fields of human activity that affect entire countries, regions, and the planet as a whole.

Titles in the Series

The Future of Europe: Democracy, Legitimacy and Justice after the Euro Crisis edited by Serge Champeau, Carlos Closa, Daniel Innerarity and Miguel Poniates Maduro.

Taming an Uncertain Future: Temporality, Sovereignty, and the Politics of Anticipatory Governance by Liam P. D. Stockdale.

The Politics of Virtue: Post-liberalism and the Human Future by John Milbank and Adrian Pabst.

The Future of Meat without Animals edited by Brianne Donaldson and Christopher Carter.

Manifestos for World Thought edited by Lucian Stone and Jason Bahbak Mohaghegh (forthcoming).

The Future of Meat without Animals

Edited by
Brianna Donaldson and Christopher Carter

ROWMAN &
LITTLEFIELD
INTERNATIONAL
London • New York

Published by Rowman & Littlefield International, Ltd.
Unit A, Whitacre Mews, 26-34 Stannary Street, London SE11 4AB
www.rowmaninternational.com

Rowman & Littlefield International, Ltd. is an affiliate of Rowman & Littlefield
4501 Forbes Boulevard, Suite 200, Lanham, Maryland 20706, USA
With additional offices in Boulder, New York, Toronto (Canada), and Plymouth (UK)
www.rowman.com

Selection and editorial matter © Brianne Donaldson and Christopher Carter 2016
Copyright in individual chapters is held by the respective chapter authors.

All rights reserved. No part of this book may be reproduced in any form or by any
electronic or mechanical means, including information storage and retrieval systems,
without written permission from the publisher, except by a reviewer who may quote
passages in a review.

British Library Cataloguing in Publication Data

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

ISBN: HB 978-1-7834-8905-3
PB 978-1-7834-8906-0

Library of Congress Cataloging-in-Publication Data

Names: Donaldson, Brianne, editor.

Title: The future of meat without animals / edited by Brianne Donaldson and
Christopher Carter.

Description: Lanham : Rowman & Littlefield International, 2016. | Series: Future
perfect : images of the time to come in philosophy, politics, and cultural studies |
Includes bibliographical references and index.

Identifiers: LCCN 2016027650 (print) | LCCN 2016028116 (ebook) |
ISBN 9781783489053 (cloth : alk. paper) | ISBN 9781783489060 (pbk. : alk. paper) |
ISBN 9781783489077 (Electronic)

Subjects: LCSH: Meat substitutes. | Artificial foods. | Animal culture—Moral and ethical
aspects. | Meat industry and trade—Moral and ethical aspects. | Animal welfare.

Classification: LCC TP447.M4 F88 2016 (print) | LCC TP447.M4 (ebook) |
DDC 664/.9—dc23 LC record available at <https://lccn.loc.gov/2016027650>

∞™ The paper used in this publication meets the minimum requirements of American
National Standard for Information Sciences—Permanence of Paper for Printed Library
Materials, ANSI/NISO Z39.48-1992.

Printed in the United States of America

Contents

| | |
|---|----------|
| List of Figures and Tables | ix |
| Introduction: In the Blink of an Eye <i>Brianne Donaldson</i> | xi |
| PART I: OUR PAST CANNOT MEAT THE FUTURE | 1 |
| Beyond Meat <i>Ethan Brown</i> | 3 |
| 1 Towards 2050: The Projected Costs of and Possible Alternatives to Industrial Livestock Production <i>Brian G. Henning</i> | 7 |
| 2 An Ethical Consumer Capitalism <i>Steven McMullen</i> | 35 |
| 3 The ‘Vegetable Basket Project’: Tracking the Increase of Meat Production and Consumption in China since the 1980s <i>Song Tian with Yao Wang, Mo Zhao</i> <i>Translated by Yuan Gao</i> | 49 |
| 4 The Rise of Non-Veg: Meat and Egg Consumption and Production in Contemporary India <i>Ana Bajželj and Shivani Bothra</i> | 67 |
| 5 Seeing Meat without Animals: Attitudes for the Future <i>Adam Wolpa</i> | 87 |

| | |
|---|------------|
| PART II: NOURISHING INNOVATION/S | 97 |
| Miyoko's Kitchen: Artisan Vegan Cheese <i>Miyoko Schinner</i> | 99 |
| 6 Meat without Flesh <i>Michael Marder</i> | 101 |
| 7 The Future of Animals, the Future of Food: Two Organizations Endeavour to Change Public Attitudes and Appetites <i>Jaya Bhumitra and Bruce Friedrich</i> | 111 |
| 8 New Harvest: Building the Cellular Agriculture Economy <i>Isha Datar, Erin Kim and Gilonne d'Origny</i> | 121 |
| 9 Beyond Happy Meat: The (im)Possibilities of 'Humane', 'Local' and 'Compassionate' Meat <i>Vasile Stănescu</i> | 133 |
| 10 The Future of Industrial Agriculture: An Environmental Justice Perspective <i>Joseph A. Tuminello, III</i> | 155 |
| 11 Exploiting Fantasy: Overconformity in Animal Agriculture, Meatless Meat and Animal Ethics <i>Brianne Donaldson</i> | 177 |
| PART III: MATTERS OF TASTE | 201 |
| Hampton Creek – Dear You <i>Josh Tetrick</i> | 203 |
| 12 Eating Prometheus' Liver: Geoengineered Meat from 1875 to the Present <i>Michael Anderson</i> | 205 |
| 13 Vegan Soul: Moving beyond (animal) Meat in Black Communities <i>Christopher Carter</i> | 217 |
| 14 The Sexual Politics of Meatless Meat: (in)Edible Others and the Myth of Flesh without Sacrifice <i>Rebekah Sinclair</i> | 229 |
| 15 Ethical Spectacles and Seitan-Making: Beyond the Sexual Politics of Meat – A Response to Sinclair <i>Carol J. Adams</i> | 249 |

| | | |
|-----------|--|------------|
| 16 | Making Meaning without Meat: A How-to Guide | 257 |
| | <i>Aaron Gross</i> | |
| 17 | Altermobilities: Animals, Mobility and the Future of Meat | 267 |
| | <i>Matthew Calarco</i> | |
| 18 | Epilogue | 277 |
| | <i>Christopher Carter</i> | |
| | Appendix A: A (non-exhaustive) List of Plant-based and Cultured Meat Food Producers, Funders and Innovation | 281 |
| | <i>Saadullah Bashir</i> | |
| | Appendix B: Strategies for Plant-Based Food Producers | 303 |
| | Bibliography | 307 |
| | Index | 333 |
| | About the Contributors | 337 |

List of Figures and Tables

FIGURES

| | | |
|------------|---|----|
| Figure 3.1 | Meat Production in China (1978–2014) | 50 |
| Figure 3.2 | Meat Consumption per Capita in China (1980–2011) | 59 |
| Figure 3.3 | Pig Breeding Stock in Shanghai, Tianjin and Beijing (1980–2010) (×10,000 units) | 62 |
| Figure 3.4 | Meat Production per Capita in China – Pork, Beef and Mutton (1978–2014) | 63 |
| Figure 5.1 | <i>Intensive Breeding</i> , Jean Marc Côté | 88 |
| Figure 5.2 | <i>A Very Busy Farmer</i> , Jean Marc Côté | 88 |
| Figure 5.3 | <i>GhostFood Trailer</i> , Miriam Simun | 92 |
| Figure 5.4 | <i>DOSD I</i> , Miriam Simun | 93 |

TABLES

| | | |
|-----------|--|-----|
| Table 3.1 | A Comparison of Meat Production of 36 Large and Mid-Sized Cities, 1987–1993 (×10,000 tons) | 57 |
| Table 3.2 | Meat Consumption per Capita in China (1980–2011) (kilogram) | 58 |
| Table 9.1 | Historical Rates of Increase in World Meat Consumption (in metric tons) | 138 |

Introduction

In the Blink of an Eye *Reimagining Our Futures of Food*

Brianne Donaldson

Innovating for a future of meat without animals is a creative act. But creativity can easily be deployed for grotesque ends and, consequently, is not a virtue in itself. The industrialization of animal agriculture is nothing if not the product of immense creativity whose terrifying efficiency and mind-numbing scale elicit intense awe and shame simultaneously if we gaze too long at its workings, immobilized as though looking upon Medusa.

The gears and grist in this production-destruction machine, as Upton Sinclair incisively wrote at the turn of the twentieth century, are living bodies themselves. Workers crack and groan as ‘cogs in the great packing machine’ (2003 [1906], 70), while creatures, ‘so very human in their protests’, are converted from feeling beings into plastic-wrapped parts (30). Before these animals’ deaths, cities’ worth of their bodily wastes overflow lagoons, infiltrating air and waterways, while critical levels of methane contribute more to greenhouse gasses than all the cars on the planet. The suffering of farmed animals (not to mention wild living creatures displaced by agriculture) is well documented and extends far beyond slaughter to include, what Matthew Halteman calls (1) *violations of inherent dignity* [removing animals from habitat, voluntary reproduction, and kinship bonds], (2) *operational harm* [bodily harms/confinement to prevent animal-animal violence; lack of veterinary care, air, light, food/water] and (3) *extreme acts of viciousness* [overt brutality by workers during confinement, transport, herding, slaughter] (2011).

The costs of agriculture impact human creatures and ecosystems as well, as detailed by many authors in this collection. Feedlots, industrial farming operations and slaughterhouses are overwhelmingly located among rural areas and communities of colour and rely upon immigrant and racialized labour forces. Agricultural lobbyists shape food and trade policies that require taxpayers to subsidize the costs of grains for animal feed, indirectly

funding the meat and dairy products that contribute to obesity, heart disease and diabetes. Meanwhile, corn and soybeans proliferate in fields loaded with fossil fuel herbicides and fertilizers, lingering in silos across the globe as increasingly wealthy farmers play commodity trade markets, eyes fixed on the burgeoning middle classes of China and India whose appetites emulate the fast-food fetishism of the West. With the global human population slated to rise to nine billion by 2050, the desire for animal flesh and by-products promises to balloon the current 68 billion mammals born, tortured and killed for food annually to 120 billion over the next three decades (not including aquatic life), in ever more inventive modes of destruction.

Thus, creativity itself is not enough to rewrite this socially sanctioned degradation towards more life-giving ends. Something more is needed to face the grief of it all and not be frozen with inaction. For if our bodies are slow to dismantle our self-negating creations, then our minds and spirits must yet churn forth new imaginaries of futures to come. These visions take root in the unwavering affirmations of our planetary life together with its mundane beauty, startling adaptations and partners in world-shaping who remind us in their quietude that we are not alone on this orbiting home. This insistent, and resistant, life – though presently manufactured for death and extraction – offers us the perennial hope that vitality and longing can yet be refreshed and redirected towards alternate food structures that aim for ever-widening attentiveness to learning from and co-flourishing with our planetary multiplicity.

In the scope of agricultural history traced back twelve thousand years, the last one hundred years of increasing industrialization is but a blink of an eye. It is imperative to place current agricultural practices in this relative timeframe so to realize afresh the fluidity of systems, and the ability to replace existing structures with alternative models. Humans have always had a history of building things and then tearing them down to build something different. Industrial agriculture did not fall to the ground from on high; it was built here by people much like you and I, and we can construct something else. The rebuilding is already underway.

NOTES FROM THE FIELD

Overlooking a prairie hillside at the Land Institute in Salina, Kansas, research director Tim Crews fingers the seeds of an Illinois Bundleflower, a native legume currently being researched for perennial intercropping experiments. Down the slope, breeding plots of drought tolerant silphium (a distant cousin to sunflowers), domesticated ‘Kernza’ wheatgrass, and sorghum shine under the penetrating summer sun as ambassadors for a new era of agroecology. The Land Institute was founded in 1976 and began developing perennial

grains in the late 1990s that could be mixed with other native plants in ‘polyculture prairies’ whose ecosystems do not require pesticides or fertilizers to thrive.

As a till-free system, these experimental plant communities overturn the ten-thousand-year-old tradition of ploughing the soil, a practice that decimates the microbial biome underground, leaves a barren ‘welcome mat for colonizing weed species’, which necessitates perpetual weed-removal either by human labour or fossil fuel herbicides and leads to erosion and run off (Crews 2015).¹ Perennial plants divide their photosynthetic resources between seeds and roots, nourishing a diverse community of life above and below ground – with a billion organisms per gram of under-soil and stable root systems that promote drought tolerance, disease resistance and insect control – while also trapping phosphorous and nitrogen that typically leech out of annually tilled fields cleared of all plant life. Understanding what this kind of soil means for crop production seems an obvious necessity for global agriculture, but as Crews explains, in agriculture that resets the field annually by ploughing, ‘We don’t even look under the hood as to what is possible with a soil like that because that soil is not achievable in annual agriculture’.

The Land Institute’s mandate is to replace *input-intensive* modes of farming begun in the Green Revolution² with *ecologically intensive* modes that achieve the necessary range of processes – such as insect control, disease regulation and fertility – ecologically rather than through inputs. Its primary teacher is the prairie itself whose mixed perennial plant community and established root structure exemplify that goal. Researchers at the institute are then developing edible plants capable of thriving in a place-specific prairie polyculture to produce food for direct consumption by people – rather than feeding it first through livestock. Researchers use two methods in their work: domestication and gene crossing. The first aims to domesticate a wild perennial species – namely grains, oilseeds and potential biofuel crops that return year after year – and then selecting for larger seed size as well as plants that do not drop their seed at the end of the growing season so they can be harvested. Although researchers do use molecular tools to analyse and assess genes, they do not transgenically manipulate them. The second method involves crossing an annual with a perennial (such as an annual wheat with a perennial wheat grass) to create a robust hybrid with high seed quality and high yield that can survive a Kansas winter and summer. Both processes take multiple rounds of selecting for the desired traits in order to develop plants that can thrive in a no-till, low-input prairie polyculture.

Existing agricultural wisdom suggests that perennials simply cannot yield enough seed, as too much of their energy is directed underground. Annuals, on the other hand, have adapted to put more energy into their edible seeds, which is why current models replant annual crops. Crews asserts that our

agricultural futures depends on moving beyond ‘the two-axis world’ of existing annual and perennial logic: ‘While in general, annuals diversify their energy strategy, putting more energy into seeds, that is not always the case – outliers show that perennial plants can produce as much or more seeds, and plant breeders want to focus on selecting for those outliers.... We have to see this variation for what it is worth’.

Crews and his team do not see a corn- and soy-based future, but imagine sweeping prairies blanketing the fields and hillsides of the Midwest without petrochemical inputs, irrigation or excessive human labour. In the interim, the Land Institute wrestles with its own paradoxes – raising monocrop fields of silphium in order to isolate individual plants for gene selection that will eventually live in intercropped prairies, or whether to plough or use herbicides after two to three years to remove one crop when they need to replant another hybrid. But even in these research quandaries, their goal of leaving the microbial biome of the soil intact drives their innovation of new harvesting technology, plant removal and genotype gathering. They are not only looking to produce, but to preserve. They are always attempting to interfere less with what plants do best, and to model their own work on the mutually beneficial efficiencies exemplified by prairie polycultures.

In the meantime, the Land Institute shares its germ plasm and breeding stock with anyone who can further the research, even though this means that they cannot control its development. Their collaborators span the globe in hopes that more research will yield greater, and more diverse, applications of ecologically intensive polyculture food for our future.

RECLAIMING THE CLEAVER

A gleaming cleaver tomahawked into a butcher block may elicit a film reel of mental images from our cultural archives: a white apron smeared with blood, animal carcasses hanging lifelessly uniform in a cooler, the glass deli case filled with the pinkish flesh and processed parts to be incorporated into the evening’s *Betty Crocker* recipe. The creativity of cooking has always required the use and destruction of life. Yet, on January 23, 2016, The Herbivorous Butcher opened in downtown Minneapolis, Minnesota to redefine the cleaver – not as a harbinger of destruction, but as a symbol of its minimization.

Sister-brother duo Aubry and Kale Walch grew up in Guam, where most of their meals consisted of more than one meat. After moving to the United States as a teenager, Aubry got a supermarket job bagging groceries. In the monotony of filling bags with various forms of packaged meats, her mind began to reanimate the flesh, remembering that this ‘thing’ was alive at one time. Life insists, it seems, even in its spectral forms. Kale later followed

suit and both were hastened and heartened by films such as *Food, Inc.*, *Forks over Knives* and *Cowspiracy* to rethink the meat and cheese at the centre of the plate. ‘What we’re trying to do’, Aubry explains, ‘is to take that food on your plate where there was so much damage done and pull it toward the plant-based world’ (Walch 2016).³

From a local community kitchen, the two began perfecting an array of wheat-based meats in what Kale calls ‘a game of ratios’, blending vital wheat gluten with other flours like garbanzo and tapioca. Some of their products (including gluten-free options) utilize pinto beans, rice or nuts to give a meaty texture. Between the spices and diverse cooking methods – smoked, braised, steamed, baked – their products such as Italian sausage, pastrami, Korean ribs, marbled bacon, pepperoni and even porterhouse steak – developed a cult following at local farmers’ markets, selling out regularly. ‘Our customers – especially omnivores – pushed us toward opening a storefront’, Aubry recounts. Beyond this friendly local pressure, the two were approached and provided initial funding to enlarge their Herbivorous Butcher operation by the owner of a nationwide assisted-living facility seeking to move his residents to a plant-based diet in order to reduce their medication dependence. Working with the Mayo Clinic to gather longitudinal data on resident health, the Minneapolis facility has begun to use Herbivorous meats and cheeses in some daily menu items.

Although there are vegan, or animal-free, butchers in Canada and the Netherlands (see Appendix A for details), The Herbivorous Butcher is the first in the United States. Aubry and Kale understand well that their ‘meat-free meats’ and ‘cheese-free cheeses’, still have a cost to life, but they see their products as way to bridge the gap between past traditions ‘of protein that sticks to your ribs, shared with your family’ and the formation of new habits. Aubry elaborates, ‘Our goal is to help people who still eat meat change over.... We’re offering something with health benefits better than any animal product; our protein is enriched with nutritional yeast, B vitamins’ in addition to being high protein and low-fat. Kale adds, ‘We don’t just make meat replacements; we make meat improvements’.

So if their aim is to move away from the traditional consumption of meat and cheese, why recreate the most quintessential image and vocation associated with both? As an unimpressed blogger at National Hog Farmer wrote in response to the shop’s grand opening, ‘If meat and cheese is such a bad thing, then why mimic it? Isn’t imitation the highest form of flattery?’ (Day 2016). Kale seems unperturbed by these questions, ‘We are marketing to a new tradition.... The aesthetic of the shop itself mimics our philosophy: old meets new. The old traditions are updated and made possible because the world cannot sustain animal agriculture much longer and we will need more alternatives like this for those traditions to continue in new ways’. In a determined voice

addressed to the ‘old’ tradition of industrial animal agriculture and slaughter, Aubry adds, ‘These knives are ours now; we’re going to cut vegetables; This word “butcher” is ours now. It’s time you stop what you’re doing’.

The Herbivorous Butcher(s) are receiving franchise requests from around the world – Italy, Germany, Dubai and elsewhere – but their own plan is more measured: to build central kitchen hubs in the south, east and west of the United States that can service storefronts in those regions to reduce the carbon footprint of shipping. They are committed to keeping their products handcrafted and training a generation of artisan butchers to create and cut meat-free meats and cheese-free cheeses. In addition to the regional assisted-living facility, their plant-based products are featured in local restaurants, and they have their eyes on universities and schools. ‘As for the planned moon base, we don’t know; maybe we’ll franchise there too’, Kale laughs. ‘It seems like there is a fundamental shift in empathy; people are beginning to eat with their ethics more than with their stomach, which is refreshing’.

Perhaps this is exactly what worries industrial producers, who take issues with the Walch’s ‘creative wordsmithing’ that uses familiar terms such as bologna, deli ham, pulled pork, fresh mozzarella, Sriracha brats and maple butter to describe the items on their plant-based menu, a move that ‘breaks the truth in advertising rule-book’ (Day 2016). But what seems clear is that The Herbivorous Butcher is not trying to break the rules, but redefine the game altogether for consumers, for animals and for our future ecological health and well-being. The Herbivorous Butcher’s Twin Cities’ location is open 6 days a week and will begin shipping select products nationwide in spring 2016. Every package features their central logo, which also hangs over the glass windows of their downtown store: a razor sharp cleaver wedged into a block of wood, slicing through the dogmas of the past towards an adventurous culinary future with less loss.

THE FUTURE OF MEAT WITHOUT ANIMALS

This book is an attempt to explore and inform creative and careful futures of meat, milk, eggs and cheese without animals. The project emerges in response to the increasing number of plant-based and cellular-cultured (also called ‘in vitro’) food producers whose innovations are gaining recognition, popularity, market share and significant international investment. The Land Institute and The Herbivorous Butcher are merely two among an exploding field of alternative producers creating products that envision a future more in tune with the entanglements of all planetary life.

Contemporary companies such as Beyond Meat, Hampton Creek Foods, Muufri, Modern Meadow, Gardein and Impossible Foods have their sights set

far beyond niche vegetarian markets towards the growing global population and ecosystems begin shredded at the seams. Propelled by new developments in chemistry and technology, plant-based and cell culture producers fashion the taste and texture of animal flesh and fluids from amino acids, fibres and liquids sourced from plants or stem cells. These foods are not meant merely to mimic the experience of a juicy burger as some edible simulacrum. As expressed by Kale and Aubry Walch's aim to make 'meat improvements' rather than mere replacements, plant-based and cultured meat, milk and eggs are designed to surpass their animal doubles with higher nutrition content, less cost and a fraction of the energy inputs.

Massive private sector support is fuelling a growing market share and driving demand. The Gates Foundation, Google Ventures, Obvious Corporation (of Twitter founders Biz Stone and Evan Williams) and international investors such as Hong Kong billionaire Li Ka Shing, along with myriad venture capital firms, are pouring millions of dollars into animal-free fare. Meat substitutes, egg replacers and plant-based extenders are being used in everything from fast-food menus and muffin mixes to mayonnaise and cookie dough – all in hopes of redirecting the predicted increases in industrial animal agriculture over the next 30 years. Industry analysts assert that plant-based meat and eggs are poised to take over one-third of the market by 2054 (Lux 2015).

This collection of essays resides in the hinge between the past and present state of animal agriculture on the one hand, and potential futures of food on the other, in the face of a burgeoning global population. As the first volume of its kind, this text is necessarily broad in scope, in the attempt to map as many issues as possible implicated in a future of meat without animals. The contributors come from diverse perspectives – from food company CEOs to activists and academics in economics, philosophy, religion, gender and race theory, art and environmental ethics. They overlap in their clear commitment to imagine futures without industrial animal breeding and killing, as well as the peripheral destructions associated with mass-produced meat, milk and eggs. They also share a common vision of transforming our self-understanding in relation to other creatures, ecological habitats, and our local and global neighbours. Yet, this does not mean they offer a uniform ethical vision.

CHAPTER OUTLINES

Like the authors themselves, the chapters cut across disciplines. Authors make helpful connections to one another's work, but important points of debate emerge, both concrete and conceptual. The objectives of this book are threefold: first, to critique the current state of industrial animal agriculture from as many angles as possible; second, to explore the development

of plant-based and cultured meat, milk and eggs as alternatives that can be competitively scaled to undermine industrial animal agriculture in global markets; third, to illuminate material and philosophical complexities that will shape the character of a future of meat without animals.

Part I of the book analyses problems with the current meat paradigm. Ethan Brown, CEO of the plant-based start-up Beyond Meat heads the section, providing a snapshot of the motivating concerns and strategies driving Beyond Meat's endeavour. In Chapter 1, Brian Henning provides a comprehensive data-driven analysis of current livestock production and explores the environmental impact of animal-intensive agricultural practices compared to two other dietary scenarios: one that substitutes more energy efficient animals for ruminant livestock and a second that is soy-based. Steven McMullen, in Chapter 2, investigates specific aspects of market economies that support the systemic abuse of animals and make it difficult for consumers to make informed ethical purchasing decisions. McMullen suggests tangible strategies to craft better laws and institutional arrangements that connect producers and consumers for human health, and animal well-being.

Chapters 3 and 4 take us to China and India respectively, where the demands for meat and eggs are profoundly shaping global production. Song Tian, et al. traces the meteoric rise of meat consumption through the liberalization of China's markets in 1978 through the state-sponsored 'Vegetable Basket Project' that continues to transform rural Chinese agriculture and urban diets towards heavy meat and dairy consumption. Ana Bajželj and Shivani Bothra map the rise of non-vegetarian Indian food in the oft-perceived nation of vegetarians, highlighting religious motivations, cultural debates and economic forces powerfully influencing agricultural trends and consumer habits. In Chapter 5, Adam Wolpa mines artefacts from visual culture that reveal inherited social norms that shape present food practices. Featuring twentieth-century artists who foresee the mass-resourcing of life, alongside contemporary exhibits of smells soon-to-be extinct due to climate change, Wolpa attempts to break loose concepts such as 'meat' from their speciesist, human-centric constraints, in order to produce attitudes capable of remaking our collective futures.

Part II investigates the conceptual reversals and paradigm shifts needed to imagine food alternatives that benefit wider swaths of life. Miyoko Schinner, CEO of Miyoko's Kitchen, leads the section by facing down the holy grail of dairy cheese. Her company crafts artisan wheels of Farmhouse cheddar and Double Cream Chive, among a dozen other flavours, all made from cashews, to be shipped nationwide. In Chapter 6, plant philosopher Michael Marder elucidates the etymology of 'meat' beyond edible flesh. Marder thinks persuasively with Hegel, showing how animal-free meats reveal an open-ended model of vegetal growth released from the bodily limits of organism. This

anarchic image – without a unified animal or hegemonic community of consumers – nourishes multiple, decentred habits needed for a regenerated world. Jaya Bhumitra and Bruce Friedrich offer a unique glimpse into two organizations shaping the attitudes and appetites of the future. Bhumitra describes the strategic work of the international farmed animal protection group Mercy For Animals with its targeted focus on socially driven, tech-savvy corporate outreach. Friedrich explains how his organization, The Good Food Institute, brings together scientists, investors and entrepreneurs to create and fund food innovation derived from plants and cell cultures, in a market largely driven by meat reducers. Technology and chemistry merge in Chapter 8 where New Harvest CEO Isha Datar, along with Gilonne d’Origny and Erin Kim, detail their work in cellular agriculture making animal-free milk, eggs, beef and even rhino horn for a ‘post-animal bioeconomy’.

Chapter 9 interrogates the concept of ‘happy meat’ in Vasile Stănescu’s thorough treatment of ‘humane’ farming. Utilizing accounts from small-scale, locavore farmers, Stănescu highlights hidden brutalities inherent in ‘traditional’ husbandry and analyses the limited impact that locally sourced meats have had in creating a viable alternative market for omnivores. Joseph Tuminello turns our attention towards environmental justice in Chapter 10 as a way to examine the overlapping inequities that affect marginalized people, animals and environmental systems in contemporary agriculture. After tracing a brief history of the environmental justice movement, Tuminello maps the inefficiencies of the grain-oilseed-livestock complex and the political ecology of those affected most by industrial farming. In Chapter 11, Brianne Donaldson examines three historic narratives that have characterized American farming from the colonial period to the present – that agriculture is for the people, centred on national security and concerned with an abundant food supply. Rather than overturn these narratives, Donaldson, suggests a strategy of *overconformity* (a term borrowed from Slovenian philosopher Slavoj Žižek) in order for consumers and companies producing plant-based meat, milk and egg alternatives to reveal the fantasies cloaked in these contemporary fables.

Part III ruminates on the alternatives themselves. What conceptual blind spots, damaging hierarchies and unexamined value claims linger within each animal-free bite? Josh Tetrick, CEO of the plant-based egg start-up Hampton Creek begins with an open letter to consumers who want to make better choices, and to food producers who can make it easier for them to do so by leaving animals out of the equation. In Chapter 12, Michael Anderson sketches a quick history of geoengineering technologies that opt for the modification of large-scale systems rather than human behaviour. Do plant-based and cultured food alternatives merely shift unchecked consumption patterns to new frontiers or might they help re-engineer technologies

of domination towards more appropriate practices sensitive to the planet's fragility? Christopher Carter engages race and food from two directions within Chapter 13. First, he asserts the value of plant-based meats for communities of colour disproportionately affected by the placement of factory farms and subsidiary industries. Second, he maps three challenges – access, marketing and food culture – that plant-based meat producers may face when attempting to reach African American consumers. Chapters 14 and 15 explore the gendered dimensions of meatless meat. Rebekah Sinclair orients readers to Carol Adams' landmark text *The Sexual Politics of Meat*, and provocatively argues that animal-free meats, much like vagina-shaped sex toys, keep us tethered to the edibility and subordination of specied or feminized bodies. Carol Adams responds to Sinclair in the subsequent chapter asserting that plant-based meats, in spite of their spectral linkage to subordinated populations, can present anew animal and female bodies in culinary spectacles that interrupt masculine discourses of consumption.

Drawing the book towards its end with Chapter 16, Aaron Gross reflects on the challenges of engaging religious communities, especially in a Judeo-Christian context, regarding the killing of animals for food. Gross provides three suggestions as to how one might explore the diversity of historical views within a given tradition, identify limits of the dominant view and revive past minority streams to be considered and heard by the community in the evolving work of long-lasting religious change. In Chapter 17, Matthew Calarco move us out of the text and onto the real roadways of transportation and mobility systems that devastate individual animals, bisect ecosystems, pollute environments and extend the long-haul logic of profit that rolls over the claims of the more-than-human world. As we consider alternative futures of food, how do we imagine the dissemination of these products and account for the inevitable cost to life and systems affected by their cultivation, manufacture and transit? How do we *move well* in a world of entangled movements?

In the epilogue, Christopher Carter reflects on the new structures of digestion (and indigestion) proposed in this volume, and the text culminates with Saadullah Bashir's considerable database of plant-based and cultured producers, funders and innovations in Appendix A, followed by a makeshift zine in Appendix B containing six strategies for plant-based producers gleaned from the book's chapters.

See-sawing between the shape of plates past and the possibilities of foods' future will not be a linear activity. There is no single thread to recover and follow into a unified horizon. In exploring the *future* of meat without animals, this text reveals a many-sided past and present. The amorphous image on the cover of this book locates us uncertainly between worlds. Are we looking backwards towards the distant fields of agriculture, at the shadows of spectral

animals no longer captive to our appetites? Are we looking forward towards a vague horizon where something strains to come into focus, and into reality?

These multiple threads of plant-based eating will not weave into only one future without animals; the future will be plural, the pathways fractal and criss-crossing. More than a hinge between past and present then, this book is a hub where the manifold resources, narratives, practices and ideas of the past can intersect with present activities before opening up into many reconceived futures.

The future as such, it seems, is no longer a monolithic time to come. Rather the future will be an assemblage of effects between what has been, the multiplicity of efforts and ideas emerging now, and how they synthesize towards different futures for people, animals, plants and the myriad forms of life and systems we hope to thrive with and respond to. ‘The past us dreams the future us’, writes Adam Wolpa in Chapter 5 of this volume, and we stand now in the visions of ghosts. What dreams do we bring for our days to come, for the life of our world, for futures unfolding in the blink of an eye?

NOTES

1. This segment is derived from an interview with Timothy Crews at the Land Institute, Salina, Kansas, August 9, 2015. All quotes herein are derived from this interview.

2. The Green Revolution refers to technology and research initiatives largely in the 1960s (though earlier example can be traced to the 1920s) that increased agricultural production worldwide, particularly in so-called ‘developing’ countries of the world. Norman Borlaug is considered the key figure due to his work creating/expanding high-yielding varieties of cereal grains, irrigation infrastructure, modernization of management techniques, distribution of hybridized seeds as well as synthetic fertilizers and pesticides to farmers.

3. This segment is derived from an interview with Aubry and Kale Walch at The Herbivorous Butcher, Minneapolis, Minnesota, January 7, 2016. All quotes herein are derived from this interview.

BIBLIOGRAPHY

- Crews, Timothy. 2015. Interview by author. Salina, KS. August 8.
- Day, Cheryl. 2016. ‘Vegan Butcher, Just Plain Wrong’. *National Hog Farmer*. January 25. Accessed online February 5, 2016, <http://m.nationalhogfarmer.com/blog/vegan-butcher-just-plain-wrong>.
- Halteman, Matthew. 2011. ‘Varieties of Harm to Animals in Industrial Farming’. *The Journal of Animal Ethics* 1 (2) Fall: 122–31.

- Lux Research. 2015. 'Alternative Protenins to Claim a Third of Market by 2015'. *Marketwired*. February 24. Accessed June 20, 2015, <http://www.luxresearchinc.com/news-and-events/press-releases/read/alternative-proteins-claim-third-market-2054>.
- Sinclair, Upton. 2003 [1906]. *The Jungle: The Uncensored Original Edition*. Tucson AZ: See Sharp Press.
- Walch, Aubry and Kale. 2016. Interview by author. Minneapolis, MN. January 7.